Visual representations as models of the past

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Introduction

In this paper some examples of documentation activities connected to an archaeological excavation which took place in 1904 will be analysed. The focus will be a set of objects connected to the so-called Oseberg ship, contextualised within the study of modelling practices in the humanities (Ciula and Marras 2016; Ciula and Eide 2017). As the objects take actively part in the relational process of several modelling efforts, its identity and properties are affected by the specificity of each modelling process, modified by the context of production and use of modelling processes. The insights that models bring around a specific phenomena can be of different nature: from practical evidence for how an excavation site was organised to evidence based scholarly knowledge about the Viking societies in Scandinavia and their production and use of material culture. The aim of this study is to use the documentation material as a case study which shows in practice how different modelling approaches operate in relation both to their contexts of production and use as well as in relation to each other.

Finding Oseberg

In August 1903 the farmer Oskar Rom visited Professor Gabriel Gustafson in Oslo. While digging in a burial mound on his property he had found parts of an old ship. Professor Gustafson immediately arranged to visit the farm Lille Oseberg a few hours' travel outside Oslo and started his investigations. The excavations themselves took place in the summer of 1904 and sparked significant public interest, not the least due to the national sentiment at this specific time in history – Norway became independent from Sweden in 1905. Professor Gustafson was not only director of the Oslo museum for antiquities but also Swedish. The Oseberg excavation had far-reaching consequences and was important in the process that led to the establishment of a Norwegian law for protection of cultural heritage[1].

The Oseberg ship was in fact the grave of two women who died in 834 CE. Who they were and how they were related remains a mystery. They were equipped with a significant treasure for their travel to the afterland: not only a highly decorated ship made for 30

[1] The law was passed in 1905 under the title "Law on conservation and protection of remains from the past" (Norge 1905. All translations by the author).

oarsmen but also animals (horses, dogs, and cows), clothes including silk, equipment of various types, sleights, a cart, beds, and tents. The ship itself was broken to pieces but most of the wood still remained – as of today more than 90% of the wood in the reconstructed ship is original. The preparation and restoration of the ship and the other major finds lasted for more than 20 years. The excavation itself took place in less than three months; yet it was an impressively professional scholarly undertaking for its time, as will be discussed further below.

Physical reconstruction as a modelling process

While the excavation and its advanced level of documentation give clear indications of the form of the Oseberg ship, it was still not a straightforward process to re-create a ship based on the state the remains were in in 1904. "To reconstruct is here a process, that through re-building and construction leads to a reconstruction, which is a term for the final product"[1]. While this specific ship is closer to the original than what is often the case in comparable reconstructions due to the high percentage of original wood it is still not correct to call it a restoration. Paasche calls for use of the word pair reconstruction/construction. Such a reconstruction is similar to a modelling process in that the reconstruction was based on implicit and explicit models of how ships were constructed in The Viking Age held by the experts involved in the process. So while the reconstruction is a process of translation from artefact remains to artefact it also includes aspects of a process of translation from model to artefact (Eide and Eide, 2016).

This is common for many of the modelling processes we study. They are processes of modelling, but not only one type of modelling – other perspectives highlight other aspects. The process does not include distinguishable modelling and reconstruction parts, both aspects are rather present at the same time. The distinction is analytical. Indeed, one of the important understandings, namely, that the ship was fit for coastal sailing only and would not handle open sea, that it was made for ceremonial purposes only, may be based more on how the reconstruction was done than the actual evidence found during the excavation. We will come back to how later modelling experiments (simulations) strengthened another theory that was originally based on dendrochronology[2], namely, that the ship was built in Western Norway and sailed the open sea around the coast to the Oslo fjord.

This is not the place to discuss changes in scholarly paradigms in any detail. It is still useful to make the general point that in all studies of cultures we face an unsolvable paradox: in order to do sound scholarly work on a culture we need to know as much as

[1] "Å rekonstruere er her en prosess, som gjennom gjenoppbygging og konstruksjon fører fram til en rekonstruksjon som er betegnelse på det ferdige produkt" (Paasche 2010: 62).

[2] Dendrochronology is a method through which the growth rings in wood is used to place the felling of the trees the wood is take from, at best, to a specific year in a specific geographical area.

possible about it, but knowing a culture there is a risk that we adjust new information to fit our previously established views. Professor Gustafson worked on the excavation with a large team, both at the excavation site and in the museum taking care of the findings and the documentation coming in. They would all have more or less scholarly and experience based models of what they were unearthing. Many of them would know boats of a comparable type as the Oseberg ship, as the Norwegian boat building tradition in the nineteenth century was a continuation of medieval traditions, although it was a long time since these techniques had been used for anything of the size of a Viking ship built for open sea.

Such paradoxes are solved in partly different ways in different disciplines. In archaeology this problem is intensified by the fact that the objects of study in many cases are taken out of context, sometimes even damaged or destroyed. Nobody can ever investigate the site of the Oseberg ship again seeing anything comparable to what the team saw in the summer months of 1904 – the site as it was is gone forever. The only solution is to record as much as possible of what is seen in order to create a level of reproducibility, given limitations in resources, methods, and skills.

Plans, figures, geometry – and text

Fig. 1 shows the Oseberg ship as it is usually seen. Its visual form, together with those of a few other ships, has embodied the icon of the Viking age for generations of fascinated visitors to the museums. While the period from 800 to 1050 was multi faceted and trade was an important part of the interaction between the Nordic Countries and other parts of Europe, the Middle East and Central Asia, the act of going Viking was violent. Yet, the beauty of the Viking ships, the efficiency, flexibility, and forcefulness of their lines show a highly sophisticated boat building tradition which in important ways was far beyond anything made by their opponents in the rest of Europe, the Middle East, and Central Asia. Those lines form part of a collective image of the Viking age.

Yet, by looking at Fig. 2 one can clearly see that what was found during the Oseberg excavation gave quite a different impression. This is nothing new, of course. The fact that the ship one can see today is a reconstruction is well known, as is the state of the object when it was found. Yet, if an image says more than a thousand words then an object says more than a thousand images. Most of us believe what we see. And indeed, as pointed out above, most of the wood in the ship comes from the ship found during the excavation. It is old. It is real.

The stories told about Oseberg say much more than the objects in the museum. The ship as a physical form is but one aspect of the materiality of those stories. By studying the documentation from the excavation one can not only see where things were but also deduce many aspects of what happened at the time of the burial. The artefacts and

Fig. 1. The Oseberg ship in the Viking Ship Museum. The Museum of Cultural History, University of Oslo / Eirik Irgens Johnsen

Fig. 2. Excavation of the Oseberg ship in 1904. Museum of Cultural History, University of Oslo / Olaf Væring

the context are used to create models of the past. The excavation also created models at other levels. One level entails the adjustments of mental models already held by the excavators. Further to that, all available recording media were used to document what was found. Indeed, creating lasting models is a process of mediation. All models, and parts of models, are media products. They are in themselves, separately, models, resulting from modelling processes. They are also the building blocks of larger, more complex models. The models of the whole site. The models of the events taking part in the 9th century. The models of the Viking society.

Oseberg is just one grave, with two dead persons, a small sample indeed. However, just the fact that these two are women has contributed in shaping our models of what the Scandinavian societies at the time were like. Oseberg took part in forming both the self understanding and external views on Scandinavia, also in smaller and more mundane ways, such as the use of Oseberg motives on stamps. The models of the finds and the theories of the past societies became models for a general view on the Viking society, models with significant political power. The political potential was not only taken out in the years around independence in 1905 but has also been used by quite different ideologies including the nazi government during the German occupation in 1940–45.

The main means of visual documentation at the time were black and white photography, paintings, drawings, and sketches. The textual is present partly as additional information on the drawings, partly as longer texts. Often these media forms complement each other. Fig. 3 and 4 show a photography and a sketch of the remains of a horse, illustrating clearly how the information is different and complementary. It also shows an example of how the sketches often include textual information. All these three media types establish iconic relationships of similarity between themselves and the reality of the

Fig. 3. The Museum of Cultural History, University of Oslo / Ill 1b. CfO0069/C55000_1. Horse carcasses port in the bow of the ship

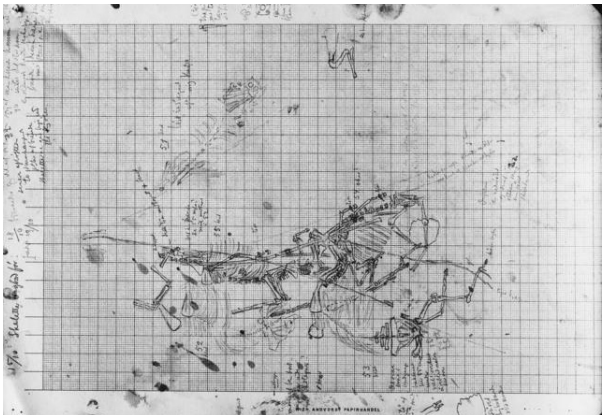

Fig. 4. The Museum of Cultural History, University of Oslo / Ill 1a. CfO0184/O1904_ hesteskjelett. Copy of plan over skeletons (horse) port in the bow of the ship

excavation pit but it is done in different ways (Ciula and Eide 2017). The photographies have image like iconic relationships established through the indexical process of analogue photography, showing also some structural relationships. The sketches and drawings also establish image like relationships to the modelled reality, but goes further in expressing also structural similarity. The textual annotations clarify structural and context relationships through the use of the "semiotic freedom" of the written language.

While some types of media objects, such as the results of laser scans, are usually seen as models, photograps and sketches are often described in other words. But such graphical forms in the context of archaeological documentation are clearly models (Nakoinz forthcoming). By observing a diagram one can establish new knowledge through iconographic reasoning (Ljungberg forthcoming). The concept of modelling describes a process in which media products, such as images or drawings, are created and a model relationship between the media product and something external is established. The photograph and the drawing are models of the remains of the horse. However, the two media types, similar as they are, still opens up for different types of use, they afford different types of engagement. The photograph gives a clearer image of how things looked during the excavation, where the drawing clarifies the elements of the skeleton and how they relate both to the anatomy of the horse in general and the specific object in the museum. The materiality of the documents is also important: once scanned and available on a computer types of deformance such as zooming and filtering becomes available in a different way from how comparable operations can be performed on a film or a paper copy. We will see below how other types of models afford yet other types of engagement.

The process of creating these documents can also be described as a mediation process where the process establishes a media product based on a human created artefact, namely, the killed horse (Eide 2015: 195–8)[1]. These are two ways to describe the same process, coming out of two different scholarly traditions. Thus, both modelling and mediation are connected to the same process, the difference between them is our perspective on and understanding of the process, rather than the process itself[2].

The process of reconstructing the ships and the other objects found during the excavation were not processes of direct causality. There were no manuals in the graves for how to build the ships – it was neither a Lego project nor an IKEA set of instructions. The pre-knowledge, the mental models held from before 1904, were parts of the basis for the reconstruction. However, the semiotically rich models created as parts of the excavation made what could have been a highly speculative activity into a scholarly evidence-based process. Not a perfect one – as we point out repeatedly aspects of the

[1] "Human created" here means that humans killed the horse in a cultural setting. It does not imply that no other forces took part in the process of transforming the dead horse into what was found in 1904.

[2] This is a simplification as our understanding is also an undividable part of such processes. However, this would opens for a complexity which it would be beside the point to explore here.

reconstructions are questionable – but still one based on solid scholarly evidence. A large number of mediated models were there, and are still there for those who want to understand better the context of the Oseberg excavation, the objects found there, and the history of the restorations and reconstructions.

Prescriptive modelling

Det Norske Veritas is a classification, verification, and risk assessment company with a strong focus on shipping.[1] This company was hired to write a report evaluating the sustainability of the Oseberg ship. The work included assessment of the current situation, evaluation of the support pillars and possible fracture in the wood, and proposals for how to move the ship which, at the time of the writing of the report in 2005, was under discussion (DNV 2005: 8).

The strength model of the ship they developed is based on input from different sources, including 3D scans, manual survey of damage, and testing of material properties. The strength model is also called a calculation model, which highlights it dynamic aspects. This model is created as an element model consisting of a large number of elements with independent connections between them and is used to evaluate the current stress situation and make prescriptions for the future, both linked to better support and to a possible moving of the ship (ibid.). The main aim is to create a model which can not only prescribe what will happen, but also decrease the risk of negative events if the ship is moved:

> The calculation model has been used to analyse a few examples of accidents and the extent of undesired events in connection with a potential move. It is demonstrated how such calculations can be used to establish requirements about handling the ship, supporting the ship and dimensioning the transport frame (ibid: 3).

The report aims at reducing future risks also for the ship in its current location through the analysis of possible extensions of the support frames. So we see an example of prescriptive modelling, but not to test hypotheses (e.g., how much a Viking ship can take before it breaks) but rather to influence the future. Through presenting decision makers with hypothetical scenario based on the strength model of the ship they are expected to make better decisions, hopefully combining their aims (keeping the ship available to the public, possibly moving it) with a highest possible likelihood that it is not damaged. Modelling in this sense is similar in aims to climate modelling and some of the modelling found in political science and conflict studies. The model does not strictly speaking give any information about the future, but can be used for simulated hypothesis testing,

[1] In 2013 Veritas merged with Germanischer Lloyd, forming the new company DNV GL. As we describe earlier events we will refer to the company as "Veritas".

evaluating the consequences of different assumptions as to the degradation of the material.

The level of detail in the model is in line with the accuracy of the collected data. The model itself is constructed as elements connected to neighbouring elements, all of them having material properties as we saw above. The geometry structuring the model comes from the digital results of the 3D scanning of the ship. Yet, the object being modelled in the strength model is not just the ship. The materiality of the model is a flexible deformable computer stored object. The active use in the simulations is indeed intimately connected to the ship but the main purpose is to create models of future events. To clarify how the dynamic aspects work some more detail will be given.

For the moving of the ship, two different types of unwanted events were identified. First, accidents that should not happen and can be prevented through strict procedures. Second, unwanted events which are to some extent inevitable, as one has to handle the ship in order to move it. The aim is to plan for avoiding the first type and minimise the consequences of the second type. The concrete examples of events described are not necessarily the most likely ones to happen; the aim is rather to show how the model can be used to provide realistic hypotheses for changes in tension. This includes identifying how the likelihood for breaches is changed through changing parameters such as support or level of strain. Thus, this work provides tools for further simulations rather than "OK or not" checklists. The calculation of the likelihood for a breach is called "Fiction" (ibid: 34) not because it is not well founded but because the result is rather a reference point than an absolute value[1].

Although truthfulness is an important part of modelling, all models are to be evaluated based on their usefulness – never being identical to the modelled object they are never true in a strict sense. Thus, given no catastrophe happens, the quality of the Veritas modelling can only be truly assessed decades from now, as the real assessment of climate models also has to be made in the future. However, both types of modelling still have quality assurance methods. The Veritas team was able to make a number of verifications through using different methods and through references to previous scholarly work on wood material preservation, cf. the matrix of the relationship between tension and bending (ibid: C-1).

The report explains in details how one should act in order to safeguard the ships, but it also explains the background for the advice – to show how they are evidence based but also to show the uncertainty of the results. It is argued repeatedly that the results are not accurate, but also, how they are conservative, thus, they work as a "best before" labelling on food – you may be fine even if going beyond but staying within you are sure, unless something totally unexpected happens, such as something heavy falling onto the ship.

[1] Cf. how the concept of fiction in scientific models is used, see e.g. Suarez (2009).

New evidence and scale models

The reconstruction of the ship was done at a specific point in time according to the knowledge and evidence available at the time. What we see as the exhibited ship is based on one interpretation of what was found in the grave. We have seen above that it is a scholarly well founded interpretation. However, other well founded reconstructions could also have been possible.

Traditionally the ship was assumed to be fit only for local travel in the Oslo fjord, and not able to sail the open seas. This assumption has partly been based on the assumed sailing capabilities of the ship as it can be seen in the museum. The history of the ship, including its place of construction, was established based on available evidence, and the historical modelling of the burial events and their political context has been based on that. Then, in the 1990s, dendrochronological studies showed that the grave was constructed in 834, and that the burial chamber in the Oseberg ship was built from regional oak. The same type of wood was used to repair the ship. The ship itself, however, was built in Western Norway (Bonde and Stylegar 2009).

Bonde and Stylegar use the new evidence and understanding around the production of the ship to re-contextualise the burial in political and social settings, suggesting new interpretations of written continental sources and the relationship between the areas in today's Norway and the rulers of what is now Denmark. Here we will explore another consequence of the dendrochronological results. Given this new evidence the ship itself, as it can be seen in the museum, could be (and in fact is in the process of being) questioned. We remember that the reconstruction happened based on evidence – but as in all such situations, on a limited set of evidence with a certain room for possible interpretations, a "room of possibilities" (Eide 2015: 178–180). The question has arisen between curators and scholars if the ship could have been different within a reasonable room of possibilities? Supported by the building of scale models, recent research points towards a positive answer.

Experiments conducted in 2008 on a 1:10 scale model of the ship in a ship modelling tank indicate that it may have had quite good sailing abilities (Lundeby 2014: 3–36). Building replica of Viking ships from wood is an extremely time and money consuming process. In addition it is highly skilled work – just making planks using an axe rather than a saw is quite difficult and takes considerable training. A hand made scale model can to some extent replace full scale reconstructions. In the modelling tank experiments only small modifications to the scale models led to quite different results, supporting the possibility of significantly higher stability at higher speed and under the stress of higher waves[1]. Our aim here is not to give evidence for one model rather than the other,

[1] "Osebergskipet langt mere sjødyktig enn antatt." Stiftelsen Nytt Osebergskip, news item from July 1 2008. https://tinyurl.com/yc5lz6do (accessed 2018-05-02).

but rather to show how modelling processes based on quite different methodologies – archaeological, historical, and engineering – work together to create and support new hypotheses; not based on newly excavated material but based on new interpretations of existing artefacts in the museums.

While all the methodologies described above have their limitations they can still help researchers in evaluation their hypotheses, bringing the research further. It can also, through testing many different versions of the model, prepare for the construction of a physical full scale hand made replica by clarifying what the most interesting way to build it would be. The news item referred to in footnote 17 above is indeed taken from the webpage of a project aiming for the construction of a new Viking ship. Scale models can add a level of interactivity which can give researchers, students, and the interested public a deeper understanding of the ships by showing how they could have been different and how changing parameters would change them. It can also be used in simulation experiments to gain new scholarly knowledge of what is through exploring what could have been.

Conclusion

In this paper a number of different models have been analysed. Their materialities and modalities are quite different, from flat image surfaces and scans to manipulable physical and virtual 3D models. While all these models in various ways are spatial they are also actively used in time. They represent in their different ways both objects and processes. Their affordances and use vary based on their different materialities. An image or a sketch in its digitised computer based version can be zoomed, turned around, and manipulated by more advanced image manipulation methods such as filtering. A physical scale model has physical attributes that can be tested in an environment, such as the ship model in a water tank. Similarly a computer based 3D model can be put into a virtual environment and various hypothetical situations can be simulated.

Many of the oldest models used in this case study were created for a purpose more or less similar to what we use them for today. Photographs and sketches from the excavation were digitised more recently and through that process have changed material interface, but they are generally used to understand and contextualise aspects of the excavation and the objects found in similar ways as their originally intended use. This is not the case for the dendrochronological and C14 analyses. The wood was stored in the museum without modern dating methods in mind. However, it is an aspect of museology that objects may be exposed to novel methods in the future, so they should be preserved also when no clear scholarly or pedagogical use can be seen.

Much of the modelling practice we have seen in this article is directly linked to physical objects and replica thereof. The pictures and drawings were of the remains of the horse

and other objects from the excavation. We looked at different models of the Oseberg ship; again images, also digital 3D models and replica. Even the stress model, abstract as it may be, is a model representing the object.

We have also looked at some models that are linked to more abstract features. We did discuss the general Viking ship concepts held by those involved in the excavation, and we have seen how models of Viking society can be modified by new modelling techniques. Once one creates a specific scholarly/scientific model this model puts various degrees of limitations on its possible use area. The model affords certain types of use.

However, it is not enough to claim that models are models of objects. There is no straight forward representation taking place in the modelling activities we have seen. It is rather a complex activity of re-thinking our conceptualisation of the objects and their role and meaning in historical as well as modern times. In this perspective we see clearly how the models also express the world view of their creators in creative tension with what the objects can tell us. This is clearly shown in the examples of models changing the understanding of the objects. The objects themselves are not changed, there is nothing happening in the objects suddenly forcing us to make new models. The change is in our academic and intellectual and practical world. We think in new ways, and we develop new methods. This calls for the possibility of new models that can change, often in detail but sometimes also in larger scale, influencing our understanding of the past and the present.

In this sense models are not only the physical or virtual objects we interact with. Also the processes we create as replica of processes in the past. Such performances are part of modelling practice, they are models. The process of sailing a model ship in a tank is a model of the process of sailing a Viking ship more than 1000 years ago. In the icon based model of modelling a similarity can exist between processes, not only between physical or virtual objects. In our pragmatic iconographic thinking about models this aspect is not yet explored in the depth it deserves. Deepening our understanding of the dynamism of modelling linked to historical and model processes is an important target for future research.

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