1 project information
Normative implications of non-invasive, quantitative, acousto-optic registration of chemical substrates in human blood and tissue.

Summary:
The research tries to answer two core-questions.
1) *What moral and societal consequences of non-invasive monitoring should inform the development of this particular technology?* Answering this question implies that we have some knowledge about the consequences of technology that does not yet exist. Here we choose the approach of 'scenario-based design'. We try to anticipate these consequences by exploring intended and unintended applications of the monitoring device; by articulating how the design of the artefact guides the behaviour of its users; and by drawing on a branch of philosophical pragmatism that investigates how technology and morality mutually shape each other. Two focusgroups, made-up of technology-researchers and medical experts, will also be invited to generate and share their views. In a second stage we explore the choices made during the technological design process, and co-deliberate with the technology developers how the design can reflect the hopes and fears about the future.
2) *To what extent and in what form can ethical awareness regarding technological design be raised, nurtured and institutionalized?*
Building on the case-study performed, the research aims to develop practicable notions of collective and/or distributed responsibility that match the network-character of modern technology development – instead of singling out the individual engineer. This will result in suggestions for a protocol.

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3 Co applicant(s)
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4 Institutional setting
Institute for Biomedical Technology (BMTI), University of Twente

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5 Period of funding
01-09-2006 / 31-08-2009

6 Composition of the Research team
a) main applicant: dr. T. Swierstra – Philosophy of Technology, in particular ethics of biomedical technology
b) –
c) drs. S. van de Burg (promotion: spring 2006)
d) project team:
- Prof. dr. A. Mol, University of Twente
- dr.P.-P. Verbeek, University of Twente
- Prof. dr. D. Willems, University of Amsterdam
- Prof. dr. R. Vos, University of Maastricht
- Prof. dr. N. Oudshoorn, University of Twente
- dr. D. Stemerding, University of Twente
- Prof. dr. H. van Luijk, emeritus professor Business Ethics

7 Description of the proposed research
<u>main research questions and -goals</u>
In the invitation to develop this research proposal two goals were stated, one more specific, the other more general:

- To develop practical suggestions regarding follow-up research;
- To develop a proposal for criteria or a protocol regarding moral and societal issues that can be raised by technological research.

Accordingly, the research proposed here aims to answer two main questions:

1. What moral and societal consequences of non-invasive monitoring should inform the development of this particular technology?
2. The results of this first study provide the case-study for the second, more encompassing, research-question: To what extent and in what form can ethical awareness regarding technological design be raised, nurtured and institutionalized, without simply adding extra bureaucracy and administrative burdens on the technology-developers?

<u>Theoretical framework</u>
The theoretical frameworks differ for both research questions, although they do overlap.

Research question 1: What moral and societal consequences of non-invasive monitoring should inform the development of this particular technology?
Non-invasive monitoring of chemical species in human blood or tissue is by and large a thing of the (near) future. This means that ethical reflection on the moral and societal consequences of using these technologies is necessarily to some extent speculative in character. This future orientation, though, is a characteristic of technology ethics in

general. Technology ethics has to be pro-active: if one waits for the new technology to be fully operational, it is often too late to alter much. (Collingridge 1980). In the context of design, a promising specimen of anticipatory technology ethics is 'scenario based design'. (cf. Elzen, Hofman, Geels 2002; Verbeek & Slob, forthcoming in 2005/6, particularly section 3: Designing Technology-Behavior Interactions) It can be considered to be a recent branch of Constructive Technology Assesment (CTA). (Rip, Misa, Schot 1995) Both stress the need for input from the stakeholders during the design process. However, compared to CTA scenario based design lays more stress on imagining the future, and on having potential users experiment with new technological devices in an early stage of their design. So it tries to be both more imaginative as practical in comparison to CTA.

Three theoretical frameworks are of particular importance for anticipating technological futures.

1. One is so-called user-theory. This theoretical approach stresses that users co-produce technological artefacts, in their roles of consumers, patients, resisters, or creative 're-applicators'. (Oudshoorn & Pinch 2003). So the first question becomes: what (other, unintended) uses are made possible by the artefact? For example: when the monitoring device is easy to use and cheap, it is plausible that it will be applied on a larger scale and in unforeseen contexts. This might generate unforeseen risks. For example: is it possible that non-invasive monitoring, although not harmful when used sparingly, does become so when used very regularly. If so, can one build an extra safety into the design?
2. The second theoretical framework is provided by the body of work that deals with the 'scripts' or 'inscribed norms' of artefacts. The central claim here is that artefacts guide the behaviour of their users in – morally speaking – non-trivial ways. (Akrich & Latour 1992, Latour 1992, Mol & Berg 2001, Mol 2002, Verbeek 2005). In what ways does the evolving monitoring-device predetermine its future use, and what imaginable uses are ruled out by the design? For example: a non-invasive monitoring device 'opens up' the world –seen from the perspective of phenomenology – in new ways. (Verbeek 2002) It is also creating new options for action that from now on might become 'wise' or 'obligatory'. (Swierstra 2003) Currently, we have a stringent norm about the 'integrity of the body' that often hampers the analysis of blood when needed in the context of a criminal investigation. The non-invasive devise would evade this moral restriction, and thus create new practical opportunities. This could be morally questionable or not.
3. Philosophical pragmatism constitutes the third framework for exploring moral consequences of future-technology. Because of its anti-foundationalism pragmatism is well suited to deal with the dynamising influence of technology on culture and society in general, and on morals in particular. Pragmatists accept that new technology creates new practical (im)possibilities, and in doing so rearranges existing constellations of rights, obligations and responsibilities; that new technology can affect existing distributions of costs and benefits and that is can profoundly influence our identities and views of the good life. (Johnson 1993, Keulartz et al. 2002, Lekan 2003, Swierstra 2003, Stemerding & Swierstra 2005). This acceptance of moral change makes pragmatism an excellent starting-point to imagine the moral consequences of new technologies.

In a second stage these educated guesses about the moral and societal consequences of non-invasive monitoring technologies have to be lead back to the technological design process itself. How to ensure that the imaginative efforts in fact bear on the design-process? In the course of every technological design process, choices are made permanently. Sometimes this happens on the basis of explicit moral considerations, more often on the basis of pragmatic, scientific, economic or managerial considerations (which of course can all possess a moral dimension). This part of the research tries to determine whether (some of) the anticipated consequences are of relevance for the choices made during the design process. For example:

- Is the device primarily designed for crisis-situations, or for ordinary use?
- For experts or for lay-people?
- If a cheaper design generates more false positives and/or negatives, what balance is struck between economic and medical considerations. Or to be more precise: between conflicting medical considerations.
- If the exploration of the future uses of the monitoring device uncovers a risk that the device will be used for undesirable ends, can one block these uses by making different design-choices?

It is important here to realize that dr. Kooyman's research is in this stage more concerned with providing a proof of principle than with practical applications. However, the fact that the project aims at a specific implementation (the measurement of blood oxygenation and cytochrome) does suggest that a feedback as indicated above will to some extent be possible.

Research question 2: To what extent and in what form can ethical awareness regarding technological design be raised, nurtured and institutionalized, without simply adding extra bureaucracy and administrative burdens on the technology-developers?

Modern policy makers realize that scientific and technological progress no longer results from a 'trickle down' process coming from the labs where isolated scientists do their fundamental research. Such progress is the result of a network or chain of many actors who collaborate: engineers, scientist, companies, lawyers, marketers, and – sometimes overlooked but crucially important – the users, who are far from passive. (Callon et al. 1992, Nowotny et al 2001, Oudshoorn & Pinch 2003) This relatively new perception is for example reflected in the format of STW-applications. These specifically ask from the applicant to mobilize a network with interested users and companies.

This complexity of modern technological development entails that we should no longer put the moral burden of responsibility on the shoulders of the engineer alone. (Radder 1996, Lynch & Kline 2000) Previous research showed that many engineers are unwilling to accept such responsibility, pointing to

- the distance between their theoretical work and the practice, or
- to the gap between the intended use and the eventual unintended uses made of their designs and devices, or
- they stress that they have to work under (financial) conditions which allow little room for ethical reflection, or

- they point out that the question whether sometime is ethically right or wrong is highly subjective, and not theirs to make anyway. (Swierstra & Jelsma, 2005, 2006)

Instead, new conceptions are needed of shared or distributed responsibility that corresponds with the network-character of modern technological research. (Bovens 1996,

Besides such a notion of distributed responsibility – for which we will also turn to business ethics for inspiration (van Luijk 1997) – another barrier to the integration of ethical reflection into technological design and development, is the idea that ethics is primarily about avoiding huge drama's, about determining whether a specific technology or device should be forbidden because it conflicts with established criteria for safety, health and sustainability. Ethics should be conceived of as dealing with a broader question: what technology is (un)desirable in the light of its consequences for the well-being of the affected (human and non-human) stakeholders. (Of course the ethical reflection becomes hard when stakeholders are adversely affected.)

Taking as a concrete example the non-invasive monitoring device to be developed by dr. Kooyman, we will research which parties are directly and indirectly involved in the development and implementation thereof, and how they can be expected to contribute to enhancing the ethical reflection on the moral and societal consequences during the development (which does not end during the implementation phase). Ideas for a corresponding protocol will be formulated.

Lay-out of the research/ method

The layout of the research, as well as the methods used, are explicated under the headings 'Theoretical framework' and 'work programme'.

scientific relevance;

The proposed research builds on state-of-the-art theoretical work, a substantial part of which is of Dutch origin. Its main importance lies in its interdisciplinary yet integrated approach. The research will contribute to technology ethics in general by trying to develop a systematic approach to anticipating the future consequences of not yet existing technology. It will contribute to (the theory of) technological design, by trying to integrate educated guesses about the future into the design-proces in a transparent way. Finally it will contribute to the management of technological development and to engineering ethics, by further developing a concept of collective/distributed responsibility that matches the character of modern technology development.

Expected impact/ relevance for policy-making

As the (often morally ambiguous) impact of technology on society and culture becomes increasingly visible, there is a growing social demand that new technology should be developed in accordance with important values and standards. From the perspective of the technology developers this need is acknowledged, because social acceptance is a precondition for the successful social embedding of new technology. By a) investigating how these values and standards can guide technological design, and by b) facilitating the moral evaluation of evolving technology with the help of criteria or a protocol, this research helps building a basis for ongoing social trust in technology development. The project aims to ensure that moral considerations will become an integral part of the

evaluative frameworks used by policy-makers who try to influence the course of technological development.

The role of the engineering scientist(s) in elaborating the core questions of the ethical research and in disseminating the results. The interaction with the engineering scientist(s) in the course of the research.

The main research questions were formulated after extensive co-deliberation with dr. Kooyman, and have been approved by him afterwards. He has expressed his willingness to contribute to the further development of the research questions.

Dr. Kooyman has agreed to regular meetings with himself, the researcher, her supervisor, the AIO and the technician. In these meetings we make an inventory of the problems met by the designers, the choices made and the solutions opted for. The technology developers will introduce the ethical investigator in the technical, pragmatic, economic, managerial, financial, moral, etc. reasons behind their choices. Dr. Kooyman cs. will also participate in focus-group meetings mentioned above. When the implementation phase draws near, dr.Kooyman will help establish contacts with the users of the proto-type. Because all participate in the same research-institute, BMTI of the University Twente, it will be relatively easy to have regular contacts.

Part of the dissemination of the ethical results will take a material form, as the project aims to develop ideas that will be infused into the technological design. Another part of the results will be integrated in the proposal for follow-up research. The results of research question 2 will take the form of suggestions for a protocol that will be presented to STW. Dr.Kooyman c.s. will of course participate in any workshop organized to present the proto-protocol.

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8 Word Count

1991 words

9 International perspectives

The proposed research is interdisciplinary, because it combines engineering ethics, scenario studies, work on pragmatism and moral imagination in philosophy and ethics, and philosophy and technology (phenomenology in particular). This combination makes the proposed research unique, in the Netherlands as well as internationally. The project will be linked to a current research project on moral scenario's, and will profit from the international network contributing to that project.

We have extensive international contacts with Prof. Ruth Chadwick (director CESAGEN, Cardiff University; ethics of technology), Prof.Carl Mitcham (Colorado School of Mines; philosophy of technology), Prof. Martha Nussbaum (University of Chicago; moral imagination), Prof. Paul Thompson (Michigan State University; philosophy of technology, pragmatism), Prof. Andrew Webster (University of York; science and technology studies) and dr. Bronislaw Szerszynski. We will consult these colleagues during the project wherever their expertise is relevant.

10 Work Programme

The total research period is three years. It is assumed that when the ethical parallel research starts the technological research on the non-invasive monitoring device itself has been underway for circa six-nine months.

During the entire project, the post-doc will follow closely how the design-process develops: what problems are encountered, what solutions chosen, and how are these choices motivated. Whenever possible and relevant, she will give feedback on the basis of here research. She will keep an extensive log-book, as is common in ethnographic research.

Year 1: the post-doc will study key-texts of the three theoretical frameworks mentioned above. Simultaneously she will organise two focus-group sessions: one with intended (medical) users (both experts and patients), the other with ethicists and philosophers/sociologists of technology. A focus group is a very efficient method to generate and discuss ideas about the technological future(s). This will result in an article, to be written at the end of the first year, about plausible moral and societal consequences of non-invasive monitoring technology.
Year 2: in the second year, the post-doc will focus on the issues of distributed and/or collective responsibility in modern technology development. This will also result in an article about the question: what is collective and/or distributed responsibility and how does one organize it in the multi-actor networks that develop technology.
Year 3: in the third and last year, the post-doc will concentrate on two tasks (apart from providing feedback for the technology developers). At the one hand she will write a reflexive article about this ethical experiment itself. What has she learned about the possibilities and impossibilities of giving ethical feedback during a technological design process? Secondly, she will develop suggestions for follow-up research. Thirdly, she will develop suggestions for a protocol to ethically assess technological research in the early phase. These suggestions will be subject of a workshop, attended by policymakers, technologists, social theorists and philosophers of technology. On the basis of this workshop she will produce a report for STW.

11 Planned deliverables and Knowledge dissemination

year 1:
-an article will be written for an international journal on the moral and societal consequences of non-invasive monitoring technology, including a weighty section on the methodology of anticipating these consequences.
-a logbook will be kept on the progress of the technological design project
-feedback will be given, whenever possible and appropriate, to the designers
Year 2:
-an article will be written for an international journal on the question how one organizes responsibility in the multi-actor networks that develop technology.
-a logbook will be kept on the progress of the technological design project
-feedback will be given, whenever possible and appropriate, to the designers.
Year 3:
-one article aiming at international journals will be written. The first will contain a self-reflexive account of the ethical parallel research itself, because this form of research is a theoretical experiment worth reporting on.
-suggestions for follow-up research will be developed.
-suggestions for a protocol, to be used by the STW and similar policy institutions.
-a workshop will be organized to promote the protocol.
-the (search for a) protocol will also be subject of a international article.

12 Short Curiculum Vitae Principal Applicant

Dr Tsjalling E. Swierstra (Zutphen 1960).

educational history
1978: final exam high school (Gymnasium)
1987: doctoral exam Philosophy, University of Amsterdam (*cum laude*)
1988: doctoral exam Political Sciences, University of Amsterdam (*cum laude*)
1998: doctoral dissertation in Philosophy, University of Groningen (title dissertation: *De sofocratische verleiding; over het ondemocratische karakter van een aantal moderne rationaliteitsconcepties (The sophocratic seduction: concerning the undemocratic character of several modern conceptions of rationality)*, Kok-Agora, Kampen)

work history
1987-1991: AIO (PhD student), University of Groningen, Department of Philosphy
1992-1996: Lecturer in philosophy, University of Groningen, Department of Philosphy
1996-now : associate professor in the Philosophy of Technology, University of Twente,

relevant activities
1987-1995: editor Dutch journal of philosophy *Krisis*
2000-present: research projects commissioned by the Rathenau Instituut::
in 2000*: Kloneren in de polder. Het maatschappelijk debat over kloneren in Nederland: februari 1997 – oktober 1999* (2000) *(Research report 'Cloning in the polder: the social debate on cloning in the Netherlands, February 1997 – Oktober 1999)*
in 2002 (with M. Kirejczyk and D. van Berkel): *Nieuwe voortplanting; het afscheid van de ooievaar. Sociaalhistorische en normatief politieke aspecten van de ontwikkeling van voortplantingstechnologie in Nederland* (New reproduction: a farewell to the stork. Social-historical and normative political aspects of the development of reproduction technology in the Netherlands)
2002-present: editor Dutch journal of philosophy *Krisis*
2002-present: series editor Amsterdam University Press `Vernieuwingen in de politieke theorie' (Innovations in political theory) (with prof.dr.I.de Haan)
2002-present: member of the national Commission on Biotechnology in Animals
2003-present: member of the Board of the Research School for Science, Technology and Modern Culture (WTMC)

research grants
- Rathenau Institute commission (2000): ethical analysis of the public debate on cloning in the Netherlands (Swierstra 2000)
- Rathenau Institute commission (2001): ethical analysis of the debate on new reproductive technologies (Kirejczek, van Berkel en Swierstra 2001)
- NWO grant (2000-2002): Pragmatism and Technology ethics (main applicant: Korthals. With: Keulartz, and Schermer)
- NWO-grant (2002): commission for an essay for the Social Component of Genomics Program (with Keulartz en Korthals)
- NWO-grant 2002-2004): The social component of genomics: the case of obesitas. (main applicant: Korthals. With: Van den Belt, Keulartz)

organized workshops on technology and ethics

- International WTMC/CSI-workshop `The consequences of Science and Technology Studies for Political Theory and Ethics', Maastricht, 16-18 January 1998.
- WTMC-workshop `Between fatalism and moralism', Enschede, 13 March 1998 (co-organized dr.J Jelsma)
- WTMC-workshop `Ethics and Technology', Enschede, 30-31 January 2004 (with dr.P.Breij)
- WTMC-workshop 'Genomics & Politiek: Wetenschap en Technologie Studies en de vraag naar politieke zeggenschap in relatie tot technologie' ('Genomics and Politics: Science and technology Studies and the question of political voice in relation to technology', 19 & 20 March 2004, Hilversum (with dr.A.Nelis)

associate supervisor of PhD-students:

- M.Smits [doctoral degree 2002]
- L.Dubbeld [doctoral degree 2004]
- R.Struhkamp [doctoral degree 2004]
- G.Valkenburg [doctoral degree scheduled for 2008]

Literature

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14 Summary for non-specialists

Dit onderzoek beoogt twee kernvragen te beantwoorden:

1) wat zijn de morele en maatschappelijke gevolgen van niet-invasief meten van chemische substanties in menselijk bloed en weefsel. Een antwoord op die vraag vooronderstelt dat we enige kennis bezitten omtrent die gevolgen. Dat is uiteraard niet eenvoudig wanneer het gaat om technieken die nog in ontwikkeling zijn. Om toch enige greep op de toekomst te krijgen, kiezen we in dit onderzoek voor een ontwerp-benadering die gebruikt maakt van scenario's. Er wordt systematisch in kaart gebracht welke bedoelde en onbedoelde toepassingen het te ontwikkelen meet-apparaat zou kunnen krijgen. Ook wordt onderzocht of er in het apparaat

als het ware bepaalde normen zitten ingebouwd, die het toekomstige gebruik sturen. Tenslotte maken we gebruik van het filosofisch pragmatisme, dat een scher oog heeft voor de manieren waarop technologische en morele ontwikkelingen elkaar wederkerig kunnen beïnvloeden. Bij het in kaart brengen van de toekomst, maken we gebruik van focus-groep gesprekken met techniek-onderzoekers en toekomstige gebruikers. Wanneer de mogelijk gevolgen zo goed en kwaad als dat gaat in kaart zijn gebracht, wordt in samenspraak met de techniek-ontwikkelaars onderzocht of en hoe deze inzichten kunnen worden verwerkt in het ontwerp.

2) In welke mate en in welke vorm kan het bewustzijn van de morele aspecten van technologisch ontwerpen worden vergroot, onderhouden en geinstitutionaliseerd? Het onder vraag 1) genoemde onderzoek vormt een case-studie voor het beantwoorden van vraag 2). Er is een kloof tussen gangbare noties van morele verantwoordelijkheid die veelal zijn toegesneden op het individu, en het collectieve netwerk-karakter van moderne technologie-ontwikkeling. Daarom wordt gepoogd een notie van collectieve of ge/verdeelde verantwoordelijkheid te ontwikkelen die niet alle verantwoordelijkheid neerlegt bij de ingenieur. Deze reflecties zullen resulteren in suggesties voor een protocol dat kan worden gebruikt bij het beoordelen van aanvragen voor technologisch onderzoek.

Research budget

Begroting tbv NWO, dossiernr. 200-31-000

Looptijd: **1 september 2006 t/m 31 augustus 2009**

1 Postdoc, startschaal 11.0/10.7

Personele kosten

		Kosten afgerond	
Jaar 1	51484.344	**52,000**	
Jaar 2	55060.14984	**55,000**	
Jaar 3	58544.9558	**59,000**	
	165089.4496		**166,000**

Materiele kosten		
3 workshops à € 4000	12,000	
Overige lasten	2,000	
		14,000
	Totale kosten	**180,000**