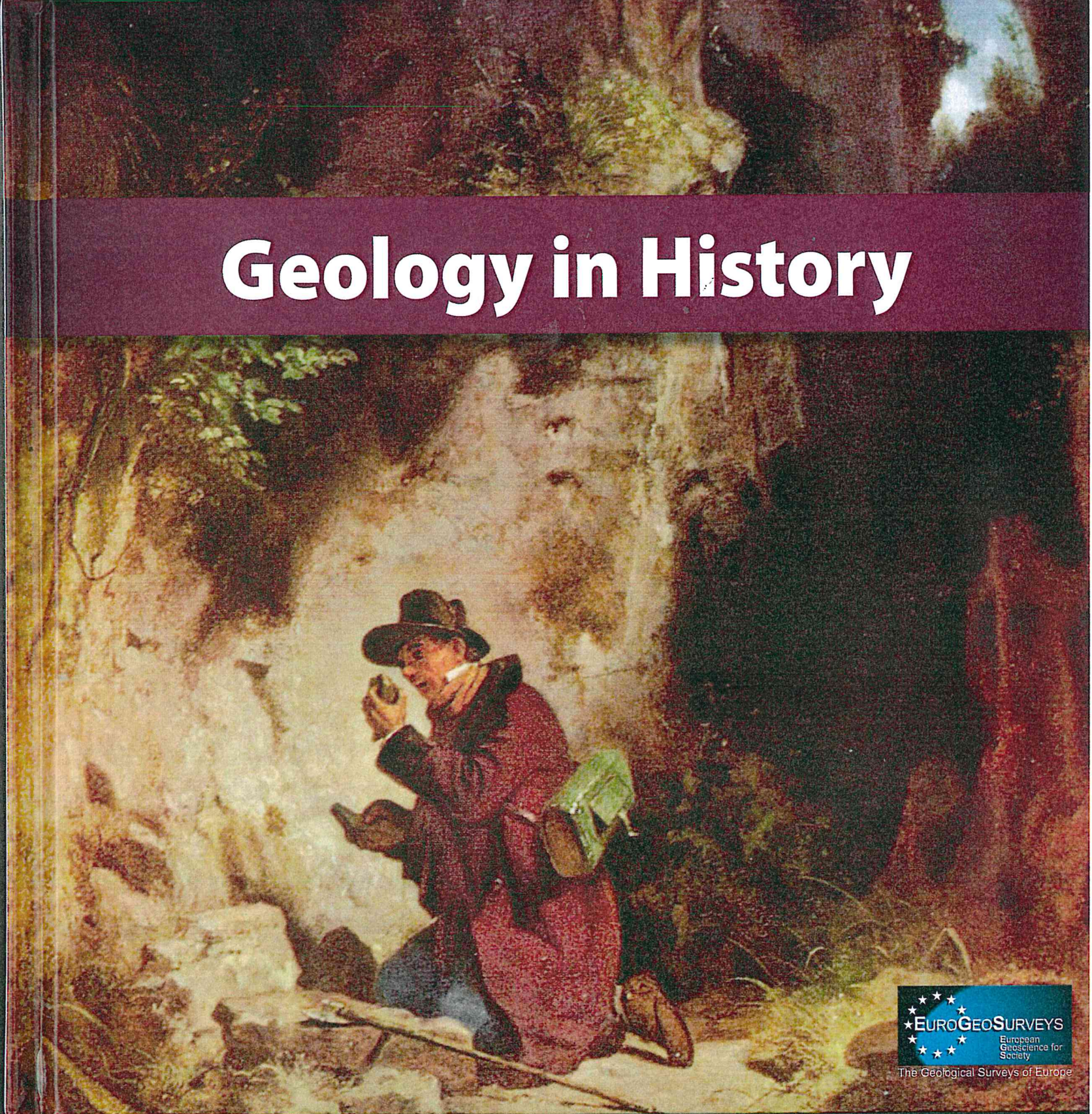


# Geology in History





## The stones of Bologna: the lithology of a city

Bologna and the rocks that compose it: an anthropic sedimentary process that has been ongoing for 3000 years

### Introduction

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Italy is a country with a great abundance of works of art: many cities boast an ancient history characterised by traces of former civilizations such as the Greeks, Etruscans, Phoenicians and Romans, who left a legacy that lives on today in local culture and folklore. Over the centuries, this history built up layer upon layer under every urban centre and nowadays it is frequently unearthed thanks to an excavation, the laying of building foundations or a structural collapse. The urban subsoil thus offers glimpses of the remains of a past which we can read and interpret with the help of geology: stone materials, fragments of buildings and roads, artifacts and everyday objects but also sediments, paleosoils, traces of ancient rivers. The picture that emerges is that of a context of intense interaction between the natural components of the territory and anthropic action.

Stone reveals the economic wellbeing which the city enjoyed in the past: the greater the distance the stone had travelled, the richer and more powerful the city was. Where there is considerable variety in stones from the same historical period, this generally indicates refined

artistic taste, intellectual vibrancy and extensive geographical knowledge of the world as it was known then. Stone reveals a number of characteristics regarding the location and how society in the past tackled problems related to the climate, epidemics and everyday life. Taken together, stones tell us about destruction, rebuilding and their reuse. Monuments, in particular, erected in the name of now defunct religions, famous and powerful individuals, commemorative sayings and popular names, represent the desire to seek eternity. However, irrespective of the use to which it is put, stone has a history of its own, that of its formation and the environment that created it. So, just as a rock represents the result of a balance within a geological process, the various different rocks that make up an ancient city are testimony to the social and economic balance that prevailed at a given moment in the past. All this applies in the case of Italy up until 1860, when the nation got its first railway. This means of transport inverted the economic relationship between man and stone: until then, labour had been cheap whilst materials were very costly, explaining why the majority of buildings were made of local stone. The arrival of trains and new materials (reinforced concrete) heralded a further transformation that marked a departure

from the past, a process that is particularly evident today. To offer an example of this geological history, we can consider the city of Bologna, which in the past decade has undergone a veritable reawakening in terms of tourism: thanks also to its stones, which retain traces of the past.

### Bologna and its stones

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The city of Bologna has a long history, as we know from the discovery within the city boundaries of settlements dating back to the Bronze Age (12 centuries before the birth of Christ). From VIII century B.C., the city went by the name Felsinia: one of the most important Etruscan cities on the Po Plain. Lithological evidence of this period consists of funerary stones in sandstone, a local stone of Mio-Pliocene age with decorations of an oriental influence, and walls in selenite, a particular variety of translucent gypsum that formed around 5 million years ago as a result of the temporary drying up of the Mediterranean, which outcrops abundantly around Bologna. Selenite has long been used for the foundations of houses because of its ability to insulate properties from damp. Gypsum rock ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) is naturally

hydrate, meaning it does not allow rising damp because, as it is already saturated in water, it does not permit the capillary action of water but acts like a buffer, which makes it a useful building material. The use of gypsum thus prevented the rampant spread of rheumatic illnesses, as occurred in other areas of the Po Plain characterized by a very damp climate. In addition, the sulfur content of gypsum contributed to a salubrious environment, acting as an antibacterial barrier.

The Etruscan presence continued until IV century B.C. when the area was settled by the Boii, a Celtic tribe (from Gaul, Boii means warrior people) and the city was renamed Bononia derived from the Celtic term Bona meaning fortified place. In 189 B.C., Bononia came under Roman rule, retaining its name but attributing the latter to bona omnia meaning here all is good. The city walls built of selenite were restored, roads were built using limestone brought from far away and marble began to be used for public buildings. In that period, gypsum was also used as lapis specularis, serving the same purpose as glass in modern-day windows: to let in light and afford protection from the cold.

During the Roman Empire, Bologna received red porphyry from Egypt and diorite from the Peloponnese region of Greece, the so called antique green porphyry. In particular, red porphyry, known to the Romans as lapis porphyrites, was used only for imperial and religious monuments due to its vivid purplish-red hue and the difficulty of working it. There are numerous Roman artifacts in Bologna although they are not immediately visible,

also because the city was destroyed by a great fire in A.D. 53 before being subsequently rebuilt from the ashes at the behest of the emperor Nero.

After the collapse of the Roman Empire and throughout the early medieval period, the city reverted to the use of local stone (predominantly gypsum and limestone) and continued its use of terracotta bricks, which had been introduced during the Etruscan-Roman period. Clay, in the form of fired bricks, is the predominant material used for the city's buildings and monuments and thanks to its nuances of colour ranging from yellow to red, it contributed to the new epithet for the city, Bologna the red. Then again, clays outcrop abundantly in proximity to the city, both on the plain as fluvial deposits and in the hills where Pliocene deposits outcrop, giving rise to striking badlands.

From the late medieval period, the use of clay bricks became increasingly widespread, and they were often used together with selenite. The city's two iconic monuments, the Garisenda and Asinelli towers, are both built from these materials. And from the 12th century on, Bologna began to use Red Verona Marble and Istrian Stone. At that time, the city of Bologna was traversed by numerous navigable waterways and the transport network was being constantly expanded and improved. There were trade links with several very important trading

Fig. 1 Selenite is the basement of Towers of Asinelli (97,2 m ) and Garisenda Towers (47 m) (XII century). They are the symbol of the city of Bologna and are both leaning 2.23 m and 3.22 m respectively. The names are derived from families that built them.



# EMILIA ROMAGNA



Fig. 2 Sandstone: Etruscan funerary stele (VI century B.C) Bologna, Museo Civico Archeologico.

although many are now home to new religions.

The roads and the stones used to pave them are also unchanged. Take, for example, the road that links Piacenza with Parma, Reggio Emilia, Bologna Forlì and

Rimini, which is the same one used in Roman times. Stones personify the same desires that drove Man in the past: skyscrapers express the same ambitions as the city's countless medieval towers built of bricks. Even if we acknowledge our fleeting presence here, stone and artifacts still continue to represent our reaching out to the future.

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