

# DRAWING TOGETHER. COLLABORATIVE DESIGN PRACTICES IN EXPERIMENTAL PHYSICS

ARTICULATIONS, ENGAGEMENTS

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## ABSTRACT

This submission investigates hand sketching as imaging practice in working environments, depicting collaborative drawing as a distinct form of knowledge. The research is based on a case study of experimental physicists' collaborative sketching practices. The core question of the exhibition submission is: How can the process of collaborative sketching be made visible between spaces, practices, and knowledge? The hypothesis is that collaborative sketching forms an integral part of the science discourse. These practices are often overlooked yet constitute powerful instruments in the formation of science, society, and politics.

## INTRODUCTION

Experimental physicists are experts in data simulation and the use of digital media. In addition to digital imaging practices, the scientists also regularly revert to hand drawing in their daily work in the laboratories. These working practices are the catalysts for conducting an ethnographic fieldwork in an x-ray research laboratory capturing the physicists' collaborative sketching.

Coming from media studies with a design background, my research interest is not in the drawing as a result, but in the "epistemische Verfahren" (Hoffmann 2013), the epistemic and operative procedures of notation, communication, and visual performance. The sketched images are not the

representation of thinking but made for thinking processes (Merz 2016 p. 364). Drawing as a joint activity has been investigated almost only in traditional design disciplines (Goldschmidt 1991; Henderson 1999; Gero 2002; Murphy 2004; Tversky 2004). The claim is, following Wolfgang Schäffner's notion of the "design turn" (Schäffner 2010), that design practices can be found in many other disciplines other than Design where they unfold their power. The title of this submission refers to Bruno Latour's essay "Drawing Things Together" in which he refers to the practice of writing and imaging as "the most powerful explanations, that is, those that generate the most out of the least, are the ones that take writing and imaging craftsmanship into account." (Latour 1990: 22). The results of these activities do not appear in official presentations of the scientific, societal or political agendas. By reading Latour's argument critically, the informal practice of collaborative sketching can only be traced down, systematically unfolded, and analysed by a detailed micro-sociological investigation. I am following the research object through an assemblage of methods, including participant observation, videography, and visual interviews accompanied by explorative drawings by the researcher.

For the exhibition, the research material is presented as an experimental video, in which the different media formats (video and photographs from the field study, sketches by scientists, reflective drawings by the author) are combined and juxtaposed. Thereby, the hybridity of drawing practices and media become visible in three aspects. First, spaces, bodies, and data constituting infrastructures and materiality of the laboratory; Second, hybrid practices combining old and new technologies, and (non-)human agencies; Third, sharing knowledge through sketches as "enabling objects" of communication. The aim is to make the findings in the laboratory visible with video material and to reflect on the research procedure as well as the methodical approach through drawing and animation.

## SPACES, BODIES, DATA

The laboratory and its environment are packed with computers, digital devices, high-precision instruments, technical equipment, and tools. Every room is also equipped with drawing and notation devices. The experiments take place in these working spaces and are frequently accompanied by talks, meetings, and collaborative, practical work.



Figure 1: Video still documenting collaborative work collecting data with technologies, tools, and instruments in the laboratory space. Video by the author, 2015



Figure 2: Video still of video sequence documenting the transformation of bodies and spaces during a group meeting. Video by the author, 2015

## DRAWING THE LAB

In the first weeks of the field study, the laboratory was seen through the lens of a Camera Lucida. Drawing with an instrument affords concentration and time. It resembles the tacit and slow manner of a scientist engaging with the experimental system.



Figure 3: Observing the laboratory through the lens of a Camera Lucida. Drawing by the author, 2015

Additionally, the continuous presence of a person with a drawing board was irritating and provoked questions. It was the starting point for a dialogue with and among scientists as well as a growing awareness of drawing practices in the research space. Here, drawing is not only the object of research but also a method. It is a tool for communication with scientists and for visualising research insights.

## HYBRID PRACTICES

Sketching by hand can be observed in the laboratory whenever a problem is discussed or suggestions are made. These activities also involve PCs, laptops, mobile phones, digital screens, tablets, boards, paper printouts, notebooks, photographs, projections, and more. Together with speech and gesture, the hybrid imaging practice of sketching can be understood as a multi-modal performance that seems to support the process of understanding and to negotiate the episteme in the laboratory. The simplicity of the drawings is striking because it contrasts with the high complexity and level of abstraction involved in the scientific problem-solving.

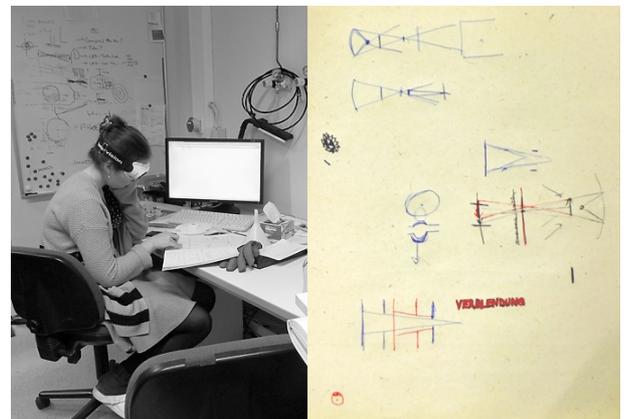


Figure 4: Left: Sketching activity in the laboratory. Right: Sketch by the scientists. Photos by the author, 2015

The sketches must serve various purposes. Besides imaging thought process they also function as objects, which are addressed as a “third” agency in the interaction. The paper sketch is a mediating object facilitating the exchange of thoughts. Thereby, the particular formation of paper, pen, supporting space, technologies and drawing bodies decides how the action takes place. The thought processes relate to the surrounding space and the interaction with the media at hand.

## MEDIA MATTERS

Designing hybridity is a standard procedure in design. In contrast, the understanding of practices through a materialistic lens has often been neglected in the studies on sciences. With the “Visual STS” approach (Galison 2014) the research object is perceived and reflected visually, including film, video, photography, drawing, and other media.

Beyond STS, the hybrid practices performed in the laboratory are adopted and transformed as a research practice in the field. Reflectively drawing and writing is integrated with other visual tools and media for research purposes – aiming at getting hold of relations and practices involved in the sketching activities that otherwise would remain invisible.



Figure 5: Page in the visual research journal: In the subgroup meeting, experimental data is collaboratively analysed using visual media tools: a. Notebooks, b. Laptop, c. Blackboard, d. Printout. The situation was also recorded with video and photo cameras. Drawing by the author, 2015.

### SHARING KNOWLEDGE

The informality and unpredictability of the working practices under investigation lead to the assumption that the process of drawing is either naturalised and comes without the need of preparation, and or, the sketching is not perceived as anything special or worth of announcing because of its simplistic characteristics and assumed banality (Galison 2000).

A typical meeting starts with the placing of one sheet of white paper and one pen for the whole group in the middle of the table, independently of the group size and other technologies involved. The pen is then passed between those who talk and sketch. The person holding the pen holds power and the right to speak. Power relations regarding people, materiality, and data become visible through the collaborative sketching.



Figure 6: Situation of collaborative drawing action through passing the pen. Drawing extracted from video still, Drawing by the author, 2015.

In the observed meeting situations, the sketching also functions as a link between intrinsic experiences and the extrinsic sharing of knowledge. The collaborative sketching and the discourse embodied in the materialised sketch supports the thinking process of the scientists and connects them to the power order of the experimental system.

### DRAWING REFLECTIONS

The visual interpretation and analysis of the research material gained on in the field constitute a major part of the research. The “re-endrawments” and analytical sketches are produced from video and photo material. They are extracted from typical situations containing significant information, and will ultimately result in a visual topology of the research.

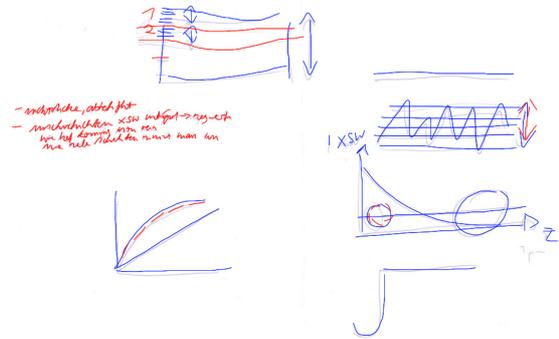


Figure 7: “Re-endrawing” of the resulting sketch depicting the quantity of drawing activity with two different colours, one for each drawer. Time-based animation by the author, 2015.

### MAKING VISIBLE THROUGH DISCOURSE

According to philosopher Michel Foucault, the discourse of a field consists not only of spoken or written words but the collectivity of practices, including images and build environments (see Foucault 1981: 74). In science studies, the discourses’ entity is often divided when dealing with pictures and subgrouped into terminologies, such as “viscourse” (Knorr-Cetina 2001).

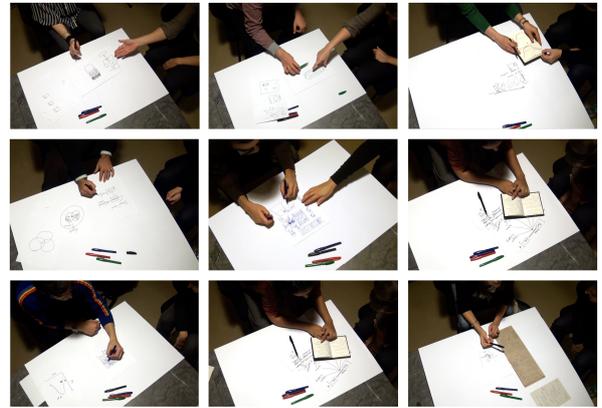


Figure 8: Visual interviews with scientists. Series of video stills by the author, 2014–2017

Here, this division is avoided by creating situations where the discourse can become visible. To find out more about the role of sketching in the scientists’ discourse, semi-structured video interviews with the scientists were conducted. During these so-called “Visual Interviews” the design researcher and experts talk and sketch together.

## EXHIBITION

The exhibition submission is an assemblage of audio-visual and written material. The research material is presented as an experimental video and a printed booklet, in which the different media formats of the field study are contrasted in a composition.

Sketching as collaborative activity and the depicted images are almost invisible – as well as in the perception of the scientists as in the participant observation. The aim of the video is to make the findings in the laboratory visible through sensory engagement. Therefore, timeline and soundtrack are composed to contrast the noisy experimental system with the quiet drawing process, or the fast sketching and talking with the slow thinking. The presence and engagement of the researcher in and with the laboratory are visualised with sequences of stills from the camera lucida drawings.

Both action and object of sketching are linking the internal worlds of the scientist' imaginative thinking with the external reality of scientific knowledge production. As material objects, they become operative in the experimental system as text and image. The multiplicity of methods offered by design research allows for equally working with text, image, materiality, and media making the scientists discourse visible. A printed booklet with text fragments from theory, reflections by the researcher, and comments by scientists accompanies the audio-visual work and displays the materiality of the discourse observed.

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