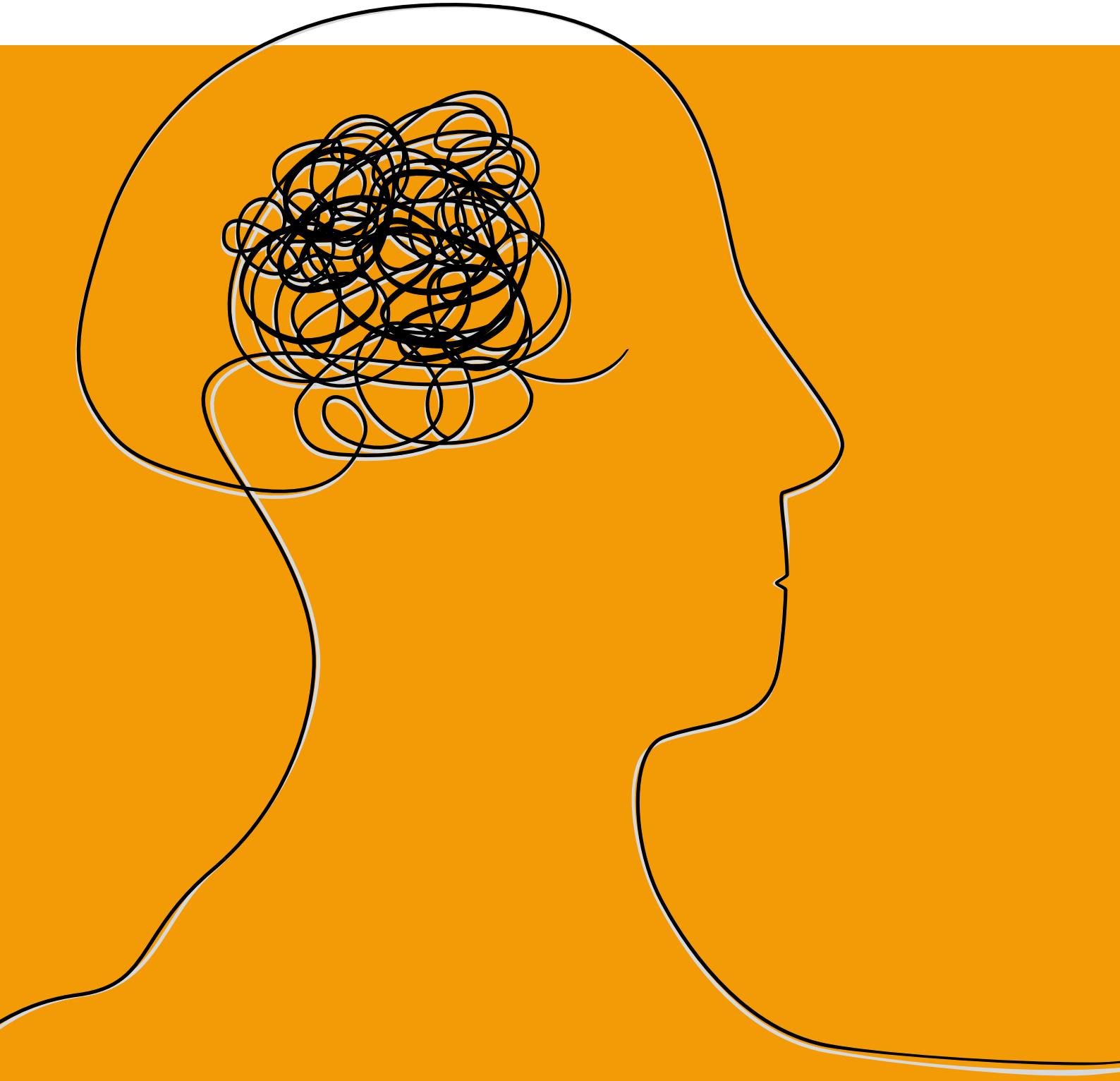
Body and soul

Ethical Aspects of Scientific Progress within Neuroscience



Observations and reflections, speeches and thoughts during and after a conference, arranged by the Swedish National Council on Medical Ethics.

Peter Sylwan

Foreword

Rapid development of new diagnostic and treatment techniques within neuroscientific research.

Developments in medical science give rise to many questions. What do we know, for example, about the different functions of the brain and the source of individual personalities? What neuroscientific techniques are used today? What will be available in the near future? Can we, and should we, improve people's memories, or their ability to interpret and process information? Where do we draw the line between curing people and improving them? Is it possible to use imaging technology to say something about personality, and can such technology be used to read a person's intentions and capacity to make moral judgements? How does this new knowledge affect our view of responsibility and justice? These were just some of the issues discussed at a conference held by the Swedish National Council on Medical Ethics on 8 May 2009.

In this publication, scientific journalist Peter Sylwan gives his personal account of the discussions held at the conference. He bears sole responsibility for the content and conclusions drawn. Through this publication, the Council on Medical Ethics is attempting to spread awareness of progress in neuroscientific research and the new possibilities that may be emerging, but also of the ethical dilemmas they bring with them. The Council hopes that the publication may continue to stimulate reflection and consideration of how we can and should make best use of new findings in the field of neuroscience.

Daniel Tarschys,
Chairman, Swedish National Council on Medical Ethics
December 2009

This is not a summary or report from a conference. It is a personal account inspired, and largely based on, a conference on neuroethics organised by the Swedish National Council on Medical Ethics. This means that the text does not have the same structure as the conference programme and that, at times, it might be somewhat difficult to see who has contributed what knowledge. However, direct quotes are always direct quotes, gathered either during the conference discussions or in email correspondence afterwards. The fact that I have also used many oral and written sources from many years of popular scientific journalism does not make it easier to keep track of where the knowledge comes from. Certain references are provided, however.

Thanks to those of you who gave presentations for agreeing to participate in this kind of production and for generously sharing your knowledge both during and after the conference on **Ethical Aspects of Scientific Progress within Neuroscience** at Rosenbad on 8 May 2009.

The Swedish National Council on Medical Ethics is an advisory board to the Swedish government on ethical issues raised by scientific and technological advances in biomedicine.
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Remarkable stories

It was a very remarkable story. The person who told the story had been a brain surgeon. He had had a patient with a severe haemorrhage inside the skull. The increasing pressure inside the head threatened the brain with lack of oxygen and death. The ensuing operation not only served to stop the haemorrhage and remove the pressure, it also removed a large part of the brain. The prognosis was very bad.

The patient would survive, but there was an obvious risk that he would have to live the rest of his life partly paralysed and, possibly also, mostly or entirely unconscious. That was also the case – at the beginning.

But, many years later, the patient and the surgeon met again, by coincidence. And now, the patient was a fully functioning engineer working towards a doctoral degree. His parents had not given up when faced with the prognosis; instead, they had taken every small opportunity to train and develop any slight connection between body and soul that they had seen a sign of after their son's operation. Gradually they – and the son himself – had trained body and soul to return to an almost normal life despite large parts of the brain being gone.

But what left with the iron bar and the piece of his brain was his ability for sympathy and responsibility. Gage became impulsive in an uncontrolled way, started using bad language and his soul had become hard

There are even more remarkable stories from the world of epileptic care. There are cases of patients who only have half of their brain left – and whose speech, thinking and or other capacities of awareness are impossible to distinguish from those of people who still have their brains intact. There are even examples of children entirely without the left cerebral hemisphere – where the language ability is normally located – who have learnt to talk again using other parts of the right cerebral hemisphere. It is uncertain what parts are used, however. [1]

After such stories, does anyone even dare to say anything at all about what a picture of the activity in the brain means? Or know what an intervention in the brain – chemical, electronic or mechanical – will mean with any certainty? Or say something certain about what the construction of the brain means for the functioning of humans? On the other hand, we have Phineas Gage.

Iron bar in the brain

A very well-liked, sympathetic, responsible, linguistically talented and mathematically skilled head of a group at a railway building site in New England. He who had a terrible accident that sent an iron bar straight through his head. It entered at an angle just below the cheek bone, straight through the frontal part of the brain and removed a square centimetre of brain tissue from the frontal lobe, before it exited through the skull bone. The strange thing was that Gage could stagger away from the site of the accident on his own – leaning on his colleagues, that is. But then, it was no longer he who walked there. Gage was no longer Gage.

He was still as bright when it came to speech and thought. And there was nothing wrong with his language skills or his mathematical knowledge. But what left with the iron bar and the piece of his brain was his ability for sympathy and responsibility. Gage became impulsive in an uncontrolled way, started using bad language and his soul had become hard. One small missing piece of his brain changed the fundamentals of his entire personality. And the increasingly exact and detailed pictures and measurements of the brain confirm and expand the story of Phineas Gage. [2]

1. http://www.scientificamerican.com/article.cfm?id=strange-but-true-when-half-brain-better-than-whole.
2. For comments and a more detailed description of similar cases see, for example, Antonio Damasio "Descartes Misstag" NoK Stockholm 1999.

Our human abilities, such as feelings, speech and thoughts, seem to be very specifically connected to specifically delimited areas of the brain – or might at any rate be connected to the fact that delimited and specific areas in the brain are active or passive. How will this knowledge be developed? What will it mean and for what can it be used when, at the same time, we also seem to be discovering more and more about the large surplus capacity of the brain, its pliability and its ability to compensate? And to what extent can we, and are we allowed to, use our knowledge to intervene and compensate for deficiencies or strengthen those abilities that we are already supplied with by the brain? Those were some of the questions at a whole day of lectures and discussions organised by the Swedish National Council on Medical Ethics (SMER) in May 2009 – Ethical Aspects of Scientific Progress within Neuroscience, and the subtitle Treatment, diagnostics and improvement of the human brain.

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The human being – the moral animal

It is difficult to see what distinguishes the brain of one person from that of another. And it is even more difficult to say what the discernible differences reveal about who a person is. It is much easier to see what distinguishes the brain of a human from that of other animals, and connect construction with function.

In our way of functioning – in our characteristics – four abilities in particular distinguish us from other animals, not in terms of quality but quantity: the ability to keep track of time, the willingness and the ability to see patterns and meaning, our language ability, and our ability to visualise the thoughts and feelings of other people, i.e. our ability to show empathy.

No other animal is as good at visualising time – the future – as humans. A few years after we are born, we can even visualise our own death 70 or 80 years later. And who can live, or would like to live, for such a long time without being able to find – or create – a notion of the meaning of life? Why one thing follows from another and how everything interconnects. We are outstanding at finding – and inventing – order, at seeing patterns in life. This is probably one of the secrets behind the evolutionary success story of our species. We are excellent at visualising time. And the order of things within time. Another is our advanced ability to cooperate – and compete – with other human beings. Both these features presuppose the ability to imagine how other people think and feel. We are excellent at visualising each other. And maybe most important of all: we can talk to ourselves and with each other about it.

In its basic characteristics, the human brain does not differ from that of other animals. All the parts we have, they also have. What distinguishes the brains are the proportions. Different animals have different specialised skills, characteristics and behaviour that give them their particular ability to survive in the particular niche where they live. This is mirrored in the brain. The hedgehog's sense of smell, for example, takes up a large part of the hedgehog's brain. Areas that are not directly connected to sense, memory or motoric functions, the so-called secondary areas, the tasks of which seem to be coordination and overview of all the others, seem to be relatively small in the hedgehog. For primates, they are relatively larger and for humans, they are entirely predominant. For us, it is above all the cerebral cortex in the frontal lobe and the temporal lobe that constitute the predominant parts of the brain.

It is the large secondary areas in our brains that have a unique ability to keep track of what the other parts are doing, weighing these together as a uniform picture of the world and visualising what will happen in the future if we behave in this or that way. Our brain gives us the ability to consider our actions and control impulses that emerge from other parts of the brain and that have been triggered by how we more or less consciously feel, what we hear, see, feel or smell.

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Humans are social creatures. We are created in interaction with others and we cannot live without each other. But we cannot live with each other either without being able to control our impulses. This is confirmed by the 'marshmallow test'. Offer a number of four-year olds a marshmallow and say that they will get another one if they can wait until you return before eating it. About one-third of all children are able to wait; two-thirds aren't. Later in life, it turns out that those who were able to wait have more friends and are more socially and professionally successful than those who could not wait. This also means that we can visualise ourselves in relation to others and that we can imagine how other people see the world. Most of this we can also find in other – in particular social – animals. Primates can wait. They can be fooled. Crows can console each other. But we can do all these things at

a much more advanced level. And then we have language.

Cognitive researcher and philosopher **Peter Gärdenfors** from Lund University shares his knowledge with us at the SMER seminar. His conclusion is that it is only humans that can have morals. But his conclusion does not mean that we are the only ones to behave in a moral way. Other animals – in particular social animals – can in our eyes perform moral heroic acts (see for example http://www.youtube.com/watch?v=ofpYRITtLSg). But they cannot reflect upon it – and definitely not talk to themselves or with others about it and conclude that they should have done something else instead. And should do so in the future. And as pointed out in the discussion – humans are thus the only kind of animal that behaves in an immoral way. That is, despite the fact that we know how we should behave, we can consciously do things entirely differently.

Perhaps this is exactly what the great story about the Fall of Man is all about. Not that humans sin, but that we learn – and become aware of – the fact that we can sin. Someone who is asleep does not sin, even if they are a somnambulist and dream about crimes that they actually also commit. Small children and animals are without sin. It is not difficult to agree on that. One does not reach the age of criminal responsibility until the Fall, i.e. the age of 15. But how do we deal with adults whose brains do not function as they should?

Peter Gärdenfors, Professor of Cognitive Science

People who have 'holes' in their head, whether this is due to a stray iron bar, brain tumour, physical and emotional abuse (such as in the Ceauşescu orphanages), alcohol abuse, being unable to hold one's liquor – or simply an inherent characteristic that makes someone unable to have a moral attitude to their own life and fellow humans.

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Ghosts from the past

Behind each attempt to connect body and soul – the functioning of humans with the construction of the brain – there is a range of hovering historical ghosts. Cesare Lombroso (1835–1909) is among the best known. It was he who claimed and got sympathy for the view that the external features of a person mirrored their inside.

There might still be someone around with an unconscious prejudice about the connection between a high brow and a large ability to think? If so, this is a legacy from Lombroso, as is the saying 'cudgel one's brains' in the hope of finding the answer to a difficult question. Even if his hypotheses are now as dead as he is, he was still the first to claim that an 'image' of the brain could also be connected to how it worked. Herman Lundborg is another ghost from the past – the prominent Swedish figurehead of European racial biology. The racial biology that consistently connected the shape of the skull with characteristics and, on that basis, evaluated races – and individuals – as more or less useful to society, at times as dangers to society and in many cases not valuable enough to be allowed to pass on their genes to new generations.

"Until 1960, about 17 000–18 000 people in Sweden were sterilised for genetic or social reasons, or, which was probably most common, a combination of both reasons," says **Mattias Tydén**, historian at the Institute for Futures Studies.

Niels Lynöe, Professor of Medical Ethics

In the years 1935–1975, a total of more than 60 000 people were sterilised; slightly more than 90 per cent were women.[3] More than half of these women were, however, sterilised at their own explicit request. These may have been women who had already given birth to many children and who could simply not deal with any more, as Professor of Medical Ethics **Niels Lynöe** said in a discussion after the conference. That such a request was sometimes called 'unlawful sterilisation' says a great deal about the view of the role of women in society. It did occur that in their applications to the Medical Board for permission to carry out a sterilisation, doctors incorrectly stated racial motives for the sterilisation.

The fact that they were allowed to conduct sterilisations with racial motives as a pretext – in addition to those who were sterilised by force or after having been persuaded for strictly racial reasons, but also for other social reasons – forms, together with Lombroso and Lundborg, a pattern that is cause for concern. A pattern where hypotheses, theories and results from the world of science are being driven forward in the search for – and being used to give – legitimacy to the notion about what people, what behaviour and what societies are desirable. And that, among conflicting contemporary theories and knowledge, we always seem to choose those that best fit the notions of the time period. Our entire colonial history, slave trade, the new human being' of communism and the mass murder during World War II of inferior' races and kinds of humans are part of this pattern.

The convenient truth

Also in the 1930s, a large number of serious geneticists had strong and well-founded arguments for the fact that it is actually not possible to pursue eugenics.

3. International Journal of Mental Health, vol. 36, no. 1, Spring 2007, pp. 18–27 and, "Oönskade i folkhemmet. Rashygien och sterilisering i Sverige". Gunnar Broberg & Mattias Tydén (Stockholm 1991).

Those who, at that time, would have liked to build a tribune from which to sing the praises of the possibilities of diversity, immigration, mixed marriages and equality, would also have been able to find material among the theories of genetics and evolution. But who would have dared to build such a tribune, and who would have listened when the message that was being broadcast from other tribunes was a different one. Time determines what we want to know and how we use the knowledge we select, both as individuals and as a society.

"The technical trend and thus the uniform organisation of society tend to continuously increase the requirements for intelligence and character."

At the seminar, Mattias Tydén and several others provide the underlying material for this story about ghosts from the past. And this is emphasised with a quote from the interwar period:

"The technical trend and thus the uniform organisation of society tend to continuously increase the requirements for intelligence and character."[4]

In this case, it is rather a question about sociologically oriented debaters who, despite a certain scepticism towards eugenics, considered that a rational' view of human beings and their ability also meant that certain individuals did not fit into society. The sterilisation policy might thus be a suitable model.

Naturally, most of us consider ourselves to be immune to the values and conclusions of the 1930s. But Mattias Tydén shows us a new quote. This time, it is a statement by specialists in neurology and genetics from our own time:


Mattias Tydén, Ph.D. in History

"Functioning well in an increasingly complex society requires unique human functions of the brain: the ability to concentrate, select relevant information and carry out plans of action. When these processes do not function effectively, very good intelligence or other gifts are not enough. It is still difficult for the individual to achieve goals in work and family life".[5] Naturally, Mattias Tydén does not mean that these statements are necessarily incorrect. But what if contemporary research claims to find more and increasingly sophisticated connections between body and soul? Between what we can take pictures of in the brain and our ability to concentrate, select relevant information and carry out plans of action? Where does that then take our thoughts and actions? These are, of course, the questions of concern that arise from the quotes.

Nobody would be likely to even touch upon the idea that we would ever again experience the discrimination, forced internment and sterilisations that were carried out in the 1930s when someone had taken a picture of someone else's brain. But how are we to ensure that our current views concerning what we see in the brain and human characteristics will not be abused in completely different ways?

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4. Alva och Gunnar Myrdal. "Kris i Befolkningsfrågan."
5. http://www.dn.se/opinion/debatt/svt-desinformerar-om-adhd-drabbade-1.765186

Elisabeth Rynning, Professor of Medical Law

In her view, without an open and public debate, we will not be able to get those laws and regulations that make it possible to use the possibilities of research and avoid what is impossible.

The verdict of the future

However we behave, there is a risk that the verdict of the future will be harsh; this is Mattias Tydén's word of caution. Not only because we gain new knowledge that proves our old conclusions were wrong and, moreover, driven by values that we no longer share. Our notions of what kind of research that can be ethically justified also change with time. We are now horrified by the fact that Swedish brain researchers went to Germany to carry out research on fresh brain tissue from executed prisoners. At that point in time, this was considered to be very respectable research, as was the research on the connection between caries and sugar carried out by giving free sweets to mentally retarded people in the 1940s.

According to Mattias Tydén, the parallel between the quotes from the 1930s and our time becomes particularly difficult to deal with against the background of the title of the seminar: *"Treatment, diagnosis and improvement of the human brain"*. If there is a diagnosis, a treatment is suggested; or if one would like to improve the human brain, the starting point must be some kind of idea of what should be diagnosed, treated and improved. That this starting point can be selected from almost identical quotes eighty years apart is a matter of concern, according to Mattias Tydén.

"Apparently, we still have very firmly rooted notions of what characteristics we would like a modern person to have," he says.

And if we have such notions and think that we are finding methods for diagnosing why certain people have those characteristics or not, and consider that we can treat and improve them, then we will also do so. Or, at any rate, be obliged to answer the question of when and why we are allowed to do so.

"Brain research forces us to ask very deep existential questions," says Mattias Tydén.

What do we mean, for example, by a person's personality? That is obviously a difficult question. And what if the personality is not 'desirable', can be somehow mirrored in the brain – or the genes – and can be 'treated'? What is then least degrading and most reasonable in relation to other deep existential questions on the liberty and rights of humans: being obliged to lose one's freedom in prison, being fitted with GPS tags and an alarm to the police or being forced to lose part of one's personality through some form of treatment of the brain or the genes?

Complete openness

Being able to ask such questions and provide answers that do not lead straight down into the bottomless pits of last century first of all requires that it is not science and expert society that have the 'privilege of formulating problems', according to Mattias Tydén. Both the questions and the answers must be formulated in a societal debate that asks questions in an open and critical way. For example, the question of what is meant by curing someone and what is meant by improvement – and when either of these is to be considered to be permitted, and where the limit is for when either of these costs too much or entails excessive risks. In his explicit requirement for openness, he gets strong support from **Elisabeth Rynning**, Professor of Medical Law, later in the day. In her view, without an open and public debate, we will not be able to get those laws and regulations that make it possible to use the possibilities of research and avoid what is impossible.

There are illustrative examples from two other areas of life science: stem cell research and research on GMOs (genetically modified organisms). Both have the potential of being of great benefit to society and in large ethical conflicts. Debate, opinions and legislation on GMOs have led to a dead end, causing all development within the area to take place outside the EU. Stem cell research can, on the other hand, be carried out within a regulatory framework that allows for efficient research without violating fundamental ethical values and has the support of public opinion.

Therapy or enhancement – the question is wrong

Where is the borderline between therapy and enhancement? And where is the borderline for how much and what we are allowed to enhance? The questions are wrongly put. This is an obvious thought after the presentation by **Christian Munthe**, Professor of Practical Philosophy at University of Gothenburg. Therapy and enhancement as compared to what? And why distinguish between therapy and enhancement?

If a person is ill and is cured, this is also an enhancement. And if someone fits into some kind of normal description of a person but wants to become somewhat better, this is also an enhancement. What do we mean by 'being ill' and 'being well'? 'Normal' and 'abnormal'? The more deeply researchers look into our brains and the more connections they make between construction and function, the more obvious it becomes that there are no 'normal' brains and that there simply cannot be any 'normal' ways of reacting. We all deviate from the statistical average in one way or another. And Mattias Tydén's example shows in a frighteningly clear way that what is considered to be normal is incredibly strongly connected to the spirit of the time, the cultural climate and political division of power.

It is just as impossible to hope that technology itself will show us some limits – that certain things are and never will be possible. Or that life itself – as a biological phenomenon in itself – sets any limits. Look at the debate on where the line should be drawn for abortion, how death is to be defined and the debate on stem cell research. When does a life become a life that is worth being protected, with complete access to all human and citizens' rights? Upon conception? Not until after week 18? When we are born? When we reach the age of criminal responsibility at the age of 15, are allowed to vote and get married at 18 or buy alcohol at the age of 20? The more deeply we think, the more obvious it becomes that all limits we try to set are random in one way or another. All limits are as difficult to define as deciding on the borderline for what is normal. Or using a manual for what can be diagnosed and considered to be an illness today. Being burnt out or being a child with a syndrome such as ADHD, for example, simply did not exist as diagnoses only a few years ago. The symptoms did exist, of course, but they belonged to the everyday life that one had to live and deal with.

Christian Munthe, who is sorting things out, turns the perspective the other way round and wonders what the discussion is *really* all about.

About priorities and professional responsibility, is his answer. As he sees it, the more we know and the more we can do, the more obvious it becomes that we need to determine some kind of minimum standard for when medical care can, and is allowed to, intervene.

Values and perceptions

Then we must discuss values and not concepts such as therapy or enhancement. Those concepts tend to become labels for what is acceptable and what is not. What we accept we call therapy, and what we consider to be more doubtful we call enhancement. More or less like in the debate on euthanasia. Passive euthanasia for what is acceptable and active euthanasia for what is unacceptable – and this without having made it clear to ourselves what perceptions of life – and whose life – that determine when we can accept euthanasia, whether active or passive. So, what then, is an acceptable improvement of the functioning of our brain – whatever we consider right now to be a therapy of an illness or only an enhancement of a normal situation?

Christian Munthe, Professor of Practical Philosophy

"This depends on the quality of the basis for knowledge, the likely outcome, the risks and the contributions," says Christian Munthe.

Using the same efforts and the same risk to improve the quality of life for a younger person is worth more than doing the same thing with the same risk and efforts for an older person. The same applies if that effort concerns someone on the shady side of life as compared to someone who is already in the VIP lane. It can also be argued that investments in improvements should be made for public health. Historically, however, this has meant restrictions as to what people are allowed and not allowed to do. It was also actually a concern about the future health of people that made sterilisation legitimate.

What about the risks? The body is an almost infinitely complex system and the head is even worse. The brain has about 1000 billion nerve cells that can each be connected to 1000 other cells. And this still only reflects the architecture of the inner network of nerves and its possible dynamics. In addition, there are all the hormone signals and other impulses from outside which, in turn, can be varied in an almost infinite number of possible combinations. Proclaiming the human brain to be the most complex structure in the universe may seem like hubris. But there is good reason for this. With this background knowledge at the back of one's mind and considering that one might be able to improve the brain, believing that one can evaluate the risks and be certain of the result can also be considered hubris that is hard to beat.

Eugenics through the back door

What if it were possible to improve the brain, for example? Is it certain that this would constitute an improvement of the entire human being if, at the same time, it is not possible to improve those complex mechanisms that make it possible for us to deal with, sort, recall – and forget – our memories. People with super memories rather claim it to be a curse. They would, most of all, like to be able to learn to forget. And IQ – can it be improved? What if IQ – as many people believe – is mainly an increased ability to make calculations? Is this an improvement or a deterioration given that – like many people think – an advanced ability to make calculations is connected to insufficient social competence?

But what if it were still possible to improve our mental abilities? Why in particular memory and IQ, wonders Christian Munthe. It is hardly those characteristics that are lacking in a time of global 'intelligent' networks with close to unlimited memory. Google promises soon to become the Alexandria of our time – an electronically easily accessible global library that contains all human knowledge on its shelves of memory.

"The most important questions of our time concern violence and environmental degradation," says Christian Munthe.

Both have their foundations in the tendency of our brain to always distinguish clearly between us and them. I and you. Individual and society. And that we have difficulties in understanding questions where we ourselves would gain from decisions that favour the other and the others.

"I think that if there were any area in which we could get any pleasure from being able to make improvements, it would be to our emotional abilities rather than our intellectual ones," he concludes.

> *"I think that if there were any area in which we could get any pleasure from being able to make improvements, it would be to our emotional abilities rather than our intellectual ones".*

But he himself is convinced that all such possibilities lie far ahead in the future. What might possibly be within reach, and that can also be dealt with in practice and ethically, is an improvement in health and alleviating such suffering as Huntington's disease, ALS, Alzheimer's, etc. Everything else is connected with excessive risks and efforts in relation to an uncertain result.

What we have already seen concerning the possibility of sharpening our mental abilities does, however, give Christian Munthe a reason to point to something we should already be talking about today. To all other and well-known concepts of class and differences of class, we can add a new one: cognitive class society. And open up for a new kind of eugenics through the back door. That people who are already successful, talented and empowered naturally embrace new opportunities more quickly than other groups. This, in turn, puts them in contact with, and enables them to better use, the next stage of progress, etc. Entirely without any decisions by a dictator, or without anyone singling out any ethnic group as being of less value than another, totally common and normal societal mechanisms are driving a trend where one group in society pulls away from the other – also in this new area.

In the 1930s, eugenics was about actively and consciously *excluding* people with certain characteristics in a political process. The eugenics of our time emerges by *choosing to add* characteristics. And this takes place by itself, without any need for political decisions that promote this. On the contrary, political decisions are needed to apply some brakes – or ensure that it ceases by giving everybody an equal chance to make the most of what neurological research might lead to.

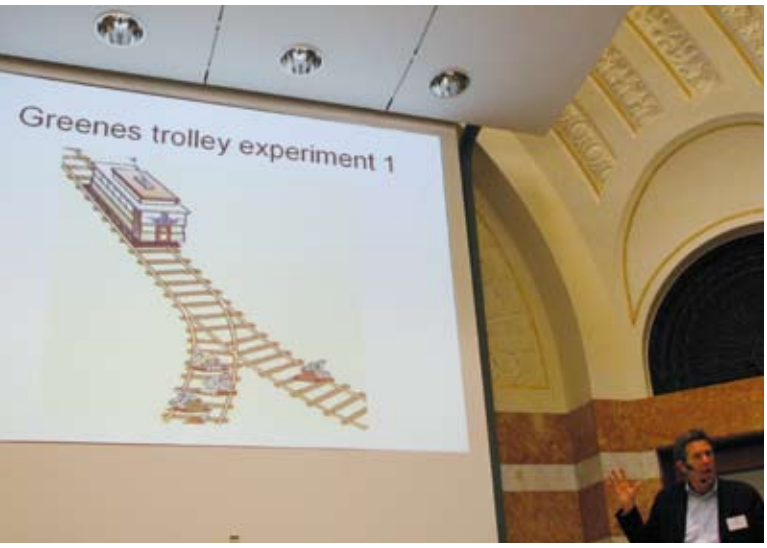
The voice of the people

But there might be an inherent human (public) resistance to using knowledge about the brain in any eugenic way. Who likes a person who cheats? Moreover, this can be interpreted as if someone is trying to take a shortcut to success by using drugs for example.

The Olympic Games have not yet become a battle between drug companies. Doping in sports has gained no public acceptance, despite decades of possibilities and getting accustomed to it. And the studies that have been made of people's views on mental doping contain the same message.

When asked whether it is OK for a doctor to prescribe amphetamines to someone to increase that person's ability to concentrate, 32 per cent answer that it is OK if this is done to be able to help others, while only 18 per cent consider this to be OK if it is done to make swifter personal progress in life. It is interesting to note that doctors themselves also say 'no' to what public opinion says 'yes' to. This might be because it would give their colleagues an advantage in their career. Prevention is better than cure.

It is Niels Lynöe who presents our view on sharpening our mental abilities. But as with many things when it comes to our values, these might change. He points to a number of examples where we already find it fairly uncontroversial to use help to keep the brain going or to get it to work a little bit better: tea, coffee, alcohol, nicotine. He does not mention cannabis, but when will that become a drug that we will accept in order to affect our thoughts and feelings?



The software of ethics

Our relationship to 'Us and Them' and what we consider to be acceptable or unacceptable ways of sharpening the brain are to a large extent related to ethics. And our ethical ability is related both to conscious thinking and strong feelings. Can photographs of the brain be taken of both of these features and can something be said about the ethical ability – and thus also something about the possibilities and limitations of free will – of the owner of the brain? Joshua Greene at Harvard in the US is conducting research on this issue. He takes photographs of people's brains when they are wrestling with difficult ethical problems.

> *He points to a number of examples where we already find it fairly uncontroversial to use help to keep the brain going or to get it to work a little bit better*

Niels Lynöe tells us about Greene's research where one scenario is about being able to save five railway workers from certain death under a runaway railway carriage by the subject of the experiment reversing a switch, a switch that will lead the carriage onto a railway track where the wagon will only kill one person. Should the switch be reversed? Most people would say: "Yes, reverse the switch and save five people by killing one."

In the next stage, the carriage is on its way under a bridge towards the five unsuspecting workers. Now, there is no switch to reverse. However, there is a very large man who is looking over the edge of the bridge. You learn that you can save the five by pushing the fat man down in front of the carriage. What do you do?

Push and kill a person to save five? Most people would answer 'no'.

The different choices are also reflected by entirely different pictures of the brain. The decision to reverse the switch activates the reasoning and controlling frontal lobe. The thought of directly pushing and killing another human being triggers the reptile brain with its strong feelings of unease, instinctive and direct brake blocks. In the case of the switch, you will find a distance between action and consequence, which is most likely a clear signal to the reasoning frontal lobe to take over.

Envy and lust are two of the Seven Deadly sins. This is probably because several thousand years of experience of human existence have taught us that ethics are tight and that social stability is threatened if those feelings get too much power over our lives.

The deadly sins in the brain

Envy and lust are two of the Seven Deadly sins. This is probably because several thousand years of experience of human existence have taught us that ethics are tight and that social stability is threatened if those feelings get too much power over our lives. This provides some logic for the deadly sins also being visible in the brain – or at least that they can be connected to certain parts of the brain being active when we commit sins. An experiment that demonstrates this clearly is where a number of randomly chosen male students are shown three pictures of other students. One picture shows a male equal, with the same background, social class and area of education. He is described as being much more successful and of a higher social status than those doing the experiment. Another picture shows a female student, from another background, with a different education but also very intelligent and successful. The third picture shows a female student with a different background and education who is not quite as intelligent and successful.

When the subjects of the experiment describe their feelings when seeing the pictures, it is only the first picture that triggers the deadly sin of envy. And the description of the strength of the feeling covaries with the strength of how a well-defined part of the brain is illuminated. This is the same part that we know from other research to be connected to physical pain; envy is 'painful' or is at least not considered to be comfortable. When the same people then get to hear that the students in the photographs are doing badly, the brain changes scenes. All of a sudden, those parts of the brain that we know to be connected to pleasure and happiness are active. To say, then, that we know schadenfreude (gloating over the other's misfortune) is an obvious pleasure is, of course, an exaggeration but it might be that it is located on the positive side of the emotions register.

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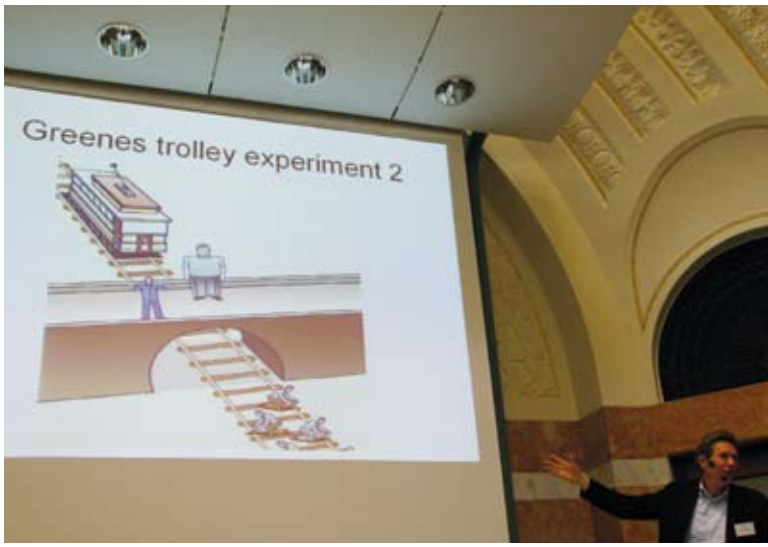
And if one wishes to speculate on the evolutionary logistics of our being equipped in this way, there are of course some hypotheses to juggle with. One is that social organisations such as the original hunting groups of men and village societies are most successful when nobody is allowed to stick out too much and the group is relatively equal, solidary and able to cooperate – in war as well as peace.

Evolutionary psychological logic behind envy being painful and schadenfreude being pleasant does not say anything more than that – that it sounds logical. A picture of an individual person's envious or schadenfreude brain says nothing about how that particular person experiences envy and schadenfreude. And, in particular, nothing about how he or she deals with his or her feelings.



The push of the psycopath

Katarina Wahlund, psychiatrist and researcher in forensic psychiatry

Studies show that anomalies in the temporal and frontal lobes are connected to violent and psychopathic behaviour.

Among 'normal people' – that is, people who do not have an assignment or the habit of thinking about ethical problems in advance – there is a group of people who do not as often answer no to the question of whether they would push the large man off the bridge – and kill one in order to save five. They have a diagnosis: psychopathy. That diagnosis is and, above all, has been deeply controversial. And it still is so for those who consider psychopathy a primarily social phenomenon – if not to say a social illness, whether or not it can be seen in the brain. Researchers working on the connection between heredity and environment nowadays only almost exclusively talk about hereditary environment – one can seldom be distinguished from the other. A person inherits a vulnerability – or a predisposition – that is triggered, developed, prevented or redirected by the environment, all to varying degrees among individuals. A certain strong inherent vulnerability, predisposition or talent in an individual can be developed whether or not it is triggered by the environment. In contrast, a brutal environment can also force or trigger a resistant individual to behave in a seriously destructive manner. But in that particular environment, this would then be considered to be a particularly constructive characteristic.

The five individuals who will be rescued by the push of the psychopath on the bridge might possibly have a reason for being grateful for his 'deficiency'. But if the Subway Superman had had the same characteristic, he would never have become a hero. His instinctive reaction, far from the reasoning frontal lobe, made him rescue a fellow human being who had had an epileptic seizure and fallen onto the tracks in front of an advancing train. Subway Superman threw himself over this person and pressed him down between the tracks. Both survived. [6]

Checklist for psychopathy

Lack of emotional empathy, but with a good ability to visualise other people's reactions, and also knowledge about how to charm and manipulate; superficial emotional life and difficulties in feeling guilt or remorse – these are all characteristics included on the psychiatric checklist for psychopathy. People with this profile often end up in the criminal register one time after another, mainly as a result of violent crime. Naturally, this makes it interesting for forensic psychiatry and those dealing with the treatment of offenders to find safe methods of making a correct diagnosis of psychopathy, according to **Katarina Wahlund**, psychiatrist and researcher in forensic psychiatry.

"If they commit crimes, these people are sentenced to prison and not to care. If we could find more exact methods of diagnosis, it would be easier to find treatments that work for the treatment of offenders and protect others from recurring violent crimes."

It might be the case that pictures of the brain will eventually become a functioning tool. It is clear that the blood flows somewhat differently and that the renewal of energy shows a somewhat different pattern in the brain of the psychopath compared with the statistically average brain. This concerns both the frontal lobe and the temporal lobes. Naturally, this observation also corresponds to other observations. The limbic system – 'the reptile brain' – resides in the temporal lobes where the amygdala is located. This is the almond-shaped body that with other parts of the limbic system is considered to be the large affective generator in the brain.

Changes in the limbic system and/or in the frontal lobe, which is located 'on top' and deals with feelings, are then most likely also connected to why, which and how strongly feelings are triggered and in what way we experience and handle them. But the knowledge of what the connections look like and how they affect our personality and our ability to deal with ourselves and the world around us is difficult to interpret and contradictory. But for how long? And how are we to relate to more certain knowledge if we find that we are able to intervene to change the brain of a psychopath?

6. http://en.wikipedia.org/wiki/Wesley_Autrey http://www.svd.se/nyheter/vetenskap/artikel_195743.svd

The power – and powerlessness – of belief and thought

We know that there are very obvious and well-substantiated connections between body and soul. How the brain sees the world determines how we see it – and ourselves. The power of voodooism is no anthropological cock-and-bull story but an actual power that can kill a person who believes in it. In contrast, curing by touch and healing are also phenomena that are taken very seriously by medical research of our time.

The placebo effect and its opposite nocebo are now considered to be respectable areas of research that, for example, use pictures of the brain.

Reliable double-blind tests show that people taking part in drug tests can also be healed by sugar pills. And the other way round. Patients can become very sick and even lose their hair when taking pills without any trace of drugs in cancer drug experiments where there has been a warning against exactly those effects. Naturally, the effects also vary with individuals, illnesses and the attitude and views of the leaders of the tests. And the effects are mirrored in the brain. Belief and confidence have their luminous points in the brain. People who are strongly convinced about the effect of a 'non-effective' treatment or a drug and who get a strong placebo effect have a strongly increasing flow of blood through a particular part of the brain compared with people who do not experience a placebo effect. How people in medical care – from pharmacies to home service with nurses and doctors – treat people and believe in their prescriptions is thus of great importance for what help people get. This observation is really worth an ethical reflection.

The manipulators of consciousness

It is, of course, not only envy/pain, schadenfreude/pleasure and placebo/nocebo that are reflected in the brain. We even have mirror neurons in the brain that mirror other people's actions that have a goal and meaning – i.e., that are done intentionally and are goal-oriented. Brain researchers are convinced that mirror neurons constitute the system that enables us to visualise other people's thoughts and feelings – and imitate what they do. The human being is a copy cat with its heart in the right place. A movement by a human in front of our eyes triggers mirror nerves that send signals to our working memory which, in turn, sends signals to those motor nerves that make us do the same thing. We can see how the brain works.

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Feeling is the driving force of life. Senses and memories trigger action. Perception, emotion, action. Knowing where the feelings are located in the brain and understanding and being able to influence them is likely to be one of the hottest areas of neuro research. All the basic colours of the emotional palette have their own areas in the brain. Neutral words such as book, house, green or door do not trigger any special reactions in the brain of a person who reads them. "Cancer and murder, on the other hand, are connected to horror, grief and loathing," says **Peter Aspelin**, Professor of Radiology and Diagnostics.

Emotionally charged words trigger the brain – it becomes generally alert. If drugs are added at that stage (SSRI drugs like Prozac) that increase the amount of the signal substance Serotonin, it relaxes and calms down. This can be seen in the pictures of the brain. Interestingly, the effect is the opposite if the brain is not alert – i.e. it has only observed neutral words. Then

Peter Aspelin, Professor of Radiology and Diagnostics

it gets going on SSRI and is made more alert by the same drug.

A brain in great shape

This means that the SSRI drugs can be used to sharpen the senses and make entirely healthy and well-functioning people somewhat more alert and in great shape entirely outside of all diagnoses of depression. Is it reasonable and correct to prescribe and use SSRI drugs and other drugs developed to cure illnesses only to enhance the experience of life and performance among people who are already functioning effectively?
In contrast, SSRI is also used to calm down a brain that has been triggered by exaggerated reactions. People who become far too frightened can reduce their fear in the pharmacological way – and also with cognitive behavioural therapy. Pictures of the brain can be taken of both effects and look similar. It is also possible to reinforce the reactions of people who should be more scared in dangerous situations. Then, it is the signal substance dopamine that must be increased in the blood to put the brain into a state of higher alert. But what is meant by 'exaggerated reactions' and when 'should' a brain react more strongly to a 'dangerous' situation? The new pharmacological possibilities to control the reactions of the brain open up for the medicalisation of emotional life, an emotional life that we are otherwise forced to deal with through better understanding and consciously handling our own reactions – without any chemical drugs affecting our brain.

People suffering from Asperger's syndrome do not connect impressions and feeling – perception and emotion – in the same multifaceted way as people without the diagnosis. In the brain of the Asberger patient, there is no visible difference between if they look at a neutral and non-dangerous picture such as a non-poisonous mushroom or a picture of a serious accident. This inability can be recognised from the psychopathological checklist. Naturally, it is a detail that raises the difficult question of when this inability is of interest to forensic psychiatry and when it should only be of interest to psychiatry.

"This entire area will blow up right in our faces," says Peter Aspelin, who talks about the potential of brain imaging. It is true that the images we get now are vague and difficult to interpret. But not so long ago, we could not take any images of brain activity at all.

The new pharmacological possibilities to control the reactions of the brain open up for the medicalisation of emotional life.

He is convinced that in the future, resolution will be at the molecular level. It is there, among the increasingly smaller parts, that we are preparing to search for answers as to why we act the way we do and are the way we are. The Devil and God are in the details. He does not say so himself but it is part of his conviction. We are not there yet – even if many people already want to consider brain pictures as objective pictures of proof of, for example, an illness, a cognitive deficiency, experience or emotion. But most often a picture of the brain can only tell us that something has happened, but nothing certain about why or what it means – more or less like a crashed car on the road tells us that something has happened but nothing about why it has happened and what the consequences are – and will be. But Peter Aspelin is convinced that certain answers are only a matter of money, time and research.

"We proceed from phenotype to genotype, and our task is to make the invisible visible and the impossible possible," he says.

Helping the brain

Jens Schouenborg, Professor of Physiology

What was impossible a moment ago suddenly becomes possible. A film shows a man who is shaking so much that he cannot possibly drink a glass of water or write his name.

Suddenly, he does both things. He puts his hand on a button and presses it. Suddenly his hand becomes steady. This kind of 'cure by touch' is far from placebo effects and biblical cures by touch – but seems no less miraculous.

Deep down

The signal system of the brain uses both chemical molecules and electrical impulses. The placebo effect is about affecting the signal system through one's own thoughts and one's own conceptions. In this case, there are electrical impulses that via an implanted electrode are inserted deep into the patient's brain. This is called Deep Brain Stimulation. The method is already widely used to help patients with Parkinson's disease. It has been successfully tried out against epilepsy, compulsory behaviour, depression and migraine and is expected to be put into extensive practical use. Being able to stimulate – or block – signals from the nerves through electrodes is a method being used very successfully for easing severe back pains. Sound can be transformed into weak electrical impulses and via electrodes in a cochlear implant be transmitted to the auditory nerve – and deaf people can hear. In the future, it might also be possible to transform light into artificial nerve signals, send them to the visual centre of the brain – and blind people can see! Or, at any rate, distinguish between light and dark and possibly get an idea of what the world looks like for those who can see.

Emerging from deep down

The opposite process is also subject to research – capturing the brain's own signals and turning them into action. There are a few examples of entirely paralysed individuals who can steer their wheelchair with the power of thought via electrodes in the brain. Or they can use a computer with a pointer that moves across the screen and clicks on links and icons entirely through the power of thought. In the extension of research, it no longer seems impossible to have a large range of different neural artificial parts that connect the brain with incoming signals from artificial organs of perception, or outgoing signals from the brain to artificial limbs. If this is to succeed, however, electronic and mechanical engineering is required that moves around among millionths of a millimetre. The brain consists of about 1 000 000 000 000 (thousands of billion) neurons. If one wishes to learn the number of points of contact between the neurons, three more zeros should be added.

It is in this tremendously complex world with literally unlimitedly complex interconnecting patterns that neural engineers move around today. If they are to succeed, their tools, tentacles and transmitters must be of the same magnitude as the neurons themselves. The materials they are made of must be soft and pliable like the brain itself and they must be able to interact with the cells of the brain as if they were made of the same material as the cells themselves. The ongoing research at Neuronano Research Center, for example, which is the home base of **Jens Schouenborg**, Professor of Physiology at Lund University, indicates that this is exactly what the future will be like. But this does not mean that we will ever be able to read people's thoughts, he says. Or control them in any detail. Everything we know, feel and do is being controlled and affected by an enormous number of neurons distributed in different areas over large parts of the brain. They are interconnected into infinitely complex and variable networks. Being able to read them or control them with any kind of precision will remain physically impossible within the foreseeable future – maybe forever, according to Schouenborg. However, increasingly exact interventions into a limited number of cells in limited areas can become very important for alleviating and curing psychological suffering – or compensating physical handicaps. This is where neuro-electronics will acquire its large and possible importance. It cannot and, even if it could, should not be discussed in contexts that suggest people/machine connections in the hope of being able to create some kind of super intelligence.

My better and worse self

Where am I? Where is the 'me' located? Test people who are asked this question think for a while and then point to a spot near the root of the nose but behind the eyes. René Descartes located the coordination centre of human awareness to the pineal gland (epiphysis).

As far as we know now, the 'me' – the human consciousness with all its cognitive abilities – is a globally distributed phenomenon whose different pieces can be found all over the brain. Consciousness seems to be a phenomenon that emerges in the communication between the parts. In a sleeping dreamless (unconscious) brain, the activity within the different parts of the brain is at full speed, but it is pretty quiet among them. In an alert and conscious brain, communication among the parts is also intensive. The 'me' emerges in the gaps.

This probably means that behind deficiencies in how our consciousness works – bad memory, slow thoughts, divided attention – there are more general deficiencies in the functioning of the brain.

"Behind a disabling bad memory, an insufficient ability to concentrate and difficulties in thinking, there is often a hidden psychological illness," says **Hans Ågren**, Professor of Psychiatry at Sahlgrenska University Hospital. To him, the ethical complexes of problems in brain research and medical care are about allocating resources to the right issues.

> *Brain research now shows us that untreated depression and other untreated psychological illnesses cause certain predetermined parts of the brain to shrink, resulting in cognitive insufficiencies*

If we want to get at cognitive insufficiencies and alleviate suffering, we should carry out research on and treat psychological illnesses. Manic depression – or bipolar disorder – is not only strongly disabling in its acute stage. Brain research now shows us that untreated depression and other untreated psychological illnesses cause certain predetermined parts of the brain to shrink, resulting in cognitive insufficiencies. Recurring depressions can lead to obvious damage to the hippocampus, which is critical for memory.

Treatment with antidepressants does not only affect the patient's spirits, thoughts, desire and willingness to be active. In the long run, the actual deficiencies in the ability to concentrate and memory will also recur. And the long run is what is crucial. It takes time for brain tissue to decompose – it occurs with the recurring depressions. And it takes time to build up new neurons. This means that relapses must be prevented and that treatment of a depression must always be carried out with a long-term view. Hans Ågren's strategy for improving cognitive ability is about establishing an intensive treatment of the underlying psychological illness. And then, this does not mean accepting an '80 per cent improvement'. The goal must be complete recovery, and relapses must be efficiently counteracted. He means that modern psychiatry can do this together with the patient, with pharmacotherapy and –not least importantly – modern psychotherapy combined with persistency and endurance.

The power over consciousness

The main problem for generals in a war is to get the soldiers to shoot at the enemy. During World War II, it was found that only 15 per cent shoot back to kill or obey when they are ordered to shoot to kill. The others would rather risk their own lives than kill someone else. This is good news in times of peace, and if one believes in the inherent mechanisms of humans not wanting to

Hans Ågren, Professor of Psychiatry

hurt another human being. But it is bad if one needs defence for oneself or for someone one wishes to protect. It is also bad for generals who require other qualities than humanity from their soldiers. Accordingly, research and tests are being done to try to change things. Research and tests increased the share of soldiers with a willingness to shoot during the Korean War to 55 per cent, and during the Vietnam War to as much as 90 per cent. [7] And never has the share of returning veterans of war with severe psychological problems been so large – or at least so debated. Is there a connection? That people in general have such a profound instinctive aversion to hurting another person that the training and the coercion to do so leads to severe psychological injuries? That a person sentenced to death is taken to his execution blindfolded not so that he will not have to see but so those carrying out the execution will not see him – and refuse to shoot. Niels Lynöe who tells us about the soldiers' refusal to shoot also thinks that there is a connection between the practice of violence and the psychological problems of the veterans of war.

"My own observation is that after the Vietnam War, we see the diagnosis post-traumatic stress disorder – which might be a moral stress disorder?" he says.

This human aversion to hurting and killing a fellow human being also makes it possible for us to turn fellow human beings into non-humans – into animals – when the circumstances point in the wrong direction

But if it is the case that we are basically equipped with such a strong reluctance to hurt another human being, we also need to find a mechanism that explains Rwanda, Darfur, Cambodia, Abu Ghraib, and Auschwitz. The most likely candidate is 'bestialisation'. This

The question is whether brain research has anything to offer and whether it is ethically defensible to use the knowledge of brain research to dehumanise soldiers and/or help them overcome their traumas once they are back home

human aversion to hurting and killing a fellow human being also makes it possible for us to turn fellow human beings into non-humans – into animals – when the circumstances point in the wrong direction. The question is whether brain research has anything to offer and whether it is ethically defensible to use the knowledge of brain research to dehumanise soldiers and/or help them overcome their traumas once they are back home. More than 2000-year old knowledge shows that it works. At least, there is a text that describes that it was done. In The Odyssey, Zeus' daughter Helen pours something into the warriors' wine so that they can talk about their memories of war without any pain. The drug is so powerful that the person who swallows it :

> "cannot shed a single tear all the rest of the day,
> not even though his father and mother both of them drop down dead,
> or he sees a brother or a son hewn in pieces before his very eyes"

It sounds like a very potent drug that can achieve both objectives, making the soldiers endure the sight of – and be able to participate in – the worst brutalities of war, and alleviating the ensuing psychological traumas. The brain pharmacology of our time already knows a great deal about what substances have similar effects. Both beta blockers and substances similar to cannabis are likely drugs for treating PTSD (post-traumatic stress disorder). [8]

7. Jonah Lehrer: How we decide. Houghton, Mifflin, Hartcourt, Boston/New York 2009
8. http://www.psychologytoday.com/blog/mouse-man/200811/posttraumatic-stress-disorder-and-cannabis-potted-history

Knowing what one does not know

It is difficult to have any ethical objections to the existence of these possibilities – severe traumas cannot be disregarded – however peaceful the world might become. No diplomacy will affect tsunamis and sinking ferries. And no cognitive behavioural therapy in the world will have any effect on certain traumas and people. Naturally, drugs are a blessing in those cases.

But given all we are now beginning to learn about the chemistry of thoughts and feelings and the paths and characteristics of neuro signals, a range of difficult questions emerge. Some of these have already been touched upon. **Nils Eric Sahlin**, philosopher and Professor of Medical Ethics, deals with the most difficult one, namely what is it that we really know, or rather, what is it that we do not know.

This means that we have very uncertain knowledge about what pictures of an individual person's brain mean, or what an incision with the aim of changing the cognitive abilities of a person will mean.

For example, we cannot know whether Jens Schouenborg is right – that the brain is so complex that mind-reading and mental control will never be possible. And Sahlin reminds us of the IBM manager who once upon a time said that no more than a few dozen computers would ever be sold in the world! Better thus to keep one's options open and be prepared to act, for it is only the imagination that limits how much we will be able to know and what power we will have over our consciousness. On the other hand, today, we do not really have any notion about what we will learn when we look at all these pictures of what is active where and when in the brain. Everything we get to see, we will see against the background of statistical averages of what applies to the 'standard brain'. We have certain knowledge about the brain being dynamic, plastic and that individual variation is large. This means that we have very uncertain knowledge about what pictures of an individual person's brain mean, or what an incision with the aim of changing the cognitive abilities of a person will mean.

One-eyed, myopia and error of refraction

Thus, important results from decision research and decision theory are particularly relevant when we consider what conclusions we are tempted to draw from the results of brain research.

"We suffer from three visual defects when we evaluate what we know – or what we think that we know – when making a decision," says Nils Eric Sahlin. We are one-eyed, we suffer from myopia and we suffer from serious errors of refraction.

We are one-eyed in that we are notoriously good at seeing facts that correspond to our hypotheses – our prejudices. We are just as notoriously bad at seeing facts that contradict what we believe in. We suffer from myopia in that we prefer to look for knowledge among what is close to us and simple, and are reluctant to do so among what is complicated and distant. The context decides, due to this error of refraction. A simple story leads our gaze and thoughts in a certain direction that determines how we look at facts. Another side of the error of refraction is that we are extremely bad at understanding and dealing with uncertainties when there are no simple unambiguous

Nils Eric Sahlin, philosopher and Professor of Medical Ethics

Every thought of being able to affect memory must be followed by the thought of what happens if this cannot be done with full control of the ability to be able to forget.

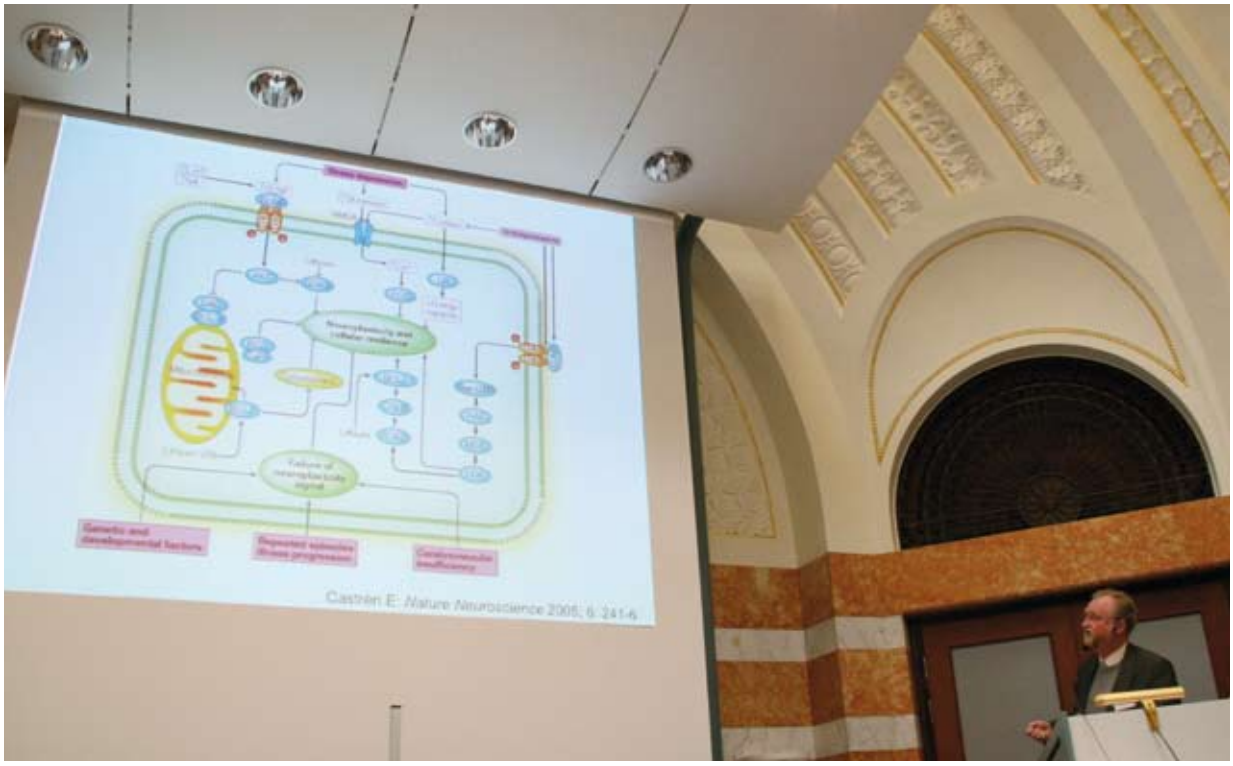
answers to difficult questions. In particular, we are bad at understanding and creating a picture of what is meant by 'likely'. To this should be added two other observations from the domains of decision research: the 'White Male Effect' and the 'Syndrome of Eternal Adolescence'. We realise that we are entering extremely uncertain territory that requires the utmost care in how we interpret and use the findings of brain research.

The 'White Male Effect' means that white well-educated men see the world through rose-tinted glasses. In other words, they tend to evaluate facts as being of less concern and risky, and more promising and easy to handle than other people, regardless of gender, education, ethnicity and social class. The 'Syndrome of Eternal Adolescence' means having nobody to ask about things. Most things that happen to adolescents – and that are of decisive importance in life – are new to them and there is nobody to ask. Not their parents – they are the ones the adolescents are breaking away from. Not those who are older – where scornful laughs are lurking. From that perspective, the ethical reflection must be about asking questions and emphasising principles. And the starting point is likely to be that everything that might be possible – and a bit more – will be possible.

Do we know what we are doing?

But when facing the obvious possibilities, we see that it is easy to forget what might follow. Take the already discussed example of improving the memory. Is this really a good idea? One of the most important tasks of the brain is to be able to screen out and forget – not to remember. Through our senses, the brain receives billions and billions of impressions from a flow that is only interrupted by sleep. And then dreams take over. Out of all this, we only need the brain to register a fraction, make us aware of an even smaller part and finally, that it can remember and recall a negligible fraction. Every thought of being able to affect memory must be followed by the thought of what happens if this cannot be done with full control of the ability to be able to forget. Not being able to forget is described as pure hell by those who suffer from it. The extreme ability to remember within special areas that characterises remarkable savants (Dustin Hoffman in 'Rain Man' for example) is most often (always?) connected with some other severe cognitive disability, such as autism. All attempts at affecting our cognitive abilities must be seen from this perspective, our emotions as well.

Treatment to alleviate disabling and sometimes life-threatening depression – or elation – is likely to be ethically uncontroversial. This also applies to obsessions that create anxiety. But this does not mean that anything has been said about the ethics on where, when and how help should be given. Or when it is reasonable and right to try to affect emotional life. The normal and functional role of feelings should be to run our lives – away from discomfort to well-being. Or to make it



possible for us to evaluate whether future well-being is worth the discomfort. But this also means that experienced feelings are likely only to be the very tip of the iceberg – an iceberg built like a multi-forked network with a reconnecting puzzle of cause and effect with pieces from everything that happens inside and outside the body and soul. Moreover, throughout life, we develop very personal strategies for dealing with our desires and dislikes, a strategy that builds on all our own personal cognitive and corporal abilities and experiences. What if anguish, fear and low-spiritedness – or, for that matter, violent euphoria – are 'only' end signals that have been started and developed in some other part of the body and brain than where they are being experienced, are shown and treated? Then, the question naturally emerges of whether we really know what we are seeing and treating. In his contribution to the seminar, Hans Ågren argues strongly that it is exactly the underlying causes of cognitive deficiencies that medical care must discover and treat. But what happens in the longer run if we do not know where the source is located but know that we can stop the flow? What will then be created below the surface and will it then break out somewhere else with entirely unexpected and catastrophic consequences?

And what happens if all those demons and the anxiety now being controlled by hard work, a great deal of research, remarkable films, immortal novels and historical heroic deeds can instead be brought to reason with a harmless pill

The risk of putting demons to sleep

And if everything becomes possible? Most of us also live in reasonable balance with our uncomfortable feelings of anxiety, fear and anguish. Sometimes these are also strong driving forces that we keep under control through our way of living, creating and working. And what happens if all those demons and the anxiety now being controlled by hard work, a great deal of research, remarkable films, immortal novels and historical heroic deeds can instead be brought to reason with a harmless pill, a white pill that has no other effect than putting demons to sleep? It is tempting to want to choose not to feel anxiety but it is difficult to know what we might lose by making that choice.

Nils Erik Sahlin illustrates dilemmas and conflicts from the other side with the examples of Bertrand Russell and Virginia Wolf. He who had a brilliant, logical analytical brain that made him see how the world was put together, but that also made him experience the world and live his entire life with a joyless pessimistic outlook. She with her fantastic ability to understand and describe the inner experiences and feelings of people that will captivate readers for several generations to come, but which also made her experience feelings that forced her to commit suicide. If I admire one of them and dream about a brilliant intellect of my own or a rich emotional life and creative skills as an author – and I could buy them at the pharmacy? The instructions on the package say something about side effects in the form of the risk of recurring pessimism and of occasionally feeling a deep weariness of life. But how often do we read the instructions on the package, and certain risks must be taken, mustn't they?

It is not even ethically uncontroversial to help the brain see and hear if the senses of sight and hearing somewhere on the way from the eye and ear to conscious sight and hearing do not work the way they should. Deaf people have their own language, sign language. With a language of one's own, there is also the experience of one's own distinctive identity and of living within a culture of one's own. This also means that it is not at all obvious that it is always right to suggest and offer people help to hear and speak. This might become especially controversial for deaf parents with deaf children, especially if the society around them signals in an insensitive way that the hearing culture is superior to the culture of signs and that signing children should at any cost be given a cochlea implement to be incorporated into the culture and society of hearing people. One could even imagine a situation where it is ethically complicated to provide blind people with sight. If a person has been blind all their life, it is not obvious that their quality of life will improve by being able to see. Their entire cognitive ability has been developed using other senses. And what happens then if a new sense is suddenly added to a brain that has already passed some of its dynamic ability. The confusion might be too great to cope with.

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Lawyers on the brain

If feelings are the driving force of life, and if they exist, are visible in and dealt with in the brain and can be affected from outside, this will raise a number of questions related to freedom and responsibility, and thus also to our views on crime and penalty. There are already researchers (and firms) claiming that pictures of the brain can show whether a person is lying or not.

If this could be said with certainty, is it then reasonable and ethically defensible to use such pictures as evidence in court procedures? What we currently know is that if there is a contraction or tension between what we say and what we feel, it is visible in the face – to a person who is sensitive enough to see it. Naturally, it can then also be seen in the brain. But this kind of tension can, of course, emerge for entirely different reasons than that a person is lying. And it does not say anything about why a person is lying.

We know that we have strong mechanisms that in special situations make us act quickly and instinctively without the presence of any conscious thought whatsoever. Are we then responsible for our actions? If a person acts 'without premeditation' to the extent that they do not know what they are doing, the law takes a more lenient view of someone, for example, who kills another person in self-defence, as in the Rödeby case. When Mattias Flink killed seven people in Falun in 1994, the court concluded that he was psychotic when he committed the crime, but in possession of all his senses both before and after the shots. People who commit severe crimes under psychosis are usually sentenced to institutional care, but Mattias Flink was sentenced to life imprisonment.

People who are psychotic do not know what they are doing. The possibility of exercising any kind of free will is limited in that situation. The sentence can be interpreted such that Mattias Flink should have used his free will as long as he still had it. Then, he should have considered that he might become psychotic and thus be responsible for having put himself in a situation where he no longer knew what he was doing.

Our knowledge map of what brain pictures really mean has large blank spaces. Nils Eric Sahlin is right about this of course, particularly if one wishes to use them as predictions of what a person is capable or not capable of doing. But we do not have any idea of how certain they will be in the future.

"This entire area will probably blow up right in our faces," Peter Aspelin said earlier in the text. The best thing is probably to take him seriously and consider that questions on the Rödeby and Flink cases will become more and more common. And then they will be examined in the light of increasingly better and more certain pictures of what is going on – or not going on – in the minds of people in court. If we allow it.

Can dangerousness been seen in the brain?

Psychopathy already exists as a concept or a diagnosis. What if we can also see that the brain of the psychopath has certain characteristics that distinguish it from other brains? What does this say and how can this information be used if one wishes to judge a person's responsibility for their actions? And how and when are they responsible? For the questions to be relevant at all, better and more certain connections between pictures and behaviour are required than what we have today. But what if they come about? There already exist both genetic tests and brain pictures that can be connected with a predisposition to commit violent crimes. How should they be used – especially when they become better and more certain? Only to explain and contribute to creating a balance between care and penalty in hindsight or to make prognoses as well? Such as in the Åsele murder case, when he was to be released from prison? When the same kind of issue is discussed by future courts, will they then be able to see inside the head of the sentenced person whether they have really improved, the treatment has been completed and they can be let out into society? And what if pedophilia that also leads to violence against children is located in the brain and can be located to a certain part of the brain that can be affected, for example, with the DBS (Deep Brain Stimulation) of the future that Jens Schouenberg told

Elisabeth Rynning, Professor of Medical Law

us about? Or with psychopharmacological drugs with a more exact effect than the 'chemical castration' that is already being discussed today? How are those possibilities to be dealt with? Is treatment by force with electrodes in the brain or deposit medication under the skin a more acceptable kind of force than being confined to a psychiatric clinic for an indeterminate period of time? In one case, the convicted person loses their personality; in the second case, freedom.

Elisabeth Rynning, Professor of Medical Law, asks the overall question:
"Who gets to know what about whom? And who shall be allowed to use that knowledge for what purpose?"

Brain and gene tests

These are the same questions as those that have been asked and are being asked about gene technique and gene diagnostics. And that is exactly her standpoint. In many ways, brain research makes us face exactly the same ethical and legal questions and deliberations as gene technique. What is it that we can actually analyse and have an impact on? How certain is our knowledge? When is it legitimate to use new knowledge and techniques to make predictions and when is it legitimate to intervene? Her questions raise a range of new questions.

> *"Who gets to know what about whom? And who shall be allowed to use that knowledge for what purpose?"*

Should an employer be able to use gene tests or brain pictures to determine whether or not a person is suitable to be a business executive, for example. In that case, a certain lack of emotional empathy, but access to cognitive empathy, might be an asset. And the army? Sweden is also moving away from conscription to more or less permanent fully or semi-professional forces. Are they to be recruited on the basis of behavioural profiling using gene analysis and brain pictures? In that case, what kinds of personalities are desirable? And is it to be permitted to use the brain's own drugs to free soldiers from difficult emotions concerning both actions and memories?

And what about the airlines? The pilot in Gottröra who landed an SAS plane with an engine breakdown in a field or the pilot who landed a US Airways plane on the Hudson River and saved all the passengers. Naturally, these had both been subjected to personality tests to be able to cope with enormous pressure and still keep a clear head. But should future such tests be completed with brain scans and gene tests?

The limits of integrity

The same questions of course apply to insurance companies, which already require that we provide information about our physical weaknesses. In the future, will they also require that we test and report our cognitive deficiencies – and what is meant by deficiencies in that case? We all have different tendencies to take risks, for example. Sometimes this is an asset, but sometimes it is a deficiency. This can, of course, mainly be observed in our behaviour; what kind of car we have chosen and how we drive it; how we spend our holidays; or what job we have chosen. But in the future, the willingness to take risks can or will also be photographed by the paparazzi of brain photography or the gene detectives of molecular biology. Are they to be allowed to take their pictures and make their analyses? Of whom and when? And for what purpose will they be used? Conducting tests to find the right person for the right job or the right insurance is nothing new. However, we are now also obliged to decide on a range of new possibilities for finding out more about us all – and without it being possible to regulate them or even reach them through laws and controls.

Also in this case, gene research provides examples of things to come. Despite all the laws and regulations on what medical care, courts, insurance companies and employers are allowed to ask for, there are all kinds of gene tests that can be bought and done on the Internet. The same possibilities exist, or will exist, regarding the increasing insolence of paparazzi as concerns brain photography. How is society to deal with this? And if anyone voluntarily, by force, by temptation or by being unable to say no, has a full neurological portrait taken of herself – or a close-up picture of a particularly interesting characteristic – what are the guarantees that this information will not fall into the wrong hands? All of a sudden, a completely unknown person might call and say: "Hey you, I know something about you that you probably do not want other people to know." This risk already exists for gene tests where the information does not only concern the person directly affected but also their children and relatives. The possibility of genetic blackmail is even simpler. Anyone can collect DNA from anyone. All that is needed is that someone one wants to get at has licked an envelope, dropped a cigarette butt, left lip marks on a glass.

What makes a human being a human being

The human brain is the most complicated structure in the universe. This is no small claim – given the infiniteness of the universe. But let that be the case – for the time being. Complexity, plasticity, dynamics and the ability to compensate with new brain cells give us a certain guarantee against the Worst Case Scenario.

Such as 'Matrix' or PC Jersild's 'En Levande Själ'. There, we live in an imaginary illusionary world with our brains connected to computers that in our minds create the total illusion of a real world and a free will of one's own. The dynamic feedback among brain, body and reality that the brain is created for, is developed in, and must have to function also creates limits as to how far it can be manipulated. It simply becomes too complicated to try to imitate the interplay between the brain and the world in an electronic way.

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But there are also other ways of controlling our emotions and thus our way of looking at the world and our fellow humans, and being able to control our behaviour individually or as a group. We see that this is possible every time we go to a party. Other examples are turning the enemy into a beast, dehumanisation of soldiers, cannabis against post-traumatic stress, deep brain stimulation. Aldous Huxley's 'soma' is, despite everything, not only an inconceivable nightmare from the 'Brave New World' of scientific imagination. It might very well soon exist as a gaseous temptation just outside the ventilation system at a workplace close to yours – or by a meeting room for big business or political decisions. And we will not even be able to find out where the limits are for what is technically possible – if there are any.

"There are definitely ethical limits to the research that is required," says Nils Eric Sahlin.

To find out what the technical and scientific limits are for what pictures can be taken, what they actually mean, what mechanical, electronic, optical or chemical impact we can have, what the effects are – and all side effects – not only research and tests on animals are required. The certainty that is required of the answers to our questions can only be found through real experiments with real brains located in real people with real bodies. A great deal of research and many tests simply cannot be done. We do not live in the 1930s described by Mattias Tydén. A hot tip is that the future ethical debate will require increasingly better protection of integrity, and protection both for ourselves and our fellow creatures – which takes us back to where we started: the moral animal. Research provides us with a great deal of data for the public moral reflection that is necessary in the wake of neuro research. But for morally sustainable decisions – in particular if we wish for them to be sustainable over time – a considerably more profound knowledge of humans is required than can be contained in a picture of the brain or a gene test. The answer to the question of what makes the human being a human being must be provided in a completely different arena.

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