a7 Physical geology and historical geology

< historical, prehistorical >

> How odd it is that anyone should not see that all observation should be for or against some view if it is to be of any service. —Charles Darwin.[3]
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> To look for a black hat in a black room, you have to believe it is there. —Popper.[4]

Earth and Sun originated along with other members of the solar system about 4.6 billion years ago. Almost all of this time is prehistory.

Physical geology is the study of Earth's physical existence during *historical times*. Information, as Agricola (***Figure a7.1***) urged, is obtained by direct observation and measurement, by modeling and experimentation, and from written accounts of witnessed geological events. An important aspect of physical geology is to understand the landscape in terms of observable processes that shape it. This leads naturally to study of the physical and chemical aspects of Earth's minerals and rocks and the existing composition, distribution and structure of these. All are nonhistorical objects in that their form and variety can and often do repeat. Systems geology, an extension of physical geology, uses computer modeling and large-scale data analysis to elucidate geosphere, hydrosphere, atmosphere and biosphere interactions.

The practical justification for physical geology is the management of the geological aspects of nature.

Historical geology is the study of Earth as an historical body to learn about the natural world of *prehistory*. Information is obtained by reading the rock record. This is accomplished by using principles of geology derived from physical geology. What has been increasingly learned of prehistory is that there is no simple story. Accidental events, great and small, have disrupted the tale in unpredictable ways. Nevertheless, between the surprises, segues, and dead ends, there is some inevitability as to the progression of events. Components of the physical Earth do change and life forms do evolve. These are historical objects in that happenstances make their states unrepeatable.

The practical justification for historical geology is that it does aid in prospecting for increasingly hard to find Earth materials.

Geological surveys (publically-funded in turn to aid coal, iron, gold, silver, copper, oil and gas prospecting) have been prolific trainers of lab and field workers and have made available topographic, aerial and other base maps and, using these, geological maps that show the structural and temporal relations among rock formations.[5] ❑

(*Figure a7.1 cont*.)

In 1546, on physical geology in *De Ortu et Causís Subterraneorum, De Natura*, subterranean waters and gases in *Eorum quae Effluent ex Terra*, history of metals and topographical mineralogy in *De Veteribus et Novís Metallís*, and, systematic mineralogy in *De Natura Fossílium*.

In 1556, (one year after his death) on the nature of mineral deposits, prospecting, the philosophy of mining, the qualities of a good miner to the arts of exploration, on false practices such as the use of the divining rod, mining law of the day, mining methods, assaying, metallurgical processes, and smelting in *De Re Metallica*. This lavish tall-folio 586 page 12-book treatise, included 290 finely illustrative woodcuts.[6]

De Re Metallica was successfully translated into English by the American mining engineer Herbert Clark Hoover (Stanford, geology, graduated 1895, later, President of the United States) and his wife Lou Henry (Stanford, first female geology major, graduated 1898), and was published by *The Mining Magazine*, London, in 1912,[7] and subsequently in the United States by *Dover Publications* in1950.[8] If this surprises, times change or, as the Hoovers might have said: "*Tempora mutantur*."