

1. Title

Neuroethics: ethical, legal and conceptual aspects of neuroscience and neurotechnology.

Summary

The neurosciences play an increasingly prominent role in society. This development gives rise to numerous ethical and legal problems. As a result, the relatively new field of neuroethics is currently undergoing an explosive growth. The present research-project aims (1) to give a conceptual clarification of the major issues in neuroethics, and (2) to study the legal aspects of neuroscience, with special attention to the Dutch legal system where relevant and appropriate.

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4. Previous Submissions

This proposal has not previously been submitted to NWO. There is no plan to submit this proposal elsewhere.

5. Institutional Setting

Section of Philosophy, Faculty of Technology, Policy and Management, Delft University of Technology.

6. Period of Funding

1 January 2007 – 1 January 2011.

7. Composition of the Research Team

Principal Applicant: Dr G.J.C. Lokhorst	Section of Philosophy, Faculty of Technology, Policy and Management, Delft University of Technology
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Post-doc	Section of Philosophy, Faculty of Technology, Policy and Management, Delft University of Technology
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8. Structure of the Proposed Research

<i>Project</i>	<i>Carried out by</i>	<i>Supervision</i>
1. Conceptual clarification of neuroethics	Post-doc	Lokhorst & Van den Hoven
2. The brain and the law	PhD Student	Lokhorst & Van den Hoven & Stout
Subsidiary project: writing an introduction to the philosophy of mind for neuroscientists and other non-philosophers	Principal applicant	Lokhorst

Project 1 will be carried out by a $\frac{3}{4}$ post-doc working for 4 years. Name: not yet known. Profile: background in medicine and philosophy.

Project 2 will be carried out by a PhD student working full-time for 4 years. Name: not yet known. Profile: background in law, and, if possible, in philosophy as well.

The subsidiary project will be carried out by the principal applicant, nominally working $\frac{1}{2}$ fte for 1 year. The subsidiary project will actually be spread out over 2 years.

9. Description of the Proposed Research

9.1. General Description

As a result of the development of new technology, it is nowadays possible to study the living brain at a level of detail which was unthinkable as recently as 25 years ago. Techniques such as CT-scans make it possible to study the anatomy of the brain *in vivo*, and techniques such as Positron Emission Tomography and functional Magnetic Resonance Imaging make it possible to “see the brain in action” and to study the cerebral correlates of cognition, emotion and behavior. On top of this, technologies aimed at modifying (influencing, treating or enhancing) the brain—ranging from neuropharmacology to neuroengineering—are becoming more and more powerful.

Both types of development give rise to a host of new moral and legal problems. These problems are now being addressed in a new field called “neuroethics,” a branch of bioethics which is currently undergoing an explosive growth. (For surveys of this field, see the bibliography in the Appendix.)

Some issues discussed in neuroethics are special cases of problems which are familiar from traditional medical ethics. For example, what to do with incidental findings, i.e., pathology (or indicators of future pathology) found in the course of experiments carried out for non-medical purposes? Should the subjects be referred to a physician or not? (Practices are remarkably different in different countries.) A second example: how reliable are the reports in the popular media (press, movies, television) and which influence (both cognitive and emotional) do they have on the audience?

However, not all of neuroethics is continuous with traditional medical ethics. The reason for this is that the brain is a very special organ. It is the “organ of thought” and the “seat of the soul” in the sense that researchers nowadays assume that all mental activity is correlated with brain activity. As a result, knowledge of brain functioning comes dangerously close to knowledge of the most intimate and private parts of the mind, and control over brain activity may be regarded as the ultimate form of control over our inner lives.

It is especially the use of brain science outside the health care system that gives rise to ethical concerns and legal problems. For example, in neuroeconomics, researchers try to understand the brain mechanisms that cause economic decisions (Glimcher 2003). This is interesting as pure science, but becomes problematic when neuromarketeers try to identify the “buy-button” and start looking for ways to manipulate it (Renvoisé & Morin 2005). Similarly, law enforcement agencies are considering “brain fingerprinting” to identify terrorists on the basis of brain activity and are interested in brain-based lie-detection, arguing that “the brain does not lie” (Wolpe et al. 2005). It is hard to think of a more drastic breach of privacy. In the foreseeable future, psychological tests may be replaced by, or at least supplemented with, brain imaging evidence for recruitment purposes, insurance companies might want to examine brain scans for indications of present or future mental illness, and so forth (see the surveys listed in the Appendix for references)—such developments might well be regarded as undesirable. This is not to say that all applications of neuroscience for non-medical purposes are undesirable. The current “brain-based learning approach” in education, for example, is widely perceived as welcome and defensible (references are again given in the surveys of neuroethics listed in the Appendix).

The development of technology to modify (treat or enhance) the functioning of the brain raises a whole host of additional issues. Neuropharmacology is making progress, but the effects are often controversial: there is, for example, a debate going on about ADHD and

Ritalin, and the discussion about the desirability or undesirability of psychotropic drugs such as Prozac to improve mood, memory or learning has just started. Neuroengineering is seen as welcome as long as it limits itself to the construction of devices such as cochlear implants to overcome manifest defects, but it generates anxiety when one reads about mentally challenged people who want to have cerebral implants installed to enhance the functions of their brains, or about military applications to improve the behavior of pilots and soldiers in the field.

The discussion about the use of brain science outside the health care system is also gaining prominence in legal circles. In the USA, several criminal court cases have already taken place in which the defense adduced medical findings (e.g., the presence of a brain tumor) to obtain reduction of sentence or even acquittal (Morse 2004, Zeki & Goodenough 2006). Such cases will become more frequent as time goes on. But is not yet clear to what extent neuroscientific evidence should be counted as relevant for legal purposes. If a cerebral cause for misbehavior can be found, does this automatically absolve the accused of moral or legal responsibility? Do such cases call for treatment rather than punishment? Should the legislator take the findings of neuroscience into account? Opinions diverge widely (Morse 2006). This debate is not entirely unprecedented, but becomes more urgent as neuroscience sheds more light on the causes of decision and action.

Both neuroethics and the debate about the challenges which the progress of neuroscience poses to the law are currently more advanced in the USA and in the United Kingdom than on the European continent. Yet the conclusions reached abroad cannot automatically be applied domestically: moral positions, social institutions and the legal system differ from country to country, and the foreign contributions sometimes reveal striking local biases. The situation is now changing: a listing of some recent European initiatives can be found in the Appendix. As the Appendix makes clear, almost no work has thus far been carried out in the Netherlands.

The present research project is based on the assumption that the debate about neuroethics and the relevance of neuroscience for the law would greatly benefit from greater attention to conceptual issues. The project is therefore largely aimed at conceptual analysis and clarification. The problem is basically the following: in the debate about neuroscience, ethics and the law, we see a mixture of two languages: the language of neuroscience and ordinary language—the language we use in our daily affairs and which is continuous with the language of the law. These languages arose under different circumstances and for different purposes and they cannot straightforwardly be translated into each other. Yet in the debate about neuroscience, ethics and the law, both are used and somehow have to be matched. It is easy to show that nonsense results if one proceeds carelessly in this respect (see Bennett & Hacker 2003 for examples), but it is more difficult to indicate the right direction. We will nevertheless proceed on the assumption that conceptual analysis is one of the main tools to advance the ongoing debate.

For practical purposes, the project is divided into two sub-projects: (1) conceptual and related issues in neuroscience and neuroethics, and (2) conceptual issues in the field of the brain and the law, with reference to the results obtained in sub-project (1) and with special attention to the Dutch legal system and legal framework, where relevant and appropriate. In addition to this, an introduction to the philosophy of mind for neuroscientists and other non-philosophers is planned.

9.2. Sub-project 1: Conceptual Clarification of Neuroethics

Philosophers have been thinking for a long time about the mind-brain problem, the relation between the languages of science and ordinary language, freedom and determinism, and similar topics which are relevant to neuroethics. However, the insights they have obtained are almost totally absent from the current neuroethics literature. We want to set this omission

straight. We are convinced that this is the first time in history that traditional ivory-tower philosophy of mind begins to pay off and have practical consequences.

We think that philosophy has obtained relevant and useful results with respect to the following five topics.

1. *Conceptual issues.* Ordinary language dates from pre-scientific times. It would be surprising if the concepts of ordinary language precisely matched those of science. This includes psychological concepts: it would be surprising if they corresponded to meaningful distinctions on the level of the brain. It is accordingly naïve to suppose that the findings of neuroscience, e.g., brain-imaging data, can accurately be described or interpreted in ordinary-language terms (folk-psychology). This is a familiar theme in the philosophy of mind (see, e.g., Bennett & Hacker 2003) and it has also been noticed by non-philosophers (see, e.g., Uttal 2001). It is clearly relevant for neuroethics. For example, if there is nothing in the brain that corresponds to thoughts in the ordinary sense of the word, then neuroethicists need not be concerned about reading the mind on the basis of images of the brain and consequent breaches of privacy. However, such considerations are absent from the current neuroethics literature.

2. *Philosophy of mind.* Some authors are dualists (man has a mind or soul over and above his body), others are monists or physicalists (we consist of things like those acknowledged by current-day physics). There is a very broad spectrum of alternatives in this area. It can be demonstrated that one's metaphysical position in these matters can have a decisive influence on one's stand towards issues of practical concern, such as the acceptability of psychosurgery. Neuroethics might benefit from a greater sensitivity on this point.

3. *Logic.* It is important to pay attention to the logical structure of argumentation. First example: Levy (forthcoming) argues that there is no clear-cut distinction between treatment and enhancement (this is a popular thesis in neuroethics). He does so on the basis of the existence of borderline cases. This has practical consequences: treatment is covered by medical insurance, enhancement is not. But the argument is flawed, as can be shown by considering the Sorites paradox. Second example: Levy (forthcoming) argues that neuroethics can be founded on the "extended mind thesis," which roughly says that the mind is not confined to the body: certain artifacts outside the body can legitimately be viewed as parts of it (Menary, forthcoming). This thesis enables us to reason as follows: intervention X on (internal) part Y has moral status S because it is analogous to intervention X on (external) part Z, which has moral status S. For example, you may not erase someone's memory because this is just like erasing the hard disc of this person's computer, which is morally wrong. However, as the example makes clear, this type of reasoning in practice boils down to reasoning by analogy, which is well known to be unreliable. This seems to suggest that, even though Levy's strategy may serve as a convenient rule of thumb and can be effective for rhetorical purposes, it cannot provide a rock-solid basis for neuroethics. This again shows that logical sensitivity is not a luxury in this emotionally charged field.

4. *Brain science as a basis for ethics.* It has been claimed that neuroscience might shed light on ethics. For example, it has been argued that mirror neurons are the cerebral substrate of empathy, and that there are two decision systems in the brain (an old, fast, hardwired system, and a new, slow, flexible and rational system), which reveal themselves in different contexts and might sometimes conflict (see the surveys listed in the Appendix for references). Are these discoveries indeed relevant for ethics, the allocation of moral and legal responsibility, and moral education, or is this nothing but the age-old is/ought fallacy in a new guise?

5. *Philosophy and history of science.* Much of the literature about the social implications of neuroscience resembles the literature about phrenology and its applications (in education, and so on) from the first half of the nineteenth century. The current neuroethics literature shows

little historical awareness. This is regrettable. For although brain science has changed since 1800, the desires, aversions, conceptions and misconceptions of the people who want to use and misuse it have remained the same. We may learn something from the historical parallels and precedents.

9.3. Sub-project 2: The Brain and the Law

To what extent are the brain sciences relevant to the law? There are several problems here.

First, the conceptual framework of neuroscience is strikingly different from that used in law, which implies that results from the former domain cannot automatically be applied in the latter. We need conceptual clarification to say something sensible about this point. This is related to the first point of the previous section.

Second, the concept of *mens rea* is quite different from the concept of causally efficacious brain activity (as lawyers have noted: Morse 2004, Zeki & Goodenough 2006). This is again related to the first point of the previous section.

Third, there is an age-old tension between understanding and forgiving (and possibly curing or treating), on the one hand, and attribution of responsibility (and consequent punishment and revenge), on the other. This tension manifests itself in the court cases mentioned above. The tension becomes greater as we become more and more capable of giving causal explanations of behavior. Does this development threaten to make the law irrelevant? Philosophers have been shedding light on this issue for centuries. Their insights warrant translation into modern terms.

Fourth, it is sometimes argued that the law should take neuroscientific findings into account, but this has—arguably for good reasons—never been done so far (Morse 2006). Examination of this issue, which involves both practical and theoretical considerations, is interesting for philosophical reasons and essential for legislative policy.

Fifth, much of the law is concerned with the regulation of economic processes. The advancement of knowledge about the nature of economic decision making, the property instinct, deception, and so on, could well have repercussions in the legal domain (as is argued in Zeki and Goodenough, 2006).

Much has already been written about these topics, but all of it reveals a typically Anglo-American point of view. Some counterbalance would be welcome—and the insights obtained abroad need reconsideration anyway because the Dutch law and legal system are different from those in operation abroad. Apart from this, the philosophical literature about causation, agency, the compatibility of determinism with the freedom of the will, guilt, responsibility and “being in control” needs to be taken into consideration to a greater extent than has been done so far. All these issues are urgent because legislators are now beginning to develop policies on how to take the findings of the neurosciences into account.

9.4. Coherence

First, there is a natural coherence between the two sub-projects because ethics and the law are intimately connected subjects: the law is to a considerable extent the institutionalized form of currently accepted morality. The topic “the law and the brain” is accordingly continuous with neuroethics. Similar issues are addressed in both domains, often even by the same authors. Second, the conceptual concerns that are relevant with respect to neuroethics play a role in the legal domain, too: in both domains one is confronted with the difficulty of interpreting scientific data in ordinary-language terms that make sense at the level of human affairs. As regards neuroscience and moral discourse, conceptual analysis is the crucial go-between, and the same applies to neuroscience and the law. Legislators and policy makers cannot make

decisions on the basis of “raw” scientific data. These data have to be interpreted first. But how? It is at this point that reflection and conceptual analysis are needed. Apart from this, we foresee a lively dialogue and exchange of ideas between the two persons working on the two sub-projects of the present project. Applied ethics is sterile if there is no contact with the field of application (such as the realm of the law in this case), and the domain of justice—in which making appropriate conceptual distinctions is an important activity in any case—might benefit from related work in adjacent areas (such as neuroethics in this case).

9.5. Methodology

A large part of the present project consists of conceptual clarification. The methodology we follow in this area is the standard one in analytical philosophy: study the discourse of the participants by reading the literature and participating in the discussion, identify the crucial concepts and the concepts that give rise to controversy, clarify these by critical reflection, and test the results of this process by applying them to the ongoing debate and presenting them for scrutiny to the academic community.

9.6. Innovative Nature of the Project

Contributions to the clarification of conceptual issues in neuroethics are rare at the moment. There is only one book in this area, namely Levy’s book (forthcoming). The subject “the law and the brain” is also relatively new. There exists only one edited volume at the moment (Zeki and Goodenough, 2006), and nothing seems to have been published in the Netherlands.

9.7. Social Relevance

The social relevance of the topics we have mentioned is immense. The brain sciences play an increasingly prominent role in society, which calls for reflection and action on the part of policy makers, lawyers, and the general public. The very existence of the *Meeting of Minds—European Citizens’ Deliberation on Brain Science (ECD)* initiative, in which citizens’ panels from nine European countries discuss the implications of neuroscience on society at large, sufficiently testifies to the social relevance of the project.

9.8. Embedding

The projects will be carried out in the Section of Philosophy of the Faculty of Technology, Policy and Management of the Delft University of Technology. This section is highly appropriate for this type of research for the following reasons.

- First, all developments we have described are technology-driven. Without neuroimaging and neuroengineering, neuroethics would not exist.
- Second, the section of philosophy has much experience with investigating the social consequences of new technology.
- Third, the section of philosophy received the highest possible score during the latest assessment of the quality of philosophical research in the Netherlands.
- Fourth, the present project continues a project which is already being carried out in the philosophy section, namely “Medical Images in the Health Care Process” (Delft University of Technology and Leiden University Medical Center, funded by NWO/STW).
- Fifth, the section organizes an NWO-funded workshop entitled “The ethics of neuroimaging and the neuroimaging of ethics” (2007).
- Sixth, the section is exploring the possibility of launching a *Journal of Neuroethics* (Springer).
- Seventh, the section has excellent contacts with researchers working abroad, such as Neil Levy, David Chalmers, and others.
- Eighth, the section forms part of the *Centre for Ethics and Technology*, one of the centers of excellence of the three technical universities in the Netherlands.

- Ninth, a board of legal specialists has been established which will regularly be consulted and which will provide feedback on the results of the research. Two senior staff members of two Dutch ministries have consented to take part in this board: Dr. H.L. Janssen, Section of Constitutional Policy, Directorate of Constitutional affairs and Legislation, Ministry of the Interior and Kingdom Relations (BZK), and Dr. S. Eschen, Head Legislative Strategies, Ministry of Justice.
- Tenth, the applicants will also keep in touch with the Leiden Institute for Brain and Cognition.
- Finally, the principal applicant and one of the co-applicants are members of the ethics research school in the Netherlands (the “Onderzoekschool Ethiek Nederland”).

10. Work Programme

The project will span four years, from 2007 to 2010. Subproject 1 will be carried out by a part-time (¾ fte) Post-doc and the principal applicant. Subproject 2 will be carried out by a PhD student. Subproject 1 should result in a book (see “planned deliverables” below), subproject 2 should lead to a PhD thesis.

The planning for both subprojects is: first year: thorough study of the relevant literature; second and third year: writing chapters of the envisaged book (in the case of the Post-Doc) or PhD thesis (in the case of the PhD student), and publishing these as papers in journals or as contributions to conferences. Fourth year: finishing the monograph (in the case of the Post-Doc) and PhD thesis (in the case of the PhD student).

In parallel with this, the main applicant will write an introduction to the philosophy of mind for neuroscientists and other non-philosophers. The nominal size of the appointment for this is ½ fte for one year, but the work will be spread out over two years.

11. Word Count (section 9)

3188 (maximum allowed: 3600, 2000 for the general description plus 800 for each sub-project).

12. Planned Deliverables

(Post-doc) Synthesizing book on conceptual aspects of neuroethics, the neurosciences, neurotechnology, and the brain and the law, with attention to philosophical, methodological and historical issues. Working title: *The Mind Meets the Brain*. To be published by a prestigious publisher.

(PhD student) PhD thesis on neuroscience, neurotechnology and the law, to be published in the *Simon Stevin Series in the Philosophy of Technology* or elsewhere.

(Main applicant) Monograph: *Philosophy of Mind for Neuroscientists*. (Possible topics: dualism and monism, physicalism, identity and reducibility, anomalous monism and supervenience, folk psychology and the language of neuroscience, common fallacies, Mary and the limits of neuroscience, making sense of neuroimaging data on the level of human affairs, neuroethics.)

In addition to this: papers in suitable refereed journals, for example, *Journal of Neuroethics* (to be launched in 2007).

13. Short Curriculum Vitae of Principal Applicant

Dr. G.J.C. Lokhorst holds degrees in both medicine (Master's degree, 1980) and philosophy (Master's degree, *cum laude*, 1985, PhD degree, 1992).

He has had positions (in several academic institutions) in the following areas:

- philosophy of medicine,
- neural networks,
- deontic expert systems,
- philosophical logic,
- philosophy of mind and philosophy of artificial intelligence,
- philosophy and ethics of science and technology.

He wrote two books on the philosophy of neuroscience (in Dutch): *Homo Duplex: Philosophical Interpretations of the Split-Brain Syndrome* (technical report, 1981, 454 pp.), and *Brain and Consciousness: The Mind-Brain Problem in Contemporary Neuroscience* (Delft, 1986, 150 pp.). For his Master's thesis, entitled *Ontology, Semantics and the Philosophy of Mind in Wittgenstein's Tractatus* (1985), he received the biennial prize for the best Master's thesis written in the Netherlands and Flanders. He published papers in prestigious refereed journals such as:

- *Behavioral and Brain Sciences*,
- *Bulletin of the History of Medicine*,
- *Clio Medica*,
- *Erkenntnis*,
- *Ethics and Information Technology*,
- *Grazer philosophische Studien*,
- *Journal of the History of Medicine*,
- *Journal for the History of the Neurosciences*,
- *Journal of Non-Classical Logic*,
- *Lecture Notes in Artificial Intelligence*,
- *Logique et Analyse*,
- *Metaphilosophy*,
- *Notre Dame Journal of Formal Logic*,
- *Philosophia*,
- *Philosophical Investigations*,
- *Studia Logica*.

In addition to this, he is interested in the dissemination of scientific knowledge to the wider public. He wrote many articles in Dutch newspapers and semi-popular journals (mainly *NRC-Handelsblad* and *Neuropraxis*), and made a documentary on brain research in the Netherlands, broadcast on Dutch public television in 1992.

He is a member of the editorial board of *Psyche* and is currently working on a research project entitled "Medical Images in the Health Care Process" (Delft University of Technology and Leiden University Medical Center, funded by NWO/STW).

Five Key Publications of Principal Applicant

- *Logical Explorations in the Philosophy of Mind*. PhD thesis, Erasmus University Rotterdam, 1992.
- The first theory about hemispheric specialization. *Journal of the History of Medicine and Allied Sciences*, 51 (3): 293–312, 1996.
- Counting the minds of split-brain patients. *Logique et Analyse*, 39 (155-156): 316-324, 1996.

- Descartes and the pineal gland. In Edward N. Zalta, ed., *Stanford Encyclopedia of Philosophy*. Stanford University, Stanford, CA, 2005.
- *Ethical aspects of medical imaging technology*. Monograph, in preparation.

14. Summary for Non-Specialists

We weten steeds meer over de hersenen en de technieken om de hersenen te onderzoeken worden steeds beter, onschadelijker en goedkoper. De gevolgen hiervan worden steeds beter zichtbaar in de maatschappij. Steeds meer verdachten in de VS laten hersenscans maken om in de hersenen ontlastend materiaal (tumoren e.d.) te vinden voor hun gedrag; wetshandhavers spreken over het maken van “hersenvingerafdrukken” om terroristen te identificeren en over “hersenleugendetectoren” om leugenaars te ontmaskeren; personeelsfunctionarissen denken dat hersenonderzoek meer informatie zou kunnen opleveren dan traditionele psychologische tests; in de neuromarketing probeert men erachter te komen wat er in de hersenen gebeurt als mensen kiezen voor merk A in plaats van merk B en hoe dit gedrag beïnvloed zou kunnen worden; economen en ethici willen graag weten wat er in de hersenen gebeurt bij het nemen van beslissingen; hersenonderzoekers dringen er bij de wetgever op aan om rekening te houden met hun bevindingen; in het onderwijs is er een “brain-based learning” beweging; kortom, er is vrijwel geen type van medisch onderzoek dat een grotere invloed op niet-medische gebieden van het dagelijks leven heeft dan het hersenonderzoek. Tegelijk worden de mogelijkheden om de hersenen te beïnvloeden en hun werking te veranderen steeds groter: denk bijvoorbeeld aan geneesmiddelen als prozac en ritalin en aan de opkomst van gehele instituten gewijd aan neuro-engineering (“sleutelen aan de hersenen”) in de VS. Het doel van dit project is om een studie te maken van de ethische en juridische aspecten van dit gebruik van de hersenwetenschappen. Het project bestaat uit twee delen. In deel (1) wordt gestreefd naar een verheldering van de filosofische en conceptuele problemen die zich bij deze ontwikkelingen voordoen. Met de opkomst van de nieuwe technieken worden allerlei tot dusver zuiver academische kwesties uit de traditionele filosofie (met name de filosofie van het bewustzijn) opeens van praktisch belang, zoals niet alleen te merken is in de vakliteratuur, maar ook in de publieke discussies over de implicaties van het hersenonderzoek die zich op het moment in diverse Europese landen afspelen. In deel (2) worden de juridische aspecten onderzocht, zowel op het gebied van het strafrecht, het civiel recht, als vanuit het oogpunt van de wetgever. Naast dit alles zal ook een monografie vervaardigd worden waarin de belangrijkste bevindingen uit de *philosophy of mind* voor een publiek van hersenonderzoekers en andere niet-filosofen uiteengezet zullen worden.

15. Research Budget

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APPENDIX

1. BIBLIOGRAPHY

Surveys of neuroethics:

- “Neuroethics” section of *The President's Council on Bioethics* (http://www.bioethics.gov/topics/neuro_index.html).
- *Neuroethics: Mapping the Field* (University of Chicago Press, 2002).
- Neuroethics, special issue of the *American Journal of Bioethics*, 2005, 5(2).
- Neuroethics, special issue of the *Journal of Medical Ethics*, 2006, 32(2).
- *Stanford Neuroethics Group Newsletter*, 2005–2006.
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- Tancredi, L., *Hardwired Behavior: What Neuroscience Reveals about Morality* (Cambridge University Press, 2005).
- Zeki, S., & O. Goodenough, eds., *Law and the Brain* (Oxford University Press, 2006).

Philosophy:

- Levy, N., *Neuroethics* (Cambridge University Press, forthcoming).

Additional references:

- Bennett, M.R., & P.M.S. Hacker, *Philosophical Foundations of Neuroscience* (Blackwell, 2003).
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- Wolpe, P.R., K.R. Foster, D.D. Langleben, “Emerging Neurotechnologies for Lie-Detection: Promises and Perils”, *AJOB* 2005; 5(2):39-49.

2. RECENT ACTIVITIES IN EUROPE

- *The Meeting of Minds—European Citizens’ Deliberation on Brain Science* (ECD) initiative, in which citizens’ panels from nine European countries discuss the implications of neuroscience on society at large.
- *Imagining the Work of the Brain—Neuroethics: Seventh Annual Symposium on Biomedicine, Ethics and Society* (Stockholm, 2005).
- *The Ethics of Neuroimaging and the Neuroimaging of Ethics* (workshop, TU Delft, 2007).