

Museum collections, scanning, and data access

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The contributions to this forum are the product of the long and extensive experience of scientists faced with an ever evolving framework for research. We would also like to share our experience as curator of a mammalogy service concerning the management of CT and MR scanned specimens. In our opinion, it is our role as institutions housing collections to find solutions in order to better preserve and utilize them. With the introduction of information technology in taxonomy and biodiversity studies, new museum policies to improve sharing and collaboration have been elaborated (Louette and Mergen, 2007). More specifically, imaging methodologies such as 2D and 3D modelling of specimens allow analytical procedures which were not previously possible and provide the opportunity to limit the use of collections while still allowing data acquisition. This, however, raises several issues, especially when considering the negotiation of access to study specimens (Sumner and Riddle, 2009). This particular issue represents the main topic of this contribution.

It indeed clearly appears that management of museum collections is rapidly entering a new era due to the increasingly widespread use of new methodologies. Geometric morphometrics and imaging facilities, among others, and tools (e.g., digitizers, surface or CT scanners, etc.) have provoked a growing demand for access to osteological collections. Such collections are by nature composed of rare, fragile, and irreplaceable specimens. When considering, for instance, the great ape osteological material of the Royal Museum

for Central Africa, it even comes to the mind that the biodiversity encountered in museums could in the future outgrow the natural biodiversity encountered in the field. Preservation and utilization of collections are unfortunately often two opposing missions for institutions. Continued use of collections may at times prevent the preservation of a specimen's integrity. Yet, the value of a collection depends on the contribution that the data collected from its specimens can make to the scientific accumulation of knowledge. In this situation, imaging methodologies represent an important opportunity for anatomical studies. They allow observation, description, and quantification of previously unavailable features and, at the same time, they offer new perspectives for the conservation of collections.

Following our line of reasoning regarding these new and yet already available perspectives concerning the conservation of collections, CT scans, for instance, should be made available at the request of visitors. The contribution of Elton and Cardini (2009) also raises important points concerning this issue. These points are worth mentioning here. Funding bodies are placing more emphasis on how data will be stored and made available in the future and this new availability may allow students and researchers on restricted budgets to be involved in analysis.

Specimens are generally made available on request but they are exceptionally granted on a loan basis. CT scans, on the other hand, can not only be made available but also downloaded and transported on media such as external hard disks

which can be purchased more and more easily. Hence, any kind of numerical data is indeed prone to be subject to what is termed “open access”. When considering osteological collections, CT scans are especially targeted because they allow the reconstruction of original specimens and the study of internal anatomical structures, which were previously unavailable. With the development of new software for landmark acquisition and morphometrics, they even open avenues for research that are not feasible using the original specimen.

It is therefore obvious that the entrance of museum collections into such a digital world raises crucial issues concerning data access or open access to the data. A thorough review of various aspects of open access is available in the joint publication of the European Commission and the German Commission for UNESCO entitled “Open Access: Opportunities and Challenges - A Handbook”. The electronic version of this publication can be downloaded from:

http://ec.europa.eu/research/science-society/document_library/pdf_06/open-access-handbook_en.pdf

or

<http://www.unesco.de/openaccess-en.html>.

In this publication, the term “open access” refers to free access to scientific information, in particular to scientific publications resulting from publicly funded research, a matter that is cause for considerable debate. We do not intend to debate the points raised in this publication here, but it is worth considering its content because the digitalisation of museum collections most often occurs from publicly funded research. In the case of scientific publications, research and library communities underline the importance of open access for the future of research and education. It is therefore of paramount importance that this JASs forum could help in establishing standards in the new field of sharing practices in digital Anthropology or Primatology.

Formally, CT scans could be considered as another kind of data, such as standard linear measurements, or cranial capacity estimation, given that CT data essentially supply two kinds of properties: density and geometry (Bruner, 2004). In this case, the scientist is the owner of his/her data and the sharing is usually left at his/her discretion (although museums are more and more frequently requesting more formal agreements). What are the implications of this situation? When generating CT scan data, especially DICOM data for 3D reconstruction, the scientist is generating a virtual collection. In many cases, this virtual collection is sufficient for research purposes and the study of the actual collection appears to be unnecessary.

In a way, this is positive because the utilization of scanned material may to some extent replace the utilization of actual collections and hence prevent the degradation of the material. This however is only possible if scientists agree to leave the museum a copy of the scans they made with the museum’s authorization. The spectre of “ownership”, as pointed out by Sumner and Riddle (2009) is here particularly apparent. We agree that researchers should be entitled to a period of exclusivity with their finds and CT scans that they have generated, but if the issue of the intellectual property of the scans is not properly addressed from the beginning of the exclusivity period, repeated scanning will occur, in the same way as previous generations of scientists used to do when coming to museums to repeatedly collect the same linear measurements. This raises issues about costs, repeated transport, repeated use, and repeated radiations, whose consequences are naturally deleterious.

Finally, if museums do not possess a copy of their scanned material, it appears that « virtual collections » can be scattered through the world without any acknowledgement offered to the museums that granted authorization for material scanning. A de facto situation where the museums are no longer recognized as depositories of the material is hence created. The « virtual

collection » generated by a given scientist makes him/her the source and the owner of the collection. This is here a crucial point; this situation occurs because the CT scans, which basically are only data, can easily be confused with the actual collections. The virtual collection owned by a given scientist represents data that allow one to generate other data just as the actual collections allow one to generate various datasets. When such an amalgam occurs, it appears that museums are no longer sources and hence lose their intellectual property.

A significant detail is sometimes evident in publications where CT scans are shared by two or more scientists without leaving a copy to the museum. The museum and also the funding agencies which cover the costs of the CT scanning are no longer acknowledged. This situation is comparable to the one that prevailed until recently where the museum, the curator and the collection manager were acknowledged but the collector who brought the material from the field to the museum and his/her resources were not. In the new situation, the museum, which was once the owner and the house of the material, now is replaced by the owner of the CT-scans. Today, the situation is comparable to what occurred in the past because the circumstances of the collection are not mentioned, and in the new situation the source is simply shifted from the actual collections to the virtual collections. My point here is not to say that this is bad or good. It is however certain that when considering this new situation, we are facing a complete absence of regulations and that the usual « gentleman's agreement » seems to be the only practice which currently prevails. Because of this lack of guidance and because of the consequences of this new situation have never been properly evaluated, I here offer the following advices

- 1) The CT scans should only be for the use of the scientist who generated them. The scientist, in the material and methods and

in the acknowledgements of his/her papers, will mention the museum where the scanned material is housed.

- 2) The scientist who generated CT scans should immediately send a copy to the museum and there should be no parallel distribution. The museum should be the owner of the CT scans distributing them to researchers, in agreement with the colleagues who generated these CT scans. The distribution of CT scans is project based and the museum should keep track of these projects. A period of exclusivity in favour of the scientist who generated the CT scans could be negotiated on the basis of the proposed projects.

These simple rules should protect the intellectual property of museums and of scientists who generate scanned data on the material housed in these museums. They can be applied to any type of data but they are essential in the case of the new imaging technologies which lead to the creation of a virtual collection (CT but also MR scans for instance).

An easier situation could occur where the museum generates the CT scans itself. In such cases, there is no issue regarding ownership and the museum can decide whether to make the data available or not. A recent work provides such an example (Balzeau *et al.*, 2009). In this work, we describe and quantify the internal cranial features of RG 9338, the type specimen of *Pan paniscus*, and most importantly we also provide a complete landmark description together with a 3D model in order to allow other scientists to include this key specimen in their own research. The original DICOM dataset is available to scientists on request. Our main objectives are to provide anatomical information regarding the type specimen of *Pan paniscus*, to make these data available for other studies, and to encourage the construction of similar databases in other institutions. The osteological collection of great apes housed in the Royal Museum for Central

Africa, in particular the type specimen of *Pan paniscus*, is a good example of these issues as it is very frequently accessed for study purposes. By providing data and information on the type specimen of *Pan paniscus* on the museum website (<http://www.metafro.be/primates/panpaniscustype>) and in the online version of Balzeau *et al.* (2009), we are providing a test case covering some of the issues raised above and in the other contributions of this JASs forum. We hope that besides helping other scientists include museum specimens in their studies and analyses, such initiatives will also help us to preserve our heritage.

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