Com os melhores cumprimentos,
Carlos Marques da Silva

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PALEONTOLOGICAL HERITAGE AS A DRIVING FORCE FOR GEOCONSERVATION: THE PORTUGUESE EXPERIENCE

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ABSTRACT

Never before in the history of Portuguese science Paleontology has been so popular as it is today. Fossils in general, and dinosaur fossils in particular, are extremely appealing for the general public. Paleontological Heritage conservation has, hence, become an important issue not only for a handful of paleontologists and geologists but for all. In this context it is crucial to understand that Paleontological Heritage, due to the specificity of fossils (biogeological entities with multiple dimensions and implications: scientific, educational, cultural, etc), is in it self an autonomous, multidisciplinary and pluriscientific entity, and should be treated as such. In Portugal, Paleontological Heritage conservation issues have worked as a powerful driving force for geoconservation in general. The Galinha and the Carenque Quarries, two remarkable dinosaur tracksites, are now protected as "Natural Monuments". The conservation of these sites required the direct intervention of the Portuguese government, and the investment of large sums of Portuguese tax payers money. This was achieved, largely, as a consequence of the enormous and highly motivated public opinion movement in favour of the geoconservation of these two particular sites.

Key words: *Paleontological heritage, dinosaurs, geoconservation, exomuseum.*

Paleontological Heritage - an autonomous and interdisciplinary entity

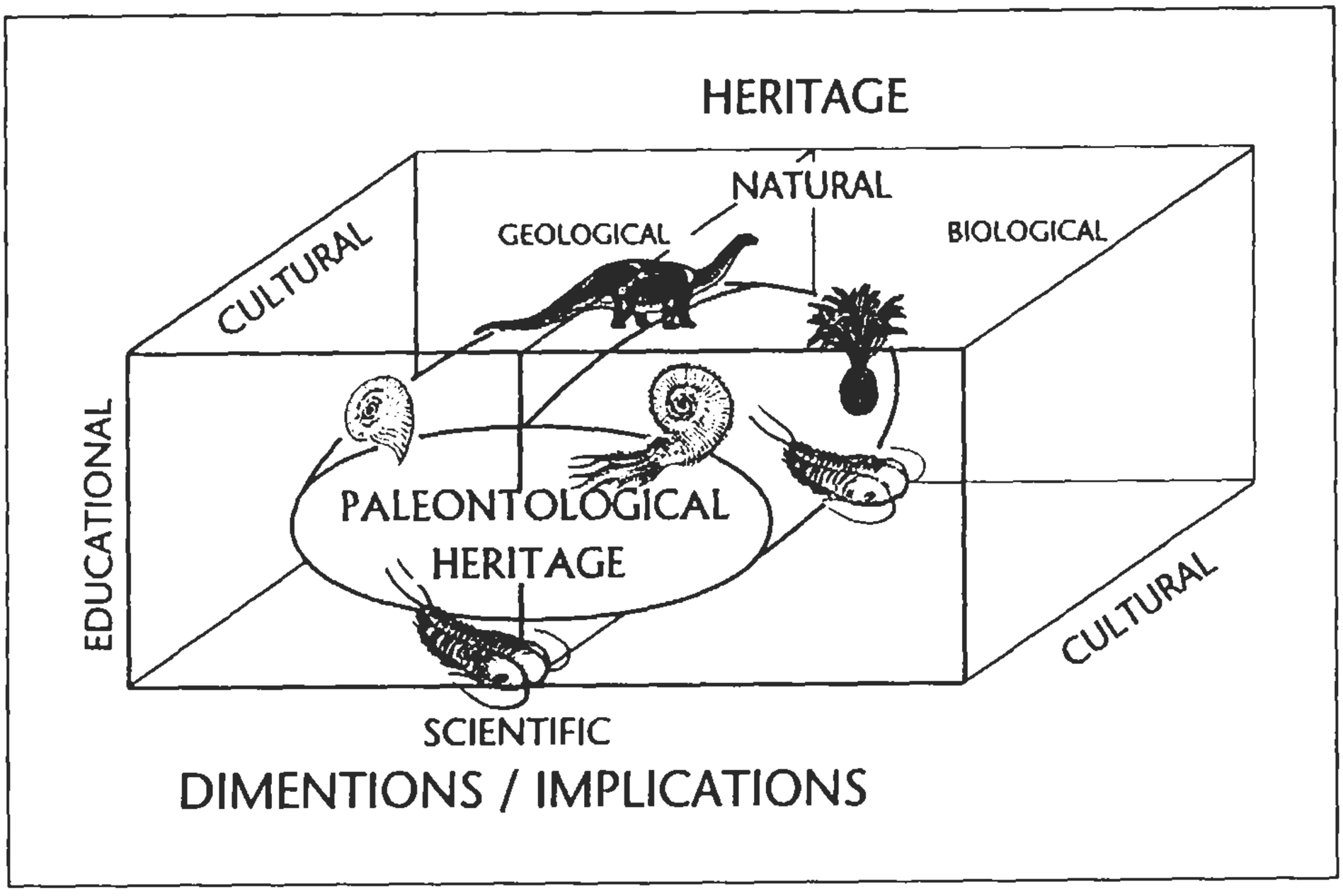
Fossils, both ichnofossils (= trace fossils) and somatofossils (= body fossils) (Silva *et al.*, 1998), are the elementary paleontological entities. Fossils are genetically linked with the geological record, meaning that they are geological objects. However, fossils are special geological objects: they have an identifiable remote biological origin, being the sole source of biological information of our Planet's past. Fossils are more than "mere" rocks, they are biogeological entities.

The Paleontological Heritage is the biogeological memory of the Planet that we must preserve and valorise for our own scientific, educational and cultural fruition and for the use of future generations. The material, tangible, part of the Paleontological Heritage is composed of fossils (biogeological entities), thus, conceptually, the Paleontological Heritage stretches far beyond the strict framework of the Geological Heritage, becoming part also (at least) of the (Paleo)Biological Heritage (Fig. 1) (Cachão *et al.*, 1998; Silva *et al.*, 1998; Cachão & Silva, 1999). (*) the rock that it is made of, or a dinosaur footprint is much more than just a load structure, so the Paleontological Heritage (although built of entities generated in a geological framework) is a distinct category within the wider context of Natural Heritage. The Paleontological Heritage should, consequently, be regarded and treated (*e.g.*

(*) Erratum (missing sentence):

Thus, for the same reason that the internal cast of an ammonite stands for much more than just the rock that it is made of, (...)

Figure 1. Paleontological Heritage (conceptual plot): an autonomous, multididimensional and pluriscientific entity.



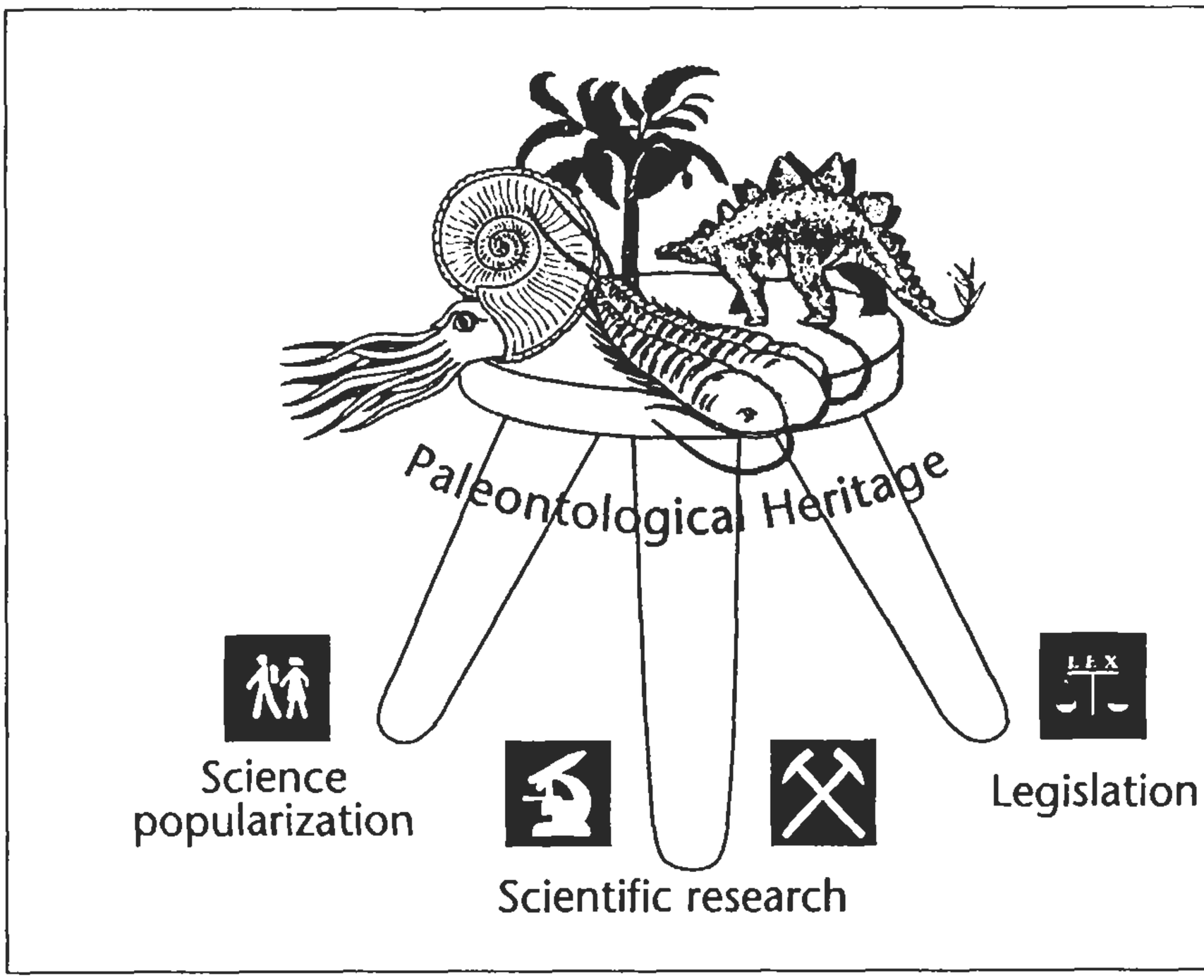
in legislation) as an autonomous entity, encompassing geological and paleobiological elements (as well as cultural and, possibly, others), generating special problems and requiring special solutions and protection measures, and having multiple implications, namely, scientific, educational and cultural (Cachão *et al.*, 1998; Silva *et al.*, 1998).

Fossils, Geoconservation and the general public

It is indisputable, unlike many other geological objects (*e.g.* faults, lithologies, geological contacts, etc) fossils in general, and dinosaur fossils in particular, are extremely appealing for the general public. Therefore, fossils (in the context of a proficient science popularisation; Fig. 2) play an important role in drawing public attention to geoconservation in general, and (obviously) in promoting a greater awareness of Paleontological Heritage conservation issues in particular.

Fossils occur in geological contexts. This implies that, in most circumstances, the conservation of fossils *in situ* (fossil sites) implies also the preservation of their (equally important, but generally less appealing to the general public) geological framework: the stratigraphic sequence in which they occur and all concomitant geological objects such as beds, unconformities, faults, dikes, etc, etc. Therefore, fossils may and must be used in order to captivate public attention and then to focus it (also) in other geological aspects and in geoconservation issues in general. In this sense, Paleontological Heritage issues do work as a powerful driving force for Geoconservation.

Figure 2. Geoconservation and Paleontological Heritage conservation must be based in three strong and well balanced fundamental pillars: competent scientific research; proficient science popularisation (in order to promote a greater awareness) and effective legislation and protection.



The portuguese experience: two examples

In the last ten years the Geoconservation awareness of the Portuguese public has experienced a remarkable increase. New and significant developments in Portuguese dinosaur Paleontology, namely the discovery of several important dinosaur bone and tracksites, have contributed decisively to the present situation. The Galinha Quarry, a remarkable sauropod dinosaur tracksite (Santos *et al.*, 1994), was protected as "Natural Monument" in 1996. It was the first, and currently still the sole, Portuguese paleontological and geological monument specially prepared to receive visitors and to have guided tours. The Carenque Quarry, another dinosaur tracksite, was protected as "Natural Monument" in 1997. The project for the transformation of this site into an outdoor geological and paleontological museum (an "exomuseum") is currently under study by the Portuguese Institute for the Conservation of Nature (ICN). The preservation of these two important paleontological sites involved, respectively, the acquisition by the Portuguese State of a huge fully operating private limestone quarry and the last minute reorganisation of a section of a highway (with the construction of a new 300 m tunnel under the tracksite), with a total cost of approximately 7.500.000 EUR (Galopim de Carvalho, 1994). This was achieved, largely, as a consequence of the enormous and highly motivated public opinion movement towards the conservation of these two particular sites.

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