

Welcome to

The International Workshop on Neuroethics

The **Institute for History, Theory and Ethics of Medicine** at the RWTH Aachen, the **IDEA League** and their partners **JARA-BRAIN**, **IRTG Schizophrenia and Autism** and the **Centre for Neurosciences of the RWTH Aachen** welcome you at the first International Workshop on Neuroethics of the IDEA League.

The scope of this workshop is an intense scientific exchange of scientists working in the cutting area of neurosciences and neuroethics. Neuroethics encompasses a wide array of ethical issues emerging from different branches of clinical neuroscience (neurology, psychiatry, psychopharmacology) and basic neuroscience (cognitive neuroscience, affective neuroscience).

The workshop deals with a variety of topics such as

- ▶ Ethical problems raised by
 - *functional neuroimaging*
 - *(pharmacological) neuroenhancement*
 - *brain surgery*
 - *brain implants*
 - *brain-machine interfaces*
 - *neuromarketing/neuroeconomy*
 - *stigmatization of psychiatric patients*
 - *psychiatric coercion versus autonomy*
- ▶ Neuronal correlates of moral judgements
- ▶ Brain science in public discourse
- ▶ Neuroscientific progress and the “freewill versus determinism debate”
- ▶ Neuroscientific progress and the mind-body problem.

Program

09:00-09:30 Address of Welcome

09:30-10:30 Section 1. Neuroenhancement and Ethics

M Schermer, Ethics (Rotterdam)	Botox for the Brain: Psychopharmacology and Enhancement
G Schäfer, Medical Ethics (Aachen)	Pharmaceutical Neuroenhancement and Ethics
D Groß, Medical Ethics (Aachen)	Engineering the Brain: Enhancement by Neurobionics

10:30-10:45 Coffee Break

10:45-11:45 Section 2. Stigmatization in Patients

K Podoll, Psychiatry (Aachen)	Migraine Art: Is it Ethically Justified to Inquire on an Artist's Neurobiological Sources of Inspiration?
U Hagenah, Pediatric & Adolescent Psychiatry (Aachen)	Stigmatization of Adolescents with Anorexia Nervosa and their Families
S Müller, Medical Ethics (Aachen)	Body Integrity Identity Disorder (BIID) – Is the Amputation of Healthy Limbs Ethically Justified?

11:45-12:45 Section 3. Functional Imaging in Psychiatry: The Ethical View

E Landeweer, Medical Ethics (Maastricht)	Psychiatry in the Age of Neuroscience. The Impact on Clinical Practice and the Lives of Patients
L Huber, Medical Ethics (Mainz)	Visualising "Kinds of Brains": Ethical Issues Raised by Functional Imaging within Psychiatry
B Heinrichs, Bioethics (Bonn)	Incidental Findings in Neuroimaging

12:45-14:00 Lunch and Poster Section

14:00-15:00 Section 4. Dilemmas in Neurosurgery

P Reinacher, Neurosurgery (Aachen)	Patient's Autonomy in Neurosurgery
A van Oosterhout, Neurosurgery (Aachen)	Acoustic Neuromas: Decision-Making of Patients
HW Bothe, Neurosurgery (Muenster)	Controlling Moral Decision Making by Deep Brain Stimulation

15:00-15:15 Coffee Break

15:15-16:15 Section 5. Moral Agency and Free Will

M Christen and J Fischer, Social Ethics (Zürich)	What Do Neural Correlates of Moral Judgments Reveal on Moral Agency?
K Stoppenbrink, Ethics (Bad Neuenahr)	Consenting to Personality Changes? Problems of Informed Consent to Deep Brain Stimulation
K Weber and K Mathiak, Psychiatry (Santa Barbara/California)	How to Study the Process of Moral Judgments with Brain Imaging Methodology?

16:15-16:30 Coffee Break

16:30-17:50 Section 6. Neuroscience, Law and Society

NA Vincent, Ethics (Delft)	Neuroscience and Legal Responsibility
D Hübner, Ethics (Bonn)	Neuroscientific Progress and the "Free Will vs. Determinism Debate".
GJ Lokhorst, Ethics (Delft)	Neuroethics and the Extended Mind Thesis
D Schmitz, Medical Ethics (Aachen)	Student's Perceptions of Modern Neurosciences – First Results of a Discourse Project

17:50-18:00 Final Discussion

18:15 Conference Dinner in the City of Aachen

12:45-14:00 Poster Section

<i>J Steinmetzer</i>	<i>Neuroeconomics from an Ethical Point of View</i>
<i>D Groß</i>	<i>"Psychosurgery": History and Ethics</i>
<i>S Müller</i>	<i>Ethical Dilemmas Concerning Interventions into the Brain</i>
<i>S Müller and A van Oosterhout</i>	<i>Acoustic Neuromas: Decision Problems of Patients</i>
<i>T Duncker, S Stork and D Groß</i>	<i>How can Neurosciences contribute to Ethics?</i>
<i>T Vloet and G van Polier</i>	<i>Morphometric Brain Abnormalities in Boys with Conduct Disorders and ADHD</i>
<i>K Pauly</i>	<i>Emotion, Cognition and their Interaction in Adolescent Onset Schizophrenia: an fMRI Study</i>

Botox for the Brain?

Maartje Schermer

► Neuroenhancement can be defined as improving human mental functioning (cognition, mood, behaviour) beyond what is necessary to sustain mental health. According to some the recent rapid developments in the fields of neuroscience and psychopharmacology make it likely that we will be able to enhance the mental functioning of humans significantly in the near future. Concomitantly, the undesired side-effects of psychopharmacological substances are expected to be minimized or even eradicated in the (near) future. This will further stimulate the use of such substances, both within and outside the medical care setting.

In our research project “Botox for the brain” the central question is: how should the developments in and applications of psychopharmacology aimed at the enhancement of human mental functioning be evaluated from a moral point of view, and how should public policy respond to these developments and applications?

► We have conducted a literature review of the current and emerging psychopharmacological possibilities for enhancement; an in depth literature study of the (neuro)ethics literature on the subject; and a qualitative empirical study into the experiences and beliefs of adults diagnosed with ADHD.

► We found that there are some drugs with potential cognitive enhancing effects that are already available on the market, and are already being used for enhancement purposes off-label. Some new and promising drugs are being developed. There are some caveats, however, such as an inverted response curve and various trade-offs.

With regard to the ethical problems the development of neuroenhancement raised, the most frequently mentioned problems are: safety and risks; justice and equality; coercion and social pressure; identity and authenticity; social effects and human flourishing.

When we look critically at the realistic prospects and current practices of neuroenhancement with psychopharmacological substances, it seems as if part of the ethical discussion has been wrongly directed, being more an

Section 1: Neuroenhancement and Ethics

example of “speculative ethics” than the kind of ethical inquiry that will help us develop sensible policies now. Important ethical and policy issues lie in the “contested area” between treatment and enhancement (how to prevent medicalisation of underperformance, normalisation, and disease mongering?); in the practices of off-label use (should that be prohibited, left to doctors, or allowed on a free market?); and in enhancement research (are current policies for research with human subjects sufficient?).

► Maartje Schermer, MD, PhD

born in Amsterdam (The Netherlands); study of Medicine and Philosophy; PhD in 2001 with a thesis on the concept and practice of patient autonomy; assistant professor at the department of Medical Ethics and Philosophy of Medicine of the Erasmus Medical Center in Rotterdam; involvement in various research projects; scientific lead of a project on psychopharmacology and enhancement. *Main research:* conceptions of autonomy and identity, neuroethics, enhancement, and technology ethics.

Pharmaceutical Neuroenhancement and Ethics

Gereon Schäfer

► Pharmaceutical neuroenhancement usually describes the improvement of cognitive and mnemonic abilities or mental conditions of healthy individuals by the extra-therapeutic use of psychopharmaceutical products. At first glance, neuroenhancement might be seen as a permissible self-determined way to self-modification. But, on closer view, many questions arise that should be dealt with. In the first part of the presentation, I will subject pharmaceutical neuroenhancement to a closer examination: What is “enhancement”? How can we distinguish “enhancement” from “therapy”? Furthermore: What are the risks and chances of pharmaceutical neuroenhancement from an ethical point of view? How could be the results of a risk evaluation? In a second part, I will sustain the thesis, that the differentiation between “good” and “bad” approaches to enhancement is depending on cultural, social and political influences and will consequently undergo permanent changes.

► The methodological approach is literature study and an ethical assessment of the current and emerging means of pharmaceutical neuroenhancement.

► (1) It is not possible to draw a clear dividing line between enhancement and therapy, so, in this regard, any distinction will remain vague.

(2) Beyond medical risks, like unpredictable side-effects, pharmaceutical neuroenhancement implies a set of ethical problems: the common use of neural enhancement is supposed to have a deep impact on our understanding of humanity and on the development of interpersonal relations. Personal aspects such as identity, individuality, and privacy will also be concerned. Likewise, effects on the concept of medicine, on the standards of health or performance and on the process of medicalisation may arise. Furthermore, a limited availability of neuroenhancement could challenge distributive justice.

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(3) The differentiation between “good” and “bad” enhancement is based on a varying emphasis of the aspects autonomy, nativeness, and risk assessment. Similarly it depends on the particular cultural and social context.

► Dr. med. dent. Gereon Schäfer

born in Frankfurt am Main (Germany); study of Dentistry and Medicine (1989 examination and license to practise dentistry, 1995 doctorate at the University of Saarland, Medical School, Homburg/Saar), study of History, French Philology and Classical Archaeology (1985-89 University of Saarland, Saarbrücken; 2007f RWTH Aachen); since 2007 Scientific Assistant and Coordinator for History in Medicine at the Institute for History, Theory and Ethics of Medicine at the RWTH Aachen. *Main research*: professionalisation in medicine and health care (current PhD-thesis), medicine in national socialism, ethics of body enhancement, clinical ethics.

Engineering the Brain: Enhancement by Neurobionics

Dominik Groß

► The term “brain engineering” (also called “neurobionic enhancement” or “invasive brain enhancement”) describes the implementation of electronic devices into the central nervous system with the objective of enhancing human capabilities. Although the development of human-computer interfaces (HCIs) is still futuristic, specific applications can be expected in the following fields: (1) sensory enhancement by the use of specific brain implants (“supersensory perception”), (2) enhancement of memory capacities by the implantation of so called “memory chips”, (3) empowerment of persons to “cyberthink” by interfaces (“google” in the brain), and (4) alteration resp. tuning of affective properties by electrical stimulation of the brain via implanted electrodes.

But questions arise about both the medical risks and the social acceptance of those procedures? How should those developments be evaluated, and how should public policy respond to them? What are the differences between brain engineering and pharmaceutical neuroenhancement from an ethical point of view? And finally, if these technologies offer opportunities to enrich life at a very low risk, would resp. should people take advantage of these possibilities?

► The methodological approach is (a) a literature review and (b) an ethical discussion of the current and emerging possibilities for neurobionic enhancement.

► For several reasons, the acceptance of neurobionic enhancement will presumably be comparatively low: First, brain engineering is supposed to considerably affect a person’s autonomy. Second, it is reputed to undermine the concept of self-efficacy. Third, enhancement by neuroimplants could induce a feeling of depersonalization, and fourth, it interferes with general conceptions of nativeness.

Furthermore, there are relevant differences between neurobionic and pharmaceutical neuroenhancement applying to aspects as invasiveness, foreign body sensation, reversibility, risk assessment and long-term (side) effects.

► **Univ.-Prof. Dr. med. Dr. med. dent. Dr. phil. Dominik Groß**

born in St. Wendel/Saar (Germany); studies of History, Philosophy and Classical Archaeology (1990 Magister artium, 1993 PhD in Saarbrücken), of Dentistry (1989 examination, 1991 Dr. med. dent. in Homburg/Saar), and of Medicine (2000 examination, 2001 Dr. med. in Ulm), postdoctoral studies in Würzburg (1998 habilitation thesis); since 2005 Full Professor for History and Ethics of Medicine and Director of the Institute for History, Theory and Ethics of Medicine at the RWTH Aachen; Member of the Task Force Ethics of the IDEA League. *Main research:* neuroethics, clinical ethics, autopsy and dead body, history of medical professions, history of psychiatry.

Stigmatization of Adolescents with Anorexia Nervosa and their Families

Ulrich Hagenah

► Anorexia nervosa (AN) often takes a chronic course and shows the highest mortality rate among psychiatric patients. There is substantial delay in seeking and starting treatment in individuals with AN, 20 - 50 percent are not seeking treatment, on average, 5 years after the onset of the eating disorder. Denial of illness in patients with anorexia nervosa is very common and may contribute to this. Starting treatment in adolescence seems to be a protective factor against mortality after 10 years in AN, potentially mediated by the role of parents in initiating and maintenance of treatment.

The importance of stigmatization in psychiatric disorders has got more attention by research in the last two decades. It has been demonstrated that mental disorders as a whole are stigmatized and that stigmatization may lead to a decrease in self-esteem in stigmatized people and to shame. Furthermore stigmatization may act as a barrier in seeking treatment. The majority of studies have examined stigma in depression, bipolar disorder and schizophrenia.

► Few published studies examined stigmatization associated with eating disorders. Individuals with AN and their families are often viewed negatively by others, e. g. eating disorders may be more likely to trigger blame. Despite recent research indicates that there is a significant genetic component to AN, psychosocial factors (e. g. self-discipline, lack of social support, and parenting), are more commonly attributed as causes in the development of AN by the general public. Parents of adolescents with AN report of perceived stigma by significant others (e. g. relatives, medical staff). The blaming attitudes may contribute to a host of serious problems that negatively impact the lives of individuals with AN and their families including drop-out of treatment.

► Future research should address, how stigma associated with AN is mediated by sociocultural phenomenons (e. g. the role of media), blame-based of AN by health care professionals and the internalization of per-

Section 2: Stigmatization in Patients

ceived stigma by the individuals with AN (self-stigmatization). Furthermore it seems promising to develop specific interventions to decrease stigma inside the families of adolescents with AN and to encourage parents to initiate earlier treatment of their child.

► **Dr. med. Ulrich Hagenah**

born in Gelsenkirchen (Germany); study of Medicine (1983 examination, 1985 doctorate); Assistant Medical Director at the Department of Child and Adolescent Psychiatry and Psychotherapy of the University Hospital Aachen (UKA) and the Faculty of Medicine of the RWTH Aachen. *Main research:* development of treatment approaches for eating disorders in childhood and adolescence.

Body Integrity Identity Disorder (BIID) – Is the Amputation of Healthy Limbs Ethically Justified?

Sabine Müller

► The term “body integrity identity disorder” (BIID) describes the desire for the amputation of one or more healthy limbs or for a paralysis. Some persons with BIID mutilate themselves; others ask surgeons for an amputation or for the transection of their spinal cord. Lobbies of persons with BIID explain the desire for amputation in analogy to the desire of transsexuals for surgical sex reassignment. Psychologists and psychiatrists offer quite different explanations for this phenomenon; but until now no successful psychotherapeutical or pharmaceutic therapy is known. Recent neurological studies suggest that BIID is a brain disorder which disrupts the body scheme, i. e. the representation of the body in the motoric and sensoric areas of the brain. Parallels for this disturbance are known from stroke patients (especially the alien hand syndrome). The alien limbs of BIID patients might be the mirror image of the phantom limbs of patients with amputated limbs.

Medical ethicists discuss controversially whether elective amputations of healthy limbs should be allowed and performed by surgeons.

► First, the current state of research about BIID will be summarized and critically evaluated. Second, the ethical arguments pro and contra elective amputations will be discussed with regard to the medical explanations of the origins of BIID.

► BIID seems to be a developmental neuropsychological disturbance of the body scheme which includes missing insight into the illness and generates a monothematic delusion. Functional imaging is required to check this hypothesis and to identify the disturbed brain areas. If the neurological hypothesis is appropriate, then amputations of healthy limbs would be counter-indicated since they would be bodily injuries performed on mentally disordered patients. This result does not implicate therapeutic nihilism: Instead of curing only the symptom, a causal therapy of BIID should be developed in order to integrate the alien limbs into the body scheme.

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Possible therapies could be offered by neurorehabilitation, repetitive transcranial magnetic stimulation (rTMS) or even deep brain stimulation (DBS).

► **Dr. phil. Dipl.-Phys. Sabine Müller**

born in Bottrop (Germany); study of Physics (diploma 1992 at the RWTH Aachen) and Philosophy (2004 doctorate at the RWTH Aachen); since 2006 Scientific Assistant and Coordinator for Ethics and Theory of Sciences at the Institute for History, Theory and Ethics of Medicine at the RWTH Aachen. *Main research:* neuroethics, philosophical and scientific theories of intelligence, biological substrates of psychic phenomena.

Psychiatry in the Age of Neuroscience. The Impact on Clinical Practice and Lives of Patients

Elleke Landeweer

- ▶ In mental hospitals, the progress of neurosciences has raised higher expectations in psychopharmaceutical treatment. In consequence, even involuntary medication is expected to benefit patients suffering from mental illness. In this presentation I want to discuss to what extent neurosciences and new psychopharmacological therapy approaches support patients. To answer this question I will focus on the perspective of patients and their experiences with psychiatric (coercive) treatments. On the basis of a case report, I will show that other issues besides appropriate medication prove to be important for recovering from mental illness.
- ▶ The data of this presentation are gathered from stakeholders in clinical psychiatry (patients, family, psychiatrists and nurses) as part of an empirical-ethical evaluation of the Dutch Act on coercive measures in mental hospitals. The study focused on the use of restraints inside mental hospitals and consisted of 37 open interviews (12 (ex-)patients, 10 family members, 15 caregivers), 3 focusgroups with patients and family members.
- ▶ The aim of this presentation is to show that issues like coping, rehabilitation and social support are of major importance for the patients' dealing with psychiatric diseases. The improvement of clinical practice by the findings of neurosciences should not imply that (coercive) medication is the only way to support the patient's recovery. The process of finding the appropriate medication requires mutual trust of psychiatrist and patient. In addition, the patient's recovery has relational aspects like being recognized as a person, taking own responsibilities, developing friendships and confidence. These findings lead to the conclusion that dealing with psychiatric diseases is more complex than the biomedical model of neurosciences suggests and that psychiatrists should consider the social context of the patient as well.

Section 3: Functional Imaging in Psychiatry: The Ethical View

► **Elleke Landeweer, MSc**

born in Meppel (The Netherlands); study of Philosophy (diploma 2004); since 2005 junior researcher for the Faculty of Health, Ethics and Society of the Department of Health, Medicine and Life Sciences, Maastricht University, since 2007 PhD student. *Main research*: philosophical and ethical aspects of coercion and restraint in mental health care.

Visualising “Kinds of Brains”: Ethical Issues Raised by Functional Imaging within Psychiatry

Lara Huber

- ▶ Given that visualisations via medical imaging have tremendously increased over the last decades, the overall presence of colour-coded brain slices generated on the basis of functional imaging, i. e. neuroimaging techniques, have led to the assumption of so-called “kinds” of brains or cognitive profiles that might be related especially to “non-healthy” humans affected by neurological, neuropsychological or psychiatric syndromes or disorders (Dumit 2004). For example, the case has been made that these technological innovations of visualising brain function is to be expected in the validation of the so-called hypofrontality-hypothesis with regard to schizophrenia (Weinberger 1996; Callicott et al. 2003).
- ▶ In clinical contexts one has to consider that visualisations based on medical imaging in general are suggestive in a twofold way. Imaging data not only tend to visualise pathological entities, but also seem to represent objective and concrete evidence for these psychophysical states in question (Huber 2008).
- ▶ This presentation aims to identify key issues raised by common strategies of visualising psychiatric disorders via functional approaches of imaging within the neurosciences. Against the background of methodological, epistemological, and also conceptual problems primarily ethical issues are addressed: Besides queries about defining criteria for participant inclusion and managing incidental findings this presentation discusses how these issues inform current debates on neuroethics.

References: Callicott J, Mattay VS et al. (2003). Complexity of Prefrontal Cortical Dysfunction in Schizophrenia: More Than Up or Down. *Am J Psychiatry* 160: 2209-2215; Dumit J (2004). *Picturing Personhood. Brain Scans and Biomedical Identity*. Princeton Univ. Press: Princeton, Oxford; Huber L (2008). *Imaging the brain – Visualising “pathological entities”?* Searching for reliable protocols within Psychiatry and their impact on the understanding of psychiatric diseases. *Poes Prax*, to be published 2008;

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Weinberger DR, Mattay VS et al. (1996). fMRI Applications in Schizophrenia Research. *Neuroimage* 4: 118-126.

► **Dr. phil. Lara Huber, MA**

born in Ruit (Germany); study of Philosophy and Contemporary History (Magistra Artium 1999 at Tübingen University; 2003 doctorate in Philosophy at Tübingen University); 2004-2005 Postdoctoral scholarship; since 2005 Lecturer at the Institute for History, Philosophy and Ethics of Medicine at the Johannes-Gutenberg University of Mainz. *Main research*: epistemology and ethics of the neurosciences, phenomenology, aesthetics, image science.

Incidental Findings in Neuroimaging

Bert Heinrichs

► In recent years, an increasing number of research projects include the method of neuroimaging. Empirical data suggest that in approximately 1-8% of the scans performed incidental findings occur [1]. This raises a number of difficult normative problems. Lately, Heinemann et al. have made a proposal how to deal with these problems [1]. The proposal has provoked a number of critical responses [2-7].

► In this paper I want to focus on two questions: (1) How can the research subject's right not to know be guaranteed without putting research staff into psychologically problematic situations, and (2) should a diagnostic check of the scans by a neuroradiologist become an obligatory part of such research protocols?

► An initial insistence on the right not to know by potential research subjects can be made an exclusion criterion, as Heinemann et al. have suggested. I will, however, argue that research staff may nevertheless get into psychologically difficult situations in which they know about pathological conditions of research subjects without having the option to share their knowledge. Furthermore, I will argue that within research projects there is no "diagnostic obligation". Therefore, a comprehensive diagnostic check-up of scans is, in general, not required. Yet, the fact that research protocols are not intended to promote the welfare of individual research subjects must be made clear, i. e. any effort must be made that a "diagnostic misconception" is avoided. Finally, if incidental findings occur, research subjects must have a quick and easy access to a specialist who offers a comprehensive diagnosis.

References: [1] Heinemann T et al. (2007). Zufallsbefunde bei bildgebenden Verfahren in der Hirnforschung: Ethische Überlegungen und Lösungsvorschläge. *Dtsch Arztebl* 104(27): A1982-A1987; [2] Klix WE (2007). Zufallsbefunde bei bildgebenden Verfahren in der Hirnforschung. Ethische Überlegungen und Lösungsvorschläge: Zentrales juristisches Problem nicht verstanden. *Dtsch Arztebl* 104(46): A3184; [3] Büchel C., Rietschel M (2007). Zufallsbefunde bei bildgebenden Verfahren in der Hirnforschung. Ethische

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Überlegungen und Lösungsvorschläge: Beim Spezialisten rückversichern. Dtsch Arztebl 104(46): A3184; [4] Hentschel F (2007). Zufallsbefunde bei bildgebenden Verfahren in der Hirnforschung. Ethische Überlegungen und Lösungsvorschläge: Grundlage ist die Aufklärung. Dtsch Arztebl 104(46): A3185; [5] Fitzek C (2007). Zufallsbefunde bei bildgebenden Verfahren in der Hirnforschung. Ethische Überlegungen und Lösungsvorschläge: Recht auf ärztliche Begutachtung. Dtsch Arztebl 104(46): A3185; [6] Kummer R (2007). Zufallsbefunde bei bildgebenden Verfahren in der Hirnforschung. Ethische Überlegungen und Lösungsvorschläge: Ignoranz als ethisches Prinzip in der Medizin? Dtsch Arztebl 104(46): A3186; [7] Heinemann T (2007). Zufallsbefunde bei bildgebenden Verfahren in der Hirnforschung. Ethische Überlegungen und Lösungsvorschläge: Schlusswort. Dtsch Arztebl 104(46): 3186.

► Dr. phil. Bert Heinrichs, MA

born in Euskirchen (Germany); study of Philosophy, Mathematics and Educational sciences in Bonn and Grenoble (France), (2001 Magister Artium at the University of Bonn, 2007 doctorate at the University of Bonn; since 2007 Head of Research Department, German Reference Centre for Ethics in the Life Sciences (DRZE), Bonn. *Main research:* ethics and applied ethics, especially bioethics, anthropology, philosophy of science.

Patient's Autonomy in Neurosurgery

Peter C. Reinacher

- ▶ The principle of the patient's autonomy is of great importance in medical ethics. However, in neurosurgical practice it is frequently limited. This leads to great scepticism of clinicians, when they are asked to enforce the patient's autonomy. In addition, in clinical practice concerns about legal consequences often influence the decisions of physicians.
- ▶ By describing examples of such conflict situations and pointing out the limitations of patient's autonomy we would like to initiate a discussion to improve the implementation of ethical theory into clinical practice.

▶ **Dr. med. Peter C. Reinacher**

born in Waldshut (Germany); study of Medicine at the Universities of Homburg/Saar, Maryland (Baltimore, MD) and Heidelberg (doctorate at the German Cancer Research Center), graduation 1999. Working at the Departments of Neurosurgery of the University of Freiburg (1999-2001) and the RWTH Aachen (since 2002). *Main research:* laserapplications in neurosurgery (in cooperation with the Fraunhofer Institute for Laser Technology, Aachen), intraoperative motor evoked potentials, cerebral 4D MR angiography.

Acoustic Neuromas: Decision-Making of Patients

Ansel van Oosterhout

► When patients have to decide about an operation of their own brain, they very often are confronted with a dilemma. The decision will have existential consequences for the physical and psychological health, but has to be made on condition of severe ambiguity. This is true especially for the decision about the therapy of benign brain tumours as acoustic neuromas (vestibular schwannomas). These tumours are difficult to operate on, and mortality and morbidity are not smoothed out yet.

Patients with acoustic neuromas have the choice between four therapy options: (1) conservative therapy (regular MRI examinations without intervention), (2) surgical tumour removal, (3) radiosurgery (e. g. Gamma Knife), (4) fractionated radiotherapy.

The three invasive therapy options (2-4) have slightly different tumour control rates, but quite different rates of mortality, morbidity and everlasting disability. The risk of malignisation of acoustic neuromas after radiation seems to be very small but greater than zero.

Ideally, physicians would inform the patients about all therapy options and their different chances and risks. According to many narrations of patients, the reality seems to be far from this ideal. Therefore we have investigated the hypothesis that in Germany the medical guidance of patients with acoustic neuromas is often fragmentary and unidirectional.

► We have send a questionnaire concerning medical consultations and further influences on therapy decision as well as about side-effects of the treatment to about 950 acoustic neuroma patients (mainly from the Vereinigung Akustikus Neurinom e.V.). We have received about 740 answers (rate of return: 78 %) and analyzed them with the statistics program spss.

► Only a minority of the patients had been informed about the minimal-invasive Gamma Knife therapy and the radio therapy at all. Especially younger patients were advised to have their tumours surgically removed. According to our findings, the medical consultation of acoustic neuroma patients has grave deficits. Reasons therefore are probably the German health

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policy, a deficient research to date, and the rivalry between the different therapies.

► Ansel van Oosterhout, PhD

born in Delft (Netherlands); study of Medicine at the University Nijmegen; specialist for neurology and for neurosurgery; thesis about small cell lung cancer and brain metastases (Maastricht 1995); working at the Gamma Knife Center of the University Hospital Aachen. *Main research*: radiosurgery, gamma knife therapy.

Controlling Moral Decision Making by Deep Brain Stimulation

Hans-Werner Bothe

► The basal ganglia (being composed of the substantia nigra, subthalamic nucleus (STN), globus pallidus, and striatum) are involved in reinforcement of behaviour, attention, and adaptive sensorimotor control (motor sequencing, and action repertoires including motivational drive, and emotional responses to social environment). Parkinson's disease (PD) characterized by tremor, rigidity, and bradykinesia is caused by degeneration of substantia nigra (pars compacta) and dopamine-containing nigrostriatal tract. The dopamine depletion of the striatum induces an increased inhibitory output from the globus pallidus internus (driven by the STN) to the thalamus, resulting in inhibition of thalamo-cortical neurons. Electrical stimulation of the STN (deep brain stimulation: DBS) has been successfully used to treat Parkinsonian patients, plausibly achieved by a depolarizing blockade of the STN neurons. However, we found impaired social and moral decision making besides worthwhile improved motor function when stimulating the STN.

► Three male patients (45-65 years old) suffering from PD were severely handicapped by gait disturbance due to bradykinesia despite sufficient pharmacological treatment. The quality of life had decreased. Cognitive abilities (attention, processing speed, memory, language aptitude) were preserved. Under local anaesthesia DBS 3389 lead-electrodes (Medtronic, Minneapolis, USA) were stereotactically implanted into the dorsolateral STN on both sides. Postoperatively quality of life assessment increased, cognitive functions continued showing normal performance. However, all patients being stimulated developed antisocial behaviour such as lying, being verbally and sexually abusive, and shoplifting leading to arrest.

► In summary, stimulation induced STN malfunction (leading to vmPFC hyperfunction) originates reversible sociopathy resembling an early-onset frontal lobe lesion. Stimulation induced unusability of antecedently acquired social knowledge suggests STN's normal mode of operation as furthering

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behavior governed by cognitive processing with smothering simultaneously emotional impulsiveness.

► Univ.-Prof. Dr. med. Hans-Werner Bothe, MA

born in Goslar (Germany); study of Philosophy (Magister Artium 1979 at University Tübingen) and Medicine (Doctorate 1981 at University Mainz); 1981-1983 Max Planck Institute for Brain Research in Cologne (Head: Prof. Dr. K.A. Hossmann); 1983-1989 Assistant Neurosurgical Department at University Mainz (Head: Univ.-Prof. Dr. Dr. K. Schürmann); 1990-1991 SALK Institute San Diego (USA); 1991-1995 Associate Professor Neurosurgical Department at MHH Hannover (Head: Univ.-Prof. Dr. mult. M. Samii); since 1995 Full Professorship at Neurosurgical Department at University Münster. *Main research:* functional neurosurgery, neurobionics (inventor), awareness and consciousness, the problem of “ought from a be”, socialmoral judgement shift and DBS.

What do Neural Correlates of Moral Judgments Reveal on Moral Agency? A Methodological and Philosophical Critique

Markus Christen, Johannes Fischer

- ▶ The investigation of the “neural basis” of human social behavior has become a major subject in neuroscience. Within the emerging field of social cognitive neuroscience, neural correlates of moral judgments, as well as “modules” of moral behavior like empathy, altruism and cooperation have become a topic of research. In our contribution, we will critically discuss to what extent these studies indeed capture the phenomenon of moral agency.
- ▶ Methodologically, we will first give an overview of the current research on neural correlates of moral judgments, focusing on imaging-based studies where various ethical dilemmas are used as experimental paradigm. These studies are then critically analyzed by addressing four types of problems: First, we ask, from which perspective (intentional vs. (self-)observation perspective) these studies usually are performed and to what extent these differentiations may influence the results of these studies. Second, based from a philosophical perspective, we investigate the concept of “morality” on which these studies are based by identifying those moral emotions that are included (and excluded) within the conceptual framework in which these studies are placed. Third, we reconstruct the structure of moral perception these studies presuppose and we ask, in particular, on what type of belief the subjects are reacting in these experiments. Fourth, we assess the role of rationality within these studies, in particular by analyzing the relation of the results of these studies to the coherency theory of ethics.
- ▶ Based on this analysis, we will argue that the current research on neural correlates of moral judgments faces methodological challenges and lacks a profound embedding in current ethical theories on moral reasoning. We also suggest how these studies could be improved to better contribute to empirically informed ethical theorizing.

Section 5: Moral Agency and Free Will

► Dr. sc. ETH Markus Christen

born in Biel (Switzerland); study of Philosophy, Physics, Mathematics and Biology (diploma 1996 at the University of Berne) and neuroinformatics (2006 doctorate at the ETH Zurich); since 2007 research assistant at the Graduate Programme for Interdisciplinary Ethics Research at the University Zurich. *Main research*: neuroethics, methodology in neuroscience, theories of autonomy.

► Univ.-Prof. Dr. theol. Johannes Fischer

born in Altötting (Germany); study of Theology, Mathematics, Physics and Sociology (Universities of Marburg, Erlangen and Tübingen, PhD in 1982); since 1998 Full Professor for Theological Ethics at the University of Zurich (Faculty of Theology) and Director of the University of Zurich Institute for Social Ethics; responsible for the University Research Priority Program for Ethics. *Main research*: fundamental theological ethical issue, foundations of moral orientation, ethical problems at the start and end of life.

How to Study the Process of Moral Judgments with Brain Imaging Methodology?

**Event-related content analysis of continuous, semi-natural stimuli as
paradigm in functional magnetic resonance imaging**

René Weber, Klaus Mathiak

- ▶ Social neuroscience is a new and interdisciplinary research area within the cognitive neurosciences. The subject matter of this research field is to understand not only how social behavior is controlled by cognitive-biological systems, but also how these cognitive processes are influenced by social systems. One of the oldest topics when it comes to the understanding of social phenomena is the question how humans process information when they observe actions of others and form a moral judgment of these actions. While neuroscientific research has provided many insights into the psychology of morality and ethical behavior since the early 1990s, it is still not clear which of the basic process models of moral judgment (i. e. the Kantian Reasoning Model of Kohlberg; the Human Emotion Model of Haidt; the Rawlsian Analysis Model of Hauser & Mikhail) is best to describe the formation of moral judgments. Moreover, we have many fMRI studies of what happens in the brain when people make trade-offs between harm and rights and when they are treated unfairly. But little is known about important everyday judgments about treason, disrespect, etc. (see Haidt, 2008). One reason for these shortcomings is of methodological nature: it is still difficult to study social behavior and real-life issues within the artificial and restricted environment of brain imaging scanners.
- ▶ This presentation aims to expand present limitations in studying processes of moral judgment by introducing theory based, event-related content analyses of continuous, semi-naturalistic stimuli in fMRI designs. An fMRI study will be presented that demonstrates the feasibility of the developed methodology. The study analyzed responses to dramatic narratives following an affective disposition coding scheme.
- ▶ Preliminary analyses showed that a competently executed, theory-based, event-related content analysis can be used as a powerful analytical para-

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digm in fMRI studies and contribute to a better understanding of the process of moral judgment with increased ecological validity.

Neurobiological mechanisms such as shift of attention to important conflicts and involvement of episodic memory in moral judgment could be observed. The methodology will provide insights into the interaction of the underlying subsystems on a neurobiological and systemic level.

► **Dr. rer. nat. Dipl.-Kfm. Dipl.-Komm. René Weber**

born in Pforzheim (Germany); bachelor/masters degree in both Communication (Berlin University of Arts, 1993) and Quantitative Economics (University of Technology Berlin, 1995); PhD in Psychology (University of Technology Berlin, 2000); Assistant Professor at the Department of Communication and Cognitive Sciences at the University of California, Santa Barbara, USA. *Main research:* cognitive and emotional effects of television and new technology media including new generation video games, neural substrates of moral judgments, neural correlates of attention & flow in semi-natural environments, development of statistical and social scientific methodology.

► **Univ.-Prof. Dr. med. Dr. rer. nat. Klaus Mathiak**

born in Braunschweig (Germany); Professor for and head of the Section for Behavioral Psychobiology at the Department for Psychiatry and Psychotherapy of the RWTH Aachen University as well as Senior Lecturer at the Institute of Psychiatry, King's College London; Bachelor/Masters degree in Applied Mathematics (University of Technology Berlin, 1995), MD degree (Free University Berlin, 1997), and PhD in Neural Sciences (University of Tübingen, 2004); habilitation in Behavioral Neuropsychology (University of Tübingen, 2002). *Main research:* neural basis or complex auditory perception, psychological dysfunctions and social interactions.

Neuroscience and Legal Responsibility

Nicole Vincent

► The concept of responsibility plays an important role in law and public policy - for instance, in tort law victims obtain damages from their injurers, but only if the latter were responsible for the former's losses; in criminal law different consequences are visited onto those who were- and those who were not responsible for their actions when a crime was committed; and in public policy it is sometimes argued that those who are responsible for their own deprivations (e. g. smokers and alcoholics) should have less access to publicly funded remedies (e. g. publicly funded health care) than those who were not responsible for them (e. g. those whose health deteriorates due to "natural" causes).

However, although neuroscientists are increasingly being invited to comment and to shed light on people's responsibility, it is not exactly clear how the findings of neuroscience are meant to be relevant here. One source of the worry is that the law's criteria of responsibility talk about such things as beliefs, desires and intentions – concepts which are most comfortable within a folk psychological framework – but yet it is not clear that these concepts have relevant correlates (either directly or through inter-theoretic reduction) within neuroscience; as Morse puts this point, “[b]rains do not commit crimes; people commit crimes” (2006:397). Furthermore, Eastman and Campbell have argued that “there is a mismatch between questions that the courts and society wish answered and those that neuroscience is capable of answering” (2006:311). For these sorts of reasons some doubt exists about whether (and if so, precisely how) neuroscience can illuminate legal and political questions about responsibility.

► In this paper I reject these worries, and then I suggest a very specific role that neuroscience can play.

► On my account, neuroscience can help us identify the sorts of capacities which a person must have in order to have “capacity responsibility”, which on H.L.A. Hart’s account one must have in order to be capable of performing genuine actions, to be a legitimate bearer (and thus a potential violator) of

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legal norms, and to be the sort of person whom it makes sense to punish, to deter or even to reward in virtue of what they have done. Thus, this paper will show both that and how the findings of neuroscience are relevant to legal and political questions about responsibility.

► **Nicole Vincent, PhD**

Study of Philosophy and Computer Science at undergraduate level (BA Hons 1997 at LaTrobe University, Victoria, Australia) and then Philosophy of Law at graduate level (2007 doctorate at The University of Adelaide, South Australia, Australia); since late 2007 postdoctoral researcher in the Philosophy Section at TU-Delft in the Netherlands. *Main research:* theories of responsibility, neuroethics, philosophy of law.

Freedom, Force, and Consciousness

Dietmar Hübner

► Modern neuroscience has recently fuelled the philosophical debate on free will, supposedly providing new or refined insights into the causal determination of human thought and behaviour. An important line of argument that is currently evoked against determinism refers to Sellar's concept of a "space of reasons". The argument runs, roughly, as follows: Human thought and behaviour is determined by reasons (moral, but also pragmatic, logical or scientific); these reasons have a non-causal structure (their relationship is not reducible to cause-and-effect-chains); consequently, human thought and action is not (or at least not completely) subject to causal determination.

► This argument has several attractive features: It does not make use of any dualistic conceptions, its premises seem to be compelling, and it is not restricted to moral thought and behaviour. However, it meets with some fundamental scepticism concerning its cogency. A basic counter-argument might claim the following: The "space of reasons" is structured in a non-causal way, but a human being's "motion" in this "space" may still be causally determined. The validity of reasons, their relations, their respective strength are surely non-causal properties, but a human being's acknowledging, understanding and accepting them may still constitute causal events.

► It shall be argued that two essential ideas must be linked to the "space of reasons" argument in order to face this challenge.

First, reasons must be conceptualized in a way that their impact on human thinking can be understood as an active exertion of forces. Rather than just representing a pseudo-spatial structure in which thinking and behaviour are embedded and subject to usual causal determination, the "space of reasons" must be understood as a pseudo-causal field that can bring its own active demands into play, thus determining thought and behaviour in a sense co-equal with causal determination.

Second, human beings must choose reasons, rather than being programmed in line with them, in order to conserve the idea of freedom. This concept

of choosing reasons brings in an obvious danger of regress, seemingly making the free choice of reasons a condition for considering the adherence to reasons as a free act. However, a more moderate conception of “choice”, not requiring “free choice” as another, regressive reference to reasons, but contenting itself with the conscious representation of reasons, may be sufficient to establish the required structure.

► PD Dr. phil. Dipl.-Phys. Dietmar Hübner, MPhil

born in Solingen (Germany); study of Physics (1995 MPhil at the University of Cambridge, 1995 diploma at the University of Bonn) and Philosophy (1999 doctorate at the University of Bonn, 2007 habilitation at the University of Bonn); since 1999 Scientific Assistant at the Institute of Science and Ethics (IWE) at the University of Bonn. *Main research*: ethics, applied ethics, distributive justice.

Neuroethics and the Extended Mind Thesis

Gert-Jan Lokhorst

► The Extended Mind Thesis is the view that the mind is not confined to the skull of individual agents, but extends into the world (Clark and Chalmers 1998). I used to think that this thesis is false (Lokhorst, 2007), but I now think that it makes a good point. Levy has argued that the Extended Mind Thesis is relevant for neuroethics (Levy 2007a, 2007b).

Levy presents the following two principles as foundations for reasoning in neuroethics.

1. The Strong Ethical Parity Principle (EPP Strong): since the mind extends into the external environment (in view of the Extended Mind Thesis), alterations of external props used for thinking are (*ceteris paribus*) ethically on a par with alterations of the brain.

2. The Weak Ethical Parity Principle (EPP Weak): alterations to external props are (*ceteris paribus*) ethically on a par with alterations of the brain to the precise extent to which our reasons for finding alterations to the brain problematic are transferable to alterations to the environment in which it is embedded.

► EPP Strong is problematical because it only leads to reasoning by analogy, which is notoriously unreliable. For example, consider the following two arguments:

1. "Memory is analogous to a notebook. I may not erase your memory, because I may not destroy your notebook either."

2. "Memory is analogous to a garbage can. I should erase your memory, because I should empty the garbage can, too." ("If I may not erase your memory, I won't empty the garbage can either.")

Which of these two arguments is valid?

► EPP Weak is preferable to EPP Strong because it leads to more than just reasoning by analogy: it leads to reasoning from first principles. For example:

1. "It is wrong to destroy irreplaceable objects. Therefore: you may not destroy the Mona Lisa, and you may not destroy my brain either."

2. "It is good to clean up the rubbish. Therefore: it is good to demolish unused buildings, and it is good to remove unused parts of the brain as well."

These arguments clearly reveal the premises on which they are based. The latter claim may be found objectionable, but it can easily be avoided by stressing the *ceteris paribus* condition.

References: Clark A, Chalmers D (1998). "The Extended Mind". *Analysis*, vol. 58, pp. 7–19; Levy N. (2007a). *Neuroethics: Challenges for the 21st Century*, Cambridge University Press, 2007, ch. 1; Levy N. (2007b). "Rethinking Neuroethics in the Light of the Extended Mind Thesis". *Am J Bioethics*, vol. 7, pp. 3-11; Lokhorst, G.J.C. (forthcoming), "Neuroethics and the Extended Mind Thesis," to appear in the Proceedings of the Eighth Congress of the Austrian Society of Philosophy (Graz, 2007).

► **Gert-Jan Lokhorst, PhD, MMedSc, MA**

study of Medicine and Philosophy at Erasmus University Rotterdam (MMedSc 1980, MA 1985, PhD 1992); researcher work at the Faculty of Medicine of Erasmus University Rotterdam, the Institute for Language Technology and AI of Tilburg University, the Erasmus University Research Institute for Decision and Information Systems, and the Faculty of Philosophy of Erasmus University Rotterdam (until 2004); researcher in the section of philosophy of the Faculty of Policy and Management of the Delft University of Technology (since 2004); member of the 3TU.Centre for Ethics and Technology; member of the editorial board of the journal "Neuroethics".

Students' Perceptions of Modern Neurosciences – First Results of a Discourse Project

Dagmar Schmitz, Ariana Zaracko, Sabine Müller

► In September 2008 the Institute of History, Theory and Ethics of Medicine (RWTH Aachen) and the Institute for German, European and International Medical Law, Public Health Law and Bioethics (IMGB) (University of Mannheim) started a discourse project in the field of modern neurosciences. The project aims at initiating a sustainable, international discourse with students of higher grade classes about current topics of the neurosciences and their ethical, juristic and social aspects. It is funded by the German Federal Ministry of Education and Research.

► This presentation will describe the project and summarize experiences as well as first results from the lessons in the schools.

Six schools are involved: three from Germany (Aachen, Hamburg, Würzburg), one from Belgium (Kelmis), and two from the Netherlands (Maastricht, Heerlen). The project started with several lessons in each school on the following topics: [1] Brain screening, brainom and brain fingerprinting, [2] neuroenhancement and the usage of psycho-active substances for a better mental performance, [3] neuroprosthetics and neural interfaces, [4] neural correlates of religiousness and spirituality, and [5] neurosciences and the debate about the free will.

The students are supported in autonomous research on these issues by the project team. In small groups, they create scientific posters which they present in their classes.

To initiate and support the discourse between the schools, several tools are applied: first an open internet forum for presenting and discussing the results of their own research and for chatting with five experts from neurosciences and neuroethics; second a scenario workshop with the aim of the formulation of a public vote which is presented in a public event and discussed with scientists, politicians and the media.

► In order to introduce the five topics from the medical, ethical and legal point of view to the students, different didactic tools were used. Whereas the

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primarily medical contents were delivered in didactic lectures, for the ethical and legal contents the students in all schools responded best to moral case deliberations and role play. They focussed their own research to a broad range of questions from all five topics with special emphasis on neuroenhancement and neuroprosthetics. Students' opinions will be presented in detail for ethical questions in relation to cochlear implants.

► **Dr. med. Dagmar Schmitz**

born in Trier (Germany); study of Medicine in Hamburg and Heidelberg (2001 doctorate); 2000-2002 genetic counsellor (University of Freiburg), 2002-2007 Scientific Assistant at the Institute for Ethics and History in Medicine at the University of Tuebingen; since 2007 Scientific Assistant at the Institute for History, Theory and Ethics of Medicine at the RWTH Aachen. *Main research:* neuroethics, ethical aspects of genetic diagnosis, ethics at the beginning of life.

► **Ariana Zaracko**

born in Pforzheim (Germany); study of Economics, English Philology and Law at the University of Mannheim (State Examination in 2006); since 2006 Scientific Assistant at the Institute for German, European and International Medical Law, Public Health Law and Bioethics at the University of Mannheim. *Main research:* legal aspects of modern neurosciences, pharmaceutical law, ethics in biomedical research, consent, stem cell research.

► **Dr. phil. Dipl.-Phys. Sabine Müller:** *see page 14*

Neuroeconomics from an Ethical Point of View

Jan Steinmetzer

► Neuroeconomics, a new promising branch of “behavioral economics”, proposes radical changes. Theories are constrained by facts about how the brain actually works. The ability to depict brain activity in PET and fMRI scanning have now made it possible to observe details that could never be seen before. Teams of academic and corporate neuromarketers have started to map people and to find out how their neurons respond to products and pitches. But, from an ethical point of view, there is a strong controversy between the neuroeconomic researchers and their critics, especially patient's organisations, commercial alert organisations and even psychologists.

► This presentation discusses the proposed changes in methodology from traditional marketing skills like behavioral economics to economic theories based on imaging techniques and its ethical implications. It focusses on literature studies, pointing out the foretold controversy.

► Neuroscientific findings raise questions about the usefulness of some of the most common constructs that economists commonly use, such as risk aversion and time preference.

Neuroeconomics goes beyond the common practice of economists by using psychological insights as inspiration for economic modeling or by giving experimental evidence that challenges behavioral assumptions of economic models. Critics have pinpointed the scenario that neuroeconomic analysis could be a new (manipulative) tool for advertisers to influence buying decisions, and that consumers should be taught to identify them. Neuroeconomics promise to tip the balance of power in the marketplace from the buyer to the seller. Therefore, economic welfare analysis should use true utility rather than the utilities governing choice (“choice utility”).

► **Jan Steinmetzer, MA**

born in Bad Neustadt (Germany); study of History, French and German Philology, Philosophy (2002 MA) and Computer Sciences (2002 diploma), since 2005 Scientific Assistant at the Institute for History, Theory and Ethics of Medicine at the RWTH Aachen and Coordinator for Education in Medical Humanities. *Main research:* gender ethics, social impacts of medicine, enhancement, doctor-patient-relationship, social history.

“Psychosurgery”: History and Ethics

Dominik Groß

► The term “Psychosurgery” describes surgical interventions into the brain of patients to treat severe mental illness. It implicated the destruction of seemingly healthy brain tissue. It started with interventions by the Swiss Psychiatrist G. Burckhardt (1888-1890) and was widespread in the era of Egas Moniz and Walter Freeman (1936-1955). The (partly intended) effects were a loss of emotional flattening, the blunting of personality, a non-transient sedation, a reduction of spontaneity and of problem solving and planning abilities and of the patient’s sexual drive. The non-curative operations have to be looked upon as high-risk interventions with a high lethality, a contentious indication. But what are the reasons for stopping lobotomies, and when did it stop?

In present, there is a scientific and ethical debate about a possible “renaissance” of psychosurgery, also called “modern psychosurgery”, pointing at stereotactic interventions and DBS in severe cases of obsessive-compulsive disorder, fear disturbance and Tourette syndrome. But questions arise about the adequateness of such a comparison.

► The presentation is based on a broad literature review (1850-2008).

► In the 1970s, “classical psychosurgery” was stopped in many countries for different reasons (no selective application, no informed consent, no follow-up examinations, severe side-effects, superior therapeutic alternatives: improvements in psychopharmacology and behaviour therapy). There are substantial differences between “classical” and “modern psychosurgery”: Today, there are rigorous screenings for non-surgical treatment options (very limited number of patients), a clear informed consent, less invasive procedures; few to no irreversible damages, optimized techniques (stereotaxy, gamma knife) and intensive follow-up evaluations resp. treatments, This, the term “modern psychosurgery” is misleading and inadequate.

► **Univ.-Prof. Dr. med. Dr. med. dent. Dr. phil. Domink Groß:** *see page 10.*

Ethical Dilemmas in Neurosurgery

Sabine Müller

► Modern medicine and medical technology provide new possibilities for the therapy of diseases or traumata of the brain. On one hand, neurosurgical interventions into the brain offer important chances: lifesaving (e. g. via the removal of brain tumours or malformations of blood vessels), healing or palliation of severe chronic diseases (e. g. epilepsy or Morbus Parkinson), prevention or cure of disabilities (e. g. in case of progressive loss of sensory functions by brain tumours), therapy of pain (e. g. amputation pain, trigeminal neuralgia). On the other hand there are severe risks such as paralyses, sensory or motor dysfunctions, long-term disability, locked-in syndrome and death.

Furthermore, interventions into the brain imply the risk – and the chance – of changes of cognitive functions or emotional properties of the patient. Since the brain is the basis of perception, emotions, cognition and activity, for basically all physical or chemical interventions into the brain, alterations of sensory, affective or intellectual properties have to be anticipated.

Several studies report severe alterations of the patient's personality after brain surgery. Many patients suffer by depression, cognitive impairments, concentration deficits, (partial) memory losses after brain surgery, and some even show alterations of the social behaviour or of the power of moral judgement.

Brain surgery not necessarily deteriorates mental properties: Sometimes depressions, aggressiveness or even paedophilia vanish after brain tumour resection – a finding that can be called “psychotherapy via scalpel”.

► The ethical dilemmas which are raised by possible personality changes as a result of neurosurgical interventions are discussed and strategies for their resolution are proposed.

► Interventions into the personality of another person generally are ethically problematic, especially if the alterations are irreversible, painful, reduce the mental capabilities, and/or downgrade the power of moral judgement and/or the social behaviour.

Poster Section

Unintended personality changes have to be differentiated from intended ones: (1) Unintended personality changes can occur as side-effects or complications of micro- or radiosurgical interventions, e. g. as consequences of bleeding, liquor accumulation, increased brain pressure, lesions, radiation necrosis or inflammations. (2) Intended personality changes sometimes are aspired when a brain lesion or disease is supposed to be the cause of a mental sickness. In some studies, personality changes were intended via functional micro- or radiosurgery or by deep brain stimulation, e. g. in case of compulsivity, severe depression, and perhaps in future even in case of extraordinary psychiatric disorders as Body Integrity Identity Disorder (BIID).

(1) If personality changes are not intended, an ethical dilemma can result from antidromic aims as the lifesaving on the one hand and the conservation of the personality on the other hand (e. g. in the case of a brain tumour in the frontal lobe). (2) In the case of intended personality changes, fundamental ethical issues are raised: Can brain surgeries with the aim of changing the personality be ethically justified? If so, which aims are legitimate? It is inevitable to evaluate personality traits in order to evaluate brain surgeries with intended personality changes. Relevant principles for this evaluation are the well-being not only of the patient, but also of his social surroundings, the autonomy and the social functioning of the patient. For the resolution of at least some of the ethical dilemmas in neurosurgery, two strategies are recommended: (1) development and usage of minimal-invasive technologies; (2) individual, patient-centred treatment strategies.

► **Dr. phil. Dipl.-Phys. Sabine Müller:** *see page 14.*

Acoustic Neuromas: Decision Problems of Patients

Sabine Müller, Ansel van Oosterhout

► When patients have to decide about an operation of their own brain, they very often are confronted with a dilemma. The decision will have existential consequences for the physical and psychological health, but has to be made on condition of severe ambiguity. This is true especially for the decision about the therapy of benign brain tumours as acoustic neuromas (vestibular schwannomas). These tumours are difficult to operate on, and mortality and morbidity are not smoothed out yet.

Patients with acoustic neuromas have the choice between four therapy options: (1) conservative therapy (regular MRI examinations without intervention), (2) surgical tumour removal, (3) radiosurgery (e. g. Gamma Knife), (4) fractionated radiotherapy.

The three invasive therapy options (2-4) have slightly different tumour control rates, but quite different rates of mortality, morbidity and everlasting disability. The risk of malignisation of acoustic neuromas after radiation seems to be very small but greater than zero.

Ideally, physicians would inform the patients about all therapy options and their different chances and risks. According to many narrations of patients, the reality seems to be far from this ideal. Therefore we have investigated the hypothesis that in Germany the medical guidance of patients with acoustic neuromas is often fragmentary and unidirectional.

► We have send a questionnaire concerning medical consultations and further influences on therapy decision as well as about side-effects of the treatment to about 950 acoustic neuroma patients (mainly from the Vereinigung Akustikus Neurinom e.V.). We have received about 740 answers (rate of return: 78 %) and analyzed them with the statistics program spss.

► Only a minority of the patients had been informed about the minimal-invasive Gamma Knife therapy and the radio therapy at all. Especially younger patients were advised to have their tumours surgically removed. According to our findings, the medical consultation of acoustic neuroma patients has grave deficits. Reasons therefore are probably the German health

Poster Section

policy, a deficient research to date, and the rivalry between the different therapies.

▶ **Dr. phil. Dipl.-Phys. Sabine Müller:** *see page 14.*

▶ **Ansel van Oosterhout, PhD:** *see page 23.*

Morphometric Brain Abnormalities in Boys with Conduct Disorder and ADHD

Georg von Polier, Timo Vloet

- ▶ Children with the early-onset type of conduct disorder (CD) are at high risk for development of an antisocial personality disorder. Although there have been several neuroimaging studies on morphometric differences in adults with antisocial personality disorder, little is known about structural brain aberrations in boys with CD.
- ▶ MRI and voxel-based morphometry were used to assess abnormalities in gray-matter volumes for 23 boys aged 12 to 17 years with CD (17 comorbid for ADHD) in comparison with age- and IQ-matched controls.
- ▶ Compared to healthy controls, mean gray-matter volume was 6 % smaller in the clinical group. Compared to controls, reduced gray-matter volumes were found in the left orbito-frontal region and bilaterally in the temporal lobes, including the amygdala and hippocampus on the left side in the CD group. Regression analyses in the clinical group indicated an inverse association of hyperactive/impulsive symptoms and widespread gray-matter abnormalities in the fronto-parietal and temporal cortices. By contrast, CD symptoms correlated primarily with gray-matter reductions in limbic brain structures. Conclusions: The data suggest that boys with CD and comorbid ADHD show brain abnormalities in fronto-limbic areas that resemble structural brain deficits, which are typically observed in adults with antisocial behavior.

▶ **Georg von Polier**

born in Hamburg (Germany); study of Medicine (graduation as medical doctor in 2007 at RWTH Aachen University); since 2007 assistant physician at the Department of Child and Adolescent Psychiatry at the University Hospital Aachen (Germany). *Main research:* family research in adolescents with early onset schizophrenia.

► **Dr. med. Timo D. Vloet**

born in Kevelaer (Germany); study of Medicine (graduation as medical doctor 2001 at the RWTH Aachen); since 2006 Senior physician at the Department of Child and Adolescent Psychiatry at the University Hospital Aachen (Germany) and Associate of the Brain Imaging Centre West, Juelich (Germany), Institute of Medicine. *Main research:* neurobiological underpinnings of conduct disorder and attention-deficit hyperactivity disorder.

Emotion, Cognition and their Interaction in Adolescent-Onset Schizophrenia: an fMRI Study

Katharina Pauly

► Schizophrenia is one of the most pervasive psychiatric disorders, leading to impairments of affective and cognitive abilities, including executive functions. Both symptoms exert a mutual influence. Early-onset schizophrenia constitutes a particularly severe form of the disorder. The neural correlates underlying the interaction of olfactory-induced negative emotion and verbal working memory in adolescent-onset schizophrenia are the focus of this study.

► During functional magnetic resonance imaging, 12 adolescent-onset schizophrenia patients and 12 healthy adolescents performed a verbal n-back task. Intermittently, negative and neutral emotion was induced by olfactory stimulation. We investigated the contrasts of verbal working memory, negative emotion and their interaction (ANCOVA, SPM2).

► In adolescent-onset schizophrenia patients, dorsolateral prefrontal, anterior cingulate and inferior parietal hypoactivation was found during working memory demands. Interestingly, for negative vs. neutral emotion induction, juvenile patients mainly showed stronger brain activation than healthy subjects in widespread brain areas associated with emotion processing – including the left orbitofrontal cortex, the left medial frontal gyrus as well as the middle and posterior cingulate gyrus. Finally, during the interaction of emotion and cognition, adolescent-onset schizophrenia patients showed brain activation aberrations in a thalamo-cortical network, including the angular gyrus and precuneus extending to the posterior cingulate gyrus.

Our results provide new insights into the neural correlates underlying the mutual influence of affective and cognitive symptoms in adolescent-onset schizophrenia. The dysfunctional thalamo-cortical network found for the interaction of negative emotion and working memory mainly included regions involved in the integration of converging information – either on the sub-cortical (thalamus) or on a higher order cortical level (comprising the angular gyrus). These findings point to dysfunctional emotion-cognition interactions

in AOS which may explain its poor prognosis. From an ethical view, the study especially raises the question whether negative emotion induction in psychiatric patients is justifiable for study aims.

► **Dipl.-Psych. Katharina Pauly**

born in Weiden (Germany); studies of Psychology (diploma 2004 at the University of Regensburg) and Cross-cultural Cooperation and Management (certificate 2002, University and FH Regensburg); since 2004 Scientific Assistant at the Department of Psychiatry and Psychotherapy at the RWTH Aachen University. *Main research:* the neural correlates of olfaction, emotion, executive functions, memory, self-reflection and emotion-cognition interactions in adult and early-onset schizophrenia patients and individuals in high risk states; influence of cognitive behavioural therapy on cerebral dysfunctions in schizophrenia.