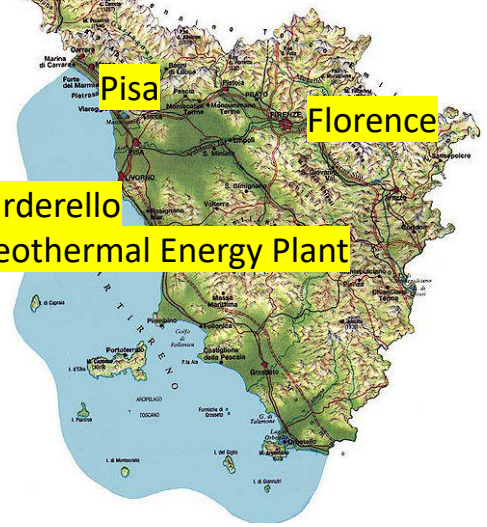


Harrow & Hillingdon  
Geological Society  
Overseas Field Trips

ITALY  
May 1999

Tuscany

Apuan Alps



Florence

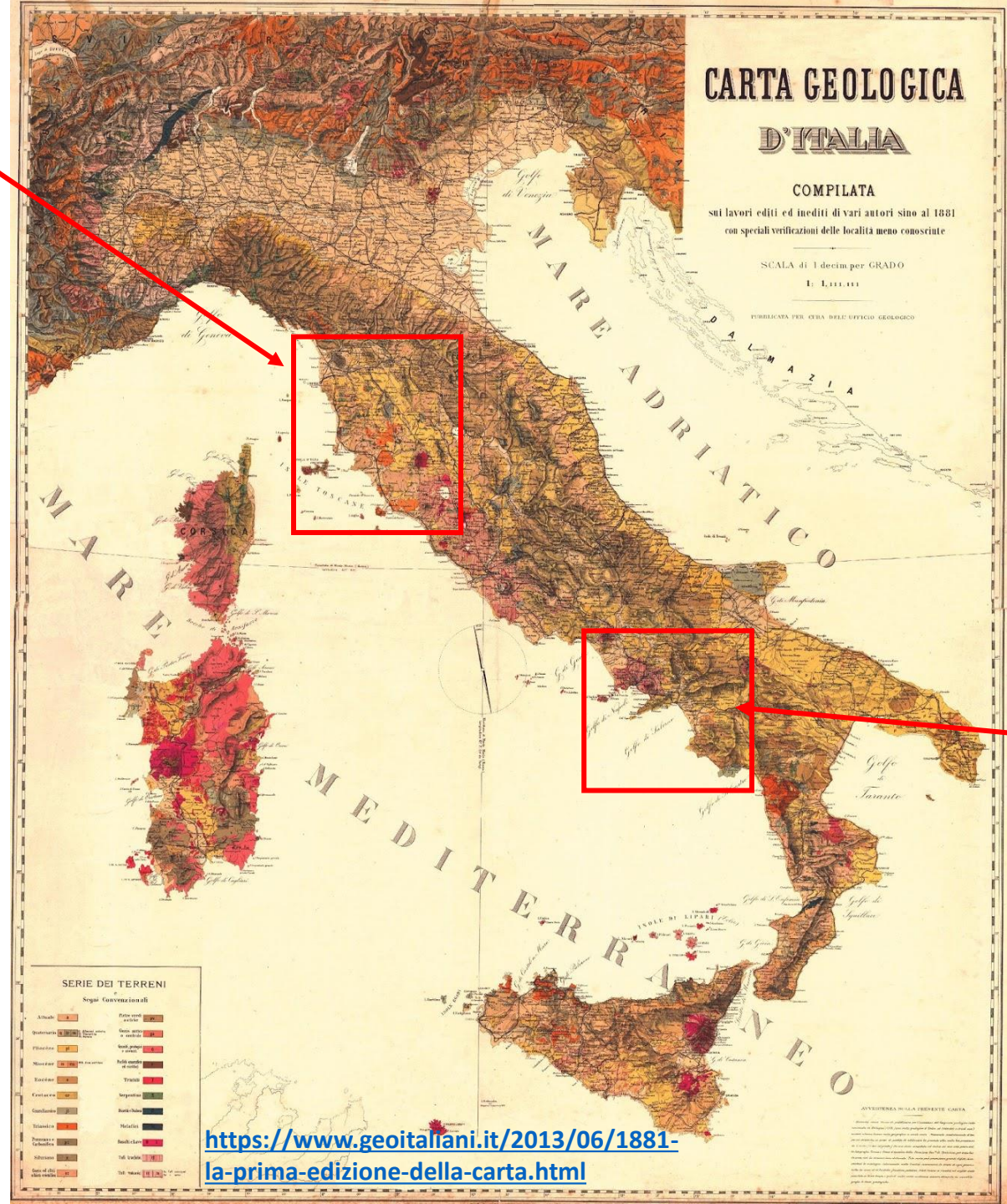
Larderello  
Geothermal Energy Plant

**CARTA GEOLOGICA  
D'ITALIA**

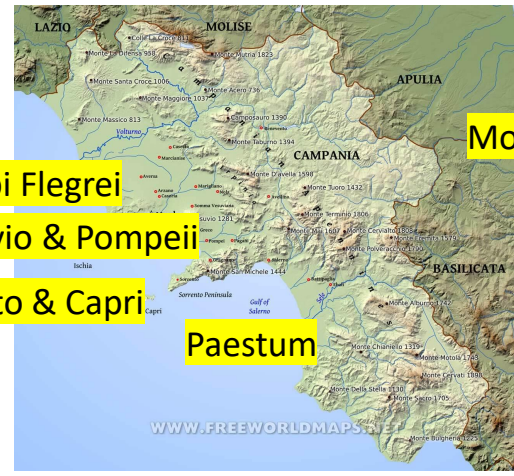
COMPILATA  
sui lavori editi ed inediti di vari autori sino al 1881  
con speciali verificazioni delle località meno conosciute

SCALA di 1 decim per GRADO  
E 1:1,111,111

PUBBLICATA PER ORDINE DELL'UFFICIO GEOLOGICO



Campania & Basilicata



Monte Vulture

Campi Flegrei  
Vesuvio & Pompeii

Sorrento & Capri

Paestum

<https://www.geoitaliani.it/2013/06/1881-la-prima-edizione-della-carta.html>

SERIE DEI TERRENI		Legenda
Soglia Convenzionale		Altezza
1	Altezza superiore	1000 m
2	Altezza intermedia	500 m
3	Altezza inferiore	200 m
4	Altezza del mare	0 m
5	Altezza di profondità	100 m
6	Altezza di profondità	200 m
7	Altezza di profondità	300 m
8	Altezza di profondità	400 m
9	Altezza di profondità	500 m
10	Altezza di profondità	600 m
11	Altezza di profondità	700 m
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13	Altezza di profondità	900 m
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31	Altezza di profondità	2700 m
32	Altezza di profondità	2800 m
33	Altezza di profondità	2900 m
34	Altezza di profondità	3000 m
35	Altezza di profondità	3100 m
36	Altezza di profondità	3200 m
37	Altezza di profondità	3300 m
38	Altezza di profondità	3400 m
39	Altezza di profondità	3500 m
40	Altezza di profondità	3600 m
41	Altezza di profondità	3700 m
42	Altezza di profondità	3800 m
43	Altezza di profondità	3900 m
44	Altezza di profondità	4000 m
45	Altezza di profondità	4100 m
46	Altezza di profondità	4200 m
47	Altezza di profondità	4300 m
48	Altezza di profondità	4400 m
49	Altezza di profondità	4500 m
50	Altezza di profondità	4600 m

# Pisa – ‘The Square of Miracles’



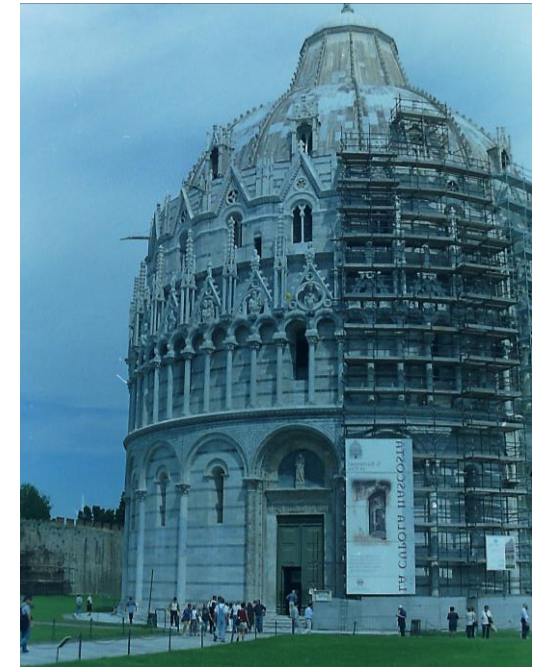
Construction of the famous **Leaning Tower** began in 1173 under architect Bonanno Pisano. However, due to the unstable alluvial soil it was being built on, it started to lean when they reached the first storey, even further by the time the third storey was completed. Work stopped for a century, when Giovanni di Simone attempted to correct it by putting less weight on the sinking side. It was finally completed in 1350.



Since it was first observed to lean, 8,000 projects have been devised to correct or save it, including shoring up the base, lowering the water table and strengthening the foundations with concrete. Stainless steel rings around the first floor were attached to cables supporting the tower.



Lead bars in concrete counterbalance the tower's lean. It is now leaning far less, just over 4 metres from the vertical at the time of this trip.



The cathedral's separate 11<sup>th</sup> Century dome (**Duomo**) undergoing external renovation.

Carrara, Apuan Alps

# Tuscany



# Apuan Alps

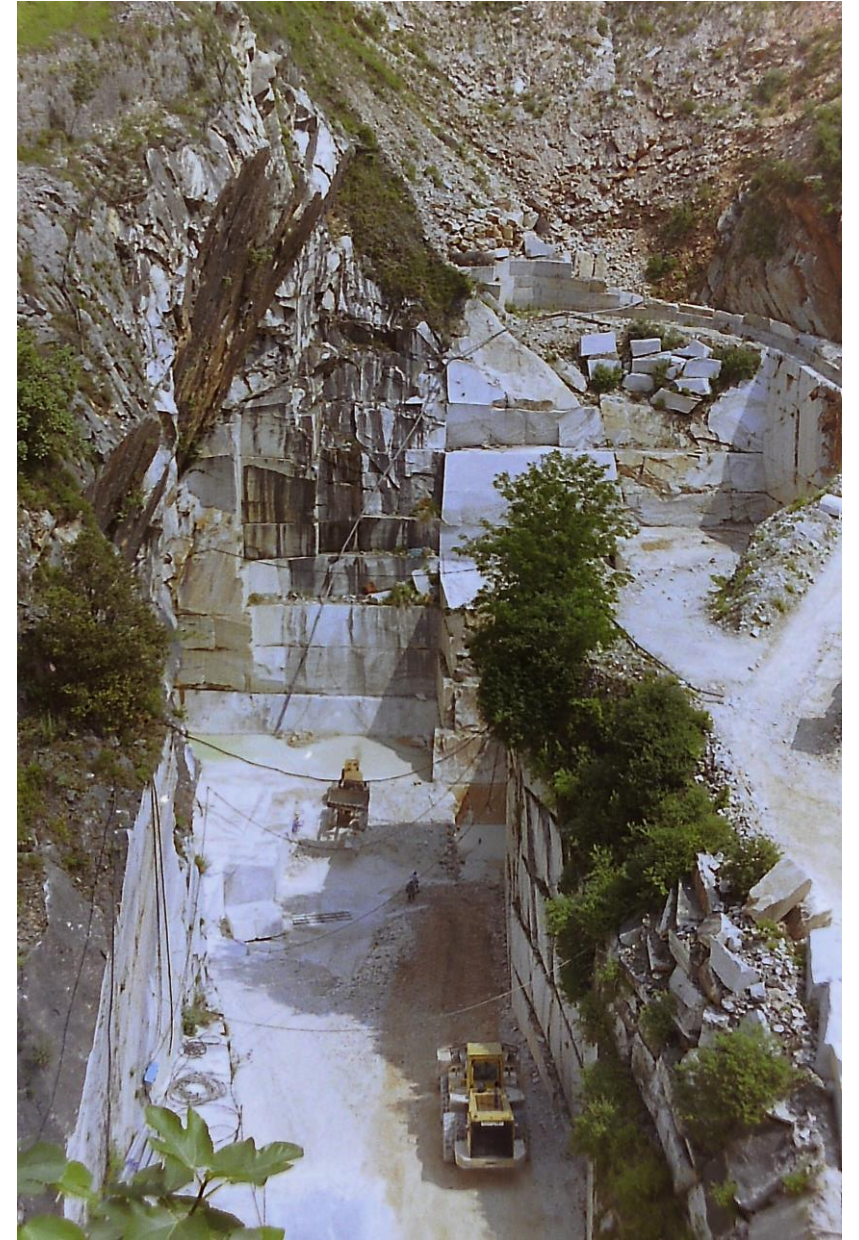


Limestones with shale partings.

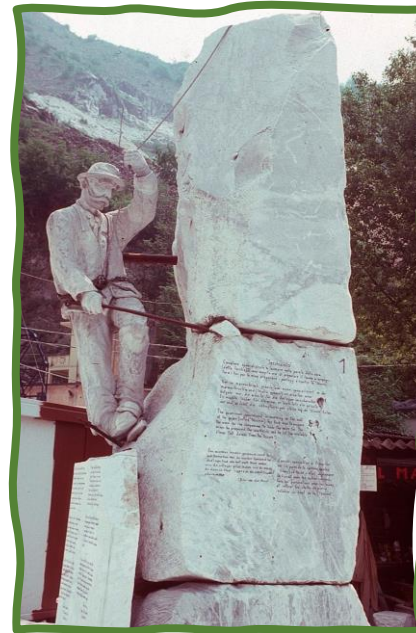
The **Apuan Alps** are described as a 'metamorphic core complex' with two major deformation phases around 27 and 12 million years ago, involving complicated wedge and nappe formations and metamorphism of the sedimentary strata. This led to the development of the ornamental and building stones industry in the area, including the renowned 'Carrara Marble'.

# Apuan Alps - Carrara Marble workings

**Carrara marble** has been extensively exploited since Roman times. It is the most bright white, least fractured, form that is most suited to sculptors and stonemasons. Of interest to mineralogists, but to the annoyance of the quarrymen (as it lowers the value of the stone), vugs and veins of minerals including quartz, sphalerite and gypsum are to be found within the marble.



# Apuan Alps - Carrara Marble workings



The whiteness of the marble gives the appearance of snow in the mountains. Once polished, it has a translucent pearly appearance making it most suitable for statuary.

**Michelangelo** and **Henry Moore** have famously chosen **Carrara marble** for their sculptures.

Larderello Geothermal Energy Plant

# Tuscany





# Larderello Geothermal Energy Plant

The **geothermoelectric** power plant is situated in an area of hot boracic spring waters, which have been used medicinally since Roman times. **Boric acid** is now used in the ceramics industry as well as pharmaceutical. Steam power has been harnessed here via boreholes since the early 20<sup>th</sup> century, initially lighting the factory and Larderello town. The electric power stations were rebuilt after WW2.



**Steam blow-out** demonstrating the force of natural steam power from fumaroles. The **turbines** in the power station are fed directly by steam coming from the ground, supplying electricity to the national grid.

Pipe taking the steam down to the power station.

# Firenze (Florence)



The 13<sup>th</sup> century gothic domed **Cathedral**, baptistry and belltower are decorated with local white, green and pink marble in typical Florentine geometrical style..

**Ponte Vecchio** is the city's oldest (14<sup>th</sup> century) bridge over the River Arno. It houses tiny corbelled craft shops either side of its central arches.



# Campania



# Sorrento and Capri

**Sorrento** is situated on high cliffs of **Campanian ignimbrites** (hardened volcanic ash) erupted 39,000 years ago from **Campi Flegrei** (Phlegraean Fields) on the opposite side of the **Bay of Naples**.



The island of **Capri**, however, is composed of **Mesozoic limestones**.



# Campania



# Vesuvio ( Mount Vesuvius)

**Mount Vesuvius** is an active stratovolcano rising above the Gulf of Naples. It is one of several volcanoes which form the Campanian volcanic arc. Its height is 1,281 metres and it last erupted with a lava flow in 1944 (top centre).



# Pompeii

**Pompeii** was a Roman town which was engulfed by a nuée ardente followed by burial under volcanic ash, lapilli and scoria when Mount Vesuvius erupted in 79 AD. The town had recently been partially rebuilt following earthquake damage in 62 AD.



Layers of ash, lapilli and scoria that buried the town.



Remains of the brick-cored columns that supported the roof of the Basilica, which was destroyed by the earthquake of 62AD and not rebuilt.



Fine Roman brickwork, much of which will have been plastered to give a marble-like appearance.

# Pompeii



The Pompeiian way of life is revealed by the streets, shops and homes preserved by the volcanic ash. Stepping stones across the streets gave people a dry route on wet days. In the foreground is a water trough.

There were 'take-away' street food restaurants and bakeries that ground their own flour. Wealthy houses had cooling shallow marble pools in their entrance halls.

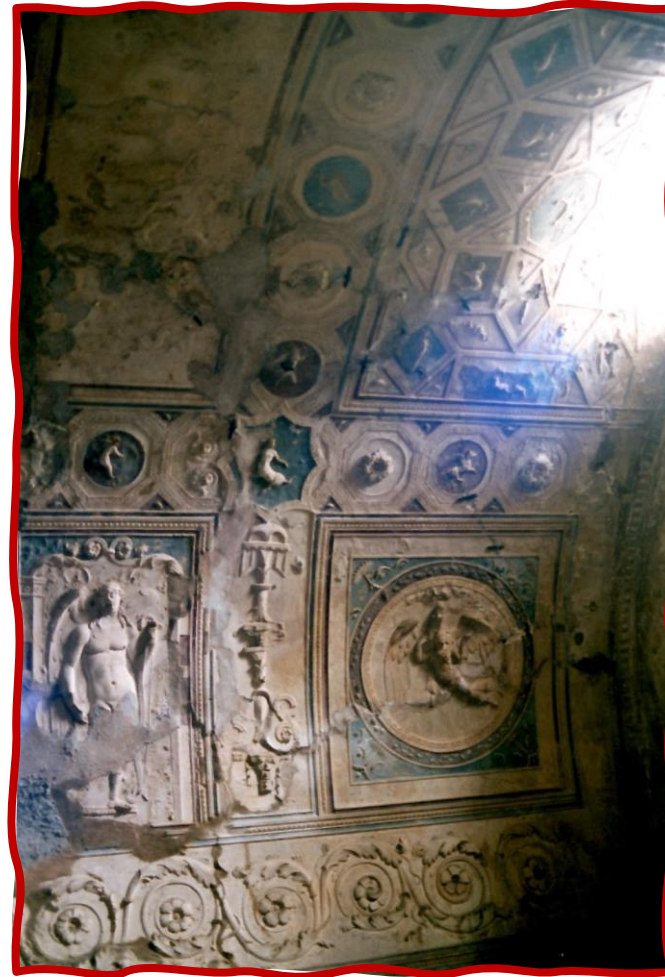




# Pompeii



The brick and stone walls were plastered and painted with brightly coloured murals, some of which remain. A great deal has been learnt about their way of life from these preserved artworks.



Due to their strong, domed roofs, the ornate Roman baths withstood burial under the layers of ash.



# Pompeii

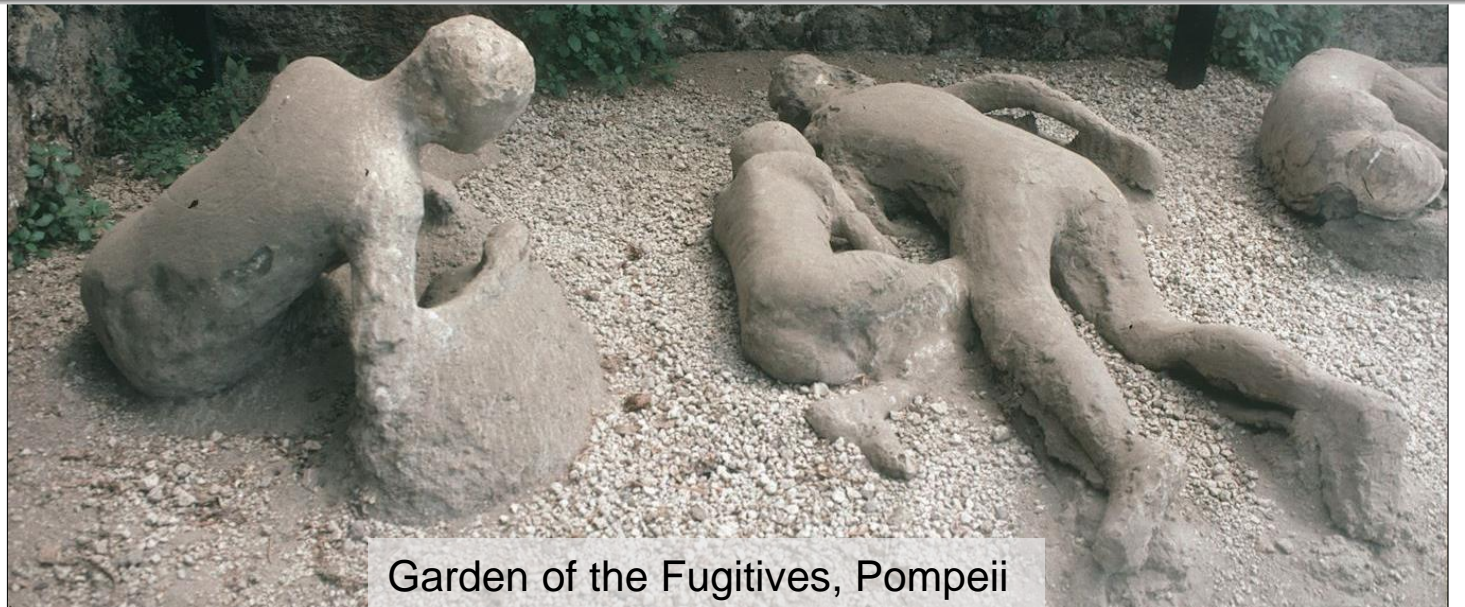


Beautiful stone **mosaics** survived, but wooden structures were vaporised due to the extreme heat of the nuée ardente, unlike nearby **Herculaneum** where wood was preserved by the volcanic muds that flooded it.

Poisonous burning gases killed people and their animals as they struggled to shelter or escape from the eruption. They were then buried under 5-6 metres of ash and lapilli. The whole area was buried within two days.

Regular excavations of Pompeii did not start until 1748, by the king of Naples, Charles of Bourbon, but this was mainly looking for treasures and works of art, some of which are now in the **National Museum of Naples**.

In 1860 **Giuseppe Fiorelli** carried out systematic excavations, and was the first to fill the voids left by decomposed bodies in the ash with plaster of Paris, preserving the exact forms of the stricken people. Excavations continue to this day.



Garden of the Fugitives, Pompeii

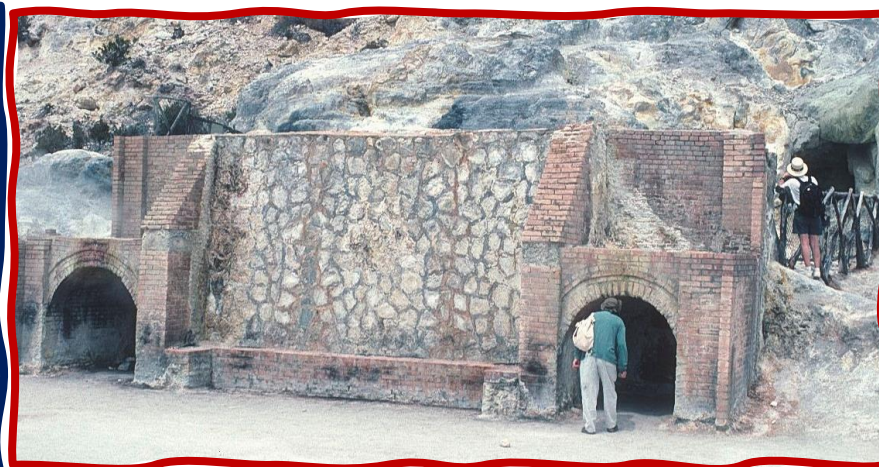
# Campania



# Campi Flegrei (Phlegraean Fields) - Solfatara



**Solfatara** is a 2.5km diameter crater full of live fumeroles, the youngest (3,900 years) volcano in the **Campi Flegrei caldera**. Due to the sulphurous gases leaking from vents, hot mineral springs and jets of boiling mud being ejected from mud volcanoes, the crater is arid and devoid of vegetation. It was once occupied by a lake of mud, which dried up naturally centuries ago.



Brick arches and a seat were used as natural **sudatoria** (hot steam rooms) in ancient Roman times.

# Campi Flegri (Phlegraean Fields) - Pozzuoli



The **Macellum**, or Serapide's Temple, in the spa town of **Pozzuoli** on a promontory dominating the Bay of Pozzuoli.

The town was known as **Puteoli** in ancient Roman times and has the remains of a number of spa complexes, temples, amphitheatres and markets.

At the **Macellum**, mussel borings in the pillars provide clear evidence of the bradyseismic fall and rise in land level along the Flegrei coastline from 4<sup>th</sup> Century AD onwards, which caused sea incursions, periodically flooding the land.

# Campania



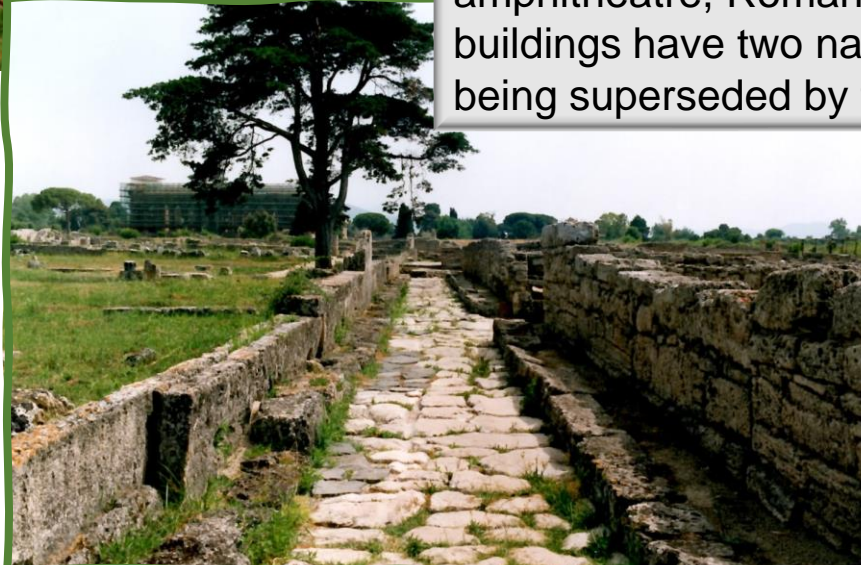
# Paestum

Temple of Athena (aka 'Temple of Ceres')



There are three enormous limestone-columned temples and the ground level stonework of several more; city walls and gates; an amphitheatre, Roman villa and residential areas to be seen. Many buildings have two names due to the 17<sup>th</sup> Century 'romantic' names being superseded by the original ones, once they were discovered.

Originally called **Poseidonia**, the ancient Greek city of **Paestum** dates back to around 600 BC. It was taken over by the Romans and renamed in the 3<sup>rd</sup> Century BC. Around 8<sup>th</sup> or 9<sup>th</sup> Century AD the inhabitants abandoned the area due to it being invaded by swamps. It was rediscovered in the 17<sup>th</sup> Century.



Temple of Hera (aka 'The Basilica')





# Monte Vulture Volcanic Complex

**Monte Vulture's** summit is about 1,200m above sea level but the volcanic deposits only form 700m of this as it is on a sedimentary basement. It is an **asymmetric stratovolcano** due to its complex combination of pyroclastic eruptions and lava flows from a series of phases from a number of vents.



**Prof Francesco Stoppa** indicating lava blocks which have disrupted the layers of carbonatitic ash tuff. **Case Agostinelli**



**Dune complex** in carbonatitic ash tuff. **Case Agostinelli**

