From CRADLE to GRAVE in the Brain
First Breath, Final Bow

As biomedical researchers, most of our work has the ultimate goal of promoting and enhancing health and longevity. But look beyond our own field and it’s astounding how much of what we all (and we mean everyone) do revolves, almost obsessively, around two fixed moments: birth and death. Day-to-day, though, we rarely pause to think of what these actually mean - to us and to society as a whole. We might ponder it occasionally, but in this issue, our team decided to dive right into this complex and controversial topic.

As a species, we’re never fully content with what we have. In our quest for improvement, we not only push the limits of our lifespans, but also what we’re capable of doing while we’re alive. In the not-so-distant future, in fact, many of us may have abilities that can now only be described as superhuman (see page 13). The result? The line between life and death becomes more blurred than ever (see page 7).

But it’s not just our eagerness to live better and longer that is striking. As you’ll read in this issue, we have a preoccupation for controlling death that, in some cases, can be unnerving (see page 14). A tad ironic considering we can’t even seem to agree on the exact moment that life ends (see pages 4 and 5). All the uncertainty isn’t helped by the fact that some diseases are so bizarre that they make us question the very meaning of what it is to be alive (page 9), or indeed, dead (page 11).

Surprise, surprise: (neuro)scientists are drawn to ambiguity. With 19 unique authors contributing articles, the enthusiasm for this issue has surpassed even our extremely popular Sports issue (June 2016). More than ever, this is a feat we can all be proud of, especially considering how busy we’ve all been – see pages 17 to 20 for a peek at all the conferences and meetings recently organized and attended by MedNeuro students.

Finally, we’re inaugurating a new section of the newsletter that we believe is extremely relevant to all young scientists. Focusing on employability, this recurring section is produced in cooperation with the Erasmus+ program Neurasmus. To read what we have in store for the first installment, see page 22.

Enjoy reading the final issue of the year, we’ll be back again in 2017!

Ahmed Khalil and Constance Holman
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 So You Want to be a Scientist? by Philip A. Schwartzkroin.

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 January 23rd, 2017.

This issue’s joint winners are Eileen Schormann and Bettina Schmerl, who wrote wonderful pieces on the newborn brain (page 6) and the undead (page 16) respectively. Congratulations, and thank you very much for your articles!
Near-death Experiences
A More-or-less Neuroscientific Journey Beyond the Light

Every now and then, people who have experienced life-threatening situations report the sensation of a bright light at the end of a tunnel. This personal experience, accompanied by sensations including warmth, peace, so-called out-of-body experiences and vivid hallucinations are grouped under the term near-death experience (NDE). But are NDEs merely a spiritual experience or the outcome of a brain being on the edge of an abyss?

Esoterics versus Neuroscientists
The transcendent explanatory model uses reports in which people experience the phenomenological features of NDEs described above as proof of rather esoteric phenomena such as the existence of an afterlife or God. More worryingly, albeit with poor evidence, they claim that human consciousness is created independently from the body or brain processes. Because each person integrates their near-death experience into their own pre-existing lives and belief systems, it is easy for esoterics to pick those religious stories in order to underline their arguments.

In contrast, the opposition searches for physiological and psychological explanations. For neuroscientists, the fact that many components of the NDE are very similar to experiences associated with pathology, neurological conditions and direct forms of brain stimulation is a strong indication that such experiences have an underlying neural basis. There is no component of the NDE that is unique to being ‘near-death’.

Due to the lack of possibilities to measure the appearance of God, we will focus on the neuroscientific point of view and will also provide arguments against the mind-brain-dualism theory.

Let’s Talk About Science
Although an NDE can be triggered by various medical situations, such as coma, cerebral infarction, cardiac arrest and many more, systematic studies have been restricted to cardiac arrest patients, where 1 in 5 survivors reports an NDE [1]. These studies suggest that NDEs are merely hallucinations – the final visions produced by a massively disinhibited and dying brain. Disinhibition and seizure-like activity, in fact, can be triggered by many psychological and neurological factors, including epilepsy, drug use and trauma [2].

Moreover, a dying brain doesn’t necessarily mean that the brain becomes silent. Jimo Borjigin and colleagues compared brain activities of rats in wakefulness, under anesthesia and after cardiac arrest [3]. Interestingly, all animals showed synchronous gamma waves in the first 30 seconds after cardiac arrest. Their brains seemed to be awake and stimulated, capable of propagating electrical signals. It is believed that the reduction of inhibition in the brain due to anoxia leads to acute hyperactivity. This is plausible when we consider that a change of a few millimoles in extracellular potassium levels can turn stable neural populations into an epileptogenic mess [4].

Esoterical Misunderstandings
Ethical and technical difficulties make it challenging to observe brain activity during medical emergencies in humans, meaning actual physiological data acquired during NDEs is sparse. This incompleteness leaves more room for misunderstanding past findings.

Esoterics have argued that a brain near to death is too unstable to produce hallucinations. The logical problem here is that if the brain is too unstable to support hallucinations, how is it possible that it is stable enough to ‘remember’ mystical experiences? For a scientist, it is crystal clear: If the brain is dead, then surely, so is memory. For esoterics, I wonder whether this is the point where their theory of mind-brain-dualism steps in. So, does this mean that if memory is intact while the brain is dead, then memory is not formed by brain activity?

And coming back to the supposed afterlife: If an afterlife existed for everybody, how come only a fraction of cardiac arrest patients had the chance to catch a glimpse? I will let you think about this.

Spiritual Scientists
To conclude, I want to put aside our scientific urge to explain everything logically and dig out our well-hidden spiritual side. We can’t argue against one aspect of NDE: Most people going through it experience something that a near-death experience once described as: “I remember having this sense of love like I’ve never experienced it before.”

Obviously, these people encounter themselves at the end of their existence, look back and realize that they have no way of correcting their mistakes. Receiving this gift of a second chance must have a noticeable impact on their life thereafter. Thus, I suppose that working on our own karma the very first chance we get is worth it.

How Do You Know You Are Really Dead?

The Medical Definition of Death

The ability to resuscitate people who have "died" has produced some remarkable stories. For example, drowning in cold water seems to slow metabolism to the incredible extent that some people have been revived after half an hour under water [1]. Especially in the age of organ transplantation, identifying the moment of death now involves another life, meaning that death has to be precisely defined. Interestingly, at present there is no standardized diagnosis of clinical death or precise definition of human death. To err on the side of caution and to prevent you from mistaking a living person as dead, here is a helpful checklist [2]:

- no pupil reaction to light
- no response of the eyes to caloric (warm or cold) stimulation
- no jaw reflex (the jaw will react with a "jerk", like the knee, when hit with a reflex hammer)
- no gag reflex (normally, touching the back of the throat induces vomiting)
- no response to pain
- no breathing
- a body temperature above 30 °C, which eliminates the possibility of resuscitation following cold-water drowning
- no other cause for the above, such as a head injury
- no drugs present in the body that could cause apparent death
- all of the above for 12 hours
- all of the above for six hours and a flat-line electroencephalogram (EEG)
- no blood circulating to the brain

The Legal Definition of Death

Unfortunately, in Germany there is no legal definition of death, only a transplantation law [3] which allows the removal of organs if “death is ascertained according to the current status of medical knowledge” (§ 3 Abs. 1 Nr. 2 TPG) and is not allowed if “the final irreversible cessation of overall functions of the cerebrum, cerebellum and brainstem cannot be confirmed according to the current status of medical knowledge” (§ 3 Abs. 2 Nr. 2 TPG). Thereby, brain death is the prerequisite for organ-transplantation. However, in legal practice death is usually defined in the sense of § 3 Abs. 1 Nr. 2 TPG.

In contrast, the U.S. has a less ambiguous definition [4]:

The Uniform Determination of Death Act (UDDA), approved in 1981, defines an individual as dead who has sustained either (1) irreversible cessation of circulatory and respiratory functions, or (2) irreversible cessation of all functions of the entire brain, including the brainstem. It also states that "determination of death must be made in accordance with accepted medical standards". Thus, it is also in a way a rather soft definition. Neither Germany nor the U.S. provide an estimate of when to decide that death will be “irreversible”.

Our current definitions of death may take on new meaning as medical technology advances.

In This World, Nothing Can Be Said To Be Certain ...

... except death and taxes. But as anyone filling out a tax return can attest, certainty does not mean clarity. As our understanding of life changes, so too does our understanding of death.

Prior to the Enlightenment, death was viewed mainly as a spiritual process. In 1768, the first edition of Encyclopaedia Britannica summarizes this position with its definition: “Death is generally considered as the separation of the soul and body; in which sense it stands opposed to life, which consists in the union thereof” [1]. At the time, a combined lack of breath, pulse, and responsiveness was a general rule of thumb in declaring a person deceased. However, faith in this started to fade as experiments began indicating that these processes could be decoupled; for example, Luigi Galvani’s famous discovery in 1780 that electricity could animate a severed frog leg. Meanwhile, a small but significant number of accidental live burials captured the public’s attention. Starting in the late 18th century, there was a mounting public fear of being buried prematurely, and medical science was under pressure to improve its definition of death.

Easier said than done. The more precise medical science tried to be in its definition of death, the more it continued to push those very boundaries. Although some methods of resuscitation were abandoned along the way, such as blowing tobacco smoke into the anus, the advent of cardiopulmonary resuscitation (CPR), artificial ventilation and defibrillation only seemed to confirm the public fear that death was not as final as had been initially thought.

Even with the definition of brain death in 1968, the controversy is unresolved (see previous article), and is intimately intertwined with a deeply existential human question: What does it mean to be alive? At its core is a problem in defining consciousness. How much brain activity is required for consciousness, and is an organism without consciousness something that we value? Without a definition of consciousness, we are finding it very hard to define death.

The Genetic Life After Life

Thanatotranscriptome: a word you probably don’t use every day. It refers to the gene activity in an organism after its death (Thanatos is Greek for death). But wait a minute – gene activity after death? Yes, you read that right. In a recent, groundbreaking study, researchers from the University of Washington found that some genes remain active for up to 4 days after death in zebras and rodents [1] and for up to 12 hours in humans [2]! Interestingly, some genes had their activity increased or were even activated after death. So this was not just a case of certain genes surviving longer than the rest of the body.

A Zombie Organism?

The ‘dead’ organism does not come alive or have any benefits regardless of the number of genes that become active. So what is the use of these postmortem genes? Most were found to be useful in emergency situations like activating the immune system and counteracting stress, but surprisingly, even some developmental genes were activated after death [2]. Peter Noble, the lead author on the study [3] believes that this is due to similar cellular conditions in newly dead organisms and in embryos. These results are interesting for today’s matters on organ transplantation, where it becomes relevant to know what happens to organs after death. Several genes related to cancer became active after death, supporting findings showing the increased risk of cancer in transplant patients [4].

So when are we really dead? After reading this issue, we really need to rethink our definitions!

Little Einsteins-In-The-Making: Brain Development in Newborns

The emergence of new life, the creation of a little human being, is one of the most fascinating events in this world. Of all organs, the development of the brain is one of the first to start and one of the last to end (although it never really ends). The first structure, the neural tube, forms within the first weeks after conception. The first movements of the fetus can be detected by ultrasound after only 7 weeks and are probably because the first neurons and synapses have already developed in the spinal cord. Although a very basic functional brain is present at birth, many aspects of brain development are nowhere near complete yet.

The Birth of Consciousness

Future parents often wonder how much of the outside world their fetus experiences consciously. For example, is it beneficial to play piano music or speak to the little one in the uterus? Although fetuses can open their eyes after some months, they are mainly asleep and can hardly be woken up. Consciousness is defined as awareness of the body, the self and the outside, and is linked to the condition of being awake. Consequently, the process of birth initiates the development of consciousness by waking the fetus. When a newborn is touched by another person, it reacts differently compared to when it touches itself, indicating it has awareness of its own body.

Furthermore, the awareness of smell allows the newborn to pursue the mother’s milk. In addition, the ability to discriminate between the mother’s voice and that of a stranger develops early on. The effort to reach the mother’s breast right after birth also indicates purposeful behavior. Together with other signs such as the sense of pain, language, and short-term memory, newborns fulfill the criteria of basic consciousness and are perfectly equipped to explore the new world.[1]

Explosion of Synapses and Glial Cells

Interestingly, the brain of an infant at birth already contains almost the same number of neurons as an adult brain. Now they only have to form their various connections to form mature neuronal circuits. Therefore, an extremely high number of synapses is built during the first months in a process called synaptogenesis, which requires the selection and elimination of synapses. This process, known as pruning, is highly delicate and, therefore, it is not surprising that early life stress can result in the development of behavioral dysfunctions and mental disorders in adulthood[2].

In the past, it was believed that the selection is mainly dependent on the activity of neuronal connections, while the help of glial cells is only required for removing synapses by phagocytosis. However, more recent evidence supports the important role of glial cells in all stages of pruning. A stepwise removal of low-activity synaptic contacts is achieved by a fine-tuned interplay between neurons, astrocytes, microglia and oligodendrocytes that communicate with each other by secreting molecules [3]. For example, during postnatal development, neurons express the chemokine Cc3cl (fractal-kine) whose receptor is expressed by microglia. As reported first by Paoliceli et al., the lack of this chemokine leads to fewer microglia and delayed synaptic pruning [4].

Sleep, Baby, Sleep...

When one considers the numerous events taking place in the newborn brain – and I’ve only mentioned a few here – it is not surprising that sleep is absolutely essential for flawless neuronal development. All this learning and processing of environmental stimuli, with their accompanying reorganization of nascent neuronal circuits sounds extremely exhausting for such a fragile organism. Intuitively, one would thus think that the phase of sleep linked to physical rest would be most important for newborns. But quite the contrary. It’s actually active sleep, also referred to as rapid eye movement (REM) sleep, which seems crucial for postnatal brain development. Newborns spend about 50% of their sleep in REM (compared to 20% in adults). Indeed, it has been shown that twitching during REM sleep leads to increased activity of Purkinje cells in the cerebellum of rat neonates, indicating that active sleep is important for sensorimotor development [5].

Impact on Our Future Minds

Since the development of a newborn’s brain is highly dependent on environmental stimuli, these bewitching creatures should be protected from any harmful influences – beginning already at pregnancy. Everything we experience in our first years after birth will somehow shape our mind for the rest of our lives. This thought is amazing and terrifying at the same time because at that stage these poor little creatures are dependent on how responsible the outside world is ...

[1] Langercrantz and Changeaux, Semin Perinatol, 2010

Eileen Schormann
PhD Student, AG Krüger

Sleeping newborn infant with an EEG net.
Will We Live Forever *In Silico*?

Our distinguishing feature as humans is our temporally and self-aware mind, which is irrevocably lost when we die. The movie *CHAPPiE* shows a way in which this could be avoided: the title character transfers the mind of his dying friend into a robot’s computing unit. The implications of this mind uploading challenge our ethics, but how close are we to actually achieving this?

Despite being part of a prevalently secular movement, some transhumanists are interested in making immortality real [1]. However, we are still far from understanding all the biochemical underpinnings of biological systems [2], so expanding the lifespan of our bodies indefinitely is beyond our reach for now. That’s why the thought of circumventing the complexity and inevitable fallibility of biological systems, by just storing ourselves on electronic devices, is so appealing. More than just confining the mind to a humanoid cyborg, having the mind wander in a virtual reality would open fascinating possibilities for problem-solving and entertainment [3].

**Can You Upload Your Mind?**

The idea of uploading our minds onto computers has been around since the advent of personal computers and has been extensively explored in the realm of science fiction literature, with works such as those of Arthur C. Clarke [4] or the Neuromancer trilogy [5]. These works date from an era where computing power sufficient to hold a mind was a far-fetched fantasy and knowledge of how the brain works was sparse. Excitingly, nowadays we have much more knowledge and computing power that could pave the way for such advances.

To find a method to upload minds, we first need to define the mind. The leading model states that the mind is composed of our self-aware thinking and judging consciousness plus our autobiographical memory [6]. Since memories are stored in distinct neural circuits [7], many transhumanists believe that mapping the circuits underlying each memory will give us the blueprint for an electronic system able to house these memories [8]. After establishing what the totality of someone’s neural circuitry – the connectome – looks like, the exact computational architecture would have to be reconstructed in silico, and then turned on at the appropriate time.

**Human Complexity Requires Power**

We are slowly approaching the computing power matching that of the human brain. In 2012, the Blue Gene Q supercomputer successfully ran a simulation of 530 billion neurons [9]. While this still does not account for the enormous number of connections in the brain’s neural network or its speed, according to Moore’s law*, we are also not very far from emulating it**.

The connectome of the worm, C. elegans was completely mapped in 2012 [10], but understanding how the cognitive functions of higher mammals work is another level of complexity altogether. Aside from having several orders of magnitude more cells and synapses, one of the biggest challenges is that we still do not understand in detail how the brain produces the sensation of a mind. We know little about how exactly memory works, and even less about our almost-constant stream of consciousness [11].

Another challenge is that a person’s connectome would need to be mapped while the person is still alive. For this, we need accurate and preferably noninvasive technologies for scanning the structure of the brain circuitry, and what we have now is still too imprecise [6]. Still, even with the necessary technological advances, mapping at the cellular level might prove to be insufficient – we may have to record all the different metabolomes at the single-neuron level in order to faithfully replicate a person’s mind in a machine, or go to an even smaller scale [6].

**The Problem is Plasticity**

If against all odds, we succeed in collecting this vast amount of information and upload it onto a computer, a fundamental problem arises: Will this mind really behave like the original mind? A key quality of the human brain connectome is its plasticity. Two scenarios are possible: 1. the electronic mind will not be able to respond to external events, or 2. it will, but will do so differently than the biological one.

Therefore, regardless of whether the synthetic mind has the ability to evolve, a transfer would inevitably create two minds that would eventually diverge and end up responding to outside stimuli differently. In the most extreme case, a transferred mind could turn against its biological counterparts, paralleling dystopian scenarios in which artificial intelligence turns against humans.

So, unless we devise technology that can accurately simulate the biological complexity of the brain in all of its facets, true mind uploading to keep ourselves “alive” will remain a pipe dream.

* In brief, Moore’s law states that computing power doubles every 1.5 years

** See http://bit.ly/2f3p9L1 for a graph of the development of computing power.

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Ioana Weber
PhD Student, AG Tarabykin

www.medical-neurosciences.de
Memento Mori*: How Our Mind Handles the Inevitable End

Death is part of our life. It is the only thing that is both certain and unclear at the same time. And that scares us, well... to death. When you are a child, death is still something surreal, a fuzzy idea that we cannot really grasp. With time we realize that death is all around us, going hand-in-hand with life. We understand that time is limited. But still - dying seems to be distant, a whole lifetime away from us.

Knowledge About Death Makes Us Human

The poet Erich Fried once said “A dog that dies and knows Memento Mori*.” [1]. The knowledge of death and its meaning is all too human and is handled differently depending on the culture or religion. But why are we so afraid of dying? The idea that there is an end to us is simply horrifying. Studies show that our mind has developed a coping mechanism to handle the inevitable end, a so-called anxiety buffer. Confronted with death-related thoughts, we react by identifying stronger with cultural values that stress immortality or higher self-esteem [2]. Survival is a crucial biological instinct, causing us to seek immortality, be it as individuals or as a species (by procreation), by writing to future generations or by seeking eternal life for our soul.

Mental Stages of Dying

And when the time comes and we receive a terminal diagnosis? According to pioneering psychiatrist Elisabeth Kübler-Ross, a dying person goes through five phases of mind. First, there is denial - they won’t accept the diagnosis, blaming a mistake for the result. Next is anger, a reaction to the injustice they have experienced. In the next phase, they bargain - asking for an extension to their lives in return for a sacrifice. When the patient sees that this won’t help, they succumb to depression, which is hopefully replaced by acceptance in the end [3]. The point of acceptance allows the patient to find peace of mind, helping friends and family to say goodbye.

This is, however, only a concept. Reactions to one’s own mortality are still individual and can be a great source of psychological distress when not properly dealt with. For some, this situation might be a source of spiritual growth, but often people do not reach the acceptance stage and struggle with their fate. Even the mother of the five stages, Kübler-Ross herself, did not experience these states of mind and fought against her death until the end [4].

Facing death is an extreme situation, forcing our minds to deal with existential concerns that were never confronted before. Patients often experience emotions and levels of consciousness that are difficult to express and thus use symbolic language to communicate. Seeking order for their lives, they might talk about cleaning up the house. Others prepare for a long journey, expressing the urge to pack a suitcase or feeling nervous about missing a train, representing the approaching departure from life [5]. At the end of their lives, patients in hospices express similar and recurrent regrets when they look back: they wish they had lived their lives in a self-determined way, free of social constraints, and that they had spent more time with friends and family and less time at work [6]. Maybe there is something to learn from them.

The Bright Side

Commodity theory says the value of things depends on their abundance [7]. If life were endless, it would be worthless. We would have no purpose and no pressure to do anything. Death is scary, certainly. But somehow it turns life into a gift. Some people realize this after they survive a life-threatening situation and suddenly worship every moment. Some engage in dangerous sports to walk the thin line between life and death and feel more alive. Some realize it when they face an actual deadline: a fatal diagnosis.

One prominent example might be Wolfgang Herrndorf, a writer who lived in Berlin and fell ill with a glioblastoma in 2010 [8]. The agony that came with his diagnosis put his doubts and fears about his work into perspective and enabled him to write his masterpieces. One of them was his blog: “Arbeit und Struktur”. Living as a writer along the lines of his philosophy of “work and structure”, doing what he loved most, helped him fight off his thoughts about dying and kept him sane.

Death is scary and certain. But is there a bright side to it? Death might help us focus on the things that really matter in our lives. Things we want to achieve. Dreams we want to realize. Or just life itself. After all - we are still alive. We can run a marathon, spend time with our loved ones, write a book or just enjoy the morning sun. We are alive. What a luck.

* Latin; originating from Ancient Rome, the phrase means “Remember that you will die”.


Pina Knauff
PhD Student, AG Wulczyn

Source: http://bit.ly/2dOZosQ
Ten Fingers, Ten Toes, One Heart... and Then What?

The Case of Organ Donation from Anencephalic Babies

In the United States, it is estimated that in 1/1000 pregnancies, the fetus is affected by a condition called anencephaly - a complete lack of forebrain and cerebrum [1]. Instead, these fetuses possess a rudimentary telencephalon and brainstem uncovered by skull or skin. Understandably, this is a serious birth defect, and most pregnancies end in miscarriage. However, surprisingly many babies survive entire pregnancies, accounting for 2-4 babies per 10,000 live births in Germany every year [2].

Most of these children die within hours to days of birth, with some exceptions (more on that later). In the short time that they are alive, these babies may exhibit reflex reactions to external stimulation, but they are blind, deaf, and unable to feel pain. Without a brain, they are completely unaware of their surroundings without any form of consciousness [1]. In absence of additional medical assistance, they usually succumb to cardiac arrest or multi-system organ failure in short order.

At its root, anencephaly is a neural tube defect, like its better-known cousin spina bifida. Little is known about why the neural tube fails to properly form early in pregnancy, though both lab and epidemiological studies have shown that folate acid plays a large role in preventing both it and related disorders [1]. However, a large number of anencephaly cases are still unaccounted for.

Researchers have proposed that some transcription factors may play a role, as well as genes controlling the activity of cilia [3]. Finally, there are also links to medications containing valproic acid (such as mood stabilizers and anticonvulsants) taken by the mother during pregnancy [1].

Ethical Flashpoint

For all its rarity and rapid mortality, one would not think that anencephaly would be a condition to attract the attention of large-scale lobby groups or ethicists. But there is one important factor that sets it apart from many other birth defects: infants with anencephaly, though having no hope of ever being sentient, typically have all other organs in good health. So what about organ donation?

Organs for transplant for infants are vanishingly rare, and many young children die every year while waiting on a donor list [4]. However, a major factor stands in the way of organ donation: due to their rudimentary brain stem activity, most newborns with anencephaly exhibit at least some spontaneous heartbeat and breathing. Thus, they cannot be considered truly brain dead, and donation is out of the question until breathing ceases by itself [1,4].

Almost no-one advocates instant organ removal from living, breathing infants, but there are a number of ethical questions that arise when considering pre- and perinatal care. Anencephaly is most commonly diagnosed via an ultrasound midway through a pregnancy. Though miscarriage is the most common endpoint for these pregnancies, many women must still choose to have an elective termination or to carry the fetus to term, with the hope it may eventually qualify for donor status. This is understandably a heartbreaking decision, made only harder by the legal and bureaucratic hurdles surrounding organ donation [4,5].

And if a child is born, yet more questions arise. For example, it may take quite some time for an infant to be declared brain dead (i.e. breathing/heartbeat cessation), at which point other organs may have degraded to the point where they are not safe to transplant [5]. This is exactly what happened in the case of “Baby Theresa”, an anencephalic baby born in 1992. Her parents fought a prolonged legal challenge to allow Theresa's organs to be transplanted, during which she died naturally. The court was sympathetic to the altruistic motivation of the parents, but stood by their opposing legal position [4].

Life, Death, and Intervention

One option to preserve organ function without changing the definition of brain death is to provide partial life support measures (for example, intubation), until an infant's heart stops beating. However, many ethicists and parents consider this as simply “prolonging the inevitable”, and elect not to go through with these more invasive procedures [4,5]. Keeping anencephalic babies on partial life support also comes with substantial legal baggage.

In 1992, “Baby K” was born with anencephaly, but due to her parents’ firm religious convictions, was placed on life support. After several challenges related to moving the baby between facilities, the hospital eventually brought the family to court, arguing that in the light of limited medical resources, K’s use of a ventilator constituted futile medical intervention. The court ruled in favour of the family, and K lived to the age of 2 years and 174 days [6]. For the record, the longest-living child with anencephaly lived to the age of 3 years and 11 months [7], though it is not clear what form of medical intervention his family used during that time.

At present, the question of organ donation from anencephalic infants is still wide open. Though many guidelines technically permit the retrieval of organs from dead anencephalic infants, it is difficult to gauge how much of this information trickles down to practitioners or patients [4,5]. In some countries, such as the UK, it is estimated that anencephalic organ donation is practically nonexistent [5]. However, most agree that the legal stance on the topic needs to be clarified. And most importantly, parents need to have access to clear information and appropriate counselling before making any decisions.

Until the day that researchers catch up with the fundamental causes of anencephaly, the question of how we define death, even in the rarest circumstances, will have to remain on the table.


Constance Holman
PhD Student, AG Schmitz

Neuronal Fate: A Story of How Neurons Grow up

The person you become all depends on your genes, your education and the experiences you make as you go through life. In science, this is condensed down to "nature and nurture". Oddly enough, this process doesn't seem to be any different for your neurons [1]! Let's have a look at how a stem cell (square one for a neuron) develops into a highly specialized neuron, and is able to take on location-, connectivity-, and marker-specific characteristics.

The career path to becoming a neuron seems quite clear: A stem cell has to become a neuronal progenitor cell, which commits to a neuronal fate and eventually differentiates into a specialized neuronal cell – so far, so good.

But, looking at the nervous system, you will realize that there are lots and lots of neuronal subtypes, each of them perfectly designed for a different task. This begs the question of how a neural progenitor cell knows whether it is to become a peripheral sensory neuron or a pyramidal cell in the brain?

What Determines a Neuron's "Personality"?

Every neuron has a distinct profile of gene expression, axodendritic morphology, neurotransmitter or sensory receptor expression [2].

To reach its final, specialized state, a neuron has to take plenty of decisions of what (not) to become. In the end, the sum of individual decisions leads to a complex cell fate [2].

During development, extracellular signals like molecular gradients or secreted proteins act on neuronal progenitors and lead to the expression of specific transcription factors inside the cell [2]. This signaling, together with epigenetic modifications [3], and the action of microRNAs [4] signal the neuron to differentiate into one specific subtype.

You can think of this process as a step-by-step development: At each stage, the neuron has to make an individual fate decision [2]. Similar to your decisions along your career, a neuron has to commit to one choice: If you decide to do a master's degree in architecture, you will most likely not pursue a career in neuroscience.

To sum up, neurons specialize step-by-step and once a decision is made, there is no turning back (at least not without researchers interfering).


Beyond the Grave: Finding True Immortality

Throughout history people have tried to cheat death, but only very few were granted immortality... at least in a certain sense.

Henrietta Lacks is probably the best studied person by biomedical scientists, yet among the least recognized.

A mother of 5, she was diagnosed with an unusually aggressive cervical cancer in 1951. During her first surgery, her doctors took a biopsy without her consent (patient approval was still a novel concept at that time). However, the tissue was not sent for diagnostics, but to the clinic's cell culture specialist, who for 30 years had tried to isolate immortal cell lines for research [1]. Unlike other cells, Henrietta Lacks' cancer cells divided at a higher rate and kept dividing multiple times without dying, becoming the first "immortal" cell line. Henrietta Lacks died later that year, but her cells continue to thrive to this day. The cell line was called HeLa in reference to the involuntary donor.

HeLa cells have become the cornerstone of modern biomedical research, being the first to test a novel polio vaccine, develop cancer drugs, be cloned, be chromosome mapped and even go to space[2]! In a cruel irony for the family, who were never officially informed nor compensated for their contribution to research, HeLa cells were commercially exploited by companies which earned billions, all while her family couldn't afford health insurance [3].

A book by science writer Rebecca Skloot has finally brought public attention to the family's legacy. [4]

Nowadays, several initiatives, foundations and research institutes have started to honor Henrietta Lacks with memorial lectures, talks and meetings. In that sense, Henrietta has finally reached immortality beyond her cells.


Cotard Syndrome
When People Think They are... Dead!

Generally speaking, you would assume that most people (excluding some emo bands) will not adamantly disagree with the statement that they are alive and breathing, right? However, as strange as this may seem, there really are some people out there who wholeheartedly believe that they have, in fact, already kicked the bucket.

More than a century ago, the French neurologist Jules Cotard was consulted on a mysterious patient who suffered from rather irregular symptoms. The 43-year old female walked into his surgery and complained vividly about being bereft of her brain. In graphic detail, she lucidly described how the lack of nerves, chest, stomach and intestines was upsetting her, and as a consequence of which she insistently demanded to be burnt. To puzzle pauvre monsieur Cotard even more, she was staunchly convinced that she was immortal and wouldn't need to eat – ironically, this story culminated in her death from starvation. Deeply mesmerized by this patient, Jules Cotard first described the syndrome as délire des negations, which later came to be known more popularly as Cotard syndrome.

How Can You be Alive and Feel Dead?
Around 100 other cases with varying severity of this bizarre phenomenon have since been documented. Way more serious than just a trashy bout of existentialism, Cotard patients are consistent that they or parts of them have ceased to exist. Paradoxically, a majority also believe that they are immortal. This understandably leaves patients with severe depression and anxiety.

Three consecutive stages of Cotard syndrome (based on a single patient, though) have been suggested [1]: During the germination stage, incipient symptoms of psychotic depression, such as delusions and suicidal ideation, as well as hypochondria first appear. During the blooming stage, patients deteriorate and delusions of negation appear as the clinical leitmotif. For instance, in the case study that Yarnada and colleagues describe, the patient refused to eat because “Food wouldn't go down my throat. My bowels don't work, and my body can't excrete urine or faeces.” Often, characteristic delusions of immortality appear during this stage. Finally, if not abated, the illness takes a chronic course with persistent, violent symptoms of delusions and fully-blowen psychotic depression.

Anecdotally, Cotard syndrome has been preceded by a variety of other neurological or psychiatric illnesses, including migraines or lycanthropy [2]. In addition, the lack of established diagnosis guidelines means that careful differential diagnosis is necessary to differentiate Cotard syndrome from similar illnesses like asomatognosia.

I Don't Feel, Therefore I Am... Not!
Little is known about the underlying pathophysiological mechanisms of Cotard Syndrome, although several hypotheses have elegantly matched symptoms with neuroanatomical theories. Conceptually, Cotard Syndrome has been explained with a two-factor model of delusional beliefs [2]. The first factor refers to highly unusual experiences (e.g. loss of all emotional experiences) possibly caused by impaired crosstalk between brain areas involved in emotional and sensory processing. Besides abnormal affective processing, patients show cognitive biases by excessive internal attribution. This way, a patient might erroneously attribute the absence of any emotional/sensory experience to the fact that they are, in fact, dead. “I don't feel myself, which I means I have to be dead...”

Neuroanatomically, Cotard-like nihilistic delusions have been related to widespread occipito-parieto-temporal and limbic disconnection, whose role in affective processing is well-known. On the other hand, more frontal areas are believed to be involved in aberrant reasoning and belief evaluation. Also, the usual suspects like the cingulate cortex or the amygdala have been implicated and link well with the widespread prevalence of psychotic depression among patients.

At the same time, it should be noted that the infinitesimal prevalence of Cotard Syndrome makes it a highly difficult illness to study. In addition, patients often present with a host of comorbidities, such as severe depression and anxiety [3], which makes it challenging to disentangle individual pathologies.

Are There Any Treatment Options?
Due to its (luckily) low frequency, there is a paucity of studies on how to treat Cotard syndrome. In general, drugs from various different groups, such as antidepressants or antipsychotics, have been used successfully either alone or in combination. Electroconvulsive therapy, arguably one of the most potent treatments for affective and psychotic disorders, may be more effective, although the literature on this topic is scant. Treating an underlying condition, such as psychotic depression, first always seems a good idea.

So what does the case of Cotard Syndrome tell us? That pretty much anything can go wrong with this strange organ in our head.

How Different Cultures View Early Life and Death

The Beginning...

When a baby is born, parents are usually overwhelmed with emotions, and only want the best for their child. But the interpretation of what “the best” is also depends on the parents’ nationality and can be somewhat, let’s say, “unique”.

Sifudu Smoke
This ritual is practiced in Nigeria and means “passing baby through smoke”. Between the third and fourteenth day after birth, leaves from a Sifudu tree are burnt, causing a pungent smoke that is irritating to the mouth and eyes. The baby is held head downwards into this smoke several times, in the belief that this prevents the child from being frightened, timid or shy [1].

Precious Saliva
An interesting way to give blessings to a baby is practiced by the Wolof people in Mauritania. They believe that saliva can retain words so the women spit into the baby’s face while men spit into the baby’s ear. To ensure that the blessing works, they rub the saliva all over its head [1].

Recycled Wedding Cake
In comparison to applying saliva onto Mauritanian babies, Irish babies seem to have better luck. Couples freeze the top tier of their wedding cake and re-use it for the christening of their first baby. Some crumbs are sprinkled over the baby’s head and if the couples have leftovers from their wedding champagne, this will also be used to wet the baby’s head for good luck [1]. Cheers!

Placenta Power
In contrast to many animal species, eating up the placenta following delivery is a somewhat unusual practice for humans. Proponents of human placentophagy claim that eating their own placenta results in better mood, increased energy and lactation although there is no study that gives evidence for a causal effect. Dried placenta is also commonly used in Chinese traditional medicine to treat infertility, impotence and other conditions [2].

Lithuanian Baby Race
Every year on International Children’s Day (June 1st), Lithuanian toddlers compete in a race where they have to crawl a 5-meter carpet to their mothers as fast as they can. All participants seem to have great fun, and the winner this year crawled the distance within 11 seconds [3].

Toddler Tossing
This ritual may be the scariest one for outsiders. At an annual festival in India, babies and toddlers are tossed from a 15-meter high tower, right onto a landing sheet. Despite appearing to be a traumatic experience for the babies, it is supposed to give luck, health and prosperity to the child [4].

...And The End

Depending on our spiritual or religious backgrounds, we see death as either the end of life or as some sort of transition. Every people has its own way of dealing with death and grief. Some of them seem very creative, others more disturbing.

Fantasy Coffins
This interesting tradition from southern Ghana is based on the belief that life continues after death the same way as it was before. Therefore, people make individual, colorful coffins that often reflect the dead person’s profession or passion, which is thought to allow them to start the afterlife as conveniently as possible [5]. From a boat to a piano to a pack of cigarettes, everything is possible.

Death Beads
Space in graveyards in South Korea is running out, so a law was passed in 2000 mandating that people who get buried need to be removed 60 years later. This crisis led to an invention which has gained popularity during the last decade: Death beads. These turquoise beads are generated by melting the cremated ashes at ultrahigh temperatures [6]. In this way, the beloved one can be kept at home “forever”.

Consuming Grief
As an act of compassion, some tribes in South America, Africa and India used to eat their deceased family members. As a part of the grieving process, the Wari’ people in Brazil ate the complete corpse whereas other tribes, like the Amahuaca Indians, made some sort of gruel out of the ground bones and corn [7].

Death is Not the End
In contrast to Western culture, members of the Toraja ethnic group in Indonesia are buried weeks, months or even years after they pass away. For the Toraja, death is a gradual process toward the afterlife. Therefore, the deceased is wrapped in several layers of cloth and kept in a special room in the family’s home. They are still part of family life, are symbolically fed and taken out every once in a while. At the actual funeral, the social status of the deceased is reflected in the numbers of sacrificed chickens and water buffaloes [8].

Sky Burial
This special form of funeral is practiced in different regions of Asia (e.g., Tibet, Mongolia), where people practice Vajrayna Buddhism. A monk or a rogyapas (body-breaker) prepares the dead body (by taking out the organs) and places it on a mountaintop to return the body to nature. Most of the time, this means that the dead body will be devoured by vultures to the bone. The bones are then ground with a special sort of flour and given to crows and hawks that wait until the vultures have departed [9]. This way, the deceased merges with the wind.


Betty Jurek
PhD Student, AG Prüß

2016 International Graduate Program Medical Neurosciences
The “Right To Die With Dignity”
What Does Legislation Across the World Say About End-of-Life Practices?

With the fast modernization of medicine in the last few decades, life-prolonging methods have gained power in controlling the time of death. Sometimes, however, this comes at the expense of quality of life. Hence, the legalization of practices that allow you to die with dignity, such as assisted suicide and euthanasia, remains a perpetual and controversial debate around the world. Although both define very closely life termination practices, these terms should be distinguished from each other.

Active euthanasia involves a direct medical act that intentionally shortens the suffering of a patient, for example by a lethal injection. It is currently only legal in 4 countries. The Netherlands was the first to allow it in 2002, followed shortly by Belgium. It was made legal in Luxembourg in 2009 and most recently in Colombia in 2015 [1].

My Life, My Death, My Choice
Physician-assisted suicide (PAS) is a life-ending method where the patient is provided with lethal drugs that he or she then self-administers under the supervision of a physician. This method was first legalized in Switzerland in 1942 and is now legal in Canada and some states of the US, in addition to the countries that allow active euthanasia [2].

Passive euthanasia, or “to let die”, consists of the termination (or not starting) of life-maintaining treatments, or forgoing food and drink. It has also been legalized in the countries mentioned above (except the US and Switzerland) and in some others such as Mexico, Ireland, and India [3].

Euthanasia and PAS are strictly regulated and are only authorized if specific criteria are met. In general, conditions require that patients are terminally ill and/or continuously suffering great pain with no treatment to alleviate their agony. The procedure has to be approved by at least one physician and patients have to formulate their desire free of any constraints and in a clear and repeated manner [4].

Moreover, in most countries, patients must be 18 or older to have the “right to die,” with the exception of the Netherlands which grants children as young as 12 years old this right, and Belgium which completely removed the age restriction in 2014. Hence, in September 2016, a terminally ill 17-year-old became the first minor to undergo PAS in Belgium [5, 6].


Valérie Boujon
PhD Student, AG Endres

Total Recall 2.0
Implantable Memory Chip Will Make Our Lives Unforgettable

Having trouble remembering things? Childhood moments, appointments, formulas for the next exam or where you put your keys? Technology is set to make memory problems a thing of the past.

Theodore Berger and his colleagues from the University of Southern California have developed a computer chip that enhances memory capacities. The prosthetic mimics the function of the hippocampus, the area of the brain where a new memory is encoded and transformed into long-term memory. It does so by recording incoming neuronal signals, translating them via defined algorithms and signalling back to the output region [1]. So far, the chip has proven itself useful for simple tasks in rats and monkeys [1,2] paving the way for human trials. By piggybacking on electrodes implanted in epileptic patients, researchers can now record neuronal activity in the hippocampus, hoping to find the algorithms that will allow them to decode the much more complex human memory [3].

The technology, promoted by the US Department of Defense, represents a promising treatment for memory impairment due to dementia, or traumatic brain injury such as in soldiers [4]. However, there is a risk that the chip will be used to implant false memories, erase memories or decode personal memories. Social injustice could arise when superior brain abilities become a matter of who has more money [5]. Even though the technology is not yet ready for the market, the vision for enhanced brain power is there. Kernel is the start-up that has been founded to promote this neuroprosthetic [6]. Enhanced memory is for sale - just don't forget to go shopping!


Pina Knauff
PhD Student, AG Wulczyn

Source: fotolia.com, Dan Race

MAKING MEMORIES LAST WITH A BRAIN IMPLANT

www.medical-neurosciences.de
Brain-gnacy: How Giving Birth Changes Your Brain

If I asked you for the most apparent change in a pregnant woman, you would probably not answer ‘the brain’. Looking at all the physical changes in a woman’s body during pregnancy, it is understandable that the brain seems to be a supporting rather than a main actor in the 9 month-long play called pregnancy. Here is why - surprise - the brain is important for pregnancy and child birth.

The pregnant brain needs to coordinate physiological changes that on the one hand allow the baby to grow and on the other hand prepare the mother for the challenges of giving birth and motherhood. Female sex steroid hormones, like estrogen and progesterone are elevated during pregnancy and can act on the brain to induce changes that favor pregnancy, like increased appetite, a reduced stress response or the inhibition and accumulation of neuropeptides until they are needed [1].

Hungry All the Time?
Growing new life inside one’s body means that a lot more energy is needed - to supply the fetus with nutrients and to build up energy reserves that can be used in the period of lactation after the child is born. Appetite is usually regulated so that energy intake is in balance with energy expenditure [2]. To allow for increased food intake, changes in the brain that suppress the sensation of satiety take place. While satiety is normally signaled by the hormone leptin, the pregnant brain develops a central resistance to leptin, which ultimately increases appetite and food intake [2]. So, in a sense, your brain acts like your grandma, stuffing you with food for the bad times!

Stressless Superwomen
Since exposure of the fetus to high levels of stress hormones increases the risk for cardiovascular, metabolic and psychiatric diseases in later life, it is necessary to minimize the exposure of the fetus to stress [3]. This means that either everyone has to tip-toe around pregnant women, or we need to change the mother-to-be’s physiological response to stress. If only it were possible to reduce the levels of circulating stress hormones! Wait - that is exactly what’s happening. In pregnancy, changes in the maternal hypothalamic-pituitary-adrenal (HPA) axis occur which render mommy hyporesponsive to stressors.

This process involves changes in several HPA components, but also higher brain regions and is reflected by reduced secretion of adrenocorticotropic hormone following stress [3].

Just On Time!
A normal pregnancy is estimated to last around 268 days, and more often than not, the due date is not too far off from what the gynecologist predicted. To prevent premature birth, the brain has to coordinate the availability and action of labor-inducing factors. For example, the neuropeptide oxytocin stimulates contractions of the uterus during birth. Throughout pregnancy, the hormonal environment changes in a way that keeps oxytocin-secreting neurons quiescent, while oxytocin continues to accumulate and its receptor expression increases [1]. This accumulation of oxytocin is believed to facilitate synchronized firing of neurons that then secrete pulses of oxytocin during birth. In concert, these stimulus contractions of the uterus and ultimately facilitate childbirth [1].

How to Be a Mommy
Let the brain do the job. Many mothers-to-be might have wondered at some point if they are capable of being a mom. Maternal love seems to be somewhat natural and unconditional everywhere in the world. You might have guessed it already, it is indeed the usual suspect who pulls the strings for maternal love: your brain.

After birth, maternal behavior needs to be initiated to ensure survival of the newborn. The medial preoptic area (mPOA), which has some control over the reward circuitry, has a central role in the regulation of maternal behavior. Priming of the mPOA by the changed endocrine environment during pregnancy is necessary for the fast initiation of maternal behavior right after childbirth [3]. During delivery, oxytocin is released and acts on receptors in the mPOA and other brain regions - and maternal behavior is induced [3].

Your Kid Lives On In You
During pregnancy, cells from the fetus can cross the placenta and remain in the mother’s body - sometimes for decades. These cells are mainly found in the bloodstream during and right after pregnancy, but can be found anywhere in the body as well. Some studies have even shown a migration of fetal cells to the maternal brain [4]. Different studies found positive or negative effects on maternal health, ranging from increased risk for autoimmune disease [5] to improved wound healing [6].

In a nutshell, your brain needs to adapt during pregnancy and changes a lot of processes in the body. Being the perfect host, the brain does everything in its powers to make pregnancy and being a mother possible.

FOCUS

Juliane Schiweck
PhD Student, AG Eickholt

PREGNANCY MAKES YOU ALMOST IMMUNE TO STRESS

In a normal pregnancy, the due date is not too far off from what the gynecologist predicted.

Adapted from http://bit.ly/2dIWIsi

[3] http://go.nature.com/2d9Du7q

2016 International Graduate Program Medical Neurosciences
Heads or Tails: The Surgical Gamble of Transplanting a Human Brain

One reason why I write for this newsletter is that I want to make neuroscience capture the public imagination. Sometimes, though, that happens in aggravating ways. Often when I get started people interrupt impatiently: “Yeah, that’s interesting,” they say, “but have you heard about the guy that’s going to have a head transplant?” And then I think to myself “Yeah… what about him?”.

“The guy” in question is Valery Spirindov, a 31-year-old Russian entrepreneur with a terminal neurodegenerative condition called Werdning-Hoffman disease that has been systemically destroying his motor neurons. Valery’s single-minded intent to save his own life brought him into contact with one of the world’s leading experts in transplantation medicine. Dr. Xiaoping Ren currently runs a lab at Harbin Medical University, where his team specializes in severing spinal cords and transplanting heads in mice. In several of his papers, it was reported that 22% of animals survived the procedure for more than two hours [1]. In fact, they seemed to regain some bodily function, and were able to eat, drink, and move clumsily around their cages.

Fringe Science or Calculated Risk?
However, Ren’s findings have recently jumped from relatively minor journals to tabloid coverage, as it was revealed last year that he had transplanted the head of a macaque. It survived for an indeterminate amount of time and, according to Ren and others, demonstrated promising motor activity (including biting). A reporter who was shown the “after” video drily reported that the animal didn’t appear to do much at all, apart from blinking when it was poked in the eye with forceps [2].

Part of the reason why head transplantation procedures have been gaining momentum (and media attention) is due to Ren’s partner, Italian neurosurgeon Sergio Canavero. Canavero, in many ways, has been a loud advocate of the procedure, in Spirindov’s case boasting that the surgery would have a “90 percent plus” chance of success [2]. Together with Ren, he is a core member of HEAVEN, the head anastomosis venture project with the rather spectacular plan to sketch out a procedure for “total cephalic exchange in man” [3].

Transplant On the Table
First, the surgery requires one extremely important ingredient: a “donor”. In Spirindov’s case, this will likely be a young male victim of an accident causing brain death. After getting consent from family members, this unfortunate individual would be brought into an operating theatre alongside Spirindov. The latter would be anesthetized, and cooled to 10 degrees Celsius [3]. Such therapeutic hypothermia has been shown to have neuroprotective effects [4], but only to a point. The doctors theorize that after this temperature is achieved, the team would have one hour to move the head without causing irreversible damage.

So away they will go. Both men will be simultaneously decapitated using the GEMINI procedure, developed by Canavero and others. Essentially, the spinal cord is severed using a diamond-coated microblade, while the environment is perfused with polyethylene glycol, a chemical that causes cell bodies to fuse and ideally lessen degeneration [1,3,5].

In an image truly delightful to contemplate, The Atlantic reports that Canavero plans to have the head “float across the operating theater to the donor body on a customized crane, hanging by Velcro straps.” [2]. The two spinal cord remants would then be aligned, doused with more polyethylene glycol and administered electrical shocks, also thought to aid in preventing nerve damage [3,6]. From there, the surgery is mostly mechanical, albeit nightmarishly so. First, blood vessels, then esophagus, trachea and muscles. Easy peasy.

Even if it “mechanically” works, I (and the rest of the medical establishment) have some serious questions. The brain is stunningly plastic, even in adulthood, but expecting a brain to communicate with an entirely new peripheral nervous system is a lot to ask. Even if autonomic functions like breathing and heartbeat regulation are successful, what about sensation? What about motor control? Mr. Spirindov hasn’t walked since infancy. And what about organ rejection (more technically, which half will be rejecting the other)? Will Spirindov ever feel “at home” in his new body?

The Verdict
I am clearly not an expert in any field of the 80+ member team trying to make this surgery happen. There is a lot of expertise being poured into this undertaking, second only to the amount of good will in the project. But as much as I hope for Mr. Spirindov’s sake that he will walk away from this a changed man (in every literal sense), I do not think it will work. I think that Ren and Canavero are really onto something - their techniques are based on decades of work in transplant medicine, and are hardly as Frankensteinian as most stories might have you believe. But their uniqueness is part of the problem.

Their published works are a veritable net of self-citation, and most other experts who weigh in do so from their scientific armchairs. Given the ethical implications, it’s understandable why more scientists don’t want to work on head transplantation. But I believe that participation from a wider scientific community would exponentially increase the team’s odds of success, while bringing some more accountability to its more outlandish claims.

However, despite all of the bombast and exaggeration flying around this news story, I still have to commend everyone involved for getting people legitimately excited (both on biological and ethical standpoint). I plan on following how the story plays out in the coming year, and will be reporting on the eventual outcome right here. Stay tuned.


Constance Holman
PhD Student, AG Schmitz
www.medical-neurosciences.de
ZOMBIES!

As the mist of fall creeps onto our desks, and Halloween stood at the door as I wrote this article, it seemed like the perfect time to deal with one of the most popular phenomena in the literature of life and death (or rather, lack thereof). Mankind has always wondered about what comes after death (nothing vs. heaven / hell vs. rebirth) or if there are creatures who could escape the path of mortality such as ghosts, demons, vampires and, most importantly, ZOMBIES!

Although most of us might have a pretty detailed imagination of what an undead would act and look like, have you ever wondered what is behind the fiction? A PubMed search for “zombie” gives 94 hits, proving that science has dealt with the topic as well. What’s it all about?

Research on the Living Dead

The word “zombie” most likely originates from the Haitian Creole word zonbie, meaning the spirit of a dead person. Documented at least since the 19th century, the term is associated with the concept of a returned and/or reanimated corpse conjured by magic. Nowadays it is often connected to the Haitian Voodoo religion like in the very first movie adaption “White Zombie” [1], although the concept is not a major part of the core religious beliefs. A much more likely explanation for PubMed’s selection than sorcery is knowledge about toxins, such as tetrodotoxin or atropine, and their ability to induce the state of apparent death and/or resurrection by “black magic”, delusions of mind control, or simply false identification of disoriented/mentally ill people as recently deceased [2].

Other articles cover the phenomenon of parasites apparently taking control over their hosts, like the tropic fungus Ophiocordyceps unilateralis which can alter infected ants’ behavior, quite in line with the classic Haitian zombie picture [3]. Amusingly, some sources also use the term to discuss research which should have been buried long ago, but still keeps staggering on [4]. However, medical explanations for zombification are also discussed [2] which is further used as setting for epidemiological modeling of disease spread [5] and to prepare public for emergency survival... although with little success [6].

Immortal and Undying

Apart from being a medical curiosity, zombies have become a major and inevitable pop-cultural phenomenon. Nowadays Zombies are present everywhere: they star very popular TV series (The Walking Dead), entertain us on our smartphone (Plants vs. Zombies), haunt us in super-realistic video games (Resident Evil), frighten us in big-budget Hollywood movies (World War Z) and even mess up classic English literature (Pride and Prejudice and Zombies).

Since the first black and white movies, the typography of zombies changed dramatically: from compliant slaves (White Zombie, 1932) to man-eating monsters (Night of the Living Dead, 1968 and ever after) arising in dangerous flocks (The Walking Dead) or even armies of undead (Game of Thrones) and as intelligent as ruthless predators (28 Days Later). With the release of the popular video game Resident Evil a new reading of the undead was introduced: the infection-based pandemic spreading of zombification leading to annihilation of our societies. In short, the zombie apocalypse.

Vampires were the (rather romantic) horror of the past when social constraints generated a lingering for myths and eroticism. The central plot of these stories have not changed much over the past 200 years. However, modern society and pop culture seems to be more obsessed with new takes on the zombie apocalypse. But why? According to George A. Romero, creator of Night of the Living Dead, zombies’ lasting popularity is due to their similarity with our own mindlessness, therefore also reflecting society problems we would like to ignore [7]. At the same time, zombies are like a blank canvas - anything can be interpreted from their dead eyes, ranging from conservatism, an inertia-filled middle class, consumerism, or mass surveillance. Whatever irritations modern society has can and will be reflected in zombie stories - therefore they never seem to get old [8].

But in the end, zombies are certainly the only group of people sharing our neuroscientists’ enthusiasm for brains!


Bettina Schmerl
PhD Student, AG Shoichet

2016 International Graduate Program Medical Neurosciences
Conference Report: World Health Summit

During the eighth World Health Summit (WHS) this year, a lot of big and ambitious topics were discussed: medical care for refugees, access to medicine, epidemics such as Ebola or Zika, non-communicable diseases such as stroke, antimicrobial resistance (which constitutes one of today’s major health challenges), translational research, technological innovations, data management and empowerment of women.

The WHS brought together about 1800 researchers, physicians, government officials, representatives from industry, non-governmental organizations, and healthcare systems from more than 90 countries to discuss the most pressing issues facing everyday facets of healthcare and medicine in the upcoming decade and beyond. Prominent participants were Herrmann Gröhe, the German minister of health, Emanuelle Charpentier from the Max Plank Institute for Infectious Diseases and Pascale Ehrenfreund from the German Aerospace Center... just to do some name dropping.

Not Your Average Scientific Conference

Rather than a series of snooze-inducing presentations, the three days were full of open dialogues and discussion rounds in small rooms with a handful of appointed speakers who gave short presentations, followed by group discussions with plenty of opportunities to ask questions. The atmosphere was very inspiring and everyone from high-level policy makers to students held discussions together as equals. One highlight of the conference was the startup track pitch competition. This included amazing contributions such as Midge Medical [1], who invented a new blood testing device for malaria, or the startup Glasschair [2], who developed a wheelchair that can be navigated by eye movements, or COLDPLASMATECH [3], a startup that produces an amazing new solution to help wounds heal faster.

Attending this conference was a great opportunity to break beyond one’s comfort zone, meet interesting people from the health sector and of course do some networking (I recommend printing business cards if you want to go next year). But above all, it was a great conference to get updated on global health issues, and it made me want to focus even more on the translational aspect of science.

The conference ended with a call to action in five key central areas of global health [4]: 1) Empowerment of Women and Girls, 2) Right to Health of Refugees and Migrants, 3) Resilience and Global Health Security, 4) Sustainable solutions against antimicrobial resistance, 5) Investment in Research, Development and Health Innovation. It’s all tall order, but nonetheless a good start!

1800 EXPERTS FROM 90 COUNTRIES

Responding to the Devil’s Chaplain

Berlin Students Developing A Diagnostic Test Called "Wormspotter"

“What a book a Devil’s chaplain might write on the clumsy, wasteful, blundering low & horridly cruel works of nature!” Charles Darwin wrote in a letter to a colleague [1]. He knew that nature produces stories beyond the most morbid corners of our imagination. Here is one of them.

Taenia solium

Taenia solium, or pork tapeworm, is a parasite with a complex lifecycle. It reproduces in the human intestine and sheds its eggs in human feces. If a pig eats this feces, the eggs hatch in its gut and the larvae burrow their way into soft tissue, where they wait as dormant cysts until humans eat undercooked pork containing the parasites. This cycle is quite harmless to humans. The nastier possibility is that a human eats tapeworm eggs, due to poor hygiene or contaminated food. The tapeworm then treats the human like a pig: the larvae burrow into tissue and form cysts there. When this occurs in the brain, it can have serious health consequences. Epileptic seizures are the most common symptom, but the cysts can also cause blindness, stroke symptoms, dementia, and in serious cases death.

A conservative guess puts the number of people worldwide suffering such extreme effects in the millions [2]. However, a clear picture of how many people are infected by T. solium does not exist, because the current diagnostic methods are either expensive, unreliable, or both.

Wormspotter

Since summer 2016, a Berlin student team has been trying to fix this. The idea is to use genetic engineering to develop a cheap, simple and accurate diagnostic test for T. solium. This test is called Wormspotter and will enter into the iGEM competition, the largest synthetic biology competition in the world. The hope is that by finding carriers of T. solium, treatment can be directed to those who need it.

The competition will be held in September 2017 at the Massachusetts Institute of Technology in Boston, and the team is still growing. If you’re interested, check out the website diagnost-x.de for more details and contact information.

THE TAPEWORM TREATS THE HUMAN LIKE A PIG

The fact that such misery can be caused by a worm getting “lost”, with no benefit to any species, embodies Darwin’s view of nature’s waste and cruelty. Perhaps, based on an understanding of nature pioneered by Darwin himself, it can be harnessed against its own cruelty.

[1] midgemedical.com
[2] glasschair.de
[3] coldplasmatech.de

Claudia Willmes
PhD Student AG Eickholt/AG Schmitz

Source: Claudia Willmes

Source: diagnost-x.de

Source: www.medical-neurosciences.de

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Source: diagnost-x.de

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Wormspotter Since summer 2016, a Berlin student team has been trying to fix this. The idea is to use genetic engineering to develop a cheap, simple and accurate diagnostic test for T. solium. This test is called Wormspotter and will enter into the iGEM competition, the largest synthetic biology competition in the world. The hope is that by finding carriers of T. solium, treatment can be directed to those who need it. The competition will be held in September 2017 at the Massachusetts Institute of Technology in Boston, and the team is still growing. If you’re interested, check out the website diagnost-x.de for more details and contact information.

THE TAPEWORM TREATS THE HUMAN LIKE A PIG

The fact that such misery can be caused by a worm getting “lost”, with no benefit to any species, embodies Darwin’s view of nature’s waste and cruelty. Perhaps, based on an understanding of nature pioneered by Darwin himself, it can be harnessed against its own cruelty.

MedNeuros on the Loose: PhD Retreat 2016

It all began when an email was sent inviting students to help in the organization of the first ever MedNeuro PhD retreat. Having formed a team of organizers, several meetings were held together with the representative of the Med-Neuro office. The retreat was organized by MedNeuro PhD students with the aim of reinforcing the communication and interaction among the PhD students amidst the exchange of scientific ideas.

The enthusiastic response of students led to a total of 33 registered participants. On D-day, our bus took off at 4 pm en route to Schloss Wahlsdorf, 2 hours south of Berlin. In the bus, each participant received the booklet for the retreat which contained the program schedule, as well as some instructions.

Our graduate school has remained very international over the years, with a diversity of nationalities from across the globe represented. Most students work in labs scattered across Berlin on the Charité campuses, with the majority on campus Mitte. A quick survey showed that most participants are in the middle of their PhDs, although a few students are just beginning and very few almost finishing.

Hitting the Town In Wahlsdorf

When we arrived at Schloss Wahlsdorf, we had a grill party for supper - lots of meat with servings of mixed greens and bread. The quietness of the location with its few inhabitants was a great advantage for socializing and brainstorming. The cool breeze of the night with its accompanying stars in the sky encouraged us to stay outside longer, socializing over bottles of beer and wine. This facilitated the interaction among participants, which was one of the main reasons for organizing the retreat.

The speed dating session that night permitted practically all participants to interact with the others. This already closed the gap between participants making each one feel comfortable and at home. Of course, on a day like this, after embarking on such a long journey, while some preferred to go early to bed, others waited a little while to enjoy the night with the stars and cool breeze. It was full of smiles, laughter and giggling.

From the Bench...

This was the day assigned to the talks and poster sessions for the exchange of scientific knowledge. The organizers ensured that each talk had 5 minutes of discussion and each poster 3 minutes. It was very inspiring to see how the students listened attentively and participated actively in the discussions that arose after each talk. Furthermore, the poster and talk sessions unraveled the dynamism of neuroscience topics in the PhD program, ranging from electrophysiology to clinical studies. To relax our minds after the scientific program, we had a game session combining mime, puzzles, a quiz and making music from some selected scientific words.

... to the Boardroom

We had an interactive table discussion about careers with Rob Thompson, an entrepreneur and well-renowned trainer. His approach was quite different from what most of us are used to. Participants raised questions or topics which were of interest to them and we dealt with them accordingly. We learnt some tips for getting the job we want and building your network. We also learnt how to deal with difficult colleagues and work in a team. The talk was exciting and had a mock job interview with some participants acting as recruiters.

Around 5 pm we prepared to head back to Berlin bringing our 2-day retreat to a successful end.

This was really a retreat to remember and we look forward to making it an annual event. Just in case you missed it, watch out for the next PhD retreat.

The organizing team is grateful to all for your support and enthusiasm shown before and during the retreat. We thank the team (Valérie, Mariana, Priscilla, Fenia, Laura and Veronika) and the Med-Neuro office for the financial support for making this retreat see the light of the day, and of course the wonderful participants without whom the retreat would not have been successful.

Priscilla Koduah
PhD Student, AG Paul
What Do We Get From Obtaining a PhD?

We Are All In the Same Boat

It is often tough work to obtain a PhD. This feeling of frustration, at least for me, especially peaks during periods of failing experiments/methods and lack of progress. But apparently I am not alone in this. I would dare to say that all PhD students experience this. As part of the PhD conference “ENCODS” – held this year in Marienlyst, Denmark – I participated in a workshop on self-management and motivation.

Oh, the Struggle

In the workshop, we discussed what being a PhD student entails on a day-to-day basis. What surprised me was that more or less all of the features contained many negative aspects. As a matter of fact, this ended up being the main focus of the workshop – how extremely hard it is to do a PhD. While sitting in this conference room, for what I thought would just be a 2-hour boost of motivation, it struck me how many of us struggle (sometimes a lot) in our PhDs.

Working long hours by yourself challenges you to be independent and to solve problems at hand. You get comfortable with making your own decisions and you eventually push your boundaries as to how much you can deal with. Working on several projects makes you a master in multi-tasking, and on how to plan and keep an overview. Working on several projects makes you a master in multi-tasking, and on how to plan and keep an overview. Having to meet high expectations automatically takes your work to a higher level.

It is fair to say that obtaining a PhD is a special type of work and not at all a walk in the park. It includes very long working hours, frequently working alone, and being forced to juggle several projects simultaneously while meeting high expectations – all of this for a rather small salary. So how to keep up motivation?

Making the Project Your Own

Quoting the teachers from the workshop, having incentive to continue your PhD requires that you feel that you are in control of your project(s). You know what to do and how to do it, and most importantly you feel that you “own” the project. In order to get there though, you need a steep learning curve plus lots of practice. One key point is to accept that you don’t know everything and yes – you will make mistakes (a lot actually – you will feel fairly incompetent especially in the beginning). You need to be willing to receive advice and criticism and build upon them, otherwise you will not move forward. For my part, the feeling of independence and ownership came when I was one year into my PhD. This came alongside the feeling that I could actually figure out things by myself. Now I keep up motivation because my PhD eventually has become my ‘baby’. The final project will inevitably have my name on it, which means that I will make the most of it despite all the obstacles.

The Practical Stuff

Moving on to more practical aspects... Getting through a PhD requires that you are structured and organized. If you are not such a person by default, then you need to pull yourself together. Having your own stringent way to keep track of your experiments seems like the most obvious thing when working in the lab, but nevertheless things quickly become messy if you don’t keep it tight – talking from experience here. Once things get messy, then everything get unnecessarily complicated and therefore overwhelming. This is a big step towards losing that motivation.

In addition, maintaining good social relationships with people in your group is crucial. As often happens with everything in life, it is not what you know but who you know. Make sure that the environment in the lab is fruitful and friendly. If this means helping out a colleague from time to time, well then it’s well worth it, even if it means that you have to work a bit overtime in your already long schedule. The next time you accidentally destroy something in the lab, they might just be there to help you. Having nice people around you, of course, is not completely in your hands. However, keeping up a positive, helpful approach definitely helps a lot, no matter who you encounter on your way.

What to Get From It?

Hitting rough patches during your PhD is unavoidable, but possible to overcome. So why do we continue with it? Because eventually there are rewards to be collected. Setting aside the technical aspects of learning how to master a pipette or patch clamping, you get skills from a PhD that rarely can be obtained from any other type of work, and here personal development is a crucial and very important aspect.

The experiences you get during your PhD will, on a personal level, make you grow. So even though the workshop on “self-management and motivation” at times mainly felt like group therapy, at the end of the day we were all sitting there because we wanted to improve our personal skills. We know that obtaining a PhD is challenging and this was indeed confirmed when I was sitting in the conference room. But then again, nothing extraordinary ever happens if you constantly stay in your comfort zone, and during your PhD you rarely do. So let’s continue the work.

Henriette Edemann Callesen
PhD Student, AG Winter

www.medical-neurosciences.de
Thoughts About Digital Networking

Let’s be honest. We know that many suitable jobs will never be visible to us. This is because most openings are given away behind closed doors. Being painfully aware of this habit, we are trying to build a large professional network to access these precious, hidden pieces of information about potential jobs.

A quick glance around you will be enough to realize that fewer and fewer people are in tenured positions that provide appropriate social insurance. Instead, most of us have to jump from project to project to make a living. This means that we are constantly on our toes, looking for the next short-term project, contract, or stipend to keep us afloat. On a side note, we scientists are not alone in this — it is a phenomenon seen in many different fields such as graphic design, child care or construction work, to name a few.

Crafting An Online Personality

In our digital world, it has become increasingly important to show one’s presence on specific online networking platforms. Sadly, though, if your online self-promotion isn’t all that impressive, you’ll likely get passed over by potential employers. We are in danger of dividing the job market in two parts. On one hand, there are people who know how to use the internet for self-promotion and engage in networking. On the other hand, there are people who never learned this skill, have underwhelming profiles on LinkedIn, Facebook, Xing or other platforms, or do not want to have their CV exposed on the internet. Even if they work equally hard, or do their jobs better than their networking-gifted peers, they will still have a disadvantage on the job market. And my critique doesn’t stop here. On these online self-promotion platforms some profiles may look fantastic, but in reality one month internships are blown up as ‘work experience’ and made-up titles such as ‘Lecturer’ are self-awarded after having given a single seminar.

What is the consequence? Are we in need of a new education system that puts emphasis not only on technical skills, but also on how to use digital self-promotion? But do we really want a job market that favors those who are the best at showcasing and ‘embroidering’ work experience?

Unfortunately, as we students and job-seekers are not in the position to change the way jobs are given. We are told how important self-promotion and networking is, therefore we adapt. What could we possibly do to change the situation? Let us know your thoughts, and we will publish a follow-up in a future issue of the newsletter.

Claudia Willmes
PhD Student AG Eickholt / AG Schmitz

PIs Are People, Just Like Me!
Experiential Learning at an International Conference (ECTRIMS 2016)

This conference report comes from London, U.K. after Brexit, where the European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS) hosted their 32nd Congress and 21st Annual Conference of Rehabilitation in MS. With a 119-page long scientific program, this congress united 9392 delegates from almost 100 countries around the world, and it was easily the largest event I had ever attended. The congress boasted scientists from all walks of life, from psychologists to computer scientists, from physicists to physicians.

It was incredibly nerve-racking to prepare a poster presentation for all of these big names in MS research. Instead of concentrating on the possibility of embarrassing myself in front of renowned scientists (including my own PI), I decided to focus on the networking opportunities available to me. This turned out to be a great strategy since all of a sudden, I was surrounded by the same people whom I had emailed several times with questions about their research and/or for help previously, but got little or no reply. After speaking to these same PIs about my area(s) of research and background, I found they were very personable and human, like me. They were even mildly interested in my research!

Thus, on top of what I learned from the teaching courses, seminars and posters, I realized that being able to sell yourself and your ideas is still an incredibly valuable skill. Since that conference, I have been invited to more group outings, meetings with visiting PIs, and been trusted to liaise with more external collaborators than before.

A special thanks to the other Med-Neuro PhDs for listening to my poster presentation during the retreat! It really helped me gain insight into my strengths and weaknesses, and to apply this practice in the real world.

In the end, I would definitely take a chance to submit abstracts to large conferences again, even if it is just for the networking!

Claudia Chien
PhD Student, AG Paul

Source: Claudia Chien http://bit.ly/2flTRTtv
Bacteria-infected Mosquitoes Fight Zika

Wolbachia bacteria can infect insects, reduce the fertility of their hosts and influence the sex of offspring. They can also block viruses from reproducing in infected fruit flies and mosquitoes. To hinder the insects’ ability to transmit the Zika virus, infected mosquito larvae will be widely released in Rio de Janeiro, Brazil, and Medellín, Colombia, over the next two years, scientists announced on 26 October. Small numbers of Wolbachia-infected mosquitoes have already been released in both these cities. But large biomedical funders have just announced US$18 million for a massive scale-up of these efforts.

(Ewen Callaway, 2016, Nature)

The 133-million-year-old Brain

In 2004 in East Sussex, England, an amateur fossil hunter found what we now know as the first fossilized dinosaur brain. Just recently, it became clear that the fossil is in fact part of the brain of a massive herbivorous dinosaur. Researchers from Britain and Australia performed forensic examinations using a scanning electron microscope and discovered that the fossil contained tissue from the cortex, the meninges, and blood vessels.

(Brazier et al, 2016 Geological Society of London.)

Pain Passed on by Smell

Mice housed in the same room as one another can pass certain types of pain to each other through smell. It was recently discovered that exposure to inflammatory molecules or withdrawal from drugs or alcohol can cause hyperalgesia, a painful hypersensitivity to touch, heat or chemical irritants. Researchers from Portland, USA found that when mice were subjected to these pain-inducing treatments, untreated mice in the same room also acquired hyperalgesia. Moreover, mice in a separate room began displaying this pain sensitivity after exposure to bedding used by the hyperalgesic animals in the first room. The authors conclude that pain can be transmitted by an olfactory cue.

(Smith et al, 2016, Science Advances)

Open Positions for Master's Students in Neuroscience Research in Berlin

Type: Lab rotation/master’s thesis – with the possibility to transit into a PhD

Project title: Preclinical investigation of the neurobiological and behavioral aspects of repetitive disorders with the aim to improve treatment of these disorders. Techniques may include; behavioral testing, stereotactic surgery, HPLC and qPCR.

Field of research: Repetitive disorders and possible new treatment strategies

Starting date: January 2017 onwards

Research group: Experimental Psychiatry, AG Professor Christine Winter

Contact: Henriette Callesen: henriette-edemann.callesen@charite.de

Claudia Willmes
PhD Student AG Eickholt/Schmitz
Keeping an Eye on Future Job Prospects

Starting this issue of our beloved newsletter, we have teamed up with the Erasmus+ program in Neurosciences (Neurasmus) to bring you a new regular section focused on careers and employability. What makes a European education special? How does it help graduates find attractive jobs? What additional skills do you need to transition successfully to the job market? How will the educational agenda of programs such as Erasmus+ change in the future, and how will students benefit?

In this edition, we start by giving you a glimpse of careers beyond an MSc or a PhD in Neurosciences. We will share the profiles of some of the people who attended this year’s successful MedNeuro Alumni event (see below). From data handling to innovation consulting, their career paths are highly diverse, and we hope their stories will inspire those of you making that exciting—but-sometimes-intimidating leap from education to employment. Mariana Cerdeira from the CNS editorial team shares her thoughts on why there is more to a PhD than research, and what are the choices open to PhDs beyond academia or industry, on page 24.

In the coming issues, we will interview professionals with influential and inspiring as well as diverse careers. We will also offer perspectives on facilitating the transition between study and employment. All of this with contributions not only from our team here in Berlin, but also from our Neurasmus partner universities in Europe.

If you have any suggestions on topics you would like us to discuss in the Employability Section, please contact us at: cns-newsletter@charite.de

We hope you enjoy it!

"Times are changing, positions in our "comfort zone" of academia are decreasing, and the global trend is towards entrepreneurship and self-employment. In this climate, we want to help you make the best of your talents and your strengths. First and foremost, we want to encourage you to start planning early."

Agnès Nadjar, Coordinator of the Neurasmus Consortium

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ALUMNI

Steffen Schulz

Job position: Drug Safety Manager at Berlin-Chemie AG.

What he does: Processes data that he gets from patients and healthcare professionals to assess the risk of drugs that are already on the market.

How he got the job: Talked to people from the company at a job fair and later saw a job ad on their website and applied / Started application 2-3 months before submitting his PhD thesis.

Requirements: As a non-physician and non-pharmacist, a PhD was required for the job / Started straight after his PhD / His job’s working languages are German and English, but the company also has an international department for drug safety that works in English.

Career progression: First started as a trainee on a 2-year contract, then got a permanent contract: first as junior employee, and then manager (after 4 years at the company).

Work-life balance: Berlin-Chemie is family-friendly / He works 40 hours per week / Has to clock-in and out every day / They even check to make sure you’re not overworking.
Caroline Szymanski

Job position: Freelance Innovation Consultant and PhD student.

What she does: Offers workshops and consulting on innovation and design thinking, while finishing her PhD in parallel.

Career path: After her master’s, went to the School of Design Thinking in Potsdam and worked at an innovation agency / Started PhD, became even more interested in design thinking and changed her PhD topic / Paused for a year before continuing with her current topic.

Coordination with PhD: She works with EEG, so she has a flexible schedule that allows her to teach design thinking once a week during her PhD / Now she is writing her thesis and can coordinate it better with her freelance work.

Her clients: Mostly come to her by word-of-mouth and through personal connections / One example of client: coaching a workshop for the Berlin-Brandenburg Center for Regenerative Therapies to increase collaboration in science

Downside: Her PhD took longer than usual, but she did what she wanted to do in parallel.

Léonard Ruedin

Job position: Data Strategist at idalab GmbH (data science agency in Berlin) since the end of 2015.

What he does: Data analysis – not only scientific, but with a focus on mobility, biotechnology and the public sector / Also project and product management, and business development.

Career path: After his MedNeuro master’s, he worked in a life sciences consulting company, and then decided to specialize in data analytics.

Tasks: Works together with his data scientist colleagues to solve business problems with meaningful data analyses / He is the point of contact between the client and the team (mathematicians and computer scientists) / He is also a product owner and carries out the translation of proofs of concept into software solutions

Amanda Snead


What she does: Writes content for marketing initiatives by looking through current cognitive neuroscience research news.

Requirements: Needed a Neuroscience background / Didn’t have previous marketing experience – learned on-the-job.

How she got the job: Found the job online at Glassdoor, applied for it, didn’t get a response, saw the ad again, applied once more, and then got a call back (so don’t be demotivated if you haven’t had a reply – maybe your application just got lost) / Took a month of phone calls, then had to do a writing sample for them.

Why she didn’t start a PhD: Wanted some time away from science before committing to an academic project / Is still considering doing a PhD.

Advice: Ask questions about the specifics of the job / If the leader of the company is very vague about the job description, or if they can’t explain it well, they may be lacking in strategic vision for the company.
7 MYTHS About Careers You Need to Stop Believing

The world of academia has a set of unspoken rules and habits that are historically so intrinsic to the system that many times go unnoticed or uncontested. Some of them might have served a purpose in the past, but are now outdated. Being a PhD student myself, and having been inside the ‘academic bubble’ for over seven years now, I’ve gathered seven very common and widely spread beliefs which, I dare to say, are not exactly true.

1. **Non-academic careers are “alternative” careers.** Very often, careers outside science, or even science-related but not in research, are referred to as alternative careers. ‘Alternative’ implies exception to the rule. But several survey reports from different countries, including the one below by the UK’s Royal Society, have shown that only a tiny percentage of PhDs actually stay in academia, while the vast majority pursue other jobs.

So, in reality, academia is the alternative career path for PhDs.

2. **There are two options: either academia or industry.** This simplistic, binary classification of the career possibilities for PhDs is, unfortunately, very frequently used. In the life sciences, the term ‘industry’ usually refers to pharmaceutical companies. But there are several other institutions and job positions that don’t fall into either of these categories. For example: business consultancy, public policy, patent protection, science journalism, public health, clinical practice, scientific journal editing, program management – to name a few. Once you start searching, you realize there are many interesting options out there. I went from thinking “What will I possibly do if I don’t stay in academia?” to “How will I possibly narrow down my options to only one?”.

A more suitable way to classify career opportunities for PhDs would be: a) academic careers; b) science-related non-academic careers; c) careers outside science; and d) clinical practice.

3. **If you leave academia, you’re a traitor.** You may find this an exaggeration, but believe me – there are quite a few people who think like this. Their argument is that your alma mater spends a lot of money and effort training you, and the least you could do in return is to remain a scientist.

Guilt is a feeling many PhD students have – even when we go on a short vacation break or leave the lab before 6 pm – and we need to learn to free ourselves from it. We should definitely be forever grateful for all the opportunities our universities give us, and be proud alumni. But we
shouldn't feel like we're betraying anyone or turning our back on science if we opt for a non-academic career. Besides, there are not enough academic positions to accommodate all graduates anyway.

It's OK to go to graduate school even if you don't want to be a researcher forever. And wanting to leave academia does not mean you're not a hard-working, committed PhD student.

If you're leaving academia, it must mean you were not good enough to make it in academia.

Once, at the beginning of my PhD, a professor asked me what my plans for after I graduated were. I said I was not sure yet, but I knew I would not stay in academia. He then went on trying to cheer me up: "But you never know how your PhD project is going to turn out... Maybe you'll have great results and be able to get a faculty position one day". So I explained further: "You don't understand... I don't want to stay in academia."

It's true that permanent positions in academia are extremely scarce and highly competitive, and only a handful of very competent people get them. And that many scientists whose first choice was actually to stay in academia are forced to find a job elsewhere. But there is also a number of people who simply prefer certain non-academic careers. Many academics are still shocked by the idea that not everyone in grad school has the dream of running their own lab.

Which brings us to the next myth...

It only makes sense to do a PhD if you want to pursue a career in academia.

This one is a CLASSIC. Most likely every PhD student who has decided not to stay in academia, or wants to work as a physician, has already heard this question: "Then why do a PhD?".

Truth is, the time when a PhD program’s only purpose was to produce university researchers is long gone. A doctorate is an enriching experience that makes one develop countless transferable skills that are valuable in different areas. These include critical thinking, analytical skills, the ability to work independently, problem-solving, time management, resilience, and so many others. It is a long-term professional investment. But it’s definitely not easy. Doing (or not doing) a PhD is a very personal decision and many factors should be considered. But if you decide to go for it, your reasons should make sense to YOU.

A PhD degree is always an advantage over a master’s.

Having a PhD title is no guarantee of getting a better job in the future. It won’t harm, but it won’t necessarily help either. Some employers value a longer ‘real work experience’ over a PhD degree, and many people succeed in landing good jobs straight out of their bachelor’s or master’s. The same applies to a post-doc compared to a PhD.

Each person should draw their own line. Mine, for example, is between a PhD and a post-doc: I believe a PhD is beneficial for many purposes, but I wouldn’t do a post-doc unless I was pursuing a career in academia. Each person’s path is different and unique, and each one should decide how to invest their time and effort the way they judge best.

You're a PhD student and should act like one.

In many countries, a PhD isn't officially considered a job, even though it looks and feels like one. Although you usually already hold two degrees, you're still enrolled in a university and are technically still a student. This ends up making PhD students feel that they're not real professionals.

When a PhD colleague shows up for a seminar or a networking event a bit more dressed up than usual, it even feels weird to see him or her in this 'work attire'. Once, in a soft skills workshop I attended, the coach suggested that we always take our business cards with us to conferences. A few people were shocked: "What, we? Having business cards? But we're mere PhD students...". But if you think about it – why not? It actually makes a lot of sense. The only reason why it feels odd is because it’s not common – but if you would like to do it, you shouldn’t feel restrained by the fear of being unconventional.

Whether you want to stay in academia or not, a PhD is always a temporary position and we’ll soon have to figure out our next move. So we might as well start portraying ourselves as the professionals we are. If we don’t promote ourselves, who will?

These 7 misconceptions are very frequently conveyed in academia and need to be pondered upon. Fortunately, a few graduate programs and institutions are starting to realize the need to tackle these issues and are slowly giving more focus to the theme of ‘careers’. As to us, we should do what scientists do best and question everything – including the mindset that surrounds us daily.

Do you have any other myths to add to the list?

Mariana Cerdeira
PhD Student, AG Harms
In memoriam: Prof. Dr. Uwe Heinemann

On behalf of the CNS newsletter, and before we close out this issue, we would like to say a few words about Prof. Dr. Uwe Heinemann, who passed away this September. Though the timing of this sad event was mere coincidence with this issue’s theme, it is still somehow fitting. On the one hand, we can reflect on how Prof. Heinemann’s passing will affect the neuroscience community in Berlin. On the other, however, he was responsible for the birth of dozens of neuroscience careers, and even our own program.

As you may recall from our last issue, “Happy Anniversary, MedNeuro!”, Prof. Heinemann was instrumental in founding the Medical Neurosciences program in Berlin. Amidst the work of reorganizing Charité’s medical and dental curricula to conform with West German standards, he managed to draw together the academic, bureaucratic, and political will to found one of the first international PhD and MD/PhD programs for neuroscience in Germany.

While developing, coordinating, and chairing dozens of collaborative funding projects, Prof. Heinemann still managed to perform ground-breaking neuroscience research. In total, this amounted to more than 300 publications. Though perhaps best known (and awarded for) his work on temporal lobe epilepsy, he also made significant contributions to the study of neuron-astrocyte interactions, mnemonic memory processes, and neuropharmacology. At a symposium in honor of Prof. Heinemann’s 70th birthday a short time ago, Michael Brecht told an amusing story about branching out to new research fields, and being foiled… by his own mentor. “Everywhere I wanted to go,” he laughed, “Uwe had already been there!”.

On a personal level, Prof. Heinemann also supervised dozens of PhD students and postdocs to whom he was a constant source of inspiration and support. And as a telling update, many have gone on to become stalwarts of the German neuroscience community in their own right (e.g. Dietmar Schmitz, Andreas Draguhn, etc.). His unending energy and curiosity spilled over beyond the lab as well. In fact, Prof. Heinemann was a founding member and Chair of the Neuroscience Research Center, as well as a co-director of NeuroCure. Despite all of this work, Prof. Heinemann still found time to exercise his talents in the classroom: almost all students of Medical Neurosciences probably have fond memories of Prof. Heinemann’s lectures.

To summarize, we at the Newsletter (and in the Medical Neurosciences program in general) owe a large debt to Prof. Heinemann. He truly was one of the creators of Berlin’s current vibrant neuroscience community, and an inspiration to all he encountered. We will certainly miss him, but that will not prevent us from considering all of the future neuroscience he has made possible by his hard work, passion, and curiosity. We are much indebted to you, Prof. Heinemann and will never forget you!

To finish off, we would like to hear a few words from the great man himself. Here is an excerpt of Claudia Willmes’ interview in our last issue. Truly words to live by!

**UH:** “What is a good scientist?” I was once asked by one of my teachers. So I said: a good scientist has to know his heart, have reliable data, and he or she must follow a more or less original question. My supervisor then said “yes, this is a good postdoc, but what is a good scientist?” So here is what we came up with: a good scientist is a person who contributes to the development of his or her field, who has respect for what others do, and is courageous – all in addition to the properties of a good postdoc. [...] But most importantly, know what you want to find out and be courageous. There were so many times during my career when people told me “this will not work”, but we tried it, and it did. When you accomplish this, your career is made!”

Ahmed Khalil and Constance Holman
Editors-in-Chief

Source: Uwe Heinemann
Master’s Graduation 2016
As in 2015, the graduation ceremony of the 2016 master’s students took place at the Festsaal of the Humboldt Graduate School. The spacious and impressive room was filled with excitement from the very beginning. The master’s thesis presentations kicked-started the ceremony. Equally exciting were the poster presentations, which were well received as an interested crowd gathered around them. Each oral and poster presentation was a masterpiece, with experts asking deep, thoughtful questions about the projects. None of the presentations lacked any enthusiasm and, more importantly, they made us proud. We congratulate each of the graduates and wish them all the best for their future careers!

Junior Master’s Students
Transitioning from (mostly) a Bachelor’s degree, 21 new Master students from around the world joined our Welcome Week this year. As usual, the week started with personal introductions that served as icebreakers before the enrollment process. One of the highlights was the guided tour for the newcomers through campus Charité Mitte by the seniors. Special thanks to Carolina and Victoria, the two senior students who took over this responsibility. Yet another event was the tour around the center of Berlin, covering the history of the city during the Cold War, with our guide Sam Noble. With his British charm and humor, he led the students through Germany’s darkest history on a chilly day in an easily digestible way.

Einstein PhD Fellowships
The Einstein Center for Neurosciences Berlin (ECN) calls for applications for its PhD program starting in Fall 2017. The ECN member institutions promote cutting-edge neuroscience research across a wide range of different disciplines and approaches. The ECN provides an umbrella structure that specifically fosters interdisciplinary and collaborative research by facilitating cooperation between institutions and by promoting interaction on all levels. With around 100 internationally recognized research groups, the ECN offers outstanding interdisciplinary training and research opportunities for national and international scientists, with research spanning from synapse to behavior, molecule to disease, and brain to mind.

Closing date for applications is January 15th, 2017.
ecn-berlin.de/education/phd-fellowships.html

Call for Master’s Applications
The Medical Neurosciences Program invites bright and interested students to apply for our program. We await for your application starting in December. Ideally, candidates should already have some laboratory work experience, having worked in a lab for a Bachelor’s project for example, or other types of work experience, e.g. a residency as a medical doctor in a hospital, or similar.

The program’s rigorous and comprehensively structured education in basic neuroscience provides and trains you to approach questions concerning the central and peripheral nervous system. Besides the in-depth theoretical training, our program emphasizes state-of-the-art practical lab experience, preparing graduates for continued research as PhD students.

Closing date for applications is January 15th, 2017.
www.medical-neurosciences.de/en/apply-now

Upcoming Events

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<td>2 Mind and Brain and CCO Christmas Party</td>
<td>17 – 19 Berlin Fashion Week</td>
<td>13 – 17 Brain Awareness Week</td>
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<td>8 – 10 Opening Symposium of the Einstein Center for Neuroscience</td>
<td>20 – 24 Winter School Ethics and Neuroscience</td>
<td>22 – 25 Göttingen Meeting of the German Neuroscience Society</td>
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<td>29.03. – 2.04. Int’l Conference on Alzheimer’s and Parkinson’s Diseases</td>
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Imprint
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Correspondence
Charité – Universitätsmedizin Berlin
International Graduate Program Medical Neurosciences, Charitéplatz 1, 10117 Berlin
ralf.ansorg@charite.de,
t: +49 30 20 93 45 85
f: +49 30 20 93 45 90

Contact:
cns-newsletter@charite.de

Editors-in-Chief
Ahmed Khalil
Constance Holman

Editors
Apoorva Rajiv Madipakkam
Helge Hasselmann
Mariana Cerdeira
James Kerr

Cover and Design
Design and Illustration: Judith Traudes
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lutz.matuschke@tk.de
Tel. 030 - 400 44-86 60