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## Assessing what the public gets from an exhibition

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### Abstract

In February 2009, the exhibition “*Allosaurus*: one dinosaur, two continents?”, opened to the public at the Museu Nacional de História Natural e da Ciência da Universidade de Lisboa (MUHNAC). The main goal of this exhibition was to explain the scientific method applied to Vertebrate Palaeontology as a tool to promote public understanding of science and enhance science literacy. This exhibition also showed some results achieved on a research project led by the museum, that lead to the identification of fossilized bones of *Allosaurus fragilis* in Portugal in the late 1980's. At the time this was a major discovery, as it was the first dinosaur species found on two continents, and the first specimen assigned to this taxon described outside the United States.

In this study, we performed a set of interviews to the public that visited the exhibition “*Allosaurus fragilis*: one dinosaur two continents?” in order to assess if it achieved the proposed goals.

Based on this study, we conclude that the exhibition was successful in transmitting the scientific knowledge that was intended, since most of the interviewed visitors understood and maintained or even increased their interest on Dinosaurs and Palaeontology.

**Keywords:** Exhibition, *Allosaurus*, public, science literacy.

### Resumo

Em fevereiro de 2009 a exposição “*Allosaurus*: um dinossáurio, dois continentes?” abriu ao público no Museu Nacional de História Natural e da Ciência da Universidade de Lisboa (MUHNAC). O principal objetivo desta exposição era divulgar o método científico inerente à Paleontologia de Vertebrados de modo a promover a compreensão de Ciência e a literacia científica do público. Esta exposição também mostrou alguns resultados obtidos num projeto de investigação liderado pelo Museu e que resultou na identificação de ossos fossilizados de *Allosaurus fragilis* em Portugal no final da década de 1980. Na altura, esta foi uma descoberta muito relevante porque foi a primeira espécie de um dinossáurio encontrada em dois continentes, e por se tratar do primeiro conjunto de restos fossilizados atribuído a este táxon fora dos Estados Unidos.

Neste estudo realizou-se uma série de entrevistas aos visitantes da exposição “*Allosaurus*: um dinossáurio, dois continentes?” com o objetivo de avaliar se a exposição atingiu os objetivos que se propunha alcançar.

Com base neste estudo, concluiu-se que a exposição foi bem-sucedida a transmitir o conhecimento científico pretendido, uma vez que a maioria dos visitantes que foram entrevistados compreendeu e manteve ou até incrementou o seu interesse em Dinossáurios e em Paleontologia.

**Palavras-Chave:** Exposição, *Allosaurus*, Público, literacia científica.

## 1. Introduction

### 1.1 Why do this assessment?

The theme “Dinosaurs” has long been considered attractive and interesting to the public (Gould 1991, 1995). Thus, this subject has been an important tool to communicate and disseminate scientific knowledge regarding Earth Sciences, and

particularly Palaeontology, to different publics. The National Museum of Natural History and Science of the University of Lisbon (MUHNAC) is no exception and has been following this trend at least since the 1980's to assure a successful strategy for science communication and scientific outreach activities.

The effectiveness of that strategy has been often proved reliable inferring by common interactions

between its staff (educators, researchers, ticket office/surveillance employees) and the public. It has also been validated through several of our own visitor's surveys (e.g. Moreira *et al.*, 1994a, 1994b; Lopes & Póvoas, 2000; Póvoas *et al.*, 2006; 2010; Lopes, 2010). Furthermore, not only is the Palaeontology of Dinosaurs a research subject carried on in the MUHNAC, but it is also pertinent considering both national and regional geology, as Lisbon is located within one of the two Portuguese meso-cenozoic basins. Lastly, this strategy provides the opportunity not only to address the topic itself, but also several other related issues (e.g.: evolution, mass extinction, global change).

To establish a successful relationship with the public, a museum must know its visitors. With this purpose, the visitors of the MUHNAC have already been invited to participate in surveys concerning exhibitions, as well as events (particularly since the 1990's), in order to access several issues: some as basic as demographic characterization; others more complex, such as visitors' generic satisfaction, and also their expectations (e.g. Andrade *et al.*, 2003; Leite, 2009).

This study intends to go one step further and to assess if the public was getting the message and knowledge that was intended to disseminate through the exhibition. In other words, this analysis aims to compare the information that is intended to transmit and the knowledge that the public retains. This was achieved through the analysis of a series of interviews to the visitors of the exhibition "*Allosaurus fragilis*: one dinosaur, two continents?" that were conducted back in 2013.

## 1.2 The exhibition

The exhibition "*Allosaurus fragilis*: one dinosaur, two continents?" opened to the public on February 2009 and remained on display until May 2017. According to our visitors records we deduced an average of 24 000 visitors per year. As in any other exhibition, the museum aimed to provide meaningful experiences to the visitors. The visits were not supposed to be merely learning opportunities, but also enjoyable events. To that purpose, the exhibition presented several elements that were visually appealing, as well as interactive features, such as a light sensor that highlighted a full-size drawing of the biggest *Allosaurus* specimen ever found (see Fig. 1) and boxes with replicas of some fossils that could be seen in the exhibition and that the visitors were supposed to identify by touch (see Fig. 1). This design was deliberated, as

this kind of interaction requires observation and comparison, two skills that are essential for natural sciences such as Palaeontology.

The main goal of this exhibition was to explain the scientific method inherent to Vertebrate Palaeontology, as a way to promote public understanding of Science, as such, to contribute for enhancing science literacy (Reis *et al.*, 2011). The pathway that goes through the exhibition (see Fig. 1), was supposed to act as a metaphor for the trajectory of the scientific research, that consists in successive steps: the fieldwork, the conservation-restoration of the fossils in the laboratory, the interpretation of data, the conclusion and the formulation of hypotheses that usually raises new questions (that is why the final panel of the exhibition contained several unanswered questions).

As previously mentioned, one of the main objectives of the exhibition was to show the methodologies used in research projects in Vertebrate Palaeontology (in the field, in the laboratory, and in the study of the fossils). Some of the issues approached in this exhibition were:

- how multidisciplinary teams of palaeontologists and geologists are able to reconstruct ancient environments;
- the several steps fossils go through since they are found in the excavation site, following conservation-restoration in the laboratory, until they are properly stored in the museum collections or placed inside an exhibition window for public display;
- the phylogenetic relationships between theropod dinosaurs and modern birds;
- the palaeogeographic scenario that could explain the presence of *Allosaurus fragilis* in two different land masses, during the Late Jurassic, when North America and Iberia were supposedly separated by the incipient opening of the North-Atlantic Ocean (Escaso *et al.*, 2007; Póvoas *et al.*, 2010).

These questions were addressed by representing the several steps associated with research methodologies using for example photos of the fieldworks and a diorama of the site, exposing some of the instruments and materials that are used in the excavation and extraction of fossils, as well as in its conservation and restoration in the Laboratory (Póvoas *et al.*, 2010) (see Fig. 1).

The narrative of the exhibition was not based on a hypothetical example, but rather a real project, in which the Museum was deeply involved. The Museum had been participating in an ongoing research, concerning the discovery of fossilized osteological materials attributed to

the theropod *Allosaurus fragilis*, following the works for construction of a building in a farm near Pombal (Leiria district – central Portugal), during the late 1980's. At that time, this taxon had only been identified in correlative levels of North America. Therefore, this discovery had important repercussions in the scientific community, both national and international. After this discovery, several fieldwork campaigns led by the MUHNAC were performed in this fossil site. Thus, there was an interest in unveiling the research findings not only to the scientific community but also to the whole Society.

Nevertheless, the aim of the exhibition went far beyond revealing those findings. There was a clear intention to show the methods that were used and how those methods led to those findings. It was not enough to expose facts, it was also as important to reveal how scientists get to those conclusions (Reis et al., 2011).

### 1.3. Dinosaurs in Portugal: why are they relevant?

Portugal has one of the most abundant fossil

records of dinosaurs, and other continental vertebrates from the Late Jurassic worldwide. This record shows a close relationship with other correlative faunas in the North-Atlantic context, especially with North America (Dantas et al., 1999; Perez-Moreno et al., 1999; Malafaia et al., 2010). The similarity of Late Jurassic continental faunas from Portugal and North America is difficult to explain, because most palaeobiogeographic models suggest that the continental faunas of North America and West Europe were separated by the processes that lead to the opening of the North Atlantic Ocean, at least since the first stages of the Upper Jurassic (e.g. Brikiatis, 2016). The similarity on the Late Jurassic dinosaur faunas of North America and Portugal has been traditionally interpreted by the presence of intermittent terrestrial bridges that would connect these landmasses during some periods in the Late Jurassic. The Portuguese record of dinosaurs is one of the few currently known available evidence to ascertain this palaeobiogeographic model and to understand the faunal evolution of the peri-Atlantic regions related with the first phases of the North-Atlantic opening.



Figure 1 - Layout of the exhibition (adapted from Reis et al 2013 ©MUHNAC). The green strip represents the pathway visitors walked through the exhibition. The area with the darker shade is where visitors stood longer. The photos highlight some features (clockwise from the bottom left corner): a photos panel of excavation campaigns that were held in 1988, 2005 and 2010; a diorama of the excavation site; a replica of a young *Allosaurus*, and a real size drawing of the biggest *Allosaurus* specimen that had been found [at the time] on the wall; showcases with *Allosaurus* fossils collected at the site, revealing the phases of preparation and storage; a generic view of the exhibition showing a 3D cladogram of theropods' (including birds) made with replicas of skeletons or skulls; an interactive panel concerning plate tectonics; panels exposing the hypothesis concerning possible routes taken by *Allosaurus* between North America and Iberia at the Late Jurassic; final panel featuring several question risen through the research; view of the exhibition from the rear end; boxes with fossil replica for a hand-on experience; panel with an illustration portraying a palaeo-environmental reconstruction of the site; showcase showing fossils found at the site that reflect an impressive palaeobiodiversity.



## 2. Methodology

In 2013, about four years after the exhibition inauguration, it was decided to check if our visitors were getting the information that was intended to be transmitted. By applying a survey then (as opposed to the beginning of the exhibition), we could assure a sample that could reflect a wider range of different publics, as it would be expected that a biased surge of very interested and knowledgeable visitors would come right at the beginning. Also, instead of engaging in a quantitative approach by applying a questionnaire with closed-ended questions [this is a common approach that consists in presenting multiple-choice answers to be selected by the subject] it was decided to conduct interviews with the visitors so that they would give their own answers. This qualitative approach did not aimed to figure out how many visitors were getting the information, but to check if the exhibition was being able to get the information through.

The interview protocol contained open ended questions and were applied before and after the visitors went through the exhibition. As other authors before us (e.g.: Bollo & Pozzolo, 2005; Yalowitz & Bronnenkant, 2009), we decided to track the visitors while going through the exhibition, marking on a plant where, on the walkway, they stood more time. In the end of both interviews the participants were given a small token of appreciation: a set of pencils from the museum merchandising.

A random sample of visitors, over 12 years old, was asked to participate voluntarily in the survey. Systematic observations of the visitors walking through the exhibition were also accomplished to determine where, on the walkway, they spent more time. So, due to the protocol, once someone accepted to be interviewed, no one else could be asked to participate until the post-visit interview was done. Notwithstanding this restriction, there was a deliberated effort to get a representative sample concerning age group, gender and nationality.

In December 2012, there was a small trial run to test this protocol, and later, between January and April 2013 (mostly on Saturdays and Sundays), the survey was conducted. The interviews were done mostly in Portuguese, but because it was expected to come across tourist and foreigners residing in Portugal, interviews in English and French were also prepared. Table 1 shows the English version of the script. In total it was considered 30 valid interviews (25 in Portuguese, 4 in English and 1 in French).

Table 1: English version of the scrip used in the interviews

Questions made before visiting the exhibition	Questions made after visiting the exhibition
<ul style="list-style-type: none"> <li>• Why did you come/ with who?</li> <li>• Is this the 1st time you came to see a dinosaur's exhibition? /to this museum?</li> <li>• Are you interested in dinosaurs? Why? What is the most interesting thing about them? What do they evoke to you?</li> <li>• How and where did you learned about them?</li> </ul>	<ul style="list-style-type: none"> <li>• After seeing the exhibition what was it that you found more interesting, or what did you like best?</li> <li>• Is this how you thought that the dinosaurs are studied?</li> <li>• Have you learned something with this exhibition?</li> <li>• Age/ gender/Place of residence/educational qualifications</li> </ul>

## 3. Discussion and results

The visitors that participated in this study mostly came accompanied with someone: 15 came as a couple, 10 came with family, three came with friends and only two came alone. Women revealed to be more willing to participate in the interviews than men: 20 women versus 10 men. (see Fig. 2). Most of the interviewees were residents in Lisbon (21), five others resided elsewhere in Portugal (Cascais, Loures, Odivelas, Sintra and Torres Vedras) and the other four came from abroad (United Kingdom, France, Germany, and Netherlands). Their ages varied between 12 and 75 years old (See Fig. 2). Most of the participants had a higher education degree or had at least completed or were attending secondary school.

All of them had already visited other exhibitions on dinosaurs, either in their country or abroad. Most people were coming to the museum for the first time and came because they wanted to visit it (or some specific exhibition). Some more specific reasons for coming were engaging in a family activity, learning, bringing their children for a learning experience, interest in science and evolution, free admission [Sunday], because they found out about it on the internet (tourist), or heard about it in school. A few were coming specifically to see the *Allosaurus* exhibition. The average time spent in the exhibition was 12.3 minutes and the median was 10 minutes for a range between 1 to 53 minutes (see Fig. 3).

Less than one third of the interviewees said that they were not very interested in the theme "dinosaurs", but these were mostly visitors that came to the museum to see other exhibitions (including an art exhibition) or accompanying someone else.

Some participants showed more enthusiasm than others, but most visitors said they were at least a little

interested in dinosaurs. Nevertheless, there were a few dismissive answers such as: "more or less", "not really" and "I prefer other things. I prefer living animals to dead animals. It is interesting, but I am not very keen on that subject". Some examples of more positive attitudes could be: "I'm not exactly interested in Dinosaurs, but this looks interesting"; "yes, it is very interesting"; "yes, I'm curious about it" and "yes, especially when I was a child".

Some people did not provide a particular reason for being interested on the subject. The ones who did mention some generic dinosaur related subjects such as: interest about biology, evolution, fossils, palaeontology, Earth History and curiosity about the biology of dinosaurs. Some of the answers were: "[liking to know about] how they lived and hunted", "(...) they were big, huge beings that disappeared. There!" "we live on the Jurassic coast, in Dorset, and we've got lots of dinosaurs in the Isle of Wight, they're always finding new dinosaurs, so it's an interesting area to live, and I think that's one of the reasons we're interested in dinosaurs and fossils".

When asked about what dinosaurs evoke to them the most common answers made generic references to big animals such as the *Tyrannosaurus rex*. A few examples of answers: "something very big"; "big animals (although I know that some were little)". Some answers were quite emphatic: "running", "giant monsters that ate everything"; "T. rex [laughing] me very little and it is chasing me"; "big scary animal. I'm glad they do not exist anymore". And even though most people just refer to *Tyrannosaurus rex* when speaking about a specific kind of dinosaur there was one visitor that said "a *Stegosaurus*".

When people were asked if they knew what is the name of the science that studies dinosaurs some did mention Palaeontology or Geology, but most said they did not know or made some reference to archaeologists and archaeology. Afterwards, when asked if they knew about the palaeontological methodologies the majority said they knew about it, or at least had some idea. The most common answers were in the lines of "yes, more or less". Other examples of answers are: "no, this was new for me"; "yes, I thought the findings were random, I did not know the museum did so much prospecting"; "I had never thought much about it, but it has some similarities with archaeology. It is amazing and almost unbelievable being able to study this 150 million years away"; "I haven't though before about how dinosaurs were studied, now is better and I'm more interested".

When asked about what they had learned in the exhibition some said they did not learn anything or just remembered or reinforced what they already knew. A few examples of answers that reflect this are: "not really (dinosaur exhibition are repetitive)"; "I learned most of it at school" or "I mostly remembered, but now I understand better the methods that are used". Others said that they could not express what they had learned or were not sure they would retain it. One visitor from the Netherlands

said he did not notice that the exhibition was bilingual (Portuguese/English) so he did not read anything. The ones that mentioned what they learned referred mostly to the size of the dinosaurs or to Plate Tectonics. A few examples of answers that reflect this are: "I was more focused on the continents formation, which I didn't know so well and I think I learned something", "I learned and I'm more curious to learn more (...) I really thought they were not so, so, so big (...)"; "seven tectonic plates!"; "I guess so, some would be birds that had claws and some were really big (weighed 19 tones)". Some answers were very emphatic "yes, what I knew was not true"; "I've learned everything because I knew nothing! I had already seen a dinosaur at the Lourinhã museum (...) but I wasn't aware of the structure and shape of each bone, and I think it is fabulous!".

Half of the people that were interviewed mentioned they learned about dinosaurs at school, but also in movies (*Jurassic park* is mentioned); documentaries, books, magazines, exhibitions and with relatives ("with my nephew" and "with my son").

The most common answer regarding the question about what they liked most in the exhibition or what was the most interesting feature to them, was the boxes (there were 6 explicit references to the boxes). As seen in Fig. 1 the walkway section where people stand more time is in the middle where the boxes with hidden fossils replicas were placed. However, there was a comment that reveals that not everybody reacted positively to the boxes: "I don't like the boxes very much, the surprise effect is weird. Adults are reluctant to put their hand inside not knowing what's inside". There are also several references related with the dinosaurs' dimension, for example: "they were huge. All those pictures with a man's silhouette and the dinosaurs, and they are very big"; "the actual dimension (bigger than I thought)"; "the drawing on the wall is hallucinating because compared to it we are really tiny. If they still existed, it would be horrible. I'm glad they don't exist anymore". There were also a few references related with Plate Tectonic "founding an Allosaurus is another proof that we were once connected with North America"; "the fact that land is pulling apart, how that happened?"; "I did not know that the continents had been together four times!". Besides these, other answers mention bones, fossils, and Portuguese findings. For example: "(...) founding out what existed in Portugal"; "Andrés findings [the site findings]"; There was also references to dinosaur's evolution "I got a better idea about dinosaur's evolution, I get it better now".

At the end people were asked if they wanted to add something or make some comment. Only a few did, mostly to complement the exhibition. "It's just a fabulous exhibition. I'm surprised there's no more people walking around the museum really"; "I'm glad dinosaurs don't exist anymore, we are tiny compared to them". After the interview was over there was one young man who mentioned that birds descend from dinosaurs and that he was surprised with the size of *Velociraptor*. He expected that it would be bigger (or at least as big as an adult man, not smaller).



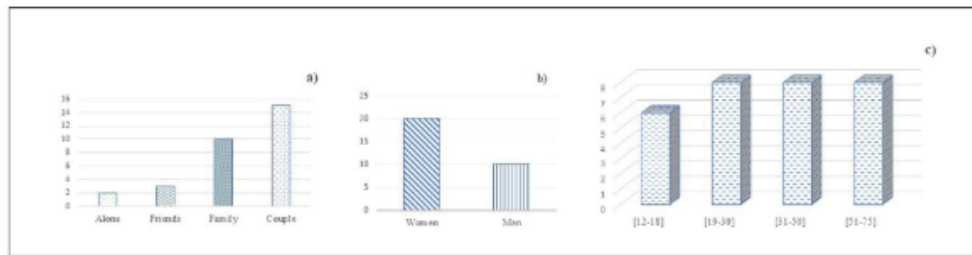


Figure 2 - Some graphics illustrating demography and some features of the visitors who participated in our survey. a) who they came with; b) gender distribution; c) age distribution.

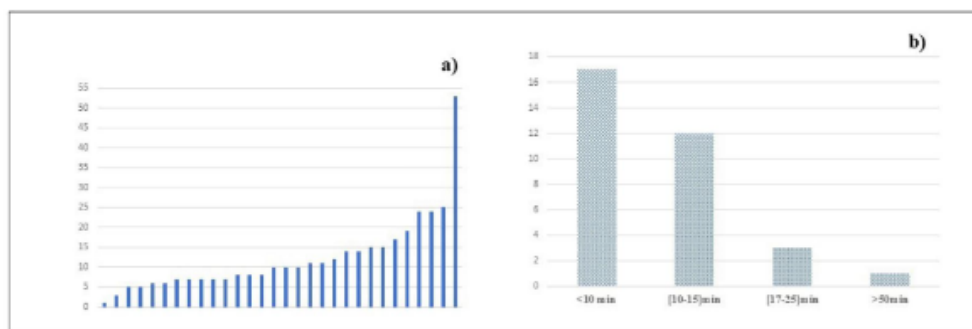


Figure 3 - Time visitors spend in the exhibition: a) sorted from shortest to longest visit, b) sorted by time range of visits

#### 4. Conclusions

The interviews results indicate that this exhibition was quite successful since it was able to fulfil the proposed goals; the visitors got from the exhibition most of the information that was intended to be transmitted. Also, even four years after the exhibition first opened to the public, there were still visitors who came specifically to visit it. Although, in most cases visitors just come to visit the museum or eventually any "dinosaur's exhibition".

The public include mostly people that are already interested in themes such as Dinosaurs or more generic themes such as Palaeontology and Evolution and most of them were already somewhat knowledgeable of these topics.

Something else that becomes clear with this study is that, even in short visits (10 minutes or less), people learn something. Particular attention was played to whether people did mentioned tectonics, dinosaur evolution and birds [specially the fact that birds evolved after dinosaurs, and so are in fact the living descendants of the dinosaurs]. Some people did mention these issues in their answers, which reflects

that the exhibition did fulfil its goals. Interestingly, this was something already apparent on the trial run. By analysing the answers, it became evident that some of the people did come out of the exhibition more knowledgeable than before. At least in one case, the visitor tried to find the answers to the questions they could not answer at first. At the very least they came out with a positive attitude towards Dinosaur Palaeontology.

This analysis also indicates that showing methodologies inherent to Palaeontology was an important approach, as for some people this was something new, and to others it helped to clarify how scientists reach their conclusions.

These interviews showed that it is quite true that dinosaurs are generally part of the imaginative realm of both adults and children. Although some people mention that some dinosaurs were small, they mostly speak about how big they were. Thus, they are indeed still famous for being "big, fierce, and extinct", i.e., very scary but also quite safe [because they do not exist anymore] (Gould, 1991; 1995; Lopes & Póvoas, 2000; Póvoas *et al.*, 2010).

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