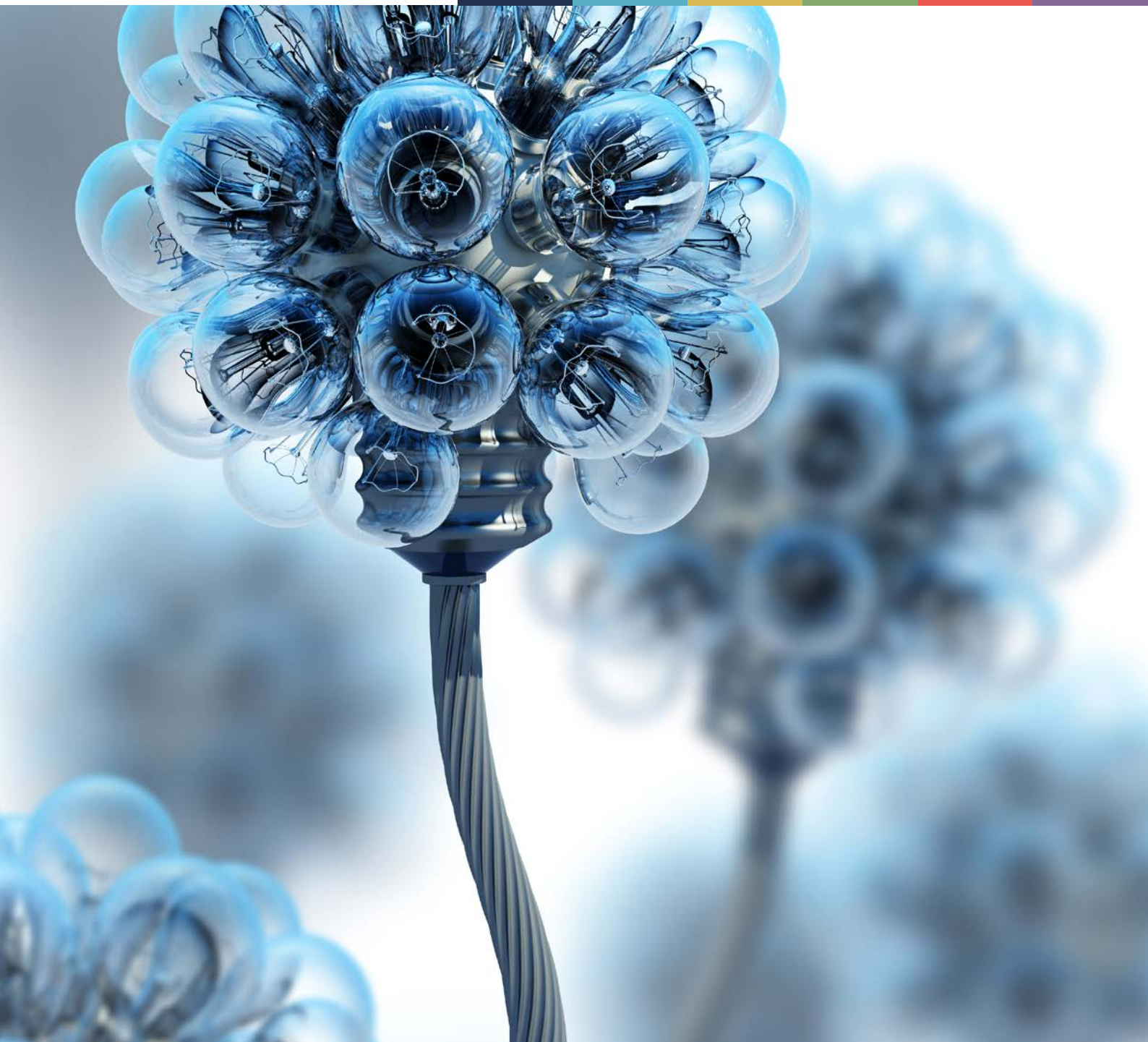


S.Net 2016 8TH ANNUAL S.NET MEETING

Book of Abstracts

The Co-Production of Emerging Bodies, Politics and Technologies



UNIVERSITY OF BERGEN





UNIVERSITETET I BERGEN
Centre for the Study of the Sciences and the Humanities



S.NET 2016 CONFERENCE OVERVIEW

Tuesday 11th October events – page 14

- 13:00-19:00 *Registration Desk open, The Student Centre, Main Hall (2nd floor)*
- 10:15-16:00 Preconference workshop Ethical and Social Aspects of Cancer Research, Auditorium 4, BBB, Jonas Lies vei 91. Free entry
- 15:00-17:00 Pikel workshop start-up: Meet up at the Student Centre Mezzanine (1st floor, by the Card Centre). Outing to fish stores
- 19:00-22:00 *Tuesday evening event: Conference pub Christie café, music and mingling*

Wednesday 12th October, The Student Centre – page 14–42

- 08:30-18:00 *Registration Desk open, Main Hall (2nd floor)*
- 09:30-10:00 Welcome and plenary addresses by S.Net President Michael Bennett and UiB rector Dag Rune Olsen, auditorium (The Egg)
- 10:00-11:00 Plenary keynote lecture by Silvio Funtowicz, auditorium (The Egg)
- 11:00-11:30 *Coffee break*
- 11:30-13:00 Parallel sessions, seminar rooms A-E and auditorium (The Egg)
- 13:00-14:15 *Lunch*
- 13:30-18:00 Pikel workshop 1: Establishing an open source and open hardware lab for DIY biology, chemistry and marine fauna research. Conference participants are welcome to take part during breaks! Mezzanine (1st floor)
- 14:15-15:45 Parallel sessions, seminar rooms A-E and auditorium (The Egg)
- 15:45-16:00 *Coffee break*
- 16:00-17:30 Parallel sessions, seminar rooms A-E and auditorium (The Egg)
- 17:30-18:00 Mingling and pizza (can be brought in to movie screening)
- 18:00-19:15 BIO-FICTION film screening
- 19:15-19:30 More pizza
- 19:30-20:30 BIO-FICTION Panel debate and audience responses
- 20:30-22:00 *Conference pub Christie café*

Thursday 13th October, The Student Centre – page 43–78

- 08:30-17:00 *Registration Desk open, Main Hall (2nd floor)*
- 09:00-10:30 Parallel sessions, seminar rooms A-E and auditorium (The Egg)
- 10:30-11:00 *Coffee break*
- 11:00-12:00 Plenary keynote lecture by Joseph Dumit, auditorium (The Egg)
- 12:00-13:30 Lunch, and S.Net Business Meeting, auditorium (The Egg)
- 13:00-17:00 Pikel workshop 1: DIY biology lab for marine research, Mezzanine (1st floor)
- 13:00-17:00 Pikel workshop 2: Solar kinetic sculptures, Mezzanine (1st floor)
- 13:30-15:00 Parallel sessions, seminar rooms A-E and auditorium (The Egg)
- 15:00-15:30 *Coffee break*
- 15:30-17:00 Parallel sessions, seminar rooms A-E and auditorium (The Egg)
- 17:00-18:00 Pikel Debate: On microplastics in marine life, auditorium (The Egg)
- 19:00-22:00 *Conference dinner, University Aula*

Friday 14th October, The Student Centre – page 79–91

- 08:30-11:00 *Registration Desk open, Main Hall (2nd floor)*
- 09:00-10:30 Parallel sessions, seminar rooms A-E and auditorium (The Egg)
- 10:00-14:00 Pikel workshop: set-up for exhibition
- 10:30-11:00 *Coffee break*
- 11:00-12:00 Plenary keynote lecture by Sheila Jasanoff, auditorium (The Egg)
- 12:00-13:00 *Lunch*
- 13:00-13:45 Plenary: Sheila Jasanoff, Alfred Nordmann, Silvio Funtowicz, auditorium (The Egg)
- 13:45-14:00 Closing remarks by Michael Bennett and Roger Strand of the Organizing Committee, auditorium (The Egg)
- 14:00-14:30 *Last coffee and goodbyes*
- 14:00-15:00 Pikel closing event: Mini exhibition, Mezzanine (1st floor)

List of participants – page 92

Cover image: new electricity concept. CC: colourbox.com

8th annual S.Net conference:

The Co-Production of Emerging Bodies, Politics and Technologies

The 8th Annual Meeting for the Society for the Study of New and Emerging Technologies

University of Bergen

Bergen, Norway, October 12–14, 2016

WELCOME BY THE S.NET PRESIDENT

What a delight to welcome you to the 8th annual meeting of S.Net, the Society for the Study of New and Emerging Technologies. The Society's commitment to cosmopolitanism is well known and evident in its embrace of scholars and researcher-participants from around the world. And its maiden appearance in Norway, thanks to its gracious hosts at the University of Bergen, accentuate this admirable trait. The camaraderie that fuels S.Net's meetings, and the goodwill they have spread by annually oscillating between European and North American locales are excellent effects of the Society's goal of openness. S.Net's cosmopolitan impulse and composition are also timely and of considerable societal value in this particular historic moment. For one, the scale of so many of the problems S.Net participants take as their objects of concern —governance of technoscientific innovations igniting effects that respect no national boundaries, or imaginaries envisioning extra-national paths into futures heavily mediated by new modes of energy and food production, for example— approach the planetary in their magnitude of significance and impact. As well, S.Net's sheer existence counters the mean-spiritedness that has crept into Continental and American politics. The Society's activities effectively militate against those xenophobic political upsurges, while deepening the techno-political toolbox that is necessary, presently and in the future, to deal with the thorny problems confronting many if not most human societies. Approaching a decade of accumulated investment in personal connections, professional collaborations and scholarly dissemination of research, S.Net is well positioned to continue its meaningful contributions to global civility and excellent scholarship. Along with our warm friends in Bergen, I invite you enjoy this event, and to join the Society in its efforts to maintain and propagate its traditions. My genuine hope, though, is that while basking in that joy, you also take up the challenge that S.Net presents to us. We are all in the tragically charmed position of beneficiary of both. Once again, welcome. I look forward to seeing you all in the coming days.

Sincerely Yours,
Michael G. Bennett
S.Net President

WELCOME

WELCOME BY THE UNIVERSITY OF BERGEN

It is my great pleasure as rector to welcome you all to Bergen and The University of Bergen where the 8th annual S.Net meeting, The Co-Production of Emerging Bodies, Politics and Technologies, takes place from the 12th to the 14th of October 2016. This meeting provides an opportunity for reflections on emerging technologies and their place in society. This year's conference has a special focus on politics, which seems pertinent in our current situation.

The fourth industrial revolution or Industry 4.0, with intelligent robots, self-driving cars, 3D-printing, nanotechnology and so on, provides great opportunities but also raises some issues that needs to be discusses and solved. I believe that interdisciplinary research, education and collaboration – that academia and universities like ours can provide – will play a key role in dealing with this issues. Technologies will become increasingly important in the years to come and it is therefore crucial to have ethical, legal and political discussion so that we can contribute to the creation of a framework for the technologies to develop within.

I am happy that our University can host this meeting place for researchers from five different continents to examine a broad range of topics surrounding new and emerging technologies.

I hope that you will have an inspiring and fruitful week academically and that you also will take some time to visit our city and enjoy some of the things that it provides.

Sincerely Yours,
Dag Rune Olsen
Rector
University of Bergen

WELCOME BY THE LOCAL ORGANISING COMMITTEE

We are very happy to be able to welcome you all to Bergen for the 8th annual S.Net meeting! We are proud to be able to offer a number of special formats in this year's conference, including films from the BIO•FICTION Synthetic Biology Science Art Film Festival, workshops, art-performance RRI and panel debates – some of which were submitted by participants as special sessions. The variety and vitality of the proposed sessions show that the S.Net community is comprised of individuals with great capacity for creativity, critical thinking and engagement with important topics of our time. The eight themes on which authors could submit papers have also, we think, contributed to a conference program that has a certain degree of thematic coherence and sessions with potential for dialogue between papers. We trust you will find that they run strongly throughout the three days of the conference.

Besides the scientific programme, a number of exhibitions brighten the mingling areas of the conference venue. On Wednesday and Thursday evening we can wet our throats at the Conference Pub, located in one of the most popular cafes on campus and within the University Museum of Natural History. This same building also holds the University Aula, where we will enjoy our Conference Dinner on Thursday evening.

As you will have noticed, the university campus is located in the heart of Bergen. The city centre is only a short walk away, and is easily accessible during breaks and pauses. The UNESCO world heritage site "Bryggen" is a must, and the funicular to the mountain Fløyen with a view over Bergen can also be recommended.

We extend our sincere thanks to the Research Council of Norway for funding the conference through specific grants as well as collaboration with CCBIO, the INTPART programme, ELSA Norway, and the RCN projects FIGO, REDIG, NORZYMED and SALMOSTERILE. S.Net 2016 is also supported by the Bergen University Fund, the EU-funded project SYNENERGENE, and the journals Nature Nanotechnology and Springer's NanoEthics. Studies of New and Emerging Technologies. We have had a fruitful collaboration with the Bergen Academy of Art and Design, Píksel Festival for Electronic Art and New Technology, and the EU project SYNENERGENE to develop the two DIYbio and DIY art workshops that are primarily aimed at local students, but which conference participants are most welcome to interact with and participate in during breaks. We hope you will enjoy all that Bergen and S.Net has to offer, and wish you a great conference experience.

Local Conference Organizing Committee, Centre for the Study of the Sciences and the Humanities:

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GENERAL INFORMATION

Conference Venue

Student Centre
University of Bergen
Parkveien 1
5007 Bergen

The conference venue is situated at Nygårdshøyden, an area consisting of a mixture of houses, shops and seats of learning in the heart of Bergen, hosting the faculties of mathematics and natural sciences, social sciences, psychology, the humanities and arts, and law. It is within easy walking distance from all of the recommended conference hotels.



The University of Bergen

The University of Bergen (UiB) is an internationally recognised research university with 14,800 students and 3,600 staff.

The organiser of the 8th Annual S.Net Meeting is the Centre for the Study of the Sciences and the Humanities (SVT), a permanent, interdisciplinary and interfaculty institution at the University of Bergen. SVT is responsible for research, teaching and dissemination within the field of “theory of science”. In Norwegian, the Centre is called Senter for vitenskapsteori, “vitenskapsteori” meaning “theory of science” but being understood broadly as “research on research”, inquiry into all the disciplines and approaches found at a comprehensive university, and their relationships to society. The Centre is internationally renowned for its work within post-normal science (PNS) as well as RRI (responsible research and innovation) and ELSA (ethical, legal and social aspects) of science and technology, and political theory.

Registration and Conference Information

The Registration Desk is located in the Main Hall (2nd floor) of the Student Centre, Parkveien 1, Bergen.

The desk is open for registration and information:

Tuesday, 11 October:	13:00-19:00
Wednesday, 12 October:	08:30-18:00
Thursday, 13 October:	08:30-17:00
Friday, 14 October:	08:30-11:00

The staff at the desk will be happy to assist you with all matters concerning the conference.

AV Equipment and Uploading your Presentation

There are stationary PCs and projectors in all the conference rooms, as well as blackboards and speakers. The auditorium (The Egg) also has microphones. Technical support is available should you encounter any trouble – but please note that support for Mac computers cannot be guaranteed, and remember to bring a VGA adapter if you are using your Mac.

Please arrive at the room ten minutes before the start of your scheduled session, and upload all presentations of a session onto the same computer in order to minimize transition time between presentations. Remember to check whether the technical aspects of your presentation work on the computer before the start of the session! If you require sound or other special equipment, please relate this to the staff at the registration desk upon your arrival.

Lunch

Lunch will be served in the Main Hall of the Student Centre, and the upper level area of the cafeteria is reserved for conference participants to eat on Wednesday and Friday. The Student Welfare Organisation in Bergen (SiB) caters the lunches. On Thursday, lunch will be served in lunch bags, which can be brought into “the Egg” for the S.Net Business Lunch.

Coffee Breaks

Coffee and snacks will be served in the Main Hall in every break between sessions. The coffee and snacks are catered by the The Student Welfare Organisation in Bergen (SiB).

Conference dinner

The conference dinner on Thursday, 13 October, will take place in the University Aula, inside the Natural History Museum, Muséplassen 3. Entrance through the Museum Garden from Olav Ryes vei (vis-à-vis the Student Centre), through Christie Café and up the stairs on your left. The food, a buffet dinner consisting of seafood, meat, and plenty of vegetarian options, followed by dessert, will be served by the restaurateur Søtt + Salt.

If you have not yet purchased a ticket for the dinner, you can do so at the Registration Desk upon your arrival. We will ask you to register within 15:00 on Wednesday, October 12, in order to give Søtt + Salt time to prepare food for the correct number of people.

Conference Pub

The Conference Pub is located at *Christie café*, inside the Natural History Museum, Muséplassen 3. Entrance through the Museum Garden from Olav Ryes vei (vis-à-vis the Student Centre). The Conference Pub will be open as a preconference venue for music and mingling on Tuesday, October 11, from 19:00-22:00. On Wednesday, October 12, it will be open from 20:30 (directly after the BIO-FICTION film screening and debate) to 22:00. Drinks can be purchased at a discount price, and light snacks will be available.

Internet Access

WiFi is available free of charge throughout the UiB campus. If you have eduroam, this is available and is the easiest way to get online. For participants who do not have access to eduroam, the network **uib-guest** is the next best option. To access the uib-guest network, please follow this procedure:

- 1) Choose the uib-guest network among the WiFi options. A window with various log-in options will appear. The message *"If you are not affiliated with UiB, this service should not be used"* can safely be ignored.
- 2) Enter your phone number in place of a username in the log-in field, and leave the password blank. You will then receive a password to use for your login. Please note that this service **does not provide encryption** on your data traffic after login, and that the organisers are not responsible for the security of your data – *be careful!*

Liability

Neither S.Net nor the University of Bergen are liable for any losses, accidents, theft, or damage to persons or objects, regardless of the cause. Participants attend the conference and related events at their own risk and responsibility.

PRECONFERENCE EVENT

11 October 2016

Ethical and Social Aspects of Cancer Research

CCBIO Special Seminar

Auditorium 4, BB Building, Jonas Lies vei 91

Open to all and free of charge.

Light lunch is served. Register by 5 October.

The seminar aims at bringing together researchers from the fields of oncology, medical ethics, priority setting in health care, and science and technology studies, in order to discuss topics ranging from the ethics of personalised medicine, the role of cancer biomarkers in clinical practice, cancer and extraordinary treatments that lead to ever longer lives, and issues of privacy in biobanks.

EXHIBITIONS

Three exhibitions will be in place in the Student Centre for the full duration of the conference. In addition, three more exhibitions will be mounted during the conference, having been produced on site as part of the proceedings.

"Fixed" exhibitions

Pankaj Sekhsaria: (Nano) Scientists and Their Favourite Instrument

Photo exhibit

The scientists, their favourite instruments and why they are important... The photo feature is the outcome of an exercise I conducted in the CNB wherein I requested the researchers to identify equipment in the laboratory they thought was most interesting and to also explain why. The an-

swers varied across the spectrum – from the micro-pipette and the humble voltmeter on the one hand to the sophisticated and expensive Atomic Force Microscope on the other. The images, framed deliberately and in a particular way, show the interpretive variability of the choices scientists make in the laboratory and illustrate how differently the scientists relate to specific tools and to the same working environment (Also see Latour and Woolgar, 1986).

TRACKS: Climate adaptation in Bangladesh

Films, photos, artwork and maps

Climate change discourses have introduced a host of scientific images of global climate. While such representations of climate have a potential quality for supporting debates in certain global institutional settings (i.e. The UN Convention on Climate Change), they are arguably of a very poor quality to support other forms of climate debate; particularly relative to adaptation to climatic impacts in local places. TRACKS is an ongoing research project that partners scientists with local communities in NE Bangladesh to improve understanding of local climate variability and its impacts, in order to support adaptation. Key to this project is creating new institutional settings for talking across different representations and epistemologies of weather, including different ways of representing the weather in images.

This exhibition presents three different ways in which we are building visual representations of local climate variability in the TRACKS project. The first is through fuzzy cognitive maps, as complex soft systems diagrams of the interacting causes and impacts of rainfall in NE Bangladesh. The second is through a painted artwork on canvas, produced by a Bangladeshi artist on the basis of discussions and sketches of local people and scientists alike. The third is a series of short films, capturing the narratives of the weather of different actors in the local community, from rice farmers, to fishers, teachers and a scientist. Some accompanying photos will show this research in action.

Each of these representations sought to make explicit different ways of understanding weather and impacts in the particular place. While the cognitive maps approached the kinds of systems understanding attached to climate science, the art captured meanings and values associated with this weather, and the narratives weaved these into particular morals for coping with the weather in NE Bangladesh.

Pina Kingman/Viten Filmfestival: Visualising the unseen

Film exhibit

The process of visualising what we cannot see with our naked eye opens the door to a whole world of possibility. The possibility of shedding light on the unknown, the possibility of creating a fascinating story, the possibility of using creative ways of seeing. When it comes to visualising molecular biology, the range of visualisation methods creates a varied and interesting body of work. So, for this screening, I have chosen a set of biomedical animations to show different ways of visualising molecular science.

One of these short films, entitled *Our Resilient Genome*, was directed and animated by me for the Visualization Group at the Department of Informatics at the University of Bergen. It won the Scientific & Educational Award the The St. Tropez International Film Festival.

To see more science films, please join us at the 1st annual Viten Filmfestival November 11-13 2016 at Cinemateket in Bergen. We will showcase international short and feature length films of any genre, fiction, documentary, experimental, animation, that tells a scientific story. Through film, we hope to inspire people with science.

Please visit vitenfilmfestival.no for more information.

WORKSHOPS CULMINATING IN EXHIBITIONS

Wednesday, October 12-Friday, October 14:

Robert Smith, Andreas Huber, Sean Low, Stefan Schäfer, Shannon Spruit

"Authority map"

Produced during the workshop **Flexing and reflexing authority in STS engagements**

Following the workshop at 14:15-15:45 on October 12, the map will be produced by the session organisers as a distillation of the negotiations, harmonies and tensions discovered. This will act as a reflexive visual artefact to be displayed and engaged with, provoking reflection and debate over the course of the conference.

See the description of the workshop in the Scientific Programme for more information.

Tuesday, October 11-Friday, October 14:

Piksel-KHiB-UiB: Sushi Roulette: Microplastics in Fish through DIY Analysis

Artists and scientists Cat Austen and Gjino Sutic invite us to examine the unseen and hard to detect impact of our increasing use of "hidden" plastic – plastic that we can't see, like micro beads, or that we don't (yet) have a narrative of as polluting, such as 3D printed materials. At the workshop, we'll be refining DIY chemical tests for micro-plastics, looking at fish samples from the local fishmongers.

Over 4 days of activities, starting with sample collection on a field trip to the fish market, participants will go through a process of exploration of these newly developed DIY techniques, to better understand the presence of plastics in the marine environment around Bergen.

The workshop will culminate with a Sushi Roulette afterparty, where through the encounter with real and dummy sushi the participants are challenged to test their reactions to the thought of consuming plastics as food.

Thursday, October 11-Friday, October 14:

Piksel-KHiB-UiB: Solar kinetic sculptures

Recycling, derelict materials, and self-sufficiency are keywords that would emerge in a possible future where new life forms will have to rely on other building blocks than those required for biology. Thinking of plastic being the only thing left for grabs for new life forms has resulted in a series of 'living' kinetic sculptures. These sculptures would act like little sprouts from this extreme futuristic scenario.

The workshop is run by artist Egil Paulsen. Attendants are invited to create playful little sculptures that move with the help of solar cells. Combine art and technology in a fun way by creating simple poetic machines, which in turn gives way to experiencing renewable energy technology, with movement and animism as aesthetic qualities.

Both Piksel workshops are created as a collaboration between Piksel Festival for Electronic Arts and Free Technology, Bergen Academy of Art and Design, Centre for the Study of the Sciences and the Humanities (SVT, UiB), and the EU project SYNENERGENE. The primary participants, mainly students from KHiB, have signed up for the full workshops, while all conference participants are invited to interact with the workshop activities during breaks

Wednesday, October 12, 18:00-20:30:

BIO•FICTION, THE INTERNATIONAL SYNTHETIC BIOLOGY FILM FESTIVAL



S.Net this year hosts the BIO•FICTION Science Art Film Festival, serving up a potpourri of short films that explore the emerging field of synthetic biology from different disciplinary angles including science and engineering, social science, cultural studies, amateur biology, film, art and design.

Films:

Reinventing the Dodo	Steven van Eekelen / NL, 2013	03:08
Living Food	Minsu Kim / UK, 2013	00:55
Simply Complex	Duguid Cameron / UK, 2013	09:34
I Wanna Deliver a Dolphin	Ai Hasegawa / JP, 2013	02:35
Expanded Self	Sonja Bäumel / AT, 2012	03:28
Electrostabilis Cardium	Agi Haines / UK, 2013	03:27
System Synthetics	Maurizio Montalti / NL, 2011	05:55
New Mumbai	Tobias Revell / UK, 2012	09:17
Bioluminescent Streetlamps	Steven van Eekelen / NL, 2013	02:22
The Arsehole Gene	Eric Romero / UK, 2013	06:48
Copy & Clone	Louis Rigaud / FR, 2010	03:15
Hybris	Arjan Bentjes / NL, 2014	06:22

Introductory video by Markus Schmidt, Biofaction.

The screening is followed by a panel debate and audience responses. Panel members are Christopher Coenen (ITAS, KIT), Karen Kastenhofer (ITA, Austrian Academy of Sciences), Cathrine Kramer (Center for Genomic Gastronomy), and Fern Wickson (GenØk Centre for Biosafety). Moderator: Nora S. Vaage (SVT, UiB). Pizza is served as part of this event.

BIO•FICTION is produced by Biofaction KG (Vienna).

SCIENTIFIC PROGRAMME

TUESDAY 11TH OCTOBER

10:15-16:00

Preconference workshop Ethical and Social Aspects of Cancer Research, Auditorium 4, BBB, Jonas Lies vei 91. Free entry.

15:00-17:00

Piksel workshop start-up: Meet up at the Student Centre Mezzanine (1st floor, by the Card Centre). Outing to fish stores. Conference participants are welcome to join the field trip and discussions, also if you do not plan to participate in the full workshop.

WEDNESDAY 12TH OCTOBER

09:30-10:00

Auditorium (The Egg)

WELCOME

UiB Rector Dag Rune Olsen and S.Net president Michael Bennett

10:00-11:00

Auditorium (The Egg)

PLENARY KEYNOTE LECTURE

Can science and democracy coexist?

Silvio Funtowicz, Professor II at the Centre for the Study of the Sciences and the Humanities (SVT), University of Bergen

Silvio Funtowicz began his career teaching mathematics, logic and research methodology in Buenos Aires, Argentina. During the 1980s he was a Research Fellow at the University of Leeds, England. Until his retirement in 2011 he was a scientific officer at the Institute for the Protection and Security of the Citizen (IPSC) of the Joint Research Centre of the European Commission (EC-JRC). Since February 2012 he has been Professor II at the Centre for the Study of the Sciences and the Humanities (SVT) at the University of Bergen, Norway.

Funtowicz is well known for introducing the idea of post-normal science (PNS) together with Jerome R. Ravetz. He is the author of numerous books and papers in the field of environmental and techno-

logical risks, and policy-related research. He has lectured extensively and is a member of the editorial board of several publications, and the scientific committee of many projects and international conferences.

Introduction by Ana Delgado, Researcher at SVT and member of the S.Net organizing committee.

11:30-13:00

Auditorium (The Egg)

Thematic session

HANDLE WITH CARE: MAKING THE WORLD SAFE FOR TECHNOLOGY

Organizer and chair: Alfred Nordmann

Even though there is only one word in German (Sicherheit) for 'safety' and 'security', the difference between these notions has inscribed itself into institutions and discursive practices, thus exposing that there are historical conditions and institutional reasons that hold these notions apart – or allow them to collapse. To the extent that the distinction revolves around the changing relations of technology and politics, we are here confronted with the S.Net theme of how, paradoxically speaking, history, politics, and culture shape the way in which technology is allowed to displace politics.

For instance, since the September 11 attacks on the World Trade Center, the notions of airplane safety and airport security have become ever more intertwined, serving as a pervasive dispositif that recasts subjects and objects, technology, time, and space. In the case of so-called IT security one can ask whether there is any intended contrast to "IT safety" at all – the latter does not exist even in name, while the former is pursued as the mostly technical endeavor to maintain the safe functioning of devices. All this can be described as a reduction of politics to technology, of building a procedural and technical firewall that ensures safe functioning by claiming to exclude concerns for security. But it is not just that. If politics operates in the time-frame of history and establishes a normative order that can accommodate contingency, we witness instead the armament of cyberspace that de-temporalizes it and seeks to exclude contingency. Does 'security' mobilize technologies for a well-defined time of crisis and state of exception, or does 'security' dedicate technologies to a regime of permanent vigilance as in the case of IT and airport security? This question will be taken up by Leon Hempel (see also below). Airports are heterotopias with normative orders that are paradoxically located in- and outside of society. Airport security concepts seek to transform dangers in calculable risks, privileging the possible over the actual. They therefore open themselves to literary fictions. Annette Ripper will show that these do not only provide threat scenarios and means of reflection, but expose the close relation, if not structural analogy between literary and security practices.

In a different manner – though perhaps not unrelated – Chernobyl and the end of the Cold War changed the constellation of 'safety' and 'security' in respect to nuclear technologies. Again, on first sight this might be described as the delegation of politics to technology. After WW II, there were on one sphere the strategic concerns with first strikes, numbers of warheads, mutually assured destruction, and in another sphere the good, the peaceful atom of nuclear energy, there was a precarious regime to guarantee international security and technical discussions regarding plant safety. In contrast, we nowadays confront the question whether the world can be a safe place for any kind of nuclear technology in the Ukraine or Iran or North Korea or Japan. Making the world safe for nuclear technologies requires tracking material flows, studying reactor designs, profiling the psychology of operators and terrorists, securing arsenals, training engineers. In order to fully appreciate this shift, however, it is not sufficient to diagnose today's approach to non-proliferation as mostly managerial, technological.

Again, it is not just that. This approach is informed by a peculiar kind of rationality (*Sachlichkeit*) that seeks to do justice to the things and their requirements – tending to the maintenance of a fragile system irrespective of its meaning. Alfred Nordmann will seek to articulate salient features of this rather particular type of prudence (see also below).

These questions of concern for the maintenance of a system shed light on what might appear to be a rather different case. If “IT safety” does not even exist as a word, while “IT security” follows strictly the safety-paradigm, the inverse holds for nanoparticles. Though “nanoparticle security” does not even exist as a word, “nanoparticle safety” cannot be accommodated within the strictly technical and regulatory paradigm of toxicology and therefore refers to questions of trust and credibility, of credulity and vulnerability, of the institutions and politics that alone can give meaning to toxicological findings or the lack thereof. Politics thus comes in through the back door, so to speak. Technological matters of safety are never just technological in that they are tied in with the larger question of how to make the world safe for technology. The politics here works from within the conditions of vulnerability and trust, as will be shown by Christina Schües (see below).

The following shortened abstracts provide additional information about each contribution:

- Leon Hempel (Technische Universität Berlin): **Security as Time binding Technologies**
To follow the history of the concept of security from its origin to the present implies to follow the narrative of its secularization. Such historical understanding of security correlates with a conception of time. Most often, it is implicit in the assertion that security transforms and overcomes the experience of contingency and temporality. Today, security technologies present themselves to be immune to time claiming a de-temporalization of time in time. 24/7/365, they deploy covert methods of “binding time” to control any contingency in time. These methods of time-binding will be examined first in regard to contemporary preemptive regimes in different historical and social settings in order to decipher the distinction between safety and security works as discursive operator.
- Alfred Nordmann (Technische Universität Darmstadt): **Four Horsemen and a Rotten Apple**
During the times of the Cold War, the precarious equilibrium of strategic threats had its own working order. Everyone was attending to the weapons for different, perhaps conflicting reasons, and yet the many observations were maintained in a relation of mutual support. The weapons themselves became fixated and paralyzed at their center of attention. These rules of the game change when the global challenge is defined not as preserving peace in an age of ideological conflict and competing national interests, but as one of preserving a working order of nuclear safety and security measures – that is, when issues of proliferation and disarmament, transparency and control appear in the collective consciousness as analogous to the question of climate change and thus as a global challenge that puts different national and stakeholder interests into a managerial mode. The Earth and the Bomb need to be handled with care.
- Annette Ripper (Technische Universität Darmstadt): **Airport Security and Literary Fiction**
Science fiction and the power of imagination are often referred to in studies of emerging technologies with less attention paid to safety technologies and questions of security. The 9/11 Commission Report attributed the security failures of that day to a lack of imagination. Accordingly, science fiction writers were invited by the DHS to give advice and participate in shaping security spaces, particularly at airports. In anthropological terms, airports have been regarded non-places as they are transient sites that are neither here nor there, situated by its customs and laws simultaneously inside and outside its territory. Considered as heterotopias in a Foucauldian sense they

inhabit the political present as well as the realm of fiction and imagination. This holds for the airport's security infrastructure, in particular. Concerned with potential threats security systems seek to anticipate and prevent future incidents. Fictions, including literary fictions, access the possible by reflecting, inverting, and scrutinizing real space. The precarious relationship between security and literary fiction will be further examined, providing insight into the imaginary nature of security systems, and thus revealing structural analogies between literary and security practices.

- Christina Schües (Universität Lübeck): **Emerging vulnerability and risks**
Bodily, linguistic, and juridical vulnerability are intertwined with a person's integrity and lived experience in personal relations and society, in technical, industrial or medical environments. Hence, vulnerability can be understood as an inherent disposition which is variable with exposure (the fact of being exposed) to more or less risks and dangers. In relation to the external world vulnerability refers to (feeling safe, having a secure environment. In relation to others, letting oneself be vulnerable to the other can enhance the strength of the relation by manifesting trust. The paper will explore this apparently paradoxical interpersonal constellation of vulnerability and trust in regard to its worldly context.

11:30-13:00

Seminar Room A

Thematic session

ENACTING URBAN FUTURES THROUGH EMERGING TECHNOLOGIES OF GOVERNANCE

Chair: Lucia Liste

Organizer: Ivana Suboticki

This thematic session aims to examine the sociotechnical co-production of emerging sustainable cities. In the last years, we have witnessed a growing interest among scholars and practitioners regarding the role of cities in addressing global climate change (Bulkeley et al. 2015). We aim to contribute to the S.Net Conference by providing empirical insights related to the enactment of sustainable cities. What practices, actors, institutions and technologies are involved in this sociotechnical co-production?

To answer this question, we aim at exploring the enactment of urban responses to climate change in different sociopolitical settings. We are especially interested in knowledge practices of sustainable urban development e.g. learning, knowledge sharing and inter-(trans)disciplinarity. In this session, we present findings exemplifying two opposite models for mainstreaming of environmental concerns in the public sector. The first one is a national initiative 'Cities of the future' (CoF), a top-down, knowledge-intensive and strategic program aiming to foster collaboration between different national and local levels for the development of sustainable metropolitan areas. The second case examines grassroots and bottom-up initiatives related to bicycling as part of an effort to improve sustainable urban transport development. This initiative can be understood as an effort towards the integration of environmental concerns in Belgrade, Serbia, which is an important aspect of EU accession-related endeavors. Both cases have been studied through analysis of relevant policy documents, shadowing techniques, and semi-structured interviews with stakeholders.

We draw on theoretical contributions from the interdisciplinary field of Science and Technology Studies (STS) and a practice-based approach to knowledge, whereby knowing is understood as a practical accomplishment situated in the historical, social, and cultural context in which it unfolds (Gherardi 2006). We approach local responses to climate change not as reduced to the realm of the state, but

rather, understood as a set of practices that operate across a broad array of actors, institutions and realms (Barry, 2001). Here, the enactment of sustainable cities relies not only on the human agency, but also on the actions of a whole array of techno-scientific objects (Barry, 2001). Therefore, this perspective help us understand the ways in which an imbroglio of science, technology and politics takes part in producing, rendering real and visible, its object of intervention (Asdal, 2008, 124).

All the confirmed contributors are working closely together within a research project and share empirical cases and theoretical standpoints. This affordance allows us to engage with innovative formats and present the findings together as an alternating conversation. Here, we pay special attention to similarities and differences, as well as, implications for the governance of cities. We study emerging sustainable cities paying attention to both the shaping narratives and imaginaries, as well as the innovative practices through which those cities are performed. More specifically, the session will discuss different types of technologies: the city as a sociotechnical imaginary; a strategic program as a technology of governance; emerging sustainable transportation technologies such as bicycle paths and lifts, light rails, and 'super buses'; and knowledge technologies. These issues will be explored throughout the following presentations:

- Lina Ingeborgrud: **The making of 'Cities of the future': imagining cities, governments and citizens**
Multilevel governance has been proposed as solution to challenges of urban development, but this requires agreement regarding distribution of responsibilities among national and local actors. In order to attain multilevel governance, we argue there is a need to reframe and re-localize problems, by exploring stakeholders' sociotechnical imaginaries of future cities, responsibilities and the role of citizens.
- Lucia Liste: **'Cities of the future': a technology of governance for urban transitions**
We study 'Cities of the Future' (CoF) as a techno-organizational innovation for the governance of urban transitions. Departing from an understanding of innovation as a situated activity, which is foremost a social-technical practice, we focus on practices through which the innovation is shaped and performed. The findings illustrate four main strategies through which innovation was shaped and enacted: driving force, framing device, learning arena, and governance framework.
- Ivana Suboticki: **Deconstructing the case of a bicycle lift in Belgrade**
We will present a specific grassroots initiative for sustainable transport development in Belgrade, Serbia. Here we will look at how a bicycle lift was constructed by one of the main city bridges. The case illustrates how the co-production of new emerging technologies involves a negotiation of context bound visions, politics, technology and knowledge.
- Lucia Liste and Lina Ingeborgrud: **From transdisciplinarity to reflexive translocality: Exploring Knowledge technologies in sustainable urban development**
With a practice-based approach to knowledge, we study knowledge technologies through which sustainable urban development in Norway is shaped and performed. Our findings show three main knowledge technologies: pilot projects, storytelling and site inspections.

We also aim to display visual data (pictures and a film) from our fieldwork in Norway (Trondheim and Bergen) and Serbia (Belgrade), which not only illustrates our findings and main arguments, but the emerging technologies in action. In the last part of the session we will open the floor to questions and comments from the audience and hopefully engage in a fruitful discussions around the implications of our research for the field of co-production of emerging sociotechnical phenomenon. Arguably, by combining presentations, visual data and discussion we will provide an interesting and rich

contribution to the conference.

Lucía Liste, PhD, is a postdoctoral fellow at Department of Interdisciplinary Studies of Culture (KULT), Norwegian University of Science and Technology (NTNU). Her main research interests concern the study of sociomaterial change in multi-stakeholder environments.

Ivana Suboticki is a PhD candidate at the KULT, NTNU. She is researching how sustainable transition is enacted in urban transportation.

Lina Ingeborgrud is a PhD Candidate at KULT, NTNU. In her PhD project she explores knowledge practices of sustainable city and transportation planning, with Norway as case study.

11:30-13:00

Seminar Room B

LESSONS FROM FUTURES PAST

Chair: Helene Nilsen

Stephan Lingner

Imagining and shaping new technologies – lessons from past narratives

It is common sense that the future is open. Many predictive attempts to foresee our socio-technological future failed so far. Past predictions e.g. of the ICT-driven paperless bureau or on nuclear fusion for sustainable power supply became icons of corresponding fiascos. As a consequence, attempts for technology foresight lost its credit in the eyes of many stakeholders, who blamed them as arbitrary oracles of modernity. Currently, new notions of techno-visionary narratives are emerging on the arena of the NEST debate, claiming some residual validity to corresponding technology visions. However, these claims stress their specific value for self-reflective diagnostics of the present while questioning their anticipative power ("hermeneutic turn"). However, imaginations of new and emerging technologies still might not be meaningless for the course of the future. Therefore, it has to be proved whether present knowledge, beliefs and attitudes might not put constraints on the openness of future. The paper will explore these considerations by comparing and reflecting selected technology visions of the past with regard to their later (non-)instantiations. Corresponding assessments will unravel both, the prospective and purpose-related dimensions of visioning techno-futures as well as the consequences for providing orientation in an initial open space of futures. Finally, the statement that technology visions are neither only self-reflections of the present nor anticipations of the future but rather imaginations for the future is constitutive for the conclusions.

Stephan has been Deputy Director of the EA European Academy. He studied geosciences and earned his PhD in planetary sciences and chemistry. His professional fields of research are systems analysis of aerospace as well as environmental and technology assessment, incl. methodological issues. Stephan coordinated numerous interdisciplinary projects on the societal challenges of new and emerging technologies. He is member of the trans-atlantic Philosophy of/as Interdisciplinary Network (PIN), among others.

Live Grinden

Responsibility and Artificial Intelligence: The case of Frankenstein

The focus of the article is on what is possible to imagine with regards to artificial intelligence. The topic will be explored through a literary lens, with special attention to the novel *Frankenstein; or, The Modern Prometheus* by Mary Shelley. This novel, written in 1818, was among the first to introduce science fiction as a genre in literature, and gave way to a new set of thinking and imagining the future. Science fiction is often thought of as mere entertainment. However, as the article highlights, introducing non-existing phenomena through narratives and imagined scenarios in literature has potential to bring important ethical and political discussions to the table. From this perspective, the article argues that the novel written almost 200 years ago is still relevant to how discussions about artificial intelligence are dealt with today, and how robots are designed for the purpose of becoming operators in wars. With this backdrop the main questions of the article are to what extent humans are responsible for their actions when developing robots with human-like traits, and in line with the creature in Frankenstein: who is to be held accountable when artificial intelligence surpasses being a mere physical product and becomes a social and moral being.

Live Grinden is currently working as a teacher at Nygård School, and studying English at UiB. She holds a master's degree in International Education and Development and a bachelor's degree in Public Health. She was inspired to write about artificial intelligence when attending the course "The Human: Nature and Culture" at UiB.

Silke Zimmer-Merkle

Innovation Policies, Narratives and Imaginaries in the History of Driver Assistance Systems – A useful pre-history to autonomous driving

Driver assistance systems in the car are the enabling technology for autonomous driving. Both, the fast development of advanced driver assistances system in recent years and the emergence of the technology of autonomous driving, attract attention. This paper offers a look into the history of driver assistance systems and therewith the pre-history of autonomous driving. It strives to give an insight in past innovation policies, and tries to identify imaginaries of driver assistance and the car in general that played a role in their co-production. In addition to that it examines the narratives that were important in the discussion about driver assistance systems. These insights into the past could help us today to better understand what autonomous driving means, where it comes from, and what shapes its manifestation.

The paper takes into account the role of historically relevant actors and their role in innovation policy and the innovation process over all. In order to do so, it applies an approach inspired by actor network theory and discourse analysis although being a piece of history of technology and new cultural history writing. It draws on and contributes to academic history of the motor car with a special focus on Germany. The presentation furthermore wants to make a contribution to the study of new and emerging technologies from a historical perspective and show how actors and imaginaries mutually influenced and shaped the technology of driver assistance systems – that again shape autonomous driving today.

Silke Zimmer-Merkle studied European Culture and History of Ideas in Karlsruhe and is doing her PhD project there at KIT's Institute for Technology Assessment and Systems Analysis (ITAS). Her research topic – a historical case study on the history of (automotive) driver assistance systems – is a first attempt to apply academic history for the purpose of technology assessment.

11:30-13:00

Seminar Room C

Workshop

SPEAKING ABOUT IMAGES OF CLIMATE CHANGE (FIGO)*Chair: Rasmus Slaattelid*

The workshop will focus on visualisations related to mitigation, adaptation, and risk communication of climate change. Based on short introductions to a small collection of images (4-6) of different genres, from line graphs to video games, the participants in the workshop will be invited to reflect upon possibilities and pitfalls in applying theoretical perspectives from different disciplines to understand these visualizations. The aim of the workshop is to work towards an interdisciplinarily informed theory of visual analysis in the context of climate visualizations that can accommodate concerns of climate science, science studies, media studies and visualization studies alike.

Two paper sessions organized by Rasmus Slaattelid follow in the periods subsequent to the workshop, in the same room.

11:30-13:00

Seminar Room D

RRI IN PRACTICE*Chair: Roger Strand*

Clare Shelley-Egan, Diana M. Bowman, Douglas K.R. Robinson

Mapping 'devices of responsibility' over a decade of Responsible Research and Innovation (RRI) initiatives for nanoscience and nanotechnology

Responsible Research and Innovation (RRI) emerged during the early days of investment in fundamental nanotechnology research and development. RRI can be viewed as a direct response to increasing recognition by government that governance frameworks were/are needed to enable safe and societally beneficial nanotechnology products and processes. Indeed nanotechnology can be seen as the leading domain for discourse on the current framing of RRI.

Surprisingly, as researchers who have been active in the sphere of 'responsible development' of nanoscience and nanotechnology over the last decade, we have observed that there seems to be little new in the ongoing discourse about responsible development/RRI in nanotechnology. Over a decade has now passed since the release of the Royal Society and Royal Academy of Engineering's seminal report Nanoscience and nanotechnologies: opportunities and uncertainties, suggesting that the time is now ripe to take stock of the myriad – and heterogeneous – activities and initiatives aimed at facilitating the responsible development of nanoscience and nanotechnology.

In this paper, we describe the RRI movement in the field of nanoscience and nanotechnologies, focusing in on the RRI concept itself and on the emergence and embedding of a nano governance landscape. Second, we develop a typology of proposed devices of responsibility for nano RRI activities with an emphasis on the principles of RRI underlying the proposed approaches. Third, we map and categorise RRI activities at different levels of governance and involving different kinds of actors. Finally, we consolidate our insights to reflect on the de facto situation regarding responsible development/RRI of N&N and, on that basis, propose further research steps.

Clare Shelley-Egan: ethics & governance of new tech. Research Group on Responsible Innovation, Oslo and Akershus University College of Applied Sciences

Diana M. Bowman: legal & policy issues of emerging tech. Associate Professor, Sandra Day O'Connor College of Law & School for the Future of Innovation and Society, Arizona State University

Douglas K.R. Robinson: dynamics, management & policies of innovation, esp. of emerging tech. Research Fellow, University Paris-Est, Laboratoire Interdisciplinaire Sciences, Innovations, Société (LISIS-ESIEE-IFRIS)

Please note that secondary affiliations could not be added for reasons of space.

Heidrun Åm

New forms of science governance: the importance of a practice perspective

Responsible Research and Innovation (RRI) is an interesting example of how to regulate science. The notion of responsibility seems to lend legitimacy even if the 'language of risk has failed' (McCarthy and Kelty 2010). Although such anticipatory soft laws have obvious disadvantages, such as vague contents, low degree of compliance, and small efforts of implementation, all anticipatory actions (e.g., codes of conduct, stakeholder forums, public engagement) perform governance. By drawing on notions of, for example, RRI, governance actors at multiple sites (from research departments, to industry, to national and supranational public authorities) visibly enact a governing style that can be seen as trustworthy (Hajer 2009: 21). Such performances that draw on the language of responsibility, foresight and anticipation, and that integrate different publics in engagement activities, seem to contribute to boosting the perception of contemporary science governance as persuasive and, thus, authoritative.

But can these ideas successfully be translated into research practices? Where does agency actually sit in multi-sited governance processes? I will in this talk argue that taking a practice perspective elicits blind spots in RRI policies. If we refocus attention to conditions of possibility for enacting RRI, we see that RRI's approach to change often focuses on transformations of individual actions. It neglects asking how changing individual patterns of action may affect notions of how 'things are being done' at the collective level. Besides, RRI neither seems to consider the politics of identifying practices needing to be disrupted nor the politics underlying decisions about what constitutes a more societally desirable practice. In sum, bringing practice theory to a problematization of RRI highlights "both action and social order" (Reckwitz 2002:246) and thus transgresses important limitations of the normative ethics discussions characterizing the RRI field.

Heidrun Åm, NTNU, has worked as a researcher within STS since 2011. She has a PhD (2011) in political sciences from the University of Vienna. Her thesis was on nanotechnology governance and she has solid expertise in social science approaches to emerging technologies such as nanotechnology, biotechnology and renewable energy. Considers herself an S.Net regular.

Harald Throne-Holst & Anita Borch

The right time for ethics?

It has been an important task for both ELSA and RRI-scholars to assist researchers at the laboratory floor in becoming ethically reflected and reflexive. This has proven to be a challenge. One of these is to create a conducive and trustful atmosphere where deliberations over ethical norms and values can take place.

We will here report from an RCN-sponsored project where we have been responsible for the ELSA work-package. The scientific aim of this particular project is to make climate-friendly cement where microbes play an important role. Even though we are under the strong impression that we have in-

deed managed to create a conducive and trustful atmosphere, we have on some occasions had the feeling that it may not be the right time for ethics now: This project may result in just the first of several steps on the path from innovation and towards something that could be commodified and commercialized.

In the project, we (They) press for a proof-of-concept, and appear at times to suggest that ethical considerations rather should wait, at least until we have a proof-of-concept. This has prompted the title of this contribution.

We believe this is an important question, which may represent a serious impediment in the ongoing efforts to assist science and scientists to become more responsible. We will present our findings from the project and offer our reflections and analysis, as well as some possible ways forward.

Harald Throne-Holst is Head of Research for 'Technology and Sustainability' at Consumption Research Norway. He has been active in ELSA and RRI research since 2006, particularly societal and consumer issues.

Anita Borch is a senior Researcher at Consumption Research Norway. She is a sociologist from the University in Oslo, and has a PhD in Sociology from the University of Helsinki. Her main interest is in the articulation of tacit knowledge and ethics.

11:30-13:00

Seminar Room E

DIGITAL TECHNOLOGIES IN SOCIETY

Chair: Kjetil Rommetveit

Ulrike Felt & Susanne Öchsner

Identifying, Tagging, and Tracing Objects: Imagining New Modes of Ordering the World

Over the past decade, the imaginary of a future "Internet of things" has become central with Radio-frequency Identification (RFID) being one of the enabling-technologies. RFID uses electro-magnetic fields to transfer data, with the aim to automatically (uniquely) identifying and tracking "RFID tags" attached/integrated in/to objects (e.g. in the clothing industry). Activated by a receiver, these tags transmit information about the "attached object" ranging for example from manufacturing date, delivery route, or location in space. No visible connection between the reader and the tag is necessary to extract the information from the tag, thus rendering the socio-material assemblages that form around any such tag as invisibly traceable. What sounds like a technological advancement for realizing a very orderly future, also poses a number of social and ethical challenges.

At the core of this paper are these "little tags" and the ways in which they become part of new socio-material assemblages which allow to perform new modes of reordering "the world". More specifically, we will investigate the ways in which citizens (in discussion workshops) imagine the future potential of such a technology, what resources they use in doing so and how they perceive the potential futures (worth attaining or not) that get coproduced. We will trace how the implementation of RFID in specific domains is seen as putting in place a specific technological and simultaneously a specific social and moral order. Concretely we will analyse how "the problems to be solved" get constructed and how this in turn justifies specific "technological futures" as solutions; we will identify the different values that are mobilised in constructing the problem-solution packages; and finally, we will reflect on how future human-technology relations get imagined.

Ulrike Felt, Department of Science and Technology Studies, University of Vienna, is Professor of Science and Technology Studies. Her research focuses on issues of governance, democracy and public participation in (emerging) technoscientific fields, changing research cultures, as well as the role of time/future in science and society issues.

Co-author: Susanne Öchsner, Department of Science and Technology Studies, University of Vienna, is a PhD student and project collaborator with experience in the study of the coproduction of technology and society.

Stefanie Jenssen

Shopping is human nature: RFID, privacy and the omni-channel customer

Market research estimates that RFID (radio frequency identification) technology was worth \$10 billion in 2015 compared to \$8.8 billion in 2013. This includes tags, readers and software services for passive and active RFID. Passive RFID is used for apparel tagging and one mundane t-shirt can now be tagged with a unique number and then counted and tracked using radio waves. The apparel market demands 4.6 billion unique RFID tags in 2016, but is still only pervading 15% of the total market for apparel (Das and Harrop 2015). RFID vendors argue that counting clothes is now no longer dependent on touch and sight as it is with barcode. Sales personnel can spend less time on counting and more on selling. RFID tags attached to apparel are not smart clothing or wearable technology. But a passive RFID chip that only emits information if activated by a reader within a few metres radius could make its entrance through the service door and contribute to bodies being 'walking sensor platforms' (Smiths 2016) as it continues to tag ordinary clothing. RFID actors claim that customer demand for 'omni-channel' shopping (anywhere, anytime, anything through any media) necessitates unique identification of apparel products. We no longer buy 'a pink dress' but 'the pink dress' whose unique identity could eventually become intertwined with a unique consumer. Apparel presents shopping as human nature and customised convenience seems more important than the 'so-called loss of privacy'. Using fieldwork in apparel I argue that we need to study the corporate (Penders 2009) in STS as an important part of emerging technologies such as RFID that comprise systems and tags as well as human bodies operating and eventually wearing them.

Stefanie Jenssen is a postdoctoral research fellow at the TIK Centre for technology, innovation and culture. Her research interests include STS, material semiotics and corporealities, feminist technology studies, emerging ICTs, reflexivity, ethnographic theory and methods, as well as foresight and scenario methods in public governance and research policy.

Pablo R. Velasco G.

Rule-bending: disruption, consensus, and decision-making in Bitcoin hard-forks

In order to observe how power relations are modified and re-branched, I identify key actors in recent Bitcoin history and follow closely the issues (in particular block scaling) and discussions for hard-forks in its blockchain. Simultaneously, I observe the proposed instrumental changes for each competing fork, and the rationale of the group of actors supporting each branch, to understand Bitcoin internal politics in relation to rule-resolution. While the current fork of the blockchain is not the first one, it has been particularly controversial, and thus has generated at least two identifiable strong groups following different motivations. To show the former, I recall the hard-fork of 2013, and compare it to the current. While Bitcoin inherits the open model of decision-making dynamics driven by consensus, power among the voting process is leveraged to specific parts of the ecosystem. The 'miner', a native figure of the Bitcoin ecosystem, holds a privileged position, as consensus within the Bitcoin network is correlated with computer (hashing) power.

I show that changes in the code are not driven by an extended community, but by a group of strong stakeholders, and that these changes are steered towards more centralized decisions. This represents an example of what has been called 'networked assemblages (Sassen, 2006), new forms of organization in-between traditional state authority and corporate capitalism, fostered and enabled by new digital objects. My study of developing Blockchain technologies then provides an opportunity to observe three events in the evolution of digital objects: the behaviour of decision-making in arguably decentralized, consensus oriented, processes; the appropriation of so-called disruptive technologies by traditionally empowered institutions; and the re-distribution of power by the emergence of novel kinds of actors.

Pablo Rodrigo Velasco González, PhD candidate, Centre for Interdisciplinary Methodologies, University of Warwick. His research explores the materiality of digital currencies observed as political devices. He is interested in the rationale behind cryptocurrencies' design and in the interwoven relations between State, borders, politics and cryptocurrencies' distribution of power. He recently participated in Transmediale Festival 2016 (conversation piece), and collaborated in APRJA (excessive research) journal and the INC' Moneylab Reader. He is particularly interested in FLOSS politics.

14:15-15:45

The Egg (Auditorium)

RRI IN GOVERNANCE I

Chair: Núria Saladié

Daniele Ruggiu

Ethics of Care and Ethics of Rights within the Framework of Responsible Research and Innovation

Responsible Research and Innovation (RRI) arose as a promising model in the field of new governance. This framework covers several positions that can be identified according to two main tendencies. One aims at anchoring European governance in pre-existing institutional values (e.g. EU goals). The other tends to foster the responsivity and reflexivity of the system via public engagement (according to the democratic principle). Under these two opposite tendencies we can detect different philosophical trends that are distinguished from each other on the basis of the notion of responsibility (utilitarianism, personalism, deontologism etc.). Recently two main ethical perspectives are rising in this framework: ethics of care and ethics of rights. Ethics of care proposes itself as a form of philosophical justification of the participatory means and thus of RRI. There are also rights-based attempts to re-interpret governance and in particular the RRI framework. These two trends distinguish each other for the focus on rights and needs. This different emphasis on rights and needs causes two different views of responsibility that are relevant for RRI.

While rights-based models of governance of research and innovation aim to insert the legal consideration of individuals' interests in research and innovation at early stage, the ethics of care aims at co-designing innovation pathways by reshaping practices from the internal. It addresses a form of innovation made by users.

In this paper I will argue that needs as such are not able to strengthen the anticipatory dimension of RRI. For this purpose RRI needs the contribution of rights. Ethics of care and ethics of rights are not necessarily alternative since there are versions of the ethics of care that are compatible with the implementation of human rights in RRI frameworks, but this implies a deep process of transformation of the RRI in terms of individual rights.

Daniele Ruggiu is a legal philosopher. He is a Research Fellow at the Centre for Environmental, Ethical and Legal, Sociological Decisions on Emerging Technologies (CIGA) of University of Padova since 2009 and a Teaching Fellow in 'Human Rights' and in 'Legal Theory' at the University of Padova (ITA). His main research interests are on implications of emerging technologies on human rights in Europe and governance models of emerging technologies, in particular RRI. He is studying rights-based-models of governance as regards Europe.

Fern Wickson

Responsible Research and Innovation: Why we are not closing the gap between theory and practice

The concept of 'responsible innovation' or 'responsible research and innovation' (RRI) is rapidly gaining currency in both European policy discourse and STS scholarship on the governance of new and emerging technologies. This rising emphasis on having technoscientific innovation develop 'responsibly' is arguably the latest manifestation of a longer historical trend to reimagine and enact the relationship between science and society towards more ethically sound, socially robust, and broadly participatory forms. An emphasis on the need for 'responsible' development has been particularly prominent in the development of nanoscale sciences and technologies. In this paper we present results of a study that combined laboratory ethnographies, interviews and group dialogue sessions across five Scandinavian nanosafety laboratories to investigate how responsibility both could be and was being integrated into research practices. This empirical work revealed a significant gap between the theory and practice of RRI. Specifically, we observed that although researchers could identify and agree with all of the key characteristics of RRI that appear in the theoretical literature, they related to them in divergent ways, namely: 1) Agree and Enact, 2) Agree but Constrained, and 3) Agree yet Disagree. These reactions from the scientists revealed not only the range of practical barriers to implementation that need to be addressed if RRI is to advance, it also highlighted significant conceptual challenges posed by the tension between ideas of responsible innovation and traditional thinking around good science. Having described these findings, the presentation will conclude by arguing that much of the current focus within RRI on the role of individual scientists needs to be supplemented by enhanced attention to the cultural and institutional changes required if RRI is to be successfully enacted in practice.

Fern Wickson is Senior Scientist and Program Coordinator of the Society, Ecology and Ethics Department at GenØk Centre for Biosafety in Tromsø, Norway. She is a cross-disciplinary researcher engaged in several national and international projects on the environmental governance of emerging technologies, including both bio- and nanotechnologies. She is also a former president of S.Net.

Rune Nydal

Why not an RRI of x, like there were an ELSA of x? Does it matter?

The ELSA acronym invites a discussion of issues and concerns. What should a focus of an ELSA of a particular initiative like nanotechnology or systems biology be? What is worth discussing and pay attention to? A research area would in turn call for a society like S.Net that could assemble researchers sharing an interest in the realities, concerns, challenges and opportunities of a particular area, like nano, as it initially did. The ELSA acronym has however become a discredited term. It became associated with a particular approach; being downstream oriented and consequently not sensitive to research driven societal changes. RRI has become the dominating term that invites for different discussions as it focuses on the challenges of 'responsible' modulation of the dynamics of coproduction.

This paper discusses the shift from ELSA to RRI calling attention to the question of what happened to the unifying role of the subject field. There is no RRI of nano or genomics, it does not seem to matter – there is only RRI. Questions of responsible innovation primarily become a matter of procedure. The

paper focuses in particular on the role stakeholder theory plays in attempts to formulate a framework for RRI.

Rune Nydal is an associate professor. He is interested in collaborative modes of ELSA/RRI research. He is currently leading the project Crossover Research – well constructed knowledge commons, financed by Samansvar program of the Research Council of Norway. The project design involves stakeholder engagement.

14:15-15:45

Seminar Room A

Workshop

FLEXING AND REFLEXING AUTHORITY IN STS ENGAGEMENTS

Chairs: Robert Smith, Andreas Huber, Sean Low, Stefan Schäfer, Shannon Spruit

Science, Technology and Society (STS) and cognate fields have developed many conceptual tools to elucidate the social, normative and political dimensions of new knowledge (e.g. science) and artefacts (e.g. technologies). These tools have served to deconstruct and 'open-up' taken-for-granted assumptions around governance, participation and forms of citizenship that circulate within these emerging forms of life. Consequently, a diverse set of publics – including ourselves as academics from the social sciences and humanities – are no longer 'observers' but more commonly vocal forces in their constitution. In an age of 'translation', 'impact' and 'grand challenges', the interactions, collaborations and investigative sites that are currently being entered seem likely to remain.

This offers opportunities for those operating within an 'interventionist turn' (Allhutter 2012) but it also forces a range of methodological tensions to the forefront of inquiry. Longstanding constructivist methodologies have provided powerful ways of deconstructing, but often fail to produce robust foundations for guiding interventions (Beaulieu et al. 2007). Despite an abundance of new research sites, an "arid rhetoric of interdisciplinarity" frequently permeates collaborations (Fitzgerald & Callard 2014, p. 3), with pre-scripted encounters, power relations, distributions of moral labour, and not least stagnant and enduring notions of 'the social' and 'the natural'. Might it be possible to attend to new engagements, sites, interactions and ultimately forms of knowledge production in ways that overspill our traditional conceptions of research practice (Michael 2012)?

In this session, we want to reflect on this changing landscape, and our experiences as early career researchers within it, to find ways to move forward in these areas. To capture how the landscape of science and technology development has been changing over time, we will mobilise the concept of authority. In so doing, we broadly follow a Weberian understanding of decision making power that is accepted by those over which it is exercised. Questioning how authority (and relatedly, credibility and legitimacy) is built, claimed, negotiated, distributed, maintained and lost as a situated product of discourse, visualisation and action is a central concern of STS scholarship. The conceptual lens of authority allows us to look across multiple scales – from interactions within the laboratory to between governments – and facilitates a productive engagement with neighbouring disciplines such as law, ethics and political science. Tracing variation in the distribution of authority over time brings to the fore questions of how what counts as a 'decision' has changed, and relatedly who is considered legitimate to contribute to, and be held accountable for, decisions. These are central concerns for an investigation into the changes that have resulted in and been promoted by an interventionist turn.

Replicating the interventionist agenda upon which it reflects, the session will draw approximately 15-20 conference participants into a 90-minute interactive exercise of "mapping authority". We will encourage participants to reflect on their own practice using a short series of provocations. Within

the workshop we will encourage break-out groups of participants to engage in a collective mapping of authority. Here, our focus is deliberately broad: on the actors; agendas; resources; sites; practices; and boundaries that underpin claims to authority in the science and technology development space. We will then emphasise how the distribution of authority has changed over time through the 'opening up' of the science and technology development space, and what the implications of this are for various constituencies. We will use this emerging 'authority map' as a stimulus to situate our own practices as social scientists and to reflect on the normative significance of the interactions captured within the "authority map" and the ways in which we may navigate them. Following the session, the organisers will work to distil the negotiations, harmonies and tensions into a formalised 'map'. This will act as a reflexive visual artefact to be displayed and engaged with, provoking reflection and debate over the course of the conference.

Robert Smith, Research Associate – Flowers Consortium, Social Science, Health and Medicine, King's College London.

Andreas Huber, Research Associate, University of Natural Resources and Life Sciences in Vienna specializing in European food law and European environmental law.

Sean Low, project scientist, Institute for Advanced Sustainability Studies (IASS), Potsdam, Germany.

Stefan Schäfer, program lead – "Emerging Technologies and Social Transformations in the Anthropocene", IASS.

Shannon Spruit, PhD researcher in Philosophy of Technology at Delft University of Technology.

14:15-15:45

Seminar Room B

ASSISTIVE TECHNOLOGIES, POLITICS AND RRI

Chair: Roger Strand

Erik Thorstensen

Using RRI for assessing assisted living technologies

The Assisted Living project will engage in development of technological solutions to needs defined by persons with mild cognitive impairment or dementia (MCI/D) in an RRI process specifically adapted to the capacities of such user groups. The project started January 1, 2016, and is in an early phase.

The paper will give an outline of the current state of the art in the development of assisted living technologies and ICT in RRI based on a systematic literature review in these fields. Based on the findings from the literature review, I will also present an assessment of existing assisted living devices. Further, the paper will align these insights with the design of the Assisted Living project.

Erik Thorstensen, PhD-student at the Assisted Living project, Oslo and Akershus University College. Main interests are assessment of emerging technologies and histories of technologies.

Maria Joao Maia & Linda Nierling

Inclusion, exclusion or integration? Assistive technologies for people with disabilities between technological visions, political frameworks and user's perceptions

The potentials of technologies to "assist" humans are currently broadly discussed, mainly in the field of an ageing society, where technology often is seen as the important enabler, promising a higher autonomy and support in daily life for the elderly. Also for people with disabilities, assistive technologies

are seen to have an important function regarding their integration into a “normal” societal-framed life course. However, in practice the use of technologies is much more complex, than it implies at first glance.

This paper aims to critically discuss the role of technologies for the inclusion of people with different types of disabilities (physical and cognitive), so in a first, step an overview about current and emerging technological trends (ranging from the field of biosciences over robots to drones and autonomous cars) of assistive technologies will be given. In a second step, an empirical study for the European Parliament will be presented. Here different aspects will be analysed, namely how different types of technologies are perceived by the disabled themselves, and how “unexpected side-effects” of these technological trends might even lead to a process of exclusion. Finally it will be proposed how policy-making can support technology development for people with disabilities.

We will argue that there cannot be a single regulative approach when it comes to assistive technologies, since they are affected by and affect many different political fields (education, employment, transportation and health policies). Also competing drivers and contrasting trends need to be carefully assessed, as different needs of people with different disabilities might even outplay each other. It will be central to reflect about common imaginaries of “normality” not only in technology development but also in negotiating political regulations in these emerging fields.

Dr. Linda Nierling (project leader) and Maria João Maia are both researchers at the ITAS/KIT, and currently working on the project “Project Assistive technologies for the inclusion of people with disabilities in society, education and jobs” for the European Parliament, The project aims at a foresight-analysis of the state of the art as well as future trends concerning the needs and perceptions of people with disabilities on assistive technologies.

Susanne Öchsner

Building Users. Imaginations of Age, Bodies and Relations of Care in Austrian Ambient Assisted Living Projects

Ambient Assisted Living (AAL) is presented as a seductive technological solution to the demographic challenge of aging European societies. The goal is to develop ICT-based systems that should enable elderly people to remain in their surroundings and prolong their autonomy and independence, while lowering costs for public health and social care, and establishing business opportunities for private companies. Throughout the research and development process technology developers imagine ideal users and contexts of use that are objectified in technological choices (Akrich, 1992).

In this paper, I will present a document analysis of user representations (“personas”) and scenarios of use that were developed in AAL projects with Austrian participation. For technology developers and users participating in user studies these personas and scenarios serve as important objects to think with. Developers construct them early on in a project, in order to stabilize the imagined users and use context and to continuously revisit them over the course of the development. Simultaneously, they serve to facilitate participants’ understanding of the devised system’s capacities and help them articulate their needs and values. Thus, the documents I base my analysis on do not only embody certain values but are also productive of them.

I will offer a critical reading of imaginations of (active) age, (aging) bodies and (gendered) relations of care that these documents entail. I will further investigate questions such as: How is old age gendered with/in these technologies? What forms of kinship are normalized? What regimes of care are taken for granted? Asking such questions is crucial, since personas and scenarios participate in normalizing and reifying particular imaginations and values that – once built into an infrastructure of care – become pervasive and difficult to question.

Susanne Öchsner is a researcher in the project "RFID & Society" at the Department of Science and Technology Studies at the University of Vienna. She studied cultural and social anthropology at the University of Vienna with a specific focus on gender studies. Susanne's research interests are located at the intersection of the production of technology and society. In her PhD-thesis she currently investigates how – in the case of Ambient Assisted Living (AAL) technologies – the collective good for aging societies is being negotiated in local research and development practices.

14:15-15:45

Seminar Room C

Thematic session

VISUALIZATION IN SCIENCE AND TECHNOLOGY I

Chair: Rasmus Slaattelid

The two sessions on Visualization in science and technology follow the workshop **Speaking about images of climate change**. Research on the perception and understanding of climate change is extensive, and has focused to a large extent on how the public and policy makers understand the scientific assessment of climate change indicators and climate change effects. Images of climate change (broadly conceived) have also been studied (Anne DiFrancesco & Young, 2011; Nerlich & Jaspal, 2013; Remillard, 2011; Schneider & Nocke, 2014; Smith & Joffe, 2013), mostly in disciplines focused on the reception and understanding of climate images by the public, such as media and communication studies, science and technology studies, studies of the visual culture of climate change research, and climate change communication (S. O'Neill & Nicholson-Cole, 2009; S. J. O'Neill & Smith, 2014). Public media images in the form of news photographs (polar bears, flooding, retracting glaciers, extreme weather, etc.) and iconic diagrams (such as the hockey stick graph (Michael E Mann, 2013; Michael E. Mann, Bradley, & Hughes, 1999), have been studied with a focus on the impact of images on the public. (Lorenzoni, Leiserowitz, De Franca Doria, Poortinga, & Pidgeon, 2006; Remillard, 2011). There has been limited attempts to broaden the field and to integrate the efforts of different disciplines and research fields into a more comprehensive perspective, especially across natural and human/social sciences, with some significant exceptions, notably (Schneider, 2011, 2012; Schneider & Nocke, 2014).

Visual representations of climate change frame the ways in which we think about and act (or not) upon the information that climate research provide. This is true not only for climate researchers themselves (Giere, 1996), but also for policymakers, organizations and the public (Joffe, 2008). The relationship between images and narratives is of particular interest in this regard in understanding scientific images, as well as public media images and transitional hybrids (Knorr Cetina, 2001; Kolve, 2009; Lowe et al., 2006; Ma, Liao, Frazier, Hauser, & Kostis, 2012). The role of images in shaping narratives is not well understood and a radically interdisciplinary approach to this topic could yield fresh insight into the ways in which images narrate. Climate change images seem to have a particularly strong narrative function, and can thus be expected to play an important role in shaping beliefs about the urgency or deferability of decisions regarding mitigation and adaptation (Herman, 2003; IPCC, 2014a).

Liv Hausken

The Process of Imaging/The Imaging of Processes

No abstract available

Nora S. Vaage

RRI of Climate Change Research Through Art and Design?

The ethical, legal and social aspects of science and technology have been explored from a number of perspectives, including materially through art and design. The proposed paper will discuss how ELSA research on climate change may benefit from ironic, critical and sometimes outrageous art and design manifestations of our climate present and potential futures. Debates on ethics of climate change often involves a deontological “thou shalt not” approach, while the ironical and humorous scenarios presented by artists and designers may represent an alternative, more palatable approach aimed at a different audience. The author proposes that ELSA scholars may successfully use such scenarios as tools for thinking and in engagement exercises.

Colin Milburn

Video Games as Environmental Media

Many video games from around the world address questions of environmental risk and climate change either in their narratives, their graphical imagery, or allegorical aspects of their gameplay mechanics. Yet even as these games hail players to attend to environmental problems, they often overlook the extent to which video games themselves – as major contributors to electronic waste accumulation and carbon emissions – exacerbate the climate crisis. This talk will consider some ways that the visualization of climate change in video games might also help sensitize players to their own responsibilities as consumers of electronic media.

14:15-15:45

Seminar Room D

MEDICINE, POLITICS AND REGULATIONS

Chair: Anne Blanchard

Giovanni De Grandis

What if we said no? The politics of not funding research on personalised medicine

Personalized Medicine (PM) emerged in the late 1990s as an upshot of the human genome project and of pharmaceutical industries joint ventures. Since 2000 the label PM, previously used to criticize the reductionist and high-tech approach to medicine, has been appropriated by visions of healthcare inspired by, and centred on, advances in molecular biology and information technologies. Both the USA and the EU have committed large funding to PM. In the meantime a substantial academic literature discussing the legal, ethical and political implications of PM has emerged. However this literature is usually framed in terms of highlighting the problems and challenges that need to be tackled and solved to support the advance and implementation of PM. Social scientists have questioned whether bioethicists have been co-opted and become part of the coalition that promotes PM, and have critically analysed the narratives of progress associated with PM. However, radical challenges to the scientific programme of PM and to the political justifiability of funding it are lacking and confined outside academia.

To fill this gap, I explore not the politics of PM, but the politics of not funding research in PM. Would it be a wrong political decision not to invest in that research? In order to answer this question I analyse whether any of the major stakeholders—current and future patients, health carers, researchers, pharmaceutical and diagnostic industry, insurers and taxpayers—would be wronged by such a decision and whether their complaints would override the reasons for using those funds differently. My

conclusion is that the case for not supporting research on PM is robust and far from extravagant. So why is it so absent from academic debate? Is it because the interests of academic researchers militate against it or because narratives of progress are still too strong to be opposed head-on?

Giovanni De Grandis is a postdoctoral researcher working on a project on Personalised Medicine (RESET:PM). His areas of interest are Ethics, Political Philosophy, Applied Ethics, Public Policy and Cross-disciplinary Research. His current research focuses on the ethical and political aspects of personalised medicine, with a particular focus on conflicts of values.

Pankaj Sekhsaria

How (non) users configure producer identities: A case of the retinoblastoma – nanotechnology – society interface in India

*An orphan disease
A tumour in the eye
A one eyed girl?
No, let her die.*

This paper is a study of two tertiary eye hospitals in India where a team of clinician-scientists is developing a nanotechnology based drug delivery protocol for Retinoblastoma, a cancer of the eye of little children, that is referred to sometimes as an 'orphan disease'.

In a worse case scenario with Retinoblastoma, the infected eye is removed completely, leaving the child one eyed, but with no more threat to her life. This, the families often don't allow, particularly if the child is a girl for the fear that no one will marry a one-eyed girl once she reaches the age for it. They would rather let her die.

I use the idea of multiple (non) users (Wyatt, 2003) to show how the girl child who comes to the clinic with a tumour in the eye is an aggregate of four different users – the helpless infant of today, tomorrow's 'to be married' woman, the infant's immediate family that decides for her and the eventual non-user – the family and the individual with Retinoblastoma. It is in responding to the one-as-many and many-as-one user ('an aggregate of users') at the same time as fulfilling the institutional mandate of engaging in translational research, that the clinician emerges as an entity with multiple identities – a 'clinician-scientist-social activist'. It is not enough any more to innovate just in the lab or in the clinic if a solution is to be found; research, innovation and intervention have to be multi dimensional and multi-scalar.

Pankaj Sekhsaria recently completed his PhD in Science and Technology Studies from Maastricht University (the thesis was defended on March 10, 2016). The submission here is based on the empirical work that was part of the thesis titled 'Enculturing Innovation, Indian engagements with nanotechnology'.

Trust Saidi

The influence of regulation in the development of medical devices: Case study of nano-enabled malaria diagnostic kit in South Africa.

Innovation in diagnostic medical devices has gained momentum in recent years due to the application of emerging technologies such as nanotechnology. The use of nanotechnology as an enabling technology in diagnostics is poised to create new opportunities for improving health care. However, translating scientific discoveries into safe, effective and innovative devices demands a regulatory framework. This paper outlines the development of a nano-enabled malaria diagnostic kit that was manufactured in South Africa. It shows how the manufacturers resorted to existing soft regulation due to the absence of specific legislation on nanotechnology and medical devices in South Africa. The study revealed that the potential risks and uncertainty about nanotechnology pose a profound reg-

ulatory dilemma for policy-makers and make it difficult to apply routine decision-making procedures for risk assessment and management. The unknown risks interfere with the application of standard scientific approaches and push the regulatory decision-making into a more political direction.

I studied for a PhD in Science and Technology Studies at Maastricht University, Netherlands in the integrated project on Nanotechnology for Development in Kenya, India and South Africa. I am currently a post-doctoral fellow in health innovation at University of Cape Town. My research interests are on the governance of nanotechnology and the relationship between emerging technologies and society.

14:15-15:45

Seminar Room E

Thematic session

RRI AND EMERGING (BIO)TECHNOSCIENCE (I): POLITICS OF SYNBIO

Chair: Alex Bogner

Intro: Christopher Coenen

This session is the first one in an invited series of sessions entitled “RRI and Emerging (Bio-)Technoscience” which are largely based on, or related to activities and research conducted in the EC-funded project SYNENERGENE, a large Mobilisation and Mutual Learning Action Plan (MMLAP) on responsible research and innovation (RRI) and synthetic biology (SynBio). Besides SYNENERGENE-related presentations, the sessions will more broadly provide space for reflection on, analysis of, and discussions about emerging (bio-)technoscience within a RRI framework, and including contributions from other projects. The session will start with a short introduction to the entire session series, followed by presentations on political aspects of the series’ thematic. This will include such aspects as RRI as a policy concept in an industry context, the results of a project on synthetic biology conducted on behalf of the German parliament, and an analysis of public engagement activities in SYNENERGENE.

Steffen Albrecht

The Next Phase of Biotechnology: Some Results of a Study on Synthetic Biology on Behalf of the German Bundestag

Synthetic biology is an emerging field of science and technology. Depending on the way it is defined, synthetic biology is still mostly a matter of basic research, or it is already influencing the markets, societies, and the environment. This presentation aims to give an overview of synthetic biology and its societal implications from the point of view of technology assessment, based on findings from a recent assessment report on behalf of the German Bundestag (Sauter et al., 2015). It will briefly discuss the definition of synthetic biology, present some case studies to highlight the actual and potential significance of the field in the context of the notion of a bioeconomy, and point to possible ways forward for the field as a whole. **Reference:** Sauter, A., Albrecht, S., van Doren, D., König, H., Reiß, Th., Trojok, R. (2015): Synthetische Biologie – die nächste Stufe der Bio- und Gentechnologie. Endbericht zum TA-Projekt. Berlin: Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag

Karsten Bolz

Responsible Innovation as a Moderator of Entrepreneurship – Learnings from the Debate on Advanced Biotechnology

This paper connects Responsible Innovation with the field of entrepreneurship and introduces the 'Prism of Responsible Innovation' (pRIsm) that can be seen as a moderator for the entrepreneurial process which converts opportunity into innovation. Starting from this abstract level of an operationalization of Responsible Innovation we analyze the perspectives of industry representatives regarding the responsible operationalization of a bioeconomy by applying advanced biotechnology to get to a more tangible level of understanding of Responsible Innovation in the context of entrepreneurial organizations. Using the learnings from this debate we then outline a theoretical framework of how the concept of Responsible Innovation could be integrated into the entrepreneurial process.

Camilo Fautz & Jutta Jahnel

Functional Settings of Public Engagement in Innovation Processes – an Analysis of SYNENERGENE Activities

Based on our work in the German national (BMBF) project PartInno', we analyse public engagement (PE) activities of the EU FP7 project SYNENERGENE with regard to their concrete functional settings in order to identify setting-specific pitfalls and best practices. That means that we analyze the concrete context of a technology related assessment or development setting with PE by considering their implicit and explicit functional requirements, resulting e.g. from the expectations of the organizers, the affectedness of specific innovation areas and phases, or the kind of engagement process. In a second step we evaluate the engagement processes according to function related criteria of PE to identify possible over- and underrides. The theoretical concept of analysis is based on the promise-requirement cycle (Geels, Smit 2000; van Lente, Rip 1998) and the sociological field theory (Schimank 2000 and 2014).

16:00-17:30

Auditorium (The Egg)

PUBLICS, DESIGN, AND FUTURES

Chair: Harro van Lente

Claudia Schwarz-Plaschg

The politics of nano labeling: Public imagination meets regulatory reality

Nanotechnologies are already applied in a broad variety of consumer products, yet their potential environmental, health, and safety implications are still largely uncertain. Consequently, the regulation and labeling of nano-enabled consumer products represents a political challenge. To date, nano labeling exists in three versions in the EU context: as nano marketing promising consumer benefits; as mandatory back labeling on cosmetics; or nano is not labeled on products at all. Building on the analysis of four discussion groups with Austrian lay people, the presentation explores how the public imagines the labeling of nano-enabled products against this ambiguous background. Firstly, the co-existence of marketing and regulatory labeling creates a dilemma for consumer-citizens, because it suggests that nanotechnologies are both "good" (marketing) and "potentially risky" (regulation). The discussants apply several strategies to handle this situation. Secondly, although consumer-citizens demand mandatory labeling for all nano-enabled consumer products, the existing mandatory back labeling of nano-enabled cosmetics remains problematic due to its lack of risk-related information.

The politics of nano-cosmetics labeling is based on shifting the responsibility of risk assessment onto consumer-citizens, who don't feel capable to perform this task. Thus, in order to create socially robust regulation and labeling (i.e. one that corresponds with consumer-citizens' practices, needs, and epistemic capacities), policy makers need to develop regulatory measures in accordance with the public imagination. The current focus on Responsible Research and Innovation –especially the inclusion of public values via public engagement – may provide one avenue of doing so, but we nevertheless need to critically engage with how responsibility is constructed and distributed in this framework, and how the inclusion of a broad variety of values is ensured in a heterogeneous Europe.

Claudia Schwarz-Plaschg is University Assistant (Post-Doc) at the University of Vienna, where she works at the interdisciplinary research platform "Nano-Norms-Nature". Her research focuses on public engagement, governance, and the ethical and social aspects of nanotechnologies.

<https://nano-norms-nature.univie.ac.at>

Alexandra Hausstein

From Politics to Design. Implications for a critical hermeneutics of technology futures

The talk will examine the shift from politics to design in the making of imaginaries of new technologies. It will discuss the effects of a semantic broadening of the term "politics" to forms of co-production, context-sensitive governance, visions of technologies, where STS research plays a fundamental role in the process of not only observing and analyzing, but creating imaginaries of possible and plausible technological futures, thus taking part in practices of anticipation and design of emerging technologies.

Increasing reflexivity that involves a critical hermeneutics of own preconceptions will lead research to analyzing sites of production of knowledge other than science and politics. It requires an understanding of technology as structuring medium of constituting social order, as both imaginary and material culture prevalent in forming life styles, subjectivities, and distinctions. It is this sphere of values, emotions, and knowledge, where expectations evolve and reconfigure current narratives of technological progress and future. And that it is why this sphere receives increasing attention in governance processes. Besides loud public controversies and debates, we can detect mechanisms of habituation to new technologies in the fields of family, education and health with their specific "technology mediating" brokers.

In contrast to politics, design is not only about processes of governance and representation, but re-connects the sphere of values, intentions, norms and morals with the sphere of creation and the material landscape of techno-scientific objects. What are the implications for a critical hermeneutics of present imaginaries, narratives and practices in processes of designing future technologies?

Alexandra Hausstein is sociologist and works as researcher and managing director of Institute of Technology Futures at KIT, Germany. Her previous affiliations include appointments as visiting professor at University of Toronto and a position as Project Manager of the EUFP6 Project Knowledge Politics and New Converging Technologies at Zeppelin University in Friedrichshafen, Germany. Her research focuses on the discursive production of knowledge and imaginaries of future technologies.

Kjetil Rommetveit & Bryan Wynne

Technoscience, imagined publics and public imaginations

In this talk we present an up-coming special issue (November 2016) of the journal *Public Understanding of Science*, dealing with public aspects and politics of emerging technosciences. The various special issue contributions focus on publics and public issue articulations in cases such as biometrics, In Vitro Meat, Cochlear Implants, do-it-yourself biology and electronic waste. Our presentation aims to

articulate some aspects of the intensified entanglements of technoscientific innovation with societal and political agendas witnessed in such cases in recent years. These entanglements have been accompanied by an apparent decline in work of purification of discourses of natural, technological and human agency, as observed by Latour in 1993. Replacing such previous discursive purifications we increasingly find technoscientific visions of the imagined-possible, embedded in socio-technical imaginaries and visions, as key providers of public meanings and policies. This poses the question of what forms of (political and social) legitimations are provided by these imaginaries, including the ways in which they enter into articulations of public matters: is an obstacle model of publics emerging along with technoscientific agendas and policies? And, do publics need to become technoscientific actors themselves in order to be heard? In posing such questions, our presentation proposes a joint focus on imagination, publics and technoscience, and their mutual co-productions.

Kjetil Rommetveit is associate professor at the Centre for the Study of the Sciences and the Humanities, UiB. Rommetveit's work focuses on issues relating to privacy, autonomy and democracy, and roles of assessments and interdisciplinarity in governance of technoscience.

Professor Brian Wynne, Lancaster University, has covered technology and risk assessment, public risk perceptions, and public understanding of science, focusing on the relations between expert and lay knowledge, and policy decision-making.

16:00-17:30

Seminar Room A

VISUALIZING BODIES

Chair: Jan Reinert Karlsen

Berge Osnes & Jan Reinert Karlsen

This is not a brain: The problem of data visualisation in cognitive neuroscience

The problem of understanding what brain imaging techniques depict is vast. In this paper we address the epistemological and methodological problems of data visualisation in cognitive neuroscience. Historically, cognitive neuroscience established itself as a separate field of inquiry by incorporating research traditions from cognitive psychology, neuropsychology, and neuroscience (McClelland, 2001). According to Dolan (2008: 498) "to measure brain activity associated with discrete states of mind is the holy grail of cognitive neuroscience." The hundreds of thousands publications each year stand testimony to the success of this approach. Indeed Huettel, Song, and McCarthy (2004) argue that the reason for the success can be found in these techniques' ability to provide an image that indicates something about hidden structural and functional processes in a previously unexplored research area. As such the techniques are taken to provide "pictures" of given mental processes that can easily be understood heuristically, both within the field of cognitive neuroscience, and perhaps more importantly – outside the field itself (Tallis 2014). The main thesis of this paper is that these techniques do not depict mental processes. Rather, they are statistically computed datasets that are graphed onto template images of human brains. Such data visualisations are the end product of a long and technically complicated process where new layers of theoretical and pre-empirical assumptions are added at each step. Following the works of Hacking (1984), Canguilhem (1988), and Kay (2000), we reconstruct this process in terms of how cognitive neuroscience is done, observing how the images are made and what one can meaningfully do with them in the scientific study of mental processes. Broadening the scope of our analysis, we discuss to what extent the notion of co-production (Jasanoff 2004; Latour 1993) can aid current epistemological work on cognitive neuroscience.

Berge Osnes works at Helse Bergen and University of Bergen. Osnes is trained in clinical psychology as well as music composition, and holds a doctoral degree in cognitive neuroscience.

Jan Reinert Karlsen is associate professor at the Centre for the Study of the Sciences and the Humanities, University of Bergen. Karlsen is trained in philosophy of science and vitenskapsteori, and holds a doctoral degree in medical ethics.

Ana Viseu

The Making and Governing of Bodies of Data

This paper presents preliminary results of an ethnography of London's 'Quantified Self' (QS) group – the largest of such groups in Europe. Founded by two influential technolibertarians from Wired magazine, the 'Quantified Self' (QS) movement is a growing international grassroots movement whose motto is, "self-knowledge through numbers". The London members are a mixed bunch of people who share an enthusiasm for science, technology, and the pursuit of self-knowledge through data. Guided by what one member terms "physiological narcissism" QS'ers develop and use technoscientific devices (tools and software) to generate bodily data to monitor and quantify themselves, hoping to achieve a more objective form of self-knowledge, a scientific self-awareness, that will then help them optimize self-performance. Drawing upon ethnographic data and interviews with QS members, in this paper I trace the practices, discourses and shared imaginaries of London QS members and link them to a feminist lens of 'care'. My goal is to examine the processes and politics of self-quantification of QS'ers in what they tell us about the process of creation and governing of the 'self'.

Ana Viseu is Associate Professor at Universidade Europeia, Portugal. Previously she was Assistant Professor in the Department of Communication Studies at York University, Canada. Her research focus is on the practices of governance, development and use of emergent (and contested) technologies, from both material and theoretical perspectives. Ana has examined these questions in nanotechnology, wearable computers, online privacy, quantified self movement, among others. Her work has been published in a number of books and journals, mostly recently Nature and Social Studies of Science.

16:00-17:30

Seminar Room C

Thematic session

VISUALIZATION IN SCIENCE AND TECHNOLOGY II

Chair: Rasmus Slaattelid

For full description of the theme of the thematic session, see **Visualization in science and technology I** (p. 30).

Scott Bremer

Visualising climate science on fuzzy cognitive maps for place-based adaptation

The co-production of climate science and politics has arguably built 'impersonal and universal' concepts of global climate change that are detached from the 'subjective, situated and normative' representations of climate in local places (Jasanoff, 2010). Place-based climate adaptation demands alternative modes of climate science; swapping universal representations with the specificity of place, reintroducing science to its social and cultural context, and recognising the uncertainties and high stakes inherent to local adaptation. This implies special attention to how we scientifically represent

or visualise local climate variability and its impacts in ways that are accessible to different local actors and that enable dialogue across different knowledge systems.

This presentation introduces the TRACKS research project, mobilising high quality knowledge of climate variability and its impacts in northeast Bangladesh to support local adaptation. TRACKS adopts a 'post-normal science' approach (Funtowicz & Ravetz, 1993) in mobilising an extended peer community of citizen scientists that work with climate scientists to identify and prioritise knowledge needed for adaptation, as a basis for designing and measuring a portfolio of indicators. This presentation focuses on the use of 'fuzzy cognitive maps' (Ozesmi & Ozesmi, 2004) as a tool for diverse actors to co-construct representations of rainfall and its impacts in particular study sites, during particular seasons. The fuzziness of these maps relates to how they can assemble 'hard' quantitative science-based variables alongside 'softer' qualitative locally understood variables, the descriptive alongside the normative, and infer causality according to an intuitive logic that recognises the significant uncertainty present on these maps. The presentation explores how fuzzy cognitive maps were used by Bangladeshi actors to qualitatively visualise weather and impact variables, and the complex causal relationships between them. It comments on how these maps can be used to integrate climate science with other local understandings of weather, and initiate a process of knowledge appraisal or 'extended peer review'. It looks at how fuzzy cognitive maps can provide the basis for engaging citizens in shaping place-based climate science.

Scott Bremer is a researcher at the Centre for the Study of the Sciences and the Humanities, University of Bergen. Scott's research focuses generally on the way knowledge is mobilised for environmental governance across the notional science-policy interface. More recently his research has focussed on the co-production of climate knowledge for place-based adaptation. He is the project manager of the TRACKS project working in northeast Bangladesh: 'Transforming Climate Knowledge with and for Society'.

J. Arjan Wardekker & Susanne Lorenz

Critical reflection on visualisations of climate change and impacts: how do the IPCC reports' visuals frame the climate issue?

With adaptation to climate change now considered to be an inevitable reality, many countries have started to develop adaptation plans. Scientific agencies, such as the Intergovernmental Panel on Climate Change (IPCC), have been trying to support this process by providing policy-relevant information. However, a thorough understanding of how to tailor and present this information to better facilitate decision-making, is currently lacking. The communication of climate information often utilises visualisations such as graphs, figures or maps. Graphical communication has the advantage of conveniently summarising significant amounts of information, and visualisations are often the first thing noted by the reader. However, often such visualisations of complex scientific data represent and reinforce particular framings, i.e. they highlight particular aspects of the issue and condense or obscure others. This can have significant impact on users' interpretation of the information.

Utilising content analysis, this paper critically examines the framings embedded in the visualisations utilised in the five IPCC Working Group 2 reports on climate impacts, adaptation and vulnerability. These reports represent the consensus of current scientific knowledge on climate change and are considered a critical part of the evidence upon which effective adaptation decisions are to be based. A better understanding of how the IPCC visualisations are framed, and the potential impacts these framings have on the decision- and policymaking process, can help scientists reflect on the messages they are conveying (intentionally or unintentionally) in this process. Furthermore, the longitudinal analysis helps to highlight the change of the framings over time. The understanding gained from this analysis can not only significantly contribute to more nuanced insights into the visual narrative communicated through the differing frames, but can also improve decision-support for climate adapta-

tion, as well as provide insights that can support more effective communication of complex scientific data in other scientific fields.

Arjan Wardekker is a Senior Researcher in the Environmental Sciences and Environmental Governance research groups at Utrecht University, where he is developing his research line on Resilience and Climate Change Adaptation under Uncertainty. His research deals with both environmental and societal uncertainties and finding ways to deal with these in climate adaptation science, policy & practice, including issue framing and visualisation.

Susanne Lorenz is a Research Fellow in the Sustainability Research Institute in the School of Earth and Environment at the University of Leeds, where she works on the Advancing Knowledge Systems to Inform Climate Adaptation Decisions Project. Her research focuses on the science-policy interface in climate change adaptation and looks particularly at how the communication of climate science for adaptation decision-making can be facilitated in the UK and in Germany.

Rasmus Slaattelid

Taming the flood in a protected river – conflicts of interest in climate adaptation expressed through visual narratives

The river Vosso in the county of Voss in Western Norway has been the source of occasional flooding on a small scale for as far back as its inhabitants can remember. In the course of the last 6-7 years the situation has changed for the worse. Unprecedented flooding in 2014 destroyed bridges, flooded homes on a large scale, and set the newly constructed municipality culture centre building under water. Several suggestions for adapting to the new situation has been put forward, i.e. by a group of investors and a hydroelectrical company, which involves drilling tunnels in the Raundal river, one of the ancillary rivers to Vosso, and lead water underground through a mountain range, to the Hardanger fjord to ease the pressure on built areas during heavy rainfalls and snow melting, and at the same time using the water to power a hydroelectric plant. Apart from the technical difficulties, one problem for the developers is that the river is “permanently protected” by law, and cannot be developed under the present regime. A conflict is developing between developers, local inhabitants in the Raun valley and Voss, and environmentalists allied with Voss’ considerable extreme sport community – kayakers and rafters. The paper presents some examples of visual narratives of the river and the flood, and discusses how they coproduce the problem space, and might be thought of as resources to also coproduce an “adaptation space” where stakeholders can work to create a viable solution to the water flooding.

16:00-17:30

Seminar Room D

Thematic session

CCBIO SESSION: THE TRANSITION FROM A BLOCKBUSTER MODEL TO PERSONALISED CANCER THERAPY

Chair: Anne Blanchard

Organizers: Anne Blanchard & Roger Strand

Cancer biomarkers are attracting a lot of attention from patients, oncology researchers and decision-makers, with the potential to predict a patient’s likelihood to develop a certain type of cancer, to monitor the cancer’s recurrence, and to tailor a treatment regimen best suited to the individual’s ge-

netic makeup. There is an expectation that cancer biomarkers will cure patients more effectively and at a lower cost, through personalised therapies that limit severe side effects of more traditional forms of cancer treatments.

But the transition from a blockbuster model of cancer care to personalised medicine is difficult. Indeed, less than 1% of cancer biomarkers make it to clinical practice. There are several reasons for this. One of them is the complexity characterising this field, and in particular the heterogeneity of cancer tumours in the tumour bulk itself, but also among the different tumours of a same individual, and among different individuals having the same type of cancer. This heterogeneity, coupled with the high complexity of the biology of cancer, leads to important uncertainties on how best to stratify patients in groups that make sense, and renders difficult the validation of cancer biomarkers for clinical practice. A second reason to this 1% is the complicated partnerships between academia, the pharmaceutical industry and governments. Indeed, to go from a blockbuster model to personalised cancer research and care requires the cooperation of these three broad groups of actors. This is complicated by the fact that these actors need to navigate between different roles, different interests and values and different methodologies and timelines. For instance, while the research community may see a particular biomarker as indispensable for a sub-group of patients, the government must weigh this up against prioritisation measures within limited healthcare resources, and the industry must consider economic aspects and risks relative to the fractioning of their markets.

In addition to the challenges related to the departure from a blockbuster model, personalised cancer medicine, despite its important promises of more efficient treatment at a lower cost, poses several questions. One of them is about justice and fairness, when targeted cancer drugs are only accessible to a limited sub-group of patients with particular genetic traits. With regard to the complexity and uncertainties surrounding cancer, how do we then justly draw a line between patients who have access to the personalised drug, and those who don't? We can also wonder whether funds into cancer biomarker research, that focuses mainly on older patients, with only 1% of cancer biomarkers being successful, should be better invested in other diseases? Another question posed by personalised medicine is its contribution to a culture of 'techno-optimism' and 'medicalisation' in our society. We can argue that cancer biomarkers are part of a suite of tools, within personalised medicine, that present cancer as being relatively 'predictable' through screening tests, and relatively 'controllable' through the best available personalised therapy. How then to deal with the high expectations towards science, and the reality of the clinical complexity and limited healthcare resources?

This special session aims to bring together different perspectives on personalised medicine, and discuss its opportunities, challenges, and the moral questions it raises.

Alessandro Blasimme

Digital selves: citizens, power and subjectivity in the age of big health data

Anne Blanchard

Cancer biomarkers looking for patients: science-industry-government partnerships

Caroline Engen

Why Targeted Therapy May Not Work

16:00-17:30

Seminar Room E

Thematic session

RRI AND EMERGING (BIO-)TECHNOSCIENCE (II): CASE STUDIES IN INTERNATIONAL CONTEXT*Chair: Silvia Woll*

Second part of the session series "RRI and Emerging (Bio-)Technoscience" (series of sessions submitted by Christopher Coenen on invitation by the organisers) at S.Net 2016

The proposal for this series of sessions is largely based on, or related to activities and research conducted in the EC-funded project SYNENERGENE, a large Mobilisation and Mutual Learning Action Plan (MMLAP) on responsible research and innovation (RRI) and synthetic biology (SynBio). Besides SYNENERGENE-related presentations, the sessions will more broadly provide space for reflection on, analysis of, and discussions about emerging (bio-)technoscience within a RRI framework, including contributions from other projects such as the MMLAP NERRI (on cognitive enhancement), PROSO (a project on RRI) and a project on SynBio on behalf of the German Bundestag.

The second session of the series will provide space for reflection on, analysis of, and discussions about emerging (bio-)technoscience within an RRI framework, without a specific focus on one science and technology field. The session aims to enable comparisons between such fields.

Melike Sahinol**Practices of Assisted Reproductive Technology in Turkey: Intercultural Aspects of RRI**

The injection of mitochondria for oocyte rejuvenation is controversial. In Germany, for example, this method is prohibited because the long-term effects of newly added mitochondrial DNA that is passed on to following generations are not yet foreseeable. It is unclear whether a vulnerability for and higher chance of mutation result from this process. In Turkey, on the other hand, it is legal to rejuvenate eggs. It is one of only four countries in the world in which this procedure is performed. Turkish fertility clinics offer the method to foreign fertility patients, too. Analysing intercultural aspects of the regulation of assisted reproductive technologies can shed light on the international dimension of RRI.

Madhulika Kumari & Sambit Mallick**Triple Helix and Politics of GM Crops: Case Study of Bt Cotton and Bt Brinjal in India**

The debates over GM crops are not just scientific or technological rather it involves non-scientific factor like politics and policy. It will be interesting to answer how biotechnology is shaped by the conflict of interest between varied stakeholders. This paper is an attempt to understand the implications of Proprietary technologies in agriculture in India where two genetically modified crops namely Bt Cotton (Non-food crop) and Bt Brinjal (Food crop) have been analyzed critically. It discusses debate, politics about biotechnology in general and Bt crops in particular. It critically examines how diverse actors involved in the process have their own agendas. It also tries to study the networking between the triple helix of government-academia-industry with a special focus on GM crops, to be specific Bt Cotton and Bt Brinjal. It further argues how increased networking and interaction between these three actors namely, Government-Academia-Industry will have better adoption of agricultural biotechnology as well as it will lead to policy level changes required for GM crops. The study is carried out through both primary and secondary data. The primary data include in-depth personal interviews with the scientists engaged in research in plant biotechnology in the government, academic and private R&D institutions in India. Interview guide and questionnaire have been deployed to ascertain the views of

various stakeholders about Bt seeds in agriculture in India.

Key Words: Politics, Genetically Modified (GM) Crops, Networking, Triple Helix and Biotechnology.

Christopher Coenen, Claudia Brändle & Rüdiger Trojok

DIY Biology as 'TechnoCitizenScience'. A View from Germany

In the project 'TechnoCitizenScience', funded by the German Federal Ministry of Education and Research (BMBF), we are assessing the potentials of technocitizenscience with regard to the life sciences (DIY biology), the maker and fab lab movements and related developments. In our presentation, we will focus on the results of conceptual and empirical work concerning DIY biology (aka 'biohacking'). In particular, we will discuss to what extent and in what sense technocitizenscience can be deemed public participation in the social shaping of research and development in the natural and engineering sciences. While the empirical parts of the presentation will have a national focus, developments and stakeholders outside of Germany will also be taken into account. Policy and governance issues will be specifically discussed.

Discussion (with the audience): *RRI and the Life Sciences in International Context*

18:00-19:15

Auditorium (The Egg)

BIO-FICTION SYNTHETIC BIOLOGY FILM FESTIVAL

S.Net this year hosts the BIO-FICTION Science Art Film Festival, serving up a potpourri of short films that explore the emerging field of synthetic biology from different disciplinary angles including science and engineering, social science, cultural studies, amateur biology, film, art and design.

Introductory video by Markus Schmidt, Biofaction.

19:30-20:30

Auditorium (The Egg)

BIO-FICTION PANEL DEBATE AND AUDIENCE RESPONSES

Panelists: Christopher Coenen (ITAS, KIT), Karen Kastenhofer (ITA, Austrian Academy of Sciences), Cathrine Kramer (Center for Genomic Gastronomy), and Fern Wickson (GenØk Centre for Biosafety). Moderator: Nora S. Vaage (SVT, UiB). Pizza is served as part of this event.

THURSDAY 13TH OCTOBER

09:00-10:30

Auditorium (The Egg)

ENERGY FUTURES

Chair: Jeroen van der Sluijs

Ingrid Foss Ballo

Pioneering new energy practices: Norwegian prosumers' motivations and alternative imaginations of energy futures

'Smart' electricity meters are being introduced in many countries, as a 'first step' towards a sociotechnical vision of a future Smart Grid, which includes solutions to most current challenges in the electricity grid. One of the core current challenges is the issue of connecting decentralized renewable energy production to the grid. A future development towards an increase in prosumers; consumers producing renewable electricity at a household level, has been a central part of the Smart Grid vision in many countries. Prosumer households are places where sociotechnical imaginaries of future Smart Grid energy transformations become spatially embedded and materialised. In that sense, the introduced technological infrastructure in prosumer households can be conceptualized as situated "boundary infrastructures"; embedded in other structures, social arrangements and technologies and both shaping and being shaped by the conventions of communities of practice. The prosumer household is a space which is actively and jointly created and constructed, where sociotechnical energy imaginaries – connecting diverse actors from different domains in the nexus of energy and digitalisation and reflecting their wide range of perspectives and interests – meet social (energy) practices and lived experience. In a Norwegian context, becoming a prosumer entails being a 'bottom-up' pioneer in a national energy context characterized by institutional and economical barriers. This paper is based on empirical data from interviews with prosumers and actors who work with prosumer policies, regulations and frameworks in Norway, as well as a discourse analysis of relevant policy document and reports. It describes the Norwegian prosumers' motivations for pioneering change in energy practices, as well as their imaginations of energy futures of energy transformation, and outlines a mismatch between these "bottom-up" motivations and imaginations and the (national) sociotechnical imaginaries of the future Smart Grid.

Ingrid Foss Ballo is a PhD candidate with research interests on the intersection of science, technology and public policy. Recent work includes writing about future energy imaginaries at different scales, using the vision of a future Smart Grid as a case-study.

Marianne Ryghaug & Sara Heidenreich

Creating energy citizenship through material participation

Transition towards a low carbon energy system will be comprehensive and demanding, requiring substantial public support. One important contribution from STS is to highlight the role of citizens and public engagement. Until recently, energy users have been considered as customers and as passive market actors, or as recipients of technologies in the margins of a rather centralized system. With respect to the latter role, critical or hesitant public action has been explained in terms of NIMBYism and knowledge deficits.

In this paper, we suggest to focus on the making of energy citizenship when considering public participation in low carbon energy transitions. We draw upon the theory of 'material participation' (Mares 2012) to bring focus to the way the introduction and use of emergent technologies may create new energy dialogues and practices. In the paper we analyze the way the ongoing introduction of three material objects that have been sparked by national policies, the electric car, the smart meter and heat pumps, provide critical articulations and disruptions of routine. In doing so we attempt to highlight the way these emerging technologies can be seen as material interventions co-constructing temporalities of new and sustainable practices. We argue that the electric car may be seen as an object of engagement or a technology of material participation and that smart meters may become an object of political participation. The paper concludes with a discussion about the effect of policies for low carbon energy transitions on the making of energy citizenship. Preferred theme: C, second choices A and B.

Marianne Ryghaug is Prof. of Science and Technology Studies (STS), Department of interdisciplinary studies of culture, NTNU. Areas of expertise include the cultural dynamics of new renewable and emergent energy technologies, public engagement, imaginaries and climate and energy policy.

Sara Heidenreich holds a PhD in STS. She is a post-doctoral research fellow in a project aiming at capacity building towards behavioural changes in ICT use. She is also involved in research on energy citizenship and public engagement with renewable energy.

Jen Richter, Thad Miller, Anthony Levenda & Erik Fisher

Social Science Engagements with Experts in a Context of Local and Alternative Imaginaries

The STIR Cities project comparatively investigates the development of smart energy systems in a variety of organizational settings, how they are imagined to create social and technological order, and whether engagements with diverse technical experts foster reflexive learning and deliberation over broader emerging contexts. To establish a basis for comparison, we investigate the national imaginaries of energy technology development as they have been historically produced in two major Western urban centers: Portland, OR and Phoenix, AZ. These two cities are ideal locations for understanding how national energy goals for development played out in two vastly different environments, both physically and politically. This portion of the project will examine the discourses that frame sociotechnical imaginaries around energy production, to further understand how the present day is informed by these imaginaries and how new ones are emerging to shape the future. Ultimately, the project seeks to create theoretical and empirical space for alternative, place-based sociotechnical imaginaries. As such, it aspires to present linkages between theoretical work in STS on imaginaries with intervention and engagement methodologies such as STIR to identify and foster alternative visions of S&T progress.

Relevant sub-themes:

- A. Innovation policies, imaginaries and practices
- B. Narratives and imaginaries of emerging and future technologies
- C. Public engagement, citizenship and emerging forms of expertise

Jen Richter, Thad Miller, Anthony Levenda, Erik Fisher (Arizona State University)

09:00-10:30

Seminar Room A

AGRICULTURE, RISK AND SUSTAINABILITY*Chair: Poonam Pandey*

Frøydis Gillund, Lilian van Hove & Anne Ingeborg Myhr

Stakeholder perspectives on sustainability, ethics and social utility of GM potato

Policymakers, both within the EU and internationally, are increasingly recognizing the need to broaden the scope of risk assessment of agricultural biotechnologies. Lack of clarity about how to assess broader impacts of agricultural biotechnologies does however prevent effective incorporation of such considerations in risk assessment frameworks. This paper argues that stakeholder deliberations may provide useful insights on what these assessments should entail. Using the case of GM potato with late blight resistance, the paper describes practical examples of up-stream deliberative exercises intended to promote reflection on, and articulate ways to assess sustainability, ethics and social utility of this particular GM crop plant among stakeholders involved in Norwegian potato production.

This type of GM potato is an interesting case as it is claimed to be one of the first GM plants that has the potential to solve a serious problem for Norwegian and European potato producers, and, if successful, may result in a reduction of fungicide applications to control the late blight disease. Moreover, these are cisgenic GM potatoes, i.e. genes are derived from naturally crossable wild potato species only.

The stakeholders identified a broad range of considerations, including issues such corporate control over genes and seed markets, opportunities for independent research, consumer trust and choice, and the durability of this control strategy. Still, they expressed opposing views about which questions to address in these assessments and how to weigh different, and sometimes conflicting, perspectives.

Providing concrete and practical examples for how to incorporate broader aspects in risk assessment frameworks is essential for ongoing policy discussions. Recognizing the value of including stakeholders' knowledge and perspectives when developing risk assessment frameworks may contribute to secure more socially responsible governance approaches of agricultural biotechnologies.

Frøydis Gillund's research interest and expertise include governance of emerging biotechnologies, sustainability, ethics scientific uncertainty, participatory approaches and risk assessments.

Lilian van Hove is a Staff Researcher at GenØk, Centre for Biosafety in Norway with an academic background in philosophy. Interested in the questions around the development and assessment of emerging technologies in our society, her research focuses on the ethical dimensions of new technologies and approaches to their governance.

Dr Anne Ingeborg Myhr is the director at GenØk – Centre for Biosafety in Tromsø. She is a molecular biologist with training in applied ethics. Myhr's main research experience is within risk assessment of GMOs, and on ethical, social and legal aspects (ELSA) related to genetic engineering including synthetic biology and nanobiotechnology. She has been a project leader for several projects within this area focusing especially on how to deal with risk and scientific uncertainty, and on how to promote sustainable and robust technology innovations.

Julia S. Guivant

Low-carbon innovations: their role in GMO and non-GMO soybean production and certification

This paper is part of the Cosmo-climate project that was coordinated by the late Ulrich Beck, in the domain of new low-carbon technologies addressing the global risk of climate change. This recognition of risk is crucial for a transitional turn in the economic sector in the direction of low-carbon innovations. This can be understood as part of collective innovation networks that may give rise to 'cosmopolitan innovations'. In the cosmopolitan order eco certifications have become crucial for private businesses that operate at a global scale in order to obtain legitimization. We will focus on the sociotechnical networks around animal feed innovations, where certified genetically modified (GM) soy, a controversial innovation in itself, has become the main ingredient. We follow the GM soy from producers, certifications of low carbon emissions (that do not reach the consumers), European supermarkets, animal farmers, animal feed companies and associations, scientists, regulators to mostly unaware European consumers. We characterize this network as pragmatic, not free of criticism, formed by heterogeneous social, political, economic and scientific actors. We go from Brazil to the EU and China, mainly using documentary research and interviews with key actors. Finally we argue that there is a global process of self-transformation of the rules of the markets, where environmental, scientific and ethical values are at stake through the process of low-carbon technologies and certifications. Related with sub themes A, B, and D.

Julia S. Guivant, Dept of Sociology and Political Science, Federal University of Santa Catarina, Brazil, has been researching emerging technologies for more than a decade (nano and GMOs), focusing on risk perceptions, governance and controversies in a global perspective, with many academic publications on these topics.

Poonam Pandey

Fractured Visions: Nanotechnology in India and the Missing Discourse on Risk and Governance

The silences over nanotechnology risks, regulation and governance mechanisms in India, even after 15 years of the launch of first nanoinitiative, are noted and documented by many scholars (Chowdhary 2006, Jayanthi et al. 2012, Beumer and Bhattacharya 2013). However, there has been rarely any attempt to take these 'facts' to a deeper level of analysis, in order to understand why there is a very little focus on the aspects of governance in approaches towards innovation. Do cultural factors, expectations and visions of the promises of innovation play any decisive role in developing such attitudes and understandings? How do broader imaginaries of the past governance attempts (such as agribiotechnology controversy) affect these decisions?

This paper, working backwards from the concept of anticipatory governance (Guston 2014; Barben et al. 2008) tries to understand the anticipated risks and uncertainties in the context of nanotechnology in India and the responses of people to deal with these challenges. This will enable a bottom-up approach to envision a governance framework specific to emerging technologies in the Indian context. The analysis relies on face-to-face interviews with senior scientists, policy makers, start-up company representatives, and Ph.D students working on different aspects of nanotechnology in health and agri-food. A specific focus lies of the Indian Institute of Toxicological Research (IITR), which has a goal of conducting toxicological and risk studies with some recent focus on nanotoxicology. The preliminary observations suggest that 'risk' needs to be analyzed in relation to cultural and spatio-temporal context in order to understand and work towards a context specific governance mechanism. It was observed that different actors conceptualize 'risks' in ways mostly to distant it from themselves and their roles in order to shift the responsibility to the imagined 'other'.

Poonam Pandey, PhD student at the Centre for Studies in Science Policy, Jawaharlal nehru University, New Delhi, India. The author's interests lie in the studies of new and emerging technologies, sociology of the expectations, visions and sociotechnical imaginaries. She has done quite some work on issues of Responsible Innovation, agribiotechnology, regulation and public engagement in the Indian context.

09:00-10:30

Seminar Room B

NEUROSCIENCE IN SOCIETY

Chair: Jan Reinert Karlsen

Karen Kastenhofer & Helge Torgersen

Options for technology assessment in a techno-scientific innovation regime

The European Union's Horizon 2020 concept of Responsible Research and Innovation (RRI) combines several aspects that are not that new to contemporary technology assessment (TA): a focus on so called "new and emerging technologies" (NESTs), a call for public participation and early intervention, as well as an assessment of risks, ethics and societal needs. All of these aspects relate to non-trivial constellations and complex problems that have been addressed by critical science and technology studies in the past, whereas a satisfactory handling of these aspects within science and society is not yet in sight. Some problems even seem to grow more acute. In our presentation we aim at illustrating some aspects of this problematique in detail, drawing on the example of the Mobilization and Mutual Learning Activity „Neuro-Enhancement: Responsible Research and Innovation“ (NERRI).

In this project, public participation stood at the core of the activity and early intervention was envisioned by debating societal issues of neuro-enhancement 'just before' revolutionary technoscientific promises would actually be realised. Our analysis shows that (1) the term neuro-enhancement represents a real issue only in a very distinct discursive setting at the boundary between politics, publics and technoscience. (2) The focus on assumed futures, their feasibility and likelihood of realisation, critically labelled as "speculative ethics" by Nordmann (2007), comes with its own momentum, glossing over the uncertainties and contingencies of visionary futures. (3) A focus on a not yet realised socio-technical innovation comes with the necessity to choose a specific level of abstraction or a specific socio-technical object-in-context (Kastenhofer 2010). (4) TA practitioners have to take into account this specific discursive setting and the contemporary techno-scientific innovation regime, as these determine the performativity of each action taken.

Karen Kastenhofer, Institute of Technology Assessment, Austrian Academy of Sciences, is a scholar in science and technology studies and technology assessment. She focusses on the reconstruction of (techno)epistemic cultures, the analysis of technoscience governance and the elaboration of new modes of technoscience assessment.

Helge Torgersen, Institute of Technology Assessment, Austrian Academy of Sciences, started as a molecular biologist. Today he investigates relations in the triangle between science, the public and politics.

Gabriel T. Velloso & Maria Joao Maia

The ELSI approach on the implications of neurotechnologies – the case of BCIs

Many technologies are shaping society. Neurotechnologies is one of them, playing an important role and carrying the potential to achieve even more. Neurotechnologies can be used to fulfill assistive roles in health related areas (improving quality of life, for therapeutic purposes like neuroprosthetics)

or for non-therapeutic applications (gaming, enhancement and even the military field).

The interactions between humans and technology can be seen from different perspectives, one of them being an increasing intimate relationship among the two. However, the rise of a more intimate technological development is a progress that does not come to happen without its ethical, legal and social issues.

One example of neurotechnologies is Brain-computer interface (BCI), which can acquire brain signals in both invasive or non-invasive ways, both raising particularly relevant privacy, intimacy and autonomy issues, among others. What are they capable of offering at the moment? What is plausible to expect in the future and what implications do they bring?

BCIs could, for instance, assist disabled people to communicate, control neuroprosthetics or even wheelchairs and autonomous cars. It could support rehabilitation or aid in the detection of consciousness. The ever growing personal information generated by current technologies and the prospects BCIs can bring to humans are of high importance.

The aim of this paper is to discuss some ELSI questions recently raised about BCIs and reflect upon not only its possible impacts but also on current positions that different communities are taking towards it. An overview of the current and emerging applications of BCIs will be presented, followed by a discussion of results obtained from two surveys and interviews made on the perceptions of the main stakeholders in the BCI Community and well as the disabled people Community.

Gabriel T. Velloso worked as a researcher at the World Future Society in Washington DC, as a Foresight consultant for the OECD in Paris and is now finishing his PhD thesis on Technology Assessment for Brain-computer Interfaces at KIT (Germany).

Maria Maia, Institute of Technology Assessment and System Analysis at Karlsruhe Institute of Technology, is working on a STOA – European Parliament project which aims a foresight-analysis of the state of the art as well as future trends concerning the needs and perceptions of people with disabilities on assistive technologies.

Youjung Shin

Politics over the Boundary Object: Electrical Brain and the Information Society in Korea

According to Julie T. Klein (1990), there is “no master paradigm of what an interdisciplinary field ought to look like” and depending on “the context of the questions and problems which gave rise to that field” it is defined in more than one way. Being regarded as one of the most interdisciplinary fields, brain research is no exception. This paper shows how the field of brain research was defined in a distinctive way in Korea in the late 1990s, leading to the establishment of the Brain Research Promotion Act; the first law in the world built to promote the field of brain research. In the particular political circumstances of late-1990s Korea, a distinctive form of the brain was highlighted while it played a role as a boundary object enabling various researchers to be gathered and linked to each other. This paper examines how the concept of the brain and the field of brain research have been defined in a particular way and how the Brain Research Promotion Act was established based upon a certain way of imaging its power as a promising emerging science and technology in Korea. It will shed light on the relationship between politics and the shaping of an emerging science and technology field through discussing the nature of a boundary object and an interdisciplinary field.

Keywords: emerging science and technology, brain research, boundary object, interdisciplinarity, politics, Korea

Youjung Shin

Graduate School of Science and Technology Policy, Korea Advanced Institute of Science and Technology. I am a doctoral student who has an interest in the responsible innovation of emerging science and technologies. I have studied on how brain research has been developed and how its discourses penetrated into peoples' daily lives and transformed the way people think themselves and interact with each other. My ultimate goal is to understand how the brain and the field of brain research are imagined, materialized, and embedded in a particular social, cultural, political context.

09:00-10:30**Seminar room D****Workshop****SETTING THE AGENDA FOR NANO2ALL DIALOGUES**

Chairs: Ineke Malsch, Foteini Psarra, Jantien Schuijjer, Laurent Bontoux

Following a sustained effort in this area, the EU is funding a new dialogue project about responsible research and innovation in nanotechnology: NANO2ALL – Nanotechnology Mutual Learning Action Plan for Transparent and Responsible Understanding of Science and Technology (www.nano2all.eu, funded by EU H2020, Grant Agreement Number 685931, 1-10-2015–31-3-2019). This project builds on the learning needs identified by prior nanotechnology projects, and aims at establishing a Europe-wide durable platform for mutual learning and informed dialogue among stakeholders and citizens. The purpose of this platform is to improve transparency and societal engagement in responsible nanotechnology. NANO2ALL is interested in the views of scientists in Social Sciences and Humanities with regard to the development of nanotechnologies, and wants to integrate their perspectives with the visions of other stakeholders. The ultimate goal is to create a societal roadmap that shows which innovation trajectories are expected to result in sustainable and desirable nanotechnology research and applications and that includes ways to enhance responsible research and innovation in nanotechnologies. To avoid duplication, the project has made an inventory of current RRI policies and stakeholder positions relevant for nanosciences and nanotechnologies (see key references below). This has resulted in a short list of issues that have not yet been resolved in earlier national, European and international projects:

- 1) Educating the young and unaware about nanotechnology in their daily life.
- 2) Cultivating awareness among stakeholders about the differences and similarities in perceptions about nanotechnologies, their implications and future directions.
- 3) Understanding how the media report about nanotechnologies.
- 4) Identifying how nanotechnologies will evolve in the future and help stakeholders get better prepared.
- 5) Fostering dialogue on desirable and undesirable nano-enabled products along the value chains from nanomaterial to end product, consumption and end of life stage. This implies connecting the current discussion on Corporate Social Responsibility to the broader stakeholder dialogue on RRI in nanotechnology.
- 6) Engaging stakeholders equally in risk governance of nanotechnologies during the new norm creation phase.
- 7) The global dimension: understanding value differences underlying international differences in perceptions of nanotechnology.

In a 90-minute interactive session, participants are invited to contribute to the NANO2ALL dialogue agenda. This should help us take a step beyond the current state of the art and offer sound advice to European decision makers about RRI in nanotechnology. The session will consist of four main phases. After a short welcome-round, the session leader will briefly sketch the current nanotechnologies landscape and will introduce some future nano-configurations based on the main trends and drivers in this field and expected stakeholder responses (15 minutes). In the second phase, we will elaborate specifically on the NANO2ALL project and its goals related to engagement practices and RRI (10 minutes). The list of unresolved issues related to RRI, which were identified earlier will then be presented (10 minutes). Participants will be asked to add any relevant issue that has not been included on the list yet. The participants will be invited to prioritise the issues to identify the top three that should be tackled in the NANO2ALL project (15 minutes). The participants will then be asked to discuss each of the three prioritised issues. They will do so in light of future nano-configurations, and will share ideas about the specific actions that NANO2ALL needs to undertake in order to contribute to the RRI-related goals of the project (40 minutes). This last phase of the session will alternate work in plenary and in sub-groups. Twenty participants would be an optimal number to have a good discussion. Participation is open to all attendants of the S.Net 2016, but pre-registration for our session is recommended by sending an e-mail to postbus@malsch.demon.nl.

Key references

OECD (2012) Planning Guide for Public Engagement and Outreach in Nanotechnology. OECD, Paris, www.oecd.org/sti/nano

UNITAR, Guidance for Developing a National Nanotechnology Policy and Programme. Pilot Edition 2011, www2.unitar.org/cwm/publications/Nano.aspx

Ineke Malsch advises and writes about responsible development of nanotechnology since 1995.

Foteini Psarra, M.Sc. is a Research, Development and Innovation Policies Analyst at Systasi Consulting in Greece.

Jantien Schuijjer is a junior researcher and lecturer in responsible research and innovation at the Athena Institute in Amsterdam.

Laurent Bontoux (JRC) brings future oriented systemic thinking into EU policy making using foresight, design thinking and serious gaming.

All authors are engaged in NANO2ALL.

09:00-10:30

Seminar Room E

Thematic session

RRI AND EMERGING (BIO-)TECHNOSCIENCE (III): FUTURES

Chair: Kjetil Rommetveit

Martin Sand

Structural, Individual and Collective Responsibility – The Case of Visioneering

In the current debate concerning new and emerging technologies an increasing demand for responsibility is articulated. It is claimed that research agendas should be arranged in “a responsible way” or that various stakeholders and policy makers should act responsibly (Schomberg 2013). It is also ar-

gued that agents who have a strong influence at the very early stage of technological development, such as “visioneers”, carry a special form of responsibility for the processes they cause (Cabrera Trujillo, Laura Yenisa 2014; Arnaldi et al. 2014). Visioneers, as it is assumed, pursue the realization of their visions by promoting them in the interface between science and the public amongst performing further activities. Such calls for the responsibility of individual agents or the responsibility to shape innovation processes attempt to do justice to the nature of early technological development which entails a high degree of risk and uncertainty (Grunwald 2014). Responsibility is put forward as the conceptual resolution to the problematic nature of the emerging technologies. This talk will respond critically to these claims: First, by analyzing thoroughly three different meanings of responsibility that are mixed up in this discussion. It will be argued that it is important to distinguish more clearly structural, individual and collective responsibility. This distinction will be clarified by analyzing topical argumentations of influential authors from the field. Second, it will be argued that an appropriate understanding of structural and collective responsibility presumes an understanding of individual responsibility. The imperative to build up a responsible governance scheme for the emerging technologies presumes that certain societal agents can respond to such a call, that they can be responsible agents so to speak. In a third section the talk will reveal some philosophical issues of individual responsibility by taking a closer look on the case of “visioneering” (McCray 2013). Through these three steps a better understanding of responsibility in the current debate concerning the new and emerging technologies should be gained.

Wieke Betten & Virgil Rerimassie

Enhancing Moral Reflection Among Synthetic Biology Students in the iGEM Competition

Synthetic biology is an emerging field in the life sciences that applies engineering principles to biology. New, enhanced, or more specific micro-organisms can be designed and created to execute functions that are useful in various processes and products. Examples can be found in the production of biofuels, medication, plastics, etc. The field of synbio comes with promises and concerns. In approaching these promises and concerns it is important that researchers know how to approach societal, ethical and legal issues. It is therefore necessary that synthetic biology students have good moral reflection skills. In this presentation we will share our experiences with the collaboration with iGEM teams in the writing of two types of future scenarios, both based on their specific projects: application scenarios and techno-moral vignettes. Results from observations and exit interviews suggest that a competition like the iGEM competition can be a good space to practice with doing moral reflection. In this we saw a clear role for the writing of scenarios: the writing process made certain abstract issues ‘come alive’ and made sure ‘no loose ends’ were left in their exploration of the issues.

Wyatt Galusky: Narratives of Control

In Vitro Meat, Science Fiction, and the New Protein Machines

Lab-grown meat protein is becoming possible, even if not yet practical. But the idea has been around for a century. Scientists successfully kept a chicken heart alive outside of its own body in the early part of the twentieth century. Winston Churchill himself dreamed of “escap[ing] the absurdity of growing a whole chicken in order to eat the breast or wing, by growing these parts separately under a suitable medium” (1931). This lab-based technology became fully realized first in science fiction. From the radio dramas of Arch Oboler to the dystopian futures of *The Space Merchants* and Margaret Atwood’s *Oryx and Crake* trilogy, these science fictional accounts of animal-less meat each explore different ways in which the problems of meat have been solved. How do such fictional solutions match up with the real life aspirations of current in vitro meat creations, developments, and advocacy? Drawing on work from science & technology studies and philosophy of technology, I argue that these fictional

accounts echo many of the imaginaries surrounding the development and promotion of this new technology and inform a society that would support it. Going forward, we must ask: What kinds of controls are we willing to assert on food animals and on ourselves? And what kinds of protein machines do we want to create?

Wyatt Galusky is Associate Professor & Coordinator of the Science, Technology, & Society program at Morrisville State College, and recently served as the Burke Chair in Regional Studies (Colgate University). His research explores technological mediations between humans and the natural world, as well as public engagement with science and technology. Recent projects include: "Technology as Responsibility" (Journal of Agricultural & Environmental Ethics); "Climates of Change" (an art, poetry, festival related to climate change); & "The Wizard of OD" (a play on digital identities).

Arianna Ferrari & Silvia Woll

Imagining In Vitro Meat Through RRI

The basic idea of in vitro meat (IVM) is to produce meat from muscle cells grown in cell culture to form a tissue. Avoiding the need for having entire animals in order to consume meat, IVM is presented as one of the most important solutions for shaping a sustainable food policy agenda: According to innovators, IVM is good for the environment, for the animal and for the health. There is a small but intensive debate on the ethical and social implications of this innovation, which is struggling with its visionary character. IVM is "a proof of concept" (cf. Post 2014) more than a ready product, since there is still no working method for its large scale production and the 'problem/solution' framework of this innovation remains contested. Despite the fact that a significant body of scientific literature has been pointing out the ecological impacts of meat consumption and production over a decade, there is a lack of public and political awareness of the negative impact of meat production and consumption (cf. Brenk et al. 2015; Wellesley et al. 2015). In this paper we would like to explore the ELSA implications of IVM through the lenses of the recent debate on responsibility in science, technology and innovation (STI) and especially RRI. Working orientation toward the future of IVM we will investigate how different visions of IVM can be associated with different forms of responsibility, taking in consideration also alternative understandings of responsibility (e.g. liability and fault, safety and precaution) beyond ethics of care and responsiveness that are typical of RRI. This presentation is coming out of a project financed by the German Ministry of Research and Education called "Visions of in vitro meat".

References: Brent K. et al. (2015): The Importance of Reducing Animal Product Consumption and Wasted Food in Mitigating Catastrophic Climate Change Post, M. J. (2014). Cultured beef: medical technology to produce food. *Journal of the Science of Food and Agriculture*, 94(6), 1039-1041 Wellesley, L. et al. (2015): Changing Climate, Changing Diets: Pathways to Lower Meat Consumption. Chatham House Report

11:00-12:00

Auditorium (The Egg)

PLENARY KEYNOTE LECTURE

Corporate Speculation: Techniques for Calibrating Our Futures

Joseph Dumit, Professor of Science & Technology Studies, and Anthropology, Director of the Institute for Social Sciences, University of California

Joseph Dumit studies how science and medicine change and how the lives of Americans, including consumers, patients, doctors and scientists also change as the nature of facts and evidence change.

His first book, *Picturing Personhood: Brains Scans and Biomedical America* (Princeton University Press, 2004), looked at the development of PET scan brain imaging and what assumptions about brain anatomy, psychology, and human nature needed to be made in order to conduct experiments, and how the images circulate through popular culture, courtrooms, and patients' lives. His second book, *Drugs for Life: How Pharmaceutical Companies Define Our Health* (Duke University Press, 2012), focuses on the way clinical trials are designed in ways that grow pharmaceutical treatments in the latter half of the 20th century. He has co-edited three books: with Gary Lee Downey, *Cyborgs & Citadels: Anthropological Interventions in Emerging Sciences and Technologies*, (SAR Press), with Robbie Davis-Floyd, *Cyborg Babies: From Techno-Sex to Techno-Tots* (Routledge), and with Regula Burri, *Biomedicine as Culture* (Routledge). Dumit has written extensively about patient experiences, difficult to define illnesses, and the history of medicine, and was the managing editor of *Culture, Medicine & Psychiatry* for 10 years. He is currently chair of Performance Studies, a member of the ModLab developing a game on fracking, and involved in creating a new undergraduate minor in Data Studies.

Introduction by Rasmus Slaattelid, Associate professor at SVT and member of the S.Net organizing committee

13:30-15:00

Auditorium (The Egg)

Thematic session

THE NEXUS APPROACH TO THE ASSESSMENT OF INNOVATION POLICIES

Chair: Zora Kovacic

In the third millennium, the shift from an "empty world" to a "full and globalized world" (Daly, 2005) is reaching its maximum speed and this generates new challenges for the governance of innovations. Problems can no longer be solved one at a time without considering their geo- and bio-political context. Conventional solutions such as re-adjusting the mix of production factors – substituting a less limited resource to compensate for a shortage of another, or externalization of the problem to someone else by taking full advantage of presently favourable terms of trade, may become unsustainable in the long run. In a fully globalized world "what goes around comes around" so problems that exit from the door only to come back through the window, even if in different forms: e.g. explosion in the flows of immigrants, failing states and deterioration of the health of global ecosystems. In this context, the reliance on innovation as a provider of solutions to increasingly globalized and interconnected problems needs to be thoroughly analysed. The session asks to what extent the "Innovation Union" programme of the EU is able to deal with the existing recession, the worrying signals of disaffection toward the European project and science's own governance crisis.

The analysis of the "Nexus" between water, energy and food has gained prominence because it addresses the interconnectedness between the narratives and policies needed to deal with the effects of innovation. Innovations such as biofuels, GMOs, fracking, desalination may solve one problem while creating another. The nexus approach makes it possible to assess the feasibility (compatibility with processes outside of human control, such as natural resources availability), viability (compatibility with processes under human control, such as economic processes) and desirability (compatibility with processes of extended peer-review, social robustness and accountability) of the different innovation policies from multiple dimensions and scales of analysis. This thematic session will assess the narratives adopted by the EU in support of three different innovations, GMOs, fracking and desalination, through the lenses of the nexus.

The session presents the on-going research carried out in the project “Moving towards Adaptive Governance in Complexity: Informing Nexus Security” (MAGIC), funded under the H2020 programme of the EC.

The session refers to theme A “Innovation policies, imaginaries and practices”. More specifically, the session addresses the constraints and trade-offs that arise between different innovation policies and their practical implementation through the analysis of narratives. This is achieved through the Quantitative Story-Telling approach, which assesses innovation narratives through the quantification of their impacts on societal metabolism.

The session is composed of the following presentations:

- 1) Quantitative Story-Telling (**Andrea Saltelli**): The objective of the approach is the verification of the narratives used to promote innovation. Narratives can be defined as frames or stories through which an observer defines what is relevant among a sea of possible perceptions and interpretations. When choosing a narrative, one is setting the context in which observations have to be interpreted. Quantitative story telling borrows from system ecology, multi-scale analysis, and theoretical ecology in order to analyse the Nexus in terms of metabolic pattern of Socio-Ecological Systems. QST uses the results expected by the chosen innovation policy to check whether these results are feasible, viable and desirable in relation to the nexus (Benessia et al. 2016).
- 2) Case study: GMOs (**Tarik Serrano**). The license to import GM crops by EU member states in 2015 generated a lot of controversy, seen by some as a step back in terms of innovation and by others as an affirmation of food sovereignty. The presentation asks: (i) which narratives were selected and which neglected when endorsing the policy promoting GMOs? (ii) is this solution effective to deal with the factors threatening food security at the world level? (iii) is this solution effective to deal with the problems of food security as perceived in EU?
- 3) Fracking (**Ângela Pereira**). In the search for alternative and renewable energy sources, hydraulic fracturing, or fracking, has gained increasing attention in the last few years. Questions to be addressed are: (i) what is the contribution of fracking to the energy supply and local/national economies? (ii) what are the natural and social constraints that this activity will face? (iii) do the negative implications for water quality, land use and the wider environment offset energy security and carbon emissions reductions potential? (iv) how to work with stakeholders at different levels to take decisions about a very conflictive nexus-related issue?
- 4) Desalination (**Zora Kovacic**). In several Mediterranean coastal areas and islands, desalination is the only water supply to maintain populations, tourist activity, industries. Desalination is a classic example of innovation used to overcome constraints posed by the ecosystem, such as water scarcity. The presentation will assess (i) scenarios of the role that desalination can play in the development of Israel and European islands; (ii) pros and cons of desalination when considered at different scales in European territories; (iii) pros and cons of the contribution of the renewables energies to the European policy and desalination industry.

The session is organized by

- 1) the Joint Research Centre of the European Commission in Ispra, Italy, where Ângela Guimarães Pereira is currently based;
- 2) the Centre for the Study of the Sciences and the Humanities at the University of Bergen, Norway, home institution of Andrea Saltelli and Roger Strand;
- 3) the Institute of Environmental Science and Technology at the Autonomous University of Barcelona, where Mario Giampietro, Zora Kovacic and Tarik Serrano are based; and
- 4) the European Centre for Governance in Complexity, co-directed by Andrea Saltelli, Roger Strand and Mario Giampietro

References:

Benessia, A., Funtowicz, S., Giampietro, M., Guimarães Pereira, A., Ravetz, J., Saltelli, A., Strand, R., van der Sluijs, J. 2016. The rightful place of science: Science on the verge. The Consortium for Science, Policy and Outcomes, Arizona State University.

Daly, H.E. 2005. Economics in a full world, *Scientific American* 293 (3): 100-107.

Andrea Saltelli, University of Bergen, has a research focus on sensitivity auditing, an analysis of the entire evidence-generating process in a policy context.

Tarik Serrano, Universitat Autònoma de Barcelona, focuses on integrated methods of analysis for rural territories under the MuSIASEM scheme.

Angela Guimaraes Pereira, Joint Research Centre, works on knowledge assessment and ethics of techno-science, with a focus on innovation narratives.

Zora Kovacic, Universitat Autònoma de Barcelona, works on science for governance from the point of view of complexity theory.

13:30-15:00

Seminar Room A

NANOTECHNOLOGY GOVERNANCE

Chair: Fern Wickson

Kobi Leins

Shining a light on regulating emerging technologies in the military

My PhD question is whether the use of nanotechnology enhanced or based weapons are prohibited or limited in an armed conflict. Although primarily a legal thesis, the legal theory cannot be entirely separated from the political and the future we envision for ourselves. How we fight our wars, and the boundaries, legal and otherwise, that we create for the use of emerging technologies in armed conflict, says a lot about our values as a society, and inevitably raises political questions.

Nanotechnology is a rapidly developing area of science, and the military is very keen to make use of its applications. The international community, including many scientists, have expressed concern about the adequacy of the current legal framework to respond to potential military applications of nanotechnology.

Through the prism of looking at nano-laser technology, this presentation will provide an overview of the current regulatory framework and an initial assessment of some of the legal issues in relation to "nano-enhanced" weapons. In particular, it will consider whether the existing laws of armed conflict or arms control treaties (such as the Geneva Conventions and their Additional Protocols, the Chemical Weapons Convention, the Biological Weapons Convention, and the Certain Conventional Weapons Convention Protocols on Weapons Primarily Injuring by non-detectable fragments and Blinding Laser Weapons) adequately cover nanotechnology-enhanced capabilities. This will include consideration of the relevance of Article 36 of 1977 Additional Protocol I, which obliges all States Parties to conduct a review of all new weapons on weapons enhanced by nanotechnology.

In order to avoid an entirely theoretical presentation, I will look at the potential legal implications of deployment of nano-enhanced lasers in armed conflict. Nano-lasers will undoubtedly enhance the performance of many weapons systems, including autonomous systems, with better energy storage,

more rapid computations, and lower power consumption, to name just a few features, but in this article I consider just two types of technology purportedly utilising nano-lasers. Firstly, I will discuss the Laser Weapons System (“LaWS”), a directed weapon already in use. The LaWS system is often wrongly described as nano-enhanced; I will explain why the descriptor is fallacious while also discussing the legal implications, if any, which arise from the deployment of the system (and whether this error has any legal implications).

Secondly, I will examine optogenetics, which utilises nano-laser light delivery technology to effectively switch neurons “on” and “off” to alter brain function. This technology is currently at the research stage with mice, and has not yet been used by the military. I plan to identify the key legal implications if such technology were to be used in humans in armed conflict.

Two key legal issues arise in relation to both technological developments. One involves the responsibility of States Parties to Additional Protocol I to review and supervise the use of emerging weapons technology to ensure compliance with the law of armed conflict (LOAC) and the second involves identifying what specific and general rules may apply to such technology. General legal principles have relevance to all means and methods of warfare and so apply as much to nano-enhanced or based laser weapons systems as to any other category of lethal or non-lethal weapon.

I will conclude with a broader discussion for future regulation, and the potential pitfalls, of the use of nanotechnology more broadly by the military.

Kobi worked for the United Nations, the International Committee of the Red Cross, and the International Service for Human Rights. In 2006, Kobi advocated for the adoption of the Declaration of Indigenous Peoples’ Rights. In 2005, she liaised with States, scientists and stakeholders to raise awareness of, and compliance with, the Biological Weapons and Chemical Weapons Conventions. In 2004, Kobi worked as a Legal Officer at the United Nations Compensation Commission. She is currently undertaking post-graduate study at the Law Faculty of the University of Melbourne.

Noela Invernizzi, Guillermo Foladori

The rise (and fall?) of nanotechnology policy in Brazil

Science and technology policies, particularly those regarding emerging technologies, are often designed in the most industrialized countries and undergo a process of replication/adaptation in peripheral contexts. Brazil started formulating its nanotechnology policy in 2001, which gave place to a national program in 2004. The area was declared strategic and conceived as a motor to achieve greater competitiveness. Considerable, although unstable, investments were made throughout 15 years, enlarging the human and material research capabilities and stimulating a group of companies to adopt the novel technology. By 2013, investments reached its pick, and the policy seemed stabilized. However, the economic and political crisis started in 2015 virtually placed nanotechnology policy in stand-by, putting at risk all the advances made. Moreover, reforms planned at the Ministry of Science, Technology and Innovation (MSTI) to reduce expenses may include the elimination of the special coordination created to manage nanotechnology policy. This paper reviews the construction, consolidation and virtual stagnation of the policy for nanotechnology in Brazil, identifying the main actors that promoted it, the difficulties encountered in incorporating issues such as the research on risks and social implications, and the changes experienced in the governance of this emerging technology. We claim that science policy replication, with minor adaptations to the local context, has as a primary supporting actor the scientific community, increasingly internationalized and interested in frontier science. However, such kind of policy exhibit a low level of embeddedness in the broader local context, including industry and civil society. The information sources are mostly documental, complemented by direct observation of several meetings organized by the MSTI.

Noela Invernizzi, *Public Policy Program, Federal University of Paraná, Brazil. Anthropologist, PhD in Science and Technology Policy. Her research has been focused on the implications of industrial innovation for workers' skills and employment conditions. She is currently researching on the social implications of nanotechnology.*

Guillermo Foladori, *Development Studies Program, Autonomous University of Zacatecas, México. Anthropologist, PhD in Economics. His research interests include: environmental issues, and social and economic aspects of nanotechnology.*

Indrani Barpujari

From 'Technologies of Hubris' to 'Technologies of Humility'? Nanotechnology Governance in India

Jasanoff (2003) observes that management of technologies in an uncertain world requires a shift in policy-making from 'technologies of hubris' to 'technologies of humility'. Emerging technologies like nanotechnology characterized by great expectations and huge uncertainties owing to the emergent nature of the science create the conditions of what Funtowicz and Ravetz (1993) call 'post-normal science' which requires acceptance of uncertainty, welcoming the diversity and an extended peer community consisting of all stakeholders to provide pluralistic inputs to the policy process.

It is in this context that this paper looks at India's engagement with nanotechnology; with the government of India through the Nano Mission bring the primary promoter of the technology. On the basis of official pronouncements, documented survey data and proceedings of dialogues conducted on nanotechnology in India, a case is made that the official scientific establishment perceives building capacity in emerging technologies as being intrinsic to the fulfillment of its aspirations to be a global leader. This coupled with an official culture of technological hubris has led to a systemic neglect of risk issues and a single minded pursuit of development with no corresponding efforts at governance, regulation and public engagement, characteristic of many developed nations. The paper argues that considering the particular vulnerabilities of a developing country like India, a precautionary, governance framework for nanotechnology is urgently needed, with policy makers required to circumvent the Collingridge's dilemma by taking steps to harness the benefits of nanotechnology for developmental goals while minimizing the potential risks of the same. The Draft Guidelines for Safe Handling of Nanomaterials brought out recently by the Nano Mission is a welcome step and would require to be bolstered by further efforts in this direction.

Key words: emerging technology, nanotechnology, India, Nano Mission

Indrani Barpujari, PhD.

Advisor (Governance)

A.B.V. Institute of Good Governance and Policy Analysis

Bhopal, India

A lawyer and social anthropologist by training, I have been conducting policy research on law-science-society interface and governance of emerging technologies. I have been part of two research studies to evolve a nanotechnology governance framework in South Asia, sponsored by IDRC-Canada. I have extensively published and presented my work on nanotechnology- IPRs, regulation, governance and public engagement and offered policy recommendations.

13:30-15:00

Seminar Room B

RRI IN GOVERNANCE II*Chair: Heidrun Åm*

Gisle Solbu

Will the imagined scientist of RRI please raise his/her hand? Governance and governmentality in Norwegian bio- and nanotech

Responsible research and innovation (RRI) has emerged as a new instrument in the ordering of the science society relationship. RRI asks for a transformation of the scientific conduct to better align its outcome to the need and desires of society by implementing dimensions such as anticipation, deliberation, reflection and responsiveness in research and innovation processes. However, these new demands of responsibility must be translated by scientists, possibly challenging existing self-regulatory practices and disrupting established routines.

We argue that in order for transformations to successfully take place, we need to improve our understanding of today's technoscientific practices, and how these may promote or constrain the implementation of RRI initiatives. The main point of this paper is thus to explore what we call native responsibility among technoscientists, that is the already existing reflections and practises regarding the ethical, legal and social aspects of their work. What are scientists and innovators' accounts of concerns regarding their research and innovation efforts, and how do they see their responsibility with respect to these concerns? An important aspect in this respect is to study how governmentality affects the scientific conduct, that is the processes by which technoscientists are conducted to be disciplined and concerned about responsibility.

Empirically the paper draws on 37 in-depth interviews with Norwegian technoscientists within the fields of bio- and nanotechnology.

Gisle Solbu, Norwegian University of Science and Technology, is a PhD candidate at the Center for Technology and Society at NTNU, and part of the NRC funded project PerformE. MA in Science and Technology Studies. Current research interests: RRI, ELSA, emerging technologies, science governance, science policy

Deborah Scott

Reflecting on RRI: can it take us beyond risk-based governance?

Initial work proposing Responsible Research and Innovation (RRI) envisioned coupling anticipation, reflection and inclusive deliberation to policy and decision-making processes – ie, responsive governance (Owen et al. 2012). This work was motivated in part by an acknowledgement of the limits of risk-based governance and failures of prediction and control (Stilgoe et al. 2013). RRI promised a new approach to politics in the era of emerging science and technology. Yet, the institutionalization of RRI in EU and national policies has been critiqued for failure to attend to its politics or connect to actual decision-making (van Oudheusden 2014; de Saille 2015).

In this presentation, I examine some of the recent RRI tools and frameworks to see how they propose to elicit responsive governance. How is RRI used to guide responses to uncertainty? How do these suggested approaches to decision-making align with and diverge from the precautionary principle (or from a “proactionary” stance)? Is RRI provoking new approaches to dealing with unknowns? I consider whether RRI still has the potential to help reimagine governance in a post-predictive paradigm.

Deborah Scott is a Research Fellow at the University of Edinburgh in Science, Technology and Innovation Studies. Trained in human geography and law, she is part of the “Engineering Life” project investigating the movement of ideas, practices and promises from engineering to the life sciences.

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Sean Low

Engineering Imaginaries: Anticipatory Foresight for Solar Radiation Management Governance

Since solar radiation management (SRM) technologies do not yet exist and capacities to model their impacts are limited, proposals for their governance are implicitly designed not around realities, but possibilities – baskets of risk and benefit that are often components of sociotechnical imaginaries. The project Solar Radiation Management: Foresight for Governance (SRM4G) aimed to make discussion of such imaginaries explicit, and to nudge the mode of thinking about the future of an engineered climate from predictive to anticipatory. Leveraging the participation of scholars and practitioners heavily engaged in early conversations on SRM governance, SRM4G applied scenario construction to generate a set of alternative futures, each exercising different influences on the need for – and challenges associated with – development of SRM technologies. The scenarios then provided the context for the design of systems of governance with the capacity and legitimacy to respond to those challenges, and for the evaluation of the advantages and drawbacks of different options against a wide range of imaginary but plausible futures. In doing so, SRM4G sought to initiate a conversation within the SRM research community on the capacity of foresight approaches to highlight how central sociotechnical imaginaries are to discussions of SRM’s risks and benefits, to examine and challenge the assumptions embedded in conceptualizing SRM’s aims, development, and governance, and to discuss the capacity of (or the need for) governance options to adapt to a wide range of possibilities. SRM4G can be situated within wider efforts to exercise anticipatory governance over emerging technologies, and more directly, with scenarios and gaming exercises exploring conceptions of future risks and governance systems, in a manner that also reflects upon the processes and pitfalls of socially constructing futures with feedback effects on the present.

Sean Low is a project scientist at the Institute for Advanced Sustainability Studies in Potsdam, Germany. His research focuses on the uses and limits of scenario and gaming methods, as well as of analogies in previous debates on emerging technologies, to explore potential future contingencies in climate engineering. He has previously done research on the politics of climate engineering and global climate policy at the Centre for International Governance Innovation and the University of Waterloo (Canada).

13:30-15:00

Seminar Room C

RENEWABLE ENERGY AND CLIMATE*Chair: Scott Bremer*

Dorothy J. Dankel, Yajie Liu & Rachel Tiller

Designing a serious game to elucidate intra- and intergenerational decision-making under climate change for communities of Svalbard

The paper presents the project "REGIMES: An interdisciplinary investigation into scenarios of national and international conflicts of ecosystem services in the Svalbard zone under a changing climate in the Arctic", which will contribute to the knowledge base about trade-offs between different ecosystem services given the expected climate changes to the marine environment in the coming decades.

Involving various stakeholders, especially local resource users, will be vital to the development and successful implementation of practical marine fisheries conflict resolution strategies across the Arctic. In addition we take an intra-generational approach by involving high school students in our stakeholder workshops. Through a newly developed climate scenario game, students and stakeholders will interact with decision-making scenarios, which also will elucidate ethical and philosophical discussions of trade-offs in the Arctic.

In order to assess intricacies in decision-making under uncertain climate scenarios, we present a serious game based on climate models from the University of British Columbia. Previous work in this realm is exemplified in the "Mercury Game" by Leah C. Stokes, Dr. Noelle E. Selin and Dr. Lawrence E. Susskind at the Massachusetts Institute of Technology that is a teaching tool for students to understand the role of science in politics and environmental treaty negotiations. Our hypothesis is that we will see different patterns and norms of decision-making when our climate game is played by high school students in Bergen and Longyearbyen, scientists in Trondheim, Bergen and Tromsø, and adult stakeholders from the Svalbard region.

*Dorothy J. Dankel, Dept of Biology, UiB**Yajie Liu, SØF-NTNU**Rachel Tiller, SINTED Fisheries and Aquaculture***Aviram Sharma****The Visions, Expectations and Realities of Diffusion of Emerging Solar Energy Technologies: A Case Study of Dharnai, Bihar**

A number of policy actors have advocated for increasing the use of emerging solar energy technologies at different level across the globe. The economic, political and innovation paradigm vividly differs in the developed and developing countries. Even in developing and emerging countries, new spaces are being created for promotion of solar technologies. Multiple actors and institutions in India are promoting solar technologies for wider diffusion. These emerging solar technologies prominently feature in the debates around climate change, global warming and sustainability of natural resources at the global and national level.

However, the existing literature can be categorised into two groups, one which deals with the environmental aspects and the other which deals with the innovation and technical aspects of these technologies. The diffusion of such technologies, especially in developing countries is a less studied

phenomenon. This paper contributes to that grey area, which is crucial for developing a comprehensive understanding of the current scenario and future possibilities.

Using a case study approach, this paper engages with the one of the first “solar villages” of India, Dharnai in Bihar. Dharnai Solar Village was a project initiated and facilitated by Greenpeace India in 2014 in one of the most economically and socially backward state of India, i.e. Bihar. The paper deals with the vision, expectations and realities of such projects. It emphasises how global visions contend with local expectations and in the process get modified. It also brings the politics into the picture, which is often overlooked in the diffusion of innovation literature.

Dr. Aviram Sharma is Assistant Professor in the School of Ecology and Environment Studies, Nalanda University, Rajgir, India. He earned his PhD from the Centre for Studies in Science Policy, Jawaharlal Nehru University, India. His doctoral work analysed the regulation making for bottled water quality standards in India. He holds an M.Phil. in Science Policy from JNU and M.A in Environmental Studies from the University of Delhi.

Carlo Altamirano-Allende

Energy Access: A Transformational Approach from Sustainability & STS

Sustainable energy access is one of the key drivers for global equity, justice, and human development. Meeting the energy challenge is critical to alleviating poverty, enhancing economic growth, and promoting human well being. The impact for marginalized communities are multidimensional and overtly complex: health hazards, urban over population, unemployment, and overall social exclusion resulting from reduced access to information and education services. The UN’s sustainable development goals are not entirely fulfilled by current solutions for energy access. Moreover, unidimensional strategies for energy access create unstable equilibrium states in communities that delay corrective measures. This paper proposes that decentralized and distributed energy systems are intricately networked and political systems with multiple socio- economic-technological actors and causal linkages. This structure gives rise to emergent feedback loops causing shifts in system dynamics, with the potential to transform it. We argue that contemporary energy access solutions, not conceived as socially “networked systems”, lack the power to provide sustainable growth. A systems approach is developed for analysis of case studies in order to bring concepts from socio-ecological systems, sustainability, and vulnerability, to the STS literature, in order to understand emergent technological system as social structures.

Further, we provide an analysis based on the notion of sociotechnical systems, to assess relatively successful cases that are able to 1) provide reliable, usable, renewable energy based on local fuels; 2) deliver a high social value, 3) integrate sustainability and human well-being into the social and economic organization of communities, and 4) address negative social outcomes emerging from coping strategies for sub-optimal energy access.

Carlo is a PhD candidate at Human And Social Dimensions of Science and Technology, Arizona State University, and Fulbright scholar in STS with research on public engagement and participatory processes within STS, as well as the social dimensions of energy transitions from the federal to the state level in Mexico.

13:30-15:00

Seminar Room D

RESPONSIBLE BIOTECHNOLOGY I*Chair: Diana Bowman*

Ellen-Marie Forsberg & Anders Braarud Hanssen

The treatment of scientific uncertainties in biotechnology patents

Emerging science and technologies, such as biotechnologies, develop very fast. This would theoretically make it harder to assess patentability criteria (novelty, industrial use, inventive step, etc.) for such technologies than for more established technologies. In this presentation we demonstrate how the uncertainty of the scientific and technological aspects of certain biotechnology inventions are assessed in the search and examination phase of the patent granting process. We also present how the uncertainties concerning the patent on the Pancreas Disease virus affecting Norwegian salmon industry have been treated by Norwegian courts. We discuss how institutional characteristics explain the reductionist way biotech patents are currently processed and suggest some options for improvement of the system. We argue that political action is needed for institutional change in the patent system.

Ellen-Marie Forsberg, Oslo and Akershus University College (corresponding author), is a senior researcher with a doctoral degree in practical ethics/philosophy focusing on methods for doing ethical evaluations of new technologies. She is the project leader of the Patent Ethics Project.

Anders Braarud Hanssen, Oslo and Akershus University College, is a PhD candidate in philosophy/practical ethics focusing on societal and ethical aspects of innovation and governance of science and technology issues.

Koen Beumer

What counts as a legitimate concern: Regulating socio-economic considerations in African biotechnology

This paper investigates the efforts made to 'objectify' the assessment of socio-economic considerations of biotechnology. Whereas in Western Europe and Northern America regulation mostly focuses on risks to human health and the environment, in other continents the object of regulation is still in flux. In many African states, for instance, biotechnology regulations are formed at this very moment. This article investigates how different African countries attempt to take into account concerns other than risks to human health and the environment in regulating biotechnology.

More specifically, the article focuses on what has become known as 'socio-economic impacts'. Article 26 of the Cartagena Protocol on Biodiversity provides countries with the option to include socio-economic considerations in decision-making. However, first of all, it is far from clear what exactly counts as a legitimate socio-economic consideration. Currently issues as diverging as religious concerns, farmers profits, employment effects and cultural uses of biodiversity have been shared under this banner. And secondly, is it far from clear how these concerns can be assessed in an objective manner. As RAEIN (2012) notes: "whilst methodology for environmental and health risk assessment is well-developed the same cannot be said for SEIA [socio-economic impact assessment]" (p 1).

By investigating the way Kenya and South Africa include socio-economic considerations into their regulatory processes, this paper identifies the contours of an emerging regulatory regime. Based on semi-structured qualitative interviews with key actors involved in drafting and executing biotechnol-

ogy regulations in the two countries, the paper hypothesizes that there are considerable differences in the ways Kenya and South Africa operationalize socio-economic considerations, thereby highlighting different views on what counts as a legitimate concern.

Koen Beumer obtained an MPhil (cum laude) in Science and Technology Studies at Maastricht University, the Netherlands. Koen has investigated emerging technologies in developing countries when working at the Advisory Council for Science and Technology Policy (AWT), the University of Amsterdam, and when writing his PhD about nanotechnology in India, South Africa, and Kenya at Maastricht University. Currently he is a postdoc at the University of Groningen where he investigates biotechnology in Africa.

Elizabeth Bullock

Trajectories: Securitization and the Body-As-Data

Scholars addressing the recent initiative for global food security have viewed these efforts as a continuation of the programs and policies supported by the Rockefeller and Ford Foundations against global hunger. I will note the implications of different ways of thinking about the body in discourses linked to the turn to food security. Evidence of a reorganization of governance and economy, I suggest food security be viewed as a “technical solution” whose target is not the individual, human body but rather the body-as-data whose goal is to insure the conditions required for its continuance. Discourses attended to will include those on biotechnology, scientific philanthropy, and biological diversity.

Fundamentally, food security underlines a relationship of technology and science to the “seed” that is at the same time a connection of technical and scientific developments to “social” problems. When addressed in connection with the first Green Revolution, questions about technology, science, and the seed point to the Rockefeller Foundation’s vision for “scientific philanthropy.” Raised here as well are questions about U.S. foreign policy and different ways of framing the discussions about the Club of Rome’s world futures report of 1972 (Meadows et al. 1972). Concerns about “limits to growth” have been associated with the end of industrial production and the suggestion that investments in the U.S. biotech industry were devised to “overcome” limits inherent to the biological human body and the “human” ecology on which continued economic growth depends (Melinda Cooper 2008). But the recent turn to seed vaults promising crop diversity in perpetuity presses us to consider a biological diversity “value” that is mobilized by political organizations and industry alike (see Cori Hayden 2003). Tracking this “value,” I outline the contours of a neoliberal conditionality, an affective capacity of and for the body-as-data that food security helps define.

Dr. Elizabeth Bullock has a doctorate in Sociology from The Graduate Center of the City University of New York (CUNY) and is the Title V Lecturer of Sociology at The City College of New York. Her research explores a technical capacity of the body that can be located in discourses that build on the communications sciences and connects this capacity to socioeconomic issues and concerns about race, sexuality and gender, postcolonialism, and other forms of inequality.

13:30-15:00**Seminar Room E**

Thematic session

RRI AND EMERGING (BIO-)TECHNOSCIENCE (IV): EXPERIENCES WITH RRI PROJECTS – NERRI, SYNENERGENE AND PROSO*Chairs: Jürgen Hampel & Helge Torgersen*

Concepts such as Upstream Engagement and Responsible Research and Innovation (RRI) have in common that they stipulate holding a societal dialogue in an early phase of the innovation process. In particular RRI demands that the social basis of decision making regarding technical innovations should be opened for stakeholders and the general public to make innovation address major societal challenges. The scope of RRI not only exceeds that of Public Understanding of Science but also of Upstream Engagement as it broadens the communication concept applied.

However, although widely referred to, it is still unclear what societal engagement under RRI precisely could or should involve as the concept is not clearly defined and lacks methodological operation guidelines. Moreover, the PROSO project identified a lack of insights regarding the demands for various forms of engagement and the incentives for main actors to engage in and with society under different R&I contexts. Finally, RRI may be interpreted as an instrument to both, inform decision-making on new technologies as well as to communicate with the public to increase public support for the technology at stake. In practice, therefore, mutual learning exercises are central in RRI projects but it is unclear which aim they pursue.

Although the RRI concept is very general and somewhat ambiguous, the European Commission had already funded a number of projects referring to RRI under the 7th framework program, such as NERRI (Neuroenhancement and Responsible Research and Innovation) and SYNENERGENE (on Synthetic Biology). Rather than research, they were to support societal dialogue on a technology either not (yet) existing or being in a very early phase of its development. Both projects had to develop an operational definition of RRI, if only implicitly.

We think it is a good point in time to have a look at the experiences with various forms of mutual learning exercises in both projects. (also RRI Tools?) In addition, the new EU-funded project PROSO currently looking at RRI projects is supposed to establish factors crucial for the success of such projects and to allow for a more systematic view on public participation.

*Chairs' contact information:**Jürgen Hampel**Stuttgart University**Department of Sociology of Technology and Environment**Seidenstraße 36**70174 Stuttgart, Germany*

Experiences in the study of public understanding of science, science controversies and governance of science. Member of the NERRI consortium.

*Dr. Helge Torgersen**Austrian Academy of Sciences**Strohgasse 45/3**Vienna, Austria*

Experiences in the study of public understanding of science, science controversies and government of science. Member of the NERRI and the Synergene consortium.

Presentations:

Ilse Marschalek, Maria Schrammel, Elisabeth Unterfrauner

Tools to support the implementation of RRI

Centre for Social Innovation, Vienna

The RRI tools project launched an online toolkit with valuable resources for the practical implementation of RRI (Responsible Research and Innovation). The toolkit contains a huge collection of existing resources from diverse fields as well as resources which were developed by the consortium within the project.

Mainly, the toolkit offers four types of resources: A “library” which compiles all sorts of relevant resources that inform on RRI and its various facets. This includes academic articles, reports from projects or institutions at all levels, books, opinion pieces, videos, presentations, as well as dedicated journals and blogs that cover RRI or related aspects. Additionally, it comprises “project descriptions” of past or ongoing initiatives dealing with RRI, “good practices” to inspire and adapt to other contexts, and finally a wide range of “tools” to plan, implement, evaluate, and disseminate RRI.

Furthermore, it contains a collection of the so called “How To’s”, i.e. documents that advise on “How to apply RRI”. In other words, these are examples of how to translate the theoretical dimensions of RRI into practise. The descriptions support stakeholders with guidelines and specific examples, like the development of RRI oriented project applications, or the embedding of RRI principles in funding calls, the integration of RRI in education, or how to consider RRI in citizen science projects.

One of the core instruments is the “self-reflection tool” that in the spirit of RRI’s process requirement “anticipation” and “reflection” aims at stimulating reflection on RRI. Moving away from the idea of an assessment instrument the tool is rather meant to stimulate a critical reflection of user’s own professional practice.

The platform furthermore offers openly accessible materials for further trainings which should help to design trainings and spark ideas on how to apply resources and tools accordingly.

The presentation will briefly introduce the RRI tools project and provide a short walk through the on-line toolkit. It will present the self-reflection tool and present some of its questions. Reported experiences with the toolkit so far and expected requirements formulated by the audience should stimulate the discussion on useful tools for RRI implementation.

Gema Revuelta

Different Forms of MLEs under NERRI

Studies Center on Science, Communication and Society (Pompeu Fabra University)

Within the context of RRI (Responsible Research and Innovation), the NERRI Project initiated a public debate on neuroenhancement in several European countries using, as the core of the initiative, Mutual Learning Exercises (MLE). MLEs aim to bring together various groups of stakeholders (researchers, users, intermediaries, professionals, students, media, broader publics) to facilitate a mutual learning process via the common exposure of views and experiences, expectations and concerns. The formats ranged from innovative approaches (such as a ‘laboratory of ideas’, gaming sessions, discussion

games, cinematic events, a world café, a cosmological café, interactive association games, debates with direct voting systems and brain hackatons), to more conventional formats (such as lectures, focus groups, science cafés, conference sessions and expert workshops). The venues were very varied: from universities and technology centers, art galleries or science museums, to pubs, Parliaments and libraries, and even including a defense college, a book club and a planetarium. The more than 60 MLEs that took place in 11 European countries have led to a great number of rich and salient insights. The objective of this presentation is to provide a summary of the main results, as well as a reflection about the methods and tools that have been employed, developed and tested in the context of the NERRI project.

Anja Bauer & Alexander Bogner

Early engagement for RRI in synthetic biology: Experiences from SYNENERGENE

Institute of Technology Assessment, Austrian Academy of Sciences

Synthetic biology is an emerging research area. To initiate a public debate and capture the views and imaginations of experts, stakeholders and citizens, the EU-FP7 project SYNENERGENE has organized a range of public engagement events, including workshops, panel discussions and theatre performances. In a broader context of Responsible Research and Innovation these so-called Mutual Learning Exercises (MLEs) serve as testbeds for the early dialogue between science and society.

In our presentation we present and discuss different types of engagement activities organized in the SYNENERGENE-project along two main questions: First, we ask how different publics, stakeholders and experts are engaged in various formats and what modes of interaction stabilise. Second, we analyse how synthetic biology is framed in different engagement settings. On the basis of these analyses we discuss a number of suggestions on how public dialogue events could be made more interactive and engaging and critically ask whether and in how far early invited participation constitutes a 'better' way of engaging the public than uninvited and self-organised participation.

Marion Dreyer

PROSO – Engaging society for RRI: Research on barriers and incentives

Societal engagement is considered to be one of the central pillars of RRI by most of the academic literature on RRI and also by the European Commission and the Council of the European Union. The Rome Declaration calls on European Institutions, EU Member States and their R&I Funding and Performing Organizations, business and civil society to make RRI a central objective across all relevant policies and activities, and it calls on all stakeholders to work together for inclusive and sustainable solutions. However, multi-actor cooperation in R&I in terms of an inclusive and deliberative process of stakeholder and citizen engagement is a demanding endeavor for all actors involved and requires adequate framework conditions able to facilitate such cooperation. In order to address the question of what are suitable conditions, more knowledge (amongst others) about the factors that influence the willingness and capacities of stakeholders and citizens to contribute to R&I is required. The EU-funded project PROSO (Promoting Societal Engagement in Research and Innovation: Moving Towards RRI, 2016-2018) carries out a systematic analysis of barriers and incentives in regard to the engagement of third sector actors and citizens in R&I and will produce from the insights of this analysis a policy and practice guide that shall assist science-policy makers, research funders, and third sector actors in developing policy and governance for the advancement of societal engagement for RRI. The presentation will outline current knowledge about tensions and hurdles societal engagement in R&I is facing and possible approaches to deal with these tensions and hurdles. These findings, mostly related to civil society organizations, lead to the conclusion that the notion of "co-responsibility", quite prominent in the RRI discourse, will – in the current systems of research and innovation – not automatically

be applauded by those now called to engage with R&I. Little is known so far about the motivations of *citizens* to engage in R&I. The presentation will focus on these addressees of calls for RRI and set out the methodological design of PROSO's research into the factors and conditions that from the perspective of citizens enable or constrain their engagement into (responsible) R&I.

15:30-17:00

Auditorium (The Egg)

Debate

'DOING CRISPR': GENETICALLY MODIFIED NORWEGIAN FARMED SALMON: BASIC SCIENCE OR PART OF YOUR DINNER?

Chairs: Dorothy J. Dankel & Anna Wargelius

Norway is home to the largest salmon farming industry in the world. The high concentrations of salmon in sea-based cages set the stage for many ecological and industrial challenges that benefit from science-based solutions. One such example is the undesired escapees of farmed salmon giving the possibility to inter-breeding with wild salmon through vaccine therapy to sterilize farmed fish. Gene-editing technology, such as the CRISPR-Cas9 methodology, is now fast, cheap and robust and is the most successful method for gene-editing in salmon currently applied. But when working and designing GM salmon for insights into vaccine therapies, what happens to quality assurance, trustworthiness and communication among scientists, industry leaders and society? Will GM salmon in the lab make the crossover to GM salmon on the market, and if so, how fast?

Dorothy J. Dankel and Anna Wargelius from the Institute of Marine Research and leader of the Salmosterile project will first present some ethnographical and embedded insights from within the CRISPR lab. Then they will start a debate which will lead into a conversation with the audience on the future of GM salmon: "in the lab or on the plate?"

15:30-17:00

Seminar Room A

RISK, GOVERNANCE AND THE ENVIRONMENT

Chair: Bruna de Marchi

Jeroen van der Sluijs, Ilektra Kouloumpi & Arjan Wardekker

The challenges of risk migration in sustainable innovation

While many technological developments at first glance seem to be contributing to sustainability, this is not always the case. The introduction of new, sustainable products and technologies intended to contribute to the solution of environmental risks, often leads to unexpected, new or increased environmental and health risks, often of a different nature than the risk they aimed to mitigate. This phenomenon is known as risk migration.

The paper will address the following questions:

What lessons on risk migration are known from the literature?

Are these lessons well known among key players in the field of sustainable innovation and what bot-

tlenecks occur when attempting to apply these lessons in the daily practice of innovation and regulation?

What new examples of risk migration in sustainable product innovation are known from the literature and from practice?

What (new) lessons can be learned from these cases to help avoid future cases of risk migration?

Is it possible to link particular aspects of sustainability of technologies to particular types of new and emerging risks of these technologies?

How can the various lessons be better utilized in the daily practice of sustainable innovation in order to detect and avoid risk migration?

How can risk governance be improved with a practice of risk exploration aimed at early detection and avoidance of possible risk migration, well before the market introduction?

We identified a range of circumstances/characteristics that occurred across many known cases of risk migration and draw lessons for the governance of innovation.

Jeroen P. van der Sluijs, Centre for the Studies of the Sciences and the Humanities, University of Bergen

Ilektra Kouloumpi is a multidisciplinary engineer with specialization in sustainable building design and low-energy city planning. She holds a position at the Amsterdam department of the global engineering firm Arup, where she is engaged with hands-on engineering design assignments, as well as research projects on sustainable masterplanning developments. Prior to Arup, Ilektra has worked as a researcher for energy policies and sustainable energy technologies in different institutes and academic positions, addressing both the technical and socio-economic aspects of the issues. Next to her engineering day role, Ilektra runs a research project together with artists on how to design spaces by incorporating more the human's body kinesiology and sensations. She holds a degree in Electrical Engineering from the National Technical University of Athens and a Master's degree in Sustainable Development from Utrecht University.

J. Arjan Wardekker, Copernicus Institute of Sustainable Development, University of Utrecht

Maurice Brennan

What is the future role of risk governance in the responsible innovation of nanomaterials in the European Union?

The benefits of intensive scientific research into nanomaterials are now being realised in the form of marketable commercial products expected to be globally worth \$ 1trillion in 2018. It is imperative to grasp the economic and societal benefits which might accrue from this emerging technological platform whilst minimizing the risks to human and environmental health. Internationally adopted standards and regulatory frameworks have an important role to play to ensure that the technology is exploited in a safe and sustainable manner. But there are still many question marks regarding the safe innovation and commercialization of nanomaterials. This is a major issue that continues to be contested both politically and scientifically within the EU. Demonstrably, we are still unable to provide a confident answer to the fundamental question, "Are nanomaterials safe". This then questions whether the current EU risk governance policy and regulatory frameworks with their technocratic approach are yet fit for purpose. This uncertainty has led to the promotion of the principles of Responsible Research and Innovation (RRI) and Safety by Design as conceptual solutions to bridge the divide between societal–ethical expectations and the commercial exploitation of the nano-innovation value chain. Yet, there continues to be unresolved debates as to how RRI can be operationalized within the hegemony of neo-liberal western market-led innovation. Where innovation is inextricably bound to a European Union political economy based on free markets, competitive destruction, value creation, consumerism, and the never ending quest for increasing market share and economic growth. Does the future need a re-framing of risk governance to a new form of innovation governance? With a

model which combines a more agile regulatory framework, reflecting democratic processes, with a flexible, adaptable RRI within a new governance paradigm?

Maurice Brennan, Honorary Senior Lecturer, Environmental Nanoscience Group, University of Birmingham, UK.

The presentation will discuss the outcomes of doctoral research into the effectiveness of the current EU risk governance instruments in the responsible development of nanomaterials. This is practitioner based research using a Delphic methodology of elite actors in EU/UK government, regulation, industry, NGOs and academia.

Dafne Lemus

The regulation of bisphenol A in Denmark and Norway: How the problem of chemical safety is framed and addressed amidst scientific uncertainty

Bisphenol A (BPA) is a widely used ingredient in modern plastics with countless commercial applications. Several health risk assessments of BPA have been conducted in the last decade and conclusions on whether or not BPA poses a risk to human health at current levels of exposure vary greatly between assessments. BPA's controversy represents a heated debate where high scientific, political and economic stakes are at work.

This paper uses qualitative text analysis and semi-structured interviews to analyze how BPA has been regulated in Denmark and in Norway. It looks into how the BPA-problem is understood and framed in each country. In particular, it studies the different regulatory processes that took place, with the aim of describing how scientific uncertainty was accommodated in each process and policy outcome.

I will claim that in Denmark, BPA's problem is mainly seen as a public health concern which attracts vast political attention. As a result of this, policy-decisions concerning BPA are in general taken by the Danish Parliament mainly based on the invocation of the precautionary principle.

In Norway, BPA's problem is rather understood as an environmental concern which is addressed by a fragmented sector based approach – where the environmental authorities and the food and health authorities have different preferences on how to manage this chemical based on their particular regulatory traditions and expertise. As a result, there has been a split advice on how to manage BPA. One can claim that in the final Norwegian policy-solution, uncertainties are treated as technical problems.

I will argue that neither the Danish nor the Norwegian policy outcomes are fit to deal with BPA's complex biology and the intrinsic scientific uncertainty of BPA. There is a need to develop governance structures and institutions that are able to accommodate deeper uncertainties in the regulation of chemicals.

I am a recently graduated social scientist interested in the environment, in particular, in the regulation of chemicals. I have a natural science background in the fields of chemistry and molecular biology.

Simon Meisch

Politics of Water Security

In 2011, the water energy food security nexus was introduced as an emerging governance approach in order to deal with water security in the so-called era of man, the Anthropocene. The nexus aims to create policy integration in social fields seen as crucial to a global sustainable development, namely water, energy and food. It is meant to avoid detrimental effects on the natural environment and to create a development of which particularly the poorest of the poor worldwide take advantage. So, who can be against such an approach?

Discussions on the nexus take place against stereotypical doomsday scenarios threatening with water shortages, water wars and the like. Water security discourses highlight the importance of water for life on earth and particularly the poorest of the poor. By creating a sense of urgency, water is established as an issue politics should deal with. Meanwhile, policy prescriptions point in a different direction. In spite of the pro-poor rhetoric, governance approaches such as the water energy food security nexus only offer technofix solutions in a neoliberal environment. After all and paradoxically, it contributes to a post-politicisation of water. Instead of opening the political discussion, it will be closed due to a consensual and managerial governance that does only ask for the right technical and socio-technological means to be applied but does not engage in political deliberations on contested issues.

From a critical security studies' perspective, the nexus will be analysed. It will be argued that so far water security approaches do not deal with the normative dilemma emerging from a securitisation of water. Subsequently, it will be argued how water can be re-politicised by considering universal ethical approaches that are open to particular notions of the good life.

Dr Simon Meisch is heading the Junior Research Group 'Ethics of Science in the Research for Sustainable Development' at the International Centre for Ethics in the Sciences and Humanities (University of Tuebingen, Germany). He studied Politics and Modern German Literature at the Universities of Tuebingen and Edinburgh (Scotland). For many years now, he has been working on ethical issues in the sciences and environmental policies. His main research interests are ethics of water sciences and governance, concepts of sustainable development and the role of humanities in sustainability research.

15:30-17:00

Seminar Room B

TECHNOLOGY, INDUSTRY AND POLICY

Chair: Lars Nyre

Lars Nyre

State diffusion versus emerging media technologies: a critique of the DAB radio policy in Norway

A new technology can be diffused authoritatively by state agencies using regulations and other strong inducements. This article critiques a recent case of state diffusion of technology from Norway, and argues that this technocratic approach was unable to supply the best solution for radio in the future.

The article first presents the history of DAB radio in Norway from ca. 2000 to the present time. It is a striking example of a strategy for planned diffusion of a new technology to the entire population of a nation state. EU broadcasting industry invented and promotes DAB, established radio stations like the NRK and P4 weighed in to secure their continued dominance in the radio market, and these forces made a politically convincing case for DAB as the best infrastructure to invest in. The FM network will be shut down in 2017, and from then on regular radio listening must take place with a DAB receiver.

The article goes on to present an alternative approach that can be called emerging media technologies. It refers to the fact that technologies are developed all the time in civil society, in the school system, academia and the media industry. Prototypes from these ecosystems are regularly bought up and become big successes in the marketplace. In relation to the radio medium all of this innovativeness takes place on the Internet, with the smartphone as a crucial interface for listeners. The alternative to DAB would consist of a policy that secures a high-quality data network for the entire surface

area of Norway, with priority for public service media, and support of grass roots initiatives.

The rollout of DAB radio in Norway is a big investment for taxpayers and consumers, but may not lead to improvement. The critique in this article shows that: 1) Traditional radio qualities (like live hosted programs) may never get a foothold in the smartphone user context; and 2) DAB radio may not be able to incorporate the innovative genres and products of emerging media technologies, and become obsolete.

Lars Nyre is a professor of media studies at the Department of Information Science and Media Studies, University of Bergen. His is a long time lecturer at the bachelor program in new media, and specializes in a research method called "media design". Nyre has collaborated with colleagues about building and testing media prototypes, and has published widely from these experiments. A good example is "Locative journalism: Designing a location-dependent news medium for smartphones" (2012). Nyre is concerned with research methodologies and researcher autonomy. See "Media Design Method" (2014) and "Normative Media Research" (2009). Nyre continues to address issues that are relevant for the emerging paradigm for Responsible Research and Innovation (RRI)

Pål Nygaard

Creating OLGA – why certain technologies prevail

During the 1970s industry in Norway suffered structural challenges. Since then oil production have put its mark on Norwegian economy. Oil and gas was not, however, evident to be a prominent feature, because the reservoirs mostly were found offshore on deep-water depths. At the time, there were no technology available to ensure cost-efficient extraction of the vast reservoirs. The Norwegian Institute for Energy Technology did however develop a technology, a multiphase flow system, that enabled the oil companies to transport oil and gas directly from the bottom of the ocean to the beach relieving them of the costly platforms. This technology have prolonged and widened the oil production worldwide. How and why this technology was developed is the theme of this paper.

The multiphase flow system was originally developed at the Institute for Energy Technology (IfE) in their efforts to promote nuclear power in Norway. But during the 1970s it became evident that nuclear power was not going to be allowed by the politicians. The institute then searched for alternative uses of their technological expertise, an expertise that were developed since 1948. They investigated solar energy, wind energy and oil.

Why did their efforts culminate in the oil industry? Today the institute has moved more into solar energy. Since the key actors in establishing the national oil corporation in Norway had background from IfE it is tempting to highlight the actors as an explanation. In order to analyze this question I wish to combine actor-network theory, systems of innovation approach and a perspective on how state-sponsored expertise has shaped the development and use of new technologies.

Pål Nygaard, researcher II at BI Norwegian Business School. I have a PhD in Study of Professions from Oslo and Akershus University College of Applied Sciences with a thesis on the professional history of engineers. I have also written a book on the history of the Norwegian road department. My main research interest revolves around expertise and institutional conditions underlying technological and industrial development.

Ingo Schulz-Schaeffer & Martin Meister

Textual and materialized narratives. How narrative scenarios and prototype scenarios guide technology development

There is a substantial amount of research showing that the paths of technological innovation can be influenced by ideas about future technology. Most of this research focuses on broad socio-technical

visions and their role for the governance of technological innovations. There is much less empirical work on how narratives of the future actually guide engineers in their work of developing new technology.

In our talk we present conceptual and empirical results from the research project “Scenarios as patterns of orientation in technology development and technology assessment” (funded by the German Research Foundation, DFG). In this project we are focusing on situational scenarios, which often exist as more or less elaborated narratives that spell out the imagined future reality of a new technology within its imagined field of application. Our empirical data (60 interviews with researchers in the USA, in Japan, and in the EU) are from the field of Ubiquitous Computing where it is very common to refer to situational scenarios.

The results of our research show that there are several ways how engineers derive from situational scenarios requirements to be met by the imagined technology or by the imagined context of use. In our talk we want to contrast two manifestations of situational scenarios, narrative scenarios and prototype scenarios. Narrative scenarios present stories of imagined technological futures in written texts, pictures or videos. Prototype scenarios are physical realizations of such narrations within laboratory settings. We will point out that prototype scenarios themselves can be viewed as narratives, and we will argue that with respect to guiding technology development prototype scenarios often turn out to be especially powerful narratives.

Ingo Schulz-Schaeffer (Department of Sociology, Technical University of Berlin, schulz-schaeffer@tu-berlin.de) is a full professor of sociology of technology and innovation. He is the principal investigator of the DFG project “Scenarios as patterns of orientation in technology development and technology assessment”.

Martin Meister (Department of Sociology, University of Duisburg-Essen, martin.meister@uni-due.de) is a sociologist specialized in sociology of technology. He worked as a senior researcher in the just mentioned DFG project on the role of future concepts in Ubiquitous Computing.

15:30-17:00

Seminar Room C

PRACTICES OF THE DIGITAL

Chair: A. Saltelli

Doris Allhutter

Governmentality and Information Infrastructures

Linked data, big data and techniques related to semantic computing have adapted the AI technologies of the 1980s to the vast web resources of the beginning twenty-first century. Machine learning and algorithms evolve based on their exposure to an ever-increasing set of data (Introna 2016). The availability of huge amounts of public and private data and of user-generated metadata has inspired new, semi-automated practices of building an intelligent networked information infrastructure that promises to equip computers with common sense, automated reasoning and the capacity to communicate with a variety of other electronic devices.

My paper explores two aspects of this current paradigm change in information infrastructures: 1) the transformation of practices of knowledge generation (from deductive to inductive inference) and 2) the involvement of “collective intelligence” or a global digital workforce to make use of the rapid growth in data for the transformation of these practices. Based on these two aspects, I will sketch out

how entangled human/machine practices enact phenomena of difference and structural inequality in and through the emerging infrastructure.

Asking what forms of politics emerge together with technological emergence, my paper considers conceptual approaches from agential realism, historical materialism and affect theory. I argue that different modalities of power interlock in these hybrid agencies to perform a multi-layered form of governmentality. Foucault's concept of governmentality focuses on how practices, knowledge, and power interconnect to co-produce societal structures and particular governed subjects. I will discuss in how far the concept of governmentality helps explain the way in which information infrastructures materialize particular enactments of the world and how the mentioned approaches can enrich an analysis of these enactments.

My background is in political science and I am researcher in STS. My research interest is in how information systems co-emerge with hierarchies and hegemonies in society and organizations, in the affective, discursive and material entanglements of systems and the practices they entail in development and use contexts.

My current research takes a socio-political perspective on semantic technologies and development practices in this field.

Christian Erbacher

How ICTs have shaped working practices in philosophy

Focusing on the case of editing the writings of the philosopher Ludwig Wittgenstein (1889-1951), this paper sketches how digital technologies have changed the work of editors in philosophy and the scope of their philosophical editions. A first generation of editors (1951-1977) was occupied with understanding Wittgenstein's philosophy and creating volumes that would render his thought easily accessible. By contrast, the editorial work of later generations (1977-2001) is characterized by solving technological problems of how to picture and encode manuscripts with minimal discrepancies between sources and editions. As of today, editors organize an online platform for collaborative research on manuscripts and on the use of semantic-web software in philosophy.

This change of focus in philosophical editing is not only scholarly or technological progress: it mirrors a fundamental change in the standards and aims in the humanities that has been fostered by the development of ICTs and by changing incentives of research funding policies. The resulting products (editions) in turn have shaped the scholarly reception, perception and discourse.

Thus, the history of editing Wittgenstein provides a case study that may serve as an example for a STS of the humanities. Exactly this is the prospect of the newly established Collaborative Research Centre "Media of Cooperation" at the University of Siegen (Germany). The talk explores the promises of this project on the basis of personal experiences at the Wittgenstein Archives at the University of Bergen and results of a 3-year research project "Shaping a Domain of Knowledge by Editorial Processes: the Case of Wittgenstein's Works". The upshot of the presentation is that the history of editing Wittgenstein may contribute to a critical understanding of how developments in media and technology have shaped the working practices and objectives in the humanities in the 20th century.

Christian Erbacher is a postdoc in the Collaborative Research Centre "Media of Cooperation" (SFB 1187) at the University of Siegen. His research on the history of editing Wittgenstein is envisaged to provide an example for STS of the humanities. After graduating in psychology at the University of Regensburg (Germany), he has worked in the eContentplus project DISCOVERY at the Wittgenstein Archives at the University of Bergen and lead the research project "Shaping a Domain of Knowledge by Editorial Processes: the Case of Wittgenstein's Works" (NFR 213080) at the University of Bergen.

Frédéric Claisse

“I, Robo-Writer”: Imaginaries of Narrative in the Age of Data Storytelling

While it is too early to speak of a “narrative turn” in Big Data, recent developments in automated storytelling technologies have contributed to renew the rhetoric of fears and promises in this domain. In January 2015, an announcement made by Associated Press that corporate earnings stories will be automated raised concerns that journalism could be the next “disappearing job”. A year later, Qlik, a software company within the field of Business Intelligence management, partnered with Narrative Science, a disruptive company that uses “advanced natural language platform” to generate stories “hidden” in the data, rendering manual analysis almost obsolete. Interestingly, algorithm and storytelling play an equal part in these sociotechnical imaginaries – narratives are even described as full-fledged technologies per se, with a sensemaking potential only enhanced by automation. It is reasonable to think that these advances would not have been possible without the amount of knowledge about storytelling slowly built up in the humanities, especially in a domain such as narratology, which considered stories as formal, combinatorial structures long before software tools could identify and recode their basic grammatical components. In this paper, we propose to reverse the premises of the relation between narrative and technology, by exploring the imaginaries of storytelling as a technology revived by technology. On the one hand, the rediscovery of storytelling by knowledge management is in line with an established trend in using stories as a means of influence in non-literary areas such as advertising, public relations or human resources. But on the other hand, as literature always paid attention to technological evolution, it has much in common with historical (cut-up, constrained writing) as well as more recent literary possibilities offered by automation.

Frédéric Claisse is a postdoctoral researcher at the Department of Romance Languages and Literatures at the University of Liège. His research interests include epistemology of social sciences, participatory methods, foresight and visions of the future. His current project, supported by the Fund for Scientific Research (FNRS), investigates the influence of storytelling practices on the contemporary novel.

15:30-17:00

Seminar Room D

SCIENTIFIC GOVERNANCE, IMPACT, AND THE PUBLIC

Chair: Noela Inverezzi

Ane Møller Gabrielsen

Well Constructed Knowledge Commons

The point of departure for this paper is the RRI project Crossover Research 2.0: Well Constructed Knowledge Commons. The project envisions a collaborative mode of integration where computer scientists and biologists work with sociohumanists to design a “prototypical” Knowledge Commons that will enable computational drug response modelling of cancer drugs.

Constructing digital Knowledge Commons is not simply about presenting knowledge in a digital format. It is also a matter of finding novel forms of representation that make this knowledge accessible for different types of users for different type of purposes. The paper contextualises these novel representations by investigating how the Knowledge Commons is constituted through relations between heterogeneous elements including institutions, curators, companies, databases, software and information.

The paper focuses on the web-platform SciCura, a tool for 'curating' knowledge. SciCura is here viewed as a translating device, both in terms of aligning the different actors, but also in terms of actual translation between the many standards and terms used in bioinformatics. SciCura envisions a future of "community curation" where everyone can contribute to the common good, which is understood as freely accessible biological knowledge. Thus, in order to succeed, SciCura also needs to translate visions for the future, in particular regarding who should have access to which information.

The SciCura-enabled Knowledge Commons expresses a vision of a desirable future for the life sciences and systems medicine. This paper investigates this vision by tracing SciCura's development and function in the network as the engagement of relevant stakeholders and end-users takes place. It also asks whether feeding these analyses back into the project can provide a way of practicing RRI that invites reflections on what possible futures the Life Science Knowledge Commons has the potential to bring into the world.

Ane Møller Gabrielsen is a postdoctoral fellow at the Programme for Applied Ethics, Department of Philosophy and Religious Studies, Norwegian University of Science and Technology (NTNU). Research interests include Responsible Research and Innovation (RRI), Science and Technology Studies (STS), Knowledge Management, Feminist Theory, Posthumanism and New Materialisms.

Tsjalling Swierstra

Soft impacts of Cyber-Physical Systems: a project evaluation

I will present a scenario study on the future soft impacts of Cyber-Physical Systems, conducted on request of the Science and Technology Options Assessment Panel (STOA) of the EU (together with Enzing, Kamphof, Sharon, and van Woensel). Cyber-Physical Systems (CPS) stands for intelligent robotics systems, linked with the Internet of Things, or for technical systems of networked computers, robots and artificial intelligence that interact with the physical world. In this interactive foresight exercise we developed four scenarios highlighting plausible soft impacts of the introduction of CPSs into the areas of manufacturing, (health/disability)care, agriculture, safety, and transportation. Whereas hard impacts are quantitative, clearly linked to non-controversial conceptions of harm, and causally linked to the technology, soft impacts by contrast are qualitative, morally ambiguous, and coproduced by the users of the technology in question. (Swierstra & te Molder 2012, Swierstra 2015) The central irony I will reflect on is that soft impacts are defined by the fact that they are more or less discarded by (technology and) policy actors, as being too 'soft' to merit serious public attention. But in this case it the policy actors themselves requested this particular foresight exercise on soft impacts. Logically, if policy makers embrace soft impacts they can no longer be called 'soft', as they are now evidently sufficiently 'hard' to be taken seriously. To explore this irony, I will assess to what extent our 'soft concerns' survived the 'legal back casting' procedure that served as link between the scenarios and the policy makers.

Prof. Dr. Tsjalling Swierstra is head of the Philosophy Department at the University of Maastricht and visiting professor at NTNU in Trondheim. He is member of the Maastricht University Science and Technology Studies (MUSTS) research program, director of the centre for Ethics and Politics of Emerging Technologies, member of the Advisory Committee on Health Research, and of the Program Committee of the 'Responsible Innovation' program funded by the Dutch Research Council NWO. He is initiating co-founder of the Journal for Responsible Innovation. He has published widely on the ethics of new and emerging science and technology (NEST-ethics), on the 'soft impacts' of technology, and on technomoral change, i.e. the mutual shaping of science and technology and morals.

Chris Toumey

The Value of SEIN Research

For more than fifteen years, researchers in the Humanities and Social Sciences have addressed the topic of SEIN, i.e., societal and ethical implications of nanotechnology. This is an umbrella term, crafted by the U.S. National Science Foundation, to embrace studies of nanotech from the perspectives of the Humanities and Social Sciences. Funding from the U.S., the E.U., the U.K., Germany, Norway, Canada and other governments has nurtured a transatlantic community of scholars in this area. That brings us to an important question: are we talking only to ourselves, or do our publications, insights and conclusions reach populations outside of the academic disciplines of the Humanities and the Social Sciences? My research, funded by the U.S. NSF, is based on interviews with persons in four populations of stakeholders, namely: [A] academic scientists and engineers working in nanotech; [B] persons in U.S. government science policy, e.g., program directors; [C] nanotech-related business and industry, especially start-ups using nanotech; and, [D] attorneys in nanotech-related intellectual property law. If SEIN research is not useful to these latter populations, are there ways to make our research more useful to them? And, can this work generate insights and recommendations that would be useful to STS research on other forms of emerging science and technology?

Chris Toumey is a cultural anthropologist who works in the anthropology of science. Since 2003 he has worked on societal and cultural issues in nanotechnology. His interests include these topics: public engagement with nanotech; religious reactions to nanotech; issues in the history of nanotech; and, epistemological issues of technology and aesthetics in images of nanoscale objects. He is the author of more than eighty publications on nanotechnology, including his humanistic commentaries that appear four times a year in Nature Nanotechnology.

15:30-17:00

Seminar Room E

ENVISAGING SYNTHETIC BIOLOGY

Chair: Nora S. Vaage

Karen Kastenhofer

“Systems biology is the worst label of all”: identity and community under techno-scientific conditions

STS scholars have been struggling for a while now with how to conceive of new phenomena such as systems biology and synthetic biology. Do these represent “empty signifiers”, “buzzwords”, “emerging research fields” or new (sub-)disciplines? I argue in my presentation that all of these attributions are neither completely wrong nor completely right; rather, they do not represent new phenomena in a ceteris paribus environment but should best be understood as manifestations of a changing techno-scientific context, in which ‘emergence’ is perpetuated, ‘futures’ are frozen, discourse has gained a new role and disciplinarity is re-invented via new modes and conditions of enculturation, socialisation and self-representation.

In my presentation I aim at addressing these contextual changes and their impact on the ways identity and community are formed and performed with regard to systems biology. My empirical study points towards the changing interrelation of research and education (abandonment of the Humboldtian model), changes in socialisation processes (e.g. iGEM competitions adding to the enculturating role of university curricula), changes in the funding regime (to a ‘label-oriented’ as well promise-fuelled

funding programmation) and changing institutional landscapes within techno-science (interdisciplinary centers, transnational collaborations, hybrid institutions). All these aspects result in the need to re-think our understanding of (techno)scientific identity and community.

Karen Kastenhofer works in science and technology studies as well as in technology assessment. She focusses on the reconstruction of (techno)epistemic cultures, the analysis of critical issues of technoscience governance and the advancement of new modes of technoscience assessment.

Chris Mellingwood

Envisioning experimental space through automated laboratory work: The politics of robotics in UK synthetic biology.

The first recommendation of the UK's Synthetic Biology Strategic Plan 2016 is to accelerate commercialisation of 'biology-enabled industries' by investing in 'empowering biodesign technologies'. My presentation unpacks these terms and uses observations of current laboratory practices to ask who is being empowered by so-called 'disruptive technologies'. Using qualitative data gathered for ongoing PhD research, I offer alternative perspectives on the meanings and mechanisms behind the 'expansion of experimental space' promised through increasing laboratory automation.

Drawing from six months of ethnographic data gathered in UK molecular biology research laboratories, and attendance at several conferences, this paper examines how political support for applications-based synthetic biology is instrumentalising laboratory automation as part of commercialisation efforts. I will argue that the visions and promises of automated technologies found in the UK strategic plan are disconnected from current practices that use computer science knowledge to augment human research capabilities in molecular biology. Furthermore, to present automation as a vessel, a conduit for feeding an imaginary 'innovation pipeline' does not take account of the long histories and disparate uses of automation in science over time.

UK government funding for synthetic biology research has focussed on capital investments in technologies that are conducive to the industrialisation of biology. For research laboratory users in my study, however, automation offers the potential for an expansion of experimental space that may or may not align with the aims and expectations of applications-based industrial biotechnology; these users, therefore, separate technological empowerment from 'biology-enabled industries'.

The preliminary findings offered in this paper explore the promissory dimensions of automation in biological research and engineering, with specific reference to how researchers and technicians at the lab bench understand, adopt and ignore disparate forms of automated laboratory practice.

Chris Mellingwood is PhD candidate in STS at Edinburgh University. Previously Chris worked on technology adoption research in the NHS. He studied for an MSc at the University of Manchester, focusing on narratives and imaginaries around the emerging field of synthetic biology. Currently Chris's PhD is affiliated with the ERC-funded Engineering Life project at Edinburgh. His interests include understanding 'engineering imaginaries' in biology, with a specific focus on the promissory dimensions of laboratory automation, and the nature of laboratory work from current users' perspectives.

Alexander Bogner & Anja Bauer

Let's (not) talk about synthetic biology: The framing of an emerging technology

Synthetic biology is an emerging research and technology area which, so far, lacks a broader public debate. Hence, it remains unclear what concerns, interests and values of the public might be relevant for responsible research and innovation of synthetic biology. To foster the societal dialogue and capture the views and imaginations of experts, stakeholders and citizens, the project Synenergine

organized a range of public engagement events, including workshops, panel discussions and theatre performances. On the basis of eight selected events, we explore and analyse the possible configurations of the emerging debate on synthetic biology. Conceptually, we draw on the notion of frames. By focusing on certain aspects of an issue and omitting others, frames offer an idea of organisation, which suggests what the debate is about.

Our analysis of the events indicates that the debate on synthetic biology differs from previous technology controversies. While the 'canonical' frames that dominated earlier technology debates, i.e. ethics, risk and economy, are still relevant they become less dominant and their meaning is changed and broadened. In addition, new frames emerge as salient. Most notably, the societal progress frame presents synthetic biology as a key to current grand challenges. This frame bears the risk of overhyping the technology and leaving little room for contentious statements. Lastly, since applications of synthetic biology are largely lacking the debate becomes easily abstract and detached from a real world context. In several events participants hardly discussed about synthetic biology but voiced generic statements on technologies and their governance. Such a meta-framing bears the risk of reproducing commonplace statements and is not suited to capture the views and imaginations of citizens, experts and stakeholder with regard to the emerging technology synthetic biology.

Alexander Bogner is a senior sociologist at the Institute of Technology Assessment of the Austrian Academy of Sciences. His main research interests are in technology controversies, the role of public participation in technology and environmental issues, social studies on expertise and the relationship between ethics and technology.

Anja Bauer is a political scientist at the Austrian Institute of Technology Assessment. She studies technology, environmental and sustainability policies and politics with a focus on the role of science and expertise in policy-making and participatory governance.

17:00-18:00

Auditorium (The Egg)

PIKSEL DEBATE: MICROPLASTICS IN MARINE ORGANISMS

Public discussion with local scientists, fisheries representatives, artists, NGOs and other interested parties on microplastics in marine life forms

Part of the DIYBio/art workshop organised by Pikel Festival for Electronic Art and Free Technology in collaboration with Centre for the Study of the Sciences and the Humanities (SVT), UiB and the EC project SYNENERGENE, and run by artists and scientists Kat Austen and Gjino Šutić. This discussion provides a forum for interested parties and conference participants to exchange viewpoints and stimulate reflection around how plastics in our environments, particularly in the oceans, affect a range of life forms. The discussion is moderated by Ana Delgado, Centre for the Study of the Sciences and the Humanities.

FRIDAY 14TH OCTOBER

09:00-10:30

Auditorium (the Egg)

SCIENCE POLICY

Chair: Silvio Funtowicz

Andrea Saltelli

Innovation policies in a fact-less society

A reflection on 'Politics in the era of emerging technologies' should factor in an unprecedented crisis in the governance of science and in science quality control mechanisms. As this crisis concerns all aspects of scientific life, from experiment reproducibility to the peer review system, from the use and abuse of metrics to the resurgence of ever more egregious cases of malpractice and misconduct, the legitimate question arises of how the ever increasing pace of innovation will be governed, especially when institutions charged with science advice choose to ignore the severity of the crisis. The doubt arises whether the conditions are being created for the resurgence of a perfect storm vindicating the direst prediction about the 'megamachine' made by the ecologists of the seventies – today resurfacing as a perception of innovation as an autonomous and self-organizing entity.

A recently published book¹ explores some of these scenarios and attempts to map the different diagnoses and etiologies of the crisis onto a possible sets of remedies from both within science (institutions and individual scientists) and from without, from the emerging ecosystem of 'amateur-citizen-scientists' (counting galaxies) and 'activist-citizen-scientists' (Love Canal) up to include the emergence of a 'scientist-citizen' movement within established science itself.

¹Benessia, A., Funtowicz, S., Giampietro, M., Guimarães Pereira, A., Ravetz, J., Saltelli, A., Strand, R., van der Sluijs, J. (eds.), 2015, *Science on the verge*, Published by The Consortium for Science, Policy and Outcomes at Arizona State University.

Andrea Saltelli (SVT-UiB) has worked in physical chemistry, environmental sciences, applied statistics, impact assessment, and science for policy – in particular sensitivity analysis of model output, a discipline in which statistical tools are used to interpret the output of mathematical or computational models, and sensitivity auditing, an extension of sensitivity analysis to the entire evidence-generating process in a policy context. His latest work is a contribution to the volume Science on the Verge on the emerging crisis of science's quality assurance system.

Margaret Kosal

Emerging Science and Technologies: Diplomacy, Security, and Governance

This paper explores the relationships between emerging science and technology (S&T) and diplomacy as part of overall national foreign policy, especially in the inter-connected, complex world of the early 21st Century. Challenges of realizing the strategic value of science diplomacy are discussed with emphasis on dealing with structural and personal challenges of the balancing technical and foreign policy expertise and the governance questions surrounding cutting-edge commercial, clinical, and research science and technologies. Within today's most cutting-edge S&T innovations – cyber, biotechnology, the cognitive sciences, nanotechnology, and the intersection with advanced computing

and information analytics – are emerging capabilities cited as carrying the potential of bringing utopian or dystopian visions closer, including having an even greater potential than nuclear weapons to radically change the balance of power. Globalization and the information revolution, including the Internet and other communication leaps – have led to much greater visibility into the availability and potential for science and technology. Science is and will continue to enable new technological developments becoming accessible and affordable to a larger number of nations and within the grasp of non-state actors: advanced technology is no longer the domain of the few. For scholars of international diplomacy and security (as well as science and technology studies), the interaction of science, technology, and the causes and outcomes of conflict and cooperation are long-standing areas of inquiry and are prominent factors in strategic choices, deterrence postures, security doctrines, international regimes, trade policy, and programmatic choices. This paper will discuss approaches and challenges to science (and technology) diplomacy and how it is linked to foreign policy and national security aims, including organizational structures (such as Track I & II diplomacy), bureaucratic politics, risk, public engagement, and governance challenges of balancing realization of the beneficial implications of emerging S&T while minimizing the potential harm and other threats.

Margaret E. Kosal, PhD, is Associate Professor of International Affairs, Sam Nunn School of International Affairs, Georgia Institute of Technology. Kosal's research explores the relationships among technology, strategy, and governance. She focuses on two, often intersecting, areas: reducing the threat of weapons of mass destruction (WMD) and understanding the role of emerging technologies for security. Kosal earned a doctoral degree in Chemistry from the University of Illinois at Urbana-Champaign (UIUC) working on biometric and nano-structured catalytic materials.

Cristina García & Roger Strand

Towards a Redefinition of the Role of Innovation in the European Growth Strategy

In the face of the present dilemmas about the pressure on the natural resources, the fossil dependence and the problem of unemployment, the European Union has boosted the “growth strategy based in innovation” of the Horizon 2020, which claims “economic growth and quality employment through smart, sustainable and inclusive growth”.

On one hand, the goal of economic growth seems to emerge even stronger and the role of innovation as its vehicle of expansion. Particularly the theories of endogenous growth appoint the technical progress as an indispensable engine of economic growth, opening the way to the notion of the Knowledge Economy. On the other hand, what used to be the contradiction between economic growth and sustainability now appears relieved with new promises and hopeful visions travelling in this strategy: decoupling growth from the fossil dependence and the scarcity on the natural resources, through the innovatory development of new and more efficient products and services.

The persistence of the current situation of crisis seems to be a symptomatic indicator that a better understanding is required about the relation between innovation, economic process and employment; in other terms a more complex one, because it is not possible to make a general assessment of what is innovative and sustainable in abstraction from the context where we find ourselves, from the social and cultural values in which the assessment is embedded.

Since we perceive empirically inadequate and problematic contradictions and assumptions in this strategy, we aim to (1) trace underlying assumptions using history of economics as a resource and (2) to identify sociotechnical imaginaries embedded in this strategy; so that the disclosed criteria can be used to discuss the desirability of these paths, what kind of innovation we want and for what purposes. And finally, could we think of other paths more desirable?

Cristina García is a PhD candidate of the Institute for Environmental Science and Technology of the Universitat Autònoma de Barcelona. Her current PhD research focus on the narratives and imaginaries of innovation embedded in Europe's innovation-based growth strategy.

Roger Strand is professor at the Centre for the Study of the Sciences and the Humanities, University of Bergen, and Co-Director of the European Centre for Governance in Complexity. He works broadly on issues of governance at the science-society interface and emerging S&T.

09:00-10:30

Seminar Room A

ART & TECHNOSCIENCE

Chair: Nora S. Vaage

Rory Viner

Future Emotions & Technology: How Synaesthesia, Technology and Experimental Music Dilate Emotional Geographies

Learn how data and human experiences can be decontextualized and recontextualized to expose new facets of understanding. Our sense of self, history, and geography all can be re-imagined and mutated through technology. Data can be presented through sound in ways both alienating and intimate that cannot be replicated in charts and graphs. By hearing data or through live sonic feedback of real time events we are forced to think in different ways.

This talk includes an exploration of artificial synaesthesia; current and previous experiments to create new emotional reactions by intentionally switching and blending our senses through technology, as well as experiments and methods of data sonification and translation of live action through sensors and synthesizers. There will be live demonstrations of techniques and a look forward to future possibilities for artificial synaesthesia, as well as the future of emotions and how our sense of what music is and what it can do for humanity may change.

Rory Viner is a sound artist and experimental composer based in Tokyo, Japan. His works have been featured in Wired Magazine, Vice's Motherboard & The Japan Times as well as various other international news outlets. His current work focuses on synesthesia (the mixing of senses), sensors, data and sound.

Silvia Casini

Neuroscience-based Art: a Challenge to the Neuro-realism Fallacy?

Since the so-called 'Decade of the Brain' in the 1990s, the images produced through brain imaging techniques have captured the public imagination and scholarly attention far beyond the closed circuit of the neurosciences: the possibility to visualize the human brain and hence to grasp the materiality of thinking and feeling seemed possible as never before. The definition of one's own identity seems to be increasingly dependent on the biology of the brain, to the point where the category of personhood has been substituted by brainhood, the ontological belief for which "the brain is the only part of the body we need in order to be ourselves" (Vidal 2009: 6). The talk will discuss, first, how brain scans obtained with Magnetic Resonance Imaging (MRI) are created and read inside the laboratory; second, it will address a few examples of art and science collaborative projects that stimulate our visual and critical thinking about brain imaging and its wider social, cultural and ethical implications. As Dumit argues in his article 'How (Not) to Do Things with Brain Images' (2014), neuro-realism is the idea that brain scans are the visual evidence of brain activity despite the complexity inherent not only

to data acquisition but also the actual image creation. If neuro-realism is the fallacy of neuroscience, are artists mainly reproducing it?

Silvia Casini is a lecturer in visual culture and film at the University of Aberdeen. She was awarded an AHRC-funded PhD in visual studies by Queen's University, Belfast (UK). Among her research interests there are: the aesthetics and epistemology of scientific visualization. Her essays appeared in among others Leonardo, Configurations, Contemporary Aesthetics, The Journal of Media Practice, Tecnoscienza, Museums ETC as well as in edited collections for Bloomsbury, Nordic Academic Press, etc.

Tetiana Gardashuk

Art-Science-Technology Convergence and Public Perception of NESTs

Since the epoch of Renaissance science and art were viewed as opposite forms of cognition of the world. Most generally, science was considered as a system for organizing the knowledge about the structure and behavior of the natural and physical world, based on facts that you can prove. In contrast art was defined as a way to express ideas or feelings which is based on imagination. ([oxfordlearnersdictionaries.com/definition/english/art_1?q=art](https://www.oxfordlearnersdictionaries.com/definition/english/art_1?q=art)).

Development and expansion of new emerging science and technologies (NESTs) is challenging a society and impacts all aspects of social life and human perception of and attitude towards the world.

Modern art is very sensitive to achievements in science/technologies. On the one hand, art reacts on challenges of NESTs and tries to rethink human/nature/technology interaction and to draw public attention to them as well as to simulate human future. On the other hand, art seeks to use new tools, techniques and materials (electron microscopy, nanoparticles, living cells, tissues, bacteria, etc.) to express artistic comprehension of the world and changes it faces.

At the same time modern science needs to be more understandable for society and seeks for new ways of communication with the public outside of scientific communities. Science/technologies are also looking for new forms of self-presentation through media, exhibitions and performances. For popularization of results of research science and technologies use artistic means and language. For instance, FASEB aims to share the beauty and excitement of biological research with the public through the BioArt competition [<https://www.faseb.org/Resources-for-the-Public/Scientific-Contests/BioArt/About-BioArt.aspx>]. These two tendencies result in convergence of science, technologies and arts (Information Art, High-tech Art, BioArt, Transgenic Art, NanoArt, etc.).

The goal of presentation is to analyze some forms of art-science-technology convergence and the ways it influences public attitude to NESTs.

Tetiana Gardashuk, leading scientific researcher, H. Skovoroda Institute of Philosophy, National Academy of Sciences of Ukraine. Dr. of sciences in Philosophy; thesis "Contemporary Ecologism: theoretic backgrounds and practical implications" (2006). Current spheres of scientific interests: sustainable development, NESTs, nanoethics, BioArt.

Participated in DAAD German Academic Exchange Service (2013) (Institute for Technology Assessment and System Analysis; Karlsruhe Technological Institute) (Germany) and in 6th S.Net annual meeting (2014)

09:00-10:30

Seminar Room B

RRI, EDUCATION AND PUBLIC PARTICIPATION*Chair: Rasmus Slaattelid*

Anja Bauer, Alexander Bogner & Daniela Fuchs

A better way of engaging? How Responsible Research and Innovation redefines participation in science and technology

Responsible Research and Innovation (RRI) not only renews but redefines the call for participation in science and technology. With a view to newly emerging technologies, participation is not any longer associated with protest-shaped demands by concerned citizens for being involved in contested decisions about technology decisions but is substituted by what STS scholars have called 'invited participation'.

Based on a systematic review of scholarly literature and policy documents we discuss different ways in which societal engagement is (re)conceptualized in the context of RRI. By comparison to existing approaches of public participation in S&T we specify whether and to what extent RRI introduces novel perspectives of and requirements for societal engagement in research and innovation.

Drawing upon the empirical analysis of eleven societal engagement events in the area of synthetic biology, we discuss how these new requirements for engagement are met and in how far early invited participation constitutes a 'better' way of engaging the public. We show that engagement events are often organized in a manner that favors a detached, rational and tame debate over emotional statements and controversies. While some may welcome this as an indication that a potentially controversial technology could be discussed calmly in a "rational" discourse, a factual and calm discussion may also entail sterility. Such an expert-like debate may only give the illusion of conflict-free technology developments while postponing conflicts to a later time – a situation RRI is intended to avoid. Hence, engagement in the context of RRI should not only aim at involving an increased number of participants at an earlier stage but also at enabling emotions, affective reasoning and controversies.

Anja Bauer is a political scientist at the Institute of Technology Assessment of the Austrian Academy of Sciences, focussing on the role of expertise, science and public participation in technology and environmental governance.

Alexander Bogner, Austrian Institute of Technology Assessment, is a senior sociologist with a special focus on science, technology and the environment and empirical work in biomedicine, agri-biotechnology and emerging technologies.

Daniela Fuchs is a researcher at the Austrian Institute Technology Assessment with a focus on nanotechnology and neuro-enhancement.

Ilse Marschalek

RRI – how would the public buy in?

Public engagement is one of the key features of the Responsible Research and Innovation concept (RRI) which is currently being implemented within the European research area. Already very first definitions of the RRI concept had emphasised its importance. Finally, it has become an integral part of all policy dimensions and process requirements that the concepts seeks to encompass. RRI is intended to identify and accommodate public concerns when developing new technologies by engaging a

wide range of actors in an interactive and transparent process. RRI thus requires the identification of relevant public values. Such values should be drawn from the experience of the public, by extracting them from public debate. However it is unclear what such processes could look like. Questions remain unsolved about its practical implementation and there is only little empirical research available on how civil society could meaningfully participate in complex research and innovation and decision making processes.

Furthermore, when understanding responsible research and innovation as a meta-responsibility there is also a need for the incorporation of reflexivity into RRI processes. That means, all stakeholders should be engaged in (self-)reflection activities that stimulate critical thinking and foster responsible mind-sets. To discuss common values and responsibilities therefore requires methods and formats for reflection and deliberation for all actors. The ongoing EC funded "RRI tools" project is providing resources which are meant to support this demand. The project is offering among other resources a self-reflection tool to stimulate questions and to enhance the implementation of RRI principles. Within the presented study participatory evaluation methods were applied assessing how civil society actors responded to the RRI concept and the dimension of public engagement when confronted with questions for self-reflection as they were suggested by the self-assessment tool. Results will contribute to answer open questions on the needs of civil society actors and how they perceive their needs being addressed by the RRI concept.

Ilse Marschalek, Sociologist, Centre for Social Innovation, technology and knowledge unit carrying out studies at the interface between technological and societal innovations. Special research interests are inter- and transdisciplinary collaborations, participation and involvement of non scientific persons into research processes. Currently she is involved in the RRI Tools project (www.rri-tools.eu), elaborating stakeholder consultation methodologies. Recently she was the coordinator of the NanOpinion project which involved involved hard to reach parts of the public.

Gema Revuelta & Núria Saladié

RRI education at the university level and the HEIRRI Project

The HEIRRI project (Higher Education Institutions and Responsible Research and Innovation) aims to integrate the concept of Responsible Research and Innovation (RRI) within the formal and informal education of future scientists, engineers and other professionals involved in the research and innovation process, in order to foster its further alignment with societal needs, values and expectations.

RRI can potentially make research and innovation investment more efficient, while at the same time focus on global societal challenges. That is why it is important to learn as early as possible the skills and tools to incorporate RRI as a regular part of professional practice. The impact of HEIRRI is expected to be a greater social involvement of the higher education institutions and their role with and for society, and also to have future researchers and innovators with the tools, skills and qualifications to truly engage with society.

Although HEIRRI takes as its starting point the six RRI key aspects identified by the European Commission (public engagement, gender, open access, science education, ethics and governance), the project wants to stress the potential of RRI as a transformative, critical and radical concept.

HEIRRI will create a State of the Art Review and a Database. Various stakeholders will participate in debates and reflections on RRI Learning through online and offline activities. Results from the Review and Database will be the basis for training programs and formative materials that will offer skills to solve specific research and innovation related problems. Materials will be designed for different educational levels and supported by multimedia materials. All HEIRRI results will be uploaded on open access at the RRI Tools platform. HEIRRI will also develop an internationalization plan to guarantee the

future use of the materials around Europe and beyond. We propose an overview of the HEIRRI project, highlighting its strengths and expected outcomes. The insightful presentation of HEIRRI can add value to the panel.

Gema Revuelta, Director of the Studies Center on Science, Communication and Society from Universitat Pompeu Fabra, associated professor of Science Communication and Director of the Master Degree on Science Communication at the same university. Coordinator of H2020 project HEIRRI (Higher Education Institutions and Responsible Research and Innovation). Has participated in several European projects (ENSCOT, ESCITY, STEPE, MASIS, PLACES and NERRI) and international projects (IBAMOCA).

Núria Saladié, Project manager of HEIRRI. Since 2013, assistant with FP7 projects PLACES, KiiCS and NERRI.

09:00-10:30

Seminar Room C

RESPONSIBLE BIOTECHNOLOGY II

Chair: Ellen-Marie Forsberg

Xueying Han & Richard P. Appelbaum

China's STEM Research Environment

The Chinese central government has invested heavily in 'indigenous innovation' over the past decade in hopes of creating a Chinese economy that will have decreased reliance on foreign technologies. According to the 2014 Science and Engineering Indicators, China's global share of scientific publications is second to only the United States. Unfortunately, China's research environment, particularly that in STEM disciplines, has been heavily criticized as numerous cases of fabrication, falsification, and academic corruption have come to light.

There are, however, no comprehensive studies on China's current STEM research environment. Questions such as "what type of conditions do Chinese researchers work under," "what is the funding situation in China", and "what is graduate education like in China" go largely unanswered. Most of what is known about China's scientific research environment is either anecdotal, or based on qualitative studies with small sample sizes. These glimpses into China's research culture suggests a broken system where scientific misconduct is rampant, research funding is biased and non-transparent, and innovative and creative thinking gives way to rote-memorization and staying 'inside the box.' Whether these observations can be generalized to the larger research environment in China or whether they represent a biased view is unclear because there is no systematic study of China's scientific research environment.

This study provides the first comprehensive, empirical assessment of China's contemporary STEM research environment based on 731 completed on-line surveys and 17 follow-up interviews. We assess a range of factors that affect China's research environment from its funding schemes and reward systems, to the confluence of domestically trained and internationally trained researchers, to the role of government, to the challenges that the system needs to overcome if China is to become a world leader in scientific research.

Dr. Richard P. Appelbaum, Co-PI, Center for Nanotechnology in Society, UCSB; Research Professor, Global & International Studies, UCSB (corresponding author). Dr. Appelbaum has published extensively in the areas of emerging technologies, particularly in China; the globalization of business; the sociology of work and labor; and social theory, urban sociology, and public policy.

Dr. Xueying (Shirley) Han, Post-Doc, Center for Nanotechnology in Society, UCSB. Dr. Han received her PhD from the Ecology, Evolution, and Marine Biology department at UCSB in the Fall of 2013, and joined CNS in 2011.

Koen Beumer

Who is the African farmer? The discursive politics in agricultural biotechnology for development

This paper examines discursive politics of biotechnology for development by focusing on the figure of the smallholder farmer. The claim that agricultural biotechnology can benefit development is widely contested. This controversy revolves around diverging accounts of the impact of biotechnology on smallholder farmers, who are considered the main subjects of development (Stone & Flachs, 2014).

I investigate the different farmer subjectivities that are constructed in this controversy in Africa. Based on semi-structured qualitative interviews with a wide range of stakeholders in Kenya and South Africa, as well as extensive document analysis, this paper demonstrates that the diverging assessments biotechnology's impact on development are rooted in different ideas about the smallholder farmer.

The paper will highlight that depending on how the farmers is constructed as subject of development, different forms of evidence are required for claims to be credible. For example, evidence about the decreasing pesticide requirements fall on deaf ears for those who consider farmers as guardians of cultural heritage while evidence of increasing farmers debts have little meaning for those considering farmers as agents in achieving national food security.

Literature on the politics of emerging subjectivities in technoscience has predominantly focused on issues of democracy and the construction of publics (e.g. Irwin, 2006; Michael, 2009). By drawing upon anthropological literature on the construction of farmer identities (e.g. Burton, 2004; Haggerty et al., 2009; Schneider, 2015), this paper extends the scope of this literature to include emerging subjectivities in issues of development.

Koen Beumer obtained an MPhil (cum laude) in Science and Technology Studies at Maastricht University, the Netherlands. Koen has investigated emerging technologies in developing countries when working at the Advisory Council for Science and Technology Policy (AWT), the University of Amsterdam, and when writing his PhD about nanotechnology in India, South Africa, and Kenya at Maastricht University. Currently he is a postdoc at the University of Groningen where he investigates biotechnology in Africa.

Alberto Aparicio

Sociotechnical Imaginaries of 'bottom up' synthetic biology and the possibilities enabled by biocontainment

Recent developments in synthetic biology have been accompanied of 'bottom up' approaches that aim to build 'new to nature' forms of nucleic acids and proteins and incorporate them into living systems. Promises of building biosafe technologies have been made, based on the impossibility of transferring genetic material to other organisms and controlling the proliferation of genetically modified microorganisms (GMMOs). However, the safety and release into the environment of GMMOs has been an object of contestation since the 1970s, and pioneers of synthetic biology make an effort to promote its importance, whereas this appears to be less of a concern in other fields, such as the genetic engineering of mosquitoes (i.e. gene drives) to tackle tropical diseases. This paper seeks to make sense of 'biocontainment' as a promise of synthetic biology. I question the concern about the safety of GMMOs, and given the notion of safely releasing GMMOs into the field, how biotechnological applications may be reshaped. These questions are explored with the support of interviews with syn-

thetic biology stakeholders, as well as participant observation in a synthetic biology laboratory. The analysis draws from the literature on sociology expectations, as well as ‘sociotechnical imaginaries’ (Jasanoff & Kim 2009) —understood as collectively imagined, visions of ‘desirable futures’ that guide the implementation of science and technology projects—. While scientists developing technologies in the field champion different goals, an imaginary of built-in safe GMMOs reflects wider ambitions of the field, which relate to novel business models and are in much agreement with a neoliberal influence on knowledge production.

I am conducting doctoral research in the STS department of UCL on Governance of Technology, studying the framings, visions and imaginaries associated with the development of synthetic biology, particularly on ‘orthogonal’ genetic systems. Such interest draws from my undergraduate and graduate degrees in the life sciences. I have extended my interest to policy issues by pursuing an MPhil in Technology Policy, and by working in different settings such as innovation management consultancy and civil service—in technology transfer—in the Colombian government.

09:00-10:30

Seminar Room D

TECHNOLOGICAL PRACTICES

Chair: Matthias Kaiser

Mark Young

Production or Emergence? The Phenomenology of Technical Artifact Functions

It has long been common in the history and philosophy of technology to distinguish between contexts of production and contexts of use. This distinction, between making and using, marks not only a means of demarcating different forms of technological practice, but also, importantly, a hierarchy of value; historians and philosophers alike have traditionally accorded far more significance to processes of production in their accounts of the development of new technologies. Furthermore, the relative significance that we accord these categories bears important implications for a variety of issues in science and technology studies, including questions concerning ethical responsibility in engineering or the ownership and priority of technical innovations.

My goal in this paper is to demonstrate how the distinction between making and using that has hitherto provided a framework for much philosophy and history of technology is untenable, both from an historical and philosophical perspective. The first section of this paper seeks to show how the make/use distinction corresponds to a particular theory of technological production, what Timothy Ingold has termed ‘the traditional conception of making’. After problematizing the traditional conception of making in historical and philosophical studies of technology, I will outline and explore an alternative conception of technological practice that draws on the phenomenological framework for material culture provided by Martin Heidegger and further elaborated by Timothy Ingold. By illustrating how the function of technical artifacts is best understood as emerging after production, within contexts of use, this account challenges the hierarchy between making and using that has hitherto provided the dominant framework for the history and philosophy of technology, and calls for new forms of scholarship attentive to the creative dimensions of practice.

Mark Thomas Young is a PhD candidate in the philosophy department at the University of Bergen and is currently working on a dissertation in the field of historical epistemology. His research investigates issues surrounding technology and embodied practice in the history and philosophy of science, with a particular emphasis on the relevance of phenomenological approaches.

Astrid Schwarz

From homo faber to homo hortensis: gardening practices in the anthropocene

My main thesis is that concepts and practices being afforded in the urban gardening movement provide a blueprint for the conceptualisation of actions to respond to the societal as well as philosophical requirements of climate change. Gardening activities are likewise identified with material and social techniques, with values like care and esteem, beauty and benefit, and of course with questions of lifestyle, of comfort and design. All of these seem to be useful to reflect on practices of maintenance and sustainability and to develop “options of adaption and mitigation” for our future societies, altogether commonplaces in the climate change debate. Similarly, the label ‘Anthropocene’, being provided by natural scientists to describe fundamental changes in the biochemical cycles of the planet, may be used to introduce questions about the modes of human existence into a debate being dominated by political deliberations about an adequate interpretation of complex scientific models. Instead, a gardening-practices vantage point could help to shift attention to already available management techniques and concepts in the present (or known from the past). It helps to focus more on considerations about epistemic and normative capacities at hand being implemented to a large extent, or at least being debated, in many societies. Thus, putting my main thesis in another way, local gardening practices and their forms of life provide techniques and values that may help to manage global problems in the Anthropocene. This is conceptualized in a transformation from homo faber to a homo hortensis, substantiated by discussing existing material practices, types of communalities, as well as shared values that meet with what has been raised as engagement with nature, and as matters of concern about the human condition.

Astrid Schwarz (lecturer at ETH Zurich) is a philosopher of technology and science. In recent years, she focused on material models, on the constitution of research objects, and on the mode of pictorial representations as well as modes of acting in a human-built world. Case studies might be drawn from ecology or nanotechnology, from environmental or climate change issues. Her latest books are “Experiments in Practice” (2014) and “Research Objects in their Technological Setting” (co-edition, in print). Currently, she is running a project on gardening practices in the Anthropocene.

Harro van Lente

Emerging technologies and novel needs: the case of space tourism

This paper investigates the contested case of space tourism and the various ways it generates and mobilizes novel needs. Space travel has been the privilege of nation-states, as has profited from huge investments due to the Cold War arms race. Space travel also figures in popular imaginations, in particular in science fiction novels and movies. This century, several operators like SpaceX and Virgin Galactic seek to offer space travel for private persons, and promise to organize such travels on a regular basis in the near future, with dropping costs. An array of orbital and sub-orbital space flights are being developed, based on new technologies and new business models. In their attempts to define and inhabit the prospective market for space tourism, these operators bring forth particular visions of the future of space tourism and why people would need it. These strategies intermingle with existing cultural repertoires about space travel. Data are drawn from newspaper articles (2005-2015), websites of operators, popular books on space travel and governmental documents.

Space tourism is not seen as a need, but that may change. The paper will address general and pertinent questions about the malleability of needs: how are novelty and needs co-produced? Can such changes be anticipated? Also, when needs are not pre-given, but dependent upon socio-technical configurations, and, in fact, both cause and effect of technological change, the question emerges what the role of publics, policies and experts can be. While the public is the carrier of the novel need, the public is also mobilized as the critical instance of the technological possibilities and the novel needs.

Harro van Lente, Professor of Science and Technology Studies Maastricht University, The Netherlands Faculty of Arts and Social Sciences P.O. Box 616, 6200 MD Maastricht, The Netherlands.

09:00-10:30

Seminar Room E

Workshop

ART AND PERFORMANCE-BASED EXERCISES IN RRI

Chairs: Sophia Efstathiou & Elena Pérez

This workshop aims to create some reflection on the range of approaches needed to support engagement in Responsible Research and Innovation (RRI). There are already several modes of pursuing the integration of technical and societal concerns involved in the development of new technology. Many involve joint work with scientists aimed to reflect on the ethical and societal consequences of technoscientific research in real time (cf. a mapping by Erik Fisher and colleagues (2015) of the “integrative field” according to the means, ends and forms that these projects take). However there are currently few approaches that explicitly consider the contributions of the arts and theater in these fields. RRI has been driven by the social sciences and philosophy which largely operate with and deploy what are seen as tools for enabling cognitive reflection, such as Socratic-inspired conversation, seminars or co-authorship. We argue that responding to the situatedness of scientific knowledge creation should include methods that directly address and modulate embodied, tacit and performative elements of the work and identities of science.

To that end, we create a three part session:

In the first part of the workshop we present in the form of an oral presentation some background and motivation for art-based approaches to RRI, evaluating literature in RRI from philosophy of science and performance studies perspectives to propose that doing responsible research and innovation needs to tackle embodying RRI and what is involved in becoming a responsible researcher and innovator. We discuss applied theater practices, as these have explicit normative aims, proposing to use performance practices for social change. In this field several practices, such as community theater and participatory art as well as games for change, have been developed for engagement and co-creation with non-professionals. We consider the roles of facilitators/agitators and interpreters, and of the audience and spect/actors abstracting from the works of artists Augusto Boal and Tino Seghal along with some possible challenges once it comes to the ethics of interventional activities with one’s collaborators and the difficulties of informed consent in such settings. Though art-based interventions may bring distinct ethical concerns these approaches may be crucial for embodying RRI.

In the second part of the workshop we pursue exercises together with workshop participants to demonstrate what performance-based approaches to RRI might involve.

The first exercise we dub “the response/able walk” involves participants walking in the room, while we give them rules for how to walk. While following a specific set of rules a pattern emerges that structures participants movements in space in (usually) unanticipated and so unintended manners. The exercise aims to help participants embody and experience what it might be like to be part of a whole, explicitly following one rule but in effect behaving as if they were following another rule, which they had not intended. It is an exercise which we reflect on in order to discuss social emergence, the difficulties of locating responsibility and the difficulties of studying or articulating decision-making in science.

The second exercise is a game we dub “virtuous designs”. The game follows the form of a card game which is played by teams of 4-5 depending on attendance. The teams are made up of one judge and 3-4 players. The participants are given playsheets where they are to draw, and describe a new invention. Players are to invent a thing which is a modulation of a known item which they see/read on a card that the judge picks. The demand is that they innovate in a direction which follows a particular verb which is meant to articulate a social or other value. For instance you might have the object “cup” and the verb “empathise” –players are to combine the object and the verb into a new invention. Or the object “enzyme” and the verb “democratise”.

The third part of the workshop aims to enable a theoretical reflection and discussion. We invite comments to the exercises and finish with a summary of our aim which is to explore, in a practical way the thesis that sociohumanists working on socio-technical integration have something to learn from the methods and experiences of artists who grapple with performance and becoming in interactional participatory formats.

Sophia Efstathiou, NTNU is a Researcher in Philosophy and Religious Studies. Efstathiou has been working with scientists on ELSA research projects in the UK and Norway, and performance philosophy. She has a PhD (2009) in Philosophy and Science Studies from UCSD, and her research has been awarded NSF, White and Max Planck Fellowships.

*Elena Pérez, NTNU is a PhD graduate in Art and Media Studies and Leder at Trondheim Kunstforeningen. Pérez has worked in pervasive game design and theater in Spain, the US and Norway. The title of her dissertation is *The Impact of Digital Media on Contemporary Performance*.*

11:00-12:00

Auditorium (The Egg)

PLENARY KEYNOTE LECTURE

Law and Order at the Technological Frontier

Sheila Jasanoff, Pforzheimer Professor of Science and Technology Studies, Harvard Kennedy School

Sheila Jasanoff is Pforzheimer Professor of Science and Technology Studies at the Harvard Kennedy School. A pioneer in her field, she has authored more than 100 articles and chapters and is author or editor of a dozen books, including *Controlling Chemicals*, *The Fifth Branch*, *Science at the Bar*, and *Designs on Nature*. Her work explores the role of science and technology in the law, politics, and policy of modern democracies, with particular attention to the nature of public reason. She was founding chair of the STS Department at Cornell University and has held numerous distinguished visiting appointments in the US, Europe, and Japan. Jasanoff served on the Board of Directors of the American Association for the Advancement of Science and as President of the Society for Social Studies of Science. Her grants and awards include a 2010 Guggenheim Fellowship and an *Ehrenkreuz* from the Government of Austria. She holds AB, JD, and PhD degrees from Harvard, and an honorary doctorate from the University of Twente.

Introduction by Jan Reinert Karlsen, Associate professor at SVT and member of the S.Net organizing committee

13:00-13:45

Auditorium (The Egg)

PLENARY DISCUSSION: THE CO-PRODUCTION OF EMERGING BODIES, POLITICS AND TECHNOLOGIES

Panel:

Sheila Jasanoff, Pforzheimer Professor of Science and Technology Studies, Harvard Kennedy School**Alfred Nordmann**, Professor of Philosophy and History of Science and Technoscience, Technische Universität Darmstadt**Silvio Funtowicz**, Professor II at the Centre for the Study of the Sciences and the Humanities (SVT), University of Bergen

Chair:

Roger Strand

The plenary will provide an opportunity to recap the topics and proceedings of this year's S.Net conference, consider the current situation and where we might be headed, looking at the Society for New and Emerging Technologies within the greater Society. Each of the panelists will provide a short reflection, followed by discussion within the panel and comments from the audience.

13:45-14:00

Auditorium (The Egg)

CLOSING REMARKS

Michael Bennett, S.Net president, and Roger Strand, Professor at SVT and member of the S.Net organizing committee

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