A HISTORY OF GEOCHEMISTRY AND COSMOCHEMISTRY

By

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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 2

Chapter 5 - Chemistry and geochemistry during the Medieval Period.

The Medieval period in Europe is generally considered to be the span from 476 to 1500 A.D. - overlapping definitions exist for India, China and the Americas. History and cultures of the medieval world. Europe after the fall of the Roman empire. The zenith of science in the Islamic world. Avicenna and his ideas on minerals, meteorites and metals. The High Middle Ages in Europe. Albertus Magnus and his *De Mineralibus*. Thomas Aquinas and Roger Bacon. Alchemy and science in India and China. Leonardo da Vinci. The life sciences.

Chapter 6 - Chemistry and geochemistry during the Renaissance.

The Renaissance in western Europe, 1250 to 1600 A.D., from the time of Roger Bacon to the death of Giordano Bruno. Science and religion, and the advent of humanism. Cosmology, cosmochemistry and meteorites. Aspects of geochemical analysis and lithogeochemistry. Mineral deposits, including gold and other metals in veins. Paracelsus and his *De Natura Rerum*. Biringuccio and early ideas on mineral exploration. Georgius Agricola. Minerals and fossils, geochemistry and metals. Agricola's works, such as *De Natura Fossilium* and *De Re Metallica*. The natural scientists of the Age. Soil, water and groundwater.

Chapter 7 - Chemistry and geochemistry during the transition to the modern scientific age - the 17th and 18th centuries.

The development of Earth sciences from Palissy to Werner, and advances in philosophical thought. Descartes, Locke, Hume and Kant. The Enlightenment in Europe, and the appearance of scientific societies. The rise of inorganic chemistry and

physical chemistry, geology and mineralogy. Robert Boyle (1627-1691). The mineral analysts of 18th century Sweden, such as Torbern Bergmann and Carl Wilhelm Scheele. The phlogiston theory. Geology in Europe: Hutton, Kircher and Becher. Robert Hooke. Nicholaus Steno. John Woodward and the Biblical influence on geological thought. Science in England, Italy, Germany and France. Guettard, De Saussure and the Compté de Buffon. Abraham Gottlob Werner and Neptunism. James Hutton. Catastrophism versus uniformitarianism. Ideas in cosmology and cosmochemistry. Galileo, Newton and Laplace. Meteorites. Lithogeochemistry and mineralogy, petrology and palaeontology. Linnaeus and Cronstedt. The Plutonists. The onward march of chemistry and discoveries of new elements usher in a new age of science. Lavoisier and Davy. Geochemistry and ideas on the genesis of mineral deposits. Soil science and agriculture. The nature of water: Priestley and Cavendish. Spring waters and the geochemical cycle. Gases and the atmosphere.

Chapter 8 - Chemistry and geochemistry during the 19th century.

Lithogeochemistry in the 19th century. Pedology, soil classification, humus, minerals, soil fertility and agriculture. Clay minerals, laterite and bauxite. The chemistry of sea water. Sir John Murray and the Challenger expedition. Oceanography and the origin of the oceans. River and lake waters. The chemistry of brines and other waters. Spring precipitates such as carbonates and silica sinter. Atmospheric gases. John Tyndall, Sterry Hunt and CO_2 in the atmosphere. Volcanic gases and sublimates. The origin of the atmosphere. Biogeochemistry and the analysis of alkali metals and many other elements in vegetable ash. Arsenic. Halogens such as iodine. Biogenic deposits, such as limestones. Coral reefs. Chert, phosphate rocks, iron and manganese deposits, peat, humus and coal. Amber. The chemistry of coal ash. Bitumen and petroleum. The origin of life. The coming of age of geology in the 19th century. The term geochemistry was introduced by Schonbein and its scope outlined in 1838. F.W. Clarke made the first estimate of elemental abundances in the Earth's crust in 1892 and 1897.