

The Naturalistic Explorations of the Milanese Barnabite Ermenegildo Pini (1739–1825) Along the Coast of Calabria: New Observations and Implications with Regard to His Views on the History of the Earth

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When the naturalist Ermenegildo Pini¹, a Barnabite cleric of the Sant’Alessandro College in Milan, began his travels at the beginning of July 1792² along the Italian Peninsula as far as the coast of upper Calabria, his knowledge of geology and mineralogy had already been consolidated for some time.

Born in Milan in 1739, Pini studied at the Barnabite schools of Monza and Milan and took his vows in October 1757. Between 1757 and 1760 he studied philosophy and geometry and later went to Rome where he was conferred with a degree in theology. He returned to Milan in 1764 and was assigned to the college of Sant’Alessandro. He was nominated professor of Canon Law in 1765 and later also taught mathematics. Apart from his teaching activities, he began a promising career as an architect, which culminated in the writing of an important treatise³ and in the project for the imposing dome of the parish church of San Giuseppe di Seregno⁴. In 1773 he was, nevertheless, suddenly required by the Barnabite Order to abandon his theological-mathematical-architectural career in order to dedicate himself to naturalistic disciplines⁵. The Hapsburg empire had in fact decided to establish a museum and a chair for Natural History in Milan with the aim of collecting rock, mineral, plant, and animal specimens, which could be useful from an economical-practical and didactic point of view. The management of these institutions was entrusted to the Barnabite Order, which, in turn, entrusted the directorship to Pini⁶. In order to master the knowledge necessary for the realization of the tasks before him, he first went to Vienna and later undertook various scientific travels in Austria, central Italy, Piedmont, Savoia, Switzerland, and to Mt. St. Gotthard. In addition, he made many short excursions within the mountains of Austrian Lom-



FIGURE 1. Ermenegildo Pini. Biblioteca Ambrosiana
Milano.

bary in order, firstly, to collect natural objects and, secondly, to initiate research on new mineralogical sites and to improve the level of work at existing sites⁷. Over the years, he intensified his activities, above all after his nomination as Delegate of Mines (1782)⁸, a post that became fundamental both for the economic growth of Austrian Lombardy⁹, and for the expansion of the Museum of Sant'Alessandro¹⁰.

Alongside these accomplishments, Pini undertook his first naturalistic studies, which were mainly oriented towards the problems posed by orographic questions and, in particular, by the structure, morphology, and height of the mountains. His first scientific work on the subject, written after his travel in Lombardy and Piedmont in 1779¹¹, was emblematic. In addition to the petrographic and mineralogical description of the material collected in the mountains of that area, he also presented some thoughts or ideas indicative of his view on the litho-stratigraphic questions frequently debated by geologists at this time. This work also showed his orientation in favour of a primordial ocean, which initially had covered the entire planet. In this regard, his reflections are of particular interest as they were mainly in agreement with the ideas of the German traveler and naturalist Peter Simon Pallas with reference to the granite formation of the highest mountains and the absence of granite strata¹². However, he did not ignore the doubts expressed on the topic by the Swiss naturalist Horace-Bénédict de Saussure who was inclined not to completely exclude the possibility of stratification in the granite¹³. Furthermore, his position with respect to the presence of granite formations in the middle and low mountains was based on the descriptions by the German geologist Johann Friedrich Wilhelm Charpentier and on those of the mineralist of Swedish origin, Johann Jacob Ferber¹⁴, to which he added his own new observations. Finally, he adhered to the studies by the Swedish chemist Torbern Olof Bergmann concerning the distinction of the mountains into primary (or rather granitic), i.e., created together with the Earth, and secondary, i.e., formed either by water (such as the limestones), or by fire.¹⁵

This promising first dissertation was followed by several essays aimed at developing the study of orogenetic and orographic questions through the interconnection of mathematical reasoning and naturalistic observations made *in loco*. Regarding this subject, a good example is the memoir on the disposition of strata of 1780¹⁶, in which he described the possibility of recognising the presence of strata and of determining their inclination and direction by using a “gonimeter”, an instrument adjusted by him for that purpose. In his work on the height of the mountains of Lombardy in 1781¹⁷, he presented the results of the measurements he had done for determining the absolute and relative heights of the mountains of Lombardy. On this basis, he thus attempted to establish a first general division between the high granite and quartzose reliefs, characterized by the presence of fractures and fissures on the one hand, and less elevated mountains, mostly formed of stratified limestones on the other.

Shortly afterward, Pini decided to try to further interweave the exact sciences and the naturalistic disciplines by applying his mathematical knowledge to the problem of reducing the physical and natural elements (mountains, lakes, valleys, plains, water courses etc.) to abstract geometric figures. The results of this work were the theories outlined in the first part of his essay on St. Gotthard mountain¹⁸, where he presented a geometric-descriptive illustration of the great physical phenomena of the Earth¹⁹ with the aim of establishing “certain principles precisely” and thus free “the mineralogists from the spirit of systems” and the danger of making their observations “without the aid of the sciences required for that aim”²⁰. A further step in this direction was taken two years later, while preparing the Italian translation of Nathanael Gottfried Leske’s manual *Anfangsgründe der Naturgeschichte* (Leipzig, Crusius 1779). In his long introduction to the work, he outlined the mathematics that he had applied up to that time to the mineral world as well as to living organisms²¹.



FIGURE 2. Capo Palinuro and its surroundings. Carta generale dell'Italia divisa ne'suoi stati e province (Roma: Calcografia Camerale, 1793) n.n. plate.

Thanks to his writings, observations and theoretical reflections, Pini had achieved in the early eighties a considerable reputation not only among the scientists of the Italian Peninsula but also among those from beyond the Alps. He was also esteemed for his assiduous work at the Museum and for his position as professor for Natural History at the college of Sant'Alessandro. In addition, he was known for his efforts in the exchange of minerals and rocks, started in 1779²², with the Museum of the University of Pavia directed by Lazzaro Spallanzani, professor of Natural History at that University²³.

In 1784, he was invited to join the Società Italiana delle Scienze, established in 1782 by the Veronese mathematician Anton Maria Lorgna²⁴. It is likely that it was Spallanzani²⁵ who suggested Pini's candidature to Lorgna, probably driven by the desire to stave off the eventual nomination of the botanist Giovanni Antonio Scopoli²⁶. It is also likely that Spallanzani's proposal was accompanied by the tacit assent of the physicist Alessandro Volta, also a professor at Pavia, as well as the technologist Marsilio Landriani. Both Volta and Landriani had had important scientific relations with Pini²⁷ and had been constantly consulted by Lorgna after their involvement regarding the foundation of the Society in 1781²⁸.

The Milanese Barnabite was also indebted to Spallanzani for encouraging him, between 1788 and 1789, to write an essay for the *Memorie* of that Society on a geological topic²⁹. The relation-

ship between the two scientists. Pini and Spallanzani, went through a particularly tranquil phase at that time. This was due, in part, to Pini's support of his colleague after the embarrassing incident provoked by accusations by the custodian Serafino Volta that he had removed naturalistic material from the Museum of the University of Pavia³⁰.

The problem that the Milanese Barnabite decided to have him address as his scientific contribution to the periodical of the Società italiana delle Scienze focused on reconstructing the origin and history of the Earth. Pini now wanted to attempt to proceed not only along the lines of mathematical reasoning and naturalistic observations but also by reflecting on the Holy Scriptures. The latter he adopted for the first time and in an explicit way³¹ as an interpretative tool for his scientific investigations. He was probably encouraged in this direction, at least in part, also by his willingness to declare that he was in agreement with the metaphysical-theological principles outlined by his powerful co-brother Cardinal Giacinto Sigismondo Gerdil, in two anti-Buffonian writings published in 1775 and 1784³². This was a demanding work for Pini, full of difficulties, pitfalls, and obstacles³³, that he carried out with firm determination and, eventually, published in two separate parts³⁴.

In order to commence his argument, he first found himself in the predicament of having to acknowledge that "the stratification", which proved so useful, as mentioned above, in the application of mathematics for determining the times of formation of the different rocks, "[could] no longer be considered as a key to the theory of the Earth"³⁵. Subsequent to "the observations of many", it emerged that, on the one hand, strata were present "also in many materials", such as lavas and tuffs, "which certainly did not originate in water"³⁶, and, on the other hand, that the study of fossil animals could have constituted a valid starting point for the reconstruction of the history of the Earth. The latter was a discovery that encouraged Pini to approach this new and promising sector of research and to identify, as a useful tool for achieving his scientific-religious aim, "the shells which are contained in the strata"³⁷ and, more particularly, "the position which some species of pholades (*Pholas dactylus*) and rock-eating mussels (*Mytilus lithophagus*) have in the mountains³⁸, which is very similar to that which they have in life".

This "position", consistent with the ability to "perforate either the earth or also the stones and to form an alveolus where to perpetually form its niche" was used by the neptunists as evidence to support the idea that, in the past, the sea had "remained permanently on the present continents as high as the highest peaks of the mountains"³⁹. This was a conclusion that, in Pini's opinion, was not sufficiently demonstrated and that accordingly required a prompt and detailed revision. Thus, he decided to begin questioning not only the hypothesis, shared by himself, that the marine waters had at one time covered the entire planet, but also the duration of time during which "the sea [remained] at that elevation where now are found those fossils" and to which period could "that presence be referred"⁴⁰.

However, before answering the question thus formulated, one had to address another question first: what was the condition of the planet before its peaks had been reached by the sea? Applying once again his mathematical knowledge to the naturalistic disciplines, the Milanese Barnabite hypothesized a first, rapid "revolution", due to the force of rotation, which he introduced as the initial impulse for the process of formation of the terrestrial globe⁴¹. Such a force, "animated by greater velocity than that required to rotate a fluid body"⁴², had altered the original mass composed of water and various earthy substances into a "globe separated into seas and dry land with a shape compressed at the poles and elevated at the equator", which soon was populated by animal and vegetable organisms, not excluding our "most remote ancestors"⁴³.

Having clarified this problem he turned to the double question of the duration and the period of the rising of the sea. In order to resolve the question he introduced into the scenario a second "tran-



FIGURE 3. Pozzuoli. William Hamilton, *Campi phlegraei, ou observations sur les volcans des Deux Siciles* (Paris: Lamy, an VII), planche XXVI.

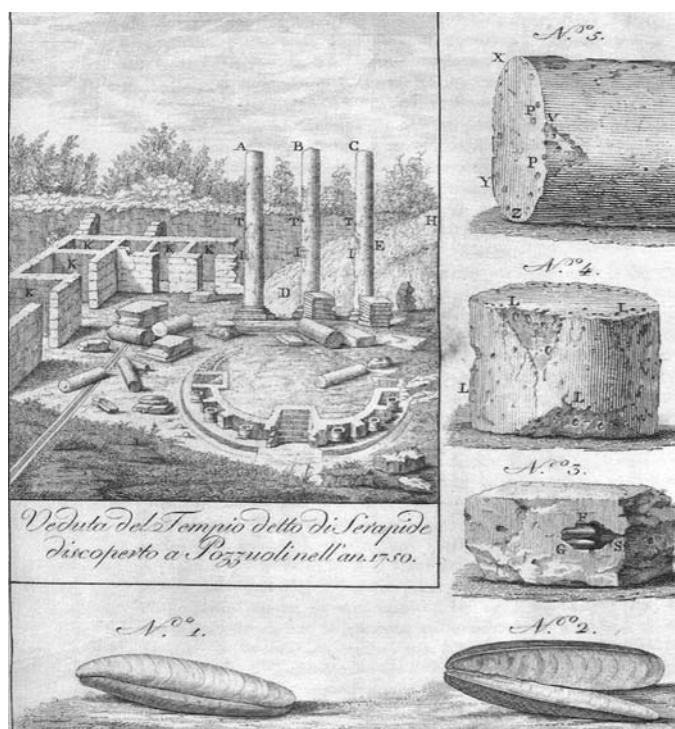


FIGURE 4. Serapide's Temple. Ermenegildo Pini, "Viaggio geologico per diverse parti meridionali dell'Italia," *Memo- rie di Matematica e di Fisica della Società Italiana delle Scienze IX* (1802): plate VI.

sitory and extraordinary revolution”⁴⁴, or rather “Universal Deluge” which, just as the Holy Scriptures had stated, had raised the waters of the planet with violence, taking all the living beings by surprise with its fury.

The link between science and religion thus started to take form and in addition to being put forward as a basis for opposing the neptunist theory which, with its view of a long and tranquil presence of the waters on the planet, was not able to account for a series of phenomena which could instead be better explained, in the opinion of the Milanese Barnabite, by the Deluge of brief duration described in the Holy Scriptures. In particular, he invoked in favour of the “transitory and extraordinary revolution” the findings of the remains of “exotic animals originally from distant and varied places”, examples of which were the large land animals of Siberia and the fishes from Monte Bolca, in the Veneto⁴⁵, whose presence could not be attributed to a long presence of the sea, but rather to “transport by rapid and impetuous currents ”⁴⁶.

The Deluge, as introduced by Pini, took place at four different times: an initial period characterized by heavy rains, with the consequent formation of rapid flows and raging streams; a second disruption due to the eruption of water from volcanoes and marine earthquakes, accompanied by strong winds which had brought the water found in the underground caves to the surface, with subsequent abrupt and swirling uplift of the waters; a third phase marked by the slower and more tranquil rise to higher elevations of the waters and of the organisms contained therein (this phase had a duration of not more than the forty days of the Holy Scriptures); finally, the last period, rapid and impetuous in which the waters retreated with violent fury into the underground caves from which they had emerged during the second disruption⁴⁷.

Having arrived at this point in his treatise, the Milanese Barnabite could return to the initial problem — that of the lithodomous, or boring bivalves, *Pholas dactylus* and *Mytilus lithophagus*, which, as has been observed, led the neptunists to conclude in favour of the extended presence of the marine waters at elevated altitudes. In continuation of this line of reasoning, Pini asked himself why it was that “in many places, and mostly the highest”⁴⁸ there remained only a few traces of these organisms or they were completely lacking. It seemed to him that this fundamental question, which was inexplicable for the neptunists, could be resolved by the idea of a rapid rise of the sea during which impetuous currents were formed. The latter raised and then dragged down the borers and finally deposited them only in places where they had passed.

Pini maintained that with this latter observation he had put forward sufficient arguments in favour of the Deluge and decided thus to conclude his reflections with the following words: “those who consider that the rock-eating mussels live as great copies in many seas, and most of all along the coasts of the Mediterreanan, easily may concede that, if the sea was permanent at a height either the same or greater than that in which those worms became fossils, these should be found in the present mountains in huge quantities and in many places; and as this phenomenon is rarely found it is quite natural that the fossils are a portion of those shells which, having been transported lived during the extraordinary flood”⁴⁹.

However, as soon as he presented this interpretation he found himself having to recognise its fragility. The scarcity of argumentation on which he had developed his theory did not in fact allow him to establish with certainty, and for the entire planet, that above a certain altitude the traces left by the borers were either scarce or completely absent. Therefore, the neptunists could still continue to place in doubt the centrality of the Deluge, or even deny it, thus causing the ruinous collapse of all the conceptual views which he had constructed with such patience.

The question, therefore, required more in-depth consideration with timely and focused observations. The latter became more urgent following the publication, of which the Milanese Barnabite only became aware of while bringing his work to a close⁵⁰, of an essay on Calabria by the neapolitan

tan scholar Angelo Fasano⁵¹. In this work, the author proposed the following: “From the promontory of Palinuro as far as Fuscaldi in upper Calabria all the calcareous cliffs of that coast, which descend to the shore, are at a lower level than the shore or at the same level, all bored by *Mytilus lithophagus* and for making our discourse easier let us say pholades [...] And it is best to observe and consider that the walls of those cliffs, where those animals exist are bored from top to bottom successively, that is to say, without intervening intervals and that those borings observing from bottom to top, in proportion as they ascend, may be recognised due to the erosion of the stone in the open air. [...] From all this is retained that the waters must have remained for a long time in these places; and must have abandoned them not for sudden lowering or retreats but very slowly and throughout centuries”⁵². These ideas, which were rather awkward in Pini’s opinion; their precision needed immediate verification in order to establish their scientific significance. Thus, Pini decided to explore the Italian Peninsula in search of clues, that is for traces and signs capable of disproving the neptunist theory and, therefore, reinforcing the idea of the Deluge.

Alongside this inevitable objective Pini placed another purpose of rather less importance, but necessary in order to justify the usefulness of the expedition to the government authorities of Austrian Lombardy. He intended to collect naturalistic material for the Museum of Sant’Alessandro and for the University of Pavia⁵³, both already well known to the general public and scholars of Europe for the abundance and variety of their collections.

Regarding the expedition, Pini left behind a wonderful report, in places brilliantly penetrating, and rich in stimulus and suggestion.⁵⁴ The report, written in the form of a letter to the plenipotentiary Johann Joseph Wilczeck⁵⁵, due to the courtesy of whom he had obtained from the government the necessary financial aid⁵⁶, starts with the explicit confirmation of his intention to combine observations of natural objects with reflections on the Holy Scriptures⁵⁷. He then continues with the description of phenomena indicative, in his opinion, of the authenticity of the Deluge. In particular, he describes the internal structure of the hill of Impruneta, south of Florence, and the rocks around Fiesole⁵⁸; the presence of fossil marine shells on Monte Mario, just outside Roma⁵⁹; the birth of Monte Nuovo in the Bay of Pozzuoli; the consistency taken on by the earth and the sand of that elevation over the course of its two and a half centuries of life⁶⁰; and, lastly, concludes with an account of the exploration of the coast of Campania⁶¹.

Pini arrived in Naples on 20 August⁶² and tried in various ways “to make the suitable arrangements for travel along the maritime coast as far as Calabria”⁶³, even though he was aware of the dangers involved in undertaking travel “in the hot season due to the pestilent air from the beaches”⁶⁴. By the end of the August, the expedition was ready to leave Naples to go to Capo Palinuro where he could investigate the credibility of Fasano’s claims⁶⁵. As soon as he arrived at Capo Palinuro, he disembarked from the ship on which he had traveled and boarded a small local boat “in order to be able to more easily approach each site in his surroundings”. He then examined the rock outcrops in great detail, finding that they “were riddled by frequent borings in many places but that their internal surface was neither smooth nor of the appropriate shape for date mussels” and that “their size [of the borings] was very often much larger than those usually made by those worms”. Besides, there was no trace of a shell, and, above all, the borings “were not found above a height of only a few tens of feet above the sea level, at a height reached by the breakers of a not very high sea, the latter being very effective with the passage of time at excavating deep and copious borings in the calcareous rocks ”⁶⁶. Therefore, these “could not be used to prove that the sea had remained for a long time as high as the highest peaks of the mountains”.

The survey took two days at the end of which the Milanese Barnabite — even if he were not able to complete the entire travel from Capo Palinuro to Fuscaldi due to symptoms of a “raging fever”⁶⁷

because of “sunstroke” suffered during the survey itself⁶⁸ — decided that Fasano’s conclusions were devoid of scientific value. Nevertheless he underlined, with diplomatic courtesy, as he was now in much more lighthearted spirits as his worries regarding Fasano’s claims were at an end, that the expedition of the Neapolitan scholar having been carried out with the purpose of visiting the places affected by the earthquake of 1783, the circumstances in which he found himself did not allow him “to lend to his observations all the precision required by mineralogists”⁶⁹.

However, the purpose of the travel by the Milanese Barnabite had as yet not been completely realized. Although in itself reassuring, the fact that he did not find traces of borers on the cliffs around Capo Palinuro did not constitute sufficient proof for confirming in a definite way their absence in other places but could be put forward in support of continuing observations and by carrying out new comparisons, verifications and inspections.

In this regard, Pini managed to give a new advantageous perspective, and as soon as he recovered from both the initial and then even more violent fever attacks, he carried out a detailed examination of the ruins of the Temple of Serapis, in the Bay of Pozzuoli. His attention had already been drawn to the Temple during a brief trip he made there prior to visiting Capo Palinuro. It left him with an impression “of a phenomenon fit to make the heads of the most expert geologists spin”⁷⁰.

The building, which today we know functioned as a *macellum*, or food market, and later served as a temple dedicated to Jupiter Serapis, had been constructed shortly after the reign of the Emperor Augustus, that is sometime between the end of the 1st and the beginning of the 2nd centuries, and it achieved its definitive lay-out in the 3rd century. It was formed of a quadriporticus surrounded by *tabernae*, or shops, and was supported by thirty-four columns, with granite shafts, that enclosed a courtyard with splendid marble paving. On the side opposite to the entrance was an apse, or exedra, a place of worship. The latter was preceded by a *propylon*, a vestibule, the front of which was formed of four marble columns, three of which — unique in the complex — were still standing. At the center of the courtyard was the *tholos*, a construction with a circular vault with sixteen columns. The ruins, which came to light in 1753 following archeological excavations started three years earlier, immediately became the focus of research not only by archeologists and scholars of antiquity but also by naturalists. The marble columns were, in fact, eroded by borers, which indicated that the sealevel had risen high enough to cover them and then it retreated, an enigma difficult to resolve for geologists who had been invited to explain the dynamics of the double variation in height. Nowadays we know that the cause of this is the phenomenon of bradyseism or rather the slow occurrence of vertical displacements of the Earth’s crust that determine the alternation of uplift and subsidence of the land with respect to sealevel, with transgressions and regressions of the sea and consequential and often subtle alteration of the position of the coastline⁷¹.

Pini made his second visit to the temple while he was still weak from his illness and “with a leg which from the remains of the fever was bored in such a way that it resembled one of those columns”⁷². On this occasion, Pini traveled with Scipione Breislak, professor of Chemistry and Mineralogy in the Royal Artillery Corps of Naples and director of the solfatara of Pozzuoli⁷³, and with William Thomson, an English physician and mineralist who for many years lived in Naples. During the visit, the Milanese Barnabite once again found himself “in such a whirl that [he despaired] of being able to say something plausible”⁷⁴. Yet, nevertheless, he was determined to attempt a response.

The first step was the examination of the most authoritative hypotheses expressed until then. He began with that by Ferber⁷⁵, who had tried to explain the phenomenon, claiming that the sea, having risen after the construction of the building, remained thus for hundreds of years, and finally subsided. Pini rejected this explanation, citing as a reason the fact that such a rise, which due to the laws of equilibrium of fluids should have been extended to all of the Mediterranean, flooding

the coasts and causing calamities and disasters — of which there was no evidence⁷⁶.

The Milanese Barnabite then went on to evaluate the second supposition, the author of which, never explicitly named by him, can nevertheless be recognised as the English diplomat living in Naples, William Hamilton, a scholar of volcanic phenomenon and collector of archeological findings⁷⁷. Hamilton had imagined a lowering and subsequent uplift of the ground, both due to earthquakes. This supposition, which the Milanese Barnabite called with an ironic expression, the “dance of the temple”, was rejected by him on the basis of the fact that the typical irregularity of the movements of earthquakes would have broken up the floor of the building, especially during the phase when the ground reemerged, thus causing all the columns to fall⁷⁸.

Finally, Pini also rejected the last of the attempts at explaining the phenomenon known to him, that of his friend Lazzaro Spallanzani⁷⁹ who, leaving aside the movements of sea and ground, had imagined that the columns had been eroded by borers prior to being used for the construction of the temple. Pini was outraged at the idea that one could think that defective materials had been used in the construction of a monument of such majesty. He observed that the presence of borings of marine borers in broken areas of the ruined columns indicated that the columns had been attacked after construction and eventual collapse of the building. The explanation, therefore, was without foundation⁸⁰.

Having rejected the most widespread theories, Pini went on to develop his own theory. He based it on his conviction that the columns had been bored by the bivalves after the temple had fallen⁸¹. He, thus, continued his line of reasoning by hypothesising that the cause of the ruin had been a volcanic eruption, most probably that of Solfatara (1198), which had covered the building with “ashes and other volcanic materials, which later were united together”. This acted to create a sort of raised levee around the temple, within which a hollow was formed. Subsequently, sea waters, suspended by a tidal wave or precipitated following a second volcanic eruption, probably that of Monte Nuovo (1538), entered that hollow dragging with it “lithophagus mussels, or their seeds or germs”⁸², and formed a small lake⁸³.

Having achieved this perspective, the Milanese Barnabite concentrated his efforts on surmounting the final difficulty to “explain how the sea waters brought into the indicated small lake were [conserved] for so long, the time [required] for the marine worms to grow and to do the work which may be observed on the ruins of the temple”⁸⁴. His response was that “for a certain time in that small lake some source of fresh water [had flowed] which [had protected] the loss of water which the lake should have [suffered], especially due to evaporation [...] and then [it dried out and diminished], in such a way as to no longer be sufficient to feed the lake ” which, in its turn disappeared⁸⁵.

The reconstruction done in this way, that relied on the theory that only a few centuries were sufficient for the bivalves to bore into the columns of the temple, thus allowed Pini to reinforce his convictions regarding the authenticity of the Deluge. The phenomenon of the small lake, which had covered the ruins of the building, was the new element introduced by him in support of his view of the history of the Earth. In his final geological work, he maintains that, “after the extraordinary and general flooding, [there remained] at different elevations a few saline lakes in which [there multiplied] some species of marine worms, and that after a certain time [were dried]”⁸⁶.

The temporary presence of the lakes, similar to that formed around the Temple of Serapis and situated at elevated altitudes, together with the impetus of the currents formed due to the rapid rise and lowering of the sea waters, provided Pini adequate explanation for why the remains of the marine borers were found in some areas of the Earth and not uniformly dispersed everywhere

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NOTES

¹ For a general biography on Pini see Cesare Rovida, *Elogio di Ermenegildo Pini* (Milano: Truffi, 1832).

² Corresponding to the southern part of the present-day Campania.

³ Ermenegildo Pini, *Dell'architettura Dialogi* (Milano: Marelli, 1770).

⁴ Carlo Mariani, “Il padre Ermenegildo Pini e il primo pantheon lombardo: la parrocchiale di San Giuseppe a Seregno”, *Barnabiti Studi* 13 (1996), pp. 133–238.

⁵ Agnese Visconti, “Alcuni aspetti svelati dell’attività del naturalista milanese Ermenegildo Pini”, in *Figure dell’invisibilità Le scienze della vita nell’Italia di Antico Regime Atti delle giornate di studio Milano-Ginevra (novembre 2002-giugno 2003)*, Maria Teresa Monti and Marc J. Ratcliff, editors (Firenze: Olschki, 2004), p. 156.

⁶ Visconti, “Alcuni aspetti”, pp. 151–155.

⁷ Agnese Visconti, “I viaggi compiuti da Ermenegildo Pini tra il 1777 e il 1782 Una breve stagione geografica”, *Schede umanistiche* 1 (2004), pp. 77–108; Laura Panzeri, “L’industria del ferro in Valsassina alla fine del Settecento”, *Il Risorgimento* 30/1-2 (giugno 1978), pp. 14–54.

⁸ The Delegation was confirmed on him by dispatch on the 6th October 1782 (Archivio di Stato di Milano (hereafter ASM), Commercio p.a., 205).

⁹ On the growth in mining production, and in particular iron production in Austrian Lombardy during the years when Pini was delegate see Armando Frumento, *Imprese lombarde nella storia della siderurgia italiana* (Milano: Allegretti di Campi, 1963) , vol. 2, pp. 300–409; Agnese Visconti, “Assolutismo illuminato e ruolo dei boschi: il caso lombardo nel dibattito tra Vienna e Milano, 1771–1789”, *Storia urbana* 20 (luglio-dicembre 1996), pp. 13–34.

¹⁰ Regarding the museum and its collections in the years just after its foundation see Hermenegildus Pinus, *Catalogus fossilium quae extant in Musaeo D. Alexandri [...] anno MDCCCLXXV* (Österreichische Nationalbibliothek, Cod. Ser. Nov. 1909).

¹¹ Hermenegilde Pini, *Mémoire sur des nouvelles cristallisations de feldspath et autres singularités renfermées dans les granites des environs de Baveno* (Milan: Marelli, 1779). The choice of the French language was dictated by Pini’s intention to also make his studies known to the naturalists beyond the Alps. For a comment approving this choice refer to the *post scriptum* in the letter from Kaunitz to Firmian dated 5th July 1779 (ASM, Studi p.a., 106).

¹² Pini, *Cristallisations de feldspath*, pp. 43–44. The reference is to Peter Simon Pallas, *Observations sur la formation des montagnes et les changements arrivés à notre globe* (St. Petersbourg, et Paris: Méquignon, 1777). For a summary of the work in Italian see A. [Carlo Amoretti], “Osservazioni sulle montagne”, in *Opuscoli scelti sulle scienze e sulle arti* (Milano: Marelli, 1779), vol. 2, pp. 342–348.

¹³ Pini, *Cristallisations de feldspath*, pp. 44–45.

¹⁴ Pini, *Cristallisations de feldspath*, pp. 45–47. The references are to Johann Friedrich Wilhelm von Charpentier, *Mineralogische Geographie der Chursächsischen Lande* (Leipzig: Crusius, 1778); and to Johann Jakob Ferber, *Lettres sur la Minéralogie et sur divers autres objets de l’Histoire Naturelle de l’Italie écrites à Mr. le Chevalier de Born* (Strasbourg-Paris, 1776).

¹⁵ Pini, *Cristallisations de feldspath.*, pp. 47–49. The reference is to Torbern Olof Bergmann, *Physik Beskrifning över Jordklot* (Upsala: Edman, 1766). Pini was familiar with the German translation of this work by Lampert Heinrich Röhl (1769).

¹⁶ Ermenegildo Pini, “Della maniera di osservare sui monti la disposizione degli strati con uno strumento

comodissimo a tal fine”, in *Opuscoli scelti sulle scienze e sulle arti* (Milano: Marelli, 1780), vol. 3, pp. 183–195.

¹⁷ Ermenegildo Pini “Della elevazione dei principali monti”, in *Opuscoli scelti sulle scienze e sulle arti* (Milano: Marelli, 1781), vol.4, pp. 3–22.

¹⁸ Ermenegildo Pini, *Memoria mineralogica sulla montagna e sui contorni di S. Gottardo* (Milano: Marelli, 1783).

¹⁹ Pini, *Montagna di S. Gottardo*, pp. 1–73.

²⁰ Pini, *Montagna di S. Gottardo*, pp. 2–3.

²¹ Nathanael Gottfried Leske, *Elementi di Storia Naturale* (Milano: Monistero di Sant’Ambrogio Maggiore, 1785), pp. III–CLXVI.

²² Regarding this refer to the letter to Spallanzani by the counsel of the government of Austrian Lombardy Nicola Pecci of 23rd January 1779 (ASM, Studi p.a., 445) and that by Spallanzani to the plenipotentiary Carlo Firmian of 27th January in *Edizione nazionale delle opere di Lazzaro Spallanzani (Carteggi)*, Pericle Di Pietro, editor, (Modena: Mucchi, 1985), vol. 4, p. 302.

²³ On the common collection-museological objectives of the two scientists see Paolo Mazzarello, *Costantinopoli 1786: la congiura e la beffa. L’intrigo Spallanzani* (Torino: Bollati Boringhieri, 2004), p.187. On the Museum of Pavia refer to *Il Museo di Lazzaro Spallanzani 1771–1799 Una camera delle meraviglie tra Arcadia e Linneo*, Clementina Rovati and Paolo Galeotto, editors, (Cava Manara (Pavia): Greppi, 1999).

²⁴ On the foundation and history of that Society see Giuseppe Penso, *Scienziati italiani e Unità d’Italia Storia dell’Accademia Nazionale dei XL* (Roma: Bardi, 1978).

²⁵ On the role of Spallanzani as confidant of Lorgna see Penso, *Scienziati italiani*, pp. 33, 53, 58.

²⁶ On the difficult relationship between Spallanzani and Scopoli see Mazzarello, *Costantinopoli 1786*, passim.

²⁷ On the relationships between Pini and Volta see Pini, “Della elevazione dei principali monti”, p. 22; on those with Landriani see Ermenegildo Pini, *Relazione del viaggio mineralogico fatto nell’anno 1779 in diverse parti della Lombardia Austriaca* (ASM, Commercio p.a., 203), § 13.

²⁸ Penso, *Scienziati italiani*, p.38.

²⁹ As is indicated by the letter from Pini to Lorgna of 3rd September 1789, in the Archivio Storico dell’Accademia dei XL, Correspondence of the early forties with Anton Maria Lorgna, 157, ua. 38 (hereafter ASAXL).

³⁰ Pini was charged by the Hapsburg government to proceed, together with brother Giuseppe Maria Racagni, to the dwelling of Spallanzani in Scandiano in order to check the possible presence of some naturalistic specimens which were missing from the Museum of Pavia. The control was carried out with extreme tact, as is indicated by the report presented by them on 26th January, 1787 to the government of Austrian Lombardy, which allowed the public authority to rapidly bring the regrettable incident to a close (ASM, Autografi, 180).

³¹ An implicit reference to the Holy Scriptures is present in Pini, *Montagna di S. Gottardo*, pp. 65–66, where the author refers to the Deluge as a tool for the reconstruction of the history of the Earth.

³² As is indicated by Ermenegildo Pini, “Sulle rivoluzioni del globo terrestre provenienti dall’azione delle acque” (part 1), *Memorie di Matematica e Fisica della Società Italiana* 5 (1790), pp. 163–258, where the author after having described Gerdil as “one of the greatest and most sage intellectuals of our century”, recalls (p. 164, note a) his two writings “Saggio d’istruzione De’ Sistemi di Storia naturale relativi all’antichità del mondo, inserito nel Saggio di istruzione Teologica stampato per la prima volta in Roma nell’anno 1775”, in *Opere edite ed inedite del cardinale Giacinto Sigismondo Gerdil* (Roma, 1808), vol. 10, pp. 306–318 and “Observations sur les Epoques de la Nature”, in *Opere Gerdil*, pp. 368–390. Regarding Gerdil and his theological-philosophical thought see *Barnabiti studi* 18 (2001), pp. 7–372.

³³ See the letter from Pini to Lorgna of 3rd September 1789, in ASAXL.

³⁴ Pini, “Sulle rivoluzioni”, and Ermenegildo Pini, “Memoria geologica sulle rivoluzioni del globo terrestre provenienti dall’azione delle acque” *Memorie di Matematica e Fisica della Società Italiana* 6 (1792), pp. 389–500. For a criticism of the two writings see Nicoletta Morello, “La Geologia nel Settecento italiano. Note

sul diluvialismo”, *Rendiconti Accademia Nazionale delle Scienze detta dei XL. Memorie di Matematica e di Scienze Fisiche e Naturali* 100/6 (1982), pp. 103–114.

³⁵ Pini, “Sulle rivoluzioni”, p. 222.

³⁶ Pini, “Sulle rivoluzioni”, p. 232.

³⁷ Pini, “Sulle rivoluzioni”, pp. 232–233.

³⁸ Pini, “Sulle rivoluzioni”, p. 242.

³⁹ Pini, “Sulle rivoluzioni”, p. 244.

⁴⁰ Pini, “Sulle rivoluzioni”, p. 246.

⁴¹ Pini himself commented after that supposition affirming that “the main novelty in [his] theory [consisted in] assuming that the rotation was one of the reasons for the primary configuration of the globe which was presumed to be originally fluid ” (Ermenegildo Pini, *Sui sistemi geologici Riflessioni analitiche* (Milano: Pirotta, 1811), pp. VII–VIII).

⁴² Pini, “Memoria geologica”, p. 390.

⁴³ Pini, “Memoria geologica”, p. 390. The subject of the population of the planet by human beings after the first revolution Pini treats in greater detail in his following geological work, “Sugli animali fossili Memoria geologica”, *Memorie di Matematica e di Fisica della Società Italiana delle Scienze* 12/2 (1805), pp. 270–329.

⁴⁴ Pini, “Memoria geologica”, pp. 390–391.

⁴⁵ Pini, “Memoria geologica”, pp. 454 e 460–466.

⁴⁶ Pini, “Memoria geologica”, p. 452.

⁴⁷ Pini, “Memoria geologica”, pp. 408–423.

⁴⁸ Pini, “Memoria geologica”, p. 423.

⁴⁹ Pini, “Memoria geologica”, pp. 470–473.

⁵⁰ As shown by Pini, “Memoria geologica”, pp. 470–471. Also refer to the two letters by Pini to Lorgna of 5th June and 25th November 1792 (ASAXL).

⁵¹ A. Fasano, “Saggio geografico-fisico sulla Calabria Ulteriore”, *Atti della Reale Accademia delle Scienze e Belle Lettere di Napoli* (1788), pp. 251–311.

⁵² Fasano, “Saggio geografico-fisico”, pp. 258–259.

⁵³ In relation to this see the letter by Pini to V.E. [Wilczeck] of 27th April, 1792, where the Milanese Barnabite expresses his intention of “making collections of precious natural products in order to increase the museums of Austrian Lombardy”; and that to the government of the 21st December 1792 where Pini gives an account of the naturalistic objects collected and acquired during the travel, underlining that he had obtained “several rarities, mainly mineralogical, some of which he knew were lacking in the distinguished collection constituting the the Museum of Pavia which was considered as the best of Italy”. Both letters are in ASM, Autografi, 180.

⁵⁴ Ermenegildo Pini, “Viaggio geologico per diverse parti meridionali dell’Italia”, *Memorie di Matematica e di Fisica della Società Italiana* 9 (1802), pp. 118–120.

⁵⁵ Even if the plenipotentiary is never explicitly named, the reference to him is apparent on pp. 118–119 and 204.

⁵⁶ The decision by the government to advance Pini £1500 of his salary as Delegate of Mines is of the 21st May 1792 (ASM, Commercio p.a., 205).

⁵⁷ Pini, “Parti meridionali dell’Italia”, pp. 121–122 e 128.

⁵⁸ Pini, “Parti meridionali dell’Italia”, pp. 146–147.

⁵⁹ Pini, “Parti meridionali dell’Italia”, pp. 165–166.

⁶⁰ Pini, “Parti meridionali dell’Italia”, pp. 176–179.

⁶¹ Pini, “Parti meridionali dell’Italia”, pp. 184–190.

⁶² Refer to the letter of the 21st August 1792 from Pini to V.E. [Wilczeck] (ASM, Autografi, 180).

⁶³ Pini, “Parti meridionali dell’Italia”, p.166.

⁶⁴ Pini, “Parti meridionali dell’Italia”, p.166.

- ⁶⁵ Pini, “Parti meridionali dell’Italia”, p. 190.
- ⁶⁶ Pini, “Parti meridionali dell’Italia”, p. 187.
- ⁶⁷ Pini, “Parti meridionali dell’Italia”, p. 185.
- ⁶⁸ Pini, “Parti meridionali dell’Italia”, p. 185.
- ⁶⁹ Pini, “Parti meridionali dell’Italia”, p. 190.
- ⁷⁰ Pini, “Parti meridionali dell’Italia”, pp. 179–181.
- ⁷¹ For an exhaustive and fascinating synthesis of the studies on that temple see Luca Ciancio, *Teatro del mutamento Immagini del ‘Tempio di Serapide’ a Pozzuoli (1750–1900)* (Rovereto: Nicolodi, 2005).
- ⁷² Pini, “Parti meridionali dell’Italia”, p. 205.
- ⁷³ Regarding the visit to the temple Breislak wrote a report in Scipione Breislak, *Topografia fisica della Campania* (Firenze: Bazzini, 1798), pp. 300–304; and in Scipion Breislak, *Voyages physiques et lythologiques dans la Campanie* (Paris: Dentu, an IX–1801), pp. 167–170, where, even if agreeing with the confutations by Pini of Ferber, Hamilton and Spallanzani, he gives no judgement on the phenomenon.
- ⁷⁴ Pini, “Parti meridionali dell’Italia”, p. 205.
- ⁷⁵ Ferber, *Lettres sur la mineralogie*, pp. 265–266.
- ⁷⁶ Pini, “Parti meridionali dell’Italia”, p. 208.
- ⁷⁷ Ciancio, *Teatro del mutamento*, pp. 30–33.
- ⁷⁸ Pini, “Parti meridionali dell’Italia”, pp. 213–214.
- ⁷⁹ Lazzaro Spallanzani, *Viaggio alle Due Sicilie e in alcune parti dell’Appennino* (Pavia: Comini, 1792), vol.1, pp. 77–82.
- ⁸⁰ Pini, “Parti meridionali dell’Italia”, pp. 214–215.
- ⁸¹ Pini, “Parti meridionali dell’Italia”, pp. 215–216.
- ⁸² Pini, “Parti meridionali dell’Italia”, p. 221.
- ⁸³ Pini, “Parti meridionali dell’Italia”, p. 222.
- ⁸⁴ Pini, “Parti meridionali dell’Italia”, p. 223.
- ⁸⁵ Pini, “Parti meridionali dell’Italia”, p. 224.
- ⁸⁶ Pini, *Sistemi geologici*, p.74.

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