ENTANGLED MATTER: THINKING DIFFERENTLY ABOUT MATERIALS IN DESIGN.

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What role do materials play in the communication of information in a public space? In this paper we look at a metro station in Oslo and focus on how and where messages, such as posters, graffiti, and commercial advertisements, are connected to the station's surfaces. How to understand this relationship between materials, surfaces, and messages? In a discussion of representational and ecological perspectives on the properties of materials, we propose to understand the station as a zone of entanglement. This enables us to see how the realities of the station, including the properties of its materials, are constantly produced in the practices of the people who use the station. This understanding of materials presents design not only as a non-deterministic practice, but challenges us to design for not yet known uses. Making future uses possible should be based on ongoing engaged and entangled design practices today.

INTRODUCTION

"Design is about imaging future possibilities and making things that enable us to live some of these possibilities" (Bratteteig, forthcoming).

Materials are the stuff that things are made of (Ingold, 2007a). If design is about making things for imaginable futures, what role do materials play in making futures possible? In this paper we present a discussion of materials, which will form the background for our future work on the design of information systems for Blindern station, a metro station in Oslo.

Photo 1. Blindern station

Blindern station is an above ground metro station located between Blindern, the main campus of the University of Oslo; residential neighbourhoods called Blindern and Vinderen; and Forskningsparken, a research park with both commercial and university buildings. The two platforms (photo 1) are connected with a bridge over the tracks (photo 2), which can be used by pedestrians, cyclists, and people in wheelchairs, etc.

Photo 2. Pedestrian bridge over the tracks

Photo 3: Banner on pedestrian bridge at Blindern station

Photo 4: Posters on shelter

As a basis for designing information systems for the station area we have analysed the information processes and practices at the station. One of the first things we noticed while walking around Blindern station were the different types of information. First of all the types of information one expects in a metro station in a capital city: the timetables on the platforms, the ticket machines with analogue buttons and digital screens (photos 9, 10 & 11), the digital overhead displays with departure times, the loudspeakers that announce delays, and the security cameras that cover both platforms. Then there are types of information that are connected with the fact that Blindern station is the main transportation hub for the students of the University of Oslo. The bridge over the rail tracks (photo 2, 3, 12), the platforms and its shelters (photo 4, 13), the wired fence, and the electricity pole (photo 5) are used for the publication of messages in the form of announcements, graffiti, and other kinds of texts. The majority of these announcements are posters that are attached to the different materials of the station with tape, pins, staples, and glue.

Photo 5: Posters on the electricity pole

A PUBLIC SPACE

A station is generally considered a public space, an area open to all people regardless of race, class, gender, nationality, etc. Some areas of a station may be semi-public, such as some underground metro stations in Oslo that have platforms that one can only 'legally' enter with a valid ticket. Although a public space is in principle open to everyone, in reality such space is always regulated by laws, norms, and designs, which

exclude certain people and certain activities. Waiting areas can be designed to prevent sleeping and security cameras can help identify people who use the station as a public notice board.

The openness of public spaces such as Blindern station is under pressure as a result of a set of related processes. First of all the process of commodification and privatisation of parts of the station through the creation of commercial spaces and the outsourcing of the management of these spaces to JC Decaux, a company specialised in outdoor advertisement. Secondly, the process of securitisation: security cameras now cover the full lengths of the platforms. Thirdly, a process we can understand as a form of 'disneyfication'[1]. Since vertical surfaces at the metro stations in Oslo have been leased out to the same content provider, all stations have identical large advertisement panels with the same commercial messages (see photo 6).

Photo 6: Commercial advertisement panel at Blindern station

In this paper we report on a study in which we in particular focused on the materials in use in and around the station. We mapped the different materials (e.g. paper, wood, concrete, metals, plastics, digital), the shapes and forms they take (e.g. bridge, platforms, tubes, casings, tickets), and how they are used in the creation and communication of information in and around the station. By taking pictures of the station over time and looking closely, zooming in on particular aspects of the station, we could see some of the history and complexity of the station as an information environment. The photos we have taken are the basis for our analysis. They are used in three different ways: i) they are visual materials, part of the data that will inform our analysis and theory-building; ii) they help us tell the (his)story of Blindern station; and iii) they help us elicit stories and comments from informants, such as users of the station and maintenance personnel.

ENTANGLED MATTER

What is a material and how to understand its properties? Vallgårda and Redström (2007) describe a material as "a physical substance that shows specific properties for its kind. It can be understood as a substance with no specific form, which can be shaped and proportioned in volumes according to needs" (p. 514-515). The idea that materials have properties that can be exploited, for example by craft people, artists, and designers, points to the idea that some properties of a material are inherent.

Photo 7: Poster remnants on the station's cement siding

Photo 8: Poster remnants on the station's wooden siding

If we look at photo 7 (concrete siding) and 8 (wooden siding), we can argue, for example, that differences in

[1] The processes of stripping a real place of its original character and repackaging it in a sanitized format. References to anything negative are removed, and the facts are watered down with the intent of making the subject more pleasant and easily grasped (Wikipedia, 2009). See also Ferell, 2001.

density result in different ways of attaching posters to it (staples on wood, glue on concrete). In what we call a representational perspective, materials 'show' their properties to us and we are then able to express or suppress some of these properties for our own purposes. This does not mean that these properties are easily recognised and exploited; a deep understanding of the inherent properties of materials is often needed. Löwgren & Stolterman (2004) speak in this context of listening to materials and thinking with materials.

In *Materials against materiality,* anthropologist Tim Ingold (2007a) discusses theorist of design David Pye, who investigated "the notion that every material has, as a matter of objective fact, a specific nature, a fixed set of *inherent properties*, which can be either expressed or suppressed when it is used" (Pye, 1995 (1968), p.86). Pye finds that only some properties can be expressed artistically and argues that a designer seeks to express the *qualities* of a material, not its properties. These qualities, Pye argues, are "subjective: they are in here: in our head. (…) We each have our own idea of what stoniness is" (Pye, 1995 (1962), p.88). The distinction between the properties and qualities of materials points to a separation of matter (the physical world made of materials with inherent properties) from humans (who observe and interact with matter by working with what they perceive as the qualities of a material) (Ingold, 2007a, p.14). Several researchers have argued that we cannot separate ourselves, as observers, from the material world we are observing (e.g. Barad, 2007; Haraway, 1997; Ingold, 2007; Latour, 1987; Law, 1999; Olsen, 2003). More symmetrical perspectives, in which humans and nonhumans, the social and the material, are treated equally, have been proposed, such as in material-semiotics (Haraway, 1997), agential realism (Barad, 2003; 2007), and actor-network theory (e.g. Callon, 1986; Latour, 1987).

Ingold (2007a) argues that in the study of matter, many do no longer speak of the properties of materials but of the materiality of objects. The notion of materiality itself has changed, from being about materials, the "physical and 'thingly' components" (Olson, 2003, p. 87) to "abstract ruminations of philosophers and theorists" (Ingold, 2007a, p. 2). Ingold argues for a direct engagement with materials, similar to what design theorists such as Pye, Löwgren, and Stolterman propose, but on the basis of a symmetry of people and things and on an understanding of their properties as relational. What we experience in the world are not objects with inherent characteristics, he says. A thing, an object or artefact, is the effect or outcome of a multitude of relations, many of them often invisible or 'black-boxed'. Ingold (2007b) argues that in order to start understanding a material or thing, we need to study the 'lines', the relationships and their stories, that make up a thing. To know a metro station, is to tie together the lines of movement and growth into a gathering or *parliament of lines* (Ingold, 2007b, p.5).

Ingold's understanding of materials is based on Gibson's ecological approach to visual perception. Gibson understands the world as an inhabited environment consisting of three components: medium (e.g. air), substances (e.g. stone, wood), and surfaces. The surface is where most of the action is, e.g. where light is reflected or absorbed, a stone is touched or vibrations of the substance are submitted into the medium (Gibson, 1986). In Gibson's approach there is no escape from the material world or what he prefers to call the *environment*. We are emerged in "this ocean of materials" (Ingold, 2007a, p.7), of substances, surfaces, and medium.

AN ECOLOGICAL PERSPECTIVE

In an ecological perspective we are not standing outside a world in which we observe pre-existing objects and act upon them, we are *in* the world. Ingold therefore prefers to speak of *world of materials* instead of material world and *things* instead of objects or artefacts (2007a). This distinction is crucial, argues Ingold, because the notion of a material world denotes materials with essential properties, a world in which material objects exist, while a *world of materials* denotes an environment in which materials are *becoming* in their ongoing materialisation (see also Barad, 2007, p.151). The properties of these emergent materials are thus *processual* and *relational*, rather than fixed attributes. They are practically experienced rather than objectively determined or subjectively imagined (Ingold, 2007a).

Ingold's focus is on the ongoing contingency and constitution of reality, be it a material or product. The world is in a constant flux in which assemblages or gatherings of relations (human and non-human) become material and things. Nothing pre-exist its relations. Ingold therefore calls attention to the practices and processes of *becoming* a thing, an object or artefact. We should look more carefully to the flows of matter. These flows should not be read 'as inversion', that is from the inward imagination of the designer to the outward

designed product, but 'as movement', as a moving along a meshwork of interwoven lines (Ingold, 2007b).

In our study we therefore sought to capture the small and large transformations during a certain period in the life of the station. For example, we have observed the coming and going of posters, we learned that the time a poster was visible at the station had more to do with who had 'ownership' over that particular part of the station, than with the properties of the material on which the poster was pinned, glued, taped, or stapled, or what message it conveyed (see photo 3 & 4). Posters put up in spaces leased out to a commercial actor were removed within 24 hours (photo 4), while the posters put up at the station's electricity pole were never removed (photo 5).

As designers of information systems we make things with materials. Digital technologies are often both our materials as well as our designed products. In the case of Blindern station we will also need to work with the materials used in the proposed new station, which are glass, concrete, steel, and climbing plants that cover vertical surfaces accessible for messages (graffiti, posters), but also with the laws, social norms, architecture, and commercial interests that interact with the uses of the station. What does it mean for our work and research if the properties of the materials we work with, or interact with, are not given but constituted by their environment? How does this perspective on materials inform our design practice?

LINES, THREADS AND TRACES

In *Lines: A brief history*, Ingold (2007b) presents a kind of taxonomy of lines, differentiating between threads and traces. A thread is a kind of line, often made by humans, which is not drawn on a surface. Ingold mentions as examples a hammock, a suspension bridge, a spider web, violin strings, etc. A trace is any enduring mark left on a surface, such as tracks made by people and animals, creases in a hand, a painting. Threads and traces are transformations of each other and it is in the process of their transformation that surfaces are formed or dissolved. Ingold (ibid, p. 52-72) gives examples of the disappearance of surfaces, when traces transform into threads (e.g. mazes and designs such as used in embroidery) and the constitution of surfaces, when threads transform into traces (e.g. knotting, weaving, and writing text). We will use his understanding of the relationship between surfaces and lines to look at the surfaces, threads, and traces of Blindern station. One such line is that of the three ticket machines. Each machine is in itself a particular gathering of lines. Ignoring their differences may make certain practices invisible, while others are amplified. For example, use of the newest machine (photo 11) requires registration, a credit card, and validation, while the oldest one (photo 9) only needs some coins.

BLINDERN STATION RHYTHMS

Cronin (2006), who has investigated the impact of advertisement structures on people's experience of urban space, speaks in this context of commodity rhythms: the rhythmic, cyclical appearance of new advertisements and their interaction with the rhythms of the city and its inhabitants. Photographing the station over a longer period of time enabled us to document some of the station' rhythms. We noticed how 'illegal' posters, focussing on student interests such as music events, meditation services, political meetings, etc., were put up almost every day, only to be removed within a few days (photo 12). How long a poster is visible depends on who owns or leases that particular space. The same is true for the graffiti. The large slogans on the bridge have been there for more than a year (photo 2), while JC Decaux maintenance personnel removes graffiti on the platforms (e.g. *lucy lurk*, see photo 13) on the same day.

Another rhythm is informed by the academic year with its semesters. During the last days before the Christmas break, no new posters were added to the station, reflecting the end of the semester when most students travel back to their families. Observing the rhythms of Blindern station helps us to understand the station as a living entity. We are in particular interested in one role, the station as an *information environment* (Benkler, 2000). Conceptually, an information environment can be understood as layered: the physical infrastructure layer (hardware, material structures); the logical infrastructure layer (software); the content layer, but also a cultural layer, economic layer, and legal layer. Benkler argues that "[h]ow a society produces its information environment goes to the very core of freedom. Who gets to say what, to whom? What is the state of the world? What counts as credible information? How will different forms of action affect the way the world can become?" (Benkler, 2006, p.129). We need to take these questions seriously. Addressing ethical issues, such as who and what matters in the design of

information systems for Blindern station, will make a difference in how the station can fulfil its role as an information environment (van der Velden, 2008).

Photo 9: Blindern station ticket machine I

Photo 10: Blindern station ticket machine II

Photo 11: Blindern station ticket machine III

While observing and using Blindern station, we experience the station as a lively place in which histories of music, information systems design, transportation, and contemporary politics are enacted in particular ways. All kinds of lines become visible, such as the railway tracks, the three ticketing machines, ranging from partly analogue to fully digital, representing part of the history of the design of information systems, and the traces left behind in and around the station, in the form of visible graffiti and posters, but also as the remnants of these traces (see photos 7, 8 & 14).

Photo 12: Posters on the pedestrian bridge

These days, a visitor to Blindern station may not see any posters or graffiti at all painted, stapled, pinned or glued on the station's surfaces. Only the commercial advertisement panels are always visible (see photo 6). The panels at Blindern station are part of a continuous line connecting similar panels in the stations before and after Blindern station and stations thereafter. The relationship between surfaces and lines at Blindern station become visible when we look at the remnants of posters and graffiti at the station (photos 7, 8 & 14). We propose to understand these remnants as traces, which are in the process of being transformed into commercial advertisement panels. For JC Decaux, the company that holds the lease contract for the vertical surfaces at all metro stations in Oslo, it makes no difference if a surface is a wooden or cement siding. In the transformations of traces (posters and graffiti) into a thread (commercial panels), the surfaces of the station, such as the wooden and cement sidings, have dissolved; they seem disentangled from the panels that form a kind of thread connecting all stations. Each panel can thus appear as a self-contained object in a network of similar objects, which runs as a thread-like line through Oslo.

Photo 13: “Lucy Lurk”, graffiti on the platform

ZONE OF ENTANGLEMENT

In our mapping of the materials of the station over time we learned how surfaces do matter. We looked in particular at the materials used in the surfaces and how people used them. We were able to capture part of the ongoing transformation of the station in our photos. The photos show how the layers of the information environment are entangled. Karen Barad (2007) calls this *quantum entanglements*: when one object cannot be adequately described without including others. Such an entanglement is not, Barad argues, a structure in which self-contained objects are connected or interweaved. Matter itself entails entanglement as its very nature (p.160). The material objects of the station, such as the wooden and cement sidings, the ticket machines, the pedestrian bridge, are thus not objects in the world but materialisations of the world. They *become* in the material-discursive practices in which the world unfolds. For example, economics (the costs of ‘legal’ advertisements versus the costs of a fine for ‘illegal’ posters), the material of the stations sidings, the security cameras, and the laws that govern behaviour in public spaces, play a role in what kind of information can be found at the station and where. In other words, the information that is available to the users of the station is constituted by the station’s environment. The role of the station’s materials - such as wood, concrete, and the digital - in informing the station’s users, is constituted by their entanglement in the information environment and is not simply the result of their inherent properties.

We found, for example, that wood was the most 'used' or versatile material. People utilised the wooden sidings of the station (bridge, shelters) to paint, spray, mark, glue, staple, tape, scratch, and pin messages. On most places we can now only see the history of such use in the form of a staples, pins, remnants of posters pulled off, discolouring, and other changes in the wood as the result of the cleaning of, for example, graffiti (see photos 7, 8 & 14).

Photo 14: Traces on wooden siding

Ecological perspectives on matter help us to understand that reality, such as the properties of wood, is constantly produced in our practices. It is in and through our practices that separations between human and non-human, subject and object come about. Particular practices result in particular realities, not different perspectives on the same reality. This relational theory of matter redefines the notions of linear cause and effect. For example, a poster is not stapled on the station’s wooden siding because of the particular density of wood, but is the effect of particular practices of, and between, a variety of actors, including wood and its density, and the experience that it is impossible to use a stapler on the station’s cement siding.

The station can thus be understood as the ongoing “intra-active becoming” (Barad, 2007, p.170) of matter. It is in this context that we envisage an information environment as a “zone of entanglement” in which relations are not between self-contained objects but along what Ingold calls “severally enmeshed ways of life” (2008, p.1807). Similarly to Barad, Ingold focuses on the nature of entanglement and finds it not in places but in movements along paths – the primary condition of becoming (ibid, p.1808). It is along the paths of continually transforming lines, of traces and threads, where the ecology of life unfolds.

DESIGNING FOR INFORMATION ENVIRONMENTS

Barad and Ingold bring matter to the foreground and ask

us to take materials seriously. In our close-up investigation of Blindern station as an information environment, we focused in particular on the places where messages connect, or used to be connected, with the surfaces of the station. With Gibson (1986), Ingold (2007a) argues that the surface of a substance (solid stuff such as wood, stone, concrete, steel, glass) is where most of the action is. Ingold departs from Gibson's perspective in the understanding of the nature of a surface. A surface is not a rigid separation between matter (substance) and medium. We observed this at the station, where, for example, years of intermingling between wood, weather, paints, and cleaning materials has changed the surface of the wooden sidings (see photo 14). It is through this intermingling, argues Ingold, that life, growth and habitation are sustained (Ingold, 2008).

It is wrong, however, to understand the surface of the shelters, bridge, or ticketing machines of the metro station "not just of the particular material from which it is made, but of materiality itself as it confronts the creative human imagination" (Ingold, 2007a, p.5). This slippage, from matter to materiality, Ingold argues, results in separations between materiality and immateriality, while a surface is in fact a separation between two materials (e.g. wood and air) (ibid, p.6). In other words, it matters if a station is made of wood or steel, even if creative humans can imagine different ways of using both these surfaces for the distribution of information.

The slippage from material to materiality/immateriality is especially visible in discussions of material that is digital. For example, because "information technology is difficult to grasp", flexible, and in ongoing development, digital materials such as computers and other information technologies are described as materials without qualities (Löwgren and Stolterman, 2004, p.3-4). Vallgårda and Redström (2007) suggest that a material without qualities is a material in between the material and the immaterial (p.514)[2]. Maybe because we can't touch it - Kirschenbaum (2001) calls this the "haptic fallacy" - scholars have been differentiating between digital material and 'physical' material such as wood or concrete. Using Barad and Ingold's perspectives on matter, we would like to argue that all matter, be it 'physical' or 'digital' matter, *becomes* in its relation with other matter. In other words, the properties of *all* materials are processual and relational. Ingold (2007a) showed this in a simple way with his example of a wet stone that dries. The stoniness of the stone changes when the stone dries. Stoniness, Ingold (ibid) argues, is not in the nature of the stone, but emerges in its environment, which includes water, wind, but also us, who study the stone.

What can the ecological perspective on matter contribute to thinking about materials in the practice of designing information systems? We would argue that in our work – in particular when we think of our future design work for the station - some entanglements are more difficult to work with than others because some relations in an entanglement are powerful than others. For example, the entanglement of law, such as the lease contract that brings a large part of the station under the control of one commercial advertisement company, has at the moment the largest influence on how we can think about materials and designs for the station's information systems. We can imagine the lease contract as a "transitory hardening" (De Landa, 1997, p.259) of the surface (of a wooden siding or a cement wall), which makes the intermingling between materials (e.g. wood, staple, and paper) difficult and often brief.

Secondly, this perspective helps us to focus not only on what *is*, for example, the thread of commercial panels, but also that what *was* – the posters and graffiti (traces) as part of a more public information environment - and what *may become* in the future. Considering this ongoing transformation or becoming in the design of new information systems for the station challenges our design approaches. If we conceptualise the station as a 'living system', we need to think of our design work as the creation of 'living information systems', which intermingle with people and other entanglements that make up the station. Our discussion on the choice of materials has to include deliberations on how they may possibly intermingle or not with the materials used in the new station and the materials and media used by the commercial actor supplying commercial messages in the station. We also need to think about the possibility of uses not yet imagined. Design approaches such as participatory design (Nygaard 1986; Greenbaum & Kyng 1991) and meta-design (Fisher, 2007; Fisher & Giaccardi, 2006) offer us a perspective on design in which we can visualise the station as a living system

[2] How 'physical' digital material is, becomes clear when one tries to clean a disk that contains such material (BBC, 2009).

and as part of a wider socio-material environment. Within this framework we can envision how the properties and qualities of materials are *becoming* in the design process and will continue to unfold and change long after the original design time.

CONCLUDING REMARKS

In this article we have described and visualised some moments in the ongoing materialisation of Blindern station. As an information environment, the station is in an ongoing flux, e.g. three different types of ticketing machines; the ongoing battles of posters versus panels, and the transformation of the space from a mixed public-commercial space to a securitised and commodified space.

In order to understand Blindern station as an information environment, we need to learn about its history, layers and actors. An ecological perspective enables a view in which we can see the station as an outcome of the ongoing relationships between a wide variety of actors, such as an outdoor advertisement company, university students, laws, maintenance crews, technologies, lease contracts, posters, security cameras, etc. This perspective presents design as a non-deterministic practice in which our work with materials is not based on their inherent properties, but on their relationships with other actors, human and nonhuman. It is in these intersections, where these actors meet and mingle, that relational qualities, such as properties, emerge.

One of our concerns in the design of new information systems is the issue of public space: what is the role of design in creating and enacting public space? Does it matter what materials we use? We have argued that there is no linear cause and effect relationship between materials and use. On the other hand, our choices do make a difference: they are not neutral. With our photos we have showed a history of how people have been enacting public space by using the station as a kind of public notice board. Focusing on the remnants of posters and graffiti, the surfaces of the station became visible. It became clear to us how both the materials of the station's surfaces as well as their entanglements matter. Using that history of use to inform our design is one of the choices we can make.

Understanding the station as an environment in flux, as a 'living' system, requires design approaches that enable us to think about our design and materials, as ongoing, unfolding, and continuing developing. We propose participatory design approaches for our future non-deterministic design work with the station. In a determinist perspective, one always travels from one location to the other, as within a transportation network. The stages or nodes form a network with a beginning and an end: often one node is the cause and another an effect. We have argued, however, that we are not outside the world but rather part of the world in its becoming. Our design *becomes* during our moving through the environment, wayfaring along a path of observation in which matter of observation and matter of what is observed form an interrelated bond. It is the "intimate bond that […] couples locomotion and perception" in wayfaring (Ingold, 2007b), that enables designers to become more responsible and accountable for the things they create.

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