

A HISTORY OF GEOCHEMISTRY AND COSMOCHEMISTRY

By
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Revised and illustrated draft of Volume 1, xxxviii+706 pages,
With 104 figures, 6 numbered tables and 602 references

Organization of the “History”

Given the ambitious scale of R.W. Boyle’s undertaking, it seems appropriate to provide a short, illustrated synopsis of the three volumes, much in the manner of annotated chapter summaries, found in the Contents pages of books from the early 20th century, and before. Here, then, is a brief keyword-oriented tour, a *vade mecum*, of Boyle’s “A History of Geochemistry and Cosmochemistry”. This summary is not comprehensive.

Volume 1.

Preface.

This book reviews those scientific disciplines known collectively as geochemistry and cosmochemistry. It proceeds in fact from prehistory -- using archaeological evidence of the use of raw materials and the development of technologies -- through the classical civilizations of antiquity, the Medieval period and the Renaissance, to the modern scientific developments of the 19th and 20th centuries.

Chapter 1 - Introduction.

Definitions of some scientific disciplines, including geology and chemistry. The evolving concept of geochemistry as a distinct discipline, from classical times, with advances in understanding across western Europe, Russia and America (this discussion will now be found largely in Appendix 2). The scope and growing literature of geochemistry.

Chapter 2 – Chemistry and geochemistry in prehistoric time.

Prehistory, including the archaeology of the Paleolithic, Mesolithic and Neolithic, collectively the Stone Age. Fabrication of stone tools from chert (fine-grained silica, including flint) and other lithologies. The use of stones in tools, as building materials and for ornamentation. Ceramics, pigments and cosmetics. Early concepts of the “elements” of matter.

Chapter 3 - The Copper-Bronze and early Iron Ages: the birth of metallurgy and primitive chemistry.

Chapter 3A - The somewhat flexible archaeological chronology of the Copper, Bronze and Iron ages. The Old World. North Africa and the Middle East - Egypt - Sumeria - the Hittites - the Phoenicians and Persians - the Indus civilization in modern Pakistan and India - China, Russia – the Americas – Mexico. Metal technologies and the rise of metallurgy.

Chapter 3B-3F – A major, 28-part review of the chemical elements known to Bronze Age and early Iron Age metalsmiths and craft workers (*very long, and so split into five more sub-chapters with their own references and endnotes*). In practice, this refers to a mixture of metals, minerals and rocks, beginning with gold. Sources of gold. Ancient Greece and Rome. Goldsmiths, cupellation, and the separation of gold and silver. Early use of copper. Native copper, and oxidized copper minerals such as turquoise and malachite. Copper smelting. Tin and tin-bearing alloys. Cassiterite and other ores. Uses of lead. Early references to zinc and cadmium. Mercury. Early sources of iron, including iron meteorites. The oldest known iron artefacts of Greece and Rome, China and India. A variety of other metals and metalloids. Sulphur, diamond and graphite, hydrocarbons, amber and bitumen. Gemstones, pigments, industrial minerals and glass making. Organic substances (including useful ones like wine and beer!).

Chapter 4 - Chemistry and geochemistry during the Classical Period of the Greek and Roman empires and the early Indian and Chinese civilizations.

Archaeology and history of the period from 600 B.C. to 476 A.D. The development of Indo-European (Aryan) philosophical and scientific thought. The Aryan tribes of northern India, Iran and adjacent lands. Ideas on the composition of matter in the Greek and Roman empires. Indian concepts, and the Sanskrit writings of the Hindus. Chemical ideas in ancient China. Alchemy. Early adventures in geochemical analysis. Concepts in cosmology and cosmochemistry. The origins of geochemistry and mineralogy. The unparalleled length of literary history in China, and early Chinese references to minerals such as micas and cinnabar. Early thoughts on volcanoes, igneous rocks and mineral deposits. Soil science, natural springs, hydrogeochemistry and hydrology, hot springs and mineral waters. Early ideas on atmogeochemistry, biology and biogeochemistry, and fossil remains.

Appendices

Created specially (the Table) or moved from Chapter 1 to the end of volume 1:

Periodic table of the elements (with brief explanation)
Historical derivation of the term “geochemistry”