

Preface

In a preface, an author generally briefly explains what inspired him to write a book. I cannot do this without providing a brief history of discoveries and ideas that have fuelled the fire of the South American tradition of research on insect fossils, and how I came across these traditions and some of its pioneering representatives.

Whether or not it has been recognized, there is a South American school on continental ichnology, that is responsible for the development of pioneer work on paleosols and their trace fossils. The origins of this school can be traced back to the nineteenth century. Contemporary representatives include Eduardo Bellosi, Luis Buatois, Gabriela Mángano, Ricardo Melchor, Renata Netto, Mariano Verde, and myself among others, who organized the First International Congress on Ichnology (Ichnia 2004) in Trelew, Argentina. Surely, this book and my embracing of insect trace fossils research, either consciously or unconsciously, has something to do with that tradition. It is a tradition that in the past lacked any direct connection between masters and disciples. This field has developed under a “pick up the gauntlet” style. We are not sure if the Uruguayan Lucas Roselli had read Serafin Rivas’s first mention of insect fossil nests in 1884 when he wrote his first paper on insect paleoichnology in 1939. Serafín Rivas (1838–1913) was a Spanish physician who lived in Uruguay and mentioned for the first time (to my knowledge) insect (hymenopteran) nests, from paleosols worldwide. They were from the red sandstones of the Asencio Formation of Uruguay. His work had been signed on February 1881, but it was actually published by 1884. It seems like a very simple discovery or interpretation today, but in the nineteenth century to even think that insect nests could be fossilized and found preserved in rocks was an impressive intellectual advance. Even when Asencio’s nests look very much as extant ones just transformed in rock, their complexity leaves few doubts on their origin. It is also unclear whether the Italian-Argentinian geologist and paleontologist Joaquin Frenguelli (1883–1958) knew of Rivas’s note when he described fossil bee cells from the limestone formations of Uruguay for the first time in 1930 (Chap. 10). Frenguelli went on to publish pioneer works on insect fossil nests from hymenopterans, coleopterans, rhizoliths, and paleosols from Patagonia and other localities of Argentina (Chap. 20). While these works might seem simple, they were groundbreaking and inspirational achievements

of their time. The phrases *nidos de véspidos solitarios* meaning solitary wasp nests, and *nidos de escarabeidos* meaning scarab nests or dung beetle nests have been used in the South American geological literature until now. We do know, however, that Frenguelli was aware of Roselli's work because of an article published in 1946, in which the former argued against the use of naming trace fossils as Roselli did, and also criticized his interpretations of some insect nests.

Francisco Lucas Roselli (1902–1987), a self-taught Uruguayan paleontologist, naturalist, blacksmith, and professor of natural sciences in Nueva Palmira first described and named what is still the largest number of insect trace fossils from paleosols. In 1939, Roselli named four ichnogenera and five ichnospecies of insect nests and pupation chambers from the Asencio Formation of Uruguay and almost half a century later described 13 ichnogenera and 15 ichnospecies of trace fossils attributed to bees, dung beetles, cicadas, and chafers right before he passed away. His work is housed presently at the Museo Municipal Lucas Roselli in Nueva Palmira (Chap. 20). By the 1930–1940s, a North American researcher—William Brown—had concurrently described and named fossil bee cells and a wasp nest from the USA (Chap. 10).

Between the years of 1971–1972, other geologists picked up the gauntlet and demonstrated that the tradition was still alive. Mario Teruggi (1919–2002) and Renato “Tito” Andreis (1935–2009) started their studies on paleosols. They published several papers including one at the “Symposium on the Age of Parent Materials and Soils”, held in Amsterdam in 1970, which set the foundation for the present state of research on paleosols (Chap. 20). Andreis, who recognized Frenguelli's pioneer work, became an expert on paleosols and included dung beetle brood balls in some of his contributions. Other contemporary geologists, however, disregard the concept of fossil soils and nests. I shared several field trips with Tito during the 1990s (Fig. 1) where he taught me, along with Tom Bown, many aspects of paleosols.

I finally arrive at the part where I can talk about my meeting with one of the pioneers that influenced my own work—Jose “Pepe” Laza. Pepe began working at the Museo de La Plata as a technician in the Division of Paleovertebrates around 1964 where he went on to become one of the most recognized and finest Argentinean paleontological technicians. He acquired an interest in insect fossil nests when he recognized dung beetle brood balls in the museum's exhibition, and when by sheer coincidence some paleontologists collected ant fossil nests from La Pampa and showed them to him. At that time, Pepe had not read Frenguelli's work, and paleosol studies were still in their infancy. Pepe had a clear idea that the paleontologists have collected fossil nests preserved in ancient soils, and that the big balls of La Pampa were in fact, ant nests. Pepe soon began to collect insect fossil nests, particularly dung beetle ones, during several trips to Patagonia in the 1970s (Fig. 2).

He published groundbreaking work on insect paleoichnology in 1982 where he described, named, and interpreted fossil ant nests from La Pampa, and also extracted paleoclimatological and paleogeographic inferences from them; an important milestone in insect paleoichnology, which involved not only the description, naming, and interpretation of insect fossil nests, but also the extraction of paleoecological



Fig. 1 Tito Andreis and the author at Bajo Santa Rosa, Río Negro, Argentina, in 1990

inferences from them. A task that very simple to accomplish nowadays but was very innovative at that time (Chap. 12).

Here is an excerpt from a textbook on ichnology authored by Ekdale, Bromley, and Pemberton (1984) that gives you a better idea of the knowledge prevalent in the field on this topic at the time.

*Continental subaerial (i.e. non-aquatic) deposits can be conveniently grouped into two main categories: eolianites and soil zones. A **common misconception regarding such deposits is that they are devoid of fossils**. Although their paleontologic record is indeed meager, distinct suites of trace fossils are present that ultimately may prove useful as diagnostic tools in identifying these environments in the rock record.*

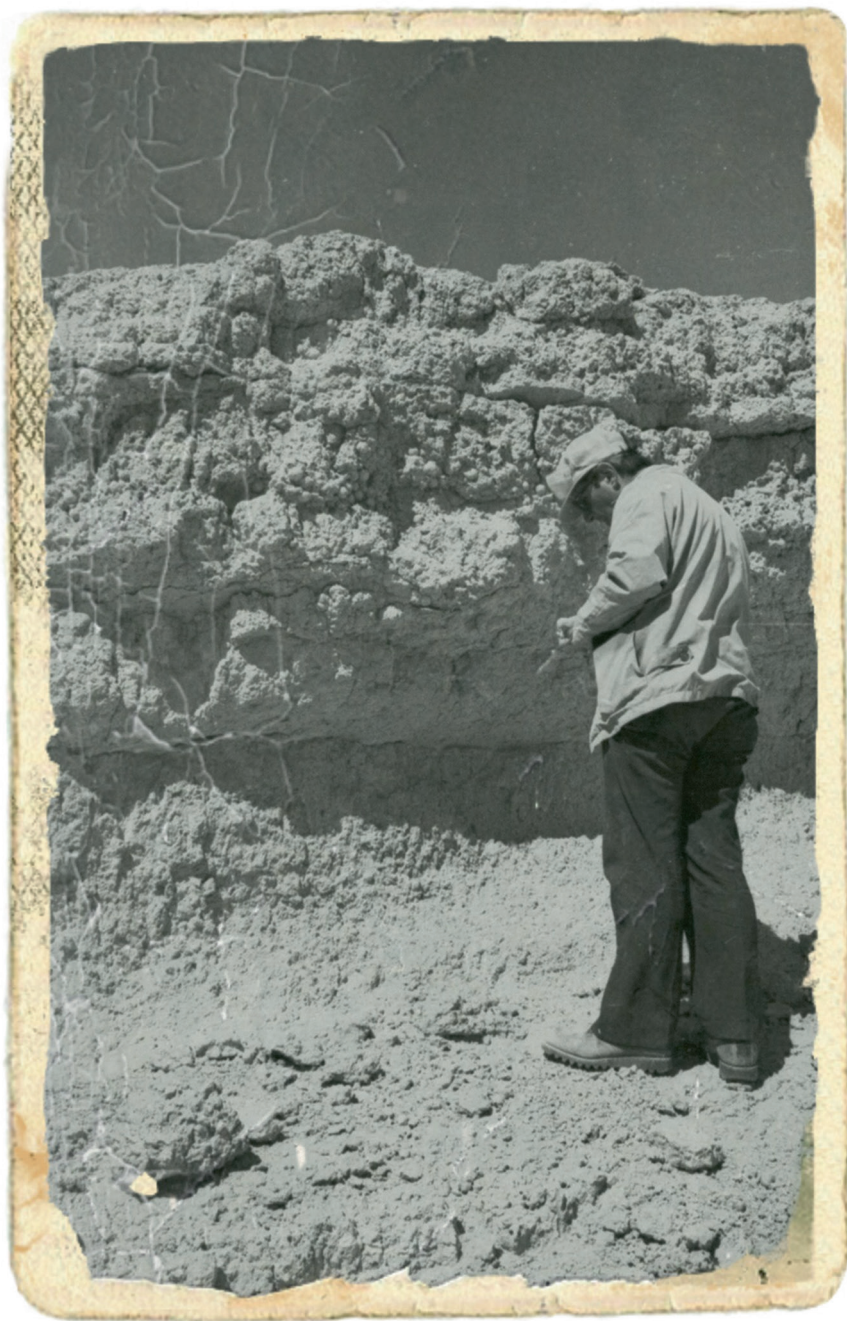


Fig. 2 Pepe Laza at Sierra de Talquino, Chubut, Argentina, in 1982 (picture courtesy of Pepe Laza)



Fig. 3 From *left to right*, Mirta González, the author and Pepe Laza at Cañadon Puerta del Diablo, Chubut, Argentina, in 1999

Pepe Laza worked with me for about 10 years before his retirement, but we are still in contact. In fact, he shared the story of his beginnings with me personally. He taught me a lot of things; we both developed a lot of ideas (some published and some not), and shared field trips, one of which, resulted in the discovery of the Cretaceous bee nests and coleopteran pupation chambers in Patagonia (Fig. 3). This is one of the oldest evidence of bees, and one of the few Cretaceous nests recorded worldwide. I believe that the preparation of these Cretaceous bee nests is one of Pepe's finest works in his career as a technician (Fig. 9.15).

Incredibly, when Pepe published his first paper in Argentina, Thomas Bown (Tom) in North America also published one on Egyptian termite and ant nests collected from Egypt. Why incredibly? Because, like Pepe, Tom had also extracted paleoecological inferences from nests for the very first time. It was a completely novel achievement at the time. The same year and independently from Pepe, Tom did the same thing but with Egyptian termite and ant nests. It was as if scientific ideas developed, grew, and exploded independently of scientists; as if ideas had their own life, and took their own time to shape up.

How were Tom's beginnings? Tom told me that he became interested in trace fossils in 1968 when he was shown impressive specimens of the coiled beaver burrows called *Daemonelix* in Nebraska. He soon began his own collection of trace fossils in Wyoming and then in Egypt in 1980, where he saw insect fossil nests for the first time. He had not read about insect fossil nests before, and most sedimentologists

spoke about concretions and worm burrows when referring to continental trace fossils. Tom read through more than 300 papers on termite and insect architecture after he discovered the nests in 1980, before writing his Egyptian contribution (Fig. 4). Even without much expertise in the subject, he interpreted Egyptian trace fossils to be nests of social insects just when he discovered them because he had read Edward Wilson's masterful work on ants.

This is when I enter the picture. In 1983, I graduated with a Doctorate in Biological Sciences from the University of Buenos Aires and began working at the



Fig. 4 Tom Bown at Fayum, Egypt, in 1984 digging the specimen of *Krausichnus altus* (picture courtesy of Tom Bown)

División Entomología of the Museo Argentino de Ciencias Naturales. My doctoral thesis and expertise was in soil nests and behavior of wasps. I had always liked paleontology, but had no idea how to combine insect behavior with fossils. I was also clueless about ichnology. I used to walk along the coastal cliffs of Buenos Aires looking for fossils. In 1983, I discovered by myself (I wasn't aware that this had already been published in the literature) that many of the small fossil mammals that I saw were preserved inside their own burrows. I was really excited by that finding because I finally had the opportunity to link animal behavior to fossil burrows in spite of the fact that they were not really made by insects. I collected data for 3 years and completed writing up the results generated from my work on rodent fossil burrows by 1986. This work was published in 1989 after being strongly critiqued about the comparison between fossil and extant burrows (Chap. 16). I was introduced to fossil mammal burrows, but was completely ignorant about the existence of ichnology and insect fossil nests. This was when Tom Bown appeared in my professional and personal life.

In the late 1980s, Tom had been working on fossil primates in Argentina with John Fleagle. He was interested in insect fossil nests due to his prior work in Egypt, and his experience collecting specimens of different nests in Patagonia. He had collected hundreds of specimens of an enigmatic fossil, named *Chubutolithes* (by Ihering) (Chap. 18) which had never before been interpreted correctly. Tom published this new interpretation of *Chubutolithes* as a mud wasp nest with Brett Ratcliffe in 1989. The late paleontologist—Miguel Soria—who worked with Tom in the field and whom I knew from university, showed me Tom's paper on *Chubutolithes* that had been published because he knew about my interest and experience working with wasp nests. It was in that precise moment, I had discovered ichnology and the existence of insect fossil nests: the perfect combination of behavior, nests, and insects that I had studied before I was at the university, and fossils, which I have always loved. I had noticed that *Chubutolithes* was being compared to the wrong extant wasp mud nest. I immediately decided to write a letter to Tom with a picture of what I believed was a more similar extant analog. By then Tom was a recognized expert in the subject, but he welcomed the information in letter and to my surprise, invited me to publish this new idea with him. This story clearly tells us what kind of a person and scientist Tom is. Since then, I have learned a lot from him on ichnology and paleosols.

Around this time, I was also introduced to José Laza's work. Tom and Laza had published a paper together on a fossil termite nests from Patagonia (Chap. 12). Tom was generous enough to invite and support me on several field trips including those to Patagonia (1991–1992), Uruguay (1994), and a wonderful one to Egypt (1992) Egypt (Figs. 5 and 6). Since then, my research has focused on insect fossil nests, and my work has involved field and laboratory work with colleagues and graduate students, some of them who had already been awarded PhD's. These researchers have been acknowledged in another section of this book. Years ago, when insect trace fossils were mostly unknown, a geologist told me: "You study things that we piss over". Now, 25 years later, the same trace fossils that were rare objects in a single locality have begun to appear in other localities, countries, and even continents.



Fig. 5 Tom Bown and the author at Pan de Azúcar, Chubut, Argentina (1991) where most of the specimens of *Chubutolithes* were found



Fig. 6 Tom Bown and the author in a camp at Qattara Depression, Egypt (1992)

You might wonder what the need is for a book on ichnoentomology?

Two quotes stated by Julio Cortazar and Jorge Luis Borges aptly describe my reasons for writing this book. Cortazar aptly summed up his feelings about his book *Rayuela* when he said: “In a way, it is the experience of a whole life and the attempt to bring it to writing”. Borges stated that “We publish our books to free ourselves from them, to avoid spending the rest of our lives correcting drafts”. I would add to Cortazar’s quote that although this book is the experience of my whole life, I am well aware that there is a lot more to do in this field and I plan to continue doing so with my team; perhaps my team will continue advancing this research after I’m gone. I believe that scientific research involves not only finding the evidence that supports our ideas, but also finding the ones that test and reject them. The subject of this book does not require further explanation, but as the Cuban poet Silvio Rodríguez wrote: “*I chose to write about impossible things because about possible ones it has been written too much*”, or as Dr. Frankenstein explained: “*I pursued nature to her hiding-places*”.

What are my expectations from the publication of this book? Perhaps only one: that some students, perhaps from other countries and in the future, find a copy of it on a dirty library shelf and decide to “pick up the gauntlet”. Speaking of dirt, let me conclude with the same words I said at the opening ceremony of Ichnia 2004 adapted from a song by an Argentinean rock band (Aquelarre, 1973): “*They are no dirty rocks, they are trace fossils...true diamonds, touch them with your mind, and you will see... how they shine*”. Antoine de Saint-Exupéry’s famous phrase from his book *Pilote de Guerre* (1942) was based on a similar idea: *Un tas de pierres cesse d’être un tas de pierres, des qu’un seul homme le contemple avec, en lui, l’image d’une cathédrale* (a rock pile ceases to be a rock pile the moment a single man contemplates it, bearing with him the image of a cathedral).

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