THE RATIONALE BEHIND OPERATIONAL CONSERVATION THEORY

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George Brock-Nannestad

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THE RATIONALE BEHIND OPERATIONAL CONSERVATION THEORY

George Brock-Nannestad
Patent Tactics, Denmark

Abstract
The recent field of audiovisual restoration and preservation had no expressed ethics of preservation. A search for existing approaches in conservation of art, paper, monuments, and in the Memory of the World programme showed very little useful consistency in relation to conservation theory. Instead of trying to make a separate new ethic, it was more useful to consider a framework which would function in any preservation environment. In order for such a framework to be useful, rather than merely philosophical, it must be able to assist decision makers in prescribing coherent actions.

Operational Conservation Theory does precisely this: it is based very firmly on the structure of information present in any object (even a landscape!), in the form of visible and latent information. The information is both of a scientific (technical) nature and of a perception nature. Another constiutent of Operational Conservation Theory is the life-cycle of an object in which there is a gradual transformation from utility into "mere" information value.

Introduction
Conservation Theory has to be defined as a body of systematic thought which provides guidance to restorers/conservators, to curators, to museum staff, to responsible administrators and funding bodies - even to the general public,

concerning how to deal with cultural heritage as it is expressed in physical form and shape. Conservation as such is a fairly recent discipline, although it has not been without theories in the period where each type of preservable object had its own methodology. The methodology and a concept of restoration ethics as well as of authenticity was particular to each type: landscapes, buildings, sculpture, painting, prints, books, natural history objects, musical instruments, artefacts from technology, photographic materials, moving images. When the present writer was starting work on the establishement from scratch of a restoration ethic for audio-visual materials [1] it was discovered with great chagrin that the desire to use "the normal restoration ethic" as a framework could not be fulfilled. There was no such thing as a unified approach to these matters across the various preservable objects. Hence an investigation was started into the practices of the various fields, not so much in order to find one existing set of thoughts that could be emulated but rather to find common denominators across the whole range of fields. After all, collection, analysis, and preservation for later perusal has been a human activity for a very long time, irrespective of the classification of the objects. Whereas it was not difficult to see that each field had good and correct state-of-the-art prescriptions for treatment, they had widely different starting points and approaches.[2]

A Conservation Theory must provide a framework for systematic thought and analysis as well as for logical and well-founded action regarding the physical entity that it is desired to keep available to present and future utilisers. Problems such as authenticity before and after treatment and the source value of the physical entity must be handled in such a way that persons responsible for decisions and for carrying them out may feel a security in having handled matters in a conscientous and responsible manner. There must be no doubt as to the consequences of an action (or its omission).

This is not the place to perform a detailled discussion of the contributions of the important theoreticians who have provided a body of thought on conservation ethics (and various similar terms which cover such considerations), such as Ruskin, Riegl, Brandi, Jokilehto, however similarities or differences will be pointed out where relevant in the text which follows.

Some examples of relevant problems in preservation and restoration

Problems are always connected with a sense of doubt in the person being responsible for an action, because in restoration and conservation we are are dealing with very long temporal perspectives. A small error now may expand to huge problems in fifty or a hundred years (or triggered earlier if the restored object was made susceptible to breakdown). Will the approaches in use today respond to future requirements?

Taking as one example problems of book conservation, let us look at the views expressed by a responsible curator[3]. The approach is conservative in the best sense of the word, recommending the use of well-tested techniques and to suspend use of the book in case its condition requires treatment which has not yet been devel-

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1. G. Brock-Nannestad, "A Comment on 'Ethics of Restoration', FIAF-FIAT Joint Technical Symposium, Berlin 22 May 1987", *Phonographic Bulletin* no. 54 (1989): 38-40.

2. This activity was aided in no small way by the present writer's attachment 1992-98 to the Danish School of Conservation in Copenhagen, and with the access to a dedicated library.

3. K. Dachs, "Conservation: The Curator's Point of View", *Restaurator* 6 (1984): 118-126.

oped. "*It is the task of conservation to prepare a book in such a way that it once again bears examination. Restoring the book to a usable condition should not however be the primary objective. The degree of robustness that can be attained depends on the demands of historical and aesthetic conservation. Less ruggedness should be balanced out by more preventive conservation in the future.*" (p.120). However, as many traces as possible of prior use of the book must also be retained: "*Spots of wax in sumptuous liturgical manuscripts of the Middle Ages are evidence of their use in worship. They must on no accounts be removed. To cite another example, the same principle applies to the heavy fingerprints found in well-thumbed vernacular epics of the Middle Ages, printed popular works and similar texts. Such marks do, of course, detract from the overall impression, but they point to the popularity of the literary genre.*" (p. 122). Later, we are told that "*... each old book is a carrier of information both in its text and in its material form*", and that "*The historical patina which every old book takes on should therefore not be completely removed along with the defects*" (p. 123). Indeed, "*Old papers were never snow-white and a slight yellowing suits them well as a sign of age*" (p. 124). On the one hand "*Materials contemporary with the book are naturally more suitable than new materials, and conservators are thus well advised to build up as rich a fund as possible of old papers and uninscribed pieces of parchment*", but on the other "*Retouching and reconstruction are forbidden in principle for book conservation in libraries, for the danger of forgery is too great*" (p. 124ff). Although the quotes are from a paper, which describes a wide range of possibilities, it appears that there is for each one item really only one "good and correct" approach. The present writer has no doubt that Dachs himself would be perceptive to any deviation from his expressed ideals, but to many the above would appear like contradictory requirements. It is the purpose of Operational Conservation Theory to enable the analysis of the possibilities for action available within the framework of the intended use of the artefact, *in casu* a book, by applying criteria which are not dependent on the fact that we are dealing with a book. And in this way any contradiction will be resolved or at least be brought out in such a detail that a precise and well-argued decision may be made.

Another example is typical of the approach in a young field such as audiovisual preservation. It concerns the future storage of recorded phonograph cylinders which have been been stored in the containers they were found in until a project of re-housing is to be undertaken. In a discussion the following comes up "..... *is it really necessary to keep the original boxes if they don't have information specific to the cylinder? How do we even know it is in the correct box?*" This set of questions points to several interesting facts. On the one hand, the cylinder itself is the carrier of content, just like the book is a carrier of text, and one might expect the same respect for the total item that was displayed above. However, the cylinder is only part of the system which also has an absolute requirement for suitable equipment for its replay. The cylinder may suffer from biological attacks on the surface (the material/air interface is where the information is encoded), and it may not be desirable to perform an invasive test on the cylinder to determine the biological agent. Here the inside of the original box may be relevant, because in very many cases a velvet surface on the inside of a cardboard tube was in intimate contact with

the recorded surface, and we may expect to find the same biological agents in the pile of the velvet in the box material. If boxes are kept and a precise record is maintained as to which box had held a particular cylinder, then any number of questions as to logistics, storage, perhaps provenance may be asked later. If these boxes are discarded or jumbled, then this body of information disappears. We see that discarding material means discarding information which in turn may be interpreted as a present-day decision to prevent future researchers from obtaining information. And from a museum or exhibition viewpoint, it will not be possible to exhibit a complete item as it was originally sold, namely as a box containing a recorded cylinder.

Definitions

The basis for Operational Conservation Theory (a term coined by the present writer) is that all objects or artefacts which surround us contain *information* of various kinds[4]. Obviously these artefacts were not all made just to provide information, but many - perhaps most - were made to have a *function* or useful purpose. When their function has worn out they may be repaired, thereby regaining their function, but this changes the *information*. Or they may be retained in their worn out condition - this retains some *information*, and the *function* is now a different one, namely that of museum artefact or collector's item. One of the important functions is that of a symbol - the artefact symbolises something which at some stage is or has been important to humans.

Some artefacts have the retaining of *information* as their function. This is the large group that the present writer has proposed to term representative artefacts or agents (figurative or nonfigurative images such as in drawings and paintings, photography, and their printed representation as well as sound recordings, films, video), in which there is intended or primary *information* and ancillary or secondary *information*. The secondary *information* may be very important indeed for evaluating the context of the artefact.

It appears that irrespective of the function, the key term of the present discussion is *information*, and we must get a grasp of this concept.

Information is all that the individual may extract from the artefact, using any means available to him. This means that the extraction may indeed be apparatus-assisted. It should be noted that some extraction may turn out to be destructive. One could say that it is the individual who defines what is *information* to him (and hence the *relevance* of a particular artefact, but the individual may form part of a group which agrees on this).

In order to structure *information* we apply classification, i.e. we decide that some *aspects* of particular types of information belong to one and the same *category*, while other aspects of the same information may belong to other categories. The categories are said to be broader than the aspects, because mentioning the categories means that all aspects are meant. It is extremely rare that aspects belong to one category only - it is usually a question of not having had the need for more categories or the technical

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4. G. Brock-Nannestad, *Applying the Concept of Operational Conservation Theory to Problems of Audio Restoration and Archiving Practice*, AES Preprint No. 4612, 103nd Convention 1997 September 26-29, New York.

means to determine aspects within them. These category fields constitute a number of frames of reference - of context - of the *information*.

We may use the word *property* instead of *category* and similarly use the word *variable* instead of *aspect*. A variable may have a measurable value. In analysis the specific content or value may be useful or even necessary, but this presupposes that the category has been made available or accessible as such. This is all part of hierarchical classification.

It should be noted that to the degree that the *information* is embodied in some physical form, that physical form exists even if there is no human observer or classifier present. This fact is demonstrated in that an archaeologist may classify objects found in order to put them into a context of his liking - and only in the ideal case will this context be identical to contexts in use when the objects were created.

Whether we like it or not, even subjective experiences, such as the perception of art forms, rely on stimuli which may themselves be ascertained objectively. We shall ignore completely those subjective experiences which are stimulus-free generation of images of the mind (you could think of chemical stimuli, though). In the present discussion, items that have the potential of being used as an input for objective and subjective human perception will be called *artefacts*, even though they may be naturally occuring items. This means that a rock on a beach, a female of the species, or a cloud in the sky are all treated as an artefact when they act as an input to a human receiver, an individual. This also means that the artefact need not be present in a collection or an archive, it may occur in its "natural" surroundings. There is no need to evade this issue; there is in principle as much potential for input for human perception in sitting under the very oak of a famous poet as there is in reading a manuscript from that poet's hand. It is hence reasonable to use the term *information* for both intellectual and sensorial/aesthetic stimuli.

In the case of purely subjective experience it is a matter of definition whether an artefact will be considered an input by one or several individuals. The decision to categorize an artefact as the provider of an input may be made at any time, but it is obvious that any exchange of opinion relating to the input and its importance to one or several individuals is absolutely dependent on this decision being communicated.

In the case of objective experiences, only the abnormal lack of certain senses or of certain interpretative functions for the stimuli (colour blindness, tone deafness) will disable the stimulus of an artefact. However, the term "abnormal" does indicate that the norm would be that the objective experience occurs whenever the individual is subjected to the stimulus. It should be clear by now that the positivistic model used by the present writer is reminiscent of that of Skinner who introduced the stimulus-response (SR) model into psychology.

Ethics of preservation or restoration has been a very vague concept in all areas, the essence of which has been that the object (or in the case of *representative artefacts*, such as sound recordings: the intended content) shall be preserved in its entirety. This vagueness has given rise to expressions such as "preserving the whole" or "any restorative activity must be reversible". However, if we look at

the whole field from a stimulus-response point-of-view, we discover that what we need is a utilitarian ethic: positivive decisions of what we want to do with our object.

We have had to go into the very basics of the input to the individual because the present discussion considers the input to be *information* in a very general sense. In fact, one may suspect that one type of preservation is that of preserving information from and *about* the artefact, and indeed this is so. This is precisely what happens when we microfilm documents and discard the originals. The intended content is preserved, and information about the provenance is added to it.

An example of information structure

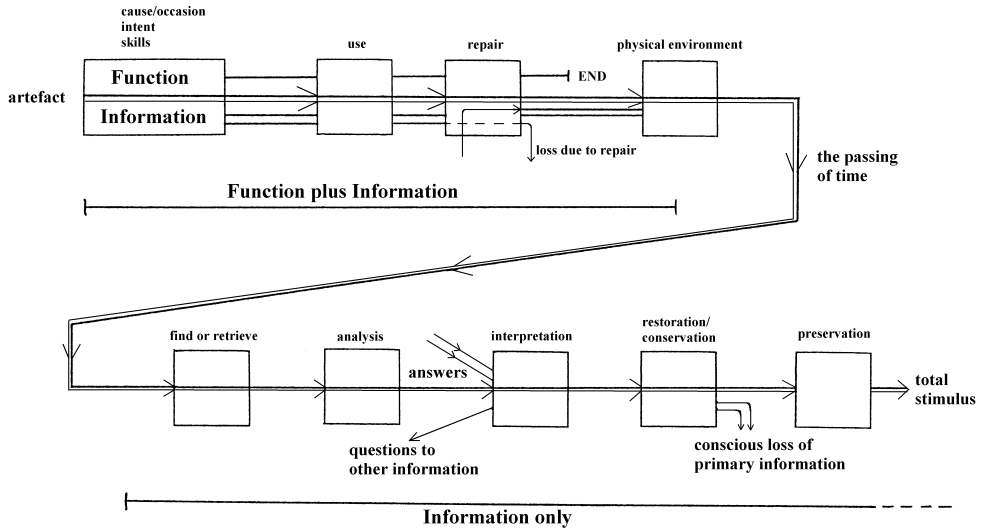
To acquaint us with the principle of information, let us look at two examples relating to *information* of an ephemeral nature which can definitely both be described and preserved,

a): a pile of index cards found in a particular but not very "logical" order (however, this was the order in the drawer it was originally in)

b): a book with many loose paper strips as bookmarks.

In case a), what happens if the pile is structured, such as by sorting or indexing? Well, to the extent that the cards refer to a collection of e.g. books which are all present, these books may now be retrieved according to the viewpoint of the present indexer. Any information as to preferences, which might have been the former system, will be lost. However, the original order might have been preserved and the access to the books could have been obtained in a different way, without the original index cards, or a list of the original order of the cards could have been prepared. This means that information need not be lost, and that a full analysis of the frame of reference of the original creator of the card file may be made at any time.

In case b), what happens if the paper strips are simply removed? Good archiving practice would require the strips to be kept in a separate cover with a reference number, but the information given by ordering will be completely destroyed. Again, both preserving the item as found and noting the spreads indicated by the strips will preserve the information. *Preservation* of the complete item will mean one of several actions: maintaining the book closed (but in this way the page numbers cannot be seen), providing some means of releasably attaching the strips to the pages (but then readable matter must not be covered) or documenting the book and strips and marking the strips with page numbers. By the same token, *restoration* would mean putting the strips back in their respective places and seeing to it that the slightly miscoloured parts of the strips are placed precisely at the edges of the pages.



Artefacts' function and development (loss/gain) of information. Information in this context means both "intellectual stimulus" *and* "aesthetic stimulus"

The development of information in an artefact - from origin to preserved item

The term life-cycle is nowadays mainly used in relation to the ecological load on our environment due to manufacture and use of products. Von der Lippe[5] used the term "object cycle" for the cycle of transfer of an artefact from raw material via function and back to raw material upon total deterioration. She was not concerned with the information content in artefacts, although many of her conclusions could have been reached via this concept. The object cycle concept is true in philosophical terms but it is not *per se* operational.

Ashton & Hallam[6], expanding on a proposal by James Burnam, look at a part of the life cycle, namely that part during which repair (of *function*) is economically advantageous. Without expressing it as such they draw upon the information inherent in the design of the original artefact (a complex hydraulic object containing many apparently disparate materials) to propose an economically valid preservation strategy.

Such approaches may be systematised by understanding the creation of *information* related to the object. In Fig. 1 we see an artefact which has been created in response to an intent, using skills of manufacture. It basically contains both *function* and *information*. Through *use* it loses its function to such a degree that it is subjected to *repair* - and in items of daily usage this is almost universally as to *function*. Some information is lost irretrievably, and some is added, due to the repair process. Perhaps it is decided that repair is not to take place ("... *any more*", in case of repeated breakdowns). This means that from this time on, the artefact only represents *information*. The function may be tried out experimentally, but the reason for this is mainly to obtain *information* about the functioning of the artefact. The *physical environment* holds the artefact until it is *found* (or

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5. I. M. von der Lippe, *Profession or Occupational Culture?*, (Diss. Univ. of Uppsala 1985): 43-62.

6. J. Ashton and D. Hallam, "The Conservation of Functional Objects - An Ethical Dilemma", *AICCM Bulletin* 16, no. 3 (1990): 19-26.

retrieved from storage in a museum or archive). *Analysis* provides questions to the *information*, and tentative Interpretations may require further questions. The artefact may be *restored* on the basis of the final *interpretation*, but in so doing, only those *aspects* which it is decided to restore will be assured continued availability. There is a conscious deselection or loss of primary *information*. Preservation should be adapted to cater for the same *aspects*, and finally the preserved artefact will have an information content which constitutes its total *conscious* capacity for *stimulus*. It is quite clear that the consciousness is that demonstrated at the time that these decisions are made.

In conclusion we may note that according to traditional conservation theory the artefact is preserved because it is thought to be the largest collection of information possible for all times. In fact any removal from the original site and any restoration activity removes information as it preserves other. Only the information that we are conscious of can really be preserved.

With this ballast, perhaps we can address a problem discussed by Brunel[7], namely reconstitution of a work of art when only a fragment has survived, using a minimum of intervention, and in the background only. "*On ne fait pas de difficulté à admettre que les dessins ne se retouchent pa, et pas davantage les photographies. Dire pourquoi n'est pourtant pas aisé. Il faut probablement faire entrer en ligne de compte le rapport que l'oeuvre entretient avec ce qui l'environne.*" [8]. According to the present writer, contemplating the information content may provide a simpler explanation: due to the fact that the materials that would be used for such intervention would actually be quite similar, probably identical, to those originally used, the *information* that future users could extract would become a garbled mixture of the original information and the filling-in. In e.g. buildings this problem is much less, because modern, suitably coloured and inoffensive materials may be used that will be *distinguishable* from the original materials.

The catch-phrase *reversibility* is also highlighted by the use of the above approach. It becomes very clear that it is an impossible concept to use in practice, even as a step in a sequence. It is only valid if the eyes of the responsible person are closed to anything but *function*.

Authenticity

The concept of *authenticity* has a long standing in conservation theory, because it is only felt justified to use huge efforts on something which is *authentic*. Confusion has arisen because the term has a dual meaning: one refers to the capability of an artefact to represent something in public (authentication markings), such as a coin or a legal document. The other is the one which is relevant in the present context, the authentic document having inherent qualities, such as source value, which distinguish it from e.g. copies.

Using the concept of *information*, it is very simple to define authenticity in an artefact as the degree to which it preserves and delivers intended information at the time it is sought. When we say *intended information* we shall mean a selection

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7. G. Brunel, "Restitution: les dangers d'une notion obscure", (Paris, ARSAG, 1994): 189-193.

8. Ibid., 192, in the present writer's translation: "*it is not difficult to admit that you do not retouch drawings, nor photographs. It is, however, not easy to say why. It is probably necessary to take into account the relationship that the work has with that which surrounds it*".

9. there is a reasonable amount of important literature available, some of it being cited in [10] and [11].

of the total information, a selection according to agreed criteria. The moment an artefact loses this information, it is only *information about* the artefact which can tell that it was once the carrier of relevant information. This means that authenticity can no longer be determined from the artefact alone. This *information about* will typically have been an oral tradition concerning the artefact, but in our times and culture it would rather be written information. There is at all times a continuous loss of information. The only value left in the artefact is *symbolic* value, it becomes part of a tradition.

One apochryphal story concerns the hammer used by the craftsman who built the original Noah's Ark (another version is about the Ark itself and the replacement of timber structures). By good chance this hammer has survived, however the craftsman in his own lifetime had to replace the handle twice. His successors also had to replace the handle, and after a period in the hands of a geologist, the head had to be replaced. However, the repaired hammer returned to a carpenter's workshop where it was revered for its unique lineage and was only used for the finishing touches of carpentry, to give the mark of a distinguished craftsman. The question that has been put is, "what is the authenticity of this hammer, and will it suffer if the handle or the head is replaced?"

The authenticity will have shifted over the lifetime of the hammer. As long as the original owner used it it would be his hammer, and as long as he was still using it in the same way and for the same purpose after the replacements of the handle it was still a part of the impression that he as a craftsman made on the world. This *impression* may be taken quite literally: from forensic science we know that every tool makes a distinctive individual mark, perhaps only distinguishable via a microscope (*information*). It is the head that makes the mark, and we must conclude that the carpenters using the hammer with the attached tradition could not by means of a replaced head emulate the physical impression that the original owner's hammer head could have made (the mentioned *information* has been destroyed forever by the actions of the geologist and the replacement). Hence the wielding of the hammer by the carpenters for finishing touches had taken on a purely *symbolic* value. A new tradition had apparently been created, serving a *function*, and the focus of the authenticity had hence shifted. The extant artefact had no documentary value as to the building of the original Ark. On the other hand, had the artefact not had the story of the Ark linked to it, it is unlikely that it would have been given its new, symbolic life.

The dilemma of the Shinto temples

One of the most shocking realisations in the cultural heritage world was that apparently the wooden temples of the Shinto shrine in Ise, Japan, did not fit into the definition of Authenticity in the World Heritage Convention, because they were copies (this is a very crude description of the problem). Since it was obvious to all responsible parties that they were without a doubt worthy of being entered on the List of the World Heritage Committee, it was necessary to analyse the concept of

Authenticity to see where it failed. A Workshop and a Conference were miraculously held in 1994 and fully reported [10, 11].

There would have been a chance of resolving the dilemma, had the problem been analysed by means of the function/information content approach according to the Operational Conservation Theory presented here. The facts are the following: every 20 years the temples are torn down and completely rebuilt using new materials by a vast workforce of craftsmen whose lives are dedicated to this task and using measurements and procedures which have been in existence since the seventh century. Even if a piece (being never older than twenty years) were copied in an identical type of wood of the same age and used for replacing a piece in such a temple, it would just be a copy if it had not been prepared by one of the dedicated craftsmen.

According to the present approach, we have a living interaction between the information and the artefact in such a manner that one cannot say that it is the artefact that provides the function of these temples but rather the 20-year cycle of information *cum* artefact. The information *about* is part of the function. The interesting thing is that the information *about* is maintained - unchanged - by the performance of the re-building, by the training required for it but also taught by doing it. There is no loss of *function*. If the very general concept of Authenticity presented above had been in vogue, there would have been no dilemma. It is all a matter of handling information responsibly.

Making conservation theory operational

It has been said that the owner, curator, or conservator has the responsibility for the artefact, however this is a terrible burden to take on. On the other hand, if we define what is the *function* and the *intended information* that it is desired to preserve or restore, then the task is human. Because this means that there is a finite number of variables that have to be dealt with. It is obvious from the above that this means making a choice which is a responsible action including the presentation of options and decisions based upon purpose and funding. Not making a choice means deselecting everything, and this can very easily lead to total loss of relevance of the artefact.

It is known that the positivist approach to our understanding of the world, which surrounds us and in which we live, was scorned and generally replaced because it was not able to provide a universal truth, independent of the human observer or thinker. However, in dealing with conscious preservation and restoration efforts, we are completly outside the quest for a universal truth or even a truly complete knowledge of the information content of an artefact. We are going to perform conscious acts and we and our successors have to live with the result. We are responsible for our actions, but obviously we can only be resposible for that which we know about. If we had a greater responsibility in mind, responsibility for the unknown, then the only sensible action is *not* to take any action, and to let decay take its natural course. Obviously this is consciously done already by certain

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10. K. E. Larsen and N. Marstein, eds., *Proceedings of Conference on Authenticity in Relation to the World Heritage Convention - Preparatory Workshop*, (Trondheim: Tapir Forlag, 1994).

11. K. E. Larsen, ed., *Proceedings of Nara Conference on Authenticity in relation to the World Heritage Convention* (Paris: UNESCO, 1995).

12. An intellectual curiousity should be noted: the terms and concepts used in plant breeding are strangely applicable to the Shinto shrine discussion: the temple corresponds to the *phenotype*, the tradition corresponds to the *genotype*, and the craftsmen perform the functions of the enzymes. Obviously a knot in a piece of wood which is part of the temple will be in a different location when the next generation temple is built, but this is totally irrelevant to the genotype - it is like an influence of the environment which makes one plant slightly different to its neighbour, although they are obviously the same.

archaeologists, by letting sites retain some undisturbed artefacts whose presence is suspected. But in denying the will to take steps to preserve even what little information we may have - either in the form of preserving aspects or features of objects or in the form of as complete documentation as our purse will allow, we lose both our traditions and that knowledge which our traditions permit us to extract[13].

It should be emphasised that selecting features for restoration or preservation in the worst instance means *deselection* of the rest. However, with the systematic approach given in the present paper, we will come to realise that the deselected features will to some extent be unknown today, because we cannot know which questions future users will ask to the artefact. At any rate, this approach points to a need for using a particular strategy when confronted with a number of similar artefacts. The strategy is to bring a range of different approaches to bear on the conservation of such a collection, thereby losing different features through the different procedures, so that future examination of a large number of restored artefacts may provide a breadth of features to analyse.

Steps in a restoration process

This is not the place to provide a detailled account of the actual use of Operational Conservation Theory, and the following will only give general principles.

The *artefact* (monument, landscape, etc.) is the object of attention and we wish that our treatment shall provide access to the information it carries. If it is in the short term after the treatment, then we term it *restoration*, if it is in the long term we term it *preservation* which also encompasses the storage conditions. We may have a traditional wish to preserve all the information the artefact contains, but we can only take responsibility for that which we are conscious about and which we handle actively. We do, however, wish to use the physical embodiment of a restored/preserved artefact to convey this information. This means that we must perform an analysis of the information content directly obtainable from the artefact. There may well be information *about* the artefact - however, this is not stored by or contained in the artefact itself and so may be in need of a completely different treatment - and we must reconcile ourselves with the realisation that some of the information that is directly obtainable from the artefact before treatment may well be relegated to (in fact, *added* to!) information *about* the artefact, because the treatment will have removed or at least distorted the original information content in the artefact.

When presented with a stringent requirement for systematic action, such as that described here, a very natural question is - "*will this not just generate a lot of information about information, most of which being superfluous to the professional?*". This is not the case in practice. For one, the results of individual procedures are well known, i.e. both their advantages and disadvantages and they only need to be accounted for once. Secondly, a checklist is traditionally the safest way to ensure that nothing has been forgotten or overlooked (cf. the practices of the highly skilled persons we know as airline pilots). Obviously we must realise that it is impossible

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13. G. Brock-Nannestad, "'The Requestor Decides' - the Fundamental Ethical Issues When Dealing With Sound Recordings", in *Proc. XII Colloquium Musical Informatics* eds. A. Argentini and C. Mirolo (Gorizia: 1998), 159-162.

to extract *all* information from an artefact - we can only economically extract in those categories, which we believe to be relevant. However, we must place the artefact in a *context* so that we realise which aspects we need to preserve by means of restoration. This means that we must identify the goal of the restoration process.

Now that we know the starting point ("*as is*") and what we desire as our goal we must devise ways to get from one to the other. The skilled person will have ideas on sequences of procedures and of alternative procedures. For each step the range of possibilities must be identified and the consequences (in particular disadvantages) must be recognised. Invariably there will be interaction between the steps, and this calls for an evaluation of the consequences when different combinations of steps are used. Step by step and for the whole sequence the consequences must be assessed and compared to the desired goal. Compromises will cause an adjustment of the goals, and the whole may be considered a feedback process. However, because it is conscious and performed on paper before any physical or chemical step is undertaken, no compromises have to be made due to bad planning. One ends up with a branched hierarchy leading from the present condition to the desired condition.

The process described above lends itself to interactive computer implementation, and in this way one may both document the original artefact and keep a record of the necessary deliberations as well as of the consequences of proposed restoration activities. Using the same approach on a collection of items it becomes possible to prioritise and to create a long-term preservation plan.

Restoration and preservation are essentially engineering undertakings - for restoration purposes it is equally important to understand the manner in which an artefact was made and the artistic or aesthetic tradition in which it fits [14]. This will require extracting information *about*, which, however, is rarely handed down individually for a specific artefact, but rather needs to be derived from the context of creation into which the artefact fits.

Conclusion

The present writer has proposed a novel approach to solving decision problems related to the preservation of cultural heritage. It is an approach, which permits those responsible for decisions to identify the consequences of any course of action contemplated. The consequences are related to the degree to which the preserved item (from the highly specialised artefact to landscapes) may function as intended and the item's capacity for providing human input.

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14. *vide* note 13.

About the author
George Brock-Nannestad, born in 1946
Graduated 1971 from the Danish Technical University
Specialised in Intellectual Property Law (patents)
European Patent Attorney since 1989
Major grant 1981-86 from the Danish Research Council for the Humanities regarding project entitled "Establishment of Objective Criteria for Correct Reproduction of Historical Sound Recordings"
Responsible 1992-98 for research and tuition in *Preservation of Media for Sound, Moving Images, and Data* at the School of Conservation of the Danish Academy of Fine Art
Member of the Technical Committee of the International Association of Sound and Audiovisual Archives (IASA) since 1983
Member of the Audio Engineering Society (and Standardisation Working Groups) since 1995
Established own consulting firm 1998 (specialising in patents, AudioVisual problems, and general authenticity issues) as Patent Tactics
Numerous courses, seminars, consultations to audiovisual archives

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