

EDITORIAL

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# Santiago Roth and his scientific legacy: a reappraisal of the Swiss collections

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The Pampean Region in the eastern central part of Argentina is today an agricultural zone, the main national food producer, and the base for a population that holds in big cities more than half of the 46 million inhabitants of the country. A century ago, Pampean landscapes were dominated by native grasslands, gallery forests confined to riverbanks, sparse dry forests towards the west of the area, and on the horizon of the flat Pampas, occasional isolated ombú trees (*Phytolacca dioica*) and eucalyptuses planted by the increasing population to provide shade in hot days and protection during storms for domesticated animals and people. Native birds, reptiles, and mammals, now replaced by humans and human activities, were certainly more frequent than today. However, these same riverbanks and lowlands were places where fossil hunters such as Santiago Roth could find bizarre extinct creatures that lived hundreds of thousands of years ago.

The main attractions were the bones and teeth of megamammals, such as huge ground sloths (*Megatherium americanum*) which weighed more than four tonnes; big armadillos, such as *Panochthus tuberculatus*, with the size of a small car; strange ungulates having nasal apertures on the top of the skull that likely sported a trunk, as in the case of *Macrauchenia patachonica*; predators with hyper-enlarged sabertooth canines like the felid *Smilodon*

*populator*, all contemporaneous with local gigantic spectacled bear relatives; proboscideans; native horses; deer with elaborate antlers; and other creatures living in South America in the near past of the Pleistocene. The Pampean Region was and still is a region where the remaining of these lost species can be found. Radiocarbon dating has demonstrated that several of these megamammals coexisted with the first humans in the area around 12,000–11,000 years ago. Did they interact? Did humans hunt them, and perhaps cause their extinction? Santiago Roth contributed to all of these topics by making new discoveries and publishing on them.

Santiago Roth was a Swiss naturalist, explorer, and palaeontologist who spent most of his active life in Argentina, where he died at the age of 74 years. At the end of the nineteenth century, Santiago Roth (then 16 years) and his family moved from Switzerland to Argentina in search of better opportunities. In Argentina, he grew up in a young republic beset by war and social revolts, but ultimately accomplished a great deal in support of the scientific development of the country. In his young years, he started collecting objects of natural sciences, including fossils. Some of his palaeontological collections from the Pampean Region were sold in Europe. Six of them were associated with catalogues, in which a number identifies the specimen, taxonomic determination, material found, and provenance. Some of these collections are still kept intact in Copenhagen and Zurich. Other fossil specimens collected by Roth are today in natural history museums in Geneva and Lausanne.

Santiago Roth was a multifaceted person. His contributions to science went well beyond palaeontology and embraced other disciplines, such as geology, geomorphology, and stratigraphy. Together with the founder

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and renowned director of the Museo de La Plata (MLP), Francisco Pascasio Moreno, for whom he worked for many years at the MLP, Roth participated in the commission that defined the border between Argentina and Chile. In addition to participating in several expeditions to Patagonia, he undertook projects like marking out the place where San Carlos de Bariloche (Río Negro) would be built, a city which today is the premier economic and touristic centre in Patagonia, Argentina.

On the centenary of the passing of Santiago Roth, we revise in this Special Issue some of his contributions, and provide an update on his collections in Europe. The Special Issue “*Santiago Roth and his scientific legacy. A reappraisal of the Swiss collections*” aims to distinguish his pioneering work, as well as to showcase the efforts of a multidisciplinary team from both sides of the Atlantic. Two articles of this volume review some historical aspects, with novel documents, field observations, and pictures to vividly maintain the memory of this pioneer of our field (Sánchez-Villagra et al., 2023; Voglino et al., 2023). The other eight articles focus on the systematics of Pampean Pleistocene mammals, principally based on specimens from Catalogue N°5 of Zurich but also featuring fossils in other European institutions that possess material originally collected by Roth (Geneva and Denmark). These chapters cover xenarthrans (Le Verger, 2023; Christen et al., 2023), Nearctic and native South American ungulates (Carrillo-Briceño et al., 2023; Carrillo & Püschel, 2023; Püschel & Martinelli, 2023), carnivorans (Ruiz-Ramoni et al., 2023), rodents (Kerber, 2023), and human remains (Menéndez et al., 2023), reviewing and updating the taxonomy of the specimens and exploring specific aspects of their anatomy and palaeobiology. We invite readers to explore the contributions in this volume, to immerse themselves in the works and times of Santiago Roth, and to re-discover his discoveries that continue to inspire new generations of researchers.

We would like to thank all authors that participated with their contributions to consolidate this volume. We also thank the Chief Editor Daniel Marty for his support all through the process and our friend and colleague Associate Editor Marcelo R. Sánchez-Villagra, who was very involved in the conception and production of this collection of papers. We also thank the many reviewers that provided comments and relevant suggestions, helping to improve the original manuscripts: Alberto Boscaini (IEGEBE-CONICET), Alfredo Zurita (CECOAL-CONICET), Brenda Ferrero (CICYTTP-CONICET), Carolina Madozzo-Jaén (INSUGEO-CONICET), Diego Brandoni (CICYTTP-CONICET), Francisco Prevosti (UNLaR-CONICET), Gonzalo

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#### Abbreviations

AMNH	American Museum of Natural History, New York, USA
CECOAL	Centro de Ecología Aplicada del Litoral, Corrientes, Argentina
CICYTTP	Centro de Investigación Científica y de Transferencia Tecnológica a la Producción, Diamante, Argentina
CIEMEP	Centro de Investigación Esquel de Montaña y Estepa Patagónica, Esquel, Argentina
CONICET	Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina
FCEFyN-UNC	Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba, Argentina
ICArHEB	Interdisciplinary Center for Archaeology and the Evolution of Human Behaviour, Faro, Portugal
IEGEBE	Instituto de Ecología, Genética y Evolución de Buenos Aires, Argentina
INSUGEO	Instituto Superior de Correlación Geológica, San Miguel de Tucumán, Argentina
MACN	Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, Argentina
MLP	Museo de La Plata, Argentina
UC-Berkeley	University of California, Berkeley, USA
UCPH	University of Copenhagen, Denmark
UDELAR	Universidad de la República, Montevideo, Uruguay
UniFI, DST	Università degli Studi di Firenze, Dipartimento di Scienze della Terra, Florence, Italy
UNLaR	Universidad Nacional de La Rioja, Argentina

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#### Availability of data and materials

PIMUZ fossil collection database: [https://www.pim.uzh.ch/apps/cms/pageframes/sammlung\\_db.php](https://www.pim.uzh.ch/apps/cms/pageframes/sammlung_db.php). 3D models from specimens of the Roth collection at PIMUZ available at Sketchfab: <https://sketchfab.com/PIMUZ>.

#### Declarations

#### Competing interests

The authors declare that they have no competing interests.

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