

## **Round table discussion at the PARIS4 conference, National Museum of Denmark, 25<sup>th</sup> of May 2011.**

The discussion was based on four questions, which were used as themes throughout the conference. Two of the delegates – one researcher and one manager – had been asked to give some of their thoughts on each question, before the discussion was opened. The discussion was chaired by David Gregory and Henning Matthiesen:

1. Degradation of archaeological remains. Can we quantify degradation rates and what rates are acceptable? – introduction by Jim Williams (English Heritage) and Mark Pollard (Oxford University)
2. Monitoring and mitigation case studies – with special focus on long term projects. How, and how long, should sites be monitored? – introduction by Jane Sidell (English Heritage) and Hans Huismann (Cultural Heritage Agency, Netherland)
3. Protocols, standards and legislation for monitoring and management. Is it realistic to make multinational standards when the sites and national legislations are so variable? – introduction by Henk Kars (Vrije Universitet, Amsterdam) and Jens Rytter (Directorate for Cultural Heritage, Norway)
4. Preserving Archaeological Remains in situ. Can we document the effectiveness of in situ preservation after nearly 2 decades of research? – introduction by Mike Corfield (independent consultant) and Vicky Richards (Western Australian Museum)

The discussion was taped and transcribed directly.

### **Question 1: Degradation of archaeological remains. Can we quantify degradation rates and what rates are acceptable?**

**Henning Matthiesen:** There were some questions that we wrote on page two of the book of abstracts. We are going to discuss those questions now, and we have thought of organizing it by first giving the word to the two chairmen of that session, to try and give their view upon the question from a scientific point of view and from a more administrative point of view. When they have their relatively short summary, then the floor is open for discussion which David and I will try to chair as well as we can and we have set about 15-20 minutes for each question. So, leaving the floor first to Jim Williams and Mark Pollard, we would like to discuss the degradation of archaeological remains. Can we quantify the degradation rates and what rates are acceptable?

**Jim Williams:** Mark and I will try to take the same role as administrator and scientist again, I am going to leave it to Mark to do the hard work. Henning asked me to say something about the large scale, sort of site based degradation that Hans and Steve Bödecker talked about. But also the small scale, though about material, material loss and material degradation. So think of you consider the site, the large scale, we can monitor, and we can observe loss of archaeological material and loss of archaeological sites from major impacts both natural impacts and manmade impacts. And to some extent we can control below ground degradation of the deposits for example from piling by planning controls that we exert through local authorities. And we can research and directly observe past and current piling impacts to provide an understanding of the degradations rates. How much of the site is lost from these various construction impacts. And I think the two key things to bear in mind really are the legibility of the site, how much can you still read from it, to what extent has one episode of piling, as Hans pointed out, has made the site difficult to read or to what extent is it still something, as an archaeologist, you can look at. And also to think about the loss of information it is not just what you can see between the piles but what you have lost from the piling and what you have lost from the compression. And the key point that links some of that together is also that the problem of cumulative impact, to what extent is one episode of piling on the site might be appropriate in order to preserve most of it in situ by the time you have done that four or five or six times then the potential for preserving anything in situ is significantly lost. Moving to the small scale I think the issues are really very much the same it is still at the site when you are looking at archaeologist materials you are still thinking about site management issues of legibility and information loss and again cumulative impacts being particularly critical variables. So for example if we think about damage to bone, and I think that it is a subject we haven't really discussed very much at all at this conference. You can break a bone but it is still identifiable morphologically. You can fragment the bone into many pieces but you can still look at a protein mix to identify the bone species. And you can still use the bone for radiocarbon dating and isotope analysis. But if we look at potential chemical impact rather than physically impacts or perhaps if we think about those cumulative impacts of co-dependent chemical and physical breakage, then the loss of potential and loss of information is obviously going to be much greater and therefore the rates in terms of what is an acceptable rate of degradation really depends on the information that you are losing. What is it that you actually want to get out of the material? The potential for then doing radiocarbon dating or isotope analysis from a bone that you can't because of the chemical loss is obviously very significant. So my feeling as a heritage manager is that we can quantify different stages of damage to material, different stages of damage to a site. We can look at a range of artifact materials and link these damages to information loss. The challenge I am going to leave Mark to discuss is to say a bit more about where we are in terms of quantifying degradation rates rather the degradation states. But I am just going to finish by saying from a resource management point of view; I think that the big challenges to make the assessment of degradation part of our routine management toolkit, certainly in England this is an area where we need to do a lot more work. Because I think practical discussion about rates of acceptable loss can only really be had in the context of how many information on the degradation and the state of preservation of the material. So handover to Mark now to try and think about degradation rates.

**Mark Pollard:** I pick upon Jim's last point because I think that is pretty critical when we are thinking about rates of degradation it does depend on what you want out of it because different components for some of these rather complex materials, in particularly bone, will degrade at different rates. We are all familiar with finding bone that looks morphologically perfect, the shape is perfect. But when it goes to the radiocarbon lab or the stable isotope lab, there is no collagen left in it, or there is no DNA in it. And so for those purposes it is effectively degraded. Whereas if you are interested in morphology, bone cut marks, kill patterns things like that, then actually it might be perfect usable for that. Degradation as a term I think is something which is quite a subtle issue to get to grips with, but I think to answer the question as directly put "How well do we understand degradation rates?", I think the answer is we have seen in this conference and in a few publications which are beginning to come out now estimates of either the life time of an object in a particular environment or the rates of loss of the environment, the sediment that contains the material itself. I think these are scientifically very challenging but it seems to me to be the ultimate aim of a scientific study of this area is to quantify the rates of loss. So you can actually answer the question "How long is this going to survive this environment?" or actually more challengingly "If this environment changes how long is this object going to survive in this environment". I think we have made huge strides over the last 20 years, in terms of understanding the processes which are going on, although of course many of the processes have been known for a hundred years. I am thinking of principles of electrochemical corrosion have been around since the 1930's. The processes have been understood, but I think we are now beginning to be able to quantify those. It seems to me that two main challenges that are left in this area are to do a sensitivity analysis "How sensitive is the rate that we predict?" for let's say iron in a particular environment, "how sensitive is that rate to changes in Eh pH?" because that is the way we will be able to understand, to answer the question "What happens if this environment changes? If the water table drops? What will happen to the rate of degradation of the material in that environment?". So I think a sensitivity analysis, and that is difficult, because of course the natural environment changes very subtle but those subtle changes can be incredible significant. So by microcosm and by modeling, I think we need to be able to understand the sensitivity of the parameters we predict to changes in environment. That I think is the next big challenge. The other big challenge is that a lot of these rates we are predicting are either coming out of projections from microcosm experiments or are the results of model building. We really need to ground truth these predictions, we really need to go back and say "okay, our prediction is that in this sort of environment iron will not last for longer than 50 years." Well, we have at our disposal the entire archaeological record, which will answer that question providing we can find the right context to do those observations. So I think we need to translate these predictions from model and microcosm into the real world and ground truth those, and begin to see whether we are actually on the right track or not. Because, of course, the problem with both microcosm and model is that we may not have been controlling for the actual parameter that is really doing the damage, and we need to find that out. To test these models and microcosm in the real world by going back to the archaeological record, and of course if we think about it one of the reasons for studying the interactions of materials in ground water, going back 30-40-50 years, was the nuclear industry who were interested in long term integrity of nuclear deposits for

high level waste. So a lot of these experiments have been done and there is a lot of data out there, and a lot of observational data, particularly on metal and particularly on vitrified material. So I think we need to bring that together and start to try and verify some of the models. Somebody had a slide, I think it was Jane, had a slide which said "Good work done, but more still to be done", yes that is where we are, thank you.

**Richard Brunning:** I think one of the problems of assessing degradation rates, is that we do not have baseline data, on the condition of the monuments. Quite often we have done projects and we have obtained them but there has been nothing previously, so then we can't really see what the rate of decay has been. It is obtaining baseline data and doing forms of analysis on the condition that can be done in the future and produce some meaningful results, where we can compare the two and then actually have proof of degradation rate. I think the problem is that a lot of the time of the monitoring; we are not getting adequate baseline data. And I think to do that you have to dig holes to get it. You cannot do it remotely by coring, I think.

**Mark Pollard:** I just like to sort out an additional comment to that. Because I think one of the really important things to think about when you are approaching, say modelling. Is that you are actually looking at, if you like, group behaviour. You are looking at, sort of, averages of the interaction of a set of objects with the environment. You are not really, mostly trying to model a particularly object in a particularly environment. I think you are looking at, if you like, higher level of collectivity in this. So the issue about modelling seems to me, is much simpler than I think you are interpreting what I was looking for, and that is we have a series of model predictions which, and I think iron is good one, you know, which says in certain environments iron should not survive for more than so many years. And actually, all we are looking for to verify those models, as in many scientific experiments, are observations which contradict that. So you might have a deposit which is 2000 years old, and the environment which says that this iron should not have survived in this environment, and yet it does, it is there. So either there is something wrong with the model, or the sophistication of which we model the environment. I think the interesting question is "how local is an environment?" I think we are all used to archaeological sites where one side of the trenches is like this and the other side of the trenches is like that. I think we got to think very much in terms of global and local. A lot of the modelling at the moment is at the global level, and we really just need to get a grip on this general issue of how does the Eh pH, dissolved oxygen, sulphate reducing bacteria concentrations for instance. How does that affect the preservation? I think we need to be careful in the use of the term modelling; it is not specific objects and specific environment. It would be nice to be able to do that, but that is too complicated.

**Henning Matthiesen:** I think it looks as if, now you took the example of iron, I think the presentation by Mandana, showed that the work of her group is really moving us a lot further to the understanding of what is going on in archaeological iron. I hope that would also end up in degradation rates, but I was very impressed by what she showed.

**Mike Corfield:** I think that we can only quantify degradation rates when we begin to document the condition of what we are recovering. These sorts of burial environments they come from. I address this particularly to my fellow conservators: When you are looking at a corroded object.

Don't just look at it as stuff that's got to get rid of so that you can have a pretty object at the end of it. Try to take the opportunity to document what sort of corrosion you have got there and how it relates to the environment that the object came from. Then perhaps we begin to get some of the data that Mark needs in order to produce his models.

**Brian Durham:** I don't want to embarrass Henning of this, but if you want to, with a specific relevance to wetlands preservation of iron, it is very well worth going back to Matthiesen 2004 who provides data on iron in a dynamic way in three dimensions spatially and over time, for specific preservation environment. And I think there is a lot to be gained by going back to that.

**David Gregory:** I was just thinking, one of the other things we have noticed with the Nydam site, I am glad Brian mentioned the work which Henning's done with the metals, but we found with the wooden artifacts a lot of the deterioration was actually the pre-depositional formation processes. Because we had the lake environment there, we found that, well, a lot of the spear shafts were, or spears, were thrown out into the lake, they would scull around on the surface some of them, and the archaeologists thought that "oh they were poorly degraded", because they were poorly degraded on the surface, but it was in fact insect attack, and on the other side we have a lower find layer where the beautiful preserved artifact where we have almost like rune markings on them, but they were deposited in another way. So I think it is quite interesting, that what is actually happening quickly after the deposition of these finds and how can we actually take that into account with our models that we are developing. And I think that's what really was the cause for us to actually do our trial excavations, saying: We are doing all the monitoring, but we couldn't really get an angle on what it actually meant for the artifacts, and we knew that some of the archaeological formation processes. So that was just really a comment.

**Jens Rytter:** Jim was talking about the information loss and I am also part of the heritage management. I think that in a way when we are talking now and talking about in situ, we are thinking of good preservation conditions. But you can have sites where the state of preservation is lousy, and it has been lousy for 1000 years. But you can still keep it in situ because you are not losing any information. That is why it is so important for us, every time in Norway we have been working mainly in the medieval cities, that when a plan is coming up, we are always going in and taking our sample to have the state of preservation and the preservation conditions. Then we are deciding what kind of development can be done on this site, and the monitoring is of course put on the preservation conditions because we have made the state of preservation, and then we are monitoring the preservation conditions and then we are seeing if anything is happening to the preservation conditions. Then we can go in and sample again and see if there has been any effect on the state of preservation, because if you are monitoring the state of preservation maybe it is too late when you find out if something is happening. So I think to separate when we are monitoring or talking about it is preservation conditions that we are monitoring.

**Jim Williams:** The only other thing that really struck me about the modelling but also the lousy deposits. Although you may have had a thousand years of poor preservation which means that you still got a deposit that is telling you something. I think is particularly relevant to modelling,

whilst we can look at how quickly something maybe ought to be degrading in a normally environmentally condition the problem that we see in development and agricultural intensity is much quicker speed of change over the last 30-40 years that is so much less sensitive to below ground materials and the rates have changed to phenomenally rapid. To lose an archaeological site like Fiskerton in the space 30 years is careless if nothing else.

**Richard Brunning:** I think to follow up at Jim's point, as well as looking at degradation rates of sites; we have to think about looking at degradation rates of whole landscapes. In some ways that is easier to do, but it also important and necessary to make political points, if you want to affect change on a landscape scale rather than just tinkering about with half a dozen sites.

**Mark Pollard:** Just to add a point to that previous point, which I entirely agree with. There is a lot of literature out there in terms of, I have been interested, as Brian Durham mentioned in his presentation the other day, I have been interested in looking at carbon turn over models, which are very common in agricultural science, because they are simply interested in, you know, if you add nutrient to the top soil, how long does that nutrient stay there. If you go into the models of carbon turnover, they will tell you that the half-life is a sort of exponential model. The half-life of carbon in the upper 30 cm of arable soil is 30 years. So you would expect archaeological wood, which is in the upper part of the soil profile, to be half gone in 30 years. I suspect Fiskerton is probably an excellent indication that that is not far off true. So I think there is a lot known on the landscape scale in the agriculture science literature for looking at simply the rate of carbon turnover, because of course to your average microbe this archaeological wood or leather is just food, and there has been quite a lot of studies on that.

**Henning Matthiesen:** I agree. I think it will be possible to get some quite good estimates on the decay rates of at least the organic materials. That is also what we are trying to find out in a lot of our studies, we go for the rates, but then the questions is, the other part of the question and that is "What rate is acceptable?" I wonder if it is possible to have an idea of, do you have the same opinion in different countries? There was an old rule of thumb for piling the "Arup 5%", that in England you could destroy 5% of a site when you piled. We heard another limit, I think it was Anke who said that there was a goal that no more than 0.5% of the archaeological remains should be destroyed by 2020. Are there other sorts of rule of thumb? What rate will we accept?

**Jane Sidell:** I'm raising an objection. It never said 5%, it said you should aim to do less than 5%. It never said 5% were acceptable, we are not selling our sites away like that. In the latest piling guidelines, available for free upstairs, we say that you should aim for less than 2% of a site, and also made the point that a site is overprinted by time. So some sites will have had three or four developments on it and that 2% should always be the whole site, not the development. Sometimes there are a misunderstanding of the term of archaeological site and the development site.

**Jens Rytter:** In Norway we now have opened for piling within the medieval cities for two years ago. We have made a guideline for developers about what the rules are and how much is acceptable. It is up to 1% of a site that is acceptable loss when piling, but we put in a lot of

terms when they are doing the work also to do with the how long that the pile should live, and we say more than 100 years, around that, because we want that they can reuse the pile, because you think a building maybe be standing for about 50 years nowadays, and then we want to have that they can reuse the pile for the next development.

**Michel Vorenhout:** Last year the VU University organized a small conference on these types of guidelines you could put down in local communities, and about 50 local communities were there and they all said that they would have their own guidelines. So every community wants to have their own rate of decay. That is the situation in the Netherlands.

**Hans Huisman:** In fact we have been under pressure to come up with rates of how much loss percentage that we are going to allow and up till now we have refused that. Because we say that the amount of damage you can allow is very dependent on the archaeological site. If you think about a large scale field system, or roman villas which are quite relative large, you can allow in fact much more damage than if you think about the Metholithic hunter-gatherer site, which would be destroyed by one pile. Or if you think what happens if you go through a burial field. At the moment some of my colleagues are trying to develop a guideline that says which properties of the archaeological site should be weighted when deciding what is allowable and what not. We really forcefully want to refrain from naming any number.

**Jim Williams:** I think the point Hans makes is very important, it is about the significance of the archaeology. That comes back to properly assessing the sites. I think certainly from the English experience and from the provinces in particularly rather than perhaps London, piling is not just seen as the most appropriate solution because you want to preserve in situ because it is a Nationally significant archaeological deposit. Piling is seen as the most appropriate solution because it is cheaper, and unfortunately that goes hand in hand with very limited levels of evaluation, the identified presence of archaeology with the smallest possible “a” and no real understanding of what it is, the depth it goes to and the state of preservation. In that circumstance the mitigation of putting piles into that to preserve it, is not very well thought through, and it certainly doesn’t allow us to say what rates are acceptable because we don’t know what we are losing. I think we could be very clear about putting piles into sites that we understand and we could give engineers much more guidance about bits of the site that we are prepared to loose if we probably characterise them. Again it comes back to the point that the characterisation that is important as the first starting point to that discussion.

**Question 2: Monitoring and mitigation case studies – with special focus on long term projects. How, and how long, should sites be monitored?**

**Henning Matthiesen:** I think on that remark we will move on. We have three more questions to go. The next that is by, we need comment from Jane Sidell and Hans Huismann. We have added to your question, if you turn around you had more “Why and what should we monitor?” it has been added, and I will leave the chairing to David.

**Jane Sidell:** I'd actually change it to "what", but that is fine. This is where I kind of need a whiteboard, but I will draw in the air. We talked a lot about this yesterday, and it has come up this morning. For the "what" should we monitor, I will leave the techniques to you, but I think less, it always has to come back to what questions we want to answer. The questions may be purely intellectual archaeological questions; they may be questions of establishing a baseline, monitoring the trend of decay, monitoring information loss. But when we are devising schemes for this, the "what" has to come up here. I think I'm gonna set some homework for the next conference now, because as well as what techniques we use and what questions we ask, I think we need to examine what archaeology it is that we are monitoring. Because over the last three days we have heard a lot about monitoring in the saturated zone, a certain amount about monitoring in the unsaturated zone, we have heard a lot about monitoring in the completely saturated underwater zone, but we have heard almost nothing about monitoring of upstanding fabric, and archaeology is moving very much towards a streamlined, all the way down to the centre of the earth and all the way up to the sky. Certainly I am getting more involved in monitoring upstanding fabric, particularly when we take it out of the ground and put it on show, because we have changed its environment very extensively and from bitter personal experience I can attest that sometimes it isn't happy that monitoring fabric we bring out of the ground and putting it on show, which is what we all try to achieve is something we need to think more about, because my first example of where it went horribly wrong was from a massive algae growth on fabric, and actually understanding how to monitor that and what to do with that would have been very useful before it all went horribly wrong for me. So I think it would be really nice if someone would take on the prospect of doing a paper like Jim has done, but for the whole world. Establishing what it is we monitor around the world and what it is we are not monitoring around the world. It would be very interesting to see the amount of upstanding fabric all the way to things on the seabed, big challenge I'll take it on with someone, if they are happy. So that I think answers the "what".

**Hans Huisman:** As Jane said we have been talking about this extensively yesterday, about the "what". One of the things that I am starting to realise by the end of the conference, is that the conference is called: Preserving Archaeological Remains In Situ. But a lot of this is monitoring archaeological remains in wetlands. I want to make a point that we have heard two organizations, one in Holland and one in Belgium, called Monumenten Wacht who in fact do a tremendous amount of monitoring that is not seen as such. They go out to a lot of archaeological sites, they go there repeatedly and just watch what it looks like, and if necessary they take some measures, removing vegetation or shooting rabbits, I don't know. Of course you can say "Well that is not ground water monitoring, it is not redox and so" but in fact they are doing already, I think a tenfold amount of the monitoring that we look at if we only look at the wetland sites. If we look at the questions again, how and in fact what we should monitor, it is any aspect of an archaeological site that may impact on its future. I think on one end that is also something we have heard a lot several times now, we should try to only take those parameters that tells us something about it, and that gives the most direct relation between archaeology and the measurements. I am very much in favour of low tech approaches, and maybe I have drifted completely from the question I was supposed to answer.



Why should we monitor this effect, the name of our conference is preserving archaeological remains in situ I think. So I will leave it at that.

**Jane Sidell:** The “how”, as efficient as possible with as few holes as possible. We all know that introducing wholes into a site causes problems; I was worried to find out that the type of redox device you might use might mock around with the reading. So yes, as few holes as possible with as efficient as possible. “How long”, this is really interesting and this comes back to “How much data do you need to answer the questions that you have?” Because how long, if you go to a site once a year for 12 years, is that as useful as going to a site once a month for a year? So it is not the duration as it is the amount of data that you are gathering. Now understanding how much data you need to answer your questions is a rather iterative process. You need to gather some data before you understand what those data are and what they are telling you. This feeds back to the point of “keep it simple”, use the techniques you know will answer the questions. I think there are a number of us in this room that have looked at sheets of data, and not quite understood what that means about our site. In terms of how long there are certain practicalities like how much money do you have, but it is more the amount of data you are gathering rather than the amount of time, the duration. Whilst there is a threat, the problem that Malcolm Lily very elegantly made, is that the site may appear to stabilize and so you may decide that there no longer is a threat, so you may think you can stop monitoring. But then what happen with these freak events that might change your site. That is something that can never be predicted and so it may be that you run out of money by then anyway, or you only have finite money and you have a number of sites. So the “how long” is impossible to answer you can’t say “I am going to monitor this site for five years” you might say “I only have five years’ worth of money” and that will answer that question. But until you have actually understood what the data are doing that question we can’t answer. What we can do is make suggestions for guidance which I think will be helpful.

**David Gregory:** Thank you Hans and Jane. I am gonna abuse my position as chairman and ask the first question to the panel. We have talked a lot about monitoring and Jane was just mentioning mitigation, but one other thing that has struck me and strikes me as well as (?) working on sites. If the monitoring or the mitigation doesn’t work, I think the big stumbling block “what do we actually do?” I know it’s another one of these elephants running around, but I think we need to, it has been clear trough several of the presentations people have seen sites are being degraded, how can we actually get the heritage agencies to support us more? Or what do you think we can actually do to improve the situation, if we mitigation isn’t working or monitoring is showing that the site is degrading, have you any ideas on how we can improve that?

**Jane Sidell:** We have quite a useful new thing for scheduled monuments. We have a thing called a “heritage of risk” register, where we have a group of people that assess all the designated assets so these are scheduled monuments, listed buildings, registered battlefields and others. We rank them according to their preservation and to the threat trajectory and then we publish them. We are effectively naming and shaming the owners, it is our last resort if negotiations have failed, and we have only been putting the monuments on it for two years,

and for the Billing Escape Bath House, that has now received a substantial grant, and it has been there for 150 years and hasn't received a grant before. So that is a useful mechanism for when sites do go wrong.

**Ian Panter:** I just want to pick up on a point that Jane made. While it is laudable being able to name and shame people for not looking out for their historical assets, who would you actually name and shame in the case of the Stirling Castle, apart from yourselves, because there is nobody who actually owns that shipwreck, the work of Bob Armstrong as a lost (?) sea has been done with his own money, with very little help from the heritage agencies, thank you.

**Jane Sidell:** That is a very good point, which I can't answer. It is not a perfect tool and for that it can't be done. We would probably have to name and shame ourselves and some of our own properties are on the register, that doesn't actually help getting much money but it does mean that people are putting pressure on ourselves as an agency. But no, the marine ones I think actually to answer David's question, the paper yesterday on the Stirling Castle made it very clear that for a site like that, you get it up, and if you can put it in a water tank till you can raise some money then that is what you have to do. It does put the owners on people like the team that are working on that who obviously have very limited funds.

**David Gregory:** I think the trouble with that is there are literally hundreds of wrecks, more than hundreds of wrecks, not just around the UK, we have got about 20.000 shipwreck sites around Denmark, we have got over 20.000 submerged settlement sites. I think it is a nice idea but it is unrealistic as well, unfortunately. I also like to add I know English heritage are making steps in the right, well not in the right direction, but it is the right direction. What I am trying to say is that it is a good initiative, I'm sorry, it is a good initiative, trying to prioritise what wreck sites or periods of history that needs to be focused on. So I think that is a move in the right direction. The next question, or person is Hans, sorry.

**Hans Huisman:** Up till very recently there was in the Netherlands every year quite a substantial budget for restoration of standing monuments. I think it is now the second year that has about 2% of that budget is now available for archaeology, and that is for management and mitigation. Still, the situation that we are a for example facing in Schokland that there is only one site that we can see go downhill extremely fast. The money is not enough to pay for that, and the money for excavation is not part of such a scheme, and excavation would be extremely expensive. That is the situation. In fact you should hope that somebody wants to build a big building on top of it because then they, according to the Malta convention, they have to pay 2-3 million to excavate it, otherwise it is gone.

**Tim Malim:** I don't really agree with what, I know what Jane is talking about when putting as few holes as possibly into a site, because that introduces all the pathways to decay. But without ground truthing, without actually doing char pitting (?) every so often, you can't check whether your indicators are actually genuine. The fact is that all sites are very complex, or, most sites are very complex and that you have horizontal strata within them which might be acting very different from the ones above and below. You need to have a combination of intermittent archaeology reality checks to the proxy indicators that you are gathering from the

other monitoring methods that you are using. Thinking beyond that out of the context of water logged remains; there have been a number of schemes in the past for monument management as we would record in the past where you were using things like Stewardship grants to agricultural grants to take sites out of plough for example or to build buffer zones around them. For example Anglo-Saxon cemetery which is within plough depth, taking it out of the plough soil to stop obviously physical damage to the skeletal remains and artefacts but also to stop agrichemical getting into those artefacts. You can monitor that, by going in and doing test bits, as I say every five years to see whether those artefacts have deteriorating further. So there are ways in which you can take a different approach and see that a limit number of holes over a long period of a long period of time are very worthwhile, and they can also be tied in with research objectives to answering questions that might arise out of analysis and publications of what was done in the first place.

**Jane Sidell:** I don't have a problem with ground treating at all; I think it is not done often enough. The point I was trying to make about the number of holes was the number of monitoring points. How many do you actually need into a site? But no, we have to actually ground truth, I know Mike is frightened and I am terrified, that when we eventually do dig up the Rose Theatre there won't be anything at all. It would be good to have put a test pin in, maybe every five years. I think that is something that should be built in to future projects. On the Stewardship point, yeah they are fantastic schemes; this is when a sister agency "Natural England" provides lots of money to farmers to stop ploughing their sites and start looking after their heritage. Unfortunately they have had a massive government cut as well, so there is less money available. But where it is available, where anyone can face filling in the forms, because they are horribly complex. They are brilliant schemes; I must admit we are a bit naughty in "English Heritage" in that we actively pursue money from a different agency to save these sites.

**Brian Durham:** I intend to make a non-controversial point for (?) to the four questions. My non-controversial point here is to go back to what Mark said about good stories that potentially attract money. Good stories I have recognised from this PARIS conference, have been Hans de Beer and his monitoring of, particularly, can I say carbon gasses at Bryggen. which is giving him a trajectory into the future. I think that is immensely important, trying to say Hans et al. no doubt in that case. My second point is arisen from the sort of thing that Vibeke has been saying, Michel and Kirsty here. The importance of sealing in deposits, deposits that we know that when a contractor comes along and puts in a surface trench or a pit or something like that. Either you put an impermeable layer over it, or it might be a partly impermeable layer, something of that sort that does seem to be a concept that I haven't come across before and I heard it first here. My third point in this case was definitely directed to monitoring, which is monitoring of surface changes by LIDAR which has come from Richard Brunning. Thank you.

**Irene Velthuis:** I wanted to comment on how sites should be monitored, because I think a lot of the monitoring projects are of the environment on the ground. If that environment is stable, what do you do with it then? I think that is where the work that the archaeological monument

watch in the Netherlands comes in and we look at the damages that is done, physical damages that are done, natural or by humans just walking on sites causing erosion. I think it is important to know that you can see that a site is stable from the parameters you measure but if you then say “It is okay, we will leave it” and no one ever visits it again it is lost anyway if some bulldozer comes along and everything is lost. So I would like to stress that there are also less expensive ways to monitor a site.

**Jim Williams:** One of the things I wanted to talk about today in my presentation was just to draw on the analysis of the 40-or-so projects in terms of the monitoring that was carried out over certainly the last 20 years. The techniques used were very, very dependent upon the person who had been setting up the project and the person had been advising on the project. Throughout the 1990’s Matt Davis was working with English Heritage, with Mike in particular, and the majority of the projects have a wide suite of both moisture analysis, piezometer based water monitoring and other chemical analysis. Matt foolishly went to work for the environment agency, and we then started to work with David Hogan, using much more in situ probe, redox monitoring and maybe less pH monitoring and more monitoring, perhaps the regularly carried out in wetland environment rather than necessarily on archaeological sites. We have also seen other areas of expertise in monitoring, people going out and setting up projects both the University of Hull and also Ian Panter and subsequently with SLR. It was quite telling actually, looking at the way in which different people monitor projects and their advice, wasn’t depended upon the best technique for the site or perhaps even what was the best cost for the site, but who was setting the project up in the first place.

**Vibeke Vandrup Martens:** I would just like to point out that what the “Monument Watch” is doing in the Netherlands and now starting in Belgium, has also been done and is being done repetitively in Norway, it has been running for more than ten years and if you would like to test your skill in reading Scandinavian languages visit the niku.no website, and there are three new reports on that site that just came out last week. That is visiting and revisiting known archaeological sites to see if there has been degradation, that’s a simple visual way of monitoring which is cost-efficient and still very important.

**David Gregory:** I think we are going to have to move on to the next two questions. Thank you very much, Hans and Jane for both being chairman and your comments, and now also to the audience. We have to move on to the third homework that Henning set us “protocols, standards and legislations for monitoring and management”.

**Question 3: Protocols, standards and legislation for monitoring and management. Is it realistic to make multinational standards when the sites and national legislations are so variable?**

**Henning Matthiesen:** Well I think that this is a direct follow up on what we have just discussed that there are different ways of monitoring, but the question is “Is it realistic and is it

something that we want, to make standards, standardisation". I know that Henk, you had some very nice comments yesterday and Jens as well, I don't know who will begin?.

**Henk Kars:** Thank you very much Henning. Jens and I did not prepare this together, which means that Jens' bringing might be different from mine, but we will see. Ok, I would like to make two statements; the first one is that indeed protocol standards or deadlines on local, regional or national levels are indeed badly needed. Why? It is not us here and neither the archaeologists who are deciding if a site is preserved in situ or not, that is on the level of administration and policy makers. They need a solid backup and basis to convince for instance the property developer to choose for in situ preservation and in doing so they are also to give advice in terms of how it shall be done and after the decision how such a site will be maintained. The second statement that relates directly to the question, in my opinion it is, for this moment one step too far to go for multinational or international level of protocols and guidelines. Why? First of all, and of course it is all too easy to conclude that there are so many different types of sites and they are changing from a settlement to a grave field to a full incision iron production site and there are so many different archaeological periods covering Neolithic sites to medieval masonry for instance, and perhaps even more important there are a broad range of different burial environments, ranging from for instance waterlogged situations to often unsaturated zones. Even a whole range of soil types, for instance very acidic sandy soils which are maybe fairly aggressive, while for instance carbonated bed rock might be rather protective. Another thing is that legislation in different countries are different although we are all covered nowadays by the Valetta treaty there still is a big difference between legislations in Scandinavian countries, UK and the countries in north western Europe, than compared, also middle countries, in the Mediterranean. Closely related to this there are different mentalities and certainly there is a clear against seeing between the Scandinavian countries and countries for instance like the Netherlands it is very easily seen that for instance in Denmark, Sweden and Norway it seems to be that the cultural heritage is really in the back bone of the people which it is certainly not for the people in the Netherlands. So that is making a big difference. In conclusion where I am trying to bring statement one and statement two together and indeed I would really propose or suggest that guidelines on a national level should be created, and to start with guidelines and protocols for very specific situations, for instance indeed it can define how wood in a waterlogged should be preserved as an example. This is a starting point, perhaps we might be able also to convince people from other countries to use the same protocols, which then might be the starting point to define for specific situations, protocol for one typical material and one typical situation. The questions also is do we need this multinational legislation and protocols? And of course, perhaps it might be relevant that everyone is working, more or less the same time, using also the same methods and materials to preserve our cultural heritage. But then we also realise that the research in this field is rather still in its infancy and a lot has to be done, and then another argument against these multinational protocols is that, at the same time a protocol is defined you have created a rather static situation, and such a static situation might be useful on the moment you have defined it, but soon you are 3-4-5-6 years further and research is progressing and to change protocols is certainly as difficult as to create them. Thank you.

**Jens Rytter:** I can only totally agree with Henk on what he is saying here. I think that making standards, as you said we have a lot of types of sites, that is one point that we should have in mind, that you can't really make standards for all of them in one standard, you've got to have many standards that's the way we have been working with it in Norway, nine years ago we didn't know anything about what was going on at Bryggen in Bergen, and then we have just been working systematically and now we have guidelines and we have a national standard and I think that starting working getting national standards are the most important thing. Then in this conference we have been talking and seeing that in England now you have been trying to use the Norwegian standard and see how it will work there, which parts will work and then, maybe in five times years we will try to make a European standard on this cultural deposit in urban areas, waterlogged and beyond the saturated zone. In the future we will have a European standard on some site-types, but it is not necessary to have them on all, but I think it is in the future it is developed, but we are at a time now that we are, in all countries, we are trying out this different subject, that we are doing errors in our monitoring and just trying to find out where to go. I think, that when we have done that, we can start talking together, at least in our type of site, it is northern Europe, you haven't got that many sites like medieval deposits in the southern Europe. So of course the standard for medieval towns and that kind of deposits mainly will be used in northern Europe. I think the legislation is different from every country and it will be, and of course one of the main problems in Europe is that, who owns our heritage, who owns the site or the monument, and I think that might be the difficult part when you are deciding what to do and making the standard. In Norway, all belong to the State. That makes it very easy for us we haven't got that many problems with private owners because the State owns it. In other countries, the private owners have really strong rights to their properties.

**Henning Matthiesen:** If I may comment as the first, I don't see any hands yet. I agree that it is time for national standards, and there are already some, I know in the Netherlands and in Norway, I don't know whether there are any in England but I heard Ian is using the Norwegian one. In Denmark we don't have any, but on the other hand, actually in all our projects we approach them more or less in the same manner. David described it briefly; we have these five points and it doesn't really matter whether it is a permafrozen site, whether it is a waterlogged site or unsaturated zone, it's still these overall principles in the monitoring of our projects, it is more or less the same. I just wondered whether - now I agree with Hans that you cannot make a technical standard that covers all types of sites - but is it maybe possible to make a more general standard saying "This is the approach you should use when you, this is a checklist, think of these things when you are starting to look at an in situ preserved site".

**Ian Panter:** Having used the Norwegian standards is a fantastic thing to use, but I would like you to bring back the term lousy if possible. But falling on from that a lot of our work is developer funded and we can use the Norwegian standards and the Dutch monitoring guidelines when we are conducting research, projects funded by English Heritage. But the problem we face when we are dealing with developer funded projects is, they want to know

“Why am I going to have to monitor at an hourly interval water level with transducers. Who says I have to do that?” Because it comes down to cost and you know, we don’t have a document that we can put on the table and say “Oh, this is from English Heritage. This is what they recommend; this is their ‘best practice’ guide”. No offense to the Norwegians, the Norwegian protocol has limited impact upon a British or a UK developer, where as English Heritage guides would help us. So I would sort of stress the need, I think, for National guidance. Just to come back to my last point I wanted to make, following up from what Jim said last session, that guide should also refer to as much prior knowledge about the site as possible. Because we do adopt management strategies depending upon our experience and where we are coming from, looking at Must Farm in some aspects if I knew then what I know now, I would have walked away from the site, but you know realising that the site was within the capillary zone not within the water table as such would have led to a different monitoring strategy. So share as much knowledge as possible.

**Mark Pollard:** I think I share the view that Henk expressed yesterday about standards. I am glad to see that somebody is working on them, but I am glad it is not me! What I would say is that we are thinking we are very Europe centric focused in this discussion, and I would like to say that I think the key is not standards, the key for me are guidelines for good practice, and I think we should be developing those. I think we might find, we are going to find within the next few years, for instance, the whole opening up for exploitation for the circum-Arctic, and it is going to be a huge impact on the environment and some archaeology up there. I think we often tend to demonise the mining industry and the extractive industries, but many of the big international companies do actually have very good environmental guidelines and they are working towards good archaeological guidelines. Certainly projects funded by the World Bank for instance do have to adhere to these standards of practice. I think the message for me would be not to worry about national legislations but to try and focus on issues of “what is good practice?” If we interested in preservation in situ of archaeological sites, how do you monitor them? What do you monitor? The key for me, as I think I said the other days, is a sort of a risk assessment, which I think is the sort of thing that everyone around the table has been saying. I think we might find if we could do that, and get that to be adopted within one or two countries as good practice then international companies would reach out for those when they are looking for good practice guidelines, because they don’t want to reinvent all of this stuff. So I think there is a potential to be really influential in areas of the world outside Europe, by simply developing good practice guidelines which may be drawn from an existing documentation in Norway, but you know, put it together into good practice. The one thing I would like to say, which is probably going to annoy virtually everybody in the room, is that we are of course taking a very euro-centric view of what the cultural heritage is. I think we possibly in the future, need to begin to think about other views of what cultural heritage is. Particularly when we, if we think of first-nations in North America or Australia. They may have different priorities for their cultural heritage, and that might require a different perspective on what preservation of the cultural heritage is. So I think there is a quite big challenge for many of the northern developed countries, not to assume that we know internationally what is cultural heritage for everybody in the world.

**Jim Williams:** I just wanted to address to Ian that his point have been duly noted, anything we write at English Heritage certainly may contain the word “lousy”. If only for the pleasure of listening to everyone else pronounce it “lousi” or “lausy”. I wanted to pick up on Mark’s point about guidelines and just mention some recent work that English heritage has been involved with, funding or helping to get off from the ground. In the maritime zone, development and legislation of the English coast is certainly less well controlled than development on shore. It is rather scary that someone asking me for my opinion on the development of the Lincolnshire coastline every time anyone wants to do something. I don’t know who gave me that sudden power. Fortunately we have been working with the industry with the mining industry and the offshore windmill farm industry to develop protocols for guidelines for borehole assessments and for geotechnical assessments and geophysics assessments. Which are best practices? Which give those operators opportunities to see what is the best way to work? And I think this has been good to work in that way and I think that is the way to sort of spread those messages in the future is by kind of offering people the chance to know and be involved in the development in their own guidelines as an industry.

[some comments may be missing due to change of CD]

**Henning Matthiesen:** Thank you for that. For our summary I think I have taken down that this is not the time to make a CEN standard, so the presentation from Jesper Stub Johnsen has had its effect. All the talk about mirror committees everybody goes “aarrgh!” So I leave the word to David for the last question.

#### **Question 4: Preserving Archaeological Remains in situ. Can we document the effectiveness of in situ preservation after nearly 2 decades of research?**

**David Gregory:** Yes, the last question preserving archaeological remains in situ, can we document the effectiveness of in situ preservation after nearly two decades of research? We have found out from Jane’s presentation that it has been lot longer than that maybe, in some places. I would like to ask Mike Corfield and Vicky to give us their views please.

**Mike Corfield:** An interesting question. Someone once said that it is better to travel than to arrive, and I am being asked to arrive. I think there is a lot of information that we have from normal archaeological work to be able to see where materials survive best, and where we can be fairly confident that if we don’t alter the preservation parameters of that site, that anything that happens there will survive equally well. It is only those situations where we have concern that there are going to be changes so that it becomes less predictable. English Heritage a number of years ago, ran four major projects looking at management of archaeology in four of the major “wetlands” areas, I use wetlands very much in parenthesis because a lot of them are very dry wetlands. The sites were investigated there in the Summerset Levels and in the Fenlands, in the Humber wetlands and in the wetlands north of Liverpool. Only one of those projects actually looked in any detail at the quality of preservation of the materials they were



finding on the sites that they were investigating, to try to understand how wetlands work. I found that quite extraordinary because all this work which showed what preservation there was there, what sites survived there, only this one really tried to put any quantitative assessment on the quality of preservation. It did, in some areas, and we have heard so much from Richard Brunning, about the good work that has transpired from that program that made it a great success, others, I think, were perhaps less successful, more like another archaeological exploration. It is important, I think, when we are looking at sites to record the condition of what there is there, record the condition of timber, the condition of metal work, so that we got a baseline that we can see, when we come and dig again, what the quality is. I had one site that I was asked to help with in London where a site over an Anglo-Saxon cemetery was to be excavated. It previously had been excavated a hundred years earlier and the archaeologists were concerned the development would be damaging to this site. We at English Heritage had to argue that “no, there is no evidence that it would be damaging”. The key area of the site that people were concerned about was going to be protected and there was no need to impose greater conditions on it, than the excavation of those areas that are going to be damaged by the site. The only way that we could show that that site was likely to be non-damaging was to go to the British Museum; look at the materials that had been excavated from that site, compare it with the condition of the material that had been excavated from that site and show that there was really very little difference in the preservation of those two different materials. So it was possible to use that, to show that it is likely that the mitigation that we put into this site was going to be effective. The truth will come of course in another hundred years when the site is developed again. This is our problem that most of the projects that we are involved with, involving very long time scales and the people who are initiating the projects are unlikely to be around when the time comes to carry out that assessment. There are shorter term-things, but there are some big things as well. Landscapes are likely to change dramatically if the predictions of the climate change researchers come to fruition and it is likely that there will be serious effects on wetlands, but also on dry lands and semi dry lands, and so how we can get the results that will show us the impact on something that we are not actually sure about the intensity of, and how we can show the likely effectiveness is very difficult to know. I think that is a challenge for you guys, thank goodness it is not me. What’s it told us after 20 years of research, 25 if we go back to Macy Taylor’s work at Etton, I think it shows us that there are problems in some areas; in other areas we can be fairly confident that things are going to be satisfactory. I will tell you about mine at the next PARIS conference and perhaps some other people can look at their sites that they have reburied and monitored and come back and tell us as well. That can be a major part of next conference perhaps.

**Vicky Richards:** I am not going to spend a lot of time, because I agree with what Mike said, so I will be brief, except I am going to, as Mark said, I am going to say a bit from the Australian point of view and the problems that we have, because they are very unique, and I think Dilys will also have the same sort of problems, as we are so isolated. So I am just going to say a few of those things because that might be the case for some of the people here, it might not be. I think we can document the effectiveness of in situ preservation, and obviously in Europe it has

been very well done, especially for sites that have got a lot of organic remains. I think there is still room for research into the effects of in situ preservation on material types that are common on underwater cultural heritage sites, but we don't necessarily do a bit a lot research, which is, you know, different metals, ceramics, glass, that sort of materials. I think we could do a bit more, on those sorts of material types. Another point is how long can we re-bury a site, or that sort of thing, until you lose the archaeological information, not the whole artefact. That is some of the problems with the modelling I think, if we are looking at how much do we lose of the surface before we lose all the archaeological information, doesn't mean you have to lose 100%, you may only have to lose the first two millimetres and all the archaeological information is gone. The other thing is with the state of preservation like Mike was saying, you know, measuring the extent of degradation and then you mitigate the site and then you can go back, take samples and measure if it is more degraded or less degraded. The problems we have especially on sites that are in the marine environment, is you usually have to trench a huge area to be able to get into a small, to get your samples. That means you change the environment every time you go and take your sample. So that when you backfill it again you can get increased degradation, that is one of the problems of getting rates of deterioration I think is when we actually change the environment ourselves in the act of sampling to get the answers that we are trying to see if the mitigation strategy is actually a good one. One of the main problems in Australia is that the people that do the monitoring in Australia are usually the delegates for the Commonwealth, and the maritime archaeologists. The issue that we have is that the maritime archaeologists do not have the expertise to be able to judge whether an in situ preservation technique has actually been successful or not. We have one museum in western-Australia that has two people that can do this, there are no other conservators or, that are actually qualified in any other states, we have seven of them, that are qualified to do that sort of analysis. So I think that the sort of guidelines that we are looking for down in Australia, have to be some more basic things that the maritime archaeologists can do, and then if they see "Oh, that's actually not very good" then they have to bring other people in. That is the reality in Australia, I don't know about New Zealand, but that is the sort of problem we have. The other thing is distances, the west Australian coast is massive 3.000 kilometres long, and we have over 50.000 wrecks. We can't monitor them, we can't get to them, half the time you have to take your own water in, your fresh water, and we get bogged, it is just amazing. So to actually monitor a lot of these sites, these sorts of sites that are out in the middle of nowhere is really very, very difficult. So for us to actually prioritise in situ preservation for certain sites is actually really difficult in Australia. I will just go back to who does the monitoring of in situ preservation; it is usually the maritime, after the excavation, it is the archaeologists that do the in situ preservation and that is sand bags or this or whatever, and we are not consulted. However, the problem is then losing data, just an example the John Matthews winch, I thought that there had been a huge amount of sediment movement on that site, we did some sediment monitoring and it didn't look like it was moving that much. It is because that when I asked the maritime archaeologists, he said that they had covered it up to the top of the winch, which is about a meter and a half. When I went through the archives, I found they had not done that, they hadn't reburied it that deep, so things change over time, so

that is also an issue. But you are doing really well over here; we've just got some really big problems in Australia that's all.

**Tajana Plese:** I just have some, maybe I add more questions to this number four, because I think about the effectiveness of in situ preservation. First of all we have to be clear of what we mean by effectiveness, so first of all we have to be clear of our goals. Do we mean in situ preservation to only preserve materials or we have some other goals, for instance we have some in situ preservation combined with visitation, so they are not reburied sites. We can have different kind of goals, we can have research goals, we can have a site preserved for the future for more investigations or we can have in situ preservation for visitation . So if we want to be clear about this question, we have to be clear about our aim and our methods. So I just want to say that we have to think about all these points when we think about the effectiveness of in situ preservation.

**Tim Malim:** Following up on checking on the effectiveness of preservation in situ and on one of the comments that Jim was making about the fact that all the monitoring regimes has been designed one or two people and the experience they've got. The experience that Ian and I have from both Must Farm, especially from Must Farm, and also Nantwich is the fact that while having a panel to have six monthly reviews and to discuss issues you have peer review and you have queries about what you have used and what the results are actually telling you, and then you have to go back as an iterative exercise, and address these queries and come up with remedies if people were suggesting that the monitoring in fact is not showing that the conditions are conducive to further preservation. So that is one way of measuring whether the preservation in situ is effective, is having suitable guidance panels or challenging review panels if you like of experienced people to discuss the issue, discuss the results and the techniques that is being used, and do come up with fresh ones as the process develops as a kind of dynamic animal.

**Jim Williams:** I totally agree with Tim that quality assurance of data by team of people, is very important. Jane mentioned earlier on, that not necessarily understanding all the data and I would certainly say that there are a lot of things that in terms of monitoring projects that I have been involved in that has taken me a long time to actually get my head around what all the elements are, it is a long learning process, and to some extent people who are managers and heritage managers should stop messing around with complicated sites that they don't understand, and then you might have a few more successful projects, and I think that is what having a multi disciplinary team is really helpful because it allows people like me to talk about the "why"s and "how long"s and the sort of important heritage management elements, and then fall back on the advice on someone who knows what they are talking about to look at the preservation. I want to make one point about people who have set up monitoring projects. At the same time that the Rose Theatre was set up, another project was set up in London where theatre remains were covered by Terram, sand, leaky pipes, plastic and concrete which sounds very familiar doesn't it? And this was the Globe Theatre and the Globe Theatre monitoring project was only ever a short term project to last one or two years, to look at the potential for using a reburial of sand, Terram and concrete for the long term preservation of the site. In fact,

that was the site where the following up for the monitoring, the reburial technique was accepted and all the monitoring equipment was removed and an additional bit of concrete was then put on the site and it was then reburied. So either gives concerns when Mike digs up the Rose and discovers that that is all gone, then perhaps it hasn't worked for the Globe or perhaps gives at least some opportunities to consider that we have already had one site which we have looked at and thought about how well the system set up at Rose had already been implemented.

**Richard Brunning:** I think from the UK perspective, I think we have got enough evidence to know that there is massive destruction happening all the time, and we have got enough evidence to know that that destruction is probably going to increase in the future, not decrease. It seems quite odd to talk about preservation in situ at a tiny handful of sites when all this massive destruction is going on, and I think we don't like talking about it because we haven't got a solution to it. That's all.

**Hanna Steyne:** I just want to build on Vicki's comment about maritime archaeologists in Australia and the way that in situ conservation works, and also the comment about what the aim of your in situ conservation is, and Victoria is a good example of where we are an exceptionally long way from the people who know how to do scientific approaches to in situ conservation and monitoring works. However, maritime archaeologists are quite good at measuring stuff with tape measures; we can put posts to the ground, we can measure things like seabed changes and changes in sand cover, we can also see things like whether the sites are eroding or whether we are losing objects from a site. One of the sites we did have in Victoria where we instituted in situ conservation, the aim of it was partly to preserve the site but also partly to act as an educational tool, so that divers could see the value of historic shipwrecks. To that end, basically the top of the site was left completely open which meant that there was a continued loss of objects from the shipwreck site. I think that is something to bear in mind, you know, comes back to all these questions, yes we can quantify the degradation rates, we are gonna lose some over time. Is that acceptable? Kind of, because we have got a lot of shipwrecks and the value is placed more on the education of the public, and sort of to prevent things like looting and various other sorts of activities and to support the protection more widely of the historic environment, at the expense of one particularly historic shipwreck. I think all of the questions that we are talking about vary hugely on the site and the reasons you are trying to preserve that particularly site, and I think you can kind of bring the Sterling Castle back into this, because it is a real, sort of, underlines all the difficulties with these problems particularly from a management point of view where the alternatives of doing anything at all was so astronomically in expense and so complicated in terms of logistics that if you like doing nothing was the best approach in terms of heritage management there wasn't really an alternative. The Mary Rose sort of illustrated that recovering ship in their entire content is actually quite difficult and rather expensive, and you are not going to get any State funding for that sort of thing. The Sterling Castle is interesting, it is a fascinating story, but it is not the most significant shipwreck that we have in England, and probably shouldn't therefore be the drain for all of the finances that we have from maritime archaeology in the UK. Basically the approach has been one of monitoring degradation and although it doesn't sit well with

people who are much attached to the site, particularly the Sea Dove, Bob Peacock, and people like myself, I do love the site, I have been on it, I have worked on it, but at the end of the day, there actually really isn't an alternative. The two choices you have is monitoring the degradation, watch it erodes, record it, say goodbye, the alternative is recover the entire shipwreck and that really isn't an option.

**Mike Corfield:** I just wanted to say that the last twenty years have been a journey of exploration of getting a better understanding of how the ground environment works, and certainly a number of the projects that Jim had on his list that I initiated were done purely to try to understand what we might expect in open country. Didn't always choose the right sites to do that as it transpired but it was better to see what happened in a natural environment than in the middle of London. What has become quite clear to me, as we have gone through these PARIS conferences, particularly this one, is to see how much smarter we have become and we are becoming smarter all the time and the way that projects are being designed to answer particularly questions is again becoming clearer so that we can look at an entire town centre and say "good preservation here, not so good there and watch out what you are doing there" and I think this is perhaps what we have to think about for the future is to try to do that area mapping of the sort that Richard has been doing at the Sommerset Level and Tim and Ian have been doing in Nantwich and then, when it comes to the time when we have to do a detailed bit of monitoring to try to show that something is feasible or something isn't causing damage, then we have got something that acts as a baseline for us.

**Henning Matthiesen:** The last comment is that we have become smarter, that is a nice stop.