

# Anniversaries

Experimental Volcanology 150 years ago



---

## PAOLO GORINI'S EXPERIMENTS ON THE FORMATION OF VOLCANOES IN MAY 1872

Ezio Vaccari (ITALY)

On April 24, 1872, a spectacular eruption of Mt. Vesuvius began, which continued until May 2 of the same year (Fig. 1). The massive lava flows destroyed the villages of Massa and San Sebastiano al Vesuvio, on the north-western side of the volcano. Among those who ascended Mt. Vesuvius to observe or study the phenomena during the eruption, 9 were killed and 11 injured by the explosive activity, which produced significant clouds of ash and lapilli. These dramatic events made a strong impact on the Italian public and prompted the national Parliament to discuss the postponement of the payment of taxes for the people affected by the eruption. At the same meeting, on May 11, 1872, the deputy Antonio Billia made an appeal to the government to encourage Italian scientists to increase their volcanological research in order to prevent future possible catastrophic events. In particular, Billia recalled the useful work of a "distinguished scientist", who lived in a small town in Lombardy "without patronage, without means, indeed in conflict with the academic sciences", but who had already proved his knowledge and skills in "understanding the secret of volcanoes" and "the reason for their formation" (Carli, 2009, p. 103). This man was Paolo Gorini (1813-1881), an eclectic scientist born in Pavia and living in Lodi, a town 40 km south-east from Milan.



Fig. 1 - The eruption of Mt. Vesuvius on April 26, 1872, at 3.30 PM (photograph by Giorgio Sommer, displayed at the exhibition *De Nittis e la rivoluzione dello sguardo*, Ferrara, Italy, December 2019 - April 2020).

Gorini (Fig. 2) had obtained a degree in mathematics (1832) and worked as a teacher of physics in Lodi High School (*Liceo*) until 1857, but he was also a brilliant and versatile scholar self-taught in natural sciences with several interests in physiology, biology, chemistry and in particular geology. He is known mainly for his theoretical and experimental contributions to the scientific study and practices of conservation of anatomical specimens and corpses (petrification), as well as on their dissolution, mainly through cremation (Lorusso, Falconi, Franchini & Porro, 2013). Gorini was engaged in these activities from the mid-1840s until the 1870s and most of the results of his research in this field can be now seen at the historical museum *Collezione anatomica "Paolo Gorini"* in Lodi (Carli, 2005). However, one of Gorini's main and still little-known interests concerned the formation of mountains and volcanoes, which he referred to the action of a primordial molten matter containing gaseous parts in its mass, whose explosions would have determined, with the rupture of the Earth's crust, the orogenetic phenomena such as the "formation" of mountains (Gorini, 1851; 1852; 1871).

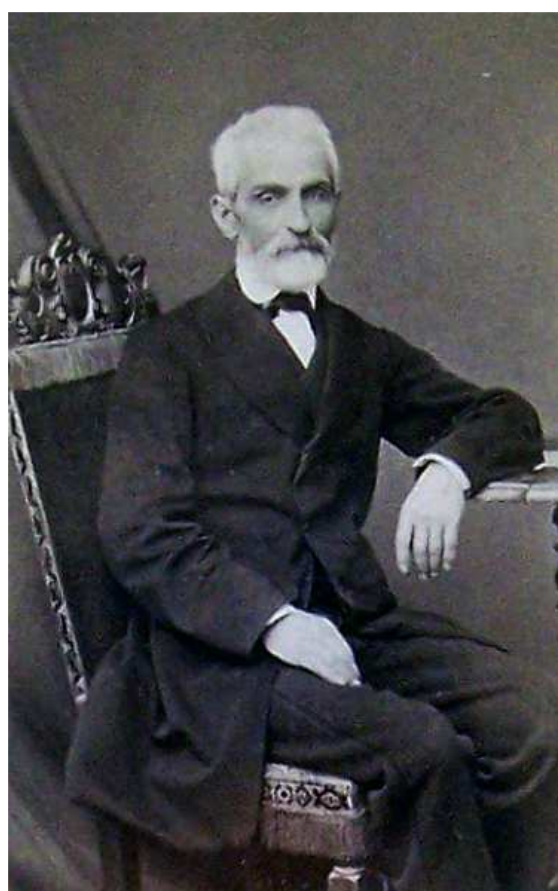


Fig. 2 - [left] Paolo Gorini - photograph by G.B. Sciutto, Genoa, 1872 (from Carli, 2009, p. 30); [right] Paolo Gorini, "a man who can play with fire" - charcoal portrait by V. Bignami, 1879 (from Carli, 2005, front cover).

Gorini dedicated most of his time to what he called "experimental geology" (*geologia sperimentale*), which he carried out in particular with "plutonic" or "volcanic experiments", about the reproduction of eruptive dynamics on a small scale, using artificial models of volcanoes (Gorini, 1862; 1868; 1872). He worked on these experiments privately in his laboratory in Lodi, but during the 1860s he started to organize public demonstrations in some high schools: later he was invited to present his "volcanic experiments" by universities, scientific societies and popular science associations, mainly in northern Italy. Although some Italian geologists strongly criticized Gorini's geological theories for their reference to Plutonism, as in the case of Antonio Stoppani (Redondi, 2014, pp. 13-14), nonetheless, the

"volcanic experiments" became rather popular among the general public. The latter included people mainly from the middle class, who became emotionally involved in the spectacular demonstrations and fascinated by the idea that volcanic eruptions and even earthquakes could be predicted with the use of Gorini's methods. For this reason, also some politicians of the newly formed government of unified Italy, such as Quintino Sella in 1865 and later Antonio Billia, became interested in the work of Gorini, hoping to obtain a clear scientific answer to the delicate question of the prevention of the catastrophic events related to volcanic eruptions and earthquakes. Consequently, some scientific institutions invited distinguished geologists to attend Gorini's public demonstrations, in order to later describe their findings and give their evaluations in special reports.

On May 12, 1872, the day after the discussion at the meeting of the Italian Parliament which had considered the measures to be taken to deal with the damage caused by the eruption of Mt. Vesuvius, Paolo Gorini performed his public "volcanic experiments" in the large room of the Ligurian Gymnastics Society in Genoa, at the invitation of the Society of Scientific Readings and Conversations of the same city. On this occasion, the Society, in order to assist Gorini in the preparation of his "experiments", had appointed a commission and asked to one of its members, the distinguished scientist Arturo Issel (1842-1922), professor of geology and mineralogy at the University of Genoa, to write a report on this public event (Issel, 1872).



Fig. 3 - Preparation of Gorini's volcanic experiments in Genoa, May 1872 (photograph by G.B. Sciutto - Collezione anatomica "Paolo Gorini", Lodi)

The preparation of the "volcanic experiment" took place in the courtyard beside the gymnasium, where Gorini directed the making of "three quadrangular furnaces of 1.10 m on each side, and 50 cm high, made up of bricks placed on top of each other without cement. In each furnace, four cylindrical cast iron crucibles were placed, slightly narrowed at the bottom (0.40 m in height and 0.30 m in diameter), filled with a material whose composition the professor [Gorini] did not disclose. Each crucible was equipped with a movable lid, made up of two pieces which

by turning one into the other allowed one to see the content [...] The material used weighed a total of 300 kg." (Issel, 1872, pp. 4-5).

Then the furnaces were loaded with coke and for about three hours Gorini supervised the melting of this lava or other hydrocarbon mixtures that he called "plutonium" (*plutonio*). When the matter was completely fluid the crucibles were extracted from the furnaces with some large pincers and were transported into the middle of the gymnasium, where the audience was waiting. The melted matter was then poured into large cast iron plates (about 1 m in diameter) and left to cool. According to Issel, "the liquid introduced into the plates is bright, flashing [...] vivid yellow flames and abundant vapors arise from its surface. It gurgles, boils, rises and falls with extraordinary agitation. Soon the superficial incandescence fades, and some solid and dark shreds are already floating and rapidly expand. [...] Meanwhile, the lakes of molten matter are being circumscribed and the openings from which this matter overflows are surrounded by raised margins and internally are shaped like a funnel. After a short time, the surface of the *plutonium* hardened and acquired stony toughness and consistency." (Issel, 1872, p. 5). When the matter began to solidify, bubbles and jets of gas could be seen being released from inside and stirring the surface crust. More matter came out at the points of least resistance forming prominences, craters and small accumulation cones similar to volcanoes, which still released from their openings at the top vapours, flames and little streams of incandescent matter like lava flows (Fig. 4).

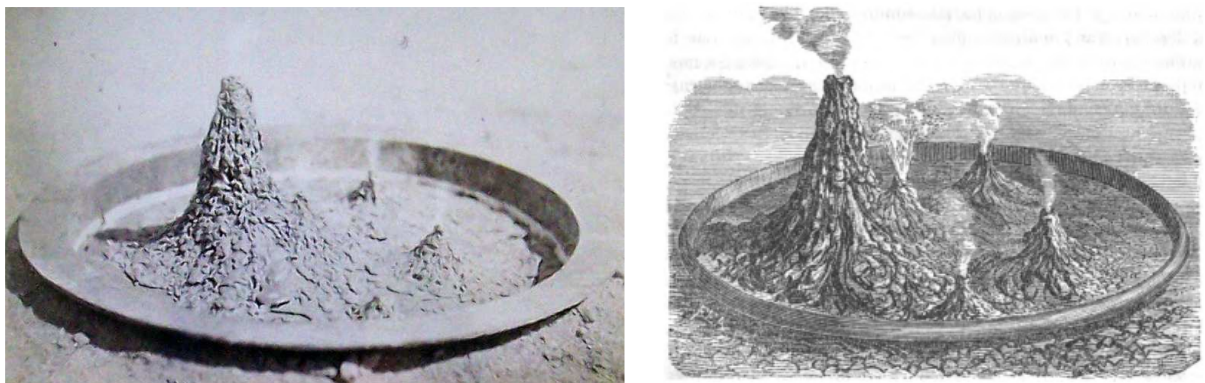


Fig. 4 - [left] The final stage of the volcanic experiment held by Gorini in Genoa, May 1872 (photograph by G.B. Sciutto - Collezione anatomica "Paolo Gorini", Lodi); [right] Drawing of the same experiment (Issel, 1872, p. 7).

Once completely cooled, Gorini smashed the little cones (which could be even 40 cm high) in order to display their internal structure, which showed a channel surrounded by concentric strata of "crystalline structure". In his report, Issel provided a very detailed description and analysis of this "volcanic experiment", which he considered very interesting for its methodological insights and potential, rather than for its possible support of Gorini's orogenetic plutonic theory. Consequently, the independent scientist from Lodi cannot be simply considered a sort of "magician" or "geological showman" (as he was defined by some of his harshest critics), but his legacy to the history of geological sciences can be found in the beginnings of the practice of modelling and reconstructing geological phenomena in the laboratory.

### Further Readings

Carli A., ed. (2005). *Storia di uno scienziato. La Collezione anatomica "Paolo Gorini"*, Bolis Edizioni, Azzano San Paolo.

Carli, A. (2009). *Paolo Gorini. La fiaba del mago di Lodi*, Interlinea Edizioni, Novara.

Conti, F. (2002). *Gorini, Paolo*, in *Dizionario Biografico degli Italiani*, Istituto dell'Enciclopedia Italiana, Roma, pp. 59-62.

Gorini, P. (1851). *Sull'origine delle montagne e dei vulcani. Studio sperimentale*, C. Wilmant, Lodi.

Gorini, P. (1852). *Gli esperimenti sulle formazioni delle montagne*, C. Wilmant, Lodi.

Gorini, P. (1862). *Due fenomeni geologici spiegati col mezzo degli esperimenti plutonici*, "Il Politecnico", 15, pp. 163-181.

Gorini, P. (1868). *Gli esperimenti vulcanici. Nota*, Vallardi, Milano.

Gorini, P. (1871). *Sull'origine dei vulcani. Studio sperimentale*, C. Wilmant, Lodi.

Gorini, P. (1872). *I vulcani promessi a Milano nel 1868. Spiegazioni*, Società Cooperativo-Tipografica, Lodi.

Issel, A. (1872). *Gli esperimenti vulcanici del professore Gorini. Relazione presentata alla Società di Letture e Conversazioni Scientifiche*, Pellas, Genova.

Lorusso, L., Falconi, B., Franchini, F.A. & Porro, A. (2013). *Geology, conservation and dissolution of corpses by Paolo Gorini (1813-1881)*, in Duffin, C. J., Moody, R. T. J. & Gardner-Thorpe, C. (eds.), *A History of Geology and Medicine*, Geological Society, London, Special Publications 375, pp. 469-474

Redondi P. (2014). *Giuseppe Mercalli. Storia di una vocazione scientifica*, "Miscellanea INGV", 24, pp. 9-19.

---

Publication online: Posted IUGS Website / INHIGEO Website Anniversaries  
May 2022  
IUGS E-Bulletin Issue 186, May 2022

Author: Prof Ezio Vaccari  
President of INHIGEO: IUGS International Commission on the  
History of Geological Sciences (INHIGEO)

Department of Theoretical and Applied Sciences,  
University of Insubria,  
Varese, Italy  
Email: [ezio.vaccari@uninsubria.it](mailto:ezio.vaccari@uninsubria.it)

The full list of contributions to the INHIGEO Anniversary Series is available on the website:  
<http://www.inhigeo.com/anniversaries.html>