Research on the Ethos of Technology: Personalized Medicine

RESET:PM

Project Summary

Tomorrow's medicine is promised to be 'personalized'. Although medicine has always in a basic sense been targeted to individuals, the promise of personalized medicine (PM) is based on a vision of diagnosis and treatment made more precise by means of utilizing large amount of newly available and affordable genomic and other biometric information. Instead of present day conventional, "one size fits all" and relatively "slow" methods, it is envisioned that health professionals will use new technology to monitor and generate detailed, real-time information about the patients. This is proposed to enable the tailoring of treatment regimens to individual needs as these needs occur, and, for certain diseases, even before patients experience symptoms. As a result, medical interventions/interactions are envisioned as more proactive: preventing or averting illness before symptoms set on – acting earlier in the continuum from health to disease than today's modern medicine. The PM vision is thus highly dependent on successful development and appropriation of new technologies. These technologies have the potential to change the focus in healthcare in manners that radically shift and reconstruct the moral landscape for individual citizens and society at large. As such, PM is an international, national and a local NTNU research priority, in need of normative scrutiny.

RESET:PM aims at a moral scrutiny of the PM vision, focusing especially on how PM is being developed in the Norwegian context. Our approach, that is to be further developed in this project, is to examine the ethos of PM as it emerges and is envisioned in a social and material context of medical practices. The ethos of a practice depends on the feasibility of its stated goals, as well as the nature of these aims, articulated and evaluated in the context and by the agents involved in the practice. To that effect, we seek to collaborate with practitioners in the fields of PM in Norway and establish the basis for informed, critical reflection on how visions of PM are being pursued in this context, and think about how they should develop.

Project description

1. Introduction

Personalized medicine (PM) is a vision based on descriptions of on-going practices, and optimistic predictions for tomorrow. However, as is common with most technological enterprises, technologies affect morality as they change – or they challenge our established moral judgements by enabling radical new human actions and considerations. The appropriation of technology-based practices such as PM pulls in different, often opposed directions. Such ambiguities relate to the potential impact of PM as envisioned in terms of future practices. Rooted in our normative approach to technology and innovation, we formulate four research topics dealing with implicit tensions we have identified in the vision of PM, and one topic concerning the methodological challenges for studying the normative impact of emerging technologies exemplified by PM:

1. Empowerment or autonomy reduction?
   - practices of control and surveillance vs. practices of empowerment and autonomy
2. Emancipation or alienation?
   - on the "proper" role and understanding of genomics, genes and genetic (risk) information in ourselves as self-interpreting beings

3. “Me” medicine or “We” medicine[1]?
   - PM investigated within the political dimension of individualism and solidarity and how PM may alter our conceptions and perceptions of health and disease
4. To know or not to know?
   - Rights and responsibilities concerning disclosure of incidental findings and return of results in Big Data research and clinical implementation of PM
5. Top-down or bottom up?
   - on the methodology of investigating technology-driven changes and challenges within science and society

The status of PM as an emerging medical paradigm means that the ethical analysis at this point must navigate between discussing the present practices as they affect people now and the potential of this paradigm for the medical field of tomorrow. This calls for a way of doing philosophical research that draws on the resources of empirical approaches to normative questions in the social sciences. To understand and analyse the promises, potentials, constraints and justifications of PM, efforts that are sensitive to the medical, social, technological and ethical challenges and drivers are called for.

Although PM promises to pay off in effective, high quality, participatory and responsible medicine, it is not merely a techno-scientific project, but a vast collective effort. As such, PM would challenge and reshape many norms, values and meanings in society, making it even more important that humanistic scholars take part in the development of medicine guided by a vision of PM. However, scholars from the humanities face methodological challenges in contributing to our understanding of how PM can and should (or should not) affect our lives. How can we anticipate and assess the possible social and moral impacts of PM?

RESET:PM is based on the assumption that we can and need to engage in philosophical reflection with both the scientists and engineers developing the various technologies that aim to enable medicine and healthcare to become personalized, and with the larger society that will develop the practical aspects of the technologies. This means engaging in a variety of anticipatory governance (Barben 2010) through integrated research (Nydal et al. 2012), developing an approach to “field philosophy” (Frodeman et al. 2012). As this is a new, developing approach to philosophy research, this project seeks to contribute to this methodology research while working with the ethical, political and epistemological questions related to PM.

This project is ground breaking both in its methods and in its questions. First of all, not many philosophers and bioethicists are able to pursue truly integrative research with the scientific groups pioneering the technology under question. Our team is well-positioned as a humanist group in a leading technological institution, having a long track record of collaborating with scientists to examine key ethical and methodological choices prospectively. Secondly, philosophical scrutiny is yet to focus on the practice and assumptions of PM. Though there has lately been increasingly more critical social science research directed into pharmacogenetics and PM, the humanities and philosophy specifically have not directly engaged the moral and methodological issues involved in the development of PM as a technoscientific endeavour, examining issues as they arise, situated within the technological context of their construction and application. In this way, we not only study technology development, but are also positioned to make an impact on concrete instances of it.

2. State of the art

Technologies associated with the PM vision are becoming a part of today’s medical practice. Basic biomedical research is already using technologies to include genomic data and make diagnosis and treatment fit the individual better than ever before (Offit 2011) and such technologies are increasingly used in the clinical context as well (Chan and Ginsburg 2011). An important driver here is the rapidly falling cost of acquiring genomics data (Vance 2014). Salari et al. (2012) point to three domains where medicine utilizes genomic data to analyse individual patient needs: Pharmacogenomics, assessments of genetic predispositions for common diseases, and identification

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[1] We have borrowed these terms from Dickinson (2013).

of rare, disease-causing genetic variants. Crucial ethical issues arise here. One of them is how to deal with incidental findings (Solberg and Steinsbekk 2012), another is under which conditions these technologies actually empower patients (Juengst et al. 2012). Other issues, already widely discussed within the ethics of genomics, include the risk of medicalization, control of information, inequity regarding access and new demands for consent (Højgaard 2012). Furthermore, strong commercial drivers are affecting the development of PM, as witnessed in the direct-to-consumer genomics genetic testing (Udeski 2011).

Though in some ways PM practices are already present, the more radical promises of PM are still mere possibilities, perhaps never to become realities. Consider the 4P-vision of PM: Personalized, Predictive, Preventive and Participatory (4P) (Hood & Friend 2011). In this vision patients will themselves participate in collecting their own data that will be computationally fit with biomedical models and used to predict and prevent illness. Huge efforts are needed to realize PM, not only financial, structural and regulatory but also scientific: significant basic and applied research are needed to develop our understandings of biological processes and to establish the validity and clinical utility of various envisioned technologies (Højgaard 2012, Hamburg & Collins 2010). There exists , as yet, no common international standard for protecting, presenting and sharing the data required for research reproducibility and validation. In addition, the understanding of biological processes assumed in the more radical promises of PM, requires an ability to analyse and make sense of massive data by means of computational biology not yet developed – an effort often associated with the field of Systems Biology (Friend & Norman 2013). Even genetic tests are currently far from perfect, and genomics data are, like other research data, often difficult to interpret and contains much “noise”, hampering interpretation (Ioannides 2005). Consequently, a great deal of the current ethical discussion of the PM vision is of anticipatory nature.

One general concern is whether PM will foster an atomistic, individual-centred society or give rise to new forms of solidarity and community action (Rose 2013). All diseases will become rare diseases, once the unique, individual genetic profile of the patient is the basis for disease aetiology and response to treatment (Dolled-Fillhart et al. 2012). This may increase rather than decrease treatment costs, demanding increasingly difficult priority decisions. A recurrent topic concerns how genetic knowledge will affect understandings of personal identity. The quest to know oneself and to realize one’s true potential is given an empirical – genomic – interpretation in PM: The idea that knowledge of my genome will pinpoint inescapable truths of who I am and will become (Hauskeller 2004). Different uses of genomics likewise relate to empowerment in heterogeneous ways. To critics, this vision of PM will fragment the person by a reducing him or her to genetic components, thereby obscuring the view of patients as persons rather than making it sharper (Nordgren & Juengst 2009).

A current challenge in critically pursuing the ethics of PM further is to ground these discussions in anticipated emerging practices of PM. In the sweeping rhetoric of PM, genomics will make medicine accomplish the 4P ideal. The PM vision, however, is currently a bricolage of technologies and practices that point in different directions. Furthermore, as recognized by the diverse group of international partners in this project, the methodological approach of such anticipatory ethics is currently an international topic in its own right. The question of method appears to be a pressing one – a question we should pay close attention to. The expectations of what can be achieved through interdisciplinary work adds to the urgency of reflexive methodological scrutiny.

3. Theoretical approach and means of analysis – research topics

RESET:PM seeks to articulate and evaluate the ethos of PM. In studying the *ethos* of technological enterprises, we seek to disclose ‘normative good’ prospects that drive the innovation processes and analyse to what extent the involved technologies reinforce the intended ideas of a good practice (in the case of PM: healthcare) and whether we should expect diverging technologically driven trajectories to occur. The key to this study is the concept of “strong evaluations”, understood as those evaluations that give meaning and direction to our lives. They “involve discriminations of right or wrong, better or worse, higher or lower, which are not rendered valid by our own desires, inclinations, or choices, but rather stand independent of these and offer standards by which they can be judged." (Taylor 1989: 5) The articulation of such strong evaluations involved in a certain practice, institution or socio-technological system, is also an articulation of its ethos. This involves normative work, unlike classical sociological or anthropological studies of value systems. It involves double reflexivity in the sense that it is an evaluative description of the strong evaluations embedded in the system. At the same time, unlike classical philosophical research RESET:PM pursues its normative work using empirical methods, such as interviews, participant observation, focus group and conversation analysis. The notion of ethos of a technological system then draws attention to immanent evaluative traces of human action, as situated within particular socio-technological milieus.

Empirical ethics is a context-sensitive approach (Musschenga 2010), and can be done in several ways, at different stages of technology development (Chu et al. 2010). One aspect of the methodology as practiced by RESET is that we work closely with the relevant research environments, as well as engaging other relevant stakeholders, employing a spectre of related qualitative methods. These include interviews, focus group studies, ethnographic observations, discussions, combined with studies of relevant scientific literature, philosophy and ethics literature, as well as public debate. We have already employed this approach successfully in a number of projects and on a number of emerging technologies, gradually refining and improving the methodology. In addition to such approaches that lend support from approaches developed in the social sciences, more classical methodology of applied ethics is part of our toolbox, such as casuistry (Jonsen & Toulmin 1988) and case based reasoning and reasoning from shared principles, based on reflective equilibrium (Daniels 1996).

The potential intended and unintended normative ramifications of PM make it an ideal case to articulate and communicate the RESET approach to be discussed in WP 5. In RESET:PM we will work closely with our local research partners: Professor Arne K. Sandvik, Professor Astrid Lægreid and Professor Finn Drabløs, Department of Cancer Research and Molecular Medicine; Professor Kristian Hveem, HUNT Biobank; Professor Jostein Halgunset and Associate Professor Wenche Sjursen, Department of Laboratory Medicine, Children´s and Women´s Health; Professor Tone F. Bathen, Department of Circulation and Medical Imaging; Professor Martin Kuiper, Department of Biology. They have agreed to participate as dialogue partners, interviewees and seminar participants. They represent the whole spectrum of PM relevant research, including clinical research, systems biology, genomics, biobank research and bioinformatics.

RESET:PM research will be pursued in parallel work packages (WP) with specified research questions, each resulting in at least one publication:

WP 1: Empowerment or autonomy reduction?

The aim of WP1 is to disclose and assess the normative implications of the tension between PM as empowering patients and PM as disciplining patients. PM can be understood as the culmination of developments in modern medicine that aim to empower patients by increasing their influence on diagnostics and treatment decisions, and control over treatment administration. However, the increased dominance of technological control apparatuses and treatment regimens that must be handled by the patients themselves may in practice constrain patients' autonomy. The patient is controlled by the routines, the demands of the technology, the expectation and responsibility that they handle it right. For instance, platforms such as Quantify Yourself (http://quantifiedself.com/) propose to offer tools for continuous, responsible patient participation in monitoring one's own healthy state and personalizing deviations from that state according to individual biomarkers. 'Responsibilization' (Rose 2013), although sound both from an economic and a health-related perspective, implies a disciplined person that self-manages many aspects of her or his life, from diet, exercise and other lifestyle-choices to the monitoring of diseases and risks. Responsibilization also implies a disempowerment of physicians and other healthcare workers (who must be expected to resist such change), which will change the structure of the on-going relationship that the patient has to the healthcare sector. The consequences from this disruption are hard to predict, but the demands on participation and expected engagement may result in errors and misuse, and in feelings of insecurity and inadequacy. It is not given that empowering the patient means increased patient-autonomy; it might result in narrowing down future options. We will choose one concrete example in cooperation with our medical project partners.

WP 1 research questions: 1) What conflicting norms of empowerment can we expect to follow from the implementation of PM-technology in healthcare? 2) What ethical and political implications will follow from this potential shift in responsibilities?

Methods: Literature review; ethical evaluations of emerging practices; interviews, dialog and discussions with key agents and major stakeholders; focus group research on actual/imagined devices.

WP 2: Emancipation or alienation?

The aim of WP 2 is to determine to what extent PM is increasing the tendency towards geneticization and medicalization, and some existential and ethical implications of such developments. Pharmacogenomics plays a major role in PM, aiming to tailor medication and treatment to the individual by way of genomic profiling and targeting. The vision of PM is to integrate and broaden this approach in order to enable medicine to overcome any “one size fits all”-approach. An important part of the appeal of the rhetoric of PM lies in its promise to make medicine able to treat each individual in an optimal way. This appeal trades on an important ambiguity in the PM rhetoric, however. In the eyes of the critics, the genomic orientation of PM will blind us to the person as a whole (Nordgren and Juengst 2009, Juengst et al., 2012). In this perspective, PM promotes genetic fatalism, rather than fulfilling its rhetoric appeal to grasp the complexity and uniqueness of each person. Clarke et al. (2003) would say that this is part of the ongoing biomedicalization, which means that we are transformed as individuals.

Possible outcomes of PM touch on basic questions of personal identity: Who am I? Where do I come from? What is my destiny? The major philosophical question here is whether what medicine has to offer will bring us closer to the good life. Genomic identity means different things, and is coupled with personal identity in different fields and uses (Hauskeller, 2004): The numerical identification for forensic use, the ascription of predicates in genetic susceptibility for disease, and the narrative identity in predictions of conditions. Moreover, a person’s social identity is intimately coupled with genetics in family identity and inclusion in fellow cohorts and patient groups and organisations based on genetic risk and disease.

WP 2 research questions: 1) How may increased use of genomics knowledge implied in PM lead to deeper understanding of ourselves as human beings and how may it lead to misconceptions of ourselves as determined by our genetic setup? 2) What are the foreseeable transformations concerning our conception of health? Is PM going to provide us with increasingly more “prediseases”, reducing life to “predeath”?

Methods: Surveys of scientific PM literature in position papers and other commentaries combined with dialogue meetings with our medical collaborators. Philosophical analysis of the identity question in light of the gene reductionism critique.

WP 3:“Me” medicine or “we” medicine?

The aim of WP 3 is to examine issues concerning difference and solidarity, as they take form in PM. According to Dickinson (2013), “Me-medicine” is medicine that presents itself as starting and ending with the individual. However, much of the success of modern medicine is based on a collective approach to combat diseases (Rose 2013) and on a collective, solidarity-based, understanding of disease. PM as “Me-medicine” may be a threat to this. Developing targeted treatments should prevent overtreatment and reduce adverse drug reactions, but may turn out to become a struggle for limited resources creating new “orphan” populations, small groups whose treatment requires a prohibitive investment given the size of the market (Tutton & Jamie 2013). PM could also lead to new categorizations and subsequently the creation of new biosocial identities (Hacking 2006) that might be categorically aligned with already existing and recognisable classes for political, marketing or policy reasons (Epstein 2007), restricting the scope of solidarity and raising issues of group stigmatization. A second focus of WP3 is the position of PM pharmacogenetic and other treatments within broader and global health policy. Neglecting treatable diseases from which populations are already suffering is already a political and ethical problem (Reiss and Kitchner 2009), which may be enhanced by the development of PM.

WP3 research questions: 1) To what extent will the PM focus on the individual undermine medicine as a solidarity-based endeavour, and to what extent will it enable new forms of solidarity and community action? How might new classifications of human difference or disease conceived within PM relate to existing cultural identities and narratives around illness? 2) To what extent will PM enhance the problem of neglected diseases, and how can the PM technologies be utilized to address this problem?

Methods: 1. literature review; dialogue meetings with medical collaborators and identification of relevant case studies on biosocial group diseases. 2. Review of global health economics and global health ethics in relation to PM; review of Norwegian discussion of social medicine and PM; Public engagement exercises.

WP 4: To know or not to know?

The aim of WP 4 is to clarify the rights and responsibilities concerning research participants in Big Data research projects that ultimately aim at clinical implementation of PM. We examine the practices of collecting and managing huge amounts of research data about individual patients and participants involved in such research. This is currently a pressing research ethics issue as legislative regimes and established research ethical practices are geared towards small-scale research. Individualized medical treatment, as envisioned in PM however, depends on a successful building of Big Data infrastructures. The more *individuating* medicine one seeks to provide - the more *collective* data must be collected, stored and made available. PM visions consequently induce new issues (like data security and ownership) and reconfigure traditional issues (like incidental findings and disclosure of data).

Individual genomic sequencing is currently becoming available at an affordable cost, which means that an enormous amount of information concerning health risk, kinship, capabilities and vulnerability come into existence provided one can juxtaposition such genomic data with knowledge data bases as well as data from other health and social registries. The status and administration of these data are currently subject to an intense international debate regarding ownership, sharing and disclosure. For instance, some argue the need for designing technological platforms of informed consent regimes that would empower research participants to influence research purposes and thereby democratize the development of the field of PM.

WP 4 research question: 1) How should access to individual genomic data be handled in research and clinical settings? Should participants be continuously updated on research results based on their biobank material and consent to new developments (Steinsbekk et al. 2013)? 2) What is the epistemic status of this knowledge and what are the security risks involved in such knowledge management structures? What are the normative differences between genomic and other kinds of personal data (Ursin and Steinsbekk 2013)?

Method: Literature review. Comparison of three genomic sequencing research projects, employing casuistry and reflective equilibrium methods. Comparison of different technological regimes of informed consent for Big Data. Dialogue meetings with clinical and biobank research collaborators.

WP 5: Top-down or bottom up?

The aim of WP 5 is to articulate and communicate the approach and methodology that seeks to make normative research activity and research output productive in contexts of ongoing societal and technological decision-making. RESET is situated in a methodological tension between a context-sensitive bottom up approach, and a theory- or principlist-driven top-down approach. Context-sensitivity is required for a precise grasp of the normative issues at stake as analysis target the ethos of technology. However, awareness of what is at stake (that in turn also guide methodological choices of how and where to be positioned to gain adequate context-sensitivity), also stem from a set of theoretical concerns, principles and values that we bring with us to the field. An essential part of RESET:PM in particular is to develop relevant methodologies for answering our PM research questions in an adequate way. This requires continued reflection and adjustments of our chosen methodology, a process that also will inform our work of articulating the RESET approach.

WP 5 research questions: What are the adequate methods for answering the normative challenges posed by emerging technologies such as PM? How do we combine empirical methods and philosophical theories in answering particular research questions related to technology development? How do we collaborate with our medical and technology partners in a way ensuring mutual research benefits?

Method: Methodology issues will be a regular part of the weekly research group meetings, informed by the specific issues discussed in the four other WPs. Empirical ethics methodology will be topic of one workshop with our international partners, one local seminar and on special sessions at conferences. We will seek to edit a journal special issue on empirical ethics methodology.

Strategic relevance

This proposal is highly relevant for the strategies of the Department and the Faculty, and is in keeping with NTNU's vision of providing "knowledge for a better world". The strategy of the former Department of Philosophy highlights interdisciplinarity, societal relevance and ethics, including bioethics and ethics of technology, as central areas of research. The Faculty of Humanities' vision is to be "a humanistic force in a technical and scientific university as well as in society at large", with applied ethics as one of the multi-disciplinary areas to be expanded towards 2020. The Faculty's expressed research objectives states that "the faculty's academic disciplines should participate in interdisciplinary research with humanistic perspectives, and show how humanistic knowledge is needed to meet the challenges of our times." RESET is already doing this, and aims to develop this activity further through the proposed project. The project will clearly contribute to the Faculty and Department realizing the objectives central to the strategy for this period.

This project proposal is likewise very relevant for the new NTNU strategic interdisciplinary research area on Health, Welfare and Technology (HEVET), where the report to the University Board focuses on personalized medicine and acknowledges that "de nye teknologibaserte mulighetene innebærer etiske og til dels samfunnsmessige utfordringer, som må håndteres i tidlig fase av teknologiutviklingen". The RESET proposal builds on well-established interdisciplinary bioethics and ethics of technology collaboration with research groups within systems biology, biobank research and other relevant fields, where we have developed knowledge and methodology for the early engagement called for within HEVET. A grant from the Faculty would enable RESET to long-term dedicated work consolidating and improving our research group's capacity to respond to calls, recruit and maintain human resources by means of innovative research. It will also be significant for the wider research community in applied ethics at IFR, and the interdisciplinary Bioethics and Humtech research groups through the seminars and workshop, bringing international capacities to NTNU, and through the generally increased research activity related to these research areas.

Internationalization

The project involves collaboration with a strong group of internationally recognized researchers and research groups within bioethics, ethics of technology, philosophy of science, sociology and STS studies. Our international partners are:

- Distinguished Research Professor Ruth Chadwick, School of English, Communication & Philosophy, Cardiff University, UK
- Professor Nancy Cartwright FBA and Professor Julian Reiss, Co-Directors of the Centre for the Humanities Engaging Science and Society CHESS, Department of Philosophy, Durham University, UK
- Professor Alan Petersen, School of Social and Political Inquiry, Monash University, Australia
- Senior Research Fellow Gaymon Bennett, Center for Biological Futures, Fred Hutchinson Cancer Research Center, Seattle, USA
- Assistant Professor Erik Fisher, Center for Nanotechnology in Society, Arizona State University, USA

- Professor Tsjalling Swierstra, Department of Philosophy, Maastricht University, The Netherlands
- Professor Mats G. Hansson, Director, Centre for Research Ethics and Bioethics, Uppsala University, Sweden
- Professor Vilhjálmur Árnason, Faculty of History and Philosophy, University of Iceland, Iceland
- Associate Professor Annamaria Carusi and Associate Professor Klaus L. Høyer, Department of Public Health, Copenhagen University, Denmark

All have accepted the invitation to take part in the project by participation in seminars and workshops, contributing to an anthology or journal special issue, as well as receiving research visits from the PhD, post.doc or project researchers. We will apply for funding of workshops, seminars and overseas research visits to the coming RCN ELSA call, which according to the early announcement will prioritize internationalization, as well as to the HEVET strategic research area and other relevant sources. Parts of this international network will form the core group of European research proposals.

Research leadership and environment

RESET:PM will be led by Bjørn K. Myskja, in close collaboration with Rune Nydal and Berge Solberg. They have extensive experience in leading projects of this kind and in collaboration on research, project work and administration for more than a decade. They have also cooperated with all the other members within the core group on previous projects. The core group has established a routine of weekly research group meetings. This collaboration is not merely formal but substantial, as is evident from the extensive co-operation on research projects, PhD- supervision and publication within the group. We will follow up this research co-operation in RESET:PM, including the PhD-student and post.doc in this close research collaboration.

The PhD-student and post.doc, positions to be announced internationally, will do the main part of the research work, supported by the rest of the research group. The PhD will primarily focus on WP 1 and 2, and the post.doc on WP 3 and 4. WP 5 will be a common task. We will develop detailed work plans in collaboration with the PhD and post.doc at the start of their employment. Myskja and Nydal will dedicate 20% of their research time to the project. Myskja will have primary responsibility for WP 1, 2 and 3, and Nydal for 4 and 5. The rest of the RESET researchers will continue to participate in the established weekly research meetings, in addition to annual seminars and workshops, and participate in article writing.

The PhD and post.doc will work closely together, as this project involves the use and further development of relatively novel methods in ethics research. Therefore, the work sketched above is divided into research questions common for the research group. They will be subject to adjustments, and should be regarded as providing a revisable structure for the total work of the research group on this project. The aim of the PhD-work will be a dissertation consisting of four peer-reviewed articles, at least two co-authored with other research group participants, and an over-arching introduction. The post.doc will also be primary author of four articles. In addition, the research group will produce at least three additional articles. The international partners will participate in an anthology or journal special issue.

The synthesizing of the project results will be done in three ways. First, the introductory part of the PhD-dissertation will present the general results of the overarching project. Second, we will write a popularized article directed at media and the general public available in English and Norwegian versions on our webpage. Third, the core group will co-author an academic article drawing together the main findings of the research.

RESET:PM is marked by the dual purpose of developing a unifying and long term program for the research group as well as research tasks for a PhD-student and a post.doc. RESET:PM will provide a basis for working out additional research proposals in order to extend knowledge in this area and maintain the human resources in the RESET group and at the faculty.

Publication and dissemination

Tentative time plan:
1. Semester: The PhD-student will start one semester before the post.doc, and use the first semester for compulsory education and literature study. NTNU seminar 1.
2. and 3. semesters: empirical studies, drafts for articles 1.1 &2 and 3.1 & 2. Workshop 1, editing and contributing to special issue on methodology.
4. and 5. semesters: finishing articles, writing 2.1, draft for 2.2, writing 4.1 & 2. Workshop 2, editing and contributing to anthology on the ethos of PM. NTNU seminar 2.
6. semester: PhD writing dissertation introductory part, publishing anthology. Open meeting.

We will publish our research results in high-impact journals within the ethics of technology, bioethics, genomics, philosophy of science and STS studies. We will establish a project webpage presenting our research, methodology, results and relevant news from the research field, directed at the wider research community, media and public. We will use Norwegian and English on the webpage, depending on the audience we wish to address. In conjunction with the international wokshops, we will cooperate with the NTNU Theory of Science Forum, the HEVET strategic research area and relevant departments in sharing the research and knowledge of the international partners with the wider research community, through open guest lectures. We will continue to arrange seminars directed at the Trondheim research communities in medicine, biotechnology, humanities and social sciences, following up our PM seminar arranged last December. The Biotechnology Advisory Board has agreed to fund and co-arrange an open public meeting presenting the research results to the wider community towards the end of the project period. We will participate actively in the public bioethics debate, and continue giving popular public talks, writing newspaper chronicles and other forms of research dissemination through media (see CRISTin for details on Solberg's and Myskja's dissemination activities).

External funding and CoE potential

The group is already highly successful in acquisition of external funding of research, the members leading or participating in sixteen projects the last twelve years from the EU, the RCN (five different programmes) and from the Liaison Committee between the Regional Health Authority and NTNU. Seven projects are currently running. RESET is well positioned for the future development of humanistic research funding within the EU Horizon 2020 and RCN with their emphasis on societal relevance, on integrated research and on responsible research and innovation. We will continue actively to pursue new projects, developing our research collaboration with researchers in medicine and technology, as well as strengthening our international network. Two of our international partners have indicated interest in building Horizon 2020 platforms. We may also apply to the ESF for exploratory workshop support.

We plan to apply for Centre of Excellence status at the next call (2016-17). Our experience in integrated ethics, the methodologies we are developing and extensive research collaborations across disciplines and countries, provides background for developing a well-founded CoE application. Currently there has only been one CoE in philosophy, having a clearly theoretical focus. Our approach is thematically and methodologically significantly different from this, and addresses a research area of growing national and international relevance for academic research as well as for society. In the coming years we will have particular focus on publishing in leading journals, in order to improve the group's publication profile.

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