

## **Les Planches Inédites de Foraminifères d'Alcide d'Orbigny—À L'aube de la Micropaléontologie**

### **The Unpublished Plates of Foraminifera by Alcide d'Orbigny—the Dawn of Micropaleontology**

**Reviewed by Jere H. Lipps**

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As the Enlightenment ended, Paris was a busy place for science, and the city fostered many famous scientists, including paleontologists and biologists. Inspired by Buffon (September 7, 1707–April 16, 1788) and his enormous 36 volume work *Histoire naturelle, générale et particulière* (1749–

1788 with 8 additional volumes published posthumously by Lacépède), their contributions led the world with paleontologic and biologic discoveries and contributions in the 18th and 19th centuries. Their names are well known to biologists, pale-

ontologists and geologists—Lamarck, Cuvier, Letreille, and St. Hillarie, among others. Streets near the Muséum national d'Histoire naturelle, where most worked, bear the names of the most famous of these men, and the Jardin des Plantes abounds with their statues and busts. Among them, but perhaps not quite so well known in general nor honored by a street name, but famous among paleontologists nevertheless, is Alcide Dessalines d'Orbigny (September 6, 1802–June 30, 1857), a paleontologist and naturalist extraordinaire (Vénec-Peyre 2002a). His bust does grace the side of the Galerie de Paléontologie et d'Anatomie Comparée, where he looks over the Jardin des Plantes and statues of both Buffon and Lamarck at opposite ends of the magnificent Allée Buffon (Figure 1).

Alcide d'Orbigny did many things in his 55 years on Earth. He started at an early age working with his father, a doctor, who had a microscope.

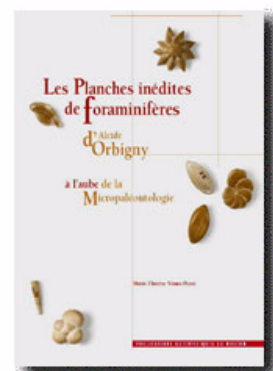
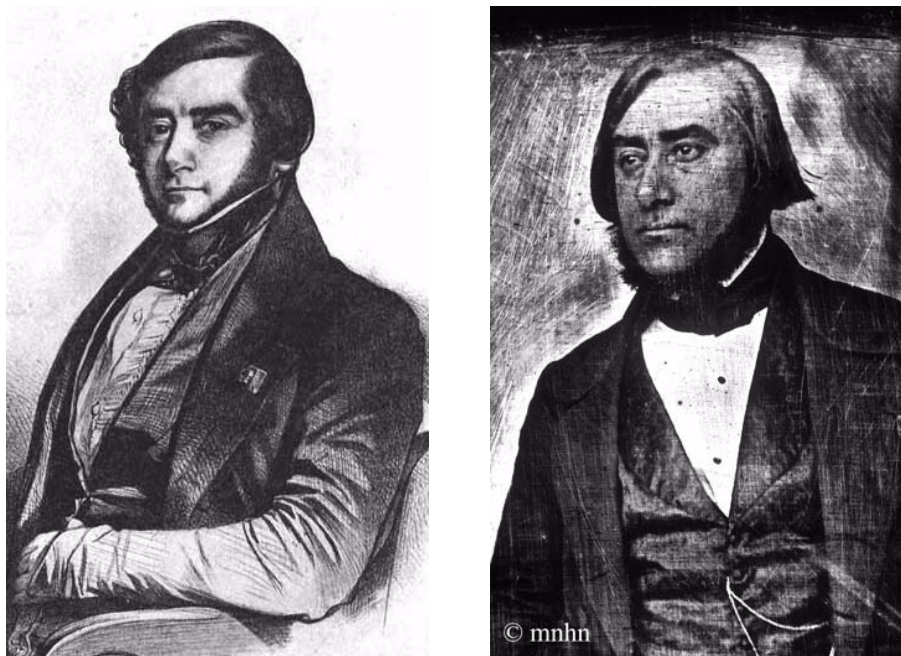


Figure 1. The bust of Alcide d'Orbigny mounted in one of the windows on the side of the Galerie de Paléontologie et d'Anatomie Comparée facing the Jardin des Plantes where he overlooks the Allée Buffon and the statues of Buffon and Lamarck. Stains on his face make it appear as if he were crying, perhaps because he did not really finish his scientific plans or because he was never admitted to the French Academy of Sciences in spite of several attempts to get him in.

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**Figure 2.** Left, Alcide d'Orbigny as a young man about the time just before he sailed for South America on the Museum's expedition to the southern part of that continent. Right, age 37 several years after he returned from the expedition to Paris (illustration by Emile Lassale, 1839).

The two of them examined beach sand from the shores near La Rochelle where they lived, and Alcide collected fossils from the region. This started a life-long interest and passion for natural history that became increasingly focused on paleontology. He worked in natural history, geology, paleontology, anthropology, linguistics, and taxonomy and systematics, publishing 310 monographs and papers and collecting thousands of specimens that others studied (Heron-Allen, 1917). Few major phyla of animals were missed by him, and he wrote on other topics, such as plants and foraminifera (Barta-Calmus 2002). His first paper was published in 1824 when he was just 22 (Figure 2) and he continued his output throughout his short life.

His publication of descriptive material was incredible with thousands of species described, many stratigraphic type sections located and described, the occurrences of fossils documented chiefly in France, as well as his outstanding *Le Voyage dans l'Amérique méridionale* in 11 volumes published between 1835-1847, and covering the biology, ethnology, anthropology, paleontology, and other aspects of Chile, Peru, Argentina, Uruguay, and especially Bolivia. He also received gifts of material from Columbia, Brazil and Cuba. Charles Darwin admired these volumes as one of the most extraordinary works of science to that date (Vénec-Peyré, 2002a). Indeed it was, in more than just a

paper publication. As with all his work, he brought his specimens, some 9330 of them, back to Paris and deposited them in the collections of the Muséum national d'Histoire naturelle, where they are still accessible to scientists today. Upon his return to Paris, he embarked not only on finishing his South American work, but also in describing the fossils of France. Again, he produced enormous works (*Paléontologie française*). *Description zoologique et géologique de tous les Animaux Mollusques et Rayonnés fossiles de France* in 43 volumes from 1840 to 1855, *Prodrome de Paléontologie stratigraphique universelle des Animaux Mollusques et Rayonnés* in three huge volumes, and the *Cours élémentaire de paléontologie et de géologie stratigraphiques*. In these and many shorter papers, he documented the fossils, their stratigraphic occurrences, inferred their biogeography and established a scheme of 27 stratigraphic stages and "creations" of new species. Creations was a unfortunate choice of words, for it led to the mistaken idea that he was a creationist but he was rather interested in the origination of new taxa as stratigraphic markers. He made no inference about how these new species were "created" at each of his discontinuities (Fischer and Vénec-Peyré, 2002). "Appeared" may have been a better word, for that seems to be what he meant. His work on fossils made France one of the paleontologically



**Figure 3.** Bottles storing foraminifera on one wall of the *Salle d'Orbigny* in the Galerie de Paléontologie et d'Anatomie Comparée, a building of the Muséum national d'Histoire naturelle. Notice the great variety of bottles d'Orbigny used and the handwritten labels.

best known places, even today (Taquet and Vénec-Peyré, 2002). Napoleon III created for him the Chair of Paleontology in the Muséum national d'Histoire naturelle, a position he clearly earned but an appointment which was not much appreciated by his colleagues. Unfortunately, this recognition came only three years before his death in 1857.

D'Orbigny made very large collections of fossils that are now housed in the Galerie de Paléontologie et d'Anatomie Comparée, a separate building with exhibits, research areas and specimen storage in the Jardin des Plantes in SE Paris. D'Orbigny's collection included more than 14,000 species and over 100,000 specimens not counting innumerable foraminifera stored in assorted glass bottles (Figure 3). Many of them are kept in a special room *Salle d'Orbigny* (Lauriat-Rage, 2002) where they are available for study.

Foraminifera were first in Alcide d'Orbigny's life. He learned about them when he helped his father back on those beaches at La Rochelle to collect and observe sand. La Rochelle, a major port on the Atlantic coast of France at the time, had visits by ships from all over the world. From the sea captains, Alcide and his father also received material that they viewed together with the father's microscope. Young Alcide thus had opportunity to see many foraminifera from a wide variety of

places. He learned them well too for, as a pre-teen and teenager, Alcide drew illustrations of foraminifera for his father.

Although d'Orbigny's paleontologic and biologic contributions are immense and should be understood by all paleontologists interested even just slightly in the history of their field, this review concerns d'Orbigny's first major scientific contribution, published at the young age of 24 but actually started when he was 11 and working with his father. This work is the micropaleontologically-famous *Tableau méthodique de la classe des Céphalopodes* (Vénec-Peyré, 2002b, 2004). In this 59-page paper he established the order foraminifera, with five families and 64 genera with 544 species distributed among them. Like others before him, he considered the foraminifera to be miniature cephalopods, but he easily accepted the later observations of his compatriot Dujardin (1835a, 1835b) that these were not higher animals at all but were single-celled organisms. The publication illustrated few of the forms he described, although it was the basis along with later publications on foraminifera for his title "The Father of Micropaleontology" (LeCalvez, 1974) and J.J. Galloway's (1933) opinion that d'Orbigny was the "greatest student of foraminifera" of all time. Only 8 plates of 31 species accompanied the paper. This led to much later speculation about the proper assignment of taxa



and, perhaps, to the English claim that he made “species with reckless indifference to the innumerable inosculating forms” (Williamson, 1858) and that such “simple organisms” could not possibly contain so many genera and species (Carpenter, Parker and Jones, 1862), a view also adopted by Darwin (1866). Deshayes (1830), another French biologist, thought d’Orbigny’s classification “unnatural”, “vicious,” and “defective.” Had d’Orbigny been able to publish all the illustrations that he had so beautifully prepared along with the text, his critics may have understood his enthusiasm, and ultimately the correctness, of his judgments. But the Museum had planned an expedition to South America and it invited young d’Orbigny to be the naturalist, a position that he relished. He rushed to get ready for this voyage and he did not properly finish his paper; it was published just before he departed for South America. Nor did he publish his illustrations when he returned some seven years later. Instead, he became increasingly involved with description of his South American explorations, with other collections sent to him, and in documenting the paleontology of France. The 45 missing plates were never published. Workers ever since have tried to understand what he had based his descriptions on, and several attempts at publishing the remaining 45 plates were all failures.

Marie-Térèse Vénec-Peyré, the micropaleontologist at the Muséum national d’Histoire naturelle, who is charged with the care of the d’Orbigny collection including the original illustrations d’Orbigny had prepared for his first publication, has now completed the considerable job of publishing the plates of the *Tableau*, 179 years later. Vénec-Peyré has produced a wonderful book showing all missing plates of d’Orbigny in their original colors, the way in which he went about making his plates, an updating of the taxonomy of each species, comments on the existing d’Orbigny collection including the models that he constructed of foraminifera, and along with various historical descriptions. The book will certainly clarify many of the questions foraminiferal workers have long had about d’Orbigny’s species.

Vénec-Peyré’s book is subtitled “the birth of micropaleontology”, referring to the importance of the paper for later work. D’Orbigny’s work was used by later British (in spite of early criticisms by Carpenter, Williamson, Parker and Jones, Brady used many of d’Orbigny’s names in his description of the foraminifera of the *Challenger* Expedition), German, Italian, and American micropaleontologists. Now d’Orbigny’s name appears in most pub-

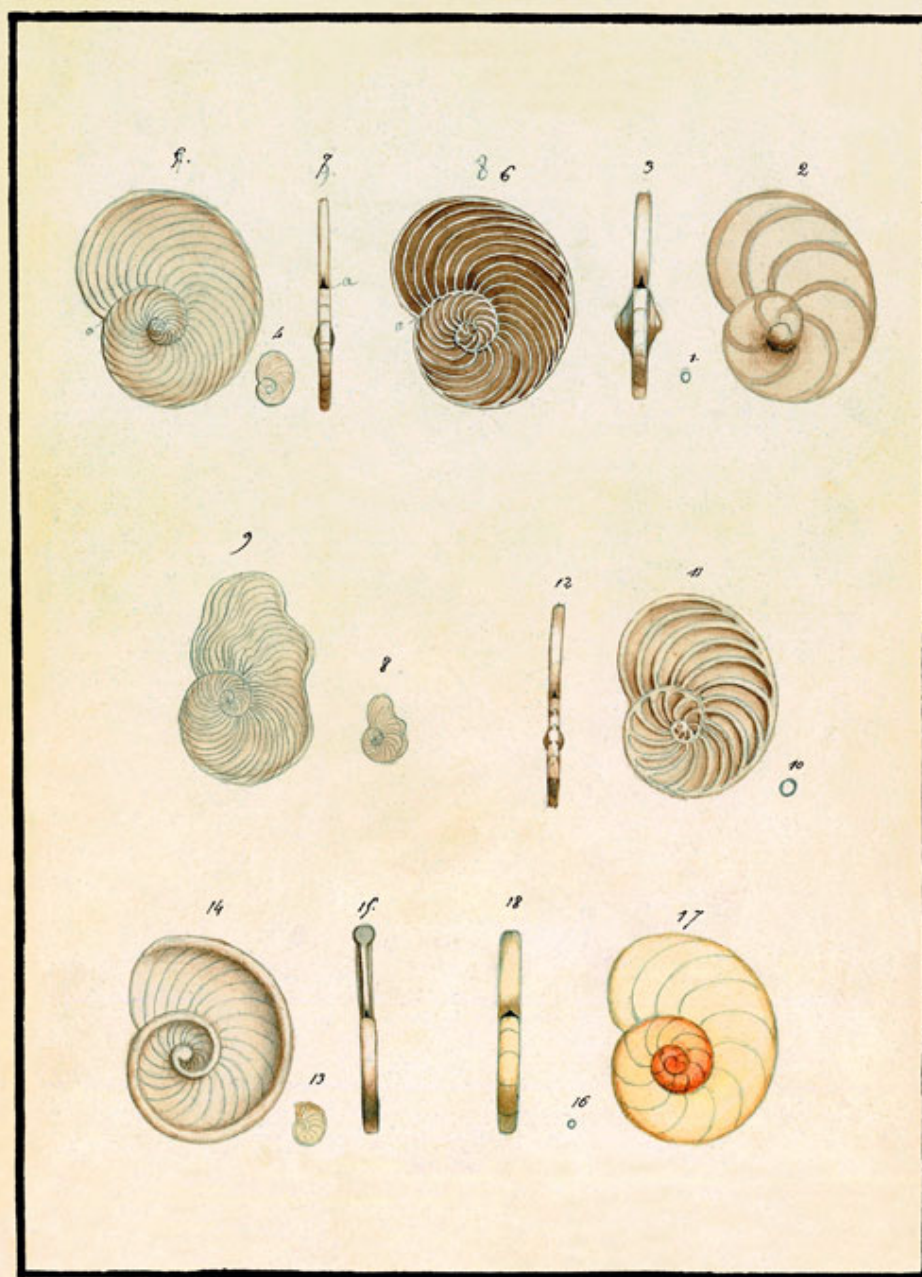
lished faunal lists of foraminifera as the author of one or more species therein. D’Orbigny went on to publish a total of seven large monographs on foraminifera and he used them in a stratigraphic context, comparing the faunas to others elsewhere.

The book also provides lessons in scientific illustration that we have forgotten in the modern age of scanning electron microscopes and digital imaging of various sorts. This in itself is well worth looking at for d’Orbigny had achieved a high level of organization and technique in developing his mostly unpublished plates. His illustrations were assembled in fifty-seven “booklets,” one for each genus he considered and all the species he assigned to it. From these, he produced his final plates. The booklets are historical documents and excellent lessons in how to draw natural history specimens, as well as valuable insights into what he observed about foraminifera. Only two are included in this book of finished plates, but the other 55 should be published in their entirety, perhaps right here in *Palaeontologica Electronica*, for their historical and current biological value.

The plates in the book show interesting methods. Each set of drawing is framed in a thick line, labeled at the top above the line with the generic name, and species names below the line at the bottom. Each specimen was drawn at a much larger size, naturally, and to give the viewer a correct impression, d’Orbigny also drew the specimen at natural size (Figure 4). Although most of these natural size drawings are merely dots, for the large specimens they are tiny miniatures of the larger drawings (Figure 5). The most interesting use of this latter technique is on plate 20 showing *Rosalina*, a genus whose species attach themselves to shallow-water algae. On that plate, then, d’Orbigny drew two algal fronds with small specks indicating the foraminifera. These are then magnified to show the attachment in dorsal and lateral views. Three other illustrations on the plate show a free specimen from all sides. D’Orbigny was a careful observer and he wanted his readers to appreciate the relationships of the foraminifera to their surroundings.

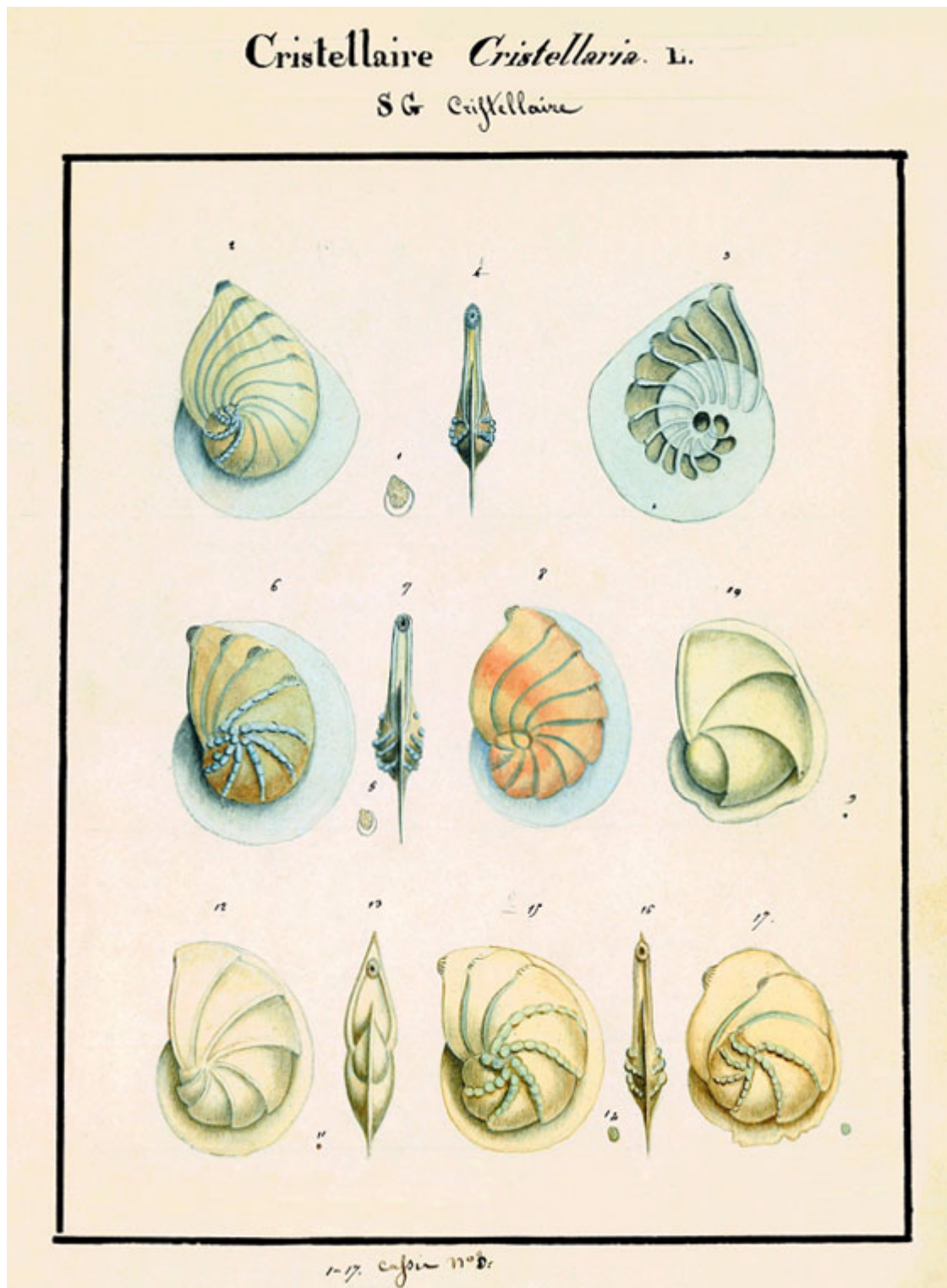
D’Orbigny was creative when it came to trying to get other people to understand foraminifera. He knew that microscopic objects were hard for viewers to visualize and that two-dimensional images of them may not be so easy to understand, so he made models of 100 of his foraminiferal species that could be handled and studied without a microscope. These were sold in four sets of 25 each, and many made their way to other centers of study

# Operculine *Operculina* d'Orb.



1-5. *Complanata* n° 1  
 6-12. *Costata* n° 2  
 13-15. *Thouletii* n° 3  
 16-18. *Madagascariensis* n° 4

**Figure 4.** Plate 28, *Operculina*, showing the details of d'Orbigny's drawings intended for the Tableau. Note the actual size drawings associated with each specimen drawn at a much larger size. Some are miniatures of the larger illustrations while others are merely pencil points. The the actual size drawing of each specimen gives the viewer a proper perspective of the foraminifera.



**Figure 5.** Plate 34, *Cristellaria*, a second example of the plates, showing the magnified, colored drawings.

in Europe. They were used extensively by micropaleontologists to understand d'Orbigny's concepts of the species, and for teaching about foraminifera. This teaching strategy is still commonly used in classrooms around the world where copies of d'Orbigny's models may be used.

D'Orbigny left a huge scientific legacy in many fields. This review merely points out that, if he is to be considered the "father of micropaleontology", then he must also be considered the father of many other subdisciplines of both paleontology and biology. He established the field of biostratigraphy, the concept of stratotypes, and correlation of similar strata across Europe. His contributions to our field were enormous. All paleontologists should revisit his work, if just briefly, to gain appreciation of the remarkable achievements of d'Orbigny. This book therefore should be studied as an example of the care that this early paleontologist took with his work. Vénec-Peyré has done us all a service by assembling d'Orbigny's first plates and placing them and their author in historical perspective. The book is beautiful, well assembled and organized itself, with text in both French and English, and moderately priced. It should be in anyone's library who is interested in the history of paleontology or scientific illustration, to say nothing of foraminifera.

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