Beyond the Point One Zero World: The Dialectics of Opsis and Optics in the Data Practice of Thorbjørn Lausten.

By Morten Søndergaard

When we want to express something important we say that we have something 'on our mind'. We tend to attribute the same qualities to art and the artist – that what they are doing should mean something and bring new insights about our known world and reality to the minds of the beholders. But this may, in fact, not really be the case. At least, the art projects that I want to present in the following contradict and subvert the very idea of bringing any reality 'to mind'. Instead, 99, 99 % of 'the world' is deeply complex and out of reach of our sensory systems and minds, however intuitive they may be. Art and everything we do in everyday life – and in science, for that matter - is only dealing with a point zero one world. It is as if a silent big bang occurred, alongside the catastrophe that created our universe, and scattered the elements and building stones of any future constructed reality in all directions and dimensions. According to resent research in cognitive psychology, this may even be a key component of our mind – that our consciousness about things and issues, what we have on our mind, is constructed by unconscious structures that we are only partially aware of. We are not aware of our awareness, in a sense, and we 'confabulate' that which we have on our minds, on the fly – even on political and romantic issues. So, in order to bring any reality to mind, it would involve creeping in behind our awareness, and make us aware of the very fact that our consciousness is under construction…

What is the practice of such a construction? How do we get anything beyond the point one zero world 'on our mind'?

Not in pursuit of answers, but rather in pursuit of the right framework to investigate these questions, the focus of this paper will be on Thorbjørn Lausten's data practice – and his artistic methods of investigating 'reality-constructs' from beyond the point one zero world. I am curious about Lausten's investigation-methods and, in this paper, I will be investigating his investigation.

Data visualizations are normally used for many purposes – but, perhaps, most commonly used by all of us in matters of weather forecasts or – more poignantly recently – in overviews of financial markets and Wall Street issues. Thorbjørn Lausten's, however, is using the practice of data visualisation to something completely different.

Thorbjørn Lausten is operating in the vast and complex field of art, technology and science. He enhances the aesthetic field into explorations of methods to access and show data from scientific measurements of e.g. sunspots, electro-magnetism or meteorology. The artistic exploration is conducted as a dialectics of optics and opsis – an ongoing investigation of ways of mediating and performing data – in real time.
Roy Ascott, in his practice, is playing with the field of textual and diagrammatical data as paradoxical "information spaces" that questions the construction of optics by a conventional visual system – which should also be understood, I would claim, as a performative perceptual framing: An opsis. 'Opsis', it will appear, is a strategy to operate with information from beyond the point one zero world – and making it perceptually available to an audience using scientific measuring methods and digital technologies.

I will begin by examining briefly the concepts of optics and opsis – with the purpose of developing a theoretical understanding of the perceptual game, which is in play between different levels of reality, and (scientific) data in Thorbjørn Lausten's art practice. I will then move on to my main task and analyse some examples of Lausten's data practice since 1971 and until this day. In this time span, many different modalities are active in Lausten's artistic production, but this paper will focus primarily on his investigation of the modalities of optics and opsis – and I will, in this paper, examine those modalities in Lausten's data practice on five levels: 1) How data become part of perceptual cycles in digital and visual reality; 2) in the genealogy of media consciousness in art; 3) as a 'new' systemic and systematic art strategy – a performed perceptual cycle; 4) the possible construction of opsis systems (and schemata) that (also) operate 'outside' the mind;

and, finally, 5) as an integral part of a the real time visual systems that constitute the main body of Lausten's real time data practice since 1996, and show that, far from making the investigation into optics obsolete, it makes the representational negotiations with scientific data from beyond the point on zero world a very real and scientific activity in art.

1) Seeing and performing data – the modalities of optics and opsis

The interesting thing about optics and opsis is that they, in dialectical opposition, makes it possible to address processes that are both humanly 'internal' and 'external' – both part of, and not part of, the 'mental construction' of any perception of reality. It also makes it possible, I think, to view data practice in art as something, which may combine the theoretical ideas of cognitive psychology and computational cognition with a level of humanistic technology genealogy – pointing out some developments that are feeding in to the way we understand and represent the field of media, art, and technology today.

Optics, in the first instance, refers to the special qualities of light as a physical phenomenon. Secondly, it refers to the human physiology that makes sight possible – the retina and the 'visual system'. Thirdly, it refers generally to optical instruments – mechanical or technological methods of 'seeing' or 'sensing' that which is far away or simply outside our perceptual range.
Opsis refers to the activity of 'sight' or 'appearance' or it simply means, in modern theatre theory, the visual aspects of the theatre performance. Opsis (even according to Aristotle) is that part of the act that may be experienced live on stage (as opposed to the written script and the director's instructions – and the entire process of making the play).

In ancient Greek thinking, two different explanation to the occurrence of vision were dominant: either it was understood as an "emission" of rays which are projected from the eyes onto the objects (and thus making them visible) (Euclid and Ptolemy); or it was envisioned as an 'intromission' of the object itself into the eyes, through some kind of representation (Aristotle and Galen). In the middle ages, Ibn al-Haytham (in his influential Book of Optics from 1021) claimed that sight arose as a kind of combination of optics and the mind – almost a combination of something 'real' and something 'divinely' conceptual – in the sense that the human mind knows how to combine things 'by divine logic'. From the middle ages and until modern times, the idea of optics – that vision is due to light from objects entering the eyes – gradually developed into the idea of visual perception as a "psychological" feature: That vision occurs in the brain, rather than in the eyes. But another, just as important development, took place – that of the enhancement or augmentation of the senses (and objects) by technology and 'media'. Science is often characterized by the use of optical technology in order to develop methods to understand better the world and its phenomenon. In the ancient Egyptians science served a religious and ritual purpose, making it possible for them to embalm their dead, and to construct pyramids or vast architectural structures (tombs) deep into the earth (in the Valley of Kings), giving them an 'eternal life'. Pythagoras was one of the first to experiment freely with the idea of an external optics which made him able to, among other things, to construct a tunnel-system in Samos, dug form two sides of a mountain simultaneously, that nevertheless met at exactly the same spot in the middle of the mountain. Pythagoras is even said to have included into this study the (first known) idea of acoustics that, as a physical phenomena, created a different kind of 'optics' than that of vision.
It is in an artistic context that the internal and external optics meet and are expressed, for the first time, as an 'opsis' – a ritual 'performance' – in the medieval cathedrals and 'mystery plays'. The architectural achievement itself relying on scientific methods of 'optical' measuring created a space that must, I think, be understood as a 'new media' of its time. Here the external optics of science and practical measurements for constructing the church are paralleled by the optical 'performance' inside the church – giving the churchgoers visual 'data', as it were, from the world beyond our own. A reality is constructed around the mysterious existence of Jesus and God that is ritually performed and visually acted in the church by priests.
During and after the Reformation, opsis as a reality-check on god's existence was not acceptable in the protestant ethics. It even became problematic for the Vatican and the Catholic ethics to defend the ritual of faith as a 'spectacle'. Thus, the important contemporary 16th century (and later) question arises: How do we prove that god exists – and how do we prove that we, ourselves, exist in the image of god? This 'method-

ological doubt' about external, visual proof of faith and the existence of Jesus was the subject of the French philosopher René Descartes. According to Ulric Neisser (Neisser, 1976), he is perhaps the first to observe and introduce the most important feature of external optics into modern thinking and research: The retinal image. Perhaps surprisingly, Descartes uses this 'insight' to develop a philosophy about the consciousness of man relying entirely on the internal optics – and the idea that we have a visual 'double' inside our brain that mirrors and compare what the retinal image shows us from the 'outside' with a large, pre-existing 'databank' of images. This optical connection between the 'small man', the 'big man' and the outside world was the foundation in which Descartes could claim to prove that 'I think, therefore I am'. Thinking, according to Descartes, is an internal optical process and a mirror for retinal images – the external optics, on the other hand, is not so important for thinking (and religious belief). From this, an entire genealogy develops in which we find represented most of the philosophical battlegrounds in the 20th century: Does (wo) man already have a centre of representations of the visual world inside her/him that she/he may compare and correct the information introduced by the retina? Or should we expect something much more complex is at stake, involving other faculties and senses, as indeed, Hobbes, Leibnitz, Immanuel Kant, Hegel and Kierkegaard did?
Building on vast experimental studies and observations, modern research in visual perception and cognition confirms that the retinal image, and human eye, is a very limited optical resource. Vision is now more understood as a kind of 'illusion' or a 'mental construct' depending on a process. The question that arises in the 20th century is centred on the problematic of perceptual processes and cognition – especially, in the final half of the century, in the context of the computer and the issue of digital representation and construction of reality. The debate has several battlefields (which it is not my purpose to deal with here in any detail, but for short reference includes the discussion between the digital computational theory of mind and the connectionist computational theory of mind (Harnish, 2002)), but I think there is (still) missing an important link in the framing of that debate – and that is the connection between internal and external optics, or – rather – between optics and opsis.

Amongst all the studies of natural phenomena, light most delights its students. Amongst the great things of mathematics, the certainty of its demonstrations most conspicuously elevates the minds of investigators. Perspective must therefore be preferred to all human discourses and disciplines. In this field of study, the radiant lines are enumerated by means of demonstrations in which are found not only the glories of mathematics but also of physics, each being adorned with the blossom of the other. (Vinci, 1989 (1651), s. 49)

In a more ''modern' artistic context, the ubiquitous inventor and user of optics and optical technology into the practice of art, Leonardo Da Vinci was one of the first to investigate systematically the physics and representation of vision and light – and, perhaps more importantly, to see a crucial connection between science (numbers and geometry) and visual art (the art of the eye and light). (Vinci, 1989 (1651)). Da Vinci was on the track of something important – something to do with the connection of art, technology and science of course – but also, something to do with the role of the artist and scientist, the investigative 'performance' or 'activity' of the human who is curious about nature, the world, and the forces and energies governing there.

This, essentially, is a question about making cognition possible. The data practice of Thorbjørn Lausten is very much conducting this sort of strategy, and so it would – at this stage in my paper – be appropriate with some theoretical understanding of what a strategy for cognition could be.
In the latter part of 20th century the discussion about cognition greatly diversifies. In Psychology, phenomenology, linguistics, computer sciences, and hermeneutics, to name a few, one of the questions that arise are centred on explaining how optics operate 'behind the scene' of visual reality and in defining the configuring of the 'visual system'. What constructs the visual field – and thus the optic vision of reality? Is it the pattern-recognition, the 'gestalt' that makes humans able to "see" the world? Or is it the cognitive processes of information that define how humans see, or rather mentally perceive, visual objects?
According to Ulric Neisser, who is naming himself a cognitive psychologist, the 'internal information-processing model of perception' is the most accepted representation of an optical perception process leading to a consciousness about the information given. This model is a strong undercurrent in most theories on computational cognition and explains – to a point - the idea of process as a crucial element in having something

on our minds.

Figure 1 the internal information-processing model of perception'

But it does not explain very well how we may have different things on our minds, for instance; or how it may appear that the same information-processing in different people construct different ideas about the information entered in the first instance? Another matter is how we may operate with information that is not conventionally understood within a cultural semantics or sign system? And what about information about something that is outside the reach of any human perception?
How can humans be flexible and creative and still create meaning out of their world?
According to Ulric Neisser expectations, exploration and modification play a central part in consciousness. Consciousness is never one thing, or indeed several things, at a time. It is a processing (and not just a mental one) of several layers of information, possible meanings, and alternative associations that take place almost 'automatically'. In this sense, perception-of-something is a construction, but this does not mean that just anything may be constructed. The construction process has constraints, and in fact it may appear that these constraints are the very stuff that Thorbjørn Lausten's data practice – and the search beyond the point one zero world - is made of.

Figure 2 the Perceptual Cycle

Ulric Neisser suggests that we are cognitively engaged in a 'perceptual cycle' based on patterns of schemata – a term that he borrows from Charles Sanders Peirce (who borrowed it – and strongly modified it – from Kant). The model of this perceptual cycle is a triangle.

It should be clear that the triangle labelled schema is highly structured. But this structure should not be conceived as a simple flow from the periphery to the mind; it subserves a continuously interactive process... the act of perceiving does not terminate in a "percept" at all. (Neisser, 1976, p. 23)

In the context of this paper, the interesting point to make here is that although scientists and psychologists primarily address these questions, artists and computer-engineers also highlight them as an experimental framework for a 'new practice' (instigated by media and technology in the 20th century) – as Rudolf Arnheim has pointed out, a practice which sees visual perception as "not a passive recording of stimulus material but an active concern of the mind […] Perception involves problem solving.". (Arnheim, 1969, p. 37) This, according to Arnheim, interrelates with the function, method and role of the scientist and the artist:

The scientist, like the artist, interprets the world around him and within him by making images. The creation of perceptual models, of course, is not the scientist's only occupation. A physicist, a biologist, or a sociologist spends much effort on collecting data, checking their validity, measuring and counting them, and testing his predictions. But all these operations serve only to prepare and confirm his discoveries and his explanations. And to discover and explain requires perceivable models. (Arnheim, 1969, p. 274)

Inspired by Neisser and Arnheim, I will define opsis in data practices as the perceptual cycle and visual thinking in action, being performed, in a networked environment – and the dialectics of optics and opsis to be the specific mark of the 'new' art practice. I will investigate this point a little further in the following.

Thorbjørn Lausten is indeed one of the few early practitioners of this 'new practice' – he is actively investigating the dialectics of opsis and optics – and constantly curious about a reconfiguration of the visual system that operates behind the conventional construction of perception in art and science (and the conventional division of the two). The interesting point to make here is that although scientists and psychologists primar-

ily address these questions, artists highlight them as an experimental framework for a perceptual cycling of consciousness. These art practices work across the fields of science, art and technology and are, among other things, especially occupied with the dialectics of optics and opsis – and a reconfiguration of the visual system that operates behind the conventional construction of reality.

A short excursion: Genealogy of Media Consciousness

Unfortunately, we have grown accustomed to regarding pictures/images, thinking and technology as separate fields, but this only alludes to the pressing need for us to bring these fields together so that they will function together, so that we will be better able to understand our visually and conceptually complex world. (Lausten, Data Visualizations 1991–1994, 2007, p. 6)

For a long time, communication media have been in control of the construction of our reality. This also encompasses those constructions that we normally call art. Not much has remained in the same condition as before 'electronic media' – and in this sense communication media have revolutionized everything concerning our sensing and experience of culture and nature. Things are brought into new relations with each other, unnoticed to most of us, but still influencing everything we do and know about the world.

One of the 20th Century's most unremarked but powerful revolutions was the introduction of rule based distinctions. Whereas chains of signs, called letters, tell people what to do in the ordinary language program, nowadays chains of numbers tell machines what to do in machine programming. The effects of this revolution are experienced by everybody in his/her environment, from art museums to airports. (Weibel, 2005)

It is the less well-known paradigmatic change in history. Most scientific and artistic circuits continue as if nothing happened: and indeed, nothing did happen; as if the world – and the humans in it – were not changed. As if everyone insisted that knowledge and art could remain "unharmed," no matter what. Within art and science there are some historically important exceptions to that rule. One may point out important experiments with the media consciousness, which created an early critical reflection on the cultural impact of communication media; and, not least, the human factor in it all.

Over the years, I have been investigating different media art practices as a curator and researcher. These art practices may deviate extremely in aesthetic form and conceptual aim but nevertheless share a method – or methodology – in the way art is seen as a practice; and, perhaps more importantly, that art is seen as a media conscious practice. (Søndergaard, SPACE PUNCTURES - SHOW-BIX and the Media Conscious Practice of Per Højholt, 2007)

This means, in a very brief definition, that art, on the one hand, and in the words of the Danish Media Artist Per Højholt, is "an investigation" (Højholt, Cézannes metode (trans: The Method of Cézanne), 1967). The artist, moreover, is "a mediator facilitating the communication between the expectations of the audience and that which the audience does not expect" (Show-bix: Per Højholt, 1969).

This, of course, is not a new insight into an emerging situation, but an artistic response to a situation that has existed for quite some time. Thus, Wilém Flusser begins his book in 1983 on photography by stating "that two fundamental turning points can be observed in human culture since its inception. The first, around the middle of the second millennium BC, can be summed up under the heading 'the invention of linear writing'; the second, the one we are currently experiencing, could be called 'the invention of technical images'." (Flusser, 2006 (1983)). And Dieter Daniels has pointed to the fact, that "all modern art is media art". (Daniels, 2002, s. 162)

Wilém Flusser, Dieter Daniels and Per Højholt share the suspicion that the structure of culture – and therefore the pattern of perception and cultural understanding – is undergoing a fundamental change. (Flusser, 2006 (1983)) (Højholt, Intethedens Grimasser (The masks of Nothingness), 1972). Whereas Dieter Daniels aim is a history of media art that includes the modernization of the means of communication into the field of aesthetics, Flusser's subject is a philosophy of the technical image, which is not a critique but a contribution in the ongoing investigation of understanding this the 'age of media' (Groys, 1997); Højholt's aim is a poetics of media conscious practice. As an artist, he is interested in finding out how best to 'perform' in order to

reach or activate the media consciousness of his audience. Inspired by Roland Barthes he annihilates 'the author' as the 'authority', as well as the 'implied reader', in order to reach a 'point zero' (Barthes, 1968 (1953)) (Højholt, Cézannes metode (trans: The Method of Cézanne), 1967). Not just for art – but for any practice in the age of technical reproducible images, texts and sound. This is where Jimi Hendrix and Paul Cézanne enters the stage in, it may seem, a strange union. But both are examples of a practice that emphasizes the process of creation, the human condition of creativity in the middle of a world that, via technology, emerges as yet more complex and un-graspable (in its totality as well as in its perceptual pattern) through simple perception. According to Højholt (although he never says this directly, but indicate it through different tactical moves), Jimi Hendrix did the exact same thing in sound (and noise) that Cézanne, 80 years before (and Marcel Duchamp 50 years before), had done in visual art: Making the artist a mediator (and, effectively, returning art – here painting and music – to point zero). Therefore, he is titling his first poetics of media conscious practice "The Method of Cézanne" – it is not about the aesthetics or art history of Cézannes art works. In fact, it is not about Cézanne in any literal (or visual) sense. The method of Cézanne is about how to investigate the world of human creativity and discover new ways of opening up the layers of conventionalized reality for interpretation.

By the end of the 1960s, media conscious actors from all genres, and from aesthetic as well as non-aesthetic fields, developed experimental forms of practice that among other things bring science and art closer together. This pattern of experimental practice spread across art genres forming new hybrid modalities, such as experimental film, Opart, Pop Art, Post Concretism, Cybernetic art, Kinetic art, Systemic Art, Light Art, Sound Art, Video etc.

Thorbjørn Lausten himself finds that it is time (for art and its critics) to realize the consequences and possibilities of media consciousness and move on to more interesting things. He wish that the exploration of media art and consciousness as a 'special phenomena' would be over – and that we, instead, would discuss the relation of art and science (again). In his view, and others with him, there is no real distinction between media art and 'other' art. It is all art, and should be considered accordingly. If we look at the development within contemporary curatorial practices this is happening to some extent. Paradoxically, it is happening in a time where media consciousness is in fact already a historical project – and should be studied as such. The challenge will be to recollect the history and experience of the media consciousness and find a way to place them within a framework – a fieldwork – that could be called a new media consciousness. The new media consciousness is much more commonly known and wider spread than the "old" media consciousness – which primarily defined its work field within art, technology and science. The "new" media consciousness seeks beyond science, technology and art; it is based in the culture of everyday life – because this is where it is being used, as a common digital language based upon a massive consumption of communication technology.

It is inside this much differentiated (and not necessarily connected) group of media conscious practitioners, that the entire body of Thorbjørn Lausten's data practice should be understood – as a digital dialectic activity:

Consciousness, according to Ulric Neisser, is consciousness of something – and should be recognized as "an aspect of activity rather than as an independently definable mechanism." And he continues, "Consciousness is an aspect of mental activity, not a switching centre on the intrapsychic railway." (Neisser, 1976). Accordingly, media consciousness is consciousness of electronic media. It is consciousness of an activity involving communication of information in a performative interaction facilitated by technology and involving a large public. Media consciousness in art is first and foremost centred on the investigation and augmentation of anticipated perceptual patterns. Media consciousness in art is always detectable as a foregrounding of practice, an activity, a process of interactivity. Media consciousness in art is a consciousness of the negotiations taking place between the technologically enhanced optics and mediated opsis.

OPSIS - perceptual cycles in Thorbjørn Lausten's early data practice.

Thorbjørn Lausten's practice relates to a genealogy of the relation between scientific research (especially within meteorology and magnetism), the scientific and technological use of optics, and media conscious practice in art. He is one of the few Danish media artists who most consistently has examined and experimented in the field that lies between art, science and technology. Since the debut in 1971, his particular inter-

est is the relation between the scientific observations of astronomical and meteorological forces of nature. Indeed, his practice is concentrated on 'representing' realities beyond the point one zero world. Thorbjørn Lausten's works from the premise, that technological means and artistic resources are the only limited resources of information that are available to know anything via representation. In fact, Lausten claims, it is imperative that art investigates the modalities and epistemological levels of technological and artistic resources. And the only way to do this is by practicing them.

Thorbjørn Lausten's purpose is to investigate the perceptual cycle of data representations from scientific research projects. This constitutes the basic point of, what I have chosen to term his 'data practice'. To understand further what the term data practice encompasses, one could turn to Roy Ascott whose influence on Lausten is evident and also important to acknowledge. Ascott"recognized the paradoxical nature of knowledge and the contradictions inherent in formal epistemologies" (Shanken, 2003). In the data practice of Thorbjørn Lausten a number of negotiations of art and technological 'representations' and their special relation to scientific data is taking place. In this paper, I have chosen to focus on the negotiation, indeed the digital dialectic exchange, between optics and opsis in Lausten's data practice.

Digital Dialectic of optics and opsis

Data consists of the values "0" and "1" which are combined into chains or codes of schemata that only machines can read/use. Not until much later in the process parts of the integrations and relations of these chains and codes are "translated" into something resembling language, grammar and signs. In the beginning of the process, a dialogue between numeric values "nothing" and "something" is initiated and conducted in a digitally designed action between machine and user.

Data is not in any case dialectic, 'by itself'. This is important to emphasize. In the digitally designed action and the exchange of sequences and chains of codes there are no meaning or symbolic sign relations – hidden or otherwise implicitly present. This occurs, however, when we use data for something. Consciousness is present before and after data, around data if you like – but never in data as such. This is an area outside consciousness and beyond our point one zero world. For that very reason, it has Thorbjørn Lausten undivided artistic attention.

In his data practice, Lausten is instigating a dialogue with this area beyond the point zero one world – and examining the case of being conscious about the non-conscious processes that constitute huge amounts of live data. So his data practice is initiating and investigating a dialogue with "before" and "after" data – as well as with the data values themselves: "0" and "1" becoming the foundation of a third position.

The data practice of Thorbjørn Lausten operates on many levels but it seems appropriate to point out he is making perceptually present that which is the very foundation of the digital: codes and chains of "0" and "1;" in a very concrete and cool – matter-of-fact – way, data is placed in relation to the human context and condition. Man and data; or, perhaps, more acutely: Existence in a construction or combination of realities that lies at the extreme end of a process where hard natural forces (that we can only measure in limited ways) and a complex and abstract sense of processing (data is values of events over time, sometimes termed a "stream") which balances on the very edge of knowledge.

The scale of it all is unimaginably big, even enormous. The data practice of Lausten covers, in every sense of the words, an area that is too vast for the human perceptive system to ever fully comprehend or understand. Perhaps it is too much for us even to try to understand it, in the sense that you really cannot ever get the master perspective of it all. This is the temptation that everyone feels: We want to bring it (down) to a scale that we can comprehend and understand! We want to see it with our own eyes. But we have to accept the absence of technological superiority or master plan in the real problems that Lausten's data practice is addressing; we have to accept the limitations that we are facing when we are dealing with reality on this scale. We encounter a number of doubts and unsolved problems translated into visual systems, which often remains that way; their function really is to provoke actions of thought in the mind of the spectator. In this way, it could be claimed that there is a kind of a function or design in the data practice of Lausten; it is instigating a digital dialectic, as Peter Lunenfeld defines it:

The digital dialectic goes beyond examining what is happening to our visual and intellectual cultures as the

computer recodes technologies, media, and art forms: it grounds the insights of theory in the constraints of practice. (Lunenfeld, 1999, p. XIX)

In the case of Lausten, The digital dialectic is enhanced into the field of real time data and the negotiations of optics and opsis taking place between the investigation of science, art and the public. It goes beyond that which reception theory and reception research can do on its own. Instead, it is essentially describing a real time data practice. It is a way to work with data as process, define this process as something that we can relate to – in between the un-constructed area of nature and the constructed realities of man. It is a field of investigation, where the investigative tool is art.

Thorbjørn Lausten's Data Practice – Three Phases

The investigation of the digital dialectics of optics and opsis in the data practice of Thorbjørn Lausten runs through three phases, roughly, which overlap and interact. In the course of the three phases, however, an investigation and experimental development of a real time data practice is taking place.

1) The first phase is predominant (but, like all the phases, still active) from 1971 and until mid-eighties, and could be termed largely as a perceptual data practice.

2) The second phase is predominant in the late 70s and in the 80s and is an active research into the dialectics of optics and opsis in a (pre-digital) data practice. This phase include a vast amount of sketches for projects that cannot yet be realized (at that time).

3) The third phase, which is still predominant today, is that of real time data practice and a digital dialectics of optics and opsis – starting in 1996 with the project NOW – The Polar Space and continuing with projects like SOL (2004) and MAGNET (2008).

All his projects are constructed as visual systems that projects or visualizes scientific data from diverse sources. His projects should not, then, be considered as art works in any traditional or other sense, but as 'visual systems'. These visual systems processes, projects and visualizes data in real-time as light, sound and movement – or as staged diagrams, that investigates and analyses the framework of our understanding of nature, aesthetics, knowledge, art, space, time, technology – and science. He asks the questions: What is the status of this framework? Who formulates and defines them?

Phase 1: FIELD WORKS– a performed perceptual cycle

In the triangular book project FIELD WORKS from 1984 the words "Being, Time, Energy" are written on each side of a drawn triangle. The catalogue is also triangular, thus repeating the figure – the triangle – in the framing of the figure. They are combined into a structure, a system that encompasses both the figure and its context.

Figure 3 Field Work - Detail. Photo: Morten Søndergaard

The work is a field, the field is work – energy is art, art is energy. The connections seem simplistic. But this is only what meets the quicker eye. This is a project that requires time and work from the audience as well, as it is the case with most of the data-opsis projects by Lausten.

Figure 4 Fieldwork detail. Photo: Morten Søndergaard

Notice the figure – the triangle – is repeated in the framing of the figure. It resembles the Perceptual Cycle of Ulric Neisser. And indeed, FIELD WORK is about perception as a FIELD of predictable and unpredictable levels collaborating or colliding. The sides of the triangle are, like in Neisser's model, schematically combined into a structure or a system that encompasses both the figure and its context. But it does not stop here… the system is itself part of a bigger scheme, a construction of relations, and so it continues like Chinese boxes of relations always leading to a new layer or connection.

"Being", "Time", "Energy" are all equally important aspects of the same problem – equal in the sense that without the one, the others would not make sense. The system and field collapses to be rebuilt in another context – a new field. The fields are crossing each other, transgressing each other – destructing some connections and creating new hybrid relations in the same process.

Figure 5 Field Work detail. Photo: Morten Søndergaard

Figure 6 Field Work detail. Photo: Morten Søndergaard

With three words we are plunged into the intricate questions of the existence of phenomena and our own role in that department. The data practice of Lausten exists on the knife's edge between the known and the totally unknown; between the cultural controls of human constructed reality and the uncontrollable energy of the earth and the universe; the big issues. But, at least, there are the borderlines to consider – and the limitations. Those are the interesting positions to seek out for the artist. And this is where Lausten's data practice is grounded. Fieldwork is data practice – it is defining a digital dialectic, in the sense that it creates a dialogue between theory and practice with that one purpose to find, and use, any borderlines and limitations available. FIELD WORKS is a work method – it is a hub for understanding the data practice in a number of his other projects in the period as well as later.

There is a precognitive level at play here, as the book project – and the interaction between the world and the models of the world – is staging the borderlines and limitations of the human body in terms of sensing and experiencing the world, making those very limitations visible for us.

Phase 2: Art as systemic and systematic strategy

In Thorbjørn Lausten's data practice, the visual field is a structure that combines precognitive and embodied schemata. The work field puts this combination into action, in a very concrete way – specifically, into an active dialectics of optics and opsis. In a number of projects, Lausten is turning the work field into a optical stage for combinatory experiment with data practice, some of which I will be presenting today: Pointany-X (1972), Presense (1975/1976), Equal Denominator (1976), TL77, Local Time (1977), CODEX (1979), Craggs-Projections (1992), Neon (1995); as well as the real time data projects, such as Now – The Polar Space (1996), Data View (2003), SOL (2004), and MAGNET (2008) (see below – on phase 3).

Historically, it is far from the first time that Thorbjørn Lausten is navigating a field – and the complexity of problems that are inherent of any investigation into the uses of data in art. Let me give some examples from the vast number of productions and projects in the period from 1971 until this day.

Pointany-X from 1972 is an interactive sound/light installation that according to the artist is "defining the/ our world as energy structures in time." From the description of the work, which is only documented by installation photos, we learn that a rotating light bulb flashes when you clap or make loud sounds in the space. The installation makes a bodily connection between the production of sound and the production of light and thus visualizing the energy exchange in a space as "an interaction". In reality, however, the interaction is part of a structural field, where embodied data is exchanged with or becomes electrical data.

Thus, interface technology is the border that separates the system from the environment, or if you like, in classical metaphorical language, interface technology separates the image, or differentiates the image, from the real world. Naturally, when you have the interface, you know that this difference is not very clear; so this difference is not a strict border like a wall, but rather like foam. With our receptors, we are able to go beyond our border; we see something beyond our own body, and we have invented hundreds of telematic machines that go much further than our natural sensory organs can go, and have a much larger horizon of visibility than the horizon of things that we can see and process. (Lausten, 2007)

In Pointany-X, an exchange between human and natural phenomena is taking place beyond our natural sensory organs, which in the endless circular rotation of the flashing bulb is rendered endless and non-processual. In other words, our being in the installation space is the context of our perception of the installation space that in principle cannot be seen. Something is already structuring our perception of things in a space before we enter that space. The circle of light flashes that appear when we interact with the space through sound or noise is a perfect example of the externalized retina. Here, the embodied basis of scientific knowledge is made active and visible in a physical space and time – in something that almost resembles an experimental research situation. But this situation, as the data practice of Thorbjørn Lausten on a whole, is drawn out of its pure experimental state and – this is the very point and aesthetics that is implied in the term "art installation"– installed into a physical framing that puts the experiment in direct contact with (in the hands of) any audience. The artist's data practice is to make the externalized retina accessible to the audience – and thus to

the processual structuring of the digital dialectic.

In 1975/1976, describing the installation Presense (pre-sense), Lausten voices this strategy clearly:

The real function of the work is revealed when the audience is structuring the installation in a process ... (Lausten, 1991)

Presense is a kinetic light/sound-installation typical of work the artist did in the same period as Pointany-X. They are clearly linked, not only by the fact that they use light and energy as material; but because the installation is a dynamic field of relations dynamically centred on an interest in energy as information media. In this case, the audience is viewed as a source of energy, and thus as information media in their own right:

… I hope to achieve an understanding of the fact that art in the future will draw on many different forms of energy serving directly as information media. In this case, the audience is also counted as a source of information by his/her presence both as a movable notation in the physical space, and as an acoustically acting person. (Lausten, 1991, pp. 16-17)

In the double meaning of the (sound of the) title, Presense, the installation stages both the presence of the audience (in the physical and acoustical space) and the "pre sensing" that makes it possible to experience anything at all in that space. Again, the kinetic installation Presense is a staged externalized retina. The sounds, and the acoustical impulses on the limit of the audible, create the visual presence of the installation – which becomes a metaphor for all wireless communication, and thus our communication with hidden phenomena outside the reach of our senses, in the global real-time reality (which in 1976 and today is still under construction):

The structure of the installation does not just encompass the electrical components and the presence of the public, but, to a certain extent, all wireless communication. (Lausten, 1991, pp. 16-17)

Creating a communication between physical spaces and mental spaces and point to the fact that they both are spaces under construction is a common denominator of Lausten's data practice. In Equal Denominator (1976) this communication between the physical and mental space is developed into a visual system in a very concrete and, on the surface, almost simplified way. Three paintings are depicting combinations of the signs 'plus' and 'minus.'

The binary system, resembling the digital "0" and "1," and its placement on the canvas is found by mathematical chance – by throwing a dice according to a certain system. The double sense of "dicing" is in use here: It is both an actual gamble structuring the physical space of the painting; and a way of cutting up the intention of the painting as representation of the world, and instead making it a visualization of the mental space or abstraction of a reality under construction. In TL77, Local Time (1977), the constructed mental space of a planetary system in the universe is visualized as data projected on a diagram and as light. The complexity, however, is intensified as the measuring is showing an interaction of mass/energy that expands and contracts in a space/time continuum. The data is primarily visualized through the five bulbs that represent the mass of each galaxy, as it grows or diminishes – in relative terms, since what is offered is the perspective from Earth, relative to observations of the other systems, over thousands of light years. The point is that no matter the scale or the distance/size of the object to earth, what we know about the galaxy (and our world) is dependent on mental constructions of information processes relative to other information processes. They are inscribed in the perceptual cycle of visual cognition.

One could add that, in Lausten's works, the world is always under mental construction – Lausten quotes Heisenberg: "What we observe is not nature itself, but nature exposed to our method of questioning." (Lausten, 1991) Indeed, the constructive principle should be seen as a universal principle – a reality under construction is also a world where methods change:

Though one may ask whether art becomes 'scientific' or science 'artistic' in visualizing (scientific) data, it

remains a fact that knowledge from the infinite small to the infinite large is constructed thus leaving us with the World as a mental construct. The construction, however, can only be seen as concrete in that you see it as a universal constructive principle in art and in science. (Lausten, Luxpress, 2002)

Of course, the universal principle of construction is also reflected in our language and sign systems, which is something that is more or less always under examination in Lausten's projects – either as a sideshow, or as the main conceptual point. CODEX (1979) is a good example of this constant and profound interest in language and signs in his data practice. Conceptually, the installation is exploring the idea that we have the tendency or ability to deal with phenomena that we cannot understand with the use of our senses, through projection on something that already has meaning for us (as cognitive references). Projections helps us "make sense" in the world. Visually, the notion of projection is used in a construction where a wooden and a glass plate are hung over each other, as seen in the picture. On the glass plate is written the word "meaning" in four languages. In the centre of the plate is written "BLIND CODE" in – blind code. On the wooden plate four black dots are placed at random, and the word "CODEX" is written. Above the two plates are placed two light bulbs that are writing the word "TIME" in Morse code. The one spells twice as fast as the other. Once again, there is a field with relations between systems as well as language and energy at play here. CODEX is a fieldwork about how projections and meaning-references are sometimes blind (self-referential); or sometimes happens outside grammatical language. On the other hand, a construction of something is taking place – the construction of construction. CODEX is about construction as a universal principle:

As we know that a language-form is manifested in the substance observed, any meaning at all has to be considered as something projected on that substance. It may be relevant to repeat the well known relation between matter/energy and time/energy/space/information plus a great many symbolic references. (Lausten, 2007)

This is also the case with the Craggs-Projections from 1992, although on a much larger scale. A simple sign system of four basic signs – a cross, a circle, a triangle and a square, is projected on black cliffs in Edinburgh by four enormous xenon spotlights. The cross is circulating, making the sign system resemble a vehicle moving across a vast geological space.
And this is perhaps what all the projects in phase 1 are: vehicles for perception and for symbolic projections; but they are abstract figures that originate from mathematics, of course – and any symbolic meaning would be a projection of our own elaboration or association. As they struggle along the mountain, the forms (which they also are), created by light and not without a certain fragility despite their size, become like (re)searchers of hidden connections and relations. The Craggs-Projections are retinas of an extremely externalized kind.

Sketching out Phase 2 – planning the construction of real time data systems
An important activity during phase 2 in the development of Thorbjørn Lausten's data practice is the sketching out what cannot really be realized at that point in time – because the optical technology and computers, and the digital networks needed, have not yet been invented. Thus, these sketches for real time data practise from the 80s have, for the most part, not been realized 'for real' – but remain 'real' as mental constructs and visual thinking. In this case, and for the reason of the length of this paper, I will let some of the sketches get on your minds without further descriptions:

Figure 7 Sketch for installation with Holograms, 1988.

Figure 8 Data Space, 2006.

Figure 9 Sketch for Interactive Light installation, 1988

Figure 10 Light installation with Plasma Panels, 1990

Figure 11 (This and the next image) Two Projects for an Installation or Environment, 1987

Phase 3 – real time data practice

Figure 12 still image of butterfly diagram from data projection in the exhibition / installation "SOL" (2004).

In phase 3, the development of Thorbjørn Lausten's data practice reaches a new modality. In this phase Lausten produces exhibitions, like NOW – The Polar Space (1996), GLIMMER (2000), DATA VIEW (2003), SOL (2005), and MAGNET (2008). For the first time in the development of Thorbjørn Lausten's data practice, those exhibitions combine the perceptual cycle of visual thinking and the dialectics of optics and opsis in to a digital field of real time data practice. In phase 3, the dialectic of optics and opsis as an activity and visual thinking is realized, and remains the modality of Thorbjørn Lausten's data practice until this day.

As Peter Weibel has pointed out, the competition between image and concept, as a division of labour between art (concrete pictures) and science (abstract numbers), is changing:

Now we are on the threshold of a new period where the strict division is becoming obscure and obsolete. Thorbjørn Lausten is one of the few artists advanced enough to be aware of this threshold. (Weibel, p. 11)

The first exhibition to realise the real time data practice was NOW – The Polar Space. The exhibition consisted of a number of large data projections that visualized and tracked (in real time – but using 'recorded' real time data, since it was not realizable for the entire period with the available Internet connections and protocols in 1996) different environmental, biological, meteorological and scientific data.

Figure 13 Now - The Polar Space. Installation view.

The data projections and the optical effects they create in the exhibition space become 'windows' to the polar space – but clearly not in concrete images, but as an opsis of optical data constructed from different scientific measurements and representational parameters. The data projections become an interface between us and the point one zero world – and an interface that is realizable only through the "externalized retinas" of technology and science (here, in the words by Michael May and Frederik Stjernfelt (echoing Michael Lynch) from the exhibition catalogue):

Technology becomes in general a corporeal rooting and embodiment of scientific knowledge and the instrument becomes an interface in which this actor meets his theoretical constituted objects in the form of observations on a kind of 'externalized retina.' In a fundamental sense the technical interface thus constitutes the body's own experienced boundary with the world, but projected towards us like a screen. (Stjernfelt, 2008)

In the example below, the movements of Polar Bears across the ice which are being visualized from this general principle of digital data practice: the externalized perceptual cycle in action.
Furthermore, the use of different, interacting spaces (physical, networked, simulated) makes 'Now – The Polar Space' the first Danish experiment with 'the expanded digital field' (for further definition on the expanded digital field, see: (Søndergaard, Transformative Creativity in the Expanded Digital Field, 2009 (in print))).

Figure 14 Now - The Polar Space. Screen shot from data projection. 1996. Photo: Bent Pedersen.

GLIMMMER (2000) (which means 'flashes' or 'glitter') exhibits the digital dialectics of optics and opsis in a quite literal and concrete sense. The dialectic itself is visualized and represented in aesthetic patterns and schemata evolving around the big screens of data projections that light up an entire (darkened) museum space.

Figure 15 Glimmer, Screen shot, 2000

Figure 16 Glimmer, Screen shot, 2000

DATAVIEW (2003) intensifies the focus of the digital data practice on perceptual cycles and opsis as an aesthetic method of working in the field between art and science. The space is mixing optical elements – data projections, neon light and electrical light – into a work field, thus making strong links and references between the three phases of data practice. DATAVIEW is reinvestigating the relationship between the embodied situation of experienced reality and the data situation of simulated and manipulated reality. The mental construction of visual representation is present in both reality forms and Lausten's aim is to show that it is the negotiation of a human optics and a data opsis that makes the world outside the experienced and simulated reality – in some measures – detectable. But 'reality' beyond the point one zero world remains on a hybrid fringe of our symbolic representational system.

Figure 17 Installation view from DATAVIEW (2003). Photo: Bent Pedersen.

In his famous essay , 'Opera Aperta', Umberto Eco says that aesthetics and art should not be understood from the view point of autonomy but should be seen as 'a structure; a system of relations.' (Eco, 1962). Thorbjørn Lausten investigates the question of representation of reality in art as a system of relations (hence, it is not a question of aesthetics, to him). According to Lausten, it is absolutely essential that the relationship of art and reality remains unsolved. It should always be an important problem that the artist will have to address. It will never be solved.
Thorbjørn Lausten's modality is investigation and experimentation, and he does not wish to 'exist' inside the 'problem' of representation. Instead, it becomes a discursive turning point in the systems of relations that are created in his digital data practice. In his works, we do not see reality itself – but we construct it form the streams of data presented to us. We perceive, in a sense, that which we are not able to perceive using our senses, ever.

Figure 18 SOL - sunspots. Screen shot.
SOL (2004), the most ambitious piece of digital data practice that Thorbjørn Lausten has engaged in, is making this point very visible, as it were. Focusing on real time data streams from different measurements of the sun (e.g. the magnetic field and sun spot-activity) it made the digital data practice strikingly present on both an optical and a mental level.

MAGNET focuses on artistic expression and, most importantly, artistic practice in a new situation. Art is a field of visual systems contributing to a digital dialectic negotiating very different disciplines and fields in a production of art, within the culture of media. MAGNET is an art exhibition – or, rather, an art system – that reflects upon the cultural status of art and practice after the paradigmatic change of media. Today, as artists, we have to put the investigation and consciousness of media behind us," Lausten claims. "Instead, we should move on, and use the experience from the investigations in our practice – as a part of, and frame for, our practice." (Lausten, Data practice, 2007)

Figure 19 MAGNET - installation view.

MAGNET experiments with real time data practice – and the installations give some ideas as to how the

problematic of representation is still relevant for the artist, albeit on another level than it is traditionally understood. The artist examines the problematic of representation, rather than 'exist in them.' (Lausten, Data practice, 2007). Instead of reproducing an abstract representation of reality, he is producing a reality. The real time data practice shows different levels of geophysical visualizations. Those levels (that in principle are invisible to us) contain series of reworking of specific data-information that is unfolded in different systems and situations that materializes and translates into visual actions. As an exhibition, MAGNET makes something visual. The geophysical world is visualized by a force, or energy, which is very basic. This world is still completely constructed as a "reality."

My focus of this paper has been on Thorbjørn Lausten's data practice – and his artistic methods of researching and producing 'reality-constructs' of data from beyond the point one zero world.
I have shown that Thorbjørn Lausten's real time data practice is developed gradually through 3 overlapping phases, in a dialectic exchange between optics and opsis. Through his data practice, Lausten is conducting his own investigation into perceptual cycles in digital and visual reality (phase 1) that should be seen as belonging to a genealogy of media consciousness and art. Moreover, Lausten is engaged in developing a systemic and systematic strategy for art, involving the construction (and sketching out) of optical systems (phase 2) as well as an actual real time data practice (phase 3). Especially the real time data practice focuses on the processes that lead to the mental construction of mixed reality. How do we construct a reality in between perceptual and computational processes? In the investigation of this question the data practice is Lausten's field of choice – his data practice is a digital dialectic in action. He conducts visual thinking with a digital twist – an ongoing examination of the relations between optics and opsis in the expanded digital field.

'In order to bring any reality to mind, it would involve creeping in behind our awareness, and make us aware of the very fact that our consciousness is under construction…', I wrote in the beginning of this paper. And I asked the following questions: 'What is the practice of such a construction?'
In this paper, I have taken a few steps towards an investigation of Thorbjørn Lausten as the practitioner of the interface beyond the point one zero world. There are many more steps to take – subjects for future papers. There is no question, however, that the investigation of the mutual relationship of art, technology and science should rightly take place within the framework of the visual thinking cycle – the dialectics of optics and opsis in action.

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