

THE QUATERNARY PALEONTOLOGICAL RESEARCH IN THE CAMPAGNA ROMANA (CENTRAL ITALY) AT THE 19TH-20TH CENTURY TRANSITION: HISTORICAL OVERVIEW.

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ABSTRACT: The Rome Basin, including the historical region of Campagna Romana, is considered as one of the most important sedimentary basin of Peninsular Italy for a paleontological viewpoint. A very high number of fossiliferous findings were collected from deposit which have a strong relationship with the evolution of the Tiber River fluvio-deltaic evolution (the “Paleo-Tiber” system). This evolution is the result of complex geological processes including tectonic, volcanism and glacio-eustatic fluctuations. A myriad of fossils were recovered during the end of 1800 and the beginning of 1900, mainly thank to the intense urbanization which affected the city of Rome. The majority of these historical fossil collection are today stored at “Museo Universitario di Scienze della Terra”, Sapienza, University of Rome (MUST), whereas sporadic specimens are kept in the scientific cabinets of several high school of the city or Latium villages. Several personalities of that time played a key role in the study of Quaternary fossiliferous deposits describing stratigraphical succession and fossil remains. The knowledge of these researchers and their histories have a crucial importance to reconstruct the storytelling of the historical fossil collection and to get more information on fossiliferous deposit today destroyed by urbanization or buried below anthropogenic deposits.

Keywords: Quaternary fauna, history of palaeontology, history of geology, Giuseppe Ponzi, Alessandro Portis.

1. INTRODUCTION

The city of Rome is placed in the centre of the historical region of Campagna Romana (Roman Campaign). Complex geological processes, occurred in particular during the Middle Pleistocene, are at the origin of the landscape where the “Città Eterna” (Eternal City) was build (Funicello et al., 2006; Heiken et al., 2007). Remains of large fossil bones from the Roman area have been known since ancient times. However, due to the lack of knowledge in the field of zoology and comparative anatomy, in several cases the huge fossil bones served in the past centuries as basis for foraging the myths of giants, cyclops, leestrigons and lithophages, as in many other cultures around the world (Mayor, 2000; Avanzini & Kustatscher, 2016; Romano & Avanzini, 2019). When correctly recognized as the remains of fossil elephants, in several cases the findings were linked to the only historical occasions in which these animals reached the Italian peninsula, namely the elephants led by Hannibal during the Punic Wars between Rome and Carthage (Romano & Palombo, 2017).

Even if such interpretations may seem childish and superficial, we have to consider that fossils in general

were interpreted as freaks of nature well into the eighteenth century (Rudwick, 1972; Accordi, 1975, 1978, 1981, 1984; Morello, 1979, 2003; Romano, 2013, 2014, 2016, 2018a; Romano et al., 2016), and even when recognized as remains of organisms they have long been explained as the result of the ‘Great Flood’, sent for punish the degenerate human race (Vai, 2003; Luzzini, 2009, 2013; Romano, 2017, 2018b, 2018c).

Concerning huge vertebrate fossils found in the Campagna Romana, Herodotus reports of large bones ascribed to the giant Pallas found in Rome (Mazzella, 1591; Romano & Avanzini, 2019). In reference to this finds, Calmet (1730) reports of the huge human skeleton found in Rome that, leaning against the buildings, was as tall as the city walls. Some fossil laminae of elephant molars, probably from the Campagna Romana (Kotsakis & Barisone, 2008), were preserved in the collection by Michele Mercati in the Vatican, illustrated by Giovanni Maria Lancisi in 1717 over a century after the death of Mercati in the famous work *Metallotheca Vaticana*.

Kotsakis & Barisone (2008) reported that the French traveller De Mancony in 1644 mentioned elephant bones found in the foundations of the Vatican and a hippopotamus canine discovered along the via No-

mentana, stored at the private collection of Virgilio Romano (see also Segre, 2001). Some of these finds ended up in the well-known collection of the Kircherian Museum, set up by the Jesuit of the Roman College Athanasius Kircher, and illustrated in 1709 by Filippo Bonanni. Accordi (1976) reports that these bones and molars were correctly referred to as elephant remains, but interpreted as the bones of extant animals brought to Italy from Africa under Antoninus Pius.

Gregorio Roisecco (1750) describes the Cabinet of the Prince Chigi in his villa in Rome, built for the Abbot Salvetti and later subject to renovation works by Cardinal Chigi (Romano & Avanzini, 2019). Among the several curiosities and tricks of the Cabinet, which included “*the corpse of a queen of Egypt, well preserved embedded in many bands, and explanation of her origins*”, giant bones are also reported, probably coming from the Roman area, however unfortunately lost with the rest of the collection. Pianciani in 1817 describes remains of quadrupeds from the territory of Viterbo in deposits of volcanic origin, with bones represented by shoulder blades, femora and five vertebrae founded for the first time in 1688 at Vitorchiano, and interpreted as bone of giants on the base of their huge size (Romano & Avanzini, 2019). The author is not surprised by this kind of preservation, since similar association between volcanic deposits and vertebrate fossil bones have been already reported near the ‘Basilica di san Paolo’ at Ostiense in Rome, embedded in pozzolans and tuffaceous deposits (Portis, 1900, Romano & Avanzini, 2019; Mecozzi et al., 2020).

According to Kotsakis & Barisone (2008) the first real scientific contribution on mammal bones from the Campagna Romana dates back to the beginning of the nineteenth century, with the contributions by Morozzo (1802, 1803), which reports the discovery of a fossil elephant from the “diluvial terrains” outcropping just out of ‘Porta del Popolo’ in Rome. The teeth of this specimen were then subjected to chemical analysis by Morichini (1803, 1805), discovering for the first time the presence of fluorine in the animal world, including humans (see also Clèrici, 1932; Kotsakis & Barisone, 2008).

Thus, for its great and peculiar geodiversity, since the end of the 19th century the stratigraphy of Campagna Romana focused the interest of scientists who began to study systematically the widely exposed volcanic rocks, the fluvio-lacustrine and coastal marine deposits and the fossil large mammal assemblages (Mecozzi et al., 2021 and reference therein). The paleontological record from the Campagna Romana area are of great scientific interest for the biochronology of the Middle Pleistocene. In fact, the names Galerian and Aurelian Mammal Ages derive respectively from Ponte Galeria and Aurelia Statal Road close to Rome (Ambrosetti et al., 1972; Gliozzi et al., 1997), where several fossil-bearing stratigraphic sequences are exposed on quarries and excavated.

Since the 19th century the geo-paleontological studies on the Quaternary deposits of the Rome Basin provided a valuable amount of information about the geological evolution of the region and to define early chronological frameworks of the large mammal assemblages. Between the end of the 19th century and the beginning of the 20th century the city of Rome was subjected to in-

tense urbanization, leading to the discovery of a large number of vertebrate fossil remains that were collected from the Campagna Romana (among others Meli, 1896; Ponzi, 1867, 1878; Portis, 1893). The fossil remains, mostly found in alluvial deposits of the Tiber River and tributaries, were later mainly referred to the Middle Pleistocene (e.g., Ambrosetti, 1967; Conato et al., 1980; Di Stefano et al., 1998; Petronio & Sardella, 1998, 1999; Milli et al., 2004; Marra et al., 2014; Sardella et al., 2015; Iannucci et al., 2021; Mecozzi et al., 2021). These deposits are frequently constituted by volcanoclastic materials and are interlayered by volcanic deposits of the Sabatini or Colli Albani Volcanic Districts (Conato et al., 1980; Milli, 1997; Giordano et al., 2003; Funicello & Giordano, 2008; Marra et al., 2014; Marra et al., 2018). These historical paleontological heritages found their way into museum collections of the ‘Museo Universitario di Scienze della Terra (MUST; former Museo di Paleontologia), Sapienza, Università di Roma’.

In the next sections, the biographies and geo-paleontological studies of prominent personalities active on the Roman scene at the transition from the 19th and 20th centuries are presented. These information are crucial to understand the history of the fossil collections stored at MUST as well as those housed in other repository of Rome and its surroundings.

2. 19th TO 20th CENTURY STUDIES

The earliest publication of a fossil elephant from the “diluvial” deposits in the countryside surrounding Rome at the time (Porta del Popolo) is due to Morozzo (1802, 1803) (Kotsakis & Barisone, 2008). Later, large mammals from the Campagna Romana have been described by Brocchi (1814, 1820), Cuvier (1834) and Pianciani (1836).

Despite Cuvier (1834) was the first to suggest that fossil vertebrates from the Rome area should have been referred to different chronological phases, no others scientists during the first half of XIX century provided a chronological framework for the discovered large mammal assemblages. In the second half of the nineteenth century (up to 1870), the presence of French imperial troops in Rome in support to the Papal States brought several French naturalists including Édouard Lartet (considered the founder of paleontology), Bleicher, Édouard de Verneuil and Frère Indes to analyse the continental deposits preserving fossil vertebrate remains (Kotsakis & Barisone, 2008), with several publications dedicated to the subject (Lartet, 1858; Bleicher, 1865a, 1865b, 1866, 1867; Verneuil, 1865; Indes, 1869, 1870, 1872). Worthy of note in this context is above all the figure of Frère Indes for being the first to organize and systematically conduct a paleontological excavation in a cave at the top of Monte delle Gioie, close to Ponte Salaro (Indes, 1872; Fig. 1), an excavation from which hundreds of kg of fossil bones were unearthed (Kotsakis & Barisone, 2008).

However, in this period contributions from Italian authors are also reported. Ceselli (1868) published a work entitled “*Sopra l'arte ceramica primitiva nel Lazio*” (On the primitive ceramic art in Latium) addressed to

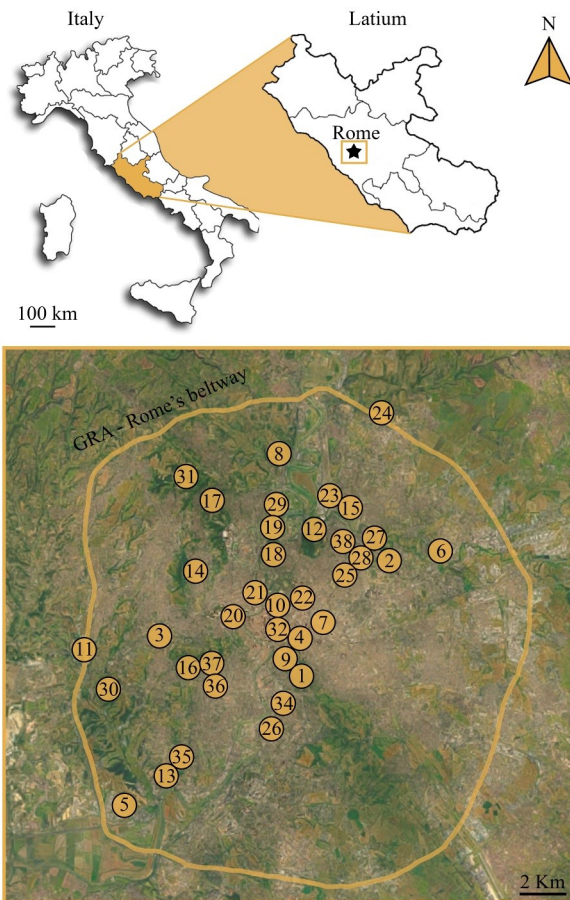


Fig. 1 - Geographical location of the fossiliferous deposits of Rome. 1-Aventino; 2-Batteria Nomentana; 3-Boccea; 4-Campidoglio; 5-Campo di Merlo; 6-Casal dé Pazzi, Ponte Mammolo; 7-Castro Pretorio; 8-Cava Nera Molinario; 9-Monte Celio; 10-Fondamenta BNL, Pincio, Quirinale; 11-GRA Km 2; 12-Monte Antenne; 13-Monte delle Pliche; 14-Monte Mario; 15-Monte Sacro; 16-Monte Verde; 17-Monti della Farnesina; 18-Parioli; 19-Ponte Molle; 20-Porta Cavalleggeri; 21-Porta Flaminia; 22-Porta Pia, Porta Salaria; 23-Prati Fiscali; 24-Redicicoli; 25-Sant'Agnese; 26-San Paolo; 27-Saccopastore; 28-Sedia del Diavolo; 29-Tor di Quinto; 30-Via Aurelia; 31-Via Cassia; 32-Via del Tritone, Via Nazionale; 34-Via Ostiense; 35-Via Portuense; 36-Vigna San Carlo; 37-Vigne Torte; 38-Villa Chigi.

the attention of Cavalier Luigi Pigorini, director of the *Museo delle Antichità di Parma* (Parma Museum of Antiquities). Although much of the work is devoted to the description of ancient vases from the Campagna Romana, in the text Ceselli reports the discovery of a large elephant tooth (Fig. 2) found in 1846 near Ponte Mammolo in Rome “*nei primi depositi quaternari unitamente a delle selci scheggiate*” (in the first Quaternary deposits associated with chipped flints) (Ceselli, 1868, p. 6). The author points out the ‘gigantic size’ of the tooth, an element that led him to give to the specimen the name ‘*Elephas elasmometeron*’, represented in Table II of the work.

In 1870 Ceselli published a work on the lithic industry of the Campagna Romana, titled “*Sunto della*



Fig. 2 - Elephant tooth found in 1846 near Ponte Mammolo in Rome, figured and briefly described by Ceselli in 1868 (modified from Ceselli, 1868).

Memoria sopra gli studi paleontologici del bacino di Roma e sue adiacenze” (Summary of the Memory on the paleontological studies of the Rome basin and its adjacencies). Ceselli reports the discovery of flint worked by humans in Quaternary deposits near Ponte Mammolo, Monte Sacro, Tor di Quinto, Ponte Molle, Acquatraversa and Magliana in Rome, “mixed”, as the author writes, to the teeth and bones of *Ursus speloeus*, *Jena speloea*, *Elephas antiquus*, *E. meridionalis*, *E. primigenius* and *E. elasmometeron*.

Ceselli again in 1872 published the contribution entitled “*Hippopotamus dactyliotus specie nova*”. In the work, the author reports and describes a hippo fossil upper canine from Quaternary deposits outcropping at Ponte Mammolo, where other remains were referred to “*Jena-Spoelea dell’Ursus-Spocleous dell’Elephas-Antiquus (Falc.), Elephas elasmometeron (nobis), Elephas-Africanus* etc. etc.” (Ceselli, 1872, p. 6). According to Ceselli, the tooth shows such differences from those already described to justify the erection of a new species. The author briefly reconstructs the history of hippopotamus studies starting from the first hints in Herodotus, Aristotle, Diodorus of Sicily and Pliny the Elder, even if the first true description can be traced back to 1603 by the Italian surgeon Federico Zerenghi, in a text remained largely unknown until a rediscovery by Buffon (Ceselli, 1872). According to Ceselli, whether the presence of more than one species of extant hippos remains highly doubtful, it is almost certain that in the past several species must have existed as evidenced by the differences in the bone material (especially teeth characters) recovered in Quaternary terrains. In the text Ceselli provides the diagnosis for the new species in Latium, stressing the differences in the canine he considered significant and underlining how “*Nei terreni quaternari della Campagna Romana la specie più abbondante è l’Hippopotamus-major di Cuv.*” (In the Quaternary terrains of the Campagna Romana, *Hippopotamus major Cuv.* is the most abundant species.

Francesco Anca (1872) deals with the elephant fossil teeth observed in the rich paleontological collection

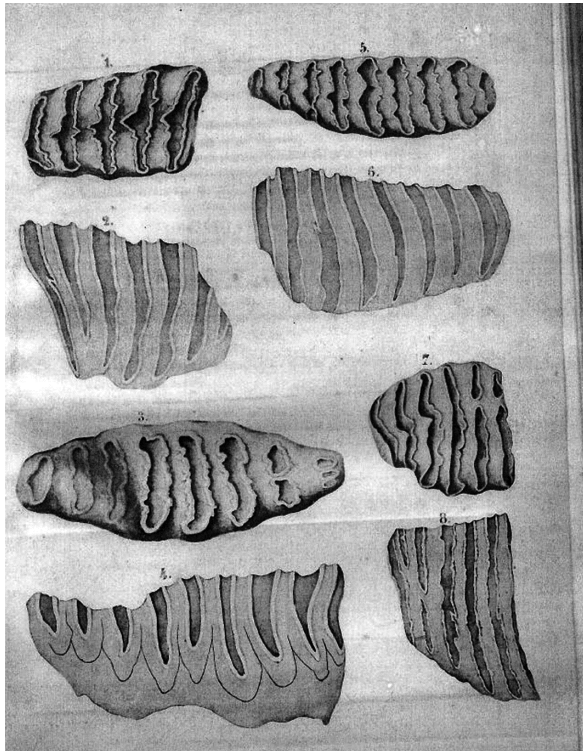


Fig. 3 - *Elephas* molars from top view and in section described and figured by Anca in his work published in 1872 (modified from Anca, 1872).

of the *Reale Università di Roma* (Royal University of Rome), accompanied by its director Prof. Ponzi, Senator of the Kingdom. As reported by the author, the remains, largely represented by elephant teeth found isolated, came from the deposits of the Tiber and Aniene rivers. The purpose of the work was a comparison of the remains with those already described from Sicily in collaboration with his friend Prof. Giorgio Gaetano Gemmellaro, and for this purpose he chose various teeth of *Elephas antiquus* from the fluvial deposits of Monte Pincio in Rome and from the conglomerates of Ponte Molle. Using the dental progression proposed by Falconer for elephants classification, Anca argues that the material should be referred to '*Elephas Africanus*', even if, as reported by the author, Ponzi had strong doubts about such an interpretation. To resolve the issue, Anca realized cross sections of the teeth (Fig. 3) which, according to the author, show without any doubt that "*tra i fossili romani insieme agli elefanti primigenio, antico, e meridionale v'ha altresì l'africano, che prima si credeva abitatore solo della Sicilia, ma che oggi dobbiamo ammetterlo diffuso in tutta l'Italia meridionale*" (among the Roman fossils together with the primeval, ancient, and southern elephants there is also the African one, which was previously believed to be an inhabitant only of Sicily, but which today we must admit is widespread throughout southern Italy) (Anca, 1872, p. 354). According to Anca, these elements would be evidence supporting the hypothesis that the modern African elephant derives from the southern one



Fig. 4 - Historical marble bust of Giuseppe Ponzi, exhibited at the MUST, University of Rome (photo by Alessio Argentieri).

(*'meridionale*'), as demonstrated by the close affinity of the teeth characters.

2.1. Giuseppe Ponzi (1805-1885)

The second half of 19th century was characterized by the studies and the activity of Giuseppe Ponzi (Fig. 4). At the beginning of his career, Ponzi was a doctor, graduating in medicine in 1829. Thanks to his study, Ponzi participates as a medical officer in the defence of Rome during the French siege of 1849 in the period of the Roman Republic. His military efforts for the defence of Rome as an officer of the papal guard continued in both 1867 and 1870 for the well-known 'Breccia di Porta Pia' (Breach of Porta Pia). Despite the prominent positions within the Papal States, and connections with the Curia, he managed to adapt quickly to the political changes that followed the annexation of Rome to the Kingdom of Italy (Argentieri, 2015).

His University career started in 1832, as a collaborator in the field of anatomy with the zootomy and zoology cabinet, where gained the chair of comparative anatomy and zoology only during the 1838.

Over and above the scientific contribution, Ponzi held positions of extreme importance, both locally, as municipal councillor in 1871, and national, as a senator from 1870. He was president of the *Accademia dei Lincei* (Lincean Academy) from 1871 to 1874, member of the commission for the reclamation of the Campagna Romana (1871), member of the *Reale Comitato Geologico d'Italia* (Royal Geological Committee of Italy) from 1871, chairman of the *commissione per i materiali edilizi d'Italia* (commission for building materials of Italy) and president of the Club Apino Italiani (Italian Alpine Club, CAI) from 1873 to 1875. He was also a member of several academies, among which the *Accademia dei Nuovi Lincei* (Academy of the New Lincei) from 1848, *Accademia Nazionale delle Scienze* (National Academy of Sciences) in 1875, corresponding member of the *Istituto lombardo di Scienze e Lettere* (Lombard Institute of Sciences and Letters) of Milan from 1876, member of the *Società italiana delle scienze, detta dei XL* (Italian Society of Sciences, known as the XL) and, internationally, a member of the *Société géologique de France*

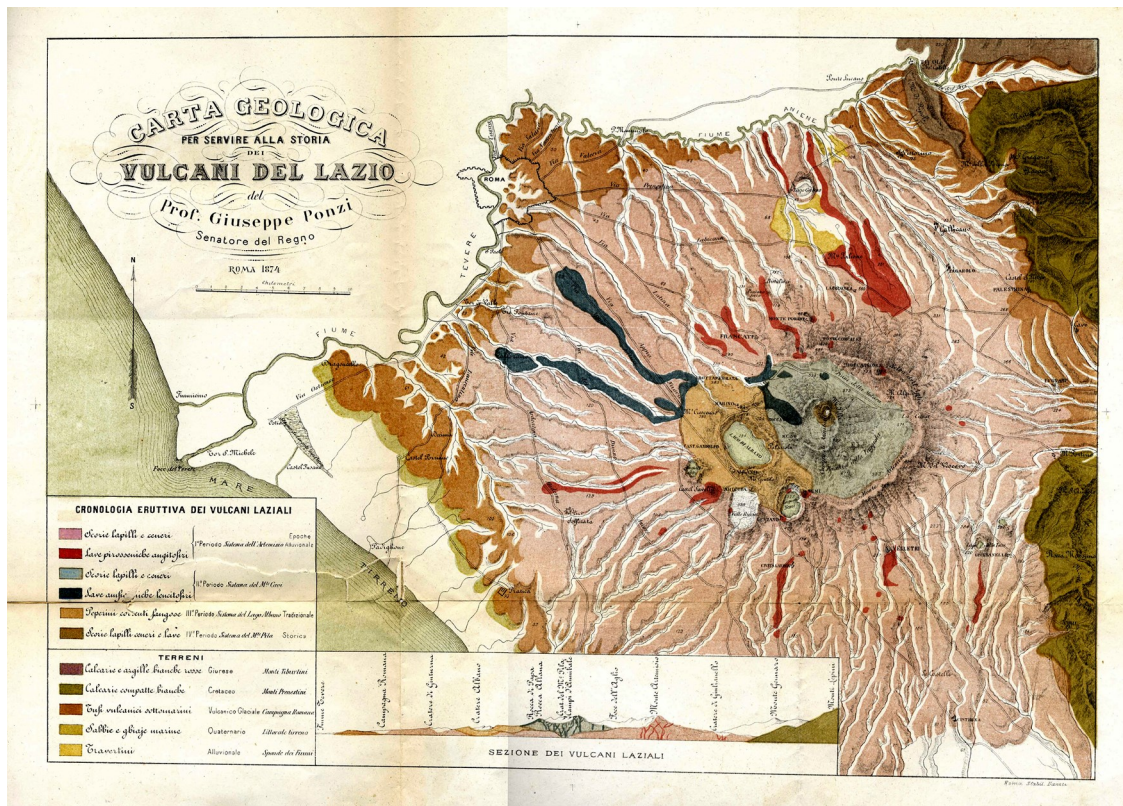


Fig. 5 - Ponzi G. (1874), 'Carta geologica per servire alla storia dei vulcani del Lazio in Storia dei vulcani Laziali Roma': Salviucci, 1875. Cartographic collections of the ISPRA Library. Autographed miscellany by the author (Courtesy of ISPRA Library).

(Geological Society of France) and of the *Geological Society of London*.

The 1854 was a crucial year for his life, since he was assigned the teaching position of mineralogy at the Sapienza, University of Rome. Shortly thereafter, Pope Pius IX founded the geology chair at the Roman Archiginnasio, period when this teaching was separated from the chair in mineralogy for the first time.

Ponzi holds both professorships, in particular that of geology until the end of his career and that of mineralogy until 1873. In 1873, the *Scuola d'applicazione degli ingegneri di Roma* (Application School of Engineers of Rome) was established by royal decree, where Ponzi holds the position of professor of geology, geognosy and mineralogy.

From a paleontological viewpoint, the greatest merit of Ponzi was the foundation of the Geology and Palaeontology museum and the Geology cabinet at the Sapienza, University of Rome during the 1873. At first, the museum hosted the mineralogical collections of the former Mineralogy Museum that Ponzi yet directed, but these were quickly enriched from donations, such as that of the Turin palaeontologist Giovanni Michelotti in 1880, and purchases (Fabiani & Maxia, 1953; Kotsakis & Barisone, 2008; Argentieri, 2015). Ponzi directed the museum until his death, with the help and support of his pupil Romolo Meli, who succeeded Ponzi in 1885. After 1875, part of the collections of the famous Kircherian Museum also converged in the Sapienza collections. In

fact, at the end of the nineteenth century the original collection of the Kircherian Museum was already essentially dismembered and it was no longer preserved in the original seat of the Roman College. In particular, following the suppression of the *Compagnia di Gesù* (Society of Jesus) decreed by Clement XIV in 1773, the collections of the *Collegio Romano* (Roman College) began to be dismembered and many specimens ended up in the collections of the Plio-Clemenino museum within the *Musei Vaticani* (Vatican Museums). Subsequently in 1870, when Rome became capital of the Kingdom of Italy, much of the ecclesiastical property were expropriated by the unitary state and in the Collegio Romano (Roman College) were located the *Libreria Nazionale Centrale* (National Central Library) and the *Liceo Ginnasio Visconti* (Visconti Gymnasium-Lyceum).

In addition to the foundation of Palaeontology and Geology Museum, Ponzi was the first scientist that systematically and carefully studied the Campagna Romana, from the forties of the nineteenth century, starting from classical studies by Italian naturalists such as Gian Battista Brocchi and Scipione Breislak. Ponzi proposed innovative modern approaches to the realization of the geological cartography (Fig. 4; Argentieri, 2015). For these innovative elements, and for the systematic character in the analysis of the Roman territory, Ponzi is rightly considered as the forefather or founder of the Roman geological school. Based on the field survey conducted under the papacy of Gregory XVI between



Fig. 6 - Original label and canid lower hemimandible fragment found at Ponte Molle (Rome) from the collection of Giuseppe Ponzi preserved at MUST, University of Rome.



Fig. 7 - Original label and felid femur and ulna found at Ponte Molle from the collection of Giuseppe Ponzi preserved at MUST, University of Rome.

1837 and 1846, and using Gaetano Spinetti's chorographic map of the Papal State, Ponzi produced a very important document, the Geological Map of the Papal State at 1: 296,000 scale, which can be considered a milestone for the geological-cartographic representation for Central Italy (Argentieri, 2015). The scientific interests of Ponzi were multifaceted, he wrote about the geology of the Campagna Romana, the Latium volcanism (Fig. 5), seismic phenomena and catastrophic sinking. Concerning the present historical contribution, he published several seminal papers on the palaeontology of Pleistocene vertebrates from the Latium region (Figs. 6-7). Most of these contributes immediately became reference points for decades. On the biochronology of the terrestrial mammals, it worth mentioned his study on the Quaternary geology of Latium in 1875, in which he grouped the main geological events of the area in 3 phases: i) the earliest "epoch" that included the Late Miocene-Pliocene sedimentary deposits, most of them of marine origin; ii) an intermediate volcano-glacial and diluvial "epoch", followed by the younger iii) defined as post-glacial with an alluvial and a modern "epoch" (Ponzi, 1875). Moreover, in 1878 Ponzi published a very important article about the subappennine fossil bones, with two faunal complexes considered: an older, preglacial one referable to the Pliocene, and a younger post-glacial Quaternary one (Ponzi, 1878). Such a general framework was widely accepted and used for decades.

2.2. Giuseppe Augusto Tuccimei (1851-1915)

Tuccimei (Fig. 8) earned several diploma, becoming a doctor in medicine, natural sciences and canon law. After just a few years of practicing, he left the medical profession, devoting himself to his greatest passion, the natural sciences, enrolling again in courses at Sapienza, University of Rome, and earning a degree in Natural Sciences in July 1876 (Meli, 1916). The degree thesis on geo-paleontological topics was entitled "*Fossili della sabbie gialle plioceniche di Acquatraversa sulla via Cassia, a 5 km da Roma*" (Fossils from the Pliocene yellow sands of Acquatraversa on the Via Cassia, 5 km from Rome), based both on fossils collected directly by himself and on specimens made available by Romolo Meli from his private collection of fossils from Monte Mario and surroundings (Meli, 1916).

Son of a well-known lawyer of the Apostolic Tribunal of the Roman Rota, and with a mother descending from an illustrious Roman family, Tuccimei grew up in an environment closely linked to the Roman Pontiff and the Catholic Church; a social and cultural context that also influenced the author's thought and scientific activity. For his charisma, dedication, and fervour with which he carried out his ideas, Tuccimei held several prominent positions, including president for the section of Natural Sciences of the *Accademia Pontificia dell'Immacolata Concezione* (Pontifical Academy of the Immaculate Conception) in 1880, vice president of the natural sciences section of the *Società Cattolica Italiana per gli studi scientifici* (Italian Catholic Society for Scientific Studies) in 1899, founding member of the *Società Zoologica Italiana* (Italian Zoological Society) in 1892, and



Fig. 8 - Photo of Giuseppe Tuccimei (GNU Free Documentation License).

of *Società Geologica Italiana* (Italian Geological Society), where he held the role of Secretary for the 1887-1889 period and in 1893, and the position of Archivist for years 1884-1886 and 1890-1892. He was also a member of the *Pontificia Accademia Romana de' Nuovi Lincei* (Pontifical Roman Academy of the New Lincei) from 1883 and of the *Società Storica Volsinese* (Volsinese Historical Society) in 1890, member of several academies including the *Reale Accademia Valdarnese del Poggio di Montevarchi* (Royal Valdarnese Academy of Poggio di Montevarchi), *Accademia dell'Arcadia* (Academy of Arcadia), the *Reale Accademia Francesco Petrarca di Arezzo* (Royal Francesco Petrarca Academy of Arezzo), *Accademia di Religione Cattolica Romana* (Academy of Roman Catholic Religion) (1896) and of the *Reale Accademia degli Zelanti di Acireale in Sicilia* (Royal Academy of the Zealous of Acireale in Sicily) (1893). Internationally, in 1893 he was also a corresponding member of the Zoological Society of Belgium and a member of the Geological Society of Belgium.

He taught in the Philosophy Faculty of the *Pontificia Università Lateranense* (Pontifical Lateran University) and several Roman high schools, and he was one of the major opponent of the spread of the Darwinian theory of evolution in Italy.

In the field of natural sciences he wrote on various topics including entomology, although his interest was

soon catalysed by geology and palaeontology. In 1880 he published his first geological work entitled "*I colli pliocenici di Magliano-Sabino*" (The Pliocene hills of Magliano-Sabino), with description of the deposits cropping out on the left bank of the Tiber valley and with an illustration and description of the fossil molluscs personally collected. Several geological and paleontological works followed, especially in the Sabina area north of Rome, with structural-sedimentological contributions such as "*Sulla struttura dei terreni che formano la catena di Fara in Sabina*" (On the structure of the terrains that form the Fara in Sabina chain) published in 1883, "*Il sistema liassico di Roccantica e i suoi fossili*" (The Liassic system of Roccantica and its fossils) of 1887, "*Note stratigrafiche sopra la formazione secondaria dei monti Sabini*" (Stratigraphic notes on the secondary formation of the Sabine mountains) published in 1890, but he also wrote about karst phenomena in the region "*Sopra le cavità naturali dei monti Sabini*" (On the natural cavities of the Sabine mountains published in 1886), and phenomena related to bradyseisms ("*Bradisismi pliocenici della regione sabina*"; Pliocene bradyseisms of the Sabine region, published in 1888).

As far as the present contribution is concerned, he also dealt extensively with Pliocene and Pleistocene vertebrate faunas, with several papers including "*Il Villafranchiano nelle valli Sabine e i suoi fossili caratteristici*" (The Villafranchian in the Sabine valleys and its characteristic fossils) published in 1889, "*Rinvenimento di avanzi di Elephas meridionalis Nesti, nel pliocene di Montoro*" (Discovery of remains of *Elephas meridionalis* Nesti, in the Pliocene of Montoro) of 1890, "*Resti di Arvicola nel pliocene lacustre della Sabina*" (Remains of *Arvicola* in the lacustrine Pliocene of Sabina) of 1893, "*Il Villafranchiano e l'Astiano nella valle tra i Corniculani e i Lucani*" (The Villafranchian and the Astian in the valley between the Corniculani and the Lucanians) published in 1895, "*Sopra alcuni cervi pliocenici della Sabina e della provincia di Roma*" (On some Pliocene deer of Sabina and the province of Rome) of 1898, "*Sopra alcune ossa fossili di cervo trovate sulla via Aurelia*" (On some fossil deer bones found on the Via Aurelia) of 1899.

As a matter of fact, by recognizing the characteristic fauna, Tuccimei (1889) was the first to introduce the Villafranchian Stage in central Italy, a continental chronostratigraphic unit previously proposed by Pareto (1865) in Piedmont. Tuccimei (1889, 1895) considered the vertebrate-bearing Villafranchian sediments as Pliocene in age and overlying, by an angular unconformity, Astian marine deposits, a theory disproved in those years by Clèrici (1895d) who, conversely, recognized the lateral continuity between Astian and Villafranchian sediments (see also Girotti & Mancini, 2003).

An interesting contribution was "*Alcuni mammiferi fossili delle provincie Umbra e Romana*" (Some fossil mammals from the Umbrian and Roman provinces) (Tuccimei, 1891) which earned him the prize from the Ministry of Education, on the special proposal of the *Accademia Reale dei Lincei* (Royal Academy of the Lincei) (Meli, 1916). In the contribution, Tuccimei describes the remains of *Mammuthus meridionalis* and

Mastodon arvernensis found in the land of the Marquis Patrizi in 1857 at Nera Montoro, *Hyppopotamus major*, *Rhinoceros etruscus*, *Equus stenorhis* from the Farfa valley, the remains of *Castor fiber* founded in Sabina and of *Elephas antiquus* from deposits exposed along the Tiber valley.

2.3. Other personalities

The transition from 19th to 20th century was characterized by several discoveries and studies. The base of data of large mammal faunas increased thanks to the work of Terrigi (1883), De Angelis d'Ossat (1895), Napoli (1907, 1911), Rellini (1916), Battaglia (1918) and Neviani (1926). The most active personalities during the transition between the two centuries were: Romolo Meli, Enrico Clèrici and Alessandro Portis (Kostakis & Barisone, 2008). To these authors we owe a truly substantial number of studies and works on Plio-Pleistocene vertebrates from the Campagna Romana, with contributions ranging from simple reporting of fossil remains found during excavations or during purely geological works, up to systematic review works on entire groups.

2.4. Romolo Meli (1852-1921)

Romolo Meli (Fig. 9) dedicate his studies and research to different topics. He obtained his Ph.D. in Philosophy in 1870, the diploma in Math in 1872 and



Fig. 9 - Photo of Romolo Meli (from <https://www.socgeol.it/N2642/romoli-meli-roma-23-aprile-1852-1-gennaio-1921.html>).



Fig. 10 - Field trip conducted by Romolo Meli on May 17, 1908 on the beach of Nettuno, with the engineering students of the Royal Application School of Rome (Courtesy of ISPRA Library). See also Meli R. (1896).

the diploma as a civil engineer and architect at Sapienza, University of Rome in 1874. However, Meli soon abandoned these subjects to devote himself to geology, first as assistant in 1875, and later obtaining a free lecturer in geology in 1881. He taught mineralogy and geology at the *Istituto Tecnico Leonardo da Vinci* (Leonardo da Vinci technical institute) in Rome since 1883, mineralogy and applied geology at the *Reale Scuola d'applicazione degli ingegneri di Roma* (Royal School of Application of Engineers in Rome) since 1885, getting earlier a permanent professor role in 1904 and later full professor position in 1912 (Argentieri, 2009; Fig. 10). At the same time, he continued teaching mineralogy and geology in the technical institute.

As aforementioned, at the death of his master Ponzi, Meli succeeded as director of the Geology Cabinet and interim director of the Geological and Paleontological Museum of the Sapienza, University of Rome, positions he held until 1888.

Among the several public roles covered by Meli during his life, it worth mentioned his position as a member of the *Consiglio Sanitario Provinciale di Roma* (Provincial Health Council of Rome) (1890-1901 and 1907-20) and member of the *Regio Comitato Geologico* (Royal Geological Committee) (1918) (Argentieri, 2009). In addition to be a founding member of the *Società Geologica Italiana* (Italian Geological Society), Meli invested so many effort in the Society, where he held the roles of archivist (1882-1883, 1887-1889, 1893-1899), secretary (1884-1886, 1890-1892), councillor (1900-1902), vice president (1903) and president (1904). He was also an active member of the *Società Geografica Reale* (Royal Geographic Society) and of the *Società italiana di storia critica delle scienze mediche e naturali* (Italian Society for the critical history of medical and natural sciences), whereby was also vice president; Meli had also an important role for the *Società Romana per gli Studi Zoologici* (Roman Society for Zoological Studies, afterwards Italian Zoological Society), first taking part in the foundation, later holding the position of

councillor and vice-president from 1896.

The interest of Meli embraced a well-diversified aspects of natural sciences, with topics ranging from fossil and living malacology and vertebrate, geology, stratigraphy, petrography, mineralogy, study of meteorites, as well as in the archaeological, philological and historical-bibliographic fields (Argentieri, 2009). Despite the multidisciplinary approach and the wide range of topics covered, what makes Meli worthy of mention for the present contribution are his works focused on the geological, paleontological and stratigraphic analysis of Quaternary deposits of Latium region, with particular regard to the Campagna Romana.

One of the main contribution was the work on the exceptional discovery of the remains of a fossil vulture in the vulcanites of the Tuscolani mountains, with the contribution published in 1889 with the title "*Sopra i resti fossili di un grande avvoltoio (Gyps) racchiuso nei peperini laziali*" (On the fossil remains of a large vulture (Gyps) enclosed in the peperini laziali) (Manni et al., 2003; Iurino et al., 2014). Between 1881 and 1918, Meli conducted numerous studies on the vertebrates of Campagna Romana, with a vast production on the remains of elephants, hippos, bovinds, rhinos, equids, cervids, suidae, canids, bears, hyenas, birds, from outcrops on the Via Flaminia (Cava Bertazzi, Melafumo, right bank of the Tiber), Aventino (Rome), Villa Pamphilj (Rome), Church of S. Silvestro (via del Quirinale, Ro-



Fig. 11 - Photo of Enrico Clèrici (from Neviani, 1938).

ma), ex-Convent of San Pietro in Vincoli (Rome), foundations of the National Bank Building ('*marne d'acqua dolce del Quirinale*', Rome), Sedia del Diavolo (via Nomentana), Monte Mario, Tor Di Quinto, Magliana (right bank of the Tiber; via Portuense; Campo di Merlo; Monte delle Picche), Via della Pisana (contrada Bravetta, Rome), Batteria Nomentana (left bank of the Aniene), Mostacciano (far out of Porta San Paolo), Ponte Buttero (via Laurentina, Roma), Frascati (via Anagnina), Anzio, Nettuno (coast of Foglino), Amaseno valley (Piperno, Pontini Mountains), Cava della Catena (S. Angelo, Terracina), Vallinfreda (Turano basin), Gallese (Orte), S. Quirico (Sugano, Orvieto) (Meli, 1881a, 1881b, 1882, 1886, 1889a, 1889b, 1891a, 1891b, 1894a, 1894b, 1895, 1897, 1908, 1918).

2.5. Enrico Clèrici (1862-1938)

Enrico Clèrici (Fig. 11) studied engineering and graduated at Sapienza, University of Rome in 1888. In 1892 he earned the bachelor degree in Natural Sciences at Sapienza, University of Rome. Engineering and geology were in fact the disciplines that involved him during his entire life. The engineering represented his stable work between 1885 and 1915, teaching electro-technics in the evening school 'Galileo Ferraris' for the artillery of the Rome Municipality. His first teaching in Mineralogy and Geology was at the school of the experimental agricultural institute of Perugia between 1896 and 1899. He obtained the title of geology professor in 1902 at Sapienza, University of Rome, holding the chair in Geology in the same University between 1928 and 1934. In addition to teaching, Clèrici worked in the Agriculture, Industry and Trade Ministry, becoming general director in 1930.

Clèrici has also held other positions including: meritorious member ('socio benemerito') and secretary of the *Società Geologica Italiana* (Italian Geological Society) for twenty-three years; member of the *Regio Comitato Geologico* (Royal Geological Committee); corresponding member of the *Pontificia accademia delle scienze* (Pontifical Academy of Sciences); member of the *Pontificia Accademia Tiberina* (Pontifical Tiberine Academy) of which he was councillor; member of the *Comitato nazionale geodetico e geofisico* (National Geodetic-Geophysical Committee) and representative for Italy at the international conference in Bern for the protection of intellectual property (for a more complete biography see Fornaseri, 1982).

In his more than 170 publications, Clèrici treated and discussed several geological, paleontological and mineralogical aspects. A common thread of his researches was the rigorous mathematical and physical approach, combining both empirical laboratory experiences and direct observations in the field. For Clèrici, practical work, both in laboratory and in the field, represented a crucial moment for teaching and to transfer to students his passion and devotion to geology and palaeontology. Worthy of note is the invention of the so-called '*soluzione di Clèrici*' (Clèrici's solution) or '*Liquido pesante di Clèrici*' (Heavy liquid of Clèrici), a mixture in water of thallium formate and thallium malonate useful for the separation of minerals and presented on the

Rendiconti della Regia Accademia dei Lincei in 1907 with the contribution titled "*Preparazione di liquidi per la separazione dei minerali*" (Preparation of liquids for the separation of minerals) (Clèrici, 1907). Thanks to this research, Clèrici became famous around the world, and received a Diploma of Honor from the International Congress of Limnology held in Rome in 1929.

Much of the research work in geology was conducted by Clèrici on the analysis of the geological structure of the Quaternary deposits in the Campagna Romana and in Campania. Neviani (1938) reports that Clèrici knew the Latium region 'point by point', thanks to the innumerable field trips conducted as soon as he had the opportunity, riding his inseparable bicycle "*che gli permetteva raggiungere lontane località in tempo relativamente breve; e più ancora di penetrare in luoghi di non facile accesso ad altri veicoli, e nel contempo trasportare notevole quantità di piccolo campioni*" ("which allowed him to reach distant locations in a relatively short time, and even more to penetrate places that are not easily accessible to other vehicles, and at the same time carrying significant quantities of small specimens"; Neviani, 1938, p. 125).

His study deeply contributed to the knowledge of fossil diatoms, describing several species for the first time (Clèrici, 1893, 1894a, 1895a, 1895b, 1896) and mapping the deposits of the Campagna Romana preserving this kind of fossils ("*Carta dei giacimenti diatomiferi dei dintorni di Roma*") (Map of the diatomaceous deposits around Rome) published in 1935 on the *Bollettino della Società Geologica Italiana* (Bulletin of the Italian Geological Society).

One of the principal work conducted by Clèrici was published in 1888 in the *Bollettino della Società Geologica Italiana* (Bulletin of the Italian Geological Society), entitled "*Sulla Corbicula fluminalis dei dintorni di Roma e sui fossili che l'accompagnano*" (On the *Corbicula fluminalis* around Rome and on the associated fossils). Here, he described the stratigraphical successions of Acquatraversa, Sedia del Diavolo and Monte Verde, (outcrops today destroyed by the urbanization), and the specimens directly collected, as well as those from the University Geological Institute collections and private collection of Romolo Meli (Neviani, 1938). In a later work published in 1891, focused on the description of the *Castor fiber* and *Elephas meridionalis*, Clèrici went back to what he had reported about the *Corbicula fluminalis*. In the text the author deepens and clarifies the relationships between the fossil fauna and the formations referred to him to 'the glacial period', in response, always with polite tones, to the critical observations and points raised on the topic by Tuccimei.

His contribution to the study of Quaternary of Latium was not limited to diatoms, flora and malacofauna; he published many works on Plio-Pleistocene vertebrate remains of Campagna Romana and central Italy, with contributions on elephants, mastodons, rhinos, tapirs, hippos, bears, felines, hares and equids (Clèrici, 1887a, 1887b, 1888, 1891, 1892, 1894b, 1894c, 1894d, 1895c, 1906, 1926, 1931). The multidisciplinary approach was a key aspect in the Clèrici's research, that pushed him to analyse the fossil not as an mere object



Fig. 12 - Photo of Alessandro Portis (from <https://www.geoitalliani.it/2016/12/portis2.html>).

but as a pawn of a broader paleoenvironmental context.

2.6. Alessandro Portis (1853-1931)

Alessandro Portis (Fig. 12), after his classical studies, graduated in natural sciences in 1875 at the University of Turin. After graduating, he spend a period abroad with the aim of deepening some palaeontological and geological aspects and topics. During this period Portis was first at Göttingen, and then he move to Munich, Basel and Paris, coming back In Italy when he got the position of free lecturer in palaeontology at the University of Turin starting in 1879.

In 1881, he was temporarily assumed as "Museum staff" of the University of Bologna, where he realized the first edition of the *Bibliographie géologique et paléontologique de l'Italie* and the *Guide aux collections de l'Institut de géologie et de paléontologie à Bologne* under the direction of Giovanni Cappellini and in collaboration with Carlo Fornasini (Pantaloni, 2016).

An important aspect of Portis's work is represented by his activity as a surveyor geologist started in 1881 with several stratigraphical contribution on Argentera, Mount Tabor (Piedmont), Maritime Alps and the province of Turin (for a more exhaustive list of production for those years see, Pantaloni, 2016).

For three years (1884-1886) Portis was the curator at the Geology Museum of Turin, a period during which he continued his study on vertebrate palaeontology. Papers worthy of note are his contribution on fossil amphibians (Portis, 1885), and the "*Catalogo descrittivo*

dei Talassoterii rinvenuti nei terreni terziari del Piemonte e della Liguria" (Descriptive catalogue of the Thalassoterii found in the tertiary terrains of Piedmont and Liguria). The latter can still be considered a reference text as a basis for classification for this fossil group (Pantaloni, 2016). The central and innovative work on chelones and Thalassoterii earned Portis a prize from the Turin Academy of Sciences in 1885.

In 1886 Portis obtained the chair of geology and mineralogy of the *Scuola degli Ingegneri di Roma* (School of engineers of Rome), but the turning point in his career arrived in 1888, when on the death of Ponzì, he was called to cover the chair of Geology and Palaeontology of the Institute of Geology of Sapienza, University of Rome, position held until 1927.

Portis is considered one of the founding members of the *Società Geologica Italiana* (Italian Geological Society), since he attended the II International Geological Congress of Bologna in 1881, participating in the founding session of the Society, of which he was then president in 1908. The recognition of scientific skills in the international field is demonstrated by the fact that he was appointed a member of the *Deutscher Geologischer Gesellschaft* (German Geological Society), of the *Société géologique de Belgique* (Geological Society of Belgium) and of the *Société Royale des Sciences de Liège* (Royal Society of Sciences of Liège). Among the youth awards for his research is worthy of mention the award with gold medal from the George III foundation in Hanover, for the contribution on fossil batrachians from the Kimmeridgian of Hannover, studied by Portis during his stay at the Geo-Paleontology Institute of Göttingen, and a special grant for the printing and publication of the same work from the Prussian Ministry of Cult (Martelli et al., 1932).

Portis had an important role for the Palaeontology Museum of Sapienza, University of Rome, enriching conspicuously both the collections (especially the palaeontological ones) and the institute's library, one of the richest at the time on palaeontological topics. Portis can be considered the founder of a real Roman school of geologists-palaeontologists which saw, among its most brilliant disciples, Tellini, De Angelis d'Ossat, Checchia-Rispoli and Cerulli-Irelli (Martelli et al., 1932).

Portis devoted himself largely to the study of the Quaternary deposits of the Campagna Romana, in particular catalysed by numerous remains of fossil vertebrates that were found in the area (Figs. 13, 14). Over the years Portis wrote and published numerous works on the subject, dealing with Quaternary fossil remains in numerous groups, including birds, elephants, rhinos, felines, hippos, bovids, canids and the contemporaneity between Palaeolithic human and some vertebrate faunas (Portis, 1896a, 1896b, 1896c, 1899, 1902, 1903, 1904, 1907a, 1907b, 1907c, 1909, 1920).

The geo-paleontological works and the intense studies on the Campagna Romana then converged in a voluminous work entitled "*Contribuzioni alla Storia fisica del Bacino di Roma*" (Contributions to the Physical History of the Rome Basin), a monograph consisting of several articles on both sedimentary and volcanic deposits, and several studies on the abundant Quaternary



Fig. 13 - Fossil carnivores from the tuffaceous deposits of Rome, described and figured by Portis in his contribution published in 1907 (Portis, 1907b).

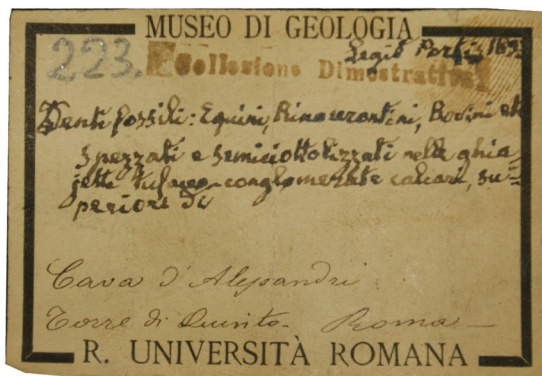


Fig. 14 - Original label and rhinoceros tooth found at Ponte Molle (Rome) from the collection of Alessandro Portis preserved at MUST, University of Rome.

vertebrate fauna of the Roman province (Portis, 1893, 1896a).

Still in the field of the Quaternary vertebrates, in 1894 Portis describes the remains of a mostly complete elephant skeleton found on the slopes of Monte Pisciato near Riofreddo (Portis, 1896b; Fig. 15), accidentally found during the ploughing of a field (Fabbi & Romano, 2020). The fossil deposits in this case refer to the intermountain basin of Oricola-Carsoli, some 40 km east of Rome, a depression of tectonic origin within the hydrographic basin of the Tevere river (sub-tributary of the Tiber) and about 40 km² wide (Fabbi & Romano, 2020).

During the Early-Middle Pleistocene the area was largely represented by a vast lacustrine environment, with deposition of the unit "*limi, argille e sabbie del Bosco di Oricola*" (silts, clays and sands of the Oricola Wood), with a thickness of over 200 m which represents the main filling of the basin (D'Orefice et al., 2010, 2014). At first Portis, relying on the preserved molars, referred the material to the species *Elephas meridionalis*, however he was not fully convinced and satisfied with the attribution; in fact, as Portis (1896a) writes the atlas vertebra and the calcaneus were very reminiscent of those of the species *Elephas antiquus*, whereas the fibula was more

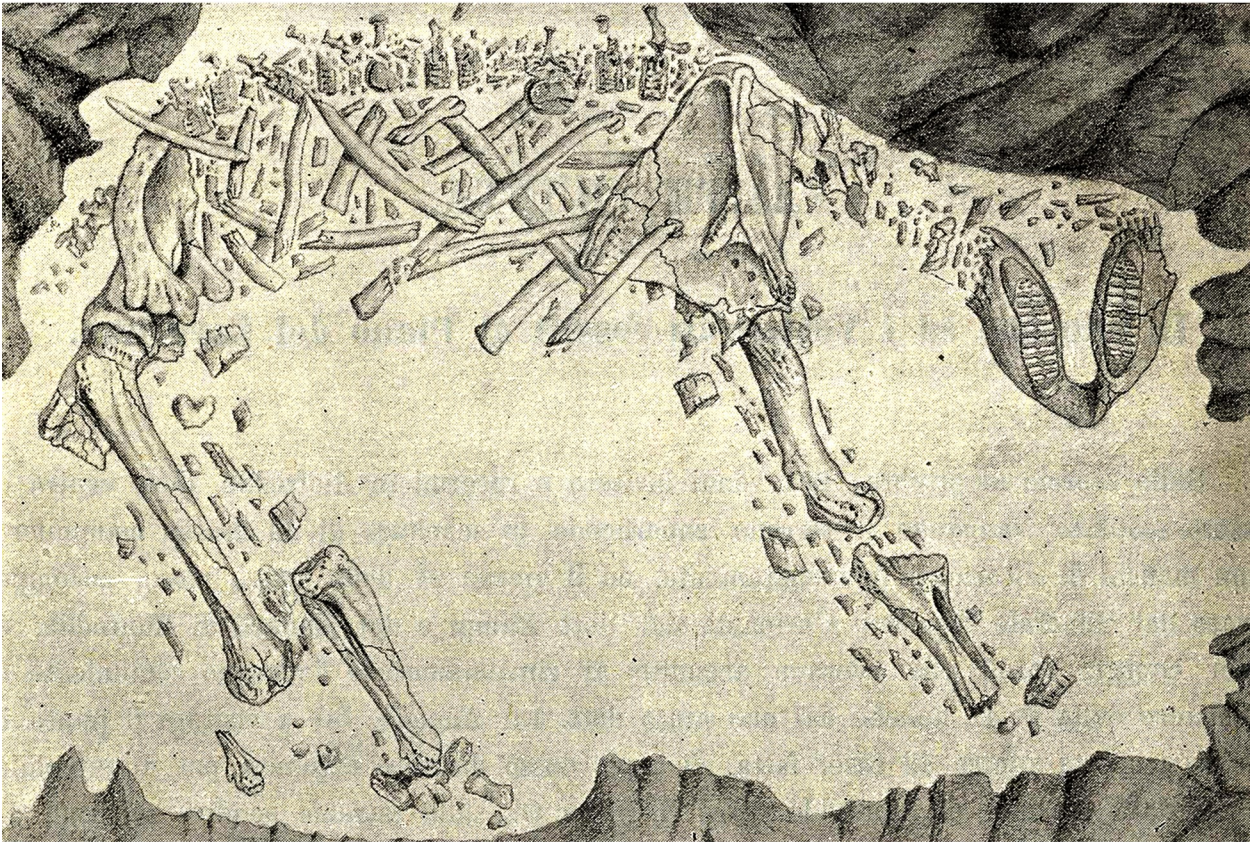


Fig. 15 - Drawing of the discovery conditions of the elephant from Riofreddo (modified from Portis, 1896a).

similar to the one characterizing *E. meridionalis*. The specimen was subsequently studied by De Angelis d'Ossat (1956) which referred it to *Elephas antiquus*, a species that appears in Italy in the Middle Pleistocene (Palombo & Ferretti, 2005), an age compatible with the Oricola deposits. In addition to the elephant remains, Portis (1896a) also analysed the remains of rhinoceros, hippopotamus and a carnivoran coprolite from the same stratigraphic unit and from the same area. The study of the remains allowed Portis to reconstruct a marshy environment of the 'Late Pliocene', characterized by the abundant presence of fossil mammal remains. As already mentioned, the deposits that returned the fossils today are referred to the Early-Middle Pleistocene, and a revision of the material allowed to attribute the fossil remains described by Portis to the species *Palaeoloxodon antiquus*, *Hippopotamus* cf. *antiquus*, *Stephanorhinus etruscus* and *Pachyrocota brevirostris* (Fabbi & Romano, 2020).

2.7. First decades of 20th century

After the period between the end of the nineteenth century and the twenties of the twentieth century, with the major contribution by Ponzi, Meli, Clèrici and Portis, the decades up to the sixties were characterized by a smaller number of works dedicated to Quaternary vertebrates of the Campagna Romana. According to Kostakis & Barisone (2008) this fact would be mainly due to a decrease of scholars who devoted themselves

to vertebrate palaeontology throughout Italy (see also Kotsakis, 2005). Nevertheless, it must be taken into account the negative influence of First World War during the twenties of XX, followed by a period of political instability, which in Italy continued until the advent of fascism. Talking about a deep crisis of the Roman geological and paleontological school, Praturlon (1993) states: "*Siamo così entrati nel '900, tra un fiorire di studiosi che ampliano velocemente il quadro delle conoscenze geologiche sull'area laziale. Il vento gelido della Grande Guerra farà purtroppo inaridire ben presto questo rigoglioso giardino*" (We thus entered the 1900s, among a flourishing of scholars who rapidly broaden the framework of geological knowledge on the Lazio area. The icy wind of the Great War will unfortunately soon dry up this luxuriant garden).

Although this period is not the subject of the present contribution, we can only briefly mention that concerning the study of vertebrate fauna, the period through the Second World War was characterized by the work of three central authors: Gioacchino De Angelis d'Ossat (1865-1957), Gian Alberto Blanc (1879-1966) and his son, Alberto Carlo Blanc (1906-1960). In particular, a more detailed and updated framework will be depicted only in the 1950s by Alberto Carlo Blanc, who developed the glacial-interglacial scheme by Penck and Bruckner (1909), and correlate it to the geological succession of the Campagna Romana with the identification of glacial erosional phases and depositional inter-

glacials (Blanc, 1938, 1939, 1946, 1948, 1955, 1957, 1958; Blanc et al., 1951; 1955a, 1955b).

3. CRITICAL DISCUSSION OF THE GEO-PALEONTOLOGICAL ROMAN SCHOOL

The end of the 19th century represented the beginning of a revolution for the Earth Sciences, with exponential growth of the studies and personalities devoted to these disciplines. During this period, Italy was affected by deep change, above all, the unification took place in March, 17 1861. Nevertheless, the complete unification of the Italian territory was reached during 1871, when Rome was nominated capital of the Reign. In fact, when the popular insurrection started, Napoleon III sent the French imperial troops in Rome in support to the Papal States; troops that occupied the city up to 1870 when the France lost the war against the Prussian. At that time, the city of Rome was defenceless, and therefore it was earlier conquered. What makes the French occupation crucial for geology and palaeontology studies was the presence of several French naturalists in Rome, among which we must mentioned Frère Indes. His contribute was really important for the development of the Natural research, in particular considering that the first paleontological excavation in a cave at the top of Monte delle Gioie, close to Ponte Salaro, was designed and conducted exactly by Indes (Indes, 1872; Kotsakis & Barisone, 2008).

Unfortunately, Indes left Rome when French troops were recalled by Napoleon III, with no time to organize the transport of his collections. In view of this fact, it is quite impossible to quantify the exact extent of the Frère Indes' collection; part of this historical material (more than 3000 specimen) is now kept in the school of San Giuseppe De Merode (Cerilli, 2014).

Afterwards the unification of Italy, the Geology underwent a massive leap forward, when the chair in Geology was instituted and the Geology Museum at the Sapienza, University of Rome was founded. Initially, this museum was located in the Sant'Ivo locals, nearest to Navona Square (Rome). Although several paleontological, geological and mineralogical private collections converged in the Geology Museum of Sapienza, several fossils were located in scientific Cabinet of Roman high schools, similarly to what happened for the Frère Indes' collections. The presence of Natural collections in the high School of Rome had a double valence: first they play an important scientific function for teaching purposes and second in representing a repository to keep together specimens of the same collection. This situation went on for decades until the institution of the chair in Palaeontology and the foundation of the Palaeontology Museum of Sapienza, University of Rome in 1928. It is worth mentioning that the *Città Universitaria* (University City), an institution that even today hosts the most of the Sapienza Departments, was built during 1930s and inaugurated in 1935. Henceforth, the paleontological collections previously housed in the Geology Museum located at Sant'Ivo were moved in the Sapienza Museum, which became the principal institution where fossils from Campagna Romana were stored.

The myriad of remains recovered during the end of 1800 and the first half of 1900, in addition to their great historical value, played a key role in the reconstruction of the evolution of terrestrial ecosystems during the late Early to late Middle Pleistocene. Is not merely the great abundance of collected fossil remains, but also the completeness and significance of these materials, often represented by nearly complete crania, with tusks in the cases of Elephantidae, horn corns for Bovidae or antlers for Cervidae, along with nearly complete skeletons found in anatomical connection (Palombo, 2004; Kotsakis & Barisone, 2007).

The first biochronological scheme based on large mammals was proposed by Blanc (1957), which recognized five glacial episodes: Acquatraversa, Cassia, Flaminia, Nomentana and Pontina: scheme, slightly modified by Ambrosetti & Bonadona (1967), that represented the basis for the paleontological study on mammals from Campagna Romana for decades (Kotsakis & Barisone, 2007). In the framework of the biochronological scheme of the Italian terrestrial large mammals, the Campagna Romana area assumes a great scientific interest, as testified by the names of two Mammal Ages (Galerian and Aurelian), by local fauna selected to instituted two faunal units (Ponte Galeria and Torre in Pietra), and by several local faunal complexes who have shed light on the terrestrial ecosystem evolution from the late Early Pleistocene to late Middle Pleistocene (e.g., Ambrosetti et al., 1972; Gliozzi et al., 1997; Di Stefano et al., 1998; Petronio & Sardella, 1998, 1999; Palombo, 2004; Kotsakis & Barisone, 2007; Marra et al., 2014; Sardella et al., 2015; Marra et al., 2018).

The majority of fossils recovered during the end of 1800s and the early 1900s were accidentally recovered often during quarry activities, lacking a clear stratigraphical context and providing scarce chronological constraints (Palombo, 2004). Systematic palaeontological and archaeological excavations became widespread during the 1910s, adopted for the first time by Blanc in the study of Grotta Romanelli (Sardella et al., 2018, 2019). Therefore, the lack of exact stratigraphical data is not surprising, and explain why the labels that accompanied these fossils (when present) reported only the bearing geological unit. Another limit of the time that must be stressed is the lack of technological tools, above all camera and total station. In addition, during the systematic excavation many data were recorded on excavation diary, whereas during the geopaleontological surveys data were reported on field book. Likewise, this documentation was rarely preserved, among which is worth mentioning the historical dossiers preserved at the *Istituto Italiano di Paleontologia Umana* (Italian Institute of Human Paleontology) and *Istituto Italiano di Preistoria e Protostoria* (Italian Institute of Prehistory and Protohistory). A final issue is represented by the exchange of correspondence, often used to communicate the latest research or discovery among involved scholars, but also to express a different viewpoint on some crucial aspects; these letters have been cited in several contributions in the literature, but the original documentation is often unaffordable.

An important point is how to approach this lack or

patchy documentation about the exact geographical and stratigraphical data. The Rome basin has been deeply studied from a geological, mineralogical and sedimentological perspectives and, as a result, the evolution of the Paleo-Tiber river is today well-known and constrained (e.g., Ambrosetti, 1967; Conato et al., 1980; Milli et al., 2004; Marra et al., 2014). By assembling the data reported in the historical works, the label information reported on fossils and updated geological maps, generally it is possible to obtain at least the macro geological unit. Thanks to the several scientific contributions on the Campagna Romana area, these units are well-chronologically constrained through radiometric dating or strong stratigraphical correlations, especially based on the volcanoclastic materials produced by the Sabatini or Colli Albani Volcanic Districts (Conato et al., 1980; Milli, 1997; Giordano et al., 2003; Funicello & Giordano, 2008; Marra et al., 2014; Marra et al., 2018). Despite these data are based on indirect sources and correlations, they represent the most commonly used method to geologically contextualize the historical collections. Finally, these specimens occasionally preserved sediments as patina which could cover the remain or, alternatively, as sediments that fill the natural empty or broken portion of fossils. The analysis of these associated sediments was used, for example, in the study of the partial cranium of *Stephanorhinus hemitoechus* where the only information reported on the label is simply 'Campagna Romana'; in this case the geochemical analysis of the associated pumice revealed an age approximately to 0.5 Ma (Pandolfi et al., 2013).

As already stressed, a systematic approach for paleontological excavations was firstly applied during the 1910s, but it became common only during the second part of the 20th century. Among the personalities of that time, a prominent scientist was Gian Alberto Blanc. Student of Portis, G.A. Blanc further developed the approach of his master, which combined the geological, stratigraphical and paleontological data on his works. G.A. Blanc added a great innovation to the paleontological research, i.e. the stratigraphical data for each fossil found during the excavation (generally reported on remains). This method was immediately followed by archaeologists, but in palaeontology became commonly followed only from the beginning of the 1980.

Finally, last but not least, a consideration is needed about the role of women in the Roman scientific community in the considered historical period. This can be related to the socio-political condition that characterised Italy, and Rome in particular. Such a topic deserves a more accurate and specific research to be published in the next future. Definitely, until 1940s the study of Quaternary in the Campagna Romana seems to be a men's job. Cesarina Cortesi was the first woman who got a degree in Geological Sciences at Sapienza in 1938-39 (Lombardi, 2015). In 1941 he wrote an article with G.A. Blanc about geochemical interpretation of the Quaternary deposits of Grotta Romanelli (Blanc & Cortesi, 1941). Cortesi worked for decades at Sapienza University. In the 1940s Angiola Maria Maccagno (1912-1991) started her geo-paleontological career at Sapienza university first, and then at Naples university. The

Quaternary of the Rome area was investigated since 1950s by Maria Follieri (1932-2012), who started advanced paleobotanical studies and gave rise to a scientific school still active today. The role of these scientists need to be properly studied and presented.

4. CONCLUDING REMARKS

The intense urbanisation which affected the city of Rome during the end of 1800 and the beginning of 1900 led the discovery of a myriad of vertebrate fossils. Most of these historical collections are today preserved in the MUST of Sapienza, University of Rome. Other fossils were kept in the scientific cabinets of several high school of the city of Rome or Latium villages. These rich fossil samples, mainly referred to Middle Pleistocene, played a key role for the study of the evolution large mammal faunal and terrestrial ecosystem as well as for the reconstruction of the evolutionary trend of the Palaeolithic human in Italian Peninsula. If on the one hand large part of these fossil collections lacks of both exact geographical and stratigraphical data, on the other, they represent a historical heritage which need to be preserved and promoted. This paleontological material was collected by a number of scientists, among which the most important were Ponzi, Tuccimei, Portis, Clèrici and Meli. Thanks to their meticulous work, the majority of the specimens are supplemented by a label, where data on collection year, author, approximate locality and preliminary description of the level in which fossils were collected, as well as the first taxonomical attribution. A comprehensive revision of fossil collections and chronostratigraphic data is needed to resume the attention of the Campagna Romana as laboratory for the study evolution of terrestrial ecosystems in the Mediterranean area. In this project will be crucial to realize a database in which to include all fossil materials dispersed in the high schools and museums. This database can be compared with the data reported in the paleontological literature, therefore allowing to understand how many fossils were lost for science over time and how many can be recovered for new reviews and future studies.

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REFERENCES

- Accordi B. (1975) - Contributions to history of geological sciences: Paolo Boccone (1633-1704) - a practically unknown excellent geopaleontologist of the 17th century. *Geologica Romana*, 14, 353-359.
- Accordi B. (1976) - Contributions to the history of geolo-

- gical sciences. Illustrators of the Kircher Museum naturalistic collections. *Geologica Romana*, 15, 113-126.
- Accordi B. (1978) - Agostino Scilla, painter from Messina (1629-1700), and his experimental studies on the true nature of fossils. *Geologica Romana*, 17, 129-144.
- Accordi B. (1981) - Ferrante Imperato (Napoli, 1550-1625) e il suo contributo alla storia della geologia. *Geologica Romana*, 20, 43-56.
- Accordi B. (1984) - Storia della geologia, Zanichelli, Bologna. pp. 114.
- Ambrosetti P. (1967) - Cromerian fauna of the Rome area. *Quaternaria*, 9, 1-17.
- Ambrosetti P., Bonadonna F.P. (1967) - Revisione dei dati sul Plio-Pleistocene di Roma. *Atti della Accademia Gioenia di Scienze Naturali di Catania*, ser. 6, 18, 33-72.
- Ambrosetti P., Azzaroli A., Bonadonna F.P., Follieri M. (1972) - A scheme of Pleistocene chronology for the Tyrrhemian side of Central Italy. *Bollettino della Società Geologica Italiana*, 91, 169-184.
- Anca F. (1872) - Sull'elefante africano rinvenuto fra i fossili post-pliocenici presso Roma. *Atti della Accademia Nazionale dei Lincei*, 25, 353-356.
- Argentieri A. (2009) - Meli, Romolo. *Dizionario Biografico degli Italiani*, 73, 289-291.
- Argentieri, A. (con la collaborazione di Pantaloni M.) (2015) - Ponzi, Giuseppe. *Dizionario Biografico degli Italiani* vol. 84.,
- Avanzini M., Kustatscher E. (2016) - Giganti di pietra: alle radici dei miti. In: Athesia SpA (Ed.), *Nani e giganti Studi storico culturali di Castel Roncolo*, Fondazione Castelli di Bolzano, Bolzano, 10, 9-41.
- Battaglia R. (1918) - Le industrie e le faune pleistoceniche d'Italia. *Rivista di Antropologia*, 22, 193-292.
- Blanc A.C. (1938) - Il giacimento musteriano di Saccopastore nel quadro del Pleistocene laziale. *Rivista di Antropologia*, 32, 223-235.
- Blanc A.C. (1939) - Sulla posizione della grotta del Monte delle Gioie nella Valle dell'Aniene. *Bollettino della Società Geologica Italiana*, 58, 133-138.
- Blanc A.C. (1946) - I reperti musteriani di Saccopastore e la posizione cronologica del giacimento alla luce dei recenti ritrovamenti. *Atti V Congresso Nazionale Studi Romani* (1937) (1946), Roma, pp. 3-11.
- Blanc A.C. (1948) - Notizie sui ritrovamenti e sul giacimento di Saccopastore e sulla posizione del Pleistocene laziale. *Palaeontographia Italica*, 42, 3-23.
- Blanc A.C. (1955) - Ricerche sul Quaternario laziale. III. Avifauna artica, crioturbazioni e testimonianze di soliflussi nel Pleistocene mediosuperiore di Roma e di Torre in Pietra. Il periodo glaciale Nomentano, nel quadro delle serie glaciali riconosciute nel Lazio. *Quaternaria*, 2, 187-200.
- Blanc A.C. (1957) - On the Pleistocene sequence of Rome. Paleocologic and archeologic correlations. *Quaternaria*, 4, 95-109.
- Blanc A.C. (1958) - Torre in Pietra, Saccopastore e Monte Circeo. La cronologia dei giacimenti e la paleogeografia quaternaria del Lazio. *Bollettino della Società Geologica Italiana*, 11, 196-214.
- Blanc A.C., Tongiorgi E., Trevisan L. (1951) - Un giacimento di fauna ad ippopotamo nel Quaternario antico della Maglianella presso Roma. *Atti 42a Riun. Soc. Ital. Progr. Sci.*, 1, Tivoli.
- Blanc A.C., Cova G., Franceschi P., Lona F., Settepassi F. (1955a) - Ricerche sul Quaternario laziale. II. Una torba glaciale, avifauna artica e malacofauna montana nel Pleistocene medio-inferiore dell'Agro Cerite e di Roma - Il periodo glaciale Flaminio. *Quaternaria*, 2, 159-186.
- Blanc A.C., Lona F., Settepassi F. (1955b) - Ricerche sul Quaternario laziale. I. Una torba ad Abies, malacofauna montana e criosedimenti nel Pleistocene inferiore di Roma - Il periodo glaciale Cascio. *Quaternaria*, 2, 151-158.
- Blanc G.A., Cortesi C. (1941) - Interpretazione geochimica delle formazioni quaternarie di Grotta Romanelli (Terre d'Otranto). III - Le sostanze umiche fossili. *Atti della Reale accademia nazionale dei Lincei. Rendiconti della Classe di Scienze Fisiche, Matematiche e Naturali*, 7, 33-55 .
- Bleicher M.G. (1865a) - Note sur une petite dent d'*Elephas antiquus* trouvée dans le diluvium des environs de Rome et renseignements sur ce diluvium. *Bulletin de la Société géologique de France* 22, 522-526.
- Bleicher M.G. (1865b) - Essai d'une monographie géologique du Mont-Sacré. *Bulletin de la Société d'histoire naturelle de Colmar, France*, 5, 147-160.
- Bleicher M.G. (1866) - Sur la géologie des environs de Rome. *Bulletin de la Société géologique de France*, 23, 645-654.
- Bleicher M.G. (1867) - Recherches géologiques faites dans les environs de Rome. *Bulletin de la Société d'histoire naturelle de Colmar*, 6-7, 65-99.
- Brocchi G. (1814) - Conchilologia fossile subappennina. Milano, Vol. 1, pp. 240, e Vol. 2, pp. 712.
- Brocchi G. (1820) - Dello stato fisico del suolo di Roma ed illustrazione della carta geognostica di questa città. Roma, pp. 281.
- Calmet A. (1730) - Il Tesoro delle antichità sacre e profane. Verona: Dioniso Ramanzini.
- Cerilli E. (2004) - Un prete e un soldato per la campagna (romana): le collezioni ottocentesche di Frère Indes e Luigi Ceselli. In Guidi A. (Ed.) - 150 anni di Preistoria e Protostoria in Italia (Studi di Preistoria e Protostoria), 111-116 pp.
- Ceselli L. (1868) - Sopra l'arte ceramica primitiva nel Lazio. Roma, coi Tipi del Salviucci, pp. 22.
- Ceselli L. (1870) - Sunto della memoria sopra gli studi paleontologici del Bacino di Roma e sue adiacenze. *Corrisp. Scient. Roma Avanz. Sci.*, 22, 1-7.
- Ceselli L. (1872) - *Hippopotamus dactyliotus* dei depositi quaternari presso Ponte Mamolo. Roma, pp. 8.
- Clèrici E. (1887a) - Sopra alcuni fossili recentemente trovati nel tufo grigio di Peperino presso Roma. *Bollettino della Società Geologica Italiana*, 6, 20-22.
- Clèrici E. (1887b) - Sopra i resti di Castori finora rinvenuti nei dintorni di Roma. *Bollettino del Regio Comitato Geologico*, 9, 278-284.
- Clèrici E. (1888) - Sopra alcune specie di Felini della Caverna al Monte delle Gioie presso Roma. *Bollettino del Regio Comitato Geologico*, 5, 149-167.

- Clèrici E. (1891) - Sul *Castor fiber*, sull'*Elephas meridionalis* e sul periodo glaciale nei dintorni di Roma. (Risposta alle osservazioni critiche del dott. Tuccimei). Bollettino della Società Geologica Italiana, 10, 333-370.
- Clèrici E. (1892) - L'*Ursus spæleus* nei dintorni di Roma. Bollettino della Società Geologica Italiana, 11, 105-110.
- Clèrici E. (1893) - Sopra un giacimento di Diatomee al monte del Finocchio o della Creta presso Tor di Valle. Bollettino della Società Geologica Italiana, 12, 759-821.
- Clèrici E. (1894a) - Sulle Diatomee fossili del suolo di Roma. Bollettino della Società Geologica Italiana, 13, 17-19.
- Clèrici E. (1894b) - Ulteriori notizie sopra il rinvenimento di alcuni mammiferi fossili. Bollettino della Società Geologica Italiana, 13, 97-105.
- Clèrici E. (1894c) - Sul ritrovamento del Castori nelle ligniti di Spoleto. Bollettino della Società Geologica Italiana, 13, 199-202.
- Clèrici E. (1895a) - Sopra un giacimento di Diatomee presso Viterbo. Bollettino della Società Geologica Italiana, 14, 96-98.
- Clèrici E. (1895b) - Sopra un nuovo giacimento diatomeifero preso Orvieto e sui blocchi di argilla marina contenuti nei materiali vulcanici sostenenti questa Città. Bollettino della Società Geologica Italiana, 14, 294-296.
- Clèrici E. (1895c) - Rinvenimento di resti di Tapiro nella lignite di Spoleto. Bollettino della Società Geologica Italiana, 14, 296-297.
- Clèrici E. (1895d) - Presentazione di fossili della regione fra Monti Cornicolani e Lucani, e digressione sulla pretesa epoca villafranchiana di detta regione. Bollettino della Società Geologica Italiana, 14, 315-320.
- Clèrici E. (1896) - Rinvenimento di Diatomee nei dintorni di Montalto (Prov. di Roma). Bollettino della Società Geologica Italiana, 15, 477-479.
- Clèrici E. (1906) - Delle sabbie fossilifere di Malagrotta sulla Via Aurelia. Rendiconti della Regia Accademia dei Lincei, 15, 133-136.
- Clèrici E. (1907) - Preparazione di liquidi per la separazione dei minerali. Atti della Regia Accademia dei Lincei, 16, 187-195.
- Clèrici E. (1926) - Resti di ippopotamo a Monte Antenne. Bollettino della Società Geologica Italiana, 45, 118-122.
- Clèrici E. (1931) - Presentazione di argilla e fossili palustri e di molare di *Rhinoceros* Mercki. Bollettino della Società Geologica Italiana, 50, 33.
- Clèrici E. (1932) - Le geologia e la paleontologia in Roma e nel Lazio. In "Le Scienze Fisiche e Biologiche in Roma e nel Lazio", Istituto di Studi Romani, (estr.), Roma. pp. 33.
- Clèrici (1935) - Carta dei giacimenti diatomeiferi dei dintorni di Roma. Bollettino della Società Geologica Italiana, 54, 223-228.
- Conato V., Esu D., Malatesta A., Zarlenga F. (1980) - New data on the Pleistocene of Rome. Quaternaria, 22, 131-176.
- Cuvier G. (1834) - Recherches sur les ossements fossiles, où on rétablit les caractères de plusieurs animaux dont les révolutions du globe ont détruit les espèces. 4ème éd., Vol. 1, Paris.
- De Angelis d'Ossat G. (1895) - Il *Rhinoceros (Coelodonta) etruscus* Falc. nella provincia romana. Atti della Accademia gioenia di scienze naturali in Catania, 9, 1-9.
- De Angelis d'Ossat G. (1956) - Notevoli denti elefantini fossili nella valle dell'Aniene. Atti e Memorie della Società Tiburtina di Storia e d'Arte, 28-29, 165-174.
- Di Stefano G., Petronio C., Sardella R. (1998) - Biochronology of Pleistocene mammal faunas from Rome urban area. Il Quaternario Italian Journal of Quaternary Sciences, 11, 191-199.
- D'Orefice M., Dramis F., Graciotti E., Graciotti R., Soligo M. (2010) - Evoluzione geomorfologica quaternaria della conca di Carsoli (AQ). Il Quaternario Italian Journal of Quaternary Sciences, 23, 55-74.
- D'Orefice M., Graciotti R., Chiessi V., Censi Neri P., Morri A., Roma M., Falcetti S. (2014) - La conca intermontana di Oricola-Carsoli (AQ): Caratteri geologici, geomorfologici e applicativi. Memorie Descrittive della Carta Geologica d'Italia, 91, pp. 138.
- Fabbi S., Romano M. (2020) - Alessandro Portis e l'elefante di Riofreddo (RM). Memorie Descrittive della Carta Geologica d'Italia, 106, 107-114.
- Fabiani R., Maxia E.C. (1953) - L'Istituto e i Musei di Geologia e Paleontologia. Pubblicazione Istituto di Geologia e Paleontologia di Roma, 9, 1-31.
- Fornaseri M. (1982) - Clèrici, Enrico. Dizionario biografico degli italiani, vol. 26.
- Funciello R., Giordano G. (2008) - Note illustrative della Carta Geologica d'Italia alla scala 1:50.000. Foglio 374 Roma. APAT, Dipartimento Difesa del Suolo, Servizio Geologico d'Italia, pp. 158.
- Funciello R., Heiken G., De Rita D., Parotto M. (2006) - I Sette Colli. Guida geologica a una Roma mai vista. Raffaello Cortina Editore, Milano, pp.328.
- Giordano G., Esposito A., De Rita D., Fabbri M., Mazzini I., Trigari A., Rosa C., Funciello R. (2003) - The sedimentation along the roman coast between Middle and Upper Pleistocene: the interplay of eustatism, tectonics and volcanism – New data and review. Il Quaternario Italian Journal of Quaternary Sciences, 16(1Bis), 121-129.
- Girotti O., Mancini M. (2003) - Plio-Pleistocene stratigraphy and relations between marine and non-marine successions in the middle valley of the Tiber River (Latium, Umbria). Il Quaternario Italian Journal of Quaternary Sciences, 16(1Bis), 89-106.
- Gliozzi E., Abbazzi L., Argenti P., Azzaroli A., Caloi L., Capasso Barbato L., Di Stefano G., Esu D., Ficcarelli G., Girotti O., Kotsakis T., Masini F., Mazza P., Mezzabotta C., Palombo M.R., Petronio C., Rook L., Sala B., Sardella R., Zanalda E., Torre D. (1997) - Biochronology of selected mammals, molluscs and ostracods from the Middle Pliocene to the Late Pleistocene in Italy. The state of the art. Rivista Italiana di Paleontologia e Stratigrafia, 103, 369-388.
- Heiken G., Funciello R., De Rita D. (2005) - The Seven

- Hills of Rome. A geological tour of the Eternal City. Princeton University Press, pp. 245.
- Iannucci A., Mecozzi B., Sardella R. (2021) - Large mammals from the Middle Pleistocene (MIS 11) site of Fontignano 2 (Rome, central Italy), with an overview of "san cosimato" assemblages. *Alpine and Mediterranean Quaternary*, 34(1), 155-164.
- Indes F. (1869) - Lettre sur la formation des tufs et sur une caverne à ossements des environs de Rome. *Bulletin de la Société géologique de France*, 26, 11-28.
- Indes F. (1870) - Deuxième 36etter sur la formation des tufs des environs de Rome. *Bulletin de la Société géologique de France*, 27, 410-425.
- Indes F. (1872) - Paléontologie quaternaire de la Campagne Romaine. *Mat. Hist. Prim. Homme*, 7, 553-563.
- Iurino D.A., Bellucci L., Schreve D., Sardella R. (2014) - Exceptional soft tissue fossilization of a Pleistocene vulture (*Gyps fulvus*): new evidence for emplacement temperatures of pyroclastic flow deposits. *Quaternary Science Reviews*, 96, 180-187.
- Kotsakis T. (2005) - Cenni di storia della Paleontologia dei Vertebrati in Italia. In: Bonfiglio L. (Ed.), *Paleontologia dei Vertebrati in Italia*, Memorie del Museo Civico di Storia Naturale di Verona, 6, 13-18.
- Kotsakis T., Barisone G. (2008) - Cenni sui vertebrati fossili di Roma. *Memorie Descrittive Carta Geologica d'Italia*, 80, 115-143.
- Lartet E. (1858) - Observations à propos des débris fossiles de divers éléphants dont la découverte a été signalée par M. Ponsi, aux environs de Rome. *Bulletin de la Société géologique de France*, 15, 564-569.
- Lombardi G. (2015) - Studenti e laureati in Scienze Geologiche a Roma La Sapienza dal 1936 al 2015. geoitaliani.it/2015/07/sapienza19362015.html
- Luzzini F. (2009) - Flood conceptions in Vallisneri's thought. *Geological Society, London, Special Publications*, 310, 77-81.
- Luzzini F. (2013) - Il miracolo inutile: Antonio Vallisneri e le scienze della Terra in Europa tra XVII e XVIII secolo. *Olschki, Firenze.*, 275.
- Mayor A. (2000) - *The first fossil hunters: paleontology in Greek and Roman Times*. Princeton (NJ): Princeton University Press, 384.
- Manni R., Palombo M.R., Palladino D.M. (2003) - The eurasian griffon, *Gyps fulvus* (Hablizl, 1783) in the "peperini" hydromagmatic deposits of the Alban Hills (Rome, Italy); a case of exceptional preservation. *Geologica Romana*, 37, 131-133.
- Marra F., Pandolfi L., Petronio C., Di Stefano G., Gaeta M., Salari L. (2014) - Reassessing the sedimentary deposits and vertebrate assemblages from Ponte Galeria area (Rome, central Italy): An archive for the Middle Pleistocene faunas of Europe. *Earth -Science Reviews*, 139, 104-122.
- Marra F., Nomade S., Pereira A., Petronio C., Salari L., Sottili G., Bahain J.J., Boschian G., Di Stefano G., Falguerès C., Florindo F., Gaeta M., Giaccio B., Masotta M. (2018) - A review of the geologic sections and the faunal assemblages of Aurelian Mammal Age of Latium (Italy) in the light of a new chronostratigraphic framework. *Quaternary Sciences Reviews*, 181, 173-199.
- Martelli A., Cerulli-Irelli S., Clerici E. (1932) - Rievocazione. *Bollettino della Società Geologica Italiana*, 51, 20-27.
- Mazzella S. (1591) - *Sito et Antichità della città di Pozzuolo, e del suo amenissimo distretto*. Napoli: Horatio Salviani, 152.
- Mecozzi B., Iurino D.A., Profico A., Rosa C., Sardella R. (2020) - The wolf from the Middle Pleistocene site of Ostiense (Rome): the last occurrence of *Canis mosbachensis* (Canidae, Mammalia) in Italy. *Historical Biology*. Doi: 10.1080/08912963.2020.1769090.
- Mecozzi B., Iannucci A., Mancini M., Sardella R. (2021) - Redefining Ponte Molle (Rome, central Italy): an important locality for Middle Pleistocene mammal assemblages of Europe. *Alpine and Mediterranean Quaternary*, 34(1), 131-154.
- Meli R. (1881a) - Notizie ed osservazioni sui resti organici rinvenuti nei tufi leucitici della provincia di Roma. *Bollettino del Regio Comitato Geologico D'Italia*, 12, 428-457.
- Meli R. (1881b) - Rinvenimento di ossa fossili nei dintorni di Roma. *Bollettino del Regio Comitato Geologico d'Italia*, 12, 580-582.
- Meli R. (1882) - Ulteriori notizie ed osservazioni sui resti fossili rinvenuti nei tufi vulcanici della provincia di Roma. *Bollettino del Regio Comitato Geologico d'Italia*, 13, 260-280 and 358-368.
- Meli R. (1886) - Sopra alcune ossa fossili rinvenute nelle ghiaie alluvionali presso la via Nomentana, al 3° chilom. Da Roma. *Bollettino del Regio Comitato Geologico d'Italia*, 17, 265-280.
- Meli R. (1889a) - Su' mammiferi fossili delle ghiaie quaternarie dei dintorni di Roma. *Bollettino della Società Geologica Italiana*, 8, 40-43.
- Meli R. (1889b) - Sopra i resti fossili di un grande avvoltoio (*Gyps*) racchiuso nei peperini laziali. *Bollettino della Società Geologica Italiana*, 8, 490-529.
- Meli R. (1891a) - Sopra alcuni resti di mammiferi fossili nei terreni quaternari della provincia di Roma. *Bollettino della Società Geologica Italiana*, 10, 1001-1002.
- Meli R. (1891b) - Sopra alcuni resti di carnivori rinvenuti nelle ghiaie alluvionali della valle del Tevere, nei dintorni di Roma. *Bollettino della Società Geologica Italiana*, 10, 1003.
- Meli R. (1894a) - Sopra una zanna elefantina a doppia curvatura rinvenuta nelle ghiaie d'alluvione dell'Aniene alla Batteria Nomentana presso Roma. *Bollettino della Società Geologica Italiana*, 13, 12-15.
- Meli R. (1894b) - Sopra alcuni resti fossili di Mammiferi rinvenuti nella cava della catena presso Terracina (Provincia di Roma) *Bollettino della Società Geologica Italiana*, 13, 183-190.
- Meli R. (1895) - Notizie sopra alcuni resti di mammiferi quaternarii (ossa e denti isolati) rinvenuti nei dintorni di Roma. *Bollettino della Società Geologica Italiana*, 15, 291-296.
- Meli R. (1896) - Sulla esistenza di strati di torba affio-

- ranti entro mare, lungo la spiaggia di Foglino presso Nettuno nella Provincia di Roma. Bollettino della Società Geologica Italiana, 15, 15-36.
- Meli R. (1897) - Sopra alcuni denti fossili di mammiferi (ungulati) rinvenuti nelle ghiaie alluvionali dei dintorni di Roma. Bollettino della Società Geologica Italiana, 16, 187-194.
- Meli R. (1908) - Rinvenimenti di denti fossili elefantini in alcune località nuove, o interessanti per la provincia di Roma. Bollettino della Società Geologica Italiana, 27, 432-434.
- Meli R. (1918) - Rinvenimento di resti fossili di un elefante nell'interno della città di Roma. Atti della Accademia Pontificia de' Nuovi Lincei, 71, 141-149.
- Meli R. (1916) - Prof. Comm. Giuseppe Tuccimei, necrologie. Bollettino della Società Geologica Italiana, 35, 89-98.
- Milli S. (1997) - Depositional setting and high-frequency sequence stratigraphy of the middle-upper Pleistocene and Holocene deposits of the roman basin. *Geologica Romana*, 33, 99-136.
- Milli S., Palombo M.R., Petronio C., Sardella R. (2004) - The middle Pleistocene deposits of the Roman basin (Latium, Italy): an integrated approach of mammal biochronology and sequence stratigraphy. *Rivista Italiana di Paleontologia e Stratigrafia*, 110, 559-569.
- Morello N. (1979) - La nascita della paleontologia nel seicento: Colonna, Stenone e Scilla. Granco Angeli Editore, Milano, 265.
- Morello N. (2003) - The question on the nature of fossils in the 16th and 17th centuries. In: Vai G.B., Cavazza W. (Eds.) - Four centuries of the word geology: Ulisse Aldrovandi 1603 in Bologna. Minerva Edizioni, Bologna, 127-151.
- Morichini D. (1803) - Analisi chimica dei denti fossili di un elefante trovato nelle vicinanze di Roma. Memoria di Matematica e di Fisica della Società Italiana delle Scienze Residente in Modena, 10.
- Morichini D. (1805) - Analisi dello smalto di un dente fossile di elefante e dei denti umani. Memoria di Matematica e di Fisica della Società Italiana delle Scienze Residente in Modena, 12-(2), 73-88.
- Morozzo C.L. (1802) - Notice sur un squelette d'un gros animal trouvé aux environs de Rome. *Journal de Physique, de Chimie, d'Histoire Naturelle et des Arts*, 54, 441-442.
- Morozzo C.L. (1803) - Sopra i denti fossili di un elefante trovato nelle vicinanze di Roma. Memoria di Matematica e di Fisica della Società Italiana delle Scienze Residente in Modena, 10(2), 162-171.
- Napoli P.F. (1907) - Intorno alla formazione di Monteverde e di alcuni fossili rinvenuti. *Memorie della Pontificia Accademia Nazionale dei Nuovi Lincei*, 25, 79-82.
- Napoli P.F. (1911) - Di alcuni rinvenimenti di fossili a Monteverde presso Roma. *Memorie della Pontificia Accademia Nazionale dei Nuovi Lincei*, 29, 229-231.
- Neviani A. (1926) - L'ippopotamo nella Campagna Romana. *Memorie della Pontificia Accademia Nazionale dei Nuovi Lincei*, 9, 27-49.
- Neviani A. (1938) - Necrologia di Enrico Clerici. *Bollettino della Società Geologica Italiana*, 57(3), 121-143.
- Palombo M.R. (2004) - Le mammalofaune della campagna romana: bio-cronologia, paleoambienti. Il Congresso GeoSed, Escursione precon-gresso, Roma, 1-29.
- Palombo M.R., Ferretti M.P. (2005) - Elephant fossil record from Italy: knowledge, problems, and perspectives. *Quaternary International*, 126/128, 107-136.
- Pandolfi L., Gaeta M., Petronio C. (2013) - The skull of *Stephanorhinus hemitoechus* (Mammalia, Rhinocerotidae) from the Middle Pleistocene of Campagna Romana (Rome, central Italy): biochronological and paleobiogeographic implications. *Bulletin of Geosciences*, 88(1), 51-62.
- Pareto M. (1865) - Note sur la subdivision que l'on pourrait établir dans les terrains de l'Apennin septentrional. *Bulletin de la Société géologique de France*, 22, 210-277.
- Pantaloni M. (con la collaborazione di Argentieri A.) (2016) - Portis, Alessandro. *Dizionario Biografico degli Italiani* 85.
- Penck A., Brückner E. (1909) - Die Alpen in Eiszeitalter. Tauchnitz, Leipzig, pp. 1199.
- Petronio C., Sardella R. (1998) - *Bos galerianus* n. sp., (Bovidae, Mammalia) from the Ponte Galeria Formation (Rome, Italy). *Neues Jahrbuch für Geologie und Paläontologie-Monatshefte*, 269-284.
- Petronio C., Sardella R. (1999) - Biochronology of the Pleistocene mammal fauna from Ponte Galeria (Rome) and remarks on the Middle Galerian faunas. *Rivista Italiana di Paleontologia e Stratigrafia*, 105, 155-164.
- Pianciani G.B. (1817). Delle ossa fossili di Magognano nel territorio di Viterbo. *Opuscoli Scientifici, Tomo Primo*. Bologna: Annesio Nobili
- Pianciani G.B. (1836) - Di alcune ossa fossili rinvenute in Roma e ne' dintorni, e conservate nel Museo Kircheriano. *Giornale Arcadico*, 67, 158-173.
- Ponzi G. (1867) - Storia fisica del bacino di Roma. Ed-Seconda, Roma, pp. 20.
- Ponzi G. (1874) - Carta geologica per servire alla storia dei vulcani del Lazio in Storia dei vulcani Laziali Roma. Salviucci.
- Ponzi G. (1875) - Cronaca subappennina o abbozzo d'un quadro generale del periodo glaciale. *Atti XI Congresso degli Scienziati Italiani*, 268-346.
- Ponzi G. (1878) - Le ossa fossili subappennine dei dintorni di Roma. *Memorie della Regia Accademia dei Lincei*, 2, 709-736.
- Portis A. (1885) - Catalogo descrittivo dei Talassoterii rinvenuti nei terreni terziari del Piemonte e della Liguria. *Memorie della Regia Accademia delle Scienze di Torino*, 37, 247-365.
- Portis A. (1893) - Contribuzioni alla storia fisica del bacino di Roma e studii sopra l'estensione da darsi al Pliocene superiore. Vol. I, Roma, pp. 293.
- Portis A. (1896a) - Contribuzioni alla Storia Fisica del Bacino di Roma e studi sopra l'estensione da darsi al Pliocene superiore. Vol. 2 parti quarta e quinta, Roux Frassati, Torino, pp. 513.

- Portis A. (1896b) - Il Cigno fossile nelle vicinanze di Roma. *Rivista Italiana di Paleontologia*, 2, 158-162.
- Portis A. (1896c) - Anomalie riscontrate sull'atlante di un elefante fossile dei dintorni di Roma. *Rivista Italiana di Paleontologia*, 2, 326-332.
- Portis A. (1899) - Una nuova specie di Rinoceronti fossile d'Italia? *Bollettino della Società Geologica Italiana*, 18, 116-131.
- Portis A. (1900) - Di una formazione stagnale presso la Basilica Ostiense di Roma e degli avanzi fossili vertebrati in essa rinvenuti. *Bollettino della Società Geologica Italiana*, 19, 179-240.
- Portis A. (1902) - Di un dente anomalo di Elefante fossile e della presenza dell'*Elephas primigenius* in Italia. *Bollettino della Società Geologica Italiana*, 21, 93-114.
- Portis A. (1903) - Ancora delle specie elefantine fossili in Italia. *Bollettino della Società Geologica Italiana*, 22, 143-146.
- Portis A. (1904) - Un interessante fossile dei peperini. *Bollettino della Società Geologica Italiana*, 23, 171-178.
- Portis A. (1907a) - È dimostrata la contemporaneità dell'uomo paleolitico coll'Elefante antico, l'Ippopotamo ed un Rinoceronte in Italia? *Bollettino della Società Geologica Italiana*, 26, 28-29.
- Portis A. (1907b) - Di due notevoli avanzi di Carnivori fossili dai terreni tufacei di Roma. *Bollettino della Società Geologica Italiana*, 26, 63-87.
- Portis A. (1907c) - Di alcuni avanzi fossili di grandi Ruminanti principalmente della Provincia di Roma. *Palaeontographia Italica*, 13, 141-198.
- Portis A. (1909) - Avanzi di Canidi fossili. *Bollettino della Società Geologica Italiana*, 28, 203-244.
- Portis A. (1920) - Elenco delle specie di Cervicorni fossili in Roma e attorno Roma. *Bollettino della Società Geologica Italiana*, 39, 132-139.
- Praturlon A. (1993) - Breve storia delle ricerche geologiche. In: Cosentino D., Parotto M., Praturlon A. (Eds.) Lazio. 14 Itinerari. Guide Geologiche Regionali a cura della Società Geologica Italiana, BE-MA editrice, 5, 12-14.
- Rellini U. (1916) - Aggiunte alla fauna pleistocenica italiana (comunicazione preventiva). *Atti della Società dei Naturalisti e Matematici di Modena*, 3, 30-34.
- Roisecco G. (1750) - Descrizione di Roma antica e moderna. Roma, Puccinelli.
- Romano M. (2013) - 'The vain speculation disillusioned by the sense': the Italian painter Agostino Scilla (1629-1700) called 'The Discoloured', and the correct interpretation of fossils as 'lithified organisms' that once lived in the sea. *Historical Biology*, 26(5), 631-651.
- Romano M. (2014) - From petrified snakes, through giant "foraminifers", to extinct cephalopods: the early history of ammonite studies in the Italian peninsula. *Historical Biology*, 27(2), 214-235.
- Romano M. (2016) - "Per tremoto o per sostegno mano": The Geology of Dante Alighieri's *Inferno*. *Italian Journal of Geosciences*, 135, 95-108.
- Romano M. (2017) - The theory of the Earth of the Barabite cleric Ermenegildo Pini: a mostly unknown Italian catastrophist. *Historical Biology*, 29(4), 519-538.
- Romano M. (2018a) - Palaeoecology before ecology: the rise of actualism, palaeoenvironments studies and palaeoclimatology in the Italian panorama between the fourteenth and eighteenth centuries. *Italian Journal of Geosciences*, 137, 16-30.
- Romano M. (2018b) - Italian Diluvianism and antidiluvianism within the international arena: the great debate that lasted more than six centuries. *Proceedings of the Geologists' Association*, 129(1), 17-39.
- Romano M. (2018c) - "Chi tutto il Fenomeno non spiega, non ne spiega nulla": Anton Lazzaro Moro e la confutazione dei sistemi di Burnet e Woodward. *Rendiconti Online della Società Geologica Italiana*, 45, 147-156.
- Romano M., Avanzini (2019) - The skeletons of Cyclops and Lestrignons: misinterpretation of Quaternary vertebrates as remains of the mythological giants. *Historical Biology*, 31(2), 117-139.
- Romano M., Palombo M.R. (2017) - When legend, history and science rhyme: Hannibal's war elephants as an explanation to large vertebrate skeletons found in Italy. *Historical Biology*, 29(8), 1106-1124.
- Romano M., Cifelli R., Vai G. (2016) - The first geological map: an Italian legacy. *Italian Journal of Geosciences*, 135, 261-267.
- Rudwick M.J.S., (1972) - The Meaning of Fossils: Episodes in the History of Paleontology. Macdonald/American Elsevier, London/New York, 304.
- Sardella R., Bedetti C., Iurino D. A., Pavia M., Bellucci L. (2015) - Comment on "Reassessing the sedimentary deposits and vertebrate assemblages from Ponte Galeria area (Rome, central Italy): An archive for the Middle Pleistocene faunas of Europe" by F. Marra, L. Pandolfi, C. Petronio, G. Di Stefano, M. Gaeta, L. Salari [Earth-Science Reviews 139 (2014), 104-122]. *Earth-Science Reviews*, 147, 201-203.
- Sardella R., Mazzini I., Giustini F., Mecozzi B., Brilli M., Iurino D.A., Lembo G., Muttillo B., Massussi M., Sigari D., Tucci S., Voltaggio M. (2018) - Grotta Romanelli (Southern Italy, Apulia): legacies and issues in excavating a key site for the Pleistocene of the Mediterranean. *Rivista Italiana di Paleontologia e Stratigrafia*, 124(2), 247-264.
- Sardella R., Iurino D.A., Mecozzi B., Sigari D., Bona F., Bellucci L., Coltorti M., Conti J., Lembo G., Muttillo B., Mazzini I. (2019) - Grotta Romanelli (Lecce, Southern Italy) Between Past and Future: New Studies and Perspectives for an Archaeo-geosite Symbol of the Palaeolithic in Europe. *Geoheritage*, 11(4), 1413-1432.
- Segre A.G. (2001) - Palaeontology and prehistory in Central Italy: an historical summary. In: Cavaretta G., Gioia P., Mussi M., Palombo M.R. (Eds.), *The World of Elephants*, Roma, 76-77.
- Terrigi G. (1883) - Il colle Quirinale, sua flora e fauna lacustre e terrestre, fauna microscopica marina degli strati inferiori. *Atti dell'Accademia Pontificia Nazionale de' Nuovi Lincei*, 35, 1-32.

- Tuccimei G. (1880) - I colli pliocenici di Magliano-Sabino. *Gli Studi in Italia*, 3, 1-21.
- Tuccimei G. (1883) - Sulla struttura dei terreni che formano la catena di Fara in Sabina. *Bollettino della Società Geologica Italiana*, 2, 16-39.
- Tuccimei G. (1886) - Sopra le cavità naturali dei monti Sabini. *Atti dell'Accademia Pontificia Nazionale de' Nuovi Lincei*, 40, 43-45.
- Tuccimei G. (1887) - Il sistema liassico di Roccantica e i suoi fossili. *Bollettino della Società Geologica Italiana*, 6, 117-157.
- Tuccimei G. (1888) - Bradisismi pliocenici della regione sabina. *Memorie dell'Accademia Pontificia Nazionale de' Nuovi Lincei*, 4, 107-121.
- Tuccimei G. (1889) - Il Villafranchiano nelle valli Sabine e i suoi fossili caratteristici. *Bollettino della Società Geologica Italiana*, 8, 13-58.
- Tuccimei G. (1890a) - Note stratigrafiche sopra la formazione secondaria dei monti Sabini. *Memorie dell'Accademia Pontificia Nazionale de' Nuovi Lincei*, 6, 266-277.
- Tuccimei G. (1890b) - Rinvenimento di avanzi di *Elephas meridionalis* Nesti, nel pliocene di Montoro. *Atti dell'Accademia Pontificia Nazionale de' Nuovi Lincei*, 43, 27-28.
- Tuccimei G. (1891) - Alcuni mammiferi fossili delle provincie Umbra e Romana. *Memorie dell'Accademia Pontificia Nazionale de' Nuovi Lincei*, 7, 89-152.
- Tuccimei G. (1893) - Resti di Arvicola nel pliocene lacustre della Sabina. *Memorie dell'Accademia Pontificia Nazionale de' Nuovi Lincei*, 9, 36-45.
- Tuccimei G. (1895) - Il Villafranchiano e l'Astiano nella valle tra i Corniculani e i lucani. *Memorie dell'Accademia Pontificia Nazionale de' Nuovi Lincei*, 11, 41-66.
- Tuccimei G. (1898) - Sopra alcuni cervi pliocenici della Sabina e della provincia di Roma. *Memorie dell'Accademia Pontificia Nazionale de' Nuovi Lincei*, 14, 33-35.
- Tuccimei G. (1899) - Sopra alcune ossa fossili di cervo trovate sulla via Aurelia. *Atti dell'Accademia Pontificia Nazionale de' Nuovi Lincei*, 52, 65-67.
- Vai G.B. (2003) - A liberal diluvianism. In: Vai G.B., Cavazza W. (Eds.), *Four centuries of the word geology: Ulisse Aldrovandi 1603 in Bologna*. Bologna, Minerva Edizioni. Bologna, Minerva Edizioni, 221-249.
- Verneuil P.E.P. De (1865) - Sur le diluvium des environs de Rome. *Bulletin de la Société géologique de France*, 22, 519-522.

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