# Scientific paradigms and complexity in modern and contemporary volcanology: the contribution of *studia* on Etna and Vesuvius

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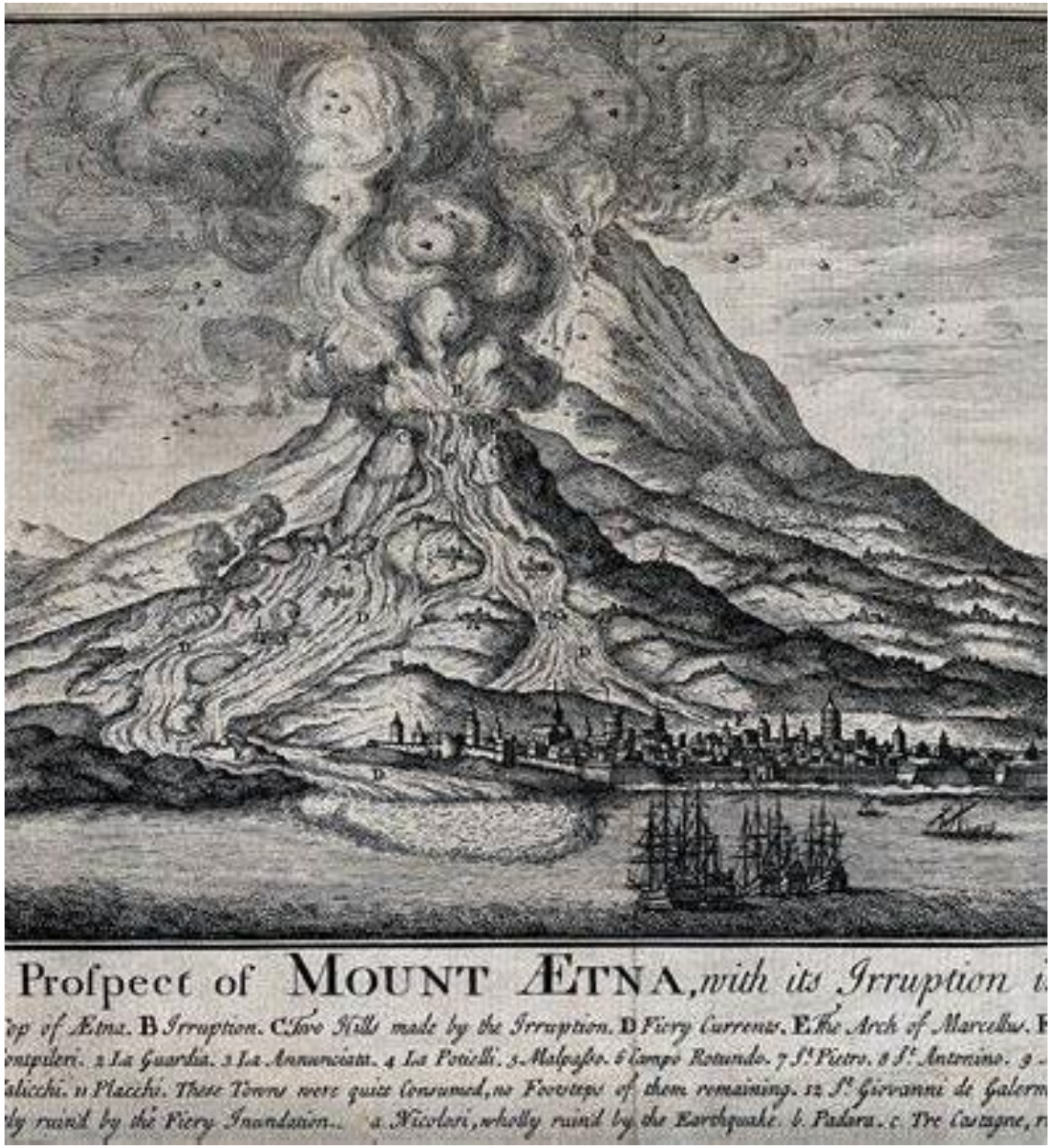
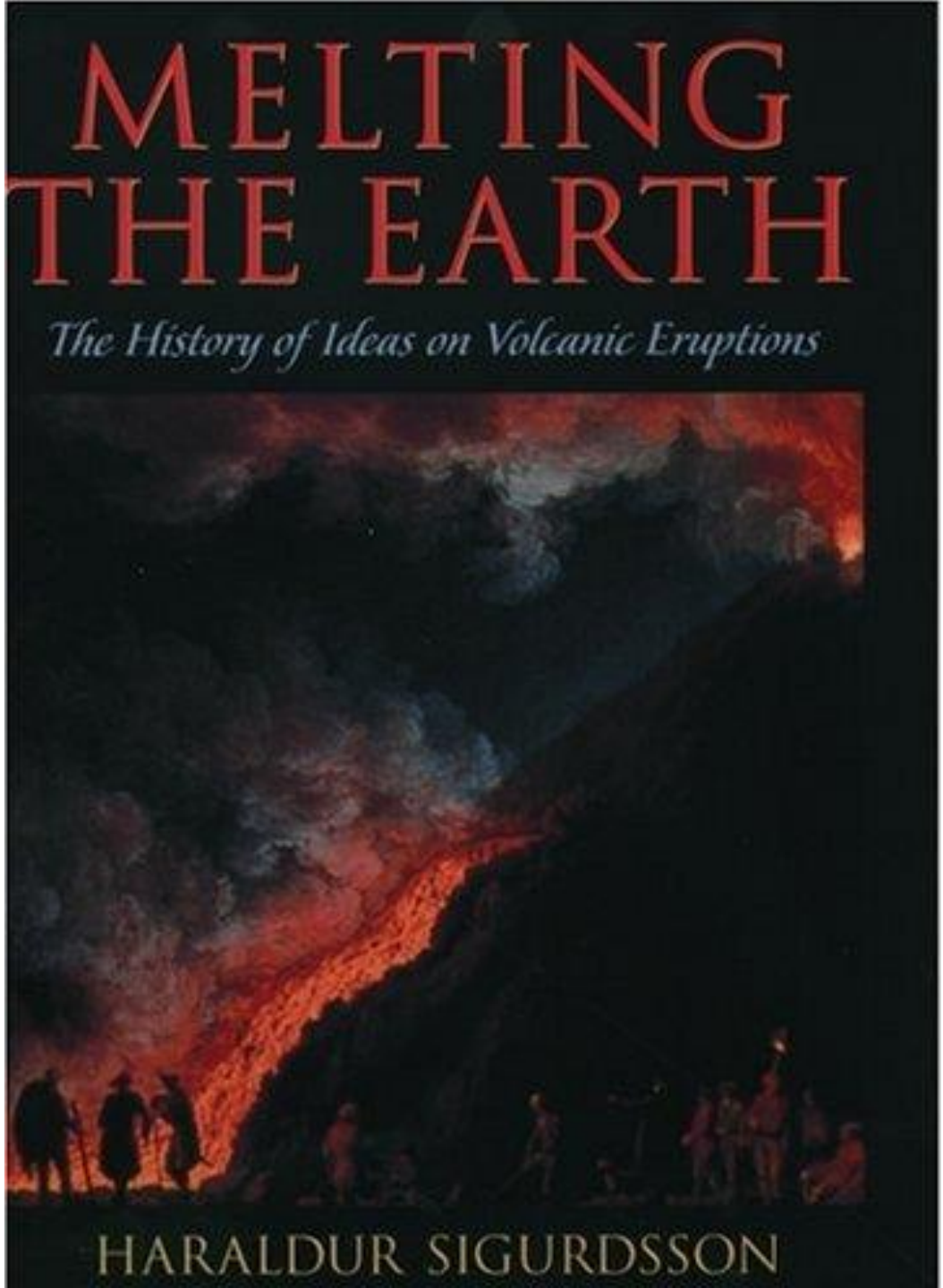
# History of volcanology

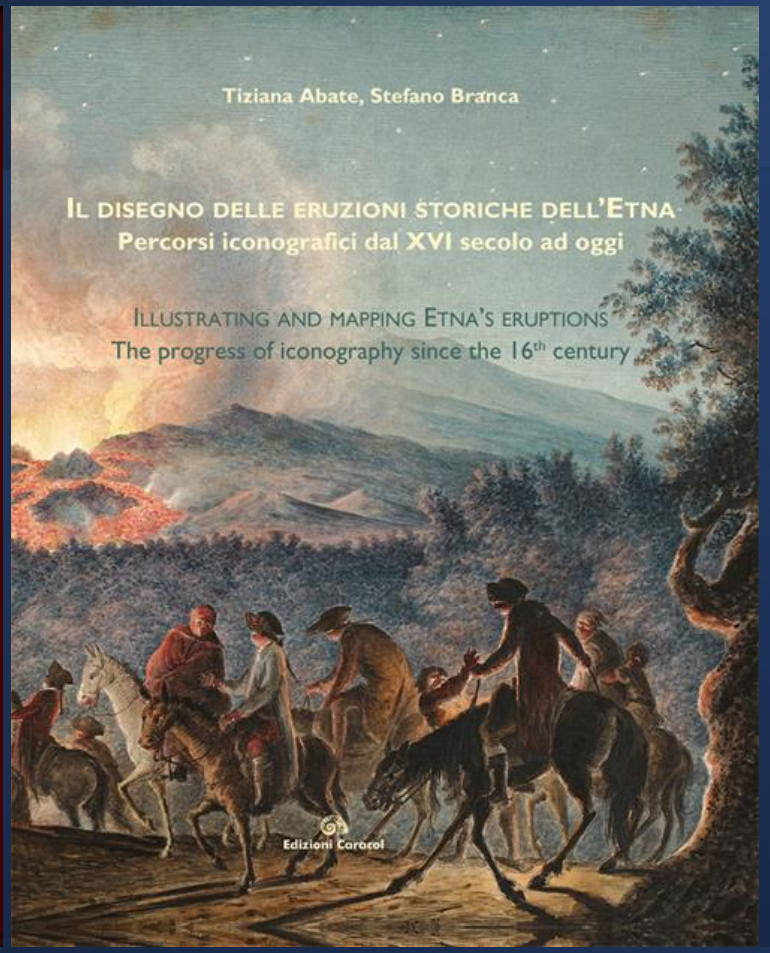


*Melting the Earth: the history of ideas on volcanic eruptions* (1999)

'This is not a book written by a historian of science, but one by a practising scientist who is deeply interested in the history of his science. It is about the manner in which magma or molten rock is generated at high temperatures within the Earth' (p. VIII).



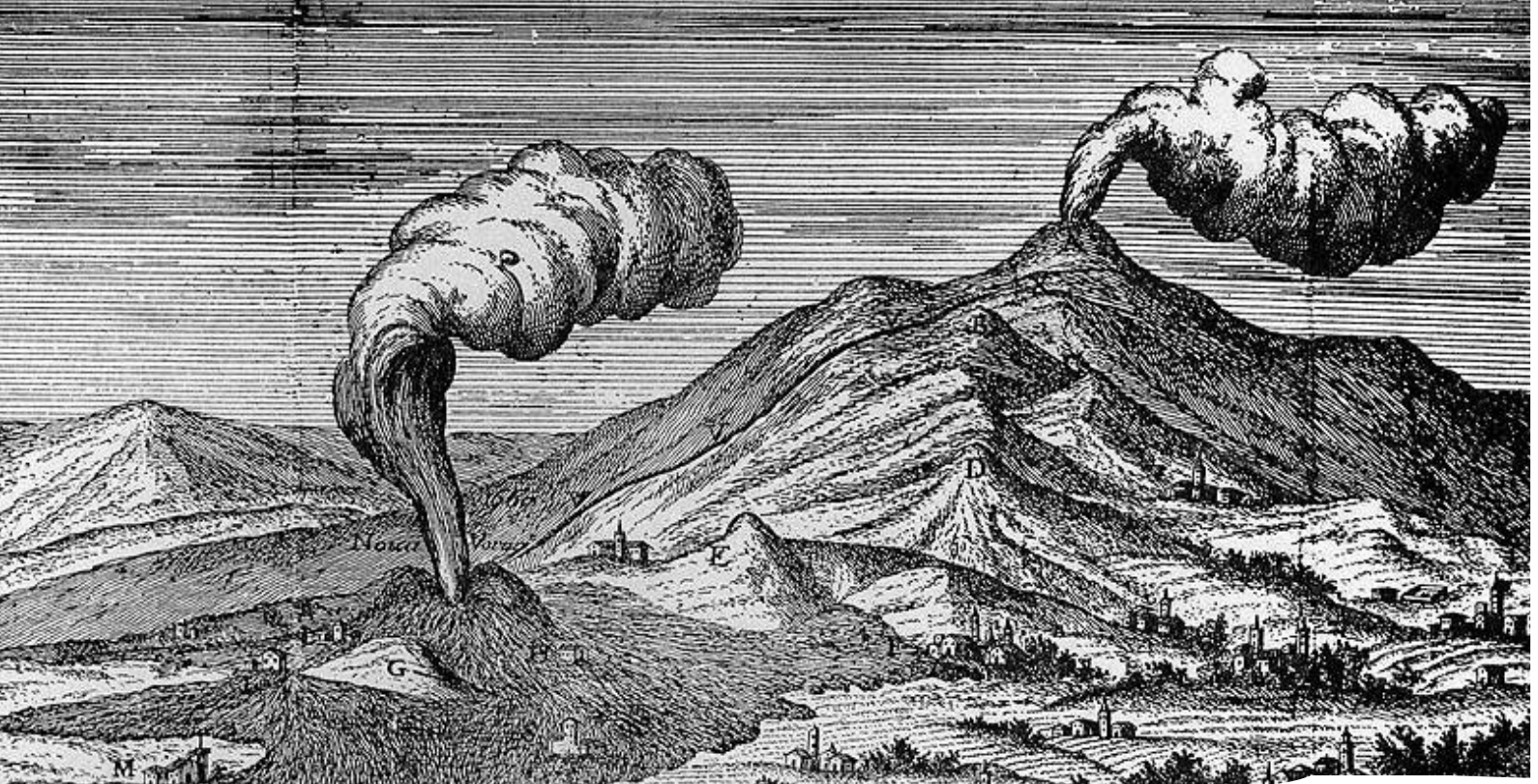
# Books about history of volcanology


- 2700 years of recorded volcanic activities
- 17 March 1987: Regional natural Park
- 21 June 2013: Unesco World Heritage Site

PARCO DELL'ETNA

UNESCO



# Borelli (1670) – *Historia et metereologia incendii Aetnei*

# Vesuvius: 79 AD

# Is *Vesuviologia* realistic?

# Mount St. Helens (1980)

# Rittmann (1893-1980) in Catania

*Alfred Rittmann and his student Carmelo Sturiale, 1967*

*Courtesy of Stefano Branca*

- **Volcanology**: founder of contemporary volcanology on an interdisciplinary basis, with a strong emphasis on magmatology
- **Mineralogy and petrography**: Norma Rittmann
- **Magmatology:** bimodality of magma
- **Tectonics:** orogenesis in 4 phases
- **Planetology**: Kuhn-Rittmann hypothesis
- **Philosopher of geosciences**: Fundamental law.

***"Magmatological Tectonics"***

**Paradigm**: a universally recognized scientific result that provides a specific field of research.

*The Structure of Scientific Revolutions* (1962)

T. S. Kuhn (1922-1996)

# Rittmann in Catania: 1958-1980

1958-1963

University of Catania:

- Director of Institute of Volcanology
- Professor of Volcanology

## Chronology of Rittmann's Institute in Catania

1960 – Helsinki – I.I.R.V.

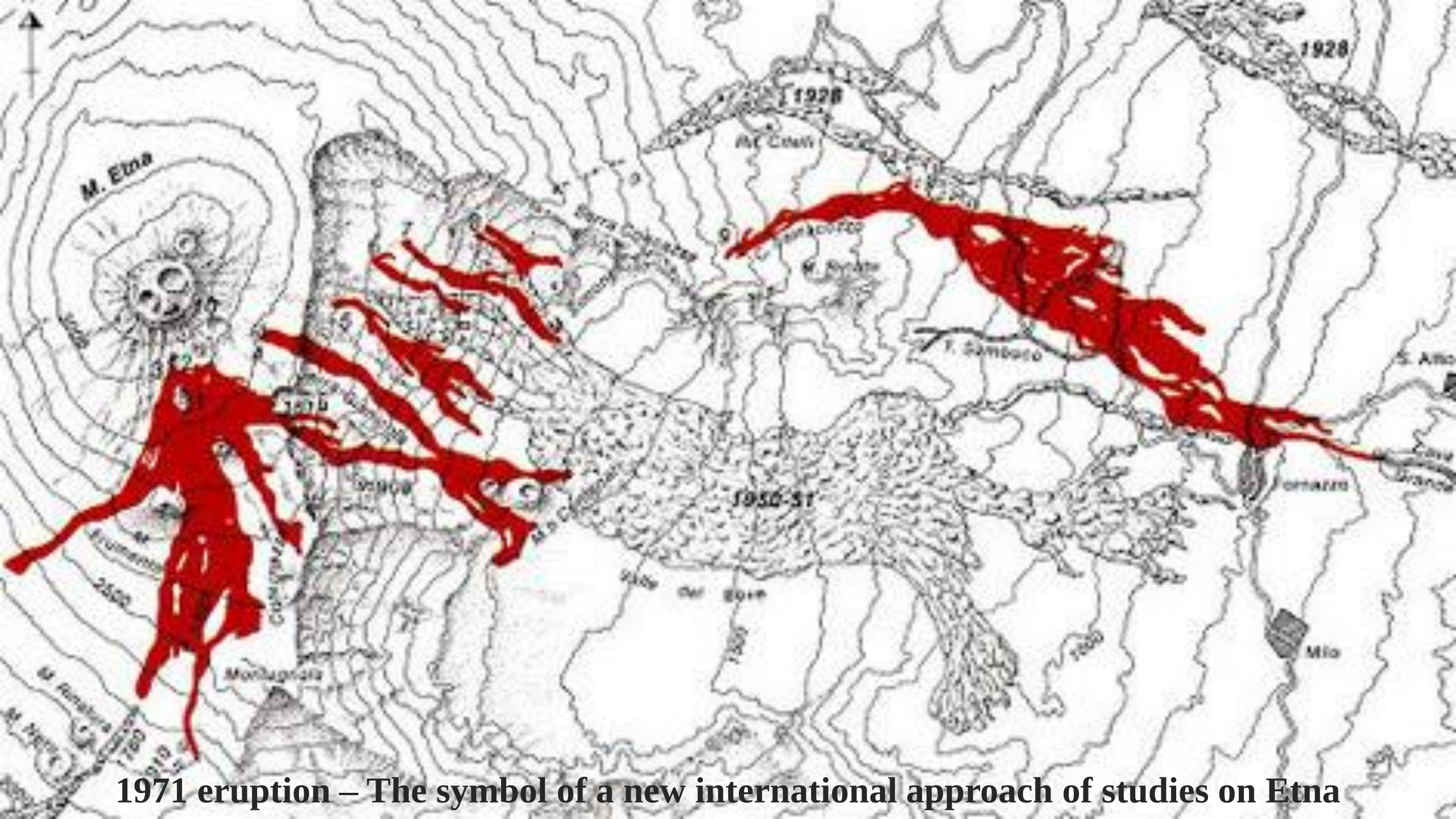
1968 – Catania : L.I.R.V

1970 – Catania : I.I.V.

2001 – Catania: I.I.V. + Poseidon (1998-2001) = INGV- Etnean Observatory

**Haroun Tazieff (1914-1998)**

**On the right, Giorgio Marinelli (1922-1993)**




**1971 eruption – The symbol of a new international approach of studies on Etna**

*Phil. Trans. R. Soc. Lond.* A. **274**, 1–179 (1973) [ 1 ]
*Printed in Great Britain*

# MOUNT ETNA AND THE 1971 ERUPTION

EDITED BY J. E. GUEST AND R. R. SKELHORN

(*Discussion held* 9 *and* 10 *February* 1972 – *MSS received* 20 *July* 1972)

[Plates 1 to 3]

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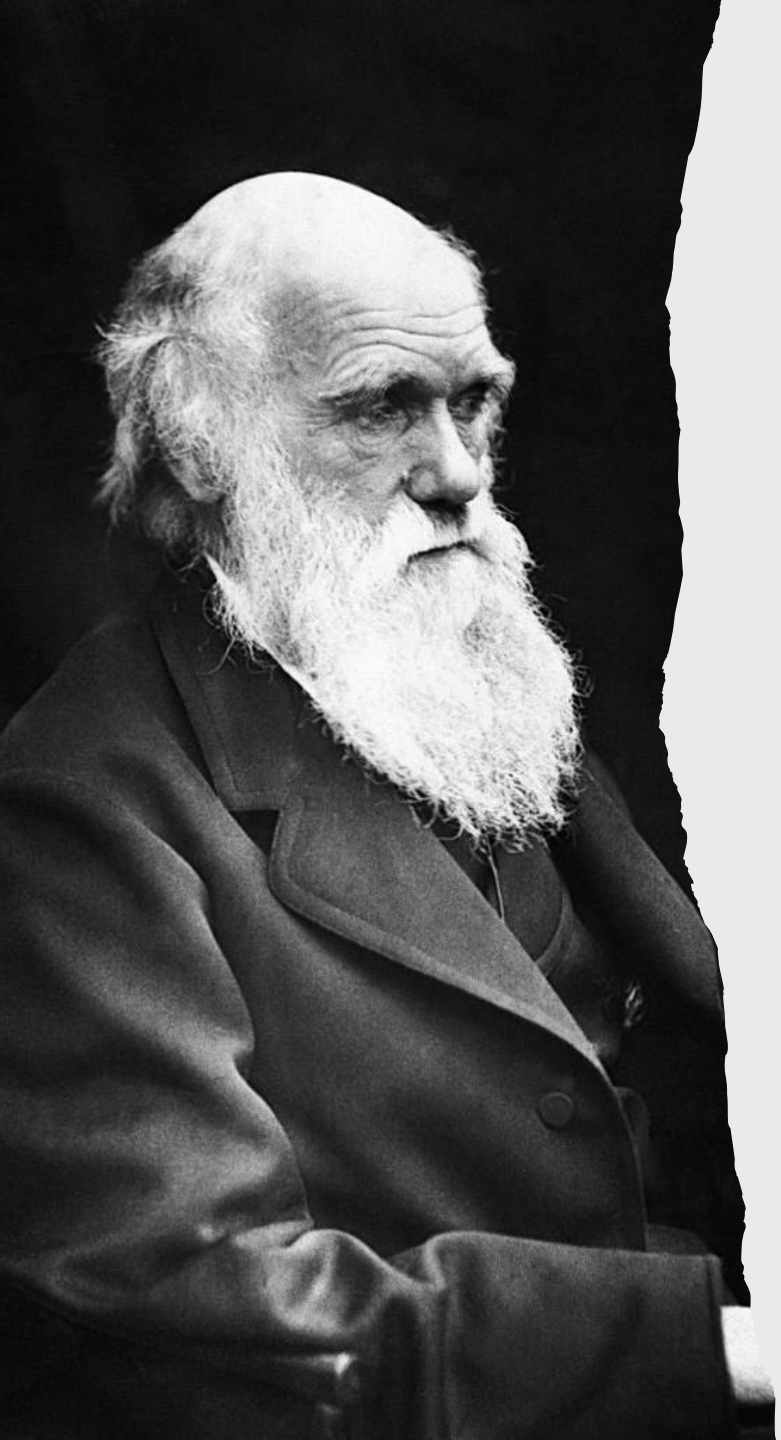
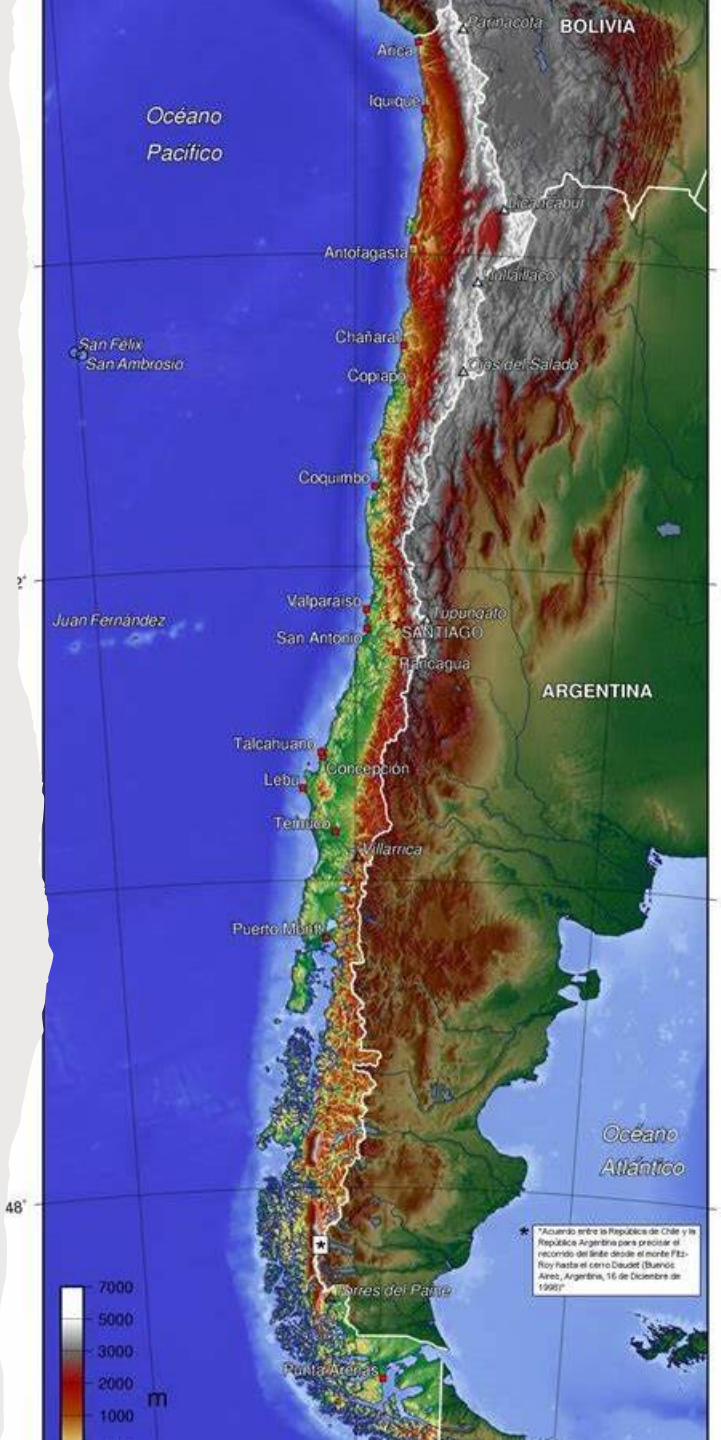
**Studies and experiments conducted during the 1971 eruption: the 1973 Volume**



# History of volcanology in Chile

Charles R. Darwin
(1809-1882)

**1840**. *On the connection of certain volcanic phenomena in South America*, «Transactions of the Geological Society of London», 5, pp. 601-631.

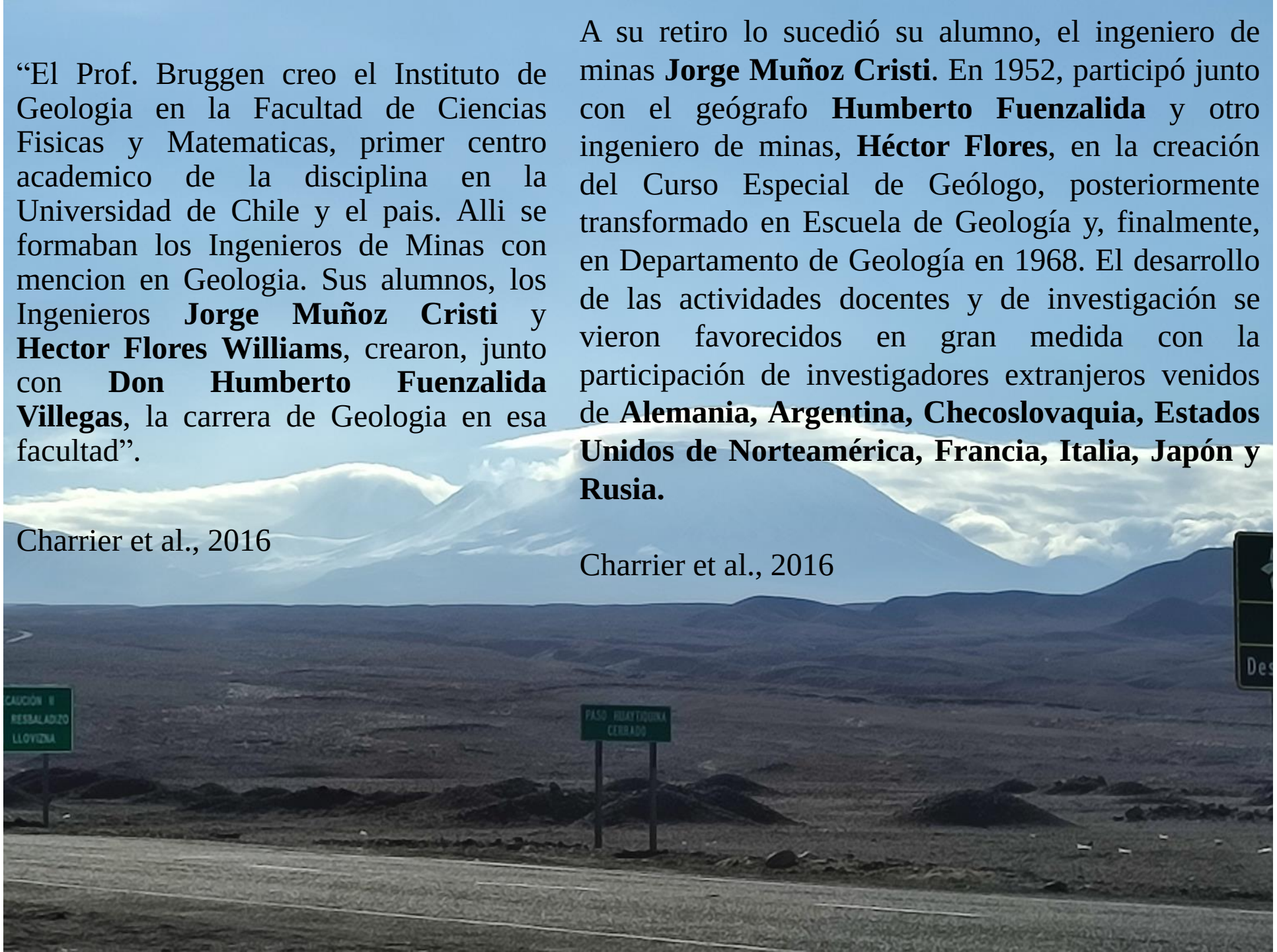


“El Prof. Bruggen creo el Instituto de Geologia en la Facultad de Ciencias Fisicas y Matematicas, primer centro academico de la disciplina en la Universidad de Chile y el pais. Alli se formaban los Ingenieros de Minas con mencion en Geologia. Sus alumnos, los Ingenieros **Jorge Muñoz Cristi** y **Hector Flores Williams**, crearon, junto con **Don Humberto Fuenzalida Villegas**, la carrera de Geologia en esa facultad”.

Charrier et al., 2016

A su retiro lo sucedió su alumno, el ingeniero de minas **Jorge Muñoz Cristi**. En 1952, participó junto con el geógrafo **Humberto Fuenzalida** y otro ingeniero de minas, **Héctor Flores**, en la creación del Curso Especial de Geólogo, posteriormente transformado en Escuela de Geología y, finalmente, en Departamento de Geología en 1968. El desarrollo de las actividades docentes y de investigación se vieron favorecidos en gran medida con la participación de investigadores extranjeros venidos de **Alemania, Argentina, Checoslovaquia, Estados Unidos de Norteamérica, Francia, Italia, Japón y Rusia.**

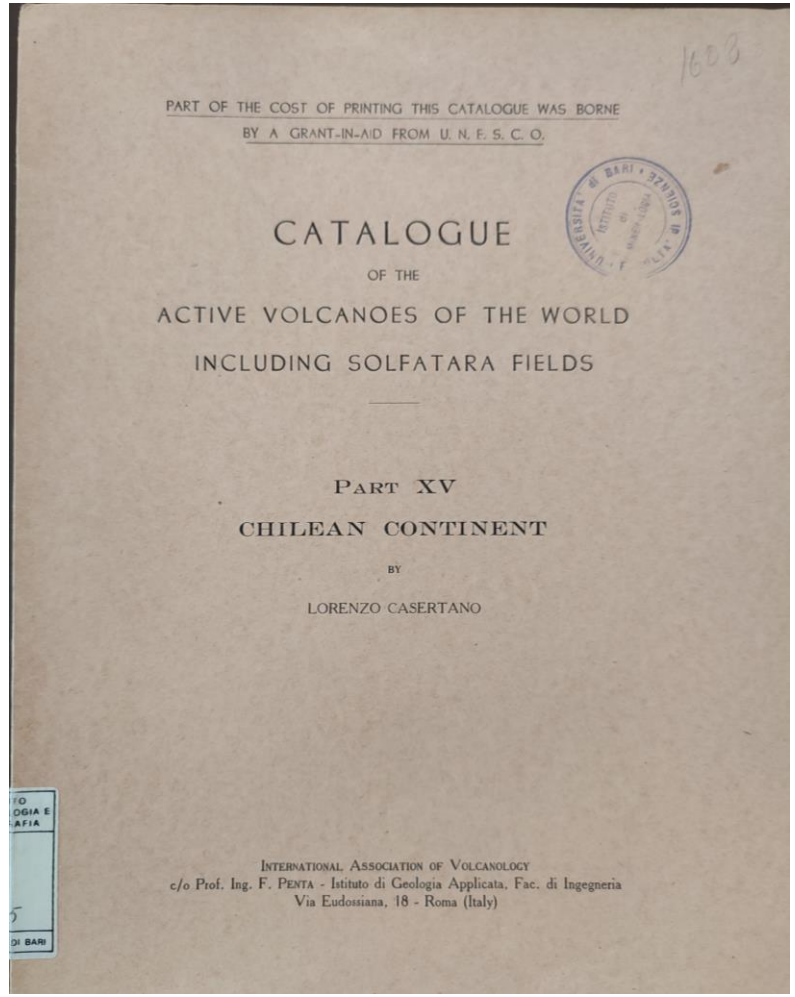
Charrier et al., 2016



# Birth of scientific Chilean volcanology

# Pioneer: Lorenzo Casertano (1921-2004)

- geophysicist, student of Imbò
- active in Italy, Chile, Costa Rica
- introduced the concept of poroelasticity in the study of the Phlegraean Fields
- author of the textbook Volcanoes and Earthquakes (1996)



PART OF THE COST OF PRINTING THIS CATALOGUE WAS BORNE BY A GRANT-IN-AID FROM U. N. E. S. C. O.

CATALOGUE

OF THE

ACTIVE VOLCANOES OF THE WORLD

INCLUDING SOLFATARA FIELDS

PART XV

CHILEAN CONTINENT

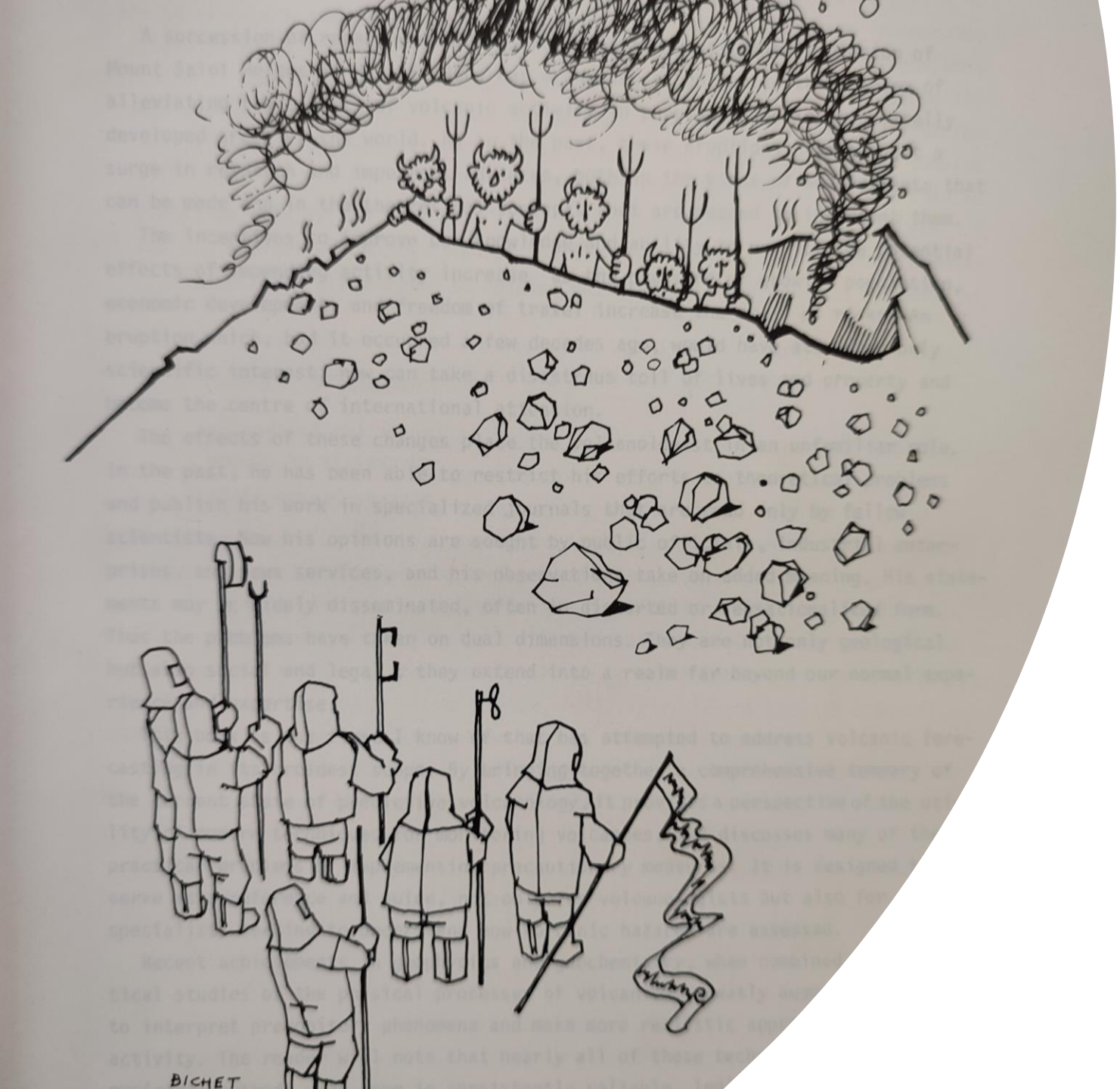
BY

LORENZO CASERTANO

INTERNATIONAL ASSOCIATION OF VOLCANOLOGY
c/o Prof. Ing. F. PENTA - Istituto di Geologia Applicata, Fac. di Ingegneria
Via Eudossiana, 18 - Roma (Italy)

# Conclusion

Current volcanology is a strongly multi- and interdisciplinary discipline.
The scientific beginnings of the quantification of eruptive phenomena can be traced back to Borelli's studies about 1669 Etna eruption.
Italian volcanoes, as well as those many others scattered around the globe, have been under the eye of naturalists and scientists over the last few centuries, but Vesuvius has certainly had a privileged place.
After the last eruption of Vesuvius in 1944, attention shifted to Etna, one of the world's most active volcanoes.
Thanks to scientists such as Rittmann, a permanent monitoring network was set up on Etna, which allows for the continuous advancement of studies and collaborations on an international level.
The Chilean example shows us how the evolution of studies has been similar and that the entry of information from Europe and Japan has brought the discipline into an already adult phase, which coincides with multidisciplinarity.




Thanks for the attention!