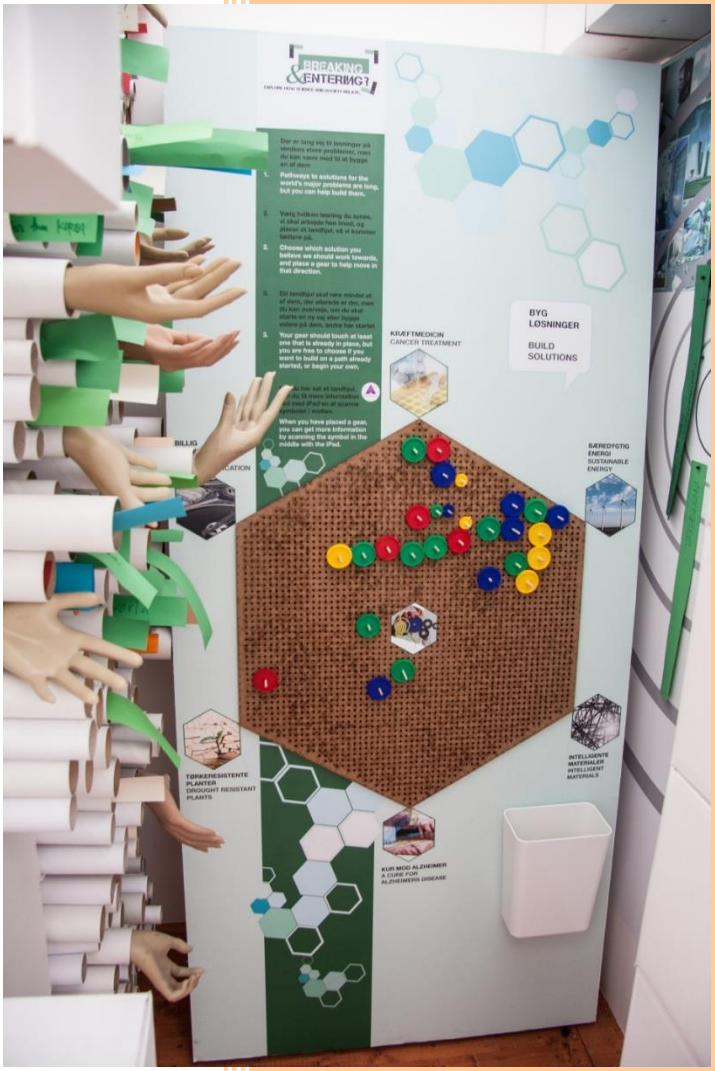
STUDYING SCIENCE COMMUNICATION

A panel of the EASST2014 Conference

easst
european association for the study of science and technology

Organised by
Sarah R Davies
and
Maja Horst

Volume edited by
Erik Stengler



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Organised by Sarah R Davies and Maja Horst

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Foreword

We knew, as we thought about proposing a panel for the EASST conference 2014, that we wanted to showcase STS research that looked at science communication. But how to frame this? The final panel abstract, for an open panel titled Studying Science Communication, read as follows:

> The last decades have, in a number of European countries, seen an increase in science communication and public engagement activities. In many places a well-defined 'deficit to dialogue' narrative tells of the move from 'public understanding of science' (PUS) models of communication (dominant in the 1980s and '90s) to more dialogic approaches, based on two-way communication between science and its publics.
>
> STS scholarship has been instrumental in these developments. Theoretical and analytical attention, as well as experiments with practice, have, however, tended to focus on policy-oriented or governmentally-sponsored engagement, and especially on overt efforts to 'democratise' science. This panel focuses on the often overlooked area of (what we might call) 'straight' science communication – that which does not claim to formally influence policy or scientific research, and which may at first glance feature one-way communication. This includes, for instance, science in museums, science fairs and festivals, popular science media, science blogging, sci-art activities, and university and lab open days. We invite critical STS analysis and discussion of these activities. This might include, for example, reflections on the role science communication may play in the democratisation of science, analyses of the constitution of publics and knowledges within particular science communication activities, or accounts of experimental practice. The panel will thus use the methodologies of critical STS to reflect upon the problems, potential and practice of contemporary science communication.

The notion of 'straight' science communication is perhaps a confusing one (is there such a thing as a queer, or a twisty, science communication?). Used as a shorthand for focusing attention beyond dialogic forms of public engagement, though, it worked well: the submissions to our panel, many of which are represented in this short volume of proceedings, explored a spread of communication forms from newspaper science to deliberative meetings. Once at the EASST meeting itself, we were thrilled with the quality and breadth of the presentations within the panel, and with our introduction not only to relevant research, but also to many new colleagues. As such we're even more pleased that this volume can act as a more lasting record of our discussions – and, hopefully, as a trigger for more conversations around this topic.

Sarah R Davies & Maja Horst

University of Copenhagen, April 2015

Deficit, deliberation and delight: STS and science Communication

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Introduction

This short conference paper discusses the relation between STS research and science communication, which is here understood as public communication of scientific knowledge or research, by scientists or others, through processes which do not seek to directly inform policy (Davies et al 2009). Examples include science in museums, science fairs and festivals, popular science media, science blogging, sci-art activities, and university and lab open days. As such this paper sets out some of the thinking behind the convening of this panel.

STS and science communication: Some history

Science communication is relatively understudied in the STS literature. In looking at science in public, scholarship has predominantly focused on 'policy-informing' forms of engagement and dialogue (Davies et al 2009), which have been extensively argued for (e.g. Jasanoff 2003; Marris et al 2001), conceptualised (e.g. Collins and Evans 2002), and empirically analysed (e.g. Irwin 2001; Kerr et al 2007). In these discussions, 'public engagement' has tended to mean deliberative public participation in science policy, rather than the informal education or leisure activities that characterise science communication.

It is unclear why this lacuna has emerged, especially when one considers how many more laypeople engage with scientific knowledge through science communication than through formal deliberative and participatory processes. One reason might lie in the recent history of STS and science in public, and in particular the narrative of 'deficit to dialogue' (Gregory and Lock 2008). This emphasises that within the 'public understanding of science' (PUS) movement of the 1980s and '90s, science communication mobilised a cognitive deficit model of its audiences and sought to produce acquiescent publics (see Irwin and Wynne 1996). The failures of this model led to a 'new mood for dialogue' in science-society relations (House of Lords 2000) and the current emphasis on dialogue, participation, and engagement. Jon Turney, for instance, assessed PUS as undergirded by the assumption that "to know science is to love it", writing that "[o]ne of the motives for trying to improve people's understanding of science has been to increase public sympathy for science and scientists, and perhaps give those trying to introduce certain new technologies an easier ride" (Turney 1998, 3).

It has, then, been hard to shake off the association of science communication with the deficit model and the desire to assure science of public support. Indeed, organisers often *do* subscribe to deficit models of their publics (Casini and Neresini 2013), and *do* cite motivations such as inspiring young people to work in science or correcting misunderstandings (Davies 2013; Wilkinson et al 2011). However, we might ask whether this is all that is going on within science communication events and practices. Even if such models are being mobilised, are they also being resisted, subverted, or transformed? And does their use allow us to write off science communication completely – or might this area of practice provide some resources for STS thinking?

I want to suggest that science communication – even 'deficit model' forms which straightforwardly seek to educate publics – does has the potential to overflow and exceed the aims and structures of PUS, and that it is therefore important to explore how it is understood and experienced by those who participate in it. My first point is therefore to propose the study of science communication as a new research agenda in STS.

Second, I also want to argue that science communication may offer STS new resources to think with. In other words, it can highlight some aspects of science, technology and society that have not been well addressed in the STS literature, and offer new angles on key research topics. In the rest of this paper I want to briefly discuss two potential examples of this.

The non-discursive in science, technology, and society

First, I want to suggest that the study of science communication may help develop STS study of science, technology and society – and especially thinking on public participation and deliberation – because it highlights the non-discursive. Science communication is focused on the elicitation of emotions such as enthusiasm, interest, outrage and delight, and it often mobilises affective, aesthetic, or material configurations or techniques in doing this. It emphasises that public interactions with science are always grounded in material realities, are always emotional, and always go beyond discursive exchanges or arguments. Science communication may be messy, loud, immersive, or reflective. It is exactly not concerned with 'pure' knowledge, as expressed in language (even written science journalism, for instance, works hard to evoke particular material set-ups, or embodiments, or enthusiasms. Public science communication is never textbook writing).

In contrast, recent work on public engagement and deliberative democracy has tended to rely on models of deliberation that emphasise the exchange of reasoned argument (Hamlett 2003). Such models are drawn from political theory (see Cohen 1989). But this manner of practicing deliberation has, within political science, been criticised as relying on models of argument that disembody its contexts and producers, and as thus functioning to limit, not enhance, democracy (Young 2001; Sanders 1997). Deliberative democracy has been encouraged to go beyond discourse, to incorporate attention to materialities, aesthetics or emotion (see Dryzek 2000; Sandercock 1998). Attention to the articulation of these features within science communication may therefore offer scholars of public participation in science resources to make engagement more democratic – because more accessible to different kinds of actors.

Scientific citizenship

The nature of scientific citizenship has been a key area of interest for STS (Irwin 2001). Understandings of scientific citizenship have tended to be tied to activities emerging from traditionally structured representative or participatory democracy; thus, STS has studied phenomena such as voting, public debate, and opinion formation (e.g. Satterfield et al 2009); participation, deliberative processes, and consultations (e.g. Irwin 2001); or, less frequently, activism and protest (e.g. Seifert and Plows 2014). Again, however, there has been relatively little engagement with political science knowledge concerning the nature of citizenship and democratic engagement (Brown 2009). Does scientific citizenship need to be expressed through organised processes of representative democracy, engagement, or activism (Campbell 2005)? Must citizenship be something active, or might passivity or disinterest also be considered a valid mode of engagement (Kearnes and Wynne 2007)? STS has not yet explored these kinds of questions in any detail.

Science communication offers one avenue for investigation. Its status as a leisure activity – something laypeople choose to engage with, for pleasure or self-education – places it outside of what is traditionally considered the public sphere. But it also involves thoroughgoing engagement with science and technology. Might such engagement be considered a part of scientific citizenship? What effects does it have on other aspects of both private and civic life? How do laypeople themselves understand scientific citizenship? Conceptual and empirical research on science communication could, I suggest, help answer these questions and therefore further develop STS thinking on citizenship in technoscientific societies.

Conclusion

In sum, I have sketched out some of the thinking that led to this EASST panel and which is behind our shared interest in developing STS research on science communication. I have argued that, though science communication tends to be rather understudied in the STS literature (especially when compared to organised processes of participation, deliberation and engagement), there are good reasons to pay attention to it. Despite its use of a model of the public with which we may not agree (the so-called deficit model), it offers an empirically rich space within which laypeople consume, negotiate, and (perhaps) resist scientific knowledge. Its use of formats and techniques that evoke the materialities and emotions of science may help us to devise more robust participatory formats, and its emphasis on pleasure, leisure, and the private sphere might point us to new conceptualisations of scientific citizenship. It deserves to have the full resources of critical STS scholarship brought to bear upon it.

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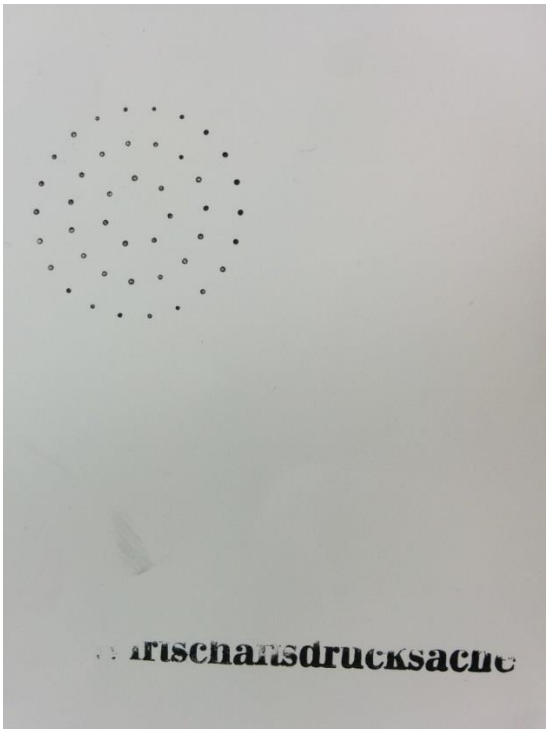

Empirical print (see page 51 for further information).

Same, same – but different: Public engagement devices enacted by science communication providers

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Abstract

This short conference paper focuses on translation processes of science museums enacting participatory devices, and investigates whether science museums as classical science communication providers have a particular approach to public engagement and participation. The case study of one of the few existing transnational citizen deliberation cases, the World Wide Views on Biodiversity (WWVB), provides insights into how local organizers – staff from science museums at selected national sites – enacted and shaped the implementation of a pre-defined participatory format.

Introduction

This short conference paper focuses on translation processes of science museums enacting participatory devices. Science museums as classical science communication providers are increasingly experimenting with public participation. Do they have a particular understanding and approach when using public engagement and participation devices? The case study of one of the few existing transnational citizen deliberation cases, the World Wide Views on Biodiversity (WWVB), provides insights into how local organizers – science museums at selected national sites in the US and in Germany – enacted and shaped the implementation of a pre-defined participatory format. This research is related to my ongoing PhD project "*Democracy under construction*: The micro-politics of coordinating transnational public engagement."

Context: 'Public engagement' and 'technologies of participation' through the lenses of science communication providers

Two different research interests inspired this research. One is the development in science communication where the 'deficit model' of citizens is increasingly being replaced by the models towards dialogue, engagement and participation (Bucchi and Trench, 2014). As classical organizations providing science communications, the role of science museums is crucial in two ways here. First, as science communication providers they aim at being a direct link between the public and the "doing of science", because museums want to be in a key position to manage the interactions of the public with the stakeholders involved in the current practice of science (Bandelli and Konijn, 2013; Chittenden et al., 2004). Second, science museums also function as a platform to enable researchers and other stakeholders to build and negotiate their own understandings of the public based on the interactions between scientists and the public which are facilitated by museums (Bandelli and Konijn, 2013). My first research question is: What is the approach of science museums to an understanding of participatory devices when they enter the field of public participation?

My second research interest comes from “technologies of participation” literature. This literature stream is concerned with how normative visions and values become inscribed in participatory models and are translated and enacted in a different manner when they are transferred to different contexts (Amelung and Voss, 2011; Felt and Fochler, 2010; Lezaun and Soneryd, 2007). Increasingly science museums as science communication providers are getting involved in using standardized ‘technologies of participation’. My second research question is: How do science museums enact public engagement in the participatory devices they use?

Analytical framework: Inscription, script and enactment of public engagement devices

In order to analyse the particular understanding of public engagement of science museums, I apply analytical concepts familiar to STS scholars: “inscription” and “enactment”. Applying Akrichs’ notion of “inscription” (1992) for technologies of participation draws attention to the normative script for public engagement which becomes inscribed into the form and materiality of participatory devices. Designers inscribe a vision of the world by “defining actors with specific tastes, competences, motives, aspirations, political prejudices, and the rest, and they assume that morality, technology, science, and economy will evolve in particular ways” (Akrich, 1992, p. 208). Those inscriptions that predetermine the settings for the projected users – the projected organizers who implement a device – to use a technology of participation are materialized in notices, contracts, forms of advices, etc. But also the materiality of the participatory device itself restricts users to using it in a particular way.

Sawards’ notion of enacting democratic principles in participatory devices focuses on the designer’s and adopter’s real environment (Saward, 2003). Even though the materiality of devices prescribes the way in which participatory devices unfold, local conditions are equally strong in shaping how participatory devices become enacted. In particular, knowledge and organizational culture and systemic constraints play a role in how normative principles become translated and enacted in local contexts.

Case study: Science communication providers enacting the World Wide Views on Biodiversity device

The case is a transnational public engagement device, the World Wide Views format, which was implemented twice at various sites by a network of civil society organizations, including science museums. The second project, the World Wide Views on Biodiversity, took place in the context of the United Nations Conference of Parties 11 on the Convention of Biological Diversity in 2012. It was a decentralized citizen deliberation event involving 42 civil society organizations which organized 34 synchronized citizen participation events in 25 countries, with about 3000 citizens in total. It was a follow-up to a previous project from 2009, World Wide Views on Global Warming (WWVGW), which took place against the backdrop of the UN climate conference in Copenhagen (the Danish Board of Technology, 2013).

I used an ethnographic case study approach with a single transnational participation device and followed the preparation and implementation process of this transnational public engagement format at various sites. I followed the designers and coordinators of the event, the Danish Board of Technology and different local organizers who

implemented the device locally. I used participant observation of meetings, interviews and documents to analyse the case.

The Danish Board of Technology (DBT) led the heterogeneous network of civil society actors including public participation agencies, science museums, university departments and environmental NGOs. DBT had predefined the standardized design which became applied to diverse local contexts, also on the basis of the pre-cursor (WWVGW).

I will focus here on particular design components and analyse how certain normative inscriptions of public engagement become materialized in particular design components. The selected design components are the “provision of information material” and the “structure of deliberation sessions”.

Information material was used to provide citizens with factual knowledge about biodiversity and to prepare them for forming their own opinions and arguments for use in discussions. At the same time, it worked as a representation of the policy issue “global biodiversity”. DBT organized a process in order to produce scientifically and globally balanced information material. It included evaluation by a scientific advisory board and the testing of cultural balances in focus groups in different countries.

The deliberation sessions were meant to give the participants the chance to qualify their perspectives further within the exchange of views. Deliberation sessions were structured along standardized pre-defined questions on biodiversity and pre-defined answers to be voted on. In defining the questions, DBT was guided by an interest in pre-structuring the deliberation process in order to produce aggregated comparable results, which would then be acknowledged by policy makers (Interview organizer A).

I follow the translation of the framework design into local designs in two different countries with particular epistemic cultures (Jasanoff, 2008). In Germany, a network of several organizations led by the Museum für Naturkunde (museum of natural history) coordinated the implementation of a single event in Berlin. In the US, four implementation sites were coordinated by an already existing network of organizations, the Expert & Citizen Assessment of Science & Technology (ECAST) network including university departments, policy think tanks and science museums such as the Boston Museum of Science.

In both cases, science museums translated the framework design differently. In the German case, the museum contributed in particular with expertise and experience on biodiversity and science communication, while in the US case the museum provided experiences and insights from public involvement in science communication.

In the German case the organization’s mission was described by an organizer from the museum:

> “Well, we have a new director […] who brought this project with him and it fits perfectly into our mission. […] We intend to increase this area of public engagement education and also the dialogue with politics and with businesses. And so far this event or this approach at least fits quite well into our new strategy.” (Interview organizer B, Museum für Naturkunde)

Although organizers followed the rules they contested the survey character of the voting procedure. Yet, they translated the framework design and invented additional components to provide further opportunities for participants’ articulation:

> "The critique from our panel was also towards the questions. They had a very differentiated discussion at the tables and then the voting was very simple. So it did not meet the discussion at the tables. So we also introduced the option to write ideas, opinions, suggestions on white cards. Because in our organization team we had also not been satisfied with the questions and the answer options. So we tried to open this process a bit more." (Interview organizer B, Museum für Naturkunde)

Organizers also contested the representation of the issue of biodiversity in the information material, mainly due to the fact that the museum has a strong group of biodiversity researchers who found the information material trivial and misleading. They said it neither pointed to trade-offs of policies, nor did it have a good educational approach to relate to the daily lives of citizens. Here, organizers aimed at influencing the information material beforehand and succeeded partly (observation notes from organizers meeting at Museum für Naturkunde).

For the US case it is necessary to distinguish between the mission of ECAST and the mission of the science museum involved. While ECAST is a network that aims to push participatory technology assessment in the US, the individual organizations involved, including the Boston Science Museum, have additional approaches of their own to using public engagement methods:

> "But the other thing I would say about the forums that we do and I said this before, is that we always try to make them a little fun, right, to bring in elements more than formal science education, so that although that deliberative discussion and contemplation, these things are all kind of essential and the things that we can't throw away but we also increasingly are trying to bring in elements that make them interesting and fun for people." (Interview organizer C, Boston Museum of Science)

The science entertainment approach gets pointed out, which is an interesting complementary aspect to deliberations and reflections. Also, the US organizers criticized the voting procedure for its survey character:

> "but of what I have seen in our work in the informal science education area with forums, sometimes the act of voting is not satisfactory to people as a culminating thing. Putting it into words it is a little bit more useful for them. But to vote is important but it might not be what they want coming out of it." (Organizer C, Boston Museum of Science)

Organizers also invented an additional design element. They decided to add a deliberation session at the end of the day after the other standardized deliberation sessions. The question focused on national policy-making issues and used open questions so that participants could formulate their answers in their own words.

Conclusions: Same, same – but different, the approach of public engagement by science communication providers

Using this preliminary analysis of two cases of implementations of public engagement methods by science communication providers, gives us hints that there is a specific approach by science museums to enacting public engagement and exemplifies its embodiments. While the DBT approach was making citizens' views productive for results relevant for policy makers, the science museums did not disagree with this

approach, but instead aimed more at education and increased the space for citizens to articulate their views in their own way. The science museums thus challenged the framing of the participant and the way in which citizens' views should be collected and represented in the results as determined in the framework design.

They used the local designs to enact their own normative visions for public engagement, which should serve the citizens' need to articulate their views and arguments in a qualitative way. They enacted divergent participatory principles and modified the designs by adding an open deliberation sessions and providing white cards.

The science museums studied constructed public engagement in participatory devices by acting as stakeholders for citizens' views and for biodiversity expertise. Museums acted to protect their own areas of reputation and expertise. Ways in which science and expertise are (re)presented to a wider public are therefore crucial, as demonstrated in the contestation by biodiversity researchers at the museum about how scientific facts about the issue at stake, biodiversity, were provided in the information material.

The analysis sharpens the assumption that the understanding of the public engagement of science museums is shaped by strong, internalized public participation ideals such as citizen empowerment. But they are combined with elements from science communication, science education and science entertainment. This can be taken as a motivation to explore these questions further.

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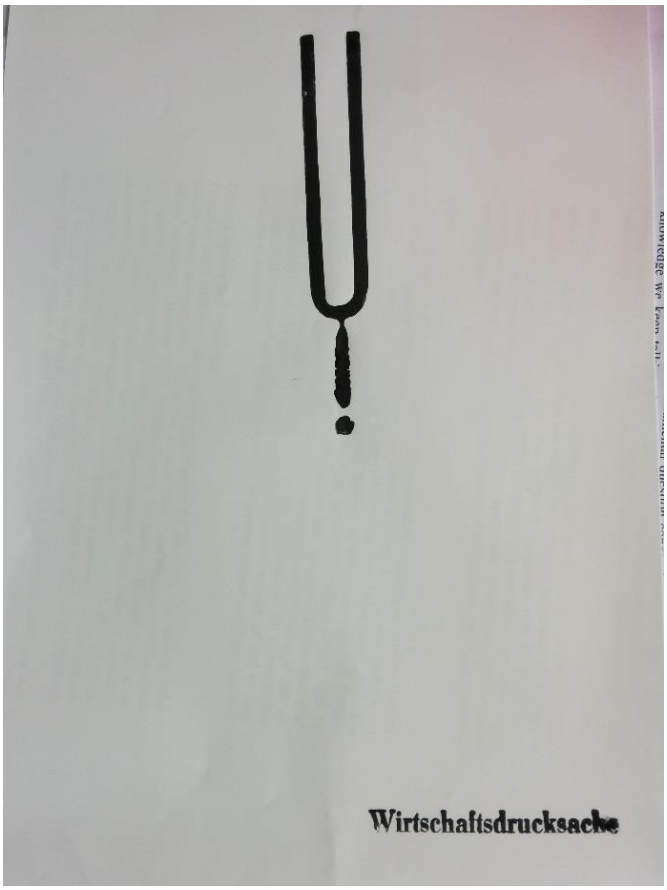

Empirical print (see page 51 for further information).

Embodiment of science in science slams. A case of informal public science communication

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Abstract

Science slam is a new approach of presenting research and science in popular and artistic ways. In public science communication events like science slams an external audience judges whether a presentation included an adequate amount of science and entertainment. Expertise and institutions are important sources for the audience to generate trust. I additionally argue that social knowledge and embodiment of science are playing an important role in public science communication.

Introduction

These days new scientific events are coming up. They are systematically trying to negotiate the challenges of performing as a scientist. Science slam, FameLab, Science Showoff, Science Pub, Bright Club and Lecture Performance manifest themselves as innovative events for presenting and communicating science. Scientists are asked to present their topic in innovative ways and speak to a commonly rare seen non-academic audience. The successful German event format of science slam is one of several events that have been established since the nineties in western societies. A science slam can be described as a form to communicate (scientific) knowledge in an entertaining way to an external public. A science slam is an event in which actors are trying to establish new and improved forms to present and legitimate the scientific production of knowledge. The self-presentation of a scientist at a science slam is expected to be different from conventional ways of science communication. The genre of science slam was founded in 2006 in the German town Darmstadt. Alexander Deppert, who had the idea to create this event, was highly inspired by poetry slams. In Germany there are more than 30 science slams taking place periodically and the event is still expanding. The strict rule of science slam is that the presentation has to be short (ten minutes). As “battle of brains” the genre has a competitive character. Science slam organizers maintain the critical discourse on nonconformist science that goes back to early modern times. Organizers of science slams criticize that in Germany there is too rare exchange between scientists and non-scientists and that a lot of scientists would stay in their ivory tower. A science slammer is expected to present innovative and to communicate scientific content in an authentic, emotional and enthusiastic way. In this way the ambition to overcome the established scientific routines of performance is one of the motivational forces.

Berger and Luckmann already claimed in the sixties that the sociology of knowledge similarly has to deal with the empirical variety of knowledge in human societies, as with “processes by which any ‘body of knowledge’ comes to be socially established as ‘reality’” (Berger/Luckmann 1967: 3). As they had described, scientists underline their

authority by using age-old symbols of power and mysteries like an outlandish costume and an incomprehensible language. A certain body of professional knowledge or legitimating machinery is at work and empowers scientists to distinguish scientific proof from quackery. There are certain techniques of intimidation that scientists use to create boundaries to laypersons. Also STS researchers have pointed to the question of how the powers of science may relate to the visual tricks and embodiments of science. Haraway was suspicious about the way in which western scientists become not locatable and irresponsible regarding their research. Disembodiment and universal claims were described as part of the western scientist's bag of tricks. Even if STS researchers already suggested making STS the leading source for public insights into science-in-action (Yearley 1994) there is still much research missing concerning interaction, materiality, aesthetics and emotions in public science communication. Scholars have recently addressed the problem that STS research on science communication has been pretty disembodied in the past (Davies 2009). Even if empirical findings within the field of STS suggest that representations and visibility in science are generated and interpreted by social actors in the context of communicative processes (e.g. Lynch 1988, Amann/ Knorr-Cetina 1990, Beaulieu 2002, Alac 2008). And even if a few scholars focused on kinaesthetic and affective entanglement in science communication (Myers 2012) or on aspects of body movement and socio-technical environment in interaction (Goodwin 1981, Goffman 1981, Knoblauch 2013, Kiesow 2014, Tuma 2012). Researchers on science communication should still expand studies about performativity. Especially approaches from the interpretive paradigm in sociology can help because they traditionally focus on interactions and interpretations in which structures are developed (like researchers from the Chicago School). Also studies from Ethnomethodology and Symbolic Interactionism have presented insights into the rich field of situated action (Garfinkel 1967, Sacks 1974, Blumer 1969). In this case audio material of communicative processes was used to understand processes of interaction. Also the sociology of knowledge (Berger/Luckmann 1967) developed a major interest in communication, because knowledge is observable in communication. The main idea was that one has to describe, reconstruct and understand performative processes in order to understand the social construction of reality. Processes by which a body of knowledge comes to be socially established as reality are embodied processes. My project addresses embodied communicative processes and focuses on the understudied area of informal public science communication.

Methods

My choice of methods is related to the constructivist statement that reality is built on an "active-constructive manufacturing process" (Flick 2005) and therefore cannot be studied through a passive-receptive process of illustration. Following Berger and Luckmann I think that science slam can best be understood by analysing the reality-constructions and communicative action of science slam participants. The general aim of my research is to use a combination of qualitative methods like it is recommended for focused ethnography (Knoblauch 2001). To understand the inner perspective and everyday life of science slam participants I choose participatory observation. I visited many science slam events and tried to catch the spirit and to understand the social dynamics. To study the situated performance on stage I picked the "microscope of

interaction studies" (Schnettler et al. 2013) - video analysis.[1] To create a multi-perspective validation and to describe different aspects of the science slam phenomenon I used qualitative interviews as third central method. With this method I tried to learn more about the justification (Berger/Luckmann 1967) of the action. Based on these different methods I aimed to triangulate features of the communicative genre of science slam. The following paper just gives a glimpse into my empirical work, based on just a small number of data.

Establishing a scientific body of knowledge in the public

Shapin reframed the history of truth as a "social history of truth" (Shapin 1994). With examples of early modern times he argued that for the constitution of a body of knowledge the identification of trustworthy agents is necessary. Other studies in STS showed how practitioners of the scientific field rhetorically and socially convince others through communication to believe in their truth. Scholars have highlighted how the rhetoric construction of a boundary between science and varieties of non-science works. Gieryn's concept of "boundary work" (Gieryn 1983) pointed to the "ideological style found in scientist's attempts to create a public image for science by contrasting it favourably to non-scientific intellectual or technical activities". He focuses on rhetorical capabilities that help to establish a scientific body of knowledge. In STS there is an interest in the different statuses and roles of communicating scientists. Shapin and Gieryn both pointed to the interesting question how practitioners of the scientific field rhetorically and socially convince others to follow a certain body of knowledge. In contrast many modern sociological studies about scientific knowledge often do not focus on interaction and embodiment. Instead many researchers follow the idea that modern science is anonymous, and that system-trust (Luhmann 1989) in faceless institutions (Giddens 1990) leads the world. Shapin has argued against this one-sided perspective on science.

> "So one story about the modern condition points to anonymity and system-trust in abstract capacities, while the other identifies persisting patterns of traditional familiarity and trust persons. […] One can characterize the modern condition through the serial application of both stories." (Shapin 1994: 415)

The study of science slam is not just about system-trust, but also about trust in persons. Relating to Goffman's (1981) thoughts about lectures one could argue that also institutional authority is warranted in talks (and system-trust is generated). Science as institution is seen as guided by trustworthy agents if scientists deliver a trustworthy image in situated presentations.

In my empirical data from the science slams it is emphasized a lot that the presented knowledge of slammers has to be self-made scientific knowledge. In this way the author and ownership of knowledge seems to be very important. For the reason that the presenting persons at science slams are introduced as researchers the visitors expect scientifically legitimate claims about reality. In my interviews with science slam organizers I tried to find out how they ensure that the content that science slammers present will be scientific. Most of them said that they simply trust that someone who is associated to university will talk about science. So first of all the institutional

[1] Back in the 1960s researchers just had audiotapes to analyse interactions. Technology has developed greatly and today we have better methods to study one-to-some or face-to-face interactions in social situations.

background of the speaker generates the trust for the scientific legitimacy. This seems typical for the period since the 18 century in which the witness of truth is no longer dependent on persons (aristocracy), but on institutions. Organizers search on google for the speakers to see in which way they are related to a university. Sometimes they shortly read the publication list and if the list looks scientific (as opposed to pseudo-scientific) they assume that the scientist will communicate science. Also previous success at past science slam events is an indicator for organizers that they do not have to revise people. Most organizers know each other and trust that someone who has been successful in another event will be a suitable scientist.

The organizers describe the milieu of the event as young, sophisticated, and committed. A creative and scenic audience seems to be part of a science slam. If people from the audience are not scientists or part of the same discipline as the presenter they just have a feeling whether they believe that the speaker is a trustworthy agent of science or not. The audience has to trust their general knowledge and their feelings to decide if someone is scientific. Informal communicating scientists are judged on the basis of their embodied performance on the stage. The gentleman from early modern times (who formerly has been the type of individual who was trusted to speak the truth) in my field of public science communication today is replaced by new types of public scientists.[2]

Slammers drink beer on the stage, read poems, dress up as prisoner, tell jokes, show inappropriate YouTube videos, make fun of politicians, wear hoodies or miniskirts, talk about football, sing and use slang words. An image of young and untraditional science is favoured. Artistic and popularized presentations in science slam often define themselves through their difference from science. This construction of non-science is established by alienating a special scientific communication type. While typical science communication is labelled as non-personal, boring, dogmatic, rigid, self-controlled, uniform, serious, the new genres want to be easy, casual, short, emotional, enthusiastic, artistic, creative, and authentic. Science slam transforms expectations on public science communication.

Discussion and Conclusion

In this paper I partly followed Shapin's argument and claimed that especially in public science communication social knowledge and trust are important warrants to identify who can legitimately speak for science. At public science communication events like science slams an external audience judges whether a presentation included an adequate amount of science and entertainment. Besides trusting that someone who is associated to a university will talk about science (institutional trust), people from the audience judge whether they believe that a speaker is a trustworthy agent of science. Although, like typical for nowadays, in science slam expertise and institutions are important sources to generate trust. I argued that social knowledge and embodiment have a remarkably important role in public science communication. What type of individuals are trusted to speak the truth in science communication events is not only dependent on faceless institutions, but on face-to-face interactions of individuals. Not only rhetorical strategies but also embodied interactions with the audience are very important to understand these processes. For that reason my PhD project will offer

[2] Some popular types of scientists will be the part of the results of my PhD project.

more insights how science is embodied in a contemporary genre of science communication.

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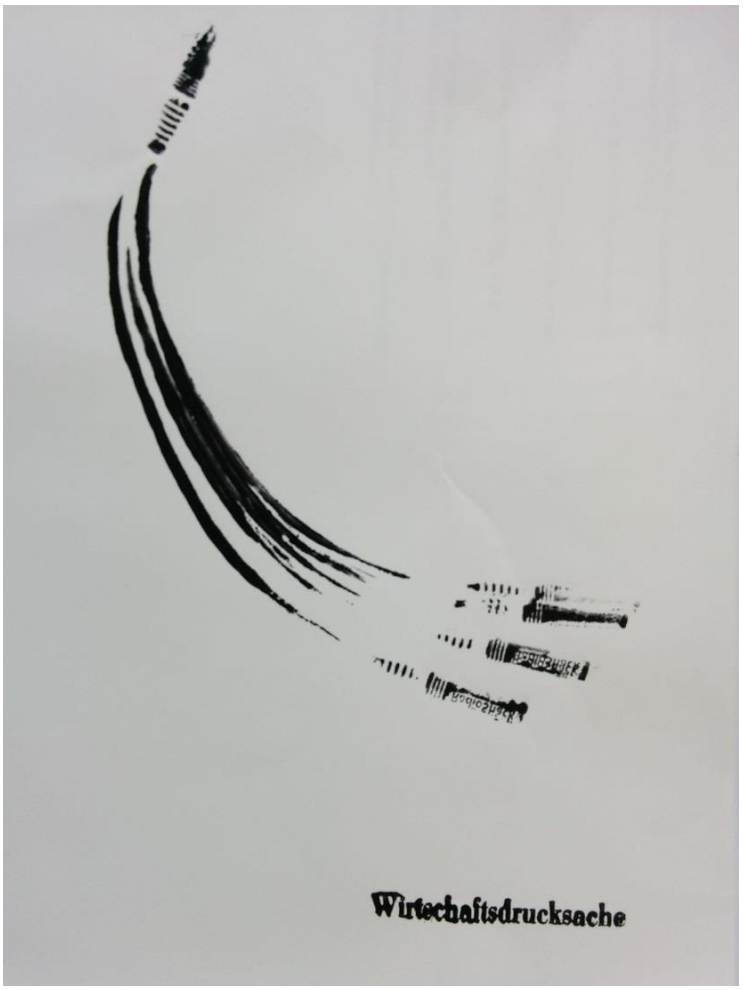

Empirical print (see page 51 for further information).

Youtubization of research. Enacting the high tech cowboy through video demonstrations

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Sustaining the promises of autonomous robots

Although video demos have become a wide-spread medium in communicating science, they remain curiously understudied in STS (Elish, 2011). With the rise of video sharing platforms, such as YouTube, researchers may easily disseminate their self-produced clips. For example, in order to excite the audience about the potential of robotics, video demos depict robots performing visible actions. Suchman (2008) argues that video demos do more than representing science. They are performative, “the videos create a record that can be reliably repeated and reviewed in what becomes a form of eternal ethnographic present.” (2008, p. 148) These videos imply that what might have only worked once will work anytime, anywhere and without the implicated networks of human and nonhuman actants. In conclusion, Suchman (2011) postulates that video demos play a significant role in sustaining the promises of humanoid robots. These videos provide proof of the existence of autonomous robots and of the feasibility of the imagined futures.

Horst argues (2013) that the activity of science communication is intimately linked with perceptions of identity and organizational culture. She identifies three different modes of representation. Each of them implies different notions of quality, audience, motivation, and learning. I take her argument as a starting point for my analysis of the relations between video demos and identity construction.

During my ongoing field work in self-driving cars research, I was surprised by the pervasiveness of video demos and the researchers' devotion of temporal resources to them. In this presentation, I elaborate on the researchers’ perception of their demo videos and the meanings they attribute to the videos. I introduce two concepts to deepen the understanding of the relations between the researchers’ identity and the medium of video demos: youtubization and high tech cowboys.

Empirical materials and methods

My interest in video demos grew out of my ongoing ethnographic field work in self-driving cars (aka robotic cars, autonomous vehicles or driverless cars) research. In June 2012 I started my field work among a University-based working group at a large German University. In order to anonymise this particular working group I will use the fictitious acronym AUC in this text. AUC consists of 20 computer scientists, mostly PhD and Master students. AUC produced 8 video demos between autumn 2009 and summer 2012. The empirical material generated through participant observation and ethnographic interviewing supplements my analysis of AUC’s video demos. My

analysis is guided by Grounded-Theory-Methodology (Corbin and Strauss, 2008) and Situational Analysis (Clarke, 2005).

Figure 1: Example life world: The group leader speaks at a science slam in German public television. A video demo is running in the background during his talk. (Screenshot: Radio Berlin-Brandenburg)

Youtubization and high tech cowboys

Winthereik et al. (2008) call for a relational analysis of video demos. By studying the "*life world* of the demo" (2008, p. 121) they foreground the time and space where video demos are shown. AUC stages video demos at various events and sites, both offline and online. For example, embedded YouTube clips have been used as eye-catchers on AUC's website. Whenever AUC's members give a presentation on their project, they usually show a video demo. There are two ways in which they integrate videos in an oral presentation. One approach is to show the video without audio in the background while a member of AUC explains what the audience is supposed to see. The other approach is to stage the video with audio during the talk to add excitement or at the very end of the presentation to make a final statement.

AUC has been very active in producing video demos because they believe that this is an efficient way of drawing attention to their projects. They insist it takes less time to make a video with a new human-robot interface and to develop the necessary software than to write a paper for a computer science conference. However, AUC's members are ambivalent as to the risks and benefits of producing video demos. While they are pleased to receive the attention of journalists, potential project partners and hackers through these videos, they are, however, wary of misinterpretations. The video demos drawing the most YouTube views feature experimental human-robot interfaces, such as a smart phone acting as a remote control for the robotic car or an EEG-headset acting as a brain-robot-interface. Among AUC's members these experiments are viewed as of little scientific value because they do not contribute to what they see as their core competences in the field of robotics. What the audience witnesses in the more popular video demos are experiments that have been conducted primarily for communicating science to audiences beyond the field of robotics. AUC's members believe that their most popular video demos deceive outsiders of the 'true' nature of

their research. Journalists who call AUC because of the popular videos have to be persuaded into filming experiments that better align with AUC's self-perception. In addition, they are afraid of losing credibility as serious computer scientists among peer researchers.

Figure 2: Example contested video demo: A researcher remotely controls the robotic car with his smart phone. (Screenshot: Youtube)

I propose the concept of 'youtubization' to denote two simultaneous processes in communicating science. First, it highlights the processes of creating or developing a choreography and a narrative for an autonomous robot, which do not necessarily conflate with the project's overall objectives and work practices. For example, the activity of writing software code is omitted from those videos. Instead, AUC *makes the audience see code* through visual actions performed by the robot and through visualisations of the robot's sensing capabilities. Second, the video is edited to comply with YouTube's aethestic conventions in terms of length (usually no more than 3 minutes), background music and plot devices.

Producing video demos contributes to AUC's culture of high tech cowboys. The concept of high tech cowboy highlights not only the fact that AUC is overtly male dominated. I derive the concept from the specific values and relations of AUC. Their imaginations and research practices highly resonate with the global myth of the cowboy (e.g. Wright, 2001). In particular, AUC's members delineate themselves from, what they call, "ivory-tower" computer scientists working on theoretical computer science. By producing videos and actively communicating science to non-academic audiences, they identify themselves as making a difference in society as opposed to "ivory-tower" computer scientists who –in their view– only disseminate their research results among peer researchers.

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Communicating science, transforming knowledge: Insights into the knowledge communication practices of the popular science magazine GEO

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Abstract

Popular science magazines are an often-neglected medium in the field of science communication. While being committed to the scientific community, upholding an ethos of scientific accuracy, they aim at mediating science and are thus actively selecting, transforming and recontextualising scientific knowledge. Constituting a hybrid space of science communication, they continuously (re)draw the boundaries between 'science' and a highly educated 'broader public' that is co-constructed through the specific communication practices of these magazines.

My paper draws on ethnographic observations at the editorial office of the German popular science magazine *GEO*. Tracing its production processes I show how editorial members conceptualise science communication and on what notions of science they base their assumptions. This is linked to how *GEO*'s target audiences are imagined and what kind of scientific literacy is ascribed to them. By approaching these practices through the lens of Science and Technology Studies (STS), this article contributes to an understanding of how popular science magazines produce and communicate knowledge.

Introduction

In modern 'knowledge societies' (Stehr, 2001) science communication has become an important endeavour for politics, the media and the scientific community alike (Weingart, 2005). Popular science magazines thereby hold an interesting position, being located at the threshold between the scientific community and the broader public (Stöckel, 2009). Within the many formats of science communication existing today, popular science magazines can be regarded as a more classic medium, building on a linear mode of knowledge transfer and being restricted to the format of written texts, photography and illustrations within the limited space of a paper magazine.

Despite building on a long tradition, popular science magazines have not been studied as extensively as mass media in regard to science communication, especially within the field of STS.

Existing studies have focused on their output, mostly the specific texts (e.g. Ricci, 2010, Christidou et al., 2004, Gouthier and Di Bari, 2003) as well as (more rarely) the visuals (Beaudreau, 2002, Heuman, 2009). In contrast, this paper focuses on studying popular science magazines from the inside. In order to know how science communication works, we need to investigate the daily routines, practices, tasks and implicit standpoints of science communicators. What are their motivations for their job?

What are their ideals of science communication and their imaginations of science as a concept?

Through ethnographic fieldwork at its editorial office I trace the history and production processes of the German popular science magazine *GEO*. I will show that through selection criteria, recontextualisations and specific ways of communication, knowledge is not simply transferred but actively transformed and thus new knowledge is created within this particular setting.

Methods

In April 2014 I spent one month in Hamburg conducting ethnographic observations at the editorial office of *GEO*. During this time I conducted 14 interviews with various members of the editorial staff, including the editor-in-chief, science journalists, photo editors as well as people working at the art- and verification department. I also attended meetings and conducted database research.

Results

Reconstructing GEO's history

Here I would to highlight the three most important points in regard to *GEO*'s history as reconstructed from my observations. While necessarily fragmented and incomplete, it offers a glance at how members of the editorial staff imagine the history of the magazine they produce.

GEO was founded in 1976 by the German photojournalist Rolf Gillhausen at the publishing house *Gruner + Jahr*. Before, Gillhausen worked for *Stern,* another magazine at the same publishing house that had continuously bought a lot of high-resolution images it could not all print. *GEO* was partly founded in order to have a space were these images could be published. This wide use of visual material, especially photography, had remained a trademark of the magazine until today.

While *GEO* became popular with ecological topics during the 1980s, it had to shift its focus during the early 2000s because the American popular science magazine *National Geographic* started producing for the German market in the late 1990s. Now *GEO* could no longer buy stories from *National Geographic*, which applied especially for nature features with beautiful photographic footage. Thus, *GEO's* focus shifted to more human centred topics, like psychology.

The attempt to make *GEO* more 'reader friendly' as a reaction to a declining readership can be seen in a recent change in the structural organisation of the magazine: Since November 2013 *GEO* is organised into 11 overall sections, dealing with different focal points such as 'biosphere' or 'focus of research'. This new outline gives the magazine a stable structure but also leads to considerably shorter articles.

Production Processes

Although the size of *GEO*'s editorial department is rather small the production processes are still complex and involve many human as well as non-human actors.

Proposals for contributions to *GEO* can be made by all participants – text editors, photo editors and the art director – during a so-called 'section conference'. Different formats of contributions exist within *GEO*. About 60% are articles, either written by text editors

or freelancers, while 40% are photo-stories selected from portfolios of photographers.

Each article gets edited and revised several time, with text editors copy-editing the work of freelancers. Next, articles are passed to the verification department, also called “DOK” (for documentation). Employing fact-checkers is not common for all print media but regarded as a sign of quality journalism (Schäfer, 2011). These journalists are responsible for checking every detail of an article by controlling if the text corresponds to the original (not necessarily cited) source. This includes a lot of tacit knowledge and implicit assumptions about what counts as a credible source. Fact checking goes beyond articles but also includes images, picture captions, scientific illustrations, graphs and maps.

Photo editors make the final selection of visuals for each article, either from photojournalists’ material or from photo archives. The final layout depends on the number of advertisement within the magazine, which may change until the last minute. Therefore, the art direction can make important changes to the content of an article through deletion of text and images.

Because of the rather small size of the editorial office informal decision-making plays an important role. The term *“kitchen cabinet”* was often employed for designating the five hierarchically most important people within the editorial department, consisting of the editor-in-chief, his deputy, the head of the photo department, the head of the art department and the executive editor. Although their tasks and responsibilities are not explicitly stated they decide on articles or images during their informal meetings.

Investigating these production processes reveals that *GEO* conveys a specific picture of science that is shaped through various factors. This starts with the many selection criteria an article has to pass to be published. One important factor is the ability of a topic to be visualized. Additionally, stories that are too complex or not deemed fitting into the overall self-image of the magazine will fail in the selection process. Informal power plays cannot be underestimated in this regard since such guidelines are nowhere formally declared.

The way stories are told also leads to a specific image of science. Aiming to embed the science into an interesting story, science journalist “use the classic techniques of story-telling” by writing the story around a protagonist and trying to present the findings as new insights (Schäfer, 2011). Thus, stories not necessarily correspond to the daily routines and practices of scientific research.

Science Communication and Self-Image

The reasons for communicating science and the way it is done are strongly intertwined. Among members of *GEO*’s editorial staff the notion of an ever-increasing importance of science for society is prevalent. One science journalist said:

> “…what I always liked about science journalism is the act of popularization, to explain things that influence our lives and society to people, to make them understandable…“ (Science Journalists_3)

The necessary selection of topics and resulting bias is understood as a central task and key feature of the magazine:

> “…the amount of data today is just so huge that we are assigned to select. It is our task to sort, to sound, to select and also to sharpen, to give the people some islands within this gigantic sea of knowledge; or rafts on which they can swim. This is really, a very challenging task.” (Editor-in-Chief)

Within such a framework science communication constitutes a tedious, responsible and important activity since it means bringing science to the people. Being a science journalist working for *GEO* is perceived as a very prestigious position.

Imagined Target Audience

This conceptualisation of science communication is connected to imaginations of the audiences at which this work is directed. *GEO* tries to interact with its readers through various ways, e.g. market research, subscriber interviews, campaigns such as *"GEO saves the Rainforest"* or events like the *"Day of Biodiversity"*.

Members of the editorial staff are well aware that their target audience is very specific with an income and educational background ranging far above average. But *GEO*'s relation to its readers is somewhat ambiguous. In *GEO*'s own perception, the specific character of its audience makes *GEO* as well as its readers stand out from the crowd. If certain scientific facts are not accurate, readers will write letters to the editor complaining or simply correcting the fact.

> "That says something about our audience, they always… if something is wrong there will always be someone to notice. That is incredible, it is terrific." (Fact Checker_1)

While it may be harder to write for a highly educated readership this readership is simultaneously presented as flattering for *GEO* since it reassures the self-image of being a high quality magazine and supports *GEO*'s ideal of scientific accuracy. *GEO* and its readers are thus co-produced (Jasanoff, 2004) through imaginations about who this readership is and what it knows as well as about what the magazine should accomplish.

On the other hand *GEO* seeks not to overwhelm their readers with information. Facts need to be made accessible by bedding them into a story.

> "It has to be our aim to build bridges, not to (…) write condescendingly for the readers, but to take the readers along on a cognitive processes" (Editor-in-Chief)

GEO assumes that long and complex stories might overcharge the readers' span of attention. Here, the market logic plays into the process of co-producing readers and magazine. *GEO* does not only want to communicate science but also wants to be bought and read. Since the magazine is also a brand in a wider media landscape, it has to be continuously refined and adapted to existing market conditions represented by reader needs and demands.

Discussion and Conclusion

There seems to exist an inherent conflict between *GEO*'s ideal of 'scientificity' and the need to adapt to changing market conditions. Bowler (2013) pointed out that popular science magazines have to make a choice between "strategies based on education or strategies based on entertainment". *GEO* is trying to juggle many balls at once. On the one hand *GEO* wants to adhere to the scientific ethos of true facts. On the other hand *GEO* has to present an interesting and understandable story to their readers. But along the process of popularisation, knowledge is simplified, recontextualised and thus transformed. Hence, in a representationalist view, the 'truth' is already 'distorted', a discordance felt by members of *GEO.*

GEO's representation of science is based on specific selections. These start with the choice of topics to be published that focus on the natural sciences, which conveys a one-sided picture of science (Geretschlaeger, 1986). But also technical, personal, strategic and political issues come into play. Thus, certain sciences and their realities are left out in these communicated images of science, which in turn may influence the public's perception of scientific research and science itself.

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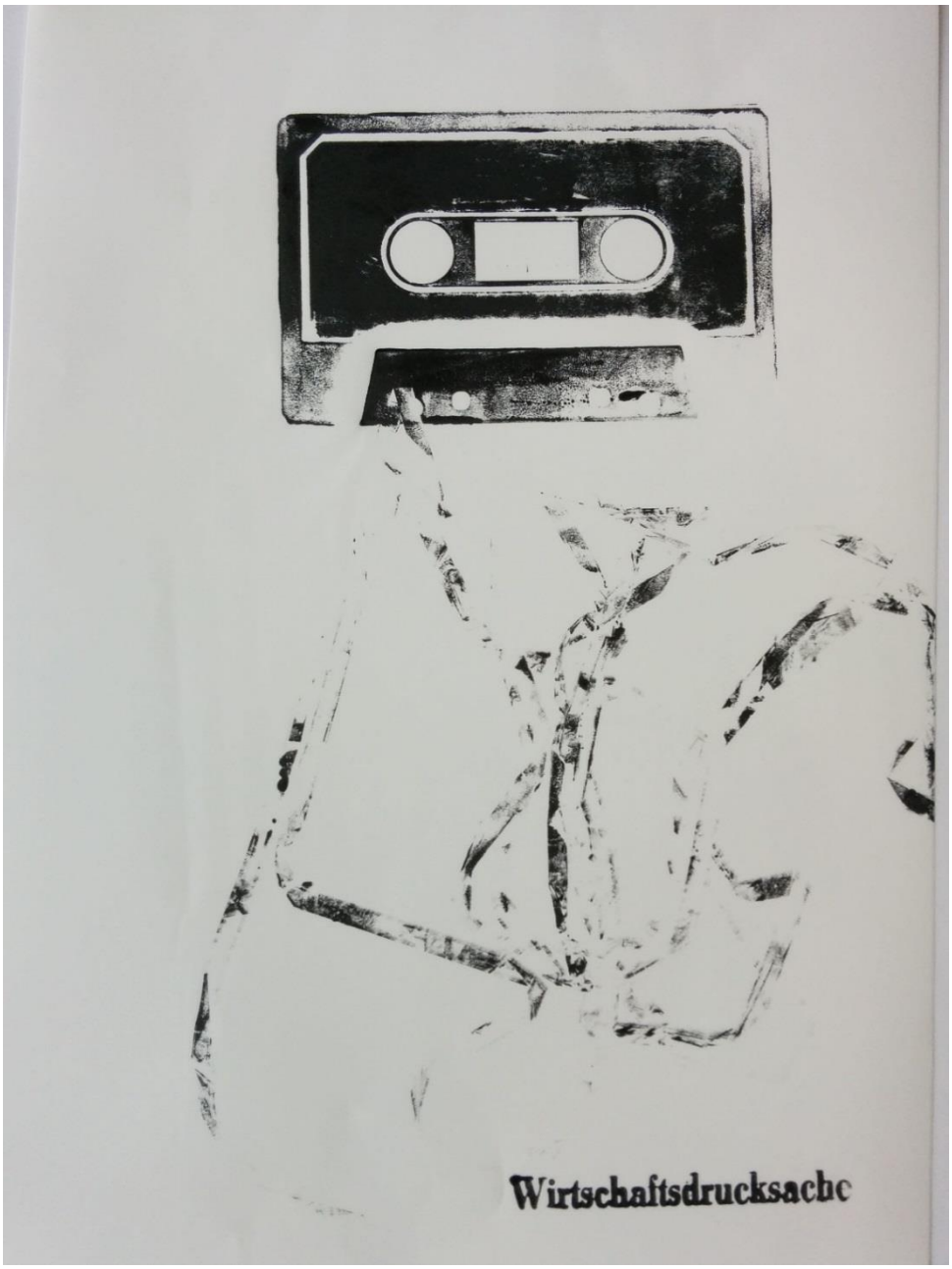

Empirical print (see page 51 for further information).

Communicating science – Shaping identities

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Abstract

This paper is a photo story about how science communication is more than just making science accessible to non-scientists. Using the 2014 ESOF conference and the related Science in the City festival as an example, the paper sketches a perspective on science communication which understands it as organizational communication.

Introduction

In the 21st Century, science communication has become institutionalized, professionalized and organized (Neresini and Bucchi 2011). Scientific organizations invest substantially in communication and they increasingly have policies, strategies and organizational units to direct their efforts in this direction. Nations and cross-national institutions such as the EU, brand themselves as knowledge societies and formulate action plans and reports on how to improve the science-society relationship through communication (Horst and Irwin 2010). At the same time science communication is also a task that is undertaken by individual scientists because they want to share their expertise, because they care deeply about the relationship between science and society or because they want to shine a positive light on their particular scientific field (Horst 2013). Communicating about research is a way of enhancing its legitimacy and reputation – some people also claim it increases the likelihood of funding. It is therefore fair to say that science communication has become an important part of the ability to DO science. And it is certainly intricately connected with organizational communication and with the shaping of individual, organizational and national identities.

ESOF and Science in the City 2014

This paper uses the example of the ESOF (EuroScience Open Forum) conference 2014, which was held in Copenhagen. The story begins at the registration area by the entrance to the conference.

Figure 1: Entrance and registration area ESOF conference 2014.

The ESOF conference is held every second year in a European city and has 4-5000 delegates. The entire European establishment within science policy participates in this conference. The programme has a mix of talks on scientific themes, science-policy issues, outreach and business as well as career sessions. It is clear from looking at the registration area depicted above that this is a professional conference. Even the red carpet is out, fitting very well with the logo of the conference, the red circle. The carpet is ready to welcome notables to the opening of the conference, including the Danish Queen Margrethe II and the chairman of the European Commission Manuel Baroso. The queen welcomed all these people to Denmark, as shown below.

Figure 2: Opening ceremony of ESOF conference.

Quite a different image of a welcome ceremony was found outside on the previous day, when the Danish minister for higher Education and Science opened the Science in the City festival, which always accompanies the ESOF conference. Run in parallel with the conference and being just as professional, the aesthetics of the festival opening, however, are quite different with its main feature being children and balloons. Judging from the two photos of opening ceremonies it is obvious that in comparison the former signals seriousness, importance, institutionalization, whereas the latter depicts fun, lightness and playfulness.

Figure 3: Opening ceremony of Science in the City festival.

At all the previous ESOF conferences, the Science in the City festivals had been held in the same city, but in different locations than the ESOF conference. In Copenhagen, the organizers had decided that they could host the two in the same location. They chose an area of the city, which used to house the Carlsberg brewery and laboratory. In 2014, however, the company had relocated and the area was in the middle of a redevelopment into a modern green, sustainable, young and family-friendly part of the city.

Carlsberg is a significant name in the Danish science world. The Carlsberg Brewery was founded in 1847 by J.C. Jakobsen who is renowned for being the first to adopt scientific technologies to improve the quality of beer brewing and for being an avid supporter of science in general. In 1875 he founded The Carlsberg Laboratory, which has had an important status as an exemplary industrial lab also producing excellent basic science. Jakobsen also established the Carlsberg foundation, which is one of the largest private foundations supporting science in Denmark. There are close links between the Carlsberg Foundation and the Danish Royal Academy of Sciences and Letters.

Placing the event in this area therefore connected it with at least two important cultural and historical trajectories, values and images. First of all, Carlsberg signifies the connection with science for economic progress and the linking of scientific excellence with industrial research. Secondly, the regeneration of the old industrial estate into a new modern and sustainable urban space links up with current branding of Copenhagen as a model of green and 'liveable' city planning – also marketed under the name of 'Copenhagenization'.

The central events of the ESOF conference including the plenary, registration and exhibition area were placed in a large facility that used to be the bottling plant of Carlsberg. The Science in the City festival was placed around this central plant in the many other unused industrial buildings and in tents between them. Since the area is vast and usable industrial buildings were not located right next to each other, the festival was organized in six different areas – all in walking distance from each other.

The co-location, however, also made some interesting differences and similarities between the two events more visible. Inside the bottling plant, the conference had its

exhibition hall where numerous scientific organisations, funding bodies, countries and companies were displaying their mission and efforts and where lots of networking were taking place throughout the conference.

Figure 4: Stands for Aarhus University and the Danish Research Council for Independent Research.

In the left photo above we see the stand of one of the Danish universities. As with most other universities, the branding language from this university is filled with words like excellence and innovation. The imagery on the wall has a simplicity that could be associated with the tradition of Danish furniture design, an association underscored by the fact that the chair is 'Myren' (The Ant) by the famous designer Arne Jakobsen. The text next to the image of the chair says: 'a chair, or the work-station of a future Nobel prize winner'. Similarly, the text above the image of the flask says: 'a flask, or a step towards the cure of cancer'.

In the photo above to the right, it is the Danish Research Council for Independent Research (DFF), which is presenting itself at the conference. DFF is called the 'free research council' in Danish. It supports bottom-up research projects suggested by researchers – in contrast to the Innovation Foundation, which supports 'strategic' or 'challenge-led' research and technological development. However, the wall slogans here at the stand at the conference must also be said to be concerned with the outcome of research: 'DFF paves the way for scientific breakthroughs' and 'When curiosity brings change'.

In the festival outside, there were also stands. Some of them were by the same universities as inside – but the content was rather different. First and foremost they contained artefacts rather than primarily relying on words and slogans. Using these various artefacts as means they were staging a different form of engagement with visitors than the stands in the conference exhibition hall. Predominantly, these engagements were about knowledge related to health, technology or the natural world. They often employed hands-on activities or spectacular demonstrations and they included interaction between visitors and people staffing the stands.

Figure 5: Photographs from the tents by University of Southern Denmark (SDU) and the Danish Technical University.

The left image above is of the University of Southern Denmark's Active Living House. In this tent, festival guests could have their physical ability tested in various ways, they could try out various gadgets and also talk to researchers about the importance of physical activity for health and well-being. The tent by the Technical University was called 'The House of future technologies' and the photo on the right above is from this tent. Inside there were a number of different little stands where researchers were talking to festival guests about their research, each using a specific artefact as a focus for the discussion.

The festival also included various forms of science shows, as seen in the photo below to the left, as well as a number of other hands-on activities for children, teenagers and their parents. In the photo below to the right, a medical student is talking to a couple of children in 'The Teddy Hospital'. Organized by the medical faculty at University of Copenhagen, children were invited to present their doll or teddy, and it would be examined, x-rayed, diagnosed and dressed in a bandage.

Figure 6: Science show and Teddy Hospital and Science in the City.

Organizational communication

Despite the fact that each of the tents and stands in the festival also had the names of their universities or organizations very visible, it could still be said that the focus was comparatively more on content and less on direct organizational branding. In some ways the festival tents could be said to tell you more about the actual research going

on in different universities, compared to the conference stands where words like 'striving for excellence' did not reveal much about what is happening in the research labs.

However, the point I want to stress in this paper is not one about difference, but rather similarity. All of the efforts at the conference and the festival were clearly linked to communicators who had a strategic reason for being present at the conference. Whether it was countries, universities, funding bodies or other organizations, they had a reason to be present at the event and spend resources communicating to delegates and festival visitors. However, while these actors were trying to make knowledge accessible to citizens, promote their own research field or brand their organization, they were at the same time also telling stories about what science, scientific organisations and scientists are and should be. In making this point, I am particularly inspired by the field of organizational communication, and the notion that communication is crucial for the construction of organizational identity (Taylor & Van Every 1999). If we are to understand science as a cultural phenomenon, we need to take an interest in this aspect of science communication. Science is not just an epistemological phenomenon – it is also an important cultural activity that has impacts on our identity as citizens, members of various communities and organisations – and as nations.

The academic field of organizational communication is large, so in the interests of simplicity I have chosen one single theoretical influence to exemplify my perspective. This is an article by Hatch and Schultz from 1997 in which they argue that organizational identity is a relational construct depending on both culture and reputation.

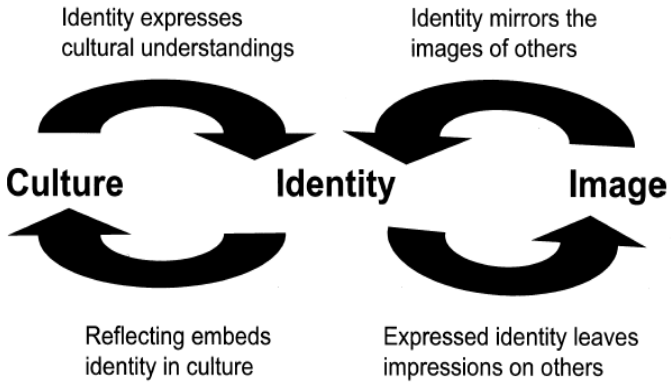

Figure 7: Organizational identity as relational construct.

In this model, image is understood as the perception of the organisation held by those which are considered the organisation's other. Culture is the tacit organizational understandings – such as values, beliefs, assumptions - that contextualise efforts to make meaning. Most of these are never made explicit, but exist as a tacit and implicit infrastructure, which organizational members use to make sense of things that happen in the world – also even though they might not be aware of it. Finally, identity is where these two influences meet and construct a self-perception of who we (as organizational members and as collective organization) are in the world. Thinking about the stands in the ESOF conference and the Science in the City festival in these

terms means that we put emphasize on how science communication is crucial for the shaping of scientific identities and the understanding of what science is and ought to be.

The prevalent image of science portrayed in the ESOF conference – here exemplified by the opening ceremony and the stands in the exhibition hall - is related to progress, professionalism, outcomes, competition, excellence and investment. Science is big business and it is crucial for our future society. It is run by a well-oiled machine that can command the most prominent figures in society to celebrate it. In contrast, science as portrayed by the Science in the City festival is playful, spectacular, relevant, colourful, entertaining, wonder-ful and engaging. It is created by people who will spend time demonstrating its usefulness and involve visitors and let them get their hands on 'the stuff'. These two imaginations of science, however, are not in competition or conflict with each other. Rather they are shaped towards two different audiences and they demonstrate how modern research organisations have become professionalised in terms of how they depict science. Both images imply science as a fundamental and inextricable part of modern life and modern society. Doing (and understanding) science is linked to doing well in the modern world.

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Science, comedy, distinction, activism and science communication

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Speaking as a guest in the first episode of BBC Radio 4's science magazine / entertainment show “The Infinite Monkey Cage”, the comedian Dara Ó Briain muses why so many comedians (like himself) have a science background.

> “I have a theory that the way you come up with ideas in comedy isn't dissimilar to the way you come up with ideas in mathematics, because you compare things to other things basically, you compare the properties of one thing to the properties of another thing and there, and from that hilarity slash mathematical illumination lie. Right? Depending on which two things you are comparing.” (Ó Briain, BBC 2009)

The past decade has seen, in the UK at least, an interesting rise in mainstream comedians taking an interest in science and incorporating science into their comedy routines, including Ó Briain himself, but also others such as Ben Miller, Tim Minchin and Ricky Gervais. Simultaneously science and science communication seem to have discovered the potential of comedy, as evidenced by the “Infinite Monkey Cage” show, which is jointly hosted by the comedian Robin Ince and the scientist and science populariser, Brian Cox, or the “Bright Club” initiative from University College London (Bright Club, n.d.; see also Pinto et al. 2013 for a similar project in Portugal). While there may be a natural affinity between comedic and scientific creativity as Ó Briain argues that will presumably have been present long before the rise of science comedy, the rise itself seems to be an interesting indicator of how the cultural values of both comedy and science have shifted in such a way that makes the combination of the two such a pervasive presence in contemporary British popular culture.

This contemporary science comedy seems to be qualitatively different from previous comedy about science – of course science, like any other important topic, has previously featured in comedy, be it as a narrative device (as in Hollywood movies like *the Nutty Professor*), a general background because the humour is achieved as a parody of science fiction (Douglas Adams' *Hitchhiker's Guide to the Galaxy*) or as a parody of science itself. What makes the new science comedy different is that the science is central to the humour, but not the target itself – the science, as with (traditional, deficit-style) science communication activities in general, is not questioned. As Ó Briain has argued, the relation between science and humour is not so much that between the joke and its subject, but as the source of comedic creativity itself. The subversiveness of humour, which previously may have targeted science and the pretentiousness of scientists, now intends to work *with* science to subvert any perceived *anti*-science: the butt of the jokes now are homeopathists (e.g. the homeopathic A&E sketch in BBC 2’s *That Mitchell and Webb Look*, 2006-2010) or

new agers and hippies (Minchin 2011). While occasionally the scientists themselves are being joked about, through often very conventional stereotypes such as their crazy Einsteinian hair, other-worldliness or social awkwardness, they nonetheless remain very much the heroes of the story, and the science itself has become off-limits to the subversion. In this sense, the contemporary science comedy of mainstream comedians aligns very much to that of the humour being used by scientists in humorous public engagement talks. There is an element of activism in science comedy, by railing against anti-science the comedians, often quite consciously so, align themselves with a wider contemporary movement that foregrounds rational thought, science and "geekness" as their group identity: the subversive power of humour is being used to promote science and disparage any perceived pseudo-science.

A sociological analysis of this phenomenon will have practical implications and lessons for science communication activities that intend to incorporate humour or comedy as a way of teaching, enthusing and/or engaging the public with science. In Riesch (2014) I have argued, with reference to studies in the sociology and psychology of humour, that some of the main social and rhetorical aspects of humour can make this task difficult if not applied carefully. As comedic texts rely on interpretative flexibility to construct the incongruities that produce the humour, any particular message can easily get lost as audiences make their own interpretations. Jokes about science often presuppose background knowledge of the scientific concepts they joke about in order to be funny, which may make it difficult to teach the same scientific concepts without destroying the jokes by explaining them. Finally, humour that arises through stereotyping – of either scientists or non-scientists, can end up strengthening a group identity among those already interested in science and/or thinking of themselves as part of the "geek" culture, but at the same time alienating those not invested with that group identity, which arguably would most often be the main target of science communication activities.

In this essay, I want to widen my analysis by considering some of the social background of science humour, whether driven by mainstream comedians or science communicators, to sketch an argument on how the idea of science comedy has become so pervasive as a way of trying to understand the movement better.

Two societal developments seem to have contributed to the rise of science comedy in its current, science activist, form as a mainstream form of popular cultural entertainment. One is the rise of comedy, specifically the stand-up and TV sketch type comedy in which this culture finds most of its expression, as a legitimate "high-cultural capital" art-form, the other is the increasing acceptance and cultural mainstreaming of "geek culture"; these will be addressed in turn below.

Friedman (2011) has recently argued convincingly that (British) comedy tastes and consumption habits align with the audience's cultural capital. Drawing on Bourdieu's analysis in *Distinction* (Bourdieu 1984), Friedman has shown through his empirical study of comedy audience members, that there is a relatively clear divide in the type of comedy preferred by people with high and low cultural capital resources. Analogously to the high and low cultural capital types of art that Bourdieu analyses, high cultural capital comedy differs from low cultural capital comedy through the

modes of appreciation that people use to evaluate it. High cultural capital comedy aims to be judged through a more Kantian aesthetic, where the point of the art-form is not merely, and not always even mainly, the enjoyment or laughter the audience gets out of it, but also the way it makes them think, addresses social and political issues and aims to subvert authority. Friedman cites the political comedy of Stuart Lee and Mark Thomas as typical examples. Low cultural capital comedy by contrast, exists for the purposes of entertainment and gets judged by whether the now mainly low cultural capital audience finds it funny or not, Friedman's main contemporary example here being Michael McIntire.

Historically, stand-up comedy has tended to be viewed as a low cultural form of entertainment, having arisen out of the vaudeville and music hall traditions (Double 2014). It was only with the rise of the “alternative comedy” movement in the early 1980s, when comedians like Alexei Sayle and Ben Elton among many others started to use comedy as a form of (left-wing) political activism that looked to radically change comedy from the often sexist and xenophobic tropes that often characterised earlier stand-up comedy, that comedy slowly changed into an artform that could be judged through high-cultural capital terms and therefore gained mainstream cultural legitimacy. While this transformation has been slow and certainly not complete, since the 1990s then comedy – the right kind of comedy – has now become something that the middle classes can enjoy, and enjoy through high-cultural, middle class aesthetics.

The other development has been the interesting rise of the “geek” sub-culture (McArthur, 2009) into the cultural mainstream which happened over the past decade. “Geek chic” is a fairly recent phenomenon that has brought the previously maligned and marginalised technology culture associated with IT and science into the high cultural mainstream. As information technology has become over the past 40 years an increasingly visible and important part of life, and possibly more importantly, the IT boom has made millionaires out of people who started out as the geeky computer nerd at school, geekdom has moved out of being a marginalised youth subculture and become increasingly acceptable as a mainstream culture. Along with IT, associated items of geek culture – such as superhero comic books, science fiction and interest and proficiency in science have become elevated with the geek subcultural capital to wider social legitimacy.

Contemporary science comedy then is an interesting result of both comedy and an interest in science having fairly recently become part of the cultural mainstream. Although science itself has always been a high-cultural capital pursuit in itself, the rise of the geek has brought science to a wider attention. The fact that comedy can now be judged in the same middle-class aesthetics as abstract art or classical music, for making you think rather than merely entertain you, means that science has become a legitimate topic for comedy. As opposed to previous comedy about science, which did not align itself to the any larger science agenda, contemporary science comedy – similarly to say the left-wing political comedy experimented with by the alternative comedy movement – has an activist focus which in addition to making people laugh fulfils other aesthetic requirements for high cultural entertainment and aligns itself to an activist agenda broadly following that of science.

Ó Briain's musings quoted above on the similarities of comic and scientific creativity are therefore significant in that they demonstrate that at least in his science comedy, science and comedy are intertwined as a way of thinking. Thus science comedy is not

about subverting science or holding it to account, rather it is about furthering science and its agenda as part of the comedy itself. It is therefore in a sense suited to old-fashioned deficit-reducing science communication, to the detriment however of some of the unique features of humour that makes it different to other science communication activities, such as subverting and ridiculing established powers and ways of thinking. The fact that science comedy seems to align itself with high cultural capital styles of appreciation in its combination of high status comedy and the high cultural status of science itself as enhanced by the geek movement, also limits its potential reach towards audiences not already aligned to high cultural capital tastes: the middle classes who presumably are already attracted to science and academia more widely as a legitimate cultural pursuit.

It is therefore an open question as to what science comedy as science communication can achieve and if this is in any way different to the established science-talks and lectures that science comedy is often hoped to do better at. In this essay I have only tried to sketch out an argument on the social and cultural origins of contemporary science comedy and how these influence the type of audience it appeals to as well as the contents and targets of the comedy itself, and why this would matter for anyone interested in using comedy to communicate science.

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Science communication in science centres and museums: Return to their core business

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Introduction

Both in my previous life as practitioner in the field, and in academic and professional meetings I have noticed there is a growing feeling that sector of Science Centres and Museums is entering a crisis regarding their identity. This is certainly triggered by the increasing need to attract audiences who have an ever wider range of choices to spend their time and money in. However, responses and attempts to address this crisis do not always seem driven by principles stemming from an understanding of what Science Centres really are and the "language" they master. In order not to break they bend with the winds that blow... but are those winds blowing in the right direction?

Science centres and trends to follow

In the 90s, when many Science Centres were being created and the financial climate allowed –or invited– to spend vast amounts of money without much thinking through, one naïve option many went for was to focus on new technologies and getting the latest gadgets built into exhibits that often lacked any other design principle. And even those that did, became obsolete within months, when visitors carried in their pockets more advanced gadgets than those in the exhibition. We were blinded then by the ICT boom, but in hindsight it seems obvious that such technologies needed to be at the service of a wider science communication concept in order to fulfil a role rather than be the attraction themselves. Notable exceptions are centres devoted to showcase the technologies in their own right, such as *Futuroscope* in France, but this only works under a very high budget to keep up with the pace at which technology advances and with very strong sponsorship from the manufacturers.

Less obvious and perhaps even surprising for many is the inclusion here of another trend that lies in the very essence of Science Centres. What we call interactivity or hands-on became the guiding principle for any new science centre or exhibition – if it is not hands-on, it has no place there. "It's forbidden not to touch" was the new motto. The result were exhibitions where visitors had to push buttons everywhere – buttons that ticked the box of interactivity, but often were nothing more than triggers for lights to blink or mechanisms to work – not quite what we would expect under the principle of interactivity. Visitors would walk around pushing every button without much thought and often without even waiting for the effect to take place.

While learning by doing is indeed a solid educational principle, it cannot be applied to everything indiscriminately, and there are objects, ideas and stories that do not need or do not lend themselves to manipulative interaction. In fact, as suggested by Jorge

Wagensberg (Terrades Arquitectos and Wagenseberg, 2006) apart from, and perhaps more important than hands-on interactivity, there are the minds-on and hearts-on interactions between visitors and exhibitions.

On the other hand, funding agencies have tried to follow the strong trend towards dialogical science communication or public engagement, and therefore many science centres felt a strong need to tick that box in order to remain eligible for their funding. Unfortunately, as explored in Owen and Stengler (2015), exhibitions do not seem to be the ideal environment for dialogue, in its "true" sense of a dialogue between society and science that informs the policy and governance of science. Science centres end up needing to organise numerous parallel activities aside from their exhibitions in order to begin to fulfil the dialogue remit, gradually drifting into becoming organisers of events for which an exhibition is not necessary in the first place. As parallel activities are also a good source of revenue, even more so when they are toured or delivered to order in venues other than the science centre itself, many science centres have become very professional event or activity organisers, perhaps neglecting, or at the expense of their exhibitions.

Another source of trends to follow is naturally public demand. Science centres have thus detected that there is a demand for venues where children can be entertained while parents either go shopping on their own or at least have a break to sit down and have a coffee. The problem with this approach in a science centre is that the easiest way to entertain is by having the children have fun, so science centres become "fun" places, and it lies close to end up identifying science with fun. Many science centres have whole sections called "Fun Science", and, particularly in North America, science centres are identified and even called "children's museums". Such an identification of science with "fun" carries various risks as explored in Stengler, Lyons and Fernández (2013), ranging from discouraging scientists to get involved in science communication to misleading[1] young people into thinking that a good reason to enrol in a scientific career is that "science is fun". Science can be many things, such as exciting, fascinating, important, enjoyable, but not necessarily fun all the time. This sends out the wrong message about science, but also about children, assuming they will only engage with things that are fun; or even about school, identifying science and the science centre with "fun", in contrast to science in school, which is "boring". At the same time a focus on fun has shown no evidence of improving engagement with science among primary and secondary students (DeWitt, J., Archer, L. and Osborne, J, 2014). But worst of all in terms of science education, a focus on fun displaces enquiry based learning from science centres, which are an ideal environment for it (Murmann and Avraamidou, 2014).

Final remarks

We therefore propose a return to science centres' "core business", namely exhibitions and the museographic language in order to make them find again their unique selling point of telling stories about science my means of exhibitions. In this area science

[1] Ironically, the word for "fun" in Spanish is "diversión", and it serves to highlight that excessive emphasis on fun may "divert" from useful science education and science communication.

centres and museums can excel and provide visitors with a unique experience that can not be found anywhere else.

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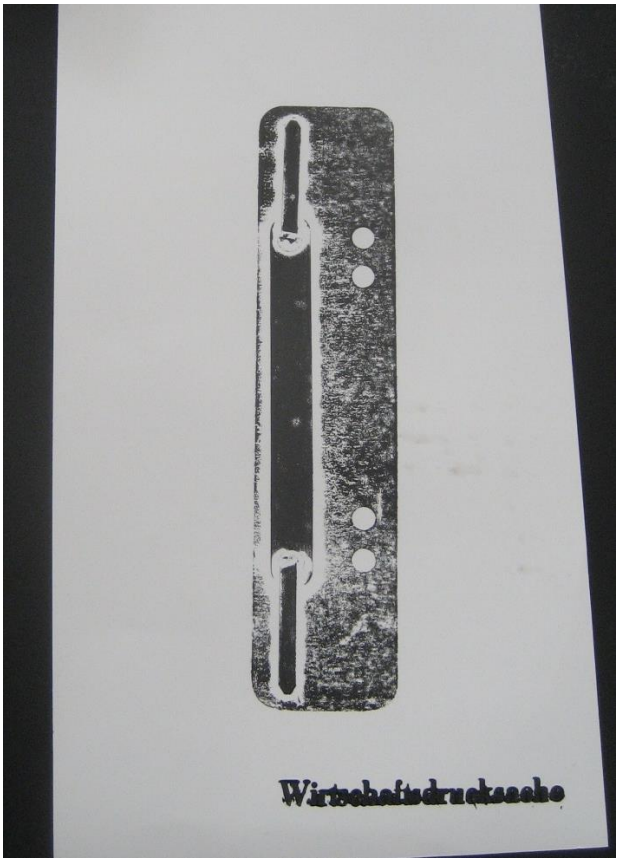

Empirical print (see page 51 for further information).

The communication of scientific knowledge: Between popularization and policy

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Abstract

When researchers communicate research findings to the public that have important social and economic implications, they often try to balance two different roles: the role of a populariser and the role of a policy adviser. Consequently, two axes of interpretation structure this paper. The first axis makes sense of the rhetoric of popular science writing moving along a continuum from science boosters to science critics. The second axis makes sense of how researchers position themselves in relation to policy and politics. Towards this end, the present study selects one general controversy among researchers whose research topic is the Internet: the controversy between those who understand technological change as continuous (characterised by an ongoing evolution) and those who understand technological change as discontinuous (characterised by smaller and larger revolutions). The two understandings of technological change guide the need for policy advice along two different trajectories.

Introduction

Within the interdisciplinary scholarly research specialisation called “science and technology communication”, there is surprisingly little written about the distinction between science communication and technology communication. Thus, this paper sets out to explore one important divergence between science communication and technology communication, i.e., how the two dominant understandings of technology change direct technology communication along two different trajectories. Technological change understood as continuous is characterised by an ongoing evolution, whereas technological change understood as discontinuous is characterised by smaller and larger revolutions (Basalla, 1988; Freeman & Perez, 1988; Kuhn, 2012). This paper will study how the two understandings influence the two different roles of researchers: the role of a populariser and the role of a policy adviser (Jasanoff, 1990; Perrault, 2013; Pielke, 2007). The paper will focus on researchers whose research topic is the Internet. Selecting the Internet as a research topic has two important advantages. First, the Internet is increasingly becoming a target of a range of policy measures. It is therefore reasonable to assume that researchers writing about the Internet will find popularization relevant for one or several policy issues. Second, readers are increasingly becoming Internet users. It is therefore reasonable to assume that researchers writing about the Internet in one way or another try to address readers/users and their interests in their popularised texts. Thus, one might claim that within technology communication, public communication of

the Internet is an “exemplar” that might establish a reference point or constitute a paradigmatic case (Flyvbjerg, 2006).

To study the interface between public communication and policy, I have chosen to focus on an ongoing general controversy that is not easily resolved. Venturini (2010) identified five features that are common to controversies: 1) they involve all kinds of actors, 2) they display the social in its most dynamic form, 3) they are reduction-resistant, 4) they are debated, and 5) they are conflicts. I have chosen a controversy that underlies most public communication of (science and) technology. The advantages of selecting this controversy are that most contributors position themselves within this controversy and that the controversy persists over time.

The role of popularization in Norway has received increased attention in the last 15 to 20 years (Hetland, 2014). In 2004, all state-financed research institutions were encouraged to develop their own dissemination strategies, and the Ministry of Education and Research was to develop a “dissemination indicator in the financial model for universities and colleges” (St.meld.no.20, 2004-05:128). The fate of this indicator will not be discussed here, but indicators were proposed for publication in popular (non-scientific) journals, feature articles in newspapers, popular science and technology journals, and other forms of dissemination to the general public. Feature articles were consequently perceived as an important communication channel for researchers. According to the committee at The Norwegian Association of Higher Education Institutions (UHR), “The committee’s majority wants to encourage more feature articles written by academic staff, since this is a valuable form of communication from research to the general public, which also helps to promote and legitimise the sector’s activities”(UHR, 2005: 33).

In the same period, much of the popular communication activities within information and communication technology (ICT) research were framed by three large research programs from the Norwegian Research Council. These programs have been crucial to setting the agenda for communicating Internet research and its relevance to policy and politics. The first program was called “Social and Cultural Preconditions for ICT” (1998-2002). Among its objectives was “to develop knowledge and expertise improving public policy and the policy of industry concerning new ICT” (NFR, 2003: 4). The second program was called “Communication, ICT and Media” (2003-2007). This program called for research to be “action-oriented and contribute to policy making and public debate, providing input to the regulation, organization and coordination of ICT, telecom and media policy” (NFR, 2002: 8). The third program was “Core Competence and Value Creation in ICT” (2005-2014). One of its objectives was to produce “research results that are used by trade and industry and that benefit the development of society” (NFR, 2010: 5). All together, these three programs have funded close to 400 projects, thereby strongly influencing the agenda of ICT and Internet research and consequently, public communication within the same field.

The public communication of scientific and technological knowledge and the demarcation between popularization and policy will be studied through two research questions:

1) How do researchers discuss Internet issues in terms of how to promote a critical understanding of (science and) technology among the public?

2) How do researchers engage in decision making by clarifying and seeking to expand the scope of choices available to decision makers?

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EMPIRICAL PRINTS – TURNING LITTER INTO OBJECTS OF INQUIRY

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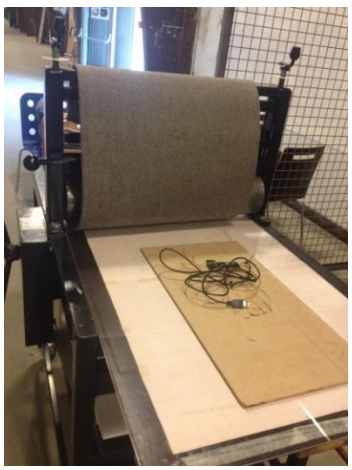
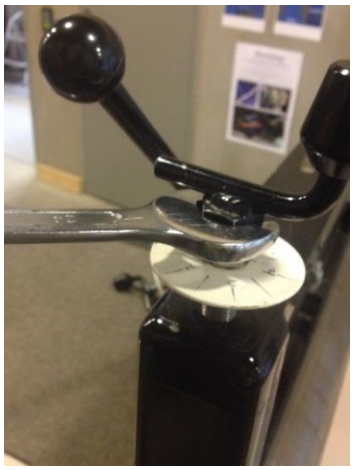
Abstract

Discover the surprisingly aesthetic qualities of marooned everyday objects. Explore materiality and ontology by having pieces of everyday research turned into empirical relief prints. In this hands-on entry we shortly introduce an investigative printmaking concept and share some illustrative photos from different print sessions.

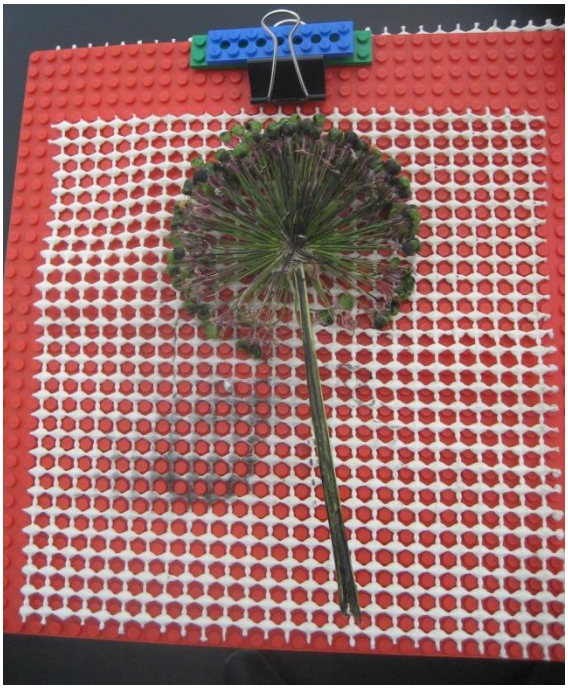
Introduction

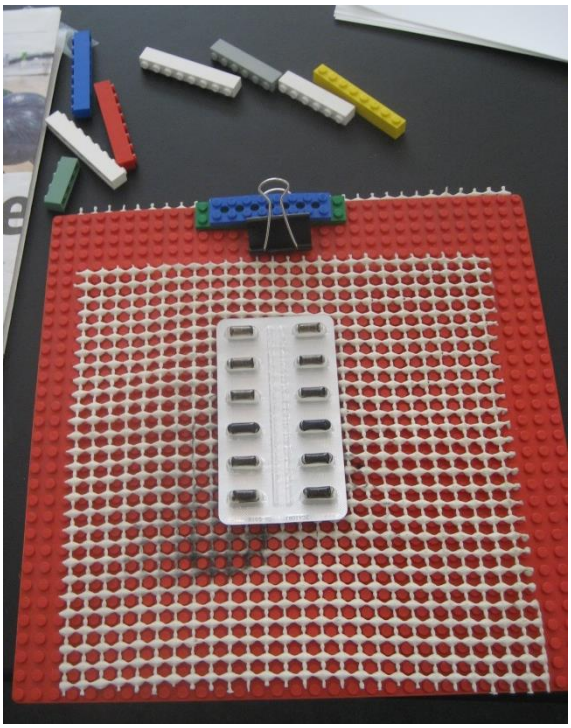
As part of the science communication track at EASST 2014 was our first take on the art/science crossover endeavor entitled 'Empirical Prints'. In the paper we investigated our findings from the IDC (Interaction Design and Children) conference in 2014. 'Empirical prints' (2014-) was first developed as an investigative non-digital concept combining academic STS perspectives with artistic relief prints. The concept was realized in collaboration between Aarhus University, The Empire (Patron for research-related interventions) and Drucksache (An Aarhus based printer). We wanted to investigate a novel way of collecting empirical materials and re-enact them in an aesthetically unusual manner. Since our initial experiment in 2014 the concept has been advanced both theoretically and practically. We have devised at rudimentary, but fully mobile and operational printing press system for making empirical prints on-location. With the mobile 'pressure printer' marooned objects from all over the world are now turned into empirical relief prints - inviting us to re-consider the 'naturality' of everyday items by making the natural seem exotic.





Figures 1, 2: The press at the IDC conference in Aarhus, Denmark, June 17-20, 2014





Figures 3-6: Objects and their empirical relief prints made with the portable printing press.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