

# The implementation of didactic collections and guidebooks of micropaleontology as a tool in teaching and research in Geosciences

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**Abstract:** The aim of paleontology is the understanding of the life history on Earth, its development and processes along the geologic time. Hence, it involves diversified fields, being the micropaleontology one of them, whose focus lies on taxonomy and applications. The micropaleontology is, sometimes, poorly developed in an institution due to the scarcity of specialists. In order to fill this gap, a didactic collection was prepared to facilitate the divulgation of the micropaleontology in the university. Due to the necessity of increase in the knowledge on microfossils among graduate and undergraduate students, an extension project of microfossils didactic collection was carried out at the Geology Department of the Universidade Federal de Pernambuco. For each fossil group (i.e. ostracods, foraminifers, calcareous nannofossils, charophytes, radiolarians, diatoms, conodonts, palynomorphs, fish fragments, echinoid spines, sponge spicules and mollusks) micropaleontological slides were assembled. The origin of the material is varied, with specimens from several Brazilian sedimentary basins and even from other countries. The collections consist in numbered and identified slides, besides the material necessary for their manipulation, such as brushes and spare slides. In each fossil group, the specimens are organized according to the morphology, taxonomy and age. Each slide has instructions for classes inserted in a Guidebook of Micropaleontology thoroughly illustrated, with general characteristics of each fossil group and the respective methodology for sample preparation. The collection is intended to be used in practical classes, workshops and short-courses, with biological, petrographic and stereoscopic microscopes, for observation of the morphological structures, identification and solution of problems proposed in the guidebook. Besides the improvement in the paleontology teaching, these collections will also contribute to the qualification of the students as future professionals.

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**Thematic line:** Geosciences in Higher Education

## 1. Introduction

The paleontology involves several scientific areas, with the possibility of being taught as an interdisciplinary theme integrating many aspects of the history of life on Earth, such as the biodiversity, the geologic time, biologic evolution and paleoclimates (Cruz & Bossetti 2007). Among the several subdivisions of this science, the micropaleontology should be highlighted due to its applicability to solve geological problems, yet poorly explored in some institutions due to the absence of specialists on the subject.

In a tentative to solve this issue, micropaleontologists of the Universidade Federal de Pernambuco, elaborated a didactic collection of microfossils and a guidebook thoroughly illustrated, to turn easier both classroom and outside classes, as well the divulgation of the micropaleontology in the

university. The project includes, moreover, activities of picking and identification of microfossils (ostracods, foraminifers, calcareous nannofossils, charophytes, radiolarians, diatoms and palynomorphs), and examples of use of the micropaleontology. It seeks also the participation of students in actual investigations allowing the development of scientific skills, increasing the opportunities of dealing with situations which would improve their ability to deal with scientific problems. The teaching process based on investigation allows the improvement of the scientific reasoning and learning, as well as the cooperation among the students (Zômpero & Laburú 2011).

## 2. Material and Methods

The didactic collection of microfossils was developed during an extension project of the

UFPE. Specimens (11 in total) of ostracods, foraminifers, calcareous nannofossils, charophytes, radiolarians, diatoms, cyanobacteria, palynomorphs and a group of diversified taxa (bryozoans, molluscs, fish teeth, among others), besides the picking material (Fig. 1, Tab. 1).

The origin of the specimens is varied, both from Brazilian basins and other countries. One of the phases of the project involved the preparation of optical microscopy slides for calcareous nannofossils, palynomorphs and ostracod appendages. In the remaining groups, the specimens were fixed in cardboard slides. Afterwards, didactic guides for identification of the specimens in the slides were prepared, as well as the elaboration of practical activities involving not only the identification of the microfossils, but also their application.

The collections have also a guidebook of practical activities which compose the Guidebook for Practical Classes and the Practical Guide of Micropaleontology (Figs. 2, 3). They contain practical activities (Fig. 2), procedures for sampling preparation (Fig. 2B-C), guides for taxonomic identification (Figs. 2B, C), and guides for identification of the cells/slides of the collection (Fig. 3).

In the cells/slides the specimens are organized according to their respective morphology, taxonomy and age, all easily identified with the use of the guide. For the foraminifers, different types of cells have been prepared according to the habit of each species (i.e. benthonic or planktonic); for the ostracods, the age was taken into account for the assembling of the slides (Paleozoic and Meso/Cenozoic), besides the study of the appendages (glass slides).

For the study and identification of calcareous nannofossils and palynomorphs the slides have been divided into four quadrants, in order to facilitate the location and identification of the specimens.



Figure 1. Setting and identification of kits in the didactic collection

### 3. Results and Discussion

This project includes not only practical activities for picking and identification of microfossils (Fig. 3A-C), but also approaches for micropaleontology application. The student will have an organized record of the practical classes with invaluable information on morphology and application of the distinct fossil groups. The didactic collection was planned for the academic community, especially of biology and geology areas. Its preparation of this

Table 1. Representative groups of the didactic collection

GROUPS		QUANTITY	
		Cells	Slides
<b>Ostracoda</b>	<i>Appendages</i>		10
	<i>Paleozoic</i>	10	
	<i>Meso-Cenozoic</i>	10	
<b>Foraminifera</b>	<i>Benthic</i>	10	
	<i>Planktonic</i>	10	
<b>Palynomorph</b>			20
<b>Cyanobacteria</b>			2
<b>Charophyta</b>		10	
<b>Radiolarians and Diatom</b>		10	
<b>Calcareous Nannofossils</b>			10
<b>Several</b> (bryozoans, molluscs, radiolaries, bivalves, fish teeth, among others)		10	
<b>Bioclasts</b> (sediment for sorting)		10 eppendorf tube	
<b>TOTAL (Cells + Slides)</b>		112	

collection involved both graduate and undergraduate students from diverse areas, such as biology, geology, oceanography and geography.

The practical activities proposed are dynamic and applied. The divulgation of these activities associated to other academic ones, stimulate the development of group activities, the pro-activity, the exchange of information and the revealing of new abilities.

This collection can be used for the development of both classroom and outside activities, such as the identification of specific taxa, the study of morphological details, copying and identification of impressions etc. There are unlimited approaches to stimulate the students in practical activities and workshops.

This collection has the detailed methodology of preparation for each group. The illustrations intend to turn easier all the activities proposed, stimulating the participation of the students and facilitating the learning processes (Bergqvist & Prestes 2014). The collection will be used both in practical classes and workshops, with biologic, petrographic and stereomicroscopic microscopes.

#### 4. Conclusions

This collection is continuously updated, due to the broad spectrum of knowledge that can be reached based on the study of microfossils. The devel-

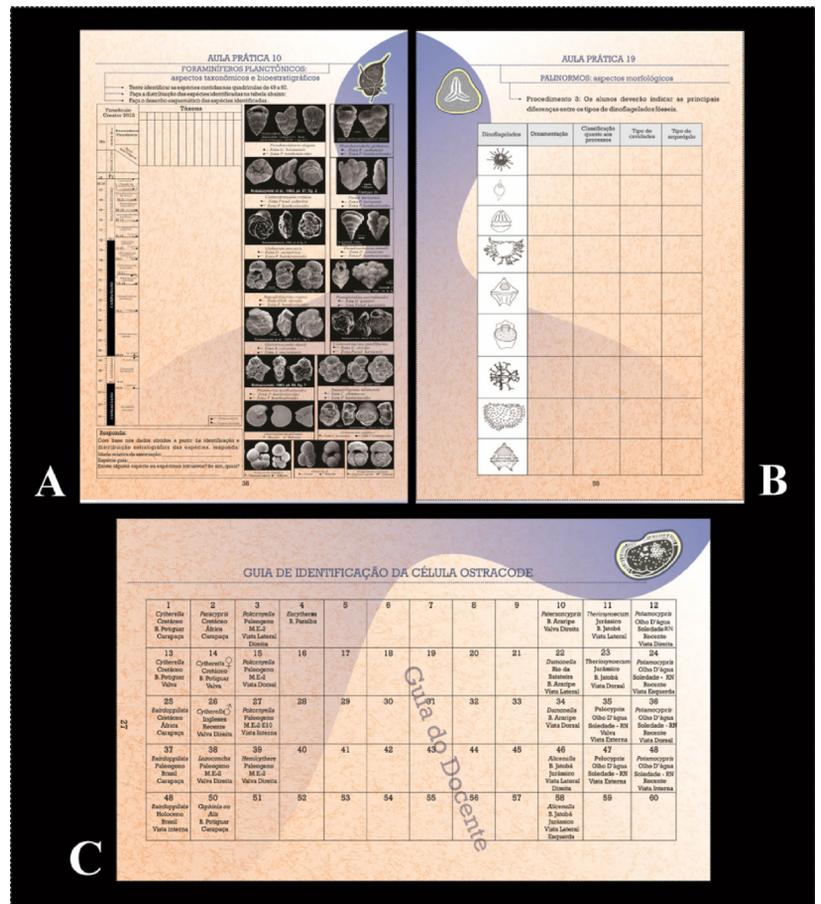


Figure 2. Practical Guide to Micropaleontology. A - Preparation stage of the samples; B - Morphological guide; C- Taxonomic identification of specimens

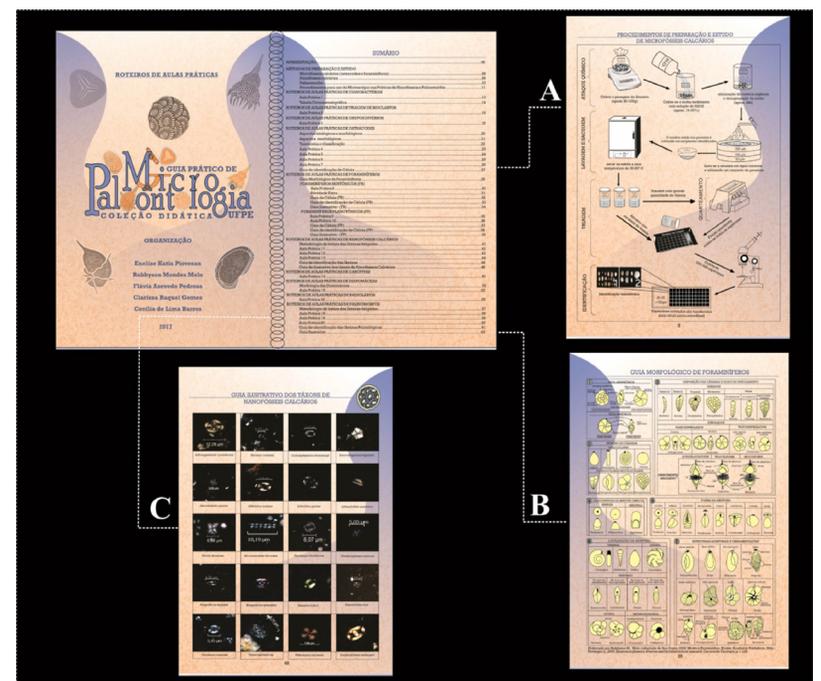


Figure 3. Practical Guide to Micropaleontology and Practical Guidebooks. A-B - Proposal of practical activities; C - Cell Identification Guide

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opment of this project will result in more visibility to the micropaleontology and its importance. It will also constitute an instrument for the improvement of the paleontology teaching and, consequently, for the professional qualification. The use of this didactic collection overcomes the classroom boundaries and promotes a more constructivist outlook in the education, which is in accordance to the present world trends.

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