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Homage to Marcel Proust – Aspects of Dissemination and Didactic in a Museum and a Science Centre: Science Communication Visions for the Third Generation Museums

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1. Introduction

In this essay focus is upon some experiences from the run of the science centre and the university museum in Trondheim, Norway, and dissemination of research and science to the school. It debates how the institutions increasingly may adapt to school programmes and the new aspect in the new curricula for Norwegian primary and secondary schools: the *budding researcher* – the young student that got the possibility for to have a closer touch of research and science. Hence, the essay display some examples of archaeological public work towards what may be can be said to represent aspects of the third generation museum. Finally – it discuss some science communication visions for the years to come. And: what motivation and benefit may the archaeologist derive from spending time imparting research?

2. The significance of the idea

Within science studies there is an examination question which goes something like this; “Progress in research is determined by the development of new techniques and equipments. Discuss”. If the answer were a straight “yes”, one may have to report that the frontiers of the field had not moved much. Fortunately, the answer is not a simple “yes”. While it is of course true that one point to fields of science which opened up because of new techniques and equipments, it may be even more often that new fields opens up because of new *ideas* rather than new techniques. And also behind new equipment, like the electron microscopy for the study of small elements in nature – and radiotelemetry for monitoring of the behaviour of large animals, one can imagine an idea behind the initiative and what kind of data that will emerge. Typically, and as one example of idea-making in practice, the 1973 receiver of the Noble Prize for Physiology and Medicine, Niko Tinbergen (1907-1988) most preferred skills was his ability to observe animals and ask four questions; 1) immediate causation for their behaviour, 2) technically development of anatomic traits, 3) looking back for evolutionary explanations, and 4) how it all function connected to succeed in surviving and reproduction. Tinbergen used his eyes and his imagination as central tools for his voyage of discovery (Tinbergen 1951, 1958). One may suppose that this way of reasoning is useful in general within science.

Is the reflections above relevant to the topic of this paper - the educational role towards the public of museums and science centres? And for subjects as archaeology? Obviously, an idea, or a notion or thought, can serve as a technique or method of performance or manipulation. A new way of thinking about a problem can become a useful way to solution, just as a new device for measuring can reveal new knowledge. This ability to intellectual action and the possibility for to direct participate in reasoning around a question or a hypothesis is of great value for individuals and society, and should be promoted during dissemination work by scientists. Daily activities, school and studies, and science centres and museums, must encourage this essential quality and capacity among pupils. Hence, science centres and museums should be a tool to stimulate imagination (Pedretti 2002).

Providing the public with information on history and archaeology is well established, and in recent decades the practice has developed into a separate discipline (e.g. Somers 1979, Colin Renfrew 1983, Kwas 2001, Watkins 2006). Books containing collections of articles dealing with how to communicate archaeology to a wider public have begun to appear and the discipline of Science Communication, which is touched upon later in this essay, is growing rapidly (e.g. Beavis & Hunt 1999, Hørnig Priest 2010). These authors stress the importance of publishing research in the best possible way and even question the validity of carrying out much of the research if it is not imparted to the public in an easily understandable fashion. In the last ten years or so, the use of the Internet has also become increasingly important for imparting archaeological research, for instance by presenting exhibitions and dissemination projects (e.g. Hembrey 2001, Warwick & Meckseper 2002, Brughmans 2010). Such activity also directly enters into the role of museums to be socially including in quite general terms (e.g. Sandell 2003), and this is expected to become an increasingly important task for museums in the years to come.

The challenge is to communicate effectively towards the public. By the science centres interactive pedagogy, they are considered as an important supplement to the formal schools, and a contribution to understanding of research (Falk & Dierking 1992, 2000, Persson 2000a). One reason to the establishments of the Norwegian centres is the recruitment swab to science subjects within the education system. One main objective for the science centre is therefore to inspire youths to keep on with science subjects in further studies and employments. One may say that classical museums within archaeological- and natural science moves in much the same direction.

In this essay focus is upon: **1)** some experiences from the run of the science centre and the university museum in Trondheim, Norway, and dissemination of research and science to the school, **2)** debates how the institutions increasingly may adapt to school programmes and the new aspect in the new curricula for Norwegian primary and secondary schools: the budding researcher, and **3)** display some examples of archaeological public work – hence some science communication visions for the years to come: what motivation and benefit may the archaeologist derive from spending time imparting research?

3. The science center and the classical museum

The science centre in Trondheim, Norway, was founded in 1988, and was from 1991 to 1997 localized together with the Museum of Natural History and Archaeology, which is an

integrated part of the University of Science and Technology in Trondheim. From 1997 and onwards it has been localized in Bank of Norway's old building in the city, but plans for another localization together with the university museum is now worked out. The exhibition area represent approximately 700 square meters respective around 200 objects that focus upon physics, anatomy and technology. 50 000 people and more have visited the centre yearly, whereas between 60 -70 % represent school classes. The potential customer group are stipulated to be around the 300 000 people living within a 100 km radius around Trondheim. Visitors are mainly from schools in the nearby surroundings of the city. Most objects are adapted to the curriculum within the school programme from age 6-15 years. Several of the models presented are given as examples in the school textbooks. Formal collaboration with some schools and groups of teachers has been accomplished.

The Museum of Natural History and Archaeology at the Norwegian University of Science and Technology (NTNU) dates back to the 19th century and is located in the centre of the same city as the science centre – that is Trondheim, central Norway (Steffensen et al. 2008). Its focus is on research on natural history and archaeology with dissemination of research results to the public and to school pupils (Overskaug et al. 2010, and see also Ross 2004). The schools, on their part, incorporate museum visits as means of educating their pupils in compliance with their curricula. Hence, the first archaeological exhibition made at this museum, and one that is still widely used by schools, is the prehistoric exhibition that dates from as long ago as 1955. The exhibition spans the entire period from the earliest settlements in Norway some 10 000 years ago up to the Viking Age, and to medieval time about 500 years ago. It is located in a quiet part of the museum and has seating to give people an opportunity to sit down and absorb the historic atmosphere the rooms attempt to impart. The aim has been to get all school pupils in central Norway to visit this exhibition at least once in the course of their period at school. The exhibition and the presentation of its content made by archaeologists has been extensive and very good. Nowadays, many people will probably say that the exhibition appears old-fashioned, since it largely comprises glass cases containing objects, but the museum have received responses that it is precisely the good atmosphere that prevails in this exhibition that invites people to visit it. However, good empirical data are still lacking to show how widespread this view is. Furthermore, the trend in recent years has been that it has been more difficult to attract pupils to permanent exhibitions than to new, temporary exhibitions.

Obviously, there are ideas that best can be realized by a co-operation between classical museums and interactive centres. One such project initiated in 2001 focus on *communication*, where the university museum presents how animal communication are figured out by postures and sound, and the Science centre build an interactive model which demonstrates principles behind communication technology like TV and radio waves. Another inter-museum project initiated in 2002 deals with *geology*. The new geology lab in the science centre serves the interactive part of this project. Furthermore, visits to the geology exhibits given at the university museum were arranged.

Finally, a fellow-actor for the museum and the science centre is the School Centre for Science Education at the Norwegian University of Nature and Technology. The School Centre is a link between the primary schools, Colleges, the University and the industry and commerce. The goal is in particular to renew and strengthen the education in mathematics, natural science and technology in the school. Consequently, the basic structure seems well.

However, as i. e. Macdonald (2003) point to in here stimulating paper on museum identities, one main challenge for future museum work is also to focus on the concept of identity, and which represent an underlying factor in the following discussion.

4. The budding researcher

New curricula for the 10-year (pupils aged 6-16 years) compulsory primary and lower secondary education and the succeeding 3-year (pupils aged 16-19 years), optional, upper secondary education was introduced in Norway from 2006. The curricula are comprised of three parts, a general normative part, principles for education, and specific syllabuses for the subjects taught. Central principles in the education are to stimulate personal development and pave the way for involving the local community in school activities. The syllabuses for the subjects mention, for instance, basic skills such as expressing oneself orally and in writing, being able to read and to do arithmetic, and the use of digital tools.

The new curricula do not lay out the same regulations, so to say, as the former ones as regards teaching methods. Nor do they mention, or place emphasis on, special historical events, or list examples of topics in science to the same extent as former curricula and syllabuses have. One intention with this is to give teachers freedom to chose the best form and content in their teaching. However, under the topic of the *budding researcher*, the new curricula place greater focus than earlier on the need to understand research processes and scientific reasoning and maturity. The budding researcher is a compulsory aspect of science subjects, i. e. the pupils must be given grounding in and practice the principles of scientific work. Here, science emerges in the teaching in two ways, as a product that illustrates current knowledge and as a process that builds on knowledge. In the curriculum for social studies, which includes history and archaeology, developing scientific reasoning in accordance with the same pattern as in the budding researcher of science subjects is implicit. The challenge facing the university museum and the archaeological work in their effort to impart knowledge will be how to best organize their dissemination work towards pupils to fit the lines laid out in the curricula.

A distinguishing feature of the university museum is that its exhibitions and the manner the museum communicate them to the public are based on research and collections, while the public service department act as intermediarie to make research and research processes available to the public through exhibitions and other forms of presentation. The combined activity of research and communication in the university museum should therefore be tailored to support the vision behind the introduction of the budding researcher – concept presented in the new curricula, aimed at providing insight into the building up of knowledge and maturity in scientific reasoning.

The university museum in Trondheim has larger natural history and cultural history collections and exhibitions, and the scientific expertise attached to the museum is particularly concerned with those two subjects. The museum organizes activities aimed at the general public and school pupils, providing them with insight into what takes place right from the initiation of research processes to half-completed products and reflections around more long-term perspectives. For instance, it is possible to arrange that school pupils can visit archaeological excavations and follow these excursions up with another visit to the museum when the material has been processed and interpreted. The purpose

is to incorporate meetings with researchers and work on assignments and the solving of various problems during visits in the field and to the museum as a compulsory part of the education of pupils in ancient and modern history. Hence, school pupils, through the museum, have a unique opportunity to gain insight into the process linked to the research, from idea to realization, and also to meet researchers who are at various stages along that line. The new curricula therefore increase the role of the museum in the current arena of education.

After going through the first generation museums consisted of artefacts in glass cases (Fig. 1), followed by the second generation encouraged interaction and hands on (Fig. 2), future activity may encourage visitors to redefine the exhibits and its contents. They may themselves participate in developing dissemination projects and in discussions with researchers – and that may be said to represent some kind of a third generation museum (Fig. 3, 4). While the science centre in many ways already touch the third generation, also Trondheim university museum has taken steps towards that goal by running dissemination projects where school-teachers- and children participate in the process towards the final product. An example are the production of middle-age clothes based upon what research said about the design of that time costumes (Fig. 3), and then by wearing the costume and perform a “pilgrimage” from the museum to the large medieval cathedral in Trondheim and discuss the history behind the building (Fig. 4). For this specific project information about the life and clothes of *The Bocksten Man* - the remains of a medieval male body found in a bog in Sweden in 1936 and dated to 14th century – were used as background information (see for example Durrani 2006). The man had been killed and knocked to the bottom of a lake which later became a bog. He was recently reconstructed to show what he may have looked like when he was alive. Depending on the interpretation of the clothing, and in particular the hood, different conclusions can be made about the man's social background. The hood he wore was usually worn by the more prosperous classes and it has therefore been suggested that he was a tax collector or a soldier recruiter. The type of hood was also used within the church. Definitely, this story attracts teachers and young students – from it was initiated based upon available literature and the design of the costumes (Fig. 3) – and through further studies of the middle-age time and the history of the medieval cathedral in Trondheim (Fig. 4).

5. Discussion and further visions

5.1 Research as guide to development

Although the justification of science centres are debated (Bradburne 1998), they seem to represent a kind of institutions of informal learning that public calls for (Borun et al 1996, Persson 2000b). Fully satisfying data that clearly demonstrates long-time effect concerning learning from museums are lacking. But for visitors, museums and science centres represent meaningful experiences (Falk 2000, Sheppard 2000). Studies shows that more than 50 % of the public could precisely repeat the principles behind exhibits one year after the visit.

In Finland, Salmi (1993) presents studies from *Heureka* Science Centre of school children that had both single stays and visited the centre several times, respectively. The conclusion was that an optimal strategy for learning is to motivate the visitors for several visits, establish



Fig. 1. First generation museums – exhibitions in glass cases. This may still function very well, in particular if there are possible to tell a story behind the exhibition and the artefacts. When were they sampled? Under what conditions – accidentally or as a result of a larger project? What was the background for the project? (Photo: K Overskaug).



Fig. 2. Second generations museums – hands-on and minds on. Visits behind the exhibitions, and stay for a day with the archaeologist – in the museum and maybe it sometimes also is possible to go with him to the field-work. Get even deeper insight into his way of working. Exhibitions where students do their own experiments are figured out in a number of more classical museums – and are among the essential ideas behind the science centers. (Photo: K Overskaug).



Fig. 3. The tunic of a medieval man from Sweden (see for example Durrani 2006) is among the best-preserved medieval tunics in Europe, and made of wollen fabric. He was wearing a hood with a 90 centimetres (35 in) long and 2 centimetres (0.79 in) wide "tail". On his upper body he wore a shirt and a cloak, while his legs were covered by hosiery. The photo shows a simple copy made on information from *the Bocksten Man* and other sources, and made by and for students and used for a dissemination project of some of the human life during parts of the medieval time (see Fig. 4). (Photo: G. Holt/K Overskaug).



Fig. 4. Maybe characteristics of the third-generation museum, and popularizing of archaeological subjects towards the public and school, is to involve children and students in themselves making dissemination projects under supervising of the museum? Hence in the university museum in Trondheim, Norway, - and exemplified by the design of a collection of middle-age-costume - and then take a "pilgrimage" from the museum to the cathedral and the amazing 1000 - year history behind the building (se also figure 3). (Photo: K Dahl).

pre-lectures that prepare students for the visit, and post-lectures that further put the exhibits into a broader context. That approximately 80 % of the first-year students at the University of Helsinki had visited Heureka before they had started their studies, may support the impression that informal learning sources can represent a motivational factor, and create active attitudes towards science, research and technology among young people (Salmi 2000). The importance of integrating the object of the visit towards the textbooks on school can also be stressed by that there at least in some museums and dissemination projects is more or less even compulsory for teachers to participate in a workshop at the centre in front of the visit with their students.

Yet, published empiric and specific visitor data for the science centre and the university museum focused upon here is mostly lacking (but see for example Overskaug et al. 2010), the overall positive response from school-children and groups from kindergarten may, however, indicate that the centre and the museum play a growing role in informal learning. For example have approximately 15 - 20 000 pupils annually visited the university museum during the last years. However, this is nevertheless a fairly small proportion of the total number of pupils in the region that can be considered the museum's natural catchment area. One of the challenges seems to be to reach teachers effectively with the information that are

distributed. And an important goal is to work further to design studies that verify the educational effect. A more formal co-operation towards schools, and attention around their needs, will make it possible to present offers that increase the use of the centre by schoolchildren. It is often also a question about time and economy – how to bring schoolchildren from the school to the museum and back again? And who pay?

5.2 What's in it for the archaeologist?

During an ordinary working day, when researchers are often snowed under with urgent tasks and under pressure to write reports and scientific publications, it can often be difficult to find time to carry out popular scientific dissemination work. Moreover, as such work often gives no purely scientific gain in expertise, nor necessarily proves gainful for project applications, it may be difficult to see how it will be attractive for archaeologists and natural scientists. There are, however, tendencies in the academic world that passing on information to school pupils, students, the general public and non-specialists in political and community management, is strengthening its position as a separate discipline and in several ways will develop into an attractive field. This is because the need for quality-assured knowledge and a knowledge-based approach to current issues is increasingly urgent, and active researchers should be among the foremost to attend to this important task for society since such knowledge may otherwise be quite unattainable for most people, for instance "hidden away" in specialised scientific journals or published in other ways that are difficult for ordinary people to gain access to. Science Communication is a disciplinary tool to make, for example, such knowledge more widely available and put it into a broader social context. Several articles have been published in recent years that sum up the essence of Science Communication (e.g. Weigold 2001, Burns et al. 2003) and, according to one of the most recently presented definitions (Hørnig Priest 2010), it concerns presenting science to non-scientists ("the public") – that is, imparting research from researchers to the public at large. Researchers refer to this as "outreaching" or "popularization", and it has evolved into the profession of popular science – that is, interpreting science to the man in the street. Hence, Science Communication includes research exhibitions, research policy and journalistic and other media productions about science. Science Communication may, however, also describe communication between researchers as well as between non-researchers ("the public").

The motivation to focus on popular science is therefore multifaceted. A prime aspect is that imparting research may be valuable for knowledge-based decisions taken by individuals, for social and political decisions, and not least to improve the research itself through the possibility it has to be presented and feedback received from the general public and other users. In this way, Science Communication has achieved increasing publicity in daily newspapers and research journals (e.g. Sherwood Rowland (1993) who gave the topic broad publicity in *Science*)). "Science Communication" (first published in 1979) and "Public Understanding of Science" (published since 1992) are important specialist journals in this field. Some of the more classical articles written about the topic, and summing up the characteristic content of the discipline, were written about the end of the 1980s. Hence, Geoffery Thomas and John Durant are two often-cited authors who addressed the various social benefits derived by increasing public interest for research and science (Durant & Thomas 1987). For instance, the authors point out the following justifications for carrying

out popular scientific dissemination – and actual for the archaeologist who may be out on an excavation, in the museum, at a school or on a stand of one sort or another, or by way of popular scientific articles and news stories:

- valuable for research (and society) in itself since, if people in general acquire a broader interest for the science, the science too will achieve more progress and also contribute to a more robust society,
- by being imparted, research has the possibility to put important questions on the society agenda and help to legitimize its own activity. A classical example for archaeology is the frequently posed question of how essential and useful archaeology is for society- do we not already know enough about bygone times?,
- knowledge is advantageous for the individual by directly supplying insight that can be utilized in everyday life,
- some production of knowledge may also have an aesthetic perspective and stimulate art and culture (examples are various scenarios regarding social development), and/or may stimulate an improvement of mental and physical health,
- the broader the knowledge, the better the basis for taking vital political and social decisions,
- dissemination can improve recruitment to the discipline,
- the ultimate benefit is an improvement of the individual's participation in and attitude to social issues, thereby strengthening democracy.

Durant et al. (1989) also had a follow-up paper in *Nature* in 1989 where they referred to a study which showed that the public in both England and the USA were more absorbed by knowledge and science than by sport, for example, but compared with the latter it is more difficult to create just as general excitement for science among the population at large and in the media. Nevertheless, still by the end of the last decade less than 1 % of published scientific work was being referred to or made available for the public in other ways (Suleski & Ibaraki 2009).

5.3 The active visitor

There may be at least four challenges that should be solved; **1)** science centres may still struggle for to be somewhat more than a “fun fair”. To try to steer this, there is worked out a guide for teachers with cross references to the curriculum, and the staff made suggestions to activities and approach to problems and projects. **2)** when interactive models are presented - how can we stimulate the public to take a closer look below the surface? To arrange this, each model is first described in depth in the exhibition area. Second, books and booklets on special subjects are written so the public have the possibility to look into the world of knowledge hidden behind each model. Third, and may be the method that function best, is to have a researcher or guide that in a proper pedagogical way can tell the story about the model, the research project, the persons behind – and how they once in the time come up with the idea, **3)** To make enthusiastic pupils we have to make enthusiastic teachers! One may meet this challenge by making lectures and organize special courses for teachers and their classes, and **4)** finally, how can we give the visitors a “heart” for science? Hence, the science centre and the museum may made do-it-yourself-laits, simple scientific toys and arrange different science-clubs keeping children at the centre every day in a week. In many ways this is also already figure out.

The conclusion may be that there is no single solution to those questions. The challenge is to stimulate the active, intelligent visitor, which is hidden in every visitor, when they all have their own special abilities and interests. Consequently, we are back at the point of departure for this essay; much of the philosophy behind the discussion above may be recognized from the heading - in the way it is expressed by Marcel Proust (1871-1922). Brilliant and simple, but certainly true, the novelist probably goes straight to the heart of pedagogical alternatives by the formulation "*The real voyage of discovery consists not in seeking new landscapes, but having new eyes*". It requires a lot of courage to produce your own, new ideas, to have new eyes on science, or even redefine old truths. Science centres and museums may stimulate, arrange and prepare for to realize this potential in visitors. I welcome suggestions, and a fruitful and stimulating discussion and debate from students, researchers, teachers and the museum community upon how to reach and realize a vision about being a significant and maybe more formal contributor to educational goals.

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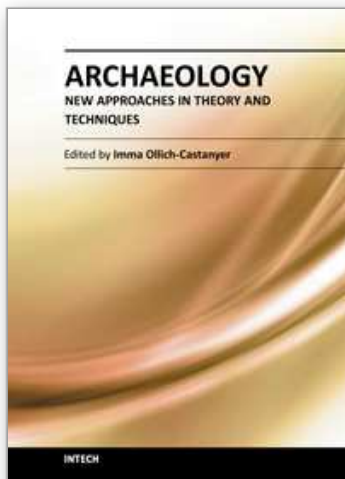
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