



How can science connect with and contribute to conservation? Recommendations and reflections

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Alison Heritage
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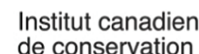
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Position paper

How can science connect with and contribute to conservation? Recommendations and reflections

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This paper reports the conclusions and recommendations of the working group that synthesized the discussions on ‘How can science connect with and be of greater benefit to conservation practice?’ during the ICCROM Forum on Conservation Science. The author reflects on these findings from her own perspective and experiences, and places them in the context of two major shifts in heritage research: the first, a shift in focus from conserving materials to managing meaning. The second, a shift in organizational structures from single, centrally funded heritage institutions towards diffuse networks which include new players who have no direct responsibility towards heritage. Both shifts are taking place in an environment of decreased funding and increased accountability to society. Science and conservation connect and contribute to each other most effectively if they together contribute to the societal benefits of heritage. In this regard, heritage science strategies can stimulate collaboration, and direct science and conservation towards innovative, applicable outcomes. Moreover, they can promote a transdisciplinary approach which connects social, economic and business sciences and stakeholders. They should also ensure the creation of sustainable nodes for consolidating knowledge within these dynamic networks.

Keywords: Heritage, Conservation, Science, Strategy, ICCROM Forum, Research infrastructures, Capacity networks

A question, a working group, some reflections

On the first day of the ICCROM Forum on Conservation Science, the question ‘How can science connect with and contribute to conservation?’ was posed as a central point for discussion. On the last day a working group was formed to synthesize the results of two previous days of discussions, and to draft recommendations specifically in answer to this question. The presentation of their conclusions and recommendations can be viewed online (ICCROM Forum, 2013). This paper starts with a summary of the conclusions and recommendations of the working group. In the part that follows the author, who did not take part in the working group but discussed the question during the first day in a different group, reflects on the recommendations from her own perspective and experiences in the Netherlands, and places them in the context of other issues discussed at the Forum.

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What came out of the working group

The group’s point of departure for their discussions was that the goal of cultural heritage conservation is to bring benefit to society. With this goal in mind, the group emphasized the need for strategies to expand and exploit scientific knowledge, to improve understanding of heritage (and thereby recognition of its values and significance), and to promote its sustainable welfare. The group emphasized that such strategies should be developed in collaboration with conservation practitioners, and used to promote creative research partnerships, undertake needs assessments, improve methods, and optimize access and dissemination of scientific knowledge and information.

The group diagrammatically represented science, heritage and its welfare, as having a symbiotic relationship in which science facilitates further understanding of heritage through humanities based research, disciplines such as archaeometry, and also through conservation practice (Figure 1).

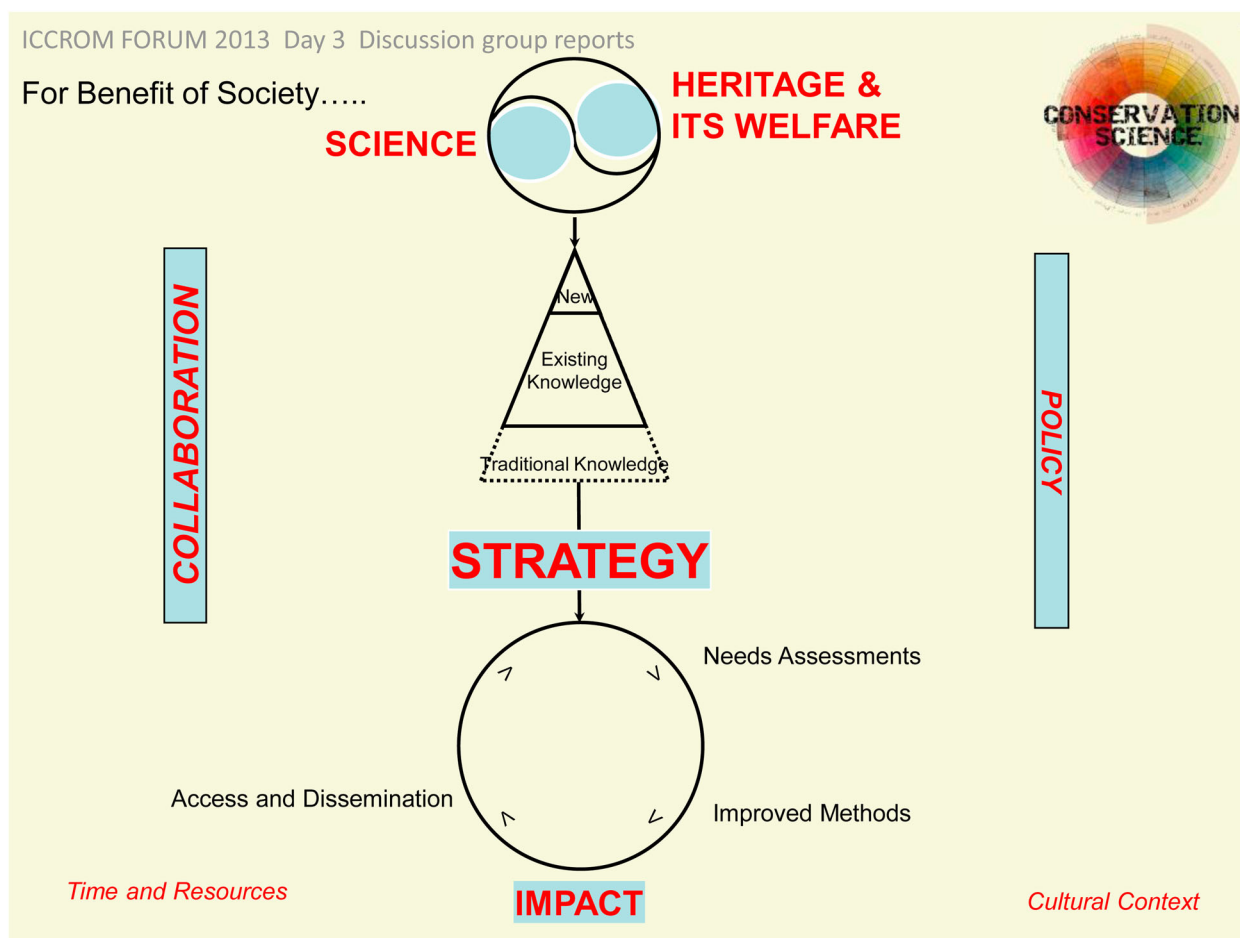


Figure 1 Diagram representing the symbiotic relationship between science, heritage, and its welfare. © ICCROM 2013.

In this context, the group identified three types of knowledge and outlined the role of science with regard to each of these:

- Traditional knowledge, of which little is written down but exists in oral and practice traditions, for example, in vernacular building techniques. Science can help understand and disseminate this knowledge.
- Existing scientific knowledge, which could benefit conservation practice if it were better known, disseminated, interpreted and understood. However, funding streams from academia tend to support new discoveries rather than the dissemination or application of existing knowledge.
- New scientific knowledge which can aid innovation within conservation practice.

The working group's proposal is based around a strategy for science in the support of conservation practice that stresses the need for interdisciplinary collaboration to ensure dissemination and applicability. Such a strategy will need to be supported by policies that enable it to proceed.

The conclusions of the working group are presented here, with some minor editing to improve legibility.

Scientists involved in heritage and conservation practitioners should collaborate and develop a heritage science strategy to:

- engage in creative partnerships,
- make assessments of need (and gaps),
- improve methods, and
- optimize access and dissemination.

Through implementing such a strategy, knowledge can be expanded and exploited, the understanding of heritage and its sustainable welfare can be improved and the recognition of its values and significance can be deepened. In these ways, science can contribute to the societal benefits from heritage.

Through the use of strategy, we recommend:

- To promote an interdisciplinary understanding which responds to the needs in practice, providing solutions to conservation problems, and optimizing conservation processes through the use of heuristic and sustainable methods.
- To develop interactive teaching tools and platforms based on science to meet needs in practice.
- To scientifically assess traditional knowledge (craftsmanship, ancient techniques) to better understand and optimize its use as an alternative in conservation practice.
- To tailor new approaches in scientific documentation that guarantees open access and co-conservation.
- To assure open and credible information, using common language and terminology, accessible for as

many end-users as possible, adapted to the level and context.

- To use impact assessments to assess the effectiveness and influence of science in support of conservation practice, by means of the ROAME methodology (Rationale, Objectives, Appraisal, Monitoring, and Evaluation).
 - For example, evaluating the quality of the science, its societal relevance, the access to and dissemination of the findings, and professional and public awareness and understanding of the results.
- To explore the narratives of conservation practice with scientific support, to demonstrate the applicability, use and benefits of scientific conservation knowledge.

To do all of the above, we need champions (who are well-known, respected, and dedicated), press coverage, and illustrated examples.

Reflections on a changing world

The working group recommended connecting science and conservation through a heritage science strategy. How does that fit in the bigger picture? The working group focussed on how to improve the relevance and impact of science to the conservation field, nevertheless, the bottom-line question for the ICCROM Forum was how should conservation science adjust to changes in society in order to stay relevant and have a sustainable future? This is an important question, because the world in which we, heritage professionals, do our work is rapidly transforming. The scientific world changes, the research infrastructure changes, the focus in conservation changes, and the interaction of society with heritage changes.

Shifts in the scientific world

Lidia Brito, UNESCO's director of the Division of Science Policy and Capacity-Building, in her opening keynote lecture in the Forum, sketched a globalized world in which the balance of global influences is shifting, as discussed some years earlier by UNESCO (2010). In terms of science development, continental Asia is growing rapidly and will overtake the old players Europe, North-America and Japan on many fronts within the next decade. Science is becoming increasingly internationalized. The distribution of research and development efforts between North and South is shifting with the emergence of new players in the global economy. A bipolar world in which science and technology were dominated by the European Union, Japan, and the USA is gradually giving way to a multipolar world, with an increasing number of public and private research hubs spreading across North and South. Newcomers, including the Republic of Korea, Brazil, China, and India, are creating a more competitive global environment by developing their capacities in the industrial, scientific, and

technological spheres. While once these countries provided cheap labour, they now show a rapid increase in the number of researchers, combined with the automatic incorporation of knowledge and intellectual property through the acquisition of 'Western' companies.

Science is also becoming increasingly democratic. Thanks to modern technology and low-cost easy access, science comes to the people. People have access to scientific knowledge from all over the world and more people are able to get actively involved in science. Citizen science, or crowd-sourced science, makes use of amateur scientists and members of the general public to collect and analyse data. These initiatives drill into a huge resource of scientific enthusiasm. A successful example is the Galaxy Zoo, an astronomy project which invites people to assist in the morphological classification of galaxies on large numbers of telescope images collected in sky surveys (Zooniverse, 2013). Examples in our own domain are the *Your Paintings* tagging project in which the public is invited to describe what they see on the digitally available UK national collection of oil paintings (BBC, 2015) and the *Google Art Project* which enables anyone to study and use high resolution images of paintings (Google, 2011). Meanwhile, we live in times of uncertainty, under pressure on a planet at risk. Increasingly it is recognized that science can more effectively contribute to solutions through dialogue with stakeholders, through co-design and co-production with cross-cutting policies and through building bridges in and between networks. Accordingly, measuring the success of scientific research in these terms requires a shift from counting academic citations as evidence of peer regard to measuring impact on society and public engagement.

These changes and requirements in the scientific world at large are equally influencing science for heritage. An indicator of the changes taking place in our field is the plurality of terminologies used to describe it. This was reflected even in the title of the Forum itself, which when announced was 'the ICCROM Forum on Conservation Science'. However, at various stages of its preparations the phrase 'Science in Conservation' was used. Although the two phrases contain the same words, they do not convey the same meaning: in particular, 'conservation science' is more purposeful and focused than 'science in conservation'. Furthermore, during the three days of the meeting many participants, especially those from the UK, used the terms 'heritage science' and 'heritage research'. Heritage science 'is about managing change and risk and maximising social, cultural and economic benefit not just today, but in such a way that we can pass on to future generations that which we have inherited' (House of Lords, 2006, p. 15).

'In order to support the various aspects of heritage: conservation, access, research, interpretation and management, heritage science must be based on an interdisciplinary palette of knowledge, from fundamental sciences (chemistry, physics, mathematics, and biology) to arts and humanities (conservation, archaeology, philosophy, ethics, history, art history, etc.), including economics, sociology, computer sciences, and engineering' (Wikipedia, 2015). This illustrates the expansion of the playing field on which we do our work. It implies the need to take time and look at where we are and where we might go, to step outside our comfortable frames and reach out to other science disciplines and heritage domains.

Shifts in focus

The shift towards heritage science coincides with ongoing shifts in focus within the heritage field: from care and restoration, to conservation, preventive conservation, and risk management; from freezing to managing change; from preservation to access; from 'looking at' to experience. An example is the development in approaches to exhibiting objects of art, which has changed from 'looking at art' presented as a type of artistic wallpaper (as in the mid-nineteenth-century salons), to 'isolating' such as that described in *Inside the White Cube* (O'Doherty, 1976), 'feeling' or interaction with installation art, and 'experiencing' or immersion in, for example, Olafur Eliasson's *The Weather Project* (Eliasson, 2003).

There is also the shift from analogue to digital and from material to meaning. The emphasis is moving from preserving heritage as material culture, with a focus on 'stuff', to preserving its content and function and increasingly to preserving this relationship in a participatory society. This amounts to a change in focus from materials and things towards people and their interaction with heritage – a shift from the container; to content and concept; to context. Whereas traditionally keeping authentic material was the prime directive, digitization in archives and libraries has pushed a move towards preserving information or content. Contemporary art produces cultural expressions that are no longer self-explanatory and need understanding of the concept and the maker's intent. This becomes highly relevant when artworks contain media with limited life expectancy such as video and audio, which may need replacement to preserve the concept. With this shift in focus the topic of meaning, value, and significance has re-entered the debate. The conservation of contemporary art also includes preserving the social aspects of experience, interaction, and relationship with the beholder and stakeholders. The conservation of ethnographic objects has changed from keeping curiosities placed on a pedestal, towards understanding their meaning

for both the original owners and the collectors and towards re-establishing and conserving the relationship with the original cultures. Thus, the tangible and the intangible aspects of culture and their mutual relationship need to be integrated into research. This shift in the focus of conservation has an impact on the contribution of science. With the recognition of cultural heritage as an anchor of identity at the heart of society, similarly conservation science needs to place itself within society as well. Hence, the material focus of conservation science and curatorial practice (technical art history and archaeometry), already interdisciplinarily connected with (art) history, needs to expand to include the social sciences. And as science democratizes, so does heritage. It is no longer the experts who solely determine importance and significance, the public has gained a voice in that process. Public participation, co-care and co-conservation require new approaches and understanding of the social interaction of heritage. The shift towards *The Object in Context* (Saunders *et al.*, 2006) is in full progress.

Shifts in research infrastructure: an example from the Netherlands

Throughout the twentieth century conservation science and curatorial study have been carried out mainly in single, centrally funded heritage institutions often supported by the state. In these institutions research matured from mono-disciplinary applications of science to multi- and interdisciplinary projects to find answers to questions about making, and solutions for problems with keeping. Curatorial study and conservation science have come together for the proper interpretation of objects and to understand the relationship between materials and meaning. This understanding is paramount for heritage management and for making well-founded decisions about its development, use, and preservation.

In the Netherlands, where the state took responsibility for the care and management of its national cultural heritage, this development is reflected in the institutes that have performed that support service. In the early 1960s, the 'Central Research Laboratory for Objects of Art and Science' was founded. It started out as a multi-disciplinary institution where scientists, (art) historians, and conservators came together to study the making, degradation and conservation of objects. The laboratory developed an interdisciplinary approach which expanded even further after the merger in the mid-1990s with the Fine Arts Bureau and the Training School for Conservators to create ICN, the 'Instituut Collectie Nederland'. The Dutch name of the Netherlands Institute for Cultural Heritage also reflects the development from studying objects to managing collections. Research

not only generated knowledge for conservation of materials and objects but also for determining significance of objects and collections and for their management. While ICN was widening its view and becoming more generalist, new research players entered the heritage science arena to deepen knowledge. Universities formed research groups that used high-tech equipment to study material change at a molecular level. ICN's conservation scientists had the task of bridging this 'fundamental' science with its application in practice, translating science into solutions for conservation, and conservation problems into scientific research questions. They also had a role in connecting the diversity of research initiatives in sciences and humanities. In 2011 ICN merged with the state services for built heritage, archaeology and landscape to form RCE, the 'Cultural Heritage Agency of the Netherlands', an organization in which all heritage domains have come together. While ICN aimed at an approach which integrated object, content and context, RCE aims to integrate knowledge, policy, and practice throughout all heritage domains.

These developments have taken place in a changing economic and political environment. While RCE integrates all the heritage domains, the Dutch state is withdrawing from the cultural arena. It prefers to take on the role of conductor or director, and encourages a participating society, and the development of private enterprise and entrepreneurship. Funding for culture is being reduced and its own heritage support agency has shrunk in size. This shift in politics requires RCE's conservation scientists to reposition themselves for a new role. As scientific research at RCE decreases in capacity and output, universities, and other research groups gain funding from the Netherlands Organisation for Scientific Research (NWO) and the European Union. NWO has a history of financing research programmes for art and heritage with the Molart, De Mayerne and Science4Arts programs. Over the coming years funding will be available for the virtual 'Netherlands Institute for Conservation, Art and Science' (NICAS) – a network initiative in which the Rijksmuseum and primary partners University of Amsterdam, Delft University of Technology and RCE have teamed up with a number of new players (NWO, 2015). The 'institute' aims to foster innovative research unifying three different disciplines: art history, conservation, and science. At this moment, it does not yet cover the full array of disciplines that heritage science encompasses, but nevertheless represents an interdisciplinary start with new players. In January 2015, a match-making day was organized where proposals could be pitched and matched with partners to initiate the design of proper research lines. The enthusiasm was overwhelming, with 51 proposals covering both curatorial study

and conservation science. The day also showed that the government's laboratory, since its birth the leader of science for heritage in the Netherlands, may no longer be the central place where knowledge is generated, but rather the place where it comes together and from which it is disseminated. A network structure is growing that in due course may be able to take over this role.

The Netherlands is not unique in this development. As a result of stimulating innovative research through cooperation and crossing of boundaries, among others through national and international funding schemes such as the European frameworks, a large number of new players have entered the cultural heritage arena. Universities and research organizations have discovered cultural heritage as an interesting topic to apply their knowledge and generate funding to develop new knowledge and technology. These organizations are well equipped and can do 'fundamental' studies that the traditional heritage organizations cannot. Old questions are re-addressed with newly available techniques and our knowledge can be deepened. This represents the next jump in scientific progress. Concurrent with this deepening there is also a broadening. Heritage research has explored new disciplines, those of humanities, social sciences, and business studies, and these new disciplines have in turn discovered heritage as a subject of focus.

In today's world, research is increasingly being planned, organized, and developed in networks, which can receive funding that is unachievable for single institutions. Competition between single players is turned into enriching and more efficient co-operation, when the players organize their work together. The planning, co-ordination, and funding of such networks requires research agendas, science strategies, and joint programming initiatives. This happens at a large scale in Europe and at a smaller scale in the Netherlands, as sketched above. While the state institute used to take the lead in programming research, it is now increasingly becoming a partner in programming research together with heritage organizations and other partners. In the UK, reduced funding, disparate players, and a lack of political support have triggered a desire to align efforts, demonstrate value, and win recognition as a coherent field. The House of Lords sub-committee for Science and Technology's Science and Heritage report recommended the creation of a group to produce a National Heritage Science Strategy, to co-ordinate activity across the sector. A steering group of heritage scientists drawn from across the heritage sector was set up and in 2009 three reports were published which form the evidence base for this strategy (National Heritage Science Strategy Steering Group, 2010). Similarly, a number of other countries and

international networks have also drawn up heritage science strategies or research agendas. In preparation for the ICCROM Forum, a review was commissioned of such strategy documents, which covered eight national and three European documents (Ottens, 2013). In this report, it is interesting to observe that France, Spain, the USA, and Japan all have a strong focus on materials and their decay, aiming for interdisciplinarity; meanwhile the UK, the Netherlands, Australia, and New Zealand already focus more on heritage in society and are crossing boundaries, with an ambition to move towards transdisciplinary heritage science.

Opportunities and threats

Science organized in networks offers enormous opportunities for heritage science, benefitting society in the end. However, the question surrounding this type of organizational structure is whether dynamic and temporary networks are solid and persistent enough to consolidate knowledge and keep it available and applicable for the field. The networks need to prove they can avoid knowledge fragmentation when connections break and new ones are formed over time. Knowledge should not disappear once funding dries up. Somehow there needs to be a continuing critical mass in which knowledge comes together, is kept, and is further generated. The National Heritage Science Forum in the UK is an example of a semi-permanent structure that could fulfil this task. Alternatively in countries with national heritage organizations they may have to act as repositories, connectors, and relays of knowledge. They can form the nodes for the application of generated scientific knowledge in conservation practice and policymaking, for dissemination of knowledge, and to connect national and international heritage science initiatives. These institutions will need to be actively involved in drawing up national heritage science strategies, as facilitators, policy makers, and inspirers. This represents a new role, in line with governments' visions and society's demands, working within networks in which sharing is the new having. Yet, this is only possible if one has something to share. Accordingly, there needs to remain a basis and a critical mass in these institutions, if they are to continue as attractive network partners.

So how can science connect with conservation?

In the middle of all these changes, the heritage profession will need to create a new, enriched, more holistic approach. Conservation science may have successfully crossed disciplinary borders between the natural sciences, (art) history, and conservation. However, the societal changes that we are facing now ask for a broader perspective, yet more crossing of new borders and combining efforts at a higher level

of innovation. Digitization and the generation of large datasets, increased involvement of the public and engagement with society, globalization, and economization, use and repurposing of heritage require crossing the borders of social, economic, business, computer, and other sciences alike. The challenge for the near future will be to integrate these disciplines, include stakeholders, and rise beyond interdisciplinary to transdisciplinary heritage science.

Simultaneously, the way in which we do our work is transforming. More and more, both science and conservation take place in environments that can be typified as large-capacity networks. Problem holders, stakeholders and knowledge holders organize themselves in temporary and diffuse networks to create new and innovative knowledge and solutions together. Creating sustainable heritage science networks requires not only dedication at champion level but at a whole level of scientists, conservators, and others who perform their work with a prime dedication to heritage be that in heritage organizations or semi-permanent structures such as fora. Only then can knowledge generated by enthusiastic scientists who see heritage as an opportunity for application of their own prime passion, be consolidated and continued. The future 'conservation scientists' will no longer be scientists who solely conduct research in support of conservation. They may still remain a main driver in support of conservation, but in the bigger picture of heritage science, will need to recognize their position as reliable and stable nodes within dynamic networks of players with diverse interests. To function effectively at those nodes scientific expertise will need to be complemented by people skills. They will have to adapt from scientist to knowledge manager, from reactive problem solver to proactive horizon scanner, and become an interpreter of material evidence in a social environment. Will they then have become 'heritage scientists'? Probably not. Perhaps heritage science is too broad for a single person. Indeed, it may only exist in a network where many minds come together, including scientists, conservators, and conservation scientists. This will be 'how' science and conservation can connect and contribute to the societal benefits from heritage. And those networks will need strategies to organize, direct, and fund themselves.

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