

# Importance of palaeobiology in Natural History Museums and modern methods of exhibiting fossils

RAJEEV PATNAIK

*CAS in Geology, Panjab University, Chandigarh 160014, India.  
E-mail: rajeevpatnaik@gmail.com*

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## ABSTRACT

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Natural History Museums exhibit remains of both present and past organisms and natural objects so that we can understand their origins, evolution and interrelationships. All over the world, palaeobiology has become an integral part of Natural History Museums. Therefore, in order to understand the present day biodiversity we need to appreciate the biota of the past. All over the world people throng the museums to see dinosaur fossils. Fossils of extinct apes and humans are regarded as equally exciting. The present paper discusses the various modern ways in which we can make the best use of the available display area in a Natural History Museum, so as to create more interest among the general public and to attract scientific research. Like any other display, fossil exhibits have to be theme based and should attract the attention of a wide range of viewers. Displayed fossils should be thoroughly cleaned and glued wherever needed. At least at one place in the museum, one should recreate the sedimentary sequence and show where and how fossils occur in the field, before they are excavated. Reconstructions of two-dimensional and three-dimensional palaeohabitat of important fauna and flora is essential to help the general public to visualize the past environmental conditions. A gallery should have moveable display boxes and adjustable lighting system. An interactive computer with a floor plan is of immense help to the visitors. A children corner, with toys, zig-zag puzzles, and video films of various fossil plants and animals creates a lot of curiosity among the kids. A Natural History Museum has to be dynamic, its collections and exhibits have to be upgraded and updated regularly. The fossil collections are priceless as they are non-renewable. We should have a systematic pest management scheme to save fossils, murals and models from getting destroyed.

**Key-words**—Palaeobiology, Museum, Exhibit, Murals, Models.

## प्राकृतिक इतिहास संग्रहालयों में पुराजीवविज्ञान की महत्ता तथा जीवाश्मों की प्रस्तुति की आधुनिक विधियाँ

राजीव पटनायक

### सारांश

प्राकृतिक इतिहास संग्रहालय वर्तमान एवं प्राचीन दोनों जीवों के अवशेष तथा प्राकृतिक वस्तुओं को प्रदर्शित करते हैं जिनसे हम उनके उद्गम, विकास और परस्परसंबंधता को समझ सकते हैं। पुराजीवविज्ञान समूचे विश्व में प्राकृतिक इतिहास संग्रहालयों का एक समग्र भाग बन चुका है। अतः वर्तमान जैवविविधता को समझने के क्रम में हमें प्राचीन जीवजात को परखने की जरूरत है। समूचे विश्व में डायनोसॉर जीवाश्मों को देखने के लिए संग्रहालयों में लोगों की भीड़ रहती है। विलुप्त कपियों एवं मानवों के जीवाश्म उतने ही ध्यान से देखे जाते हैं जितने उद्बलित करते हैं। वर्तमान शोध-पत्र विभिन्न आधुनिक तरीकों पर विचार करता है जिनमें कि हम प्राकृतिक इतिहास संग्रहालय में उपलब्ध प्रदर्शित क्षेत्र का सर्वोत्तम उपयोग कर सकते हैं, ताकि आम जन में अधिक रुचि जागृत और वैज्ञानिक शोध आकर्षक हों। अन्य प्रदर्शों की भाँति, जीवाश्म प्रदर्श प्रतिपाद्य विषय आधारित ही होने चाहिए तथा दर्शकों की विशाल पंक्ति का ध्यान आकर्षित होना चाहिए। प्रदर्शित जीवाश्मों को अच्छी तरह से साफ करना चाहिए तथा जहाँ जरूरत हो चिपका देने चाहिए। संग्रहालय में कम-से-कम एक स्थान पर, उन्हें उत्खनित करने से पहले, कोई अवसादी अनुक्रम पुनर्निमित्त करे तथा दर्शाए कि क्षेत्र में जीवाश्म कहाँ और कैसे प्राप्त होते हैं। प्राचीन जलवायवी (वातावरणीय) स्थितियाँ दृश्यमान करने को महत्वपूर्ण प्राणिजात और पेड़-पौधों की द्वि-आयामी एवं त्रि-आयामी पुराआवास की पुनर्संरचनाएं आम जनता की मदद के लिए जरूरी हैं। दीर्घा में चल सजावट डिब्बे तथा समायोज्य विद्युत व्यवस्था होनी चाहिए। सभा-कक्ष व्यवस्था सहित एक परस्पर-क्रिया संबंधी कंप्यूटर दर्शकों की असीम सहायता के लिए हो। खिलौनों,

टेढ़ी-मेढ़ी पहेलियों और विभिन्न जीवाश्म पेड़-पौधों और जंतुओं की वीडियो फिल्मों सहित बच्चों का कोना, बच्चों में बहुत जिज्ञासा जगा देता है। प्राकृतिक इतिहास संग्रहालय प्रेरणादायी ही होना चाहिए, इसके संग्रहण तथा प्रदर्श नियमित रूप से कोटि-उन्नत एवं अद्यतन होते रहने चाहिए। जीवाश्म संग्रहण अनमोल हैं क्यों कि ये गैर-नवीकरणीय हैं। हमें जीवाश्मों, भित्ति-सज्जाओं और मॉडलों को नष्ट होने से बचाने के लिए नियमित विनाशक प्रबंधन योजना बनानी चाहिए।

**संकेत-शब्द**—पुराजीवविज्ञान, संग्रहालय, प्रदर्श, भित्ति-सज्जा, मॉडल।

## INTRODUCTION

**N**ATURAL History Museums are the institutions where remains of both modern and extinct organisms are preserved, displayed and studied. Palaeobiology is a very important aspect of natural history. Inclusion of fossils in Natural History Museums allows visitors to relate the modern world and the extinct world. It also enables the visitor to comprehend how plants and animals have evolved through time, and how ever changing environments have effected both ancient and modern biodiversity. Fossils usually create a lot of interest among the visitors and take them on a time travel, showing strange ancient worlds of extinct organisms. Origin of life, evolution of early land animals and plants, catastrophic events such as extinction of dinosaurs at the Cretaceous-Tertiary boundary and human evolution are the topics people are most fascinated with. Although the public does get fascinated with fossil findings but museum visitors do not always understand them. In the present communication, an attempt has been made to suggest various modern methods to exhibit fossils and to disseminate knowledge about them by providing additional information, so that fossils are not seen as only objects of amusement.

A museum exhibiting fossils should generate interest amongst the visitors of all ages. Children learn by doing/creating and enjoy hands-on experience. Piscitelli and Anderson (2001) have found that children's positive perspectives of museums is connected to exhibits with which they could link with their pre-existing knowledge and understandings. Grownup visitors with some knowledge in palaeontology are interested in fundamental aspects of fossil finds. In general, most of the visitors do to not have the patience to read through text pamphlets. Illustrations are therefore, the best guide.

## METHODS OF EXHIBITING FOSSILS

Visitors come primarily to the museum to see real, natural specimens, not artificial replicas. Unlike the case of libraries and archives, where on most occasions a digital replica will serve the same purpose as the original manuscript, in natural history exhibitions no digital replica, or the like, can substitute for a properly prepared real specimen (Valdecasas *et al.*, 2006; Linnie, 2000). The original specimen should be complete as

much as possible. It should be clean and well illuminated when displayed. The display stage of the cabinet should be placed at the right height from the ground and at the right angle, so that the specimen could be viewed comfortably by most of the visitors. As far as possible, covering the surface of the specimen with glue or color should be avoided.

## Murals/Panels

Two dimensional murals/panels are essential in order to display additional information about fossils. For example these are used:

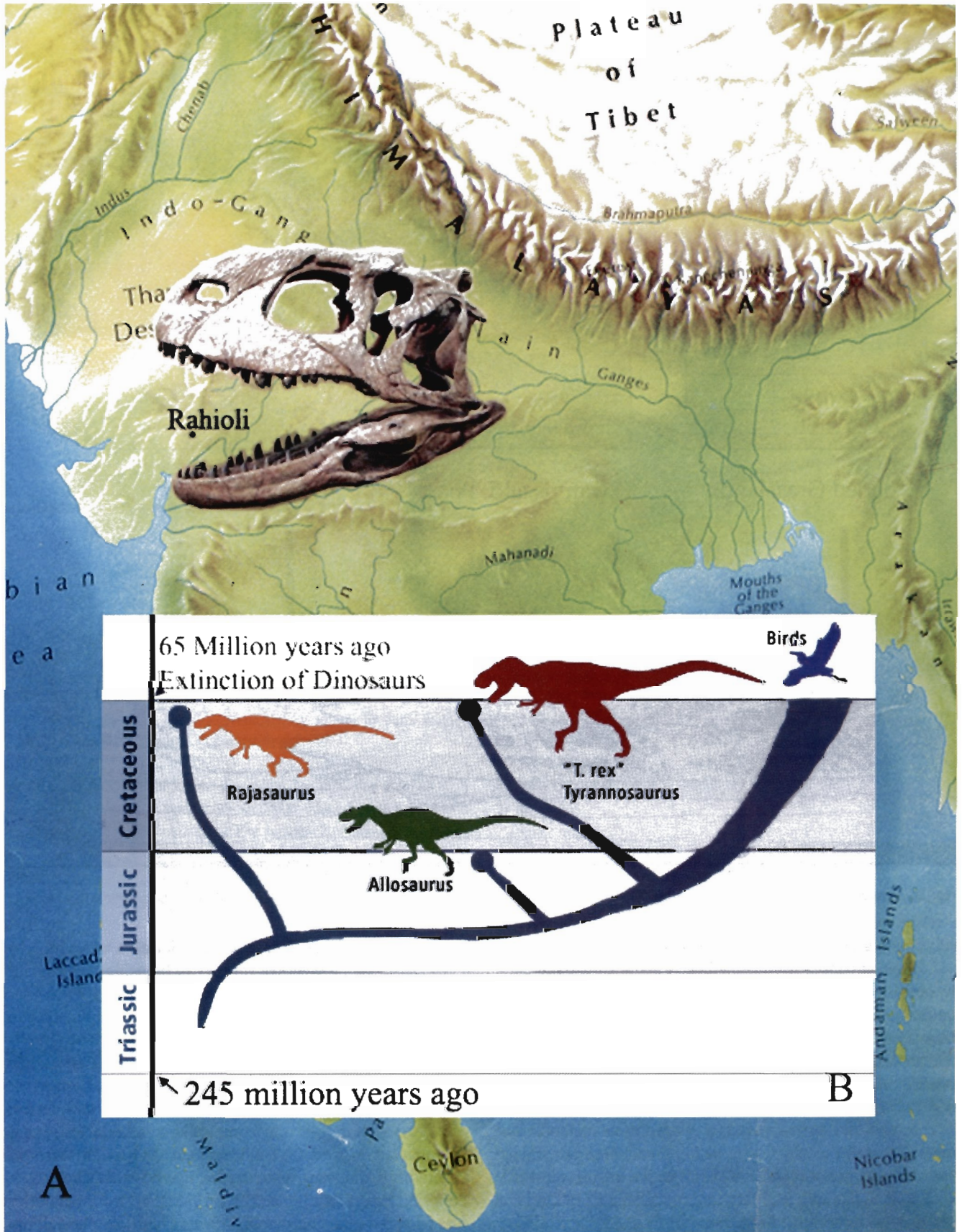
- To provide fossil locality on the maps. Geographical and stratigraphical (approximate age in million or thousand of years) locations offer a visitor with first hand information about where the fossil comes from and what is its approximate age (Fig. 1A, B).
- To provide a brief history of the discovery of the fossil on display.
- To show interrelationships, affinities and origin of ancient animals and plants. It is important particularly for those visitors who have some background of the fossil studies to place the specimen in the animal/plant kingdom (Fig. 1B).
- To recreate its taphonomy, i.e. what happens to an organism after its death and until its discovery as a fossil?.
- To display palaeoecological and palaeoenvironmental conditions in which the organism lived (Fig. 2).
- To provide illustrations to show how it was discovered, excavated, reconstructed and displayed.

## Conventional methods of preparing murals

- Oil Paintings
- Water Color Paintings

Advantages of conventional methods are that these murals can be of any size and usually they are known to last very long. Disadvantages are that they require professional artists to work with a palaeontologist. Also preparation of these murals usually takes a lot of time. One of the main limitations of these murals and panels are that they are not easy to manipulate because redrawing/repainting is a very complicated task. Additionally, the large size oil paintings can be very expensive.

Fig. 1—*Rajasaurus narmadaensis* locality map (A); age and phylogenetic relationship (B) (modified from news.nationalgeographic.com/news/2003/08/photogalleries/rajasaur/).





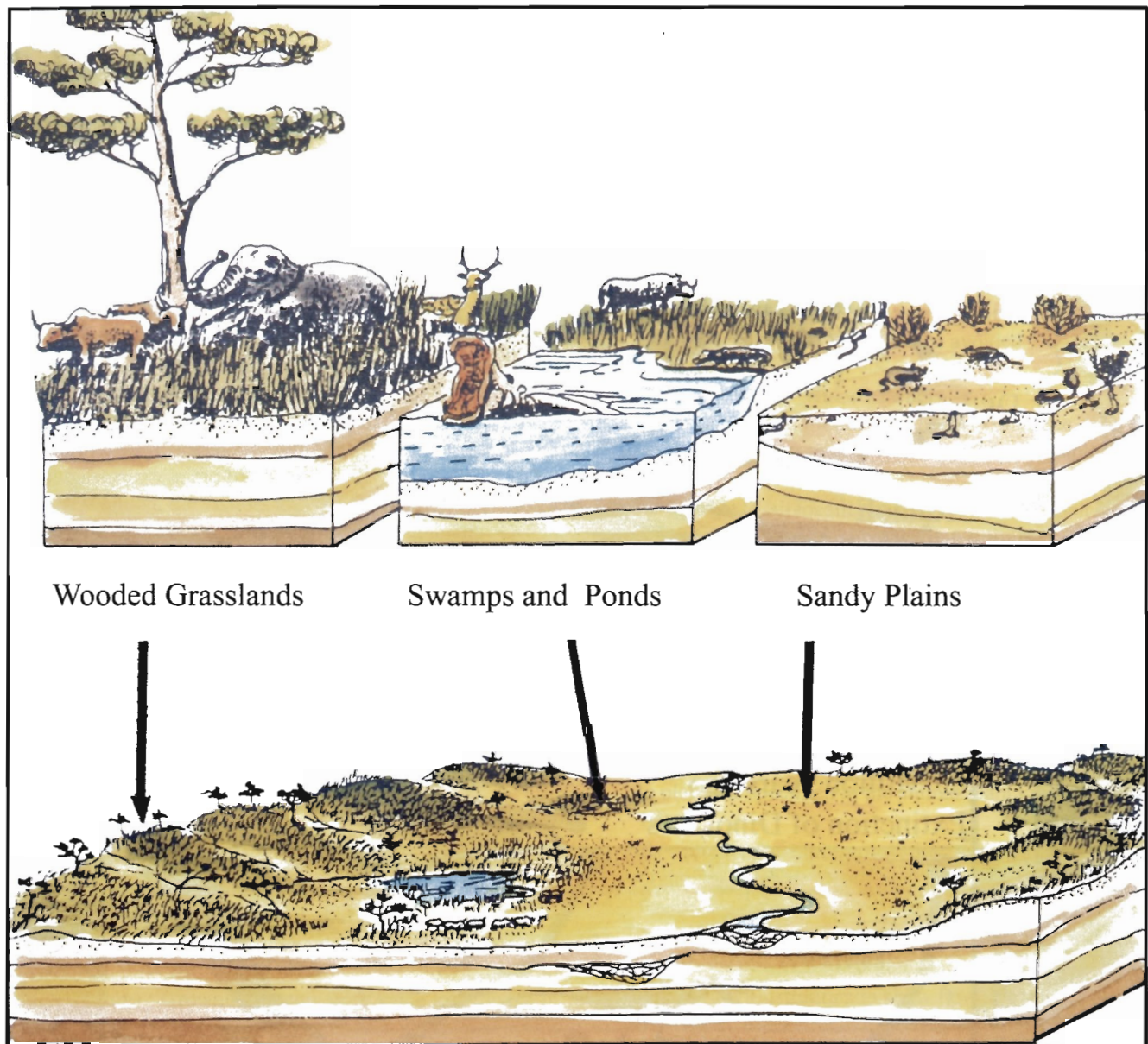


Fig. 2—Palaeoecological condition of Central Narmada Valley during the Middle Pleistocene time (modified after Patnaik, 1995 Fig.11).

#### *Modern method of Computer Graphics*

Main advantage of this method is that it can be prepared by an individual who has some interest in drawings and is well versed in computer softwares such as Adobe Photoshop and Corel Draw. Computer Graphics can be manipulated very easily and are less time consuming. Computer graphic panels can be printed on different media such as Uncoated, Coated, Glossy and Transparent media. These are usually not very expensive as compared to those prepared by conventional methods. The main disadvantages are that large high resolution printers are not available in small cities. The ink on the media could fade with time. Sometimes in order to construct large murals, several pieces have to be joined together.

#### **Three Dimensional Models**

These can be prepared directly or by using molding and casting technique.

The commonly used materials include:

Clay, Plaster of Paris, Bronze/Steel, M-Seal (Epoxy compound) and Fiber Glass.

#### *Direct Method*

The author used the commonly available M-Seal to reconstruct a model of *Rajasaurus narmadaensis*, the carnivorous dinosaur recently discovered from Cretaceous deposits, Near Rahioli (see Fig.1), Gujarat. First an armature was prepared using thermocol, iron wire and nail. The nail was

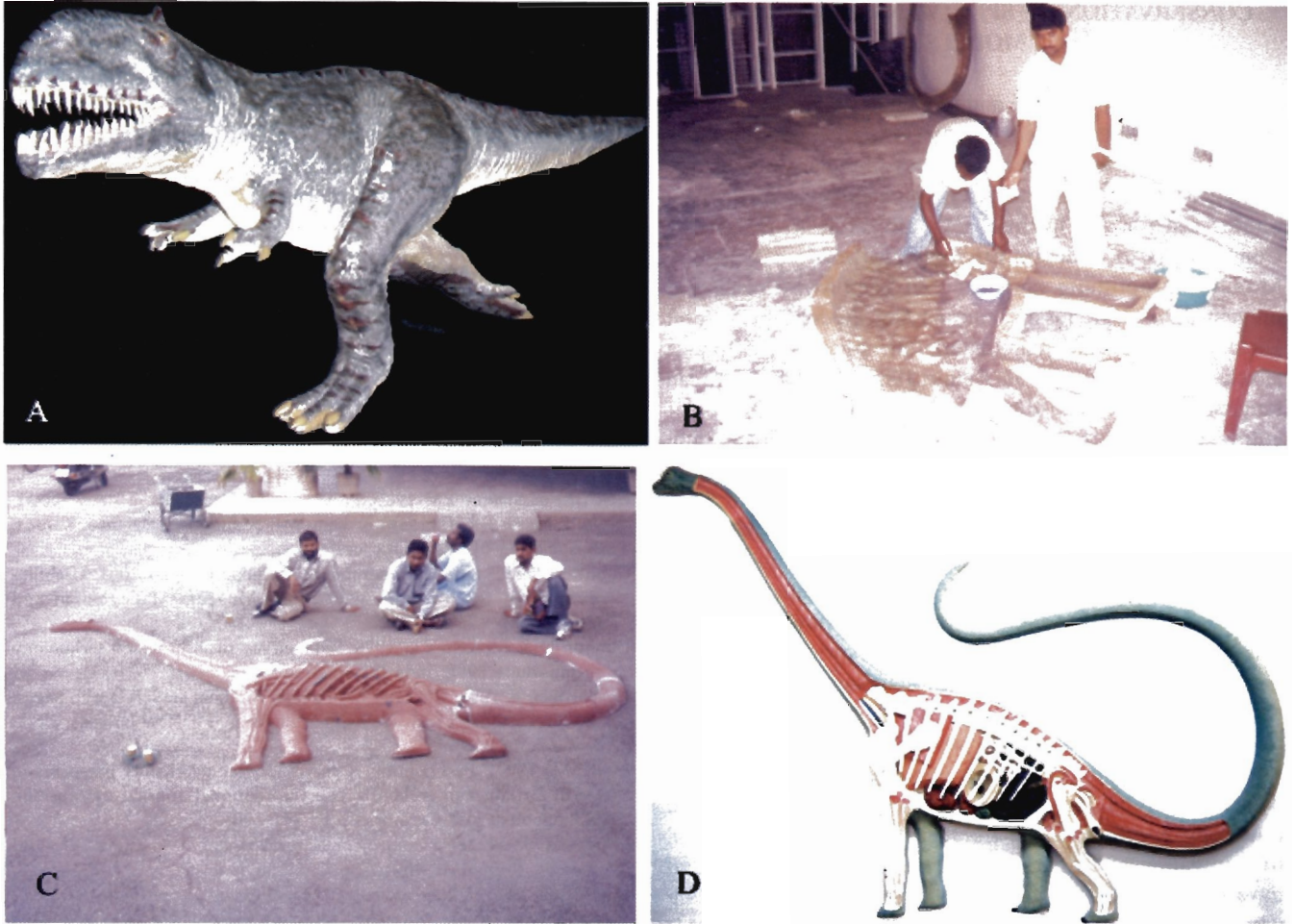


Fig. 3—*Rajasaurus narmadaensis* model (A); Plaster of Paris mold being filled with fibreglass (B); Fibreglass cast coated with iron oxide (C); Acrylic painted and displayed model (D).

put into a wooden block to form the base of the dinosaur. A layer of the common epoxy M-Seal was coated on the armature to give a preliminary shape to the model. Subsequently, more layers of M-Seal were used to develop the finer details of the skull, teeth, skin, feet, tail and nails. Finally acrylic paint was used to color the model (Fig. 3A).

#### *Molding and Casting Technique*

This method is preferred over direct method because it allows a lot of room for manipulation at the first level of the development of the model. Here an example is provided where the author was actively involved in the preparation of a model showing internal organs of a dinosaur displayed at the Government Museum of Natural History, Chandigarh. First a model with all the intricate details was prepared using clay, then it was coated with Plaster of Paris (POP). The soft clay was removed to make the mold. Into this mold fibreglass sheets were placed and then epoxy resin was poured (Fig. 3B). After 24 hours, the POP was dismantled to remove the fibreglass cast. This cast (Fig. 3C) was coated with red iron oxide paint.

Finally the model was painted using acrylic paint and displayed (Fig. 3D).

#### **DIGITIZATION OF MUSEUM COLLECTION**

By digitizing the catalogue of the museum and including photos of all the specimens of the museum, one can preserve and document important database. Digital photography has made this process very cheap, easy and less time consuming. Museums and galleries have now adopted the Web as a mode of communication (Cunliffe *et al.*, 2002; Dawson & McKenna, 1998). Virtual visits to museums have become more popular than physical visits (Haapalainen, 1999; Sphaera, 1999). An Interactive computer (automation) with the floor plan is very useful these days to provide the setup of the museum. Also additional information can be supplied as it is easier to navigate with hypertext links. Using mice are becoming unpractical in public settings, therefore “touch screens” are the best alternative.



## CONSERVATION OF SPECIMENS, MURALS AND MODELS

Fossils are invaluable and are the heritage of a country. We have to preserve them for the future generations. It is always better if fossil specimens and fibreglass models are displayed in glass cabinets. Plastic-laminated two dimensional murals last for a long time. It is advisable to install Air Conditioners to maintain air moisture inside a Museum. Monitoring optimum moisture can keep away pests and prevent damage of fossils, murals and models. In Natural History Museums the main material damages are due to pest attacks (Bell & Stanley, 1980; Linnie, 1987; 1994). Damage can range from minor and isolated incidents to the destruction of entire collections. Chemical treatments for the prevention, control and eradication of pests have been the most conventional practice (Linnie, 1996). Disadvantages of these methods, as summarised by Linnie (1996), are: "Possible long-term damage to specimens (discolouration, colour fading, molecular and structural changes) and to associated materials (softening of adhesives, metal corrosion, structural weakening, brittleness); Possible health hazards (respiratory damage, dermatological impact, throat and eye irritant, potential toxic and carcinogenic effect); Effectiveness (possible short residual life, effects on certain pest species and development stages not fully investigated, some chemicals effective as deterrents only); Labor intensive (require regular application, time consuming); and Cost and legal implications (high cost of fumigation and treatments, relative labour costs, trend towards reduced threshold limits, potential litigation for unsafe practices)". Therefore an 'Integrated Pest Management' (IPM) strategy has been proposed by Linnie (1996) to avert/minimise the risk of pest attack.

## CONCLUSIONS

Palaeobiology has become an essential element of most of the Natural History Museums world over, mainly because it provides a window to the past life in general and those of dinosaurs and humans in particular, environment and catastrophic events like the Cretaceous-Tertiary Extinction. Palaeobiological exhibits should be idea-based and to make them more informative we should use two-dimensional murals and three dimensional models. Fossil collections in Natural History Museum have to be vibrant and restructured regularly. Digitization of the catalogue, photos of the fossils and putting them on the web will not only help preserving the data-base,

but also generate awareness among virtual visitors. We should follow a strict pest management procedure to save the collection and associated display items from getting destroyed.

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