

**Geo 495 Course**

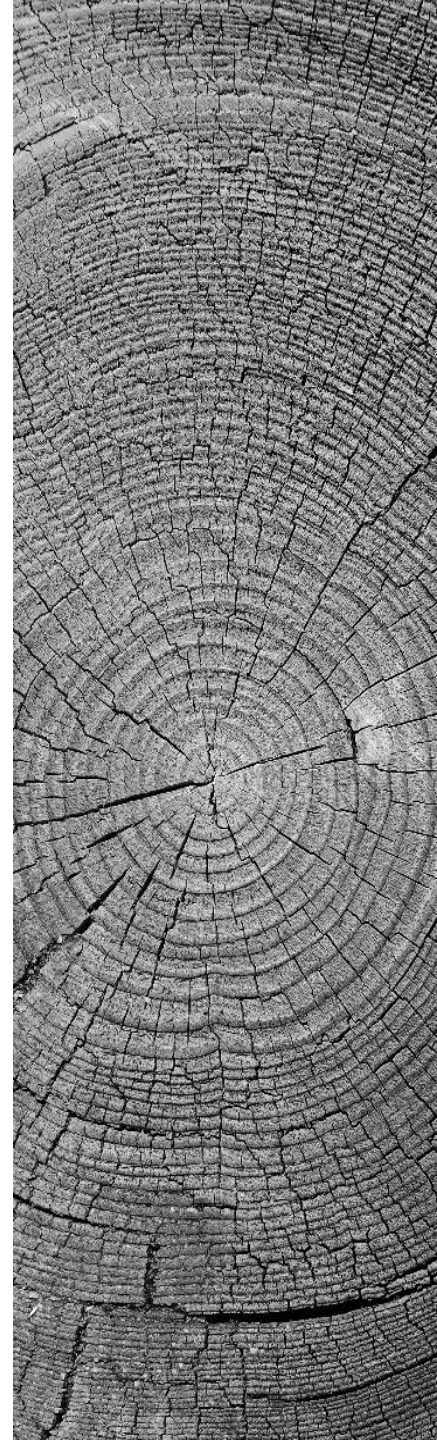
**History Of Geology Course  
“Contribution of Early Muslem to field of  
Earths Scioences”**

**Course Director  
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## Introduction

- **There were a magnificent contributions of Early Muslims to the field of Earth Sciences,**
- **it has been wrongly assumed that the birth of such sciences actually take place in 1830 A.C.** by the publication of Charles Lyell's book "Essentials of Geology".
- **Some knowledge of the earth and its resources must have been booming long before Lyell's time, as quarrying for building and decorative stones, ore-mining and metal extraction, exploration for gems and gemstones as well as their industries were developed in all ancient civilizations.**



## Introduction

- **The techniques used have been simple and primitive, but definitely were based on some knowledge and experience, particularly with miner's gemmologists, quarrymen, professionals in ore prospection and extraction, specialists in other industries and trades dealing in minerals and rocks, scientists, philosophers and even clergymen.**

Consequently

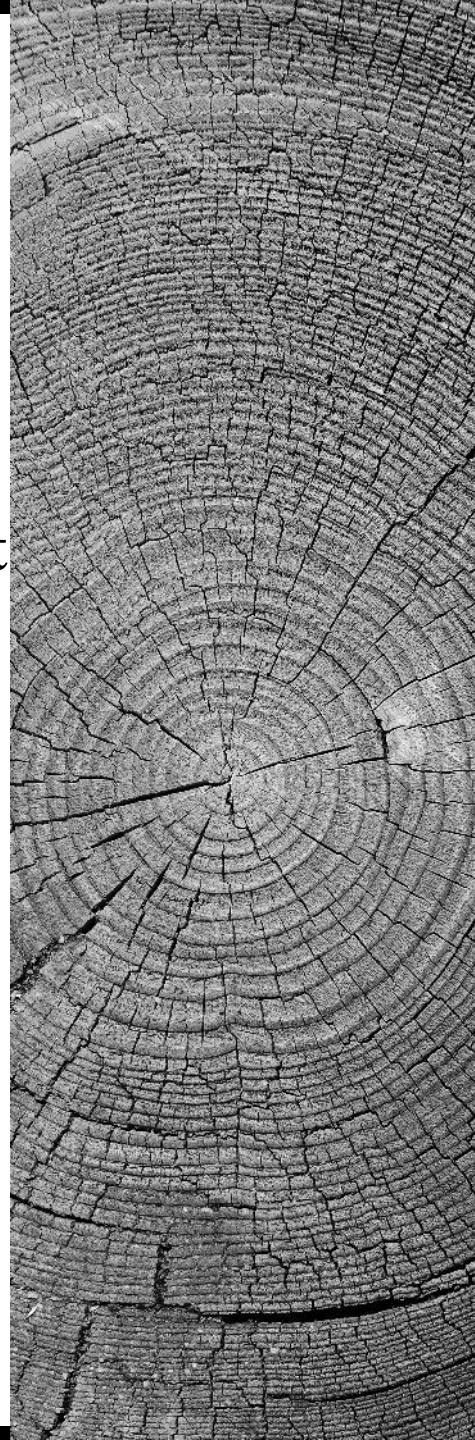
- **The synthesis (mixing) and theorization of the collected information about the earth were distorted by such strange beliefs, despite marked successes in the applied field.**



- **The Tracing the origin of Geological knowledge in such unusual were in explanations of classic times, or jumping from there to Renaissance, watching the “Golden Age” of the Islamic civilization.**
- **Ancient Greek and Roman writers - like their predecessors in ancient Egypt, Mesopotamia, India and China - think over about the origin of the earth and of the rest of the universe,**

But,

- **Their conclusions were nothing more than a number of facts borrowed from previous revelations, highly twisted and corrupted by academic assumptions and presumptions, without much observational or experimental deductions.**



➤ Luckily enough most of their writings are lost and-indeed-what is left makes such a loss, **described by Schwarz (1968) under the correct title** “The Failure of Geological Attempts by the Ancient Greeks from Old Ages to the Reign of Alexander”.



➤ Definitely, some ancient Greek and Roman writers assumed the presence of fire at the earth's centre and recognized the remains of animals and plants in rocks of the earth's crust, the rise and subsidence of land areas and a number of other geological phenomena,

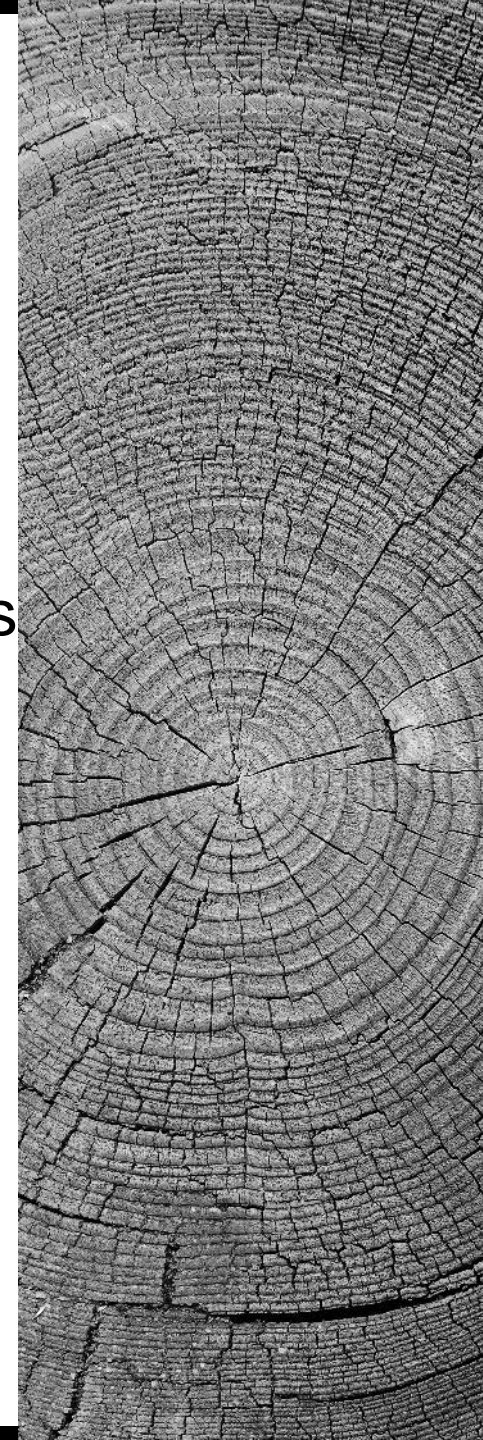
But,

➤ **Failed to explain their explanations for such assumptions and observations as myths normally pre-occupied any systematic thinking in their minds.**

Consequently,,



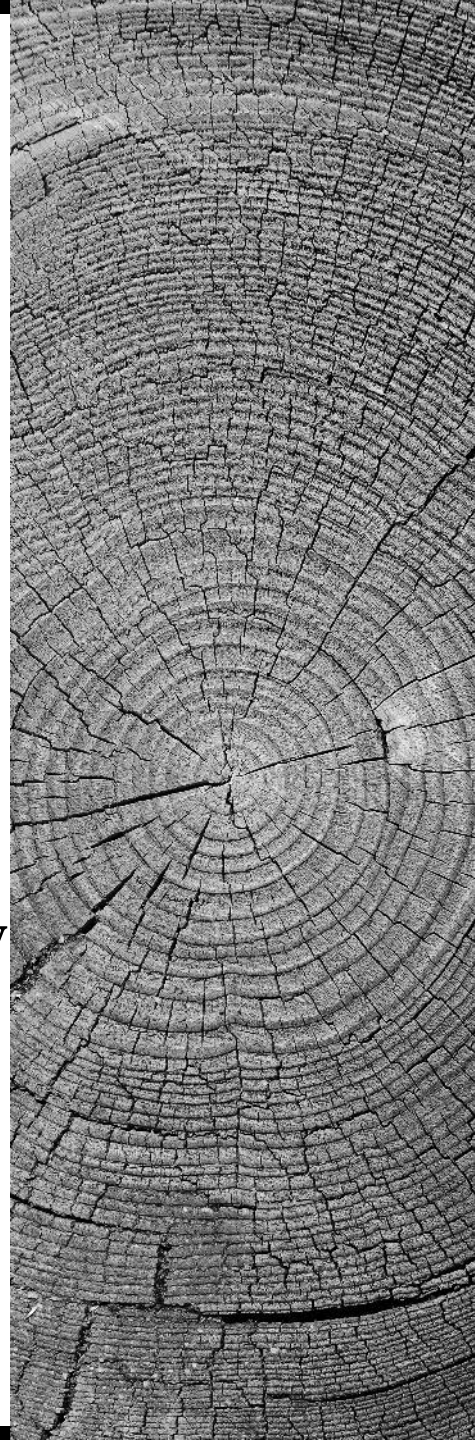
- ✓ their contribution to Earth Sciences is, indeed small and of little worth.
- ✓ **Zittel** mentioned this in what is translated in the following lines:
  - Not a single writer on these subjects in the ancient world had examined the rocky crust of the earth with a view to ascertain its composition,
  - nor considered that fossils in the sedimentary succession can afford clues to the history of the earth.



- **The aims and objectives of modern geological and paleontological studies** were absolutely unknown to the ancients, in reference to baseless hypotheses and haphazard observations,
- So, cannot be considered as a foundation for scientific achievement.,

However,

- ✓ if such generalization applies to the heritage of the Greco-Roman civilization, it definitely does not apply to the contributions of the Early Muslims.





- These contain a wealth of **scientific knowledge experiences and procedures for the identification of minerals and rocks, including** :
- ✓ *physical and chemical properties (such as specific gravity, colour lustre, transparency, impurities, streak, hardness, fractures, cleavage, fusibility, refractivity, crystallinity and crystal form, reaction to both heat and acids, etc.);*

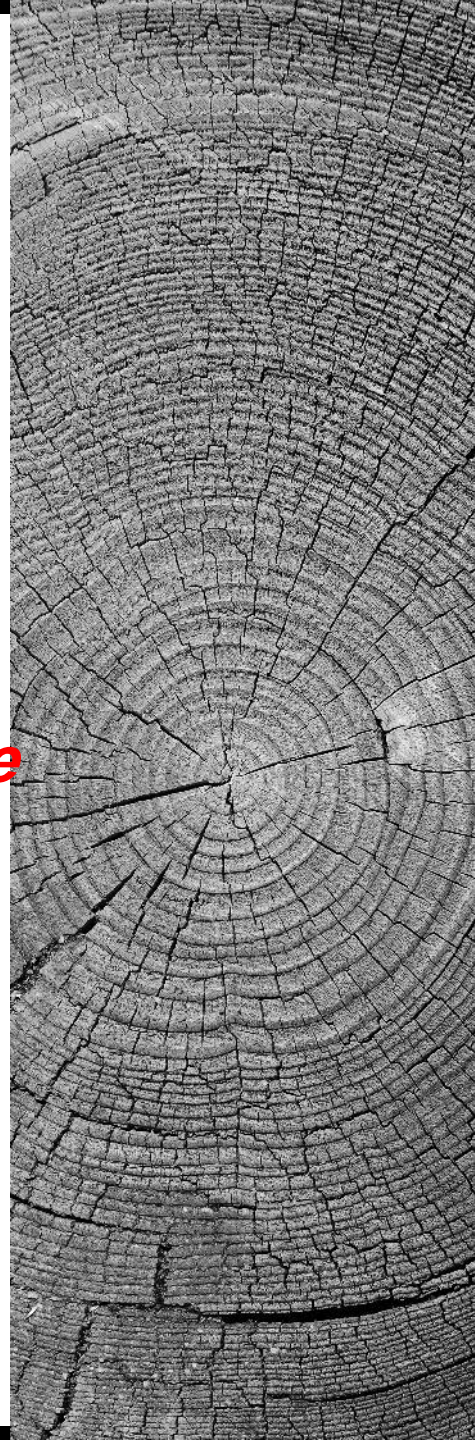


✓ as a certain pertinent (related) information about the occurrence, association, genesis, classification, extraction and uses of economic minerals and rocks ( such as gems and gemstones, gold, silver copper mercury; , lead and zinc, iron, borax, alum, rock salt, corals; crude oil and oil seeps, tar, coal, asbestos etc.

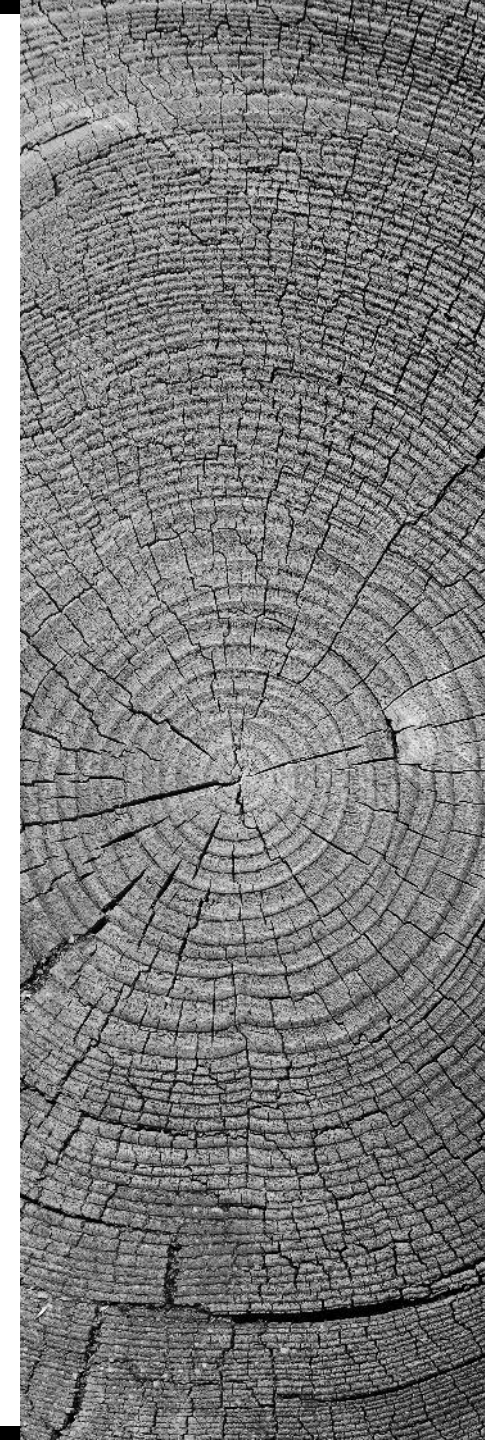
➤ ***Early Muslims' contributions to Earth Sciences also include the description of the shape of the earth,***

✓ ***proving earth's sphericity and rotational movements; the measurement of its dimensions*** (radius, circumference and volume with an error of no more than 3% ),

✓ the ***notion to the presence of most of its mass at its centre;***



- ✓ description of the geomorphologic features of the earth's surface and the processes shaping such features;
- ✓ the distribution of land and sea and the their description of many oceanographic characteristics (such as shoals and shoal deposits, islands and peninsula, coral reefs, tides and tidal effects, etc.)
- ✓ description of both internal and external forces of the earth and their associated processes and phenomena ( e.g. earthquakes, volcanic eruptions, orogenic movements, faults and surface collapses, other catastrophic events,



- ✓ the processes of both weathering and erosion and their products etc.); the rising of temperature towards the centre of the earth and the rising of mountains from within oceans and seas (an early notion to the ocean/continent' cycle);
- ✓ the recognition and classification of both meteors and meteorites; the suggestion of a scale of hardness for determining the relative hardness of minerals [ 8 centuries before Fredrich Mohs ( 1773-1839) introduced his scale],
- ✓ the rock cycle or the formation of igneous rocks from molten magma and their disintegration by weathering into sediments and sedimentary rocks,



- Indeed, numerous Arabic manuscripts have been translated into Latin and Greek, and referred to other European authors.
- As in the case of Ibn Sina's section on "Minerals" in his famous book "Al-Shifaa" (or the Book of Remedy" Treatment") is only one of the many shameful practices by Europeans during Renaissance.
  - ❖ This chapter was partly translated and partly condensed under the Latin title "De Mineralibus" and wrongly indorsed to Aristotle.



## ❑ **SELECTED EXAMPLES OF MUSLIM SCHOLARS DISTINGUISHED IN THE AREA OF EARTH SCIENCES:**

- 1. Imam J'aafar Al-Sadeq (died 148 A.H - 765 A.C.)** who wrote a manuscript on mineralogy, that was published by Ruska (1924)
- 2. Jabir bin Hayyan (died 160 A.H. - 776 A.C.)** who was basically a chemist, and a medical scientist, was the first to synthesize minerals from natural (e.g. Cinnabar from mercury and sulphur), and to classify them on the basis of their physical properties.
  - ✓ He suggested the possibility of transformation of base metals such as tin, lead and iron into precious metals such as gold and silver,  
and



- ✓ He described in a professional manner the operations of calcinations, oxidation, evaporation, filtration, sublimation, melting, distillation and crystallization, as well as the solubility of gold in a mixture of acids (aqua regia).
- ✓ **He wrote** a number of treatises on chemistry and mineralogy of which at least 3, selections translated by Julius Ruska & Paul Kraus (1935)..
- ✓ Many of his works were also translated into Latin and referred to Greek authors such as his manuscript on minerals (Mineralibus) which was wrongly ascribed to Garlandius.



3. **Al-Haseb (died 206 A.H - 821 A.C.), and Ibn Masaweeh (died 215 A.H. - 830 A.C.)** whom they wrote a book on the uses of rocks.
4. **Al-Khuwarizme (died 235 A.H. - 852 A.C.)** who wrote 3 treatises on the shape of the earth and its geography. A manuscript copy of his book “The Image Of The Earth” is preserved **at Strassbourg, France** and **was edited and translated into Italian by Nallino and into German by Hans Mzik.**
5. **Al-Kindy (died 252 A.H. - 866 A.C.)** who wrote 7 treatises on geological issues including one on gems and semi-precious stones, a second wrote on tides and a third wrote on thunder storms, lightning, snow, hail and rain.





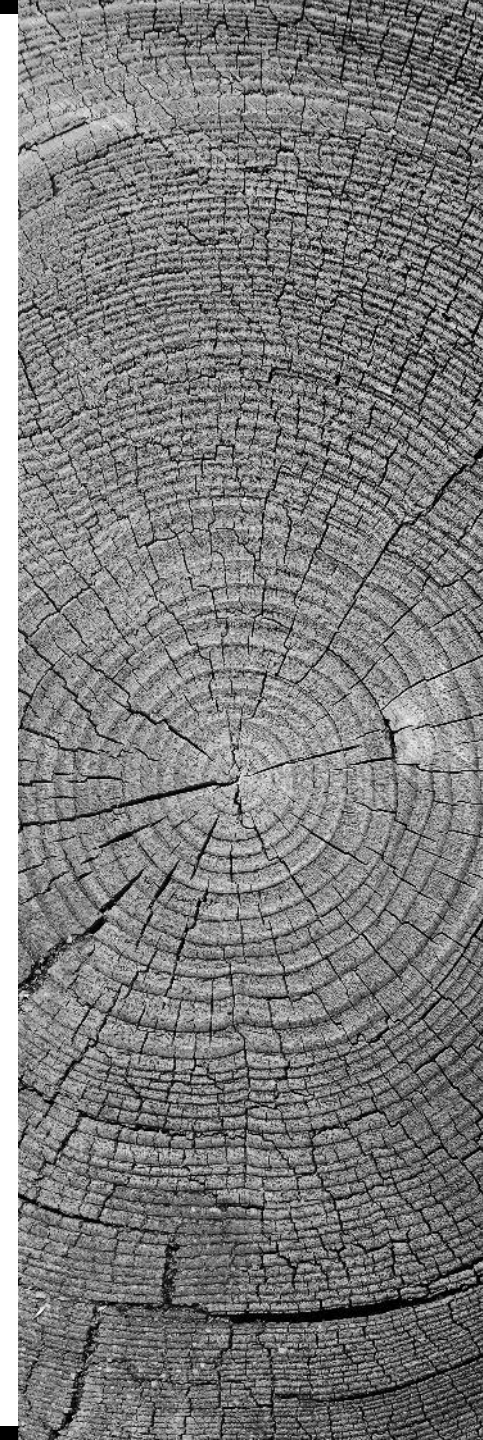
6. Al-Razy (died 320 A.H. - 932 A.C.) who wrote 7 treatises on minerals, rocks and the origin of the earth. His book "The Secret of Secrets" was fully translated by Ruska and reviewed by Mieli (1938).

7. Al-Hamadany (died 334 A.H. - 945 A.C. ) who wrote a treatise on gold and silver that was revised and published in Uppsala, by Sweden called C. Toll (1968),



8. **Al-Masaudy (died 346 A.H. - 957 A.C.)** who wrote 4 treatises on subjects related to the earth, including one on gold and gemstones, that was translated into English by Springer (1841) and into French by Barbier de Meynard & Pavet de Corteille ( 1861-1877).

9. **Ikhwan Al-Safa (4th century A.H. - 11th A.C.)** who wrote three thesis on Earth Sciences out of a collection of 52 (the 4th, the 5th and the 19th). These thesis were translated completely into Persian, Hindustani and Turkish and partly into German and French by Dieteric (1861- 1886) and Forbes & Rieu (1861), respectively.



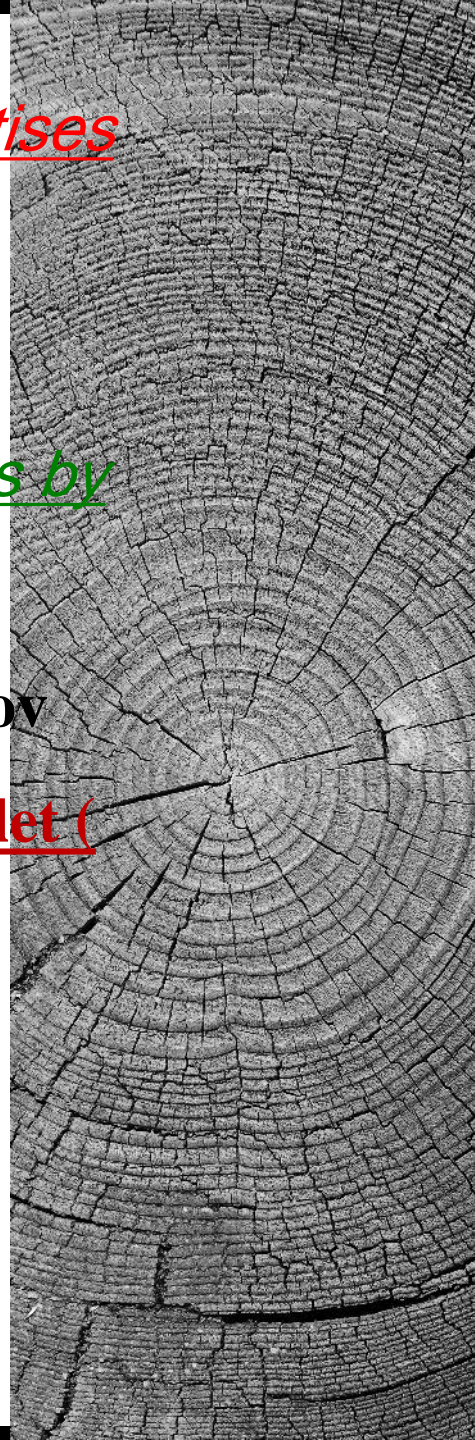
10. Al-Yanbuay, Abou Dilfe (4th Century A.H. - 11th A.C.) who wrote a treatise on minerals that was revised by Minorsky and published in Cairo (1955).

11. Ibn Al-Jazzar (died 400 A.H. - 1009 AC.) who wrote a book on rocks.

12. Ibn Sina (died 428 A.H. - 1037 A.C.) who wrote 3 chapters on geological in his treatise entitled “The Book of Remedy (Medicine)”, 1) on minerals and meteorological phenomena, 2) a second on natural forces and 3) a third one on properties of the equator. The chapter on minerals was translated into Latin and ascribed wrongly to Aristotle. It was translated into German by Ruska (1912) and into French by Holmyard & Mandeville



- ✓ **Al-Bayrouny (died 443 A.H. - 1051 A.C.)** who wrote at least 13 treatises on subjects related to the earth, including: gems and gemstones, minerals, specific gravity of minerals and precious stones, the determination of the direction of Qiblah, the determination of locations by means of the intersection between latitudes and longitudes.
- ✓ His book on gems and gemstones translated into German by Kramkov (1907), Sachau (1898, 1910), and was was reviewed by Clement -Mullet (1858), revised and published by Stapleton (1905),
- ✓ And Wiedemann published serially since the beginning of the 20th century A.C



13. Al-Jirjany (died towards the end of the 5th century A.H. - beginning of the 11th century A.C.) who wrote a book on rocks that was reviewed by Ritter (1935).

14. Al-Bakry (died 487 A.H. - 1095 A.C.) who wrote an encyclopaedic work on the geography of the earth and a glossary to explain the necessary terminology.

15. Al-Tughr'aiy (died 515 A.H. - 1121 A.C.) who wrote two treatises on the transformation of minerals, that were translated into Latin.

16. Al-Zamakhshary (died 538 A.H. - 1151 A.C.) who wrote a treatise on "Mountains, Places and Water".

17. Al-Idreesy (died 560 A.H. - 1164 A.C.) who wrote 4 treatises on the earth, its shape, morphologic features, maps, routes and kingdoms.



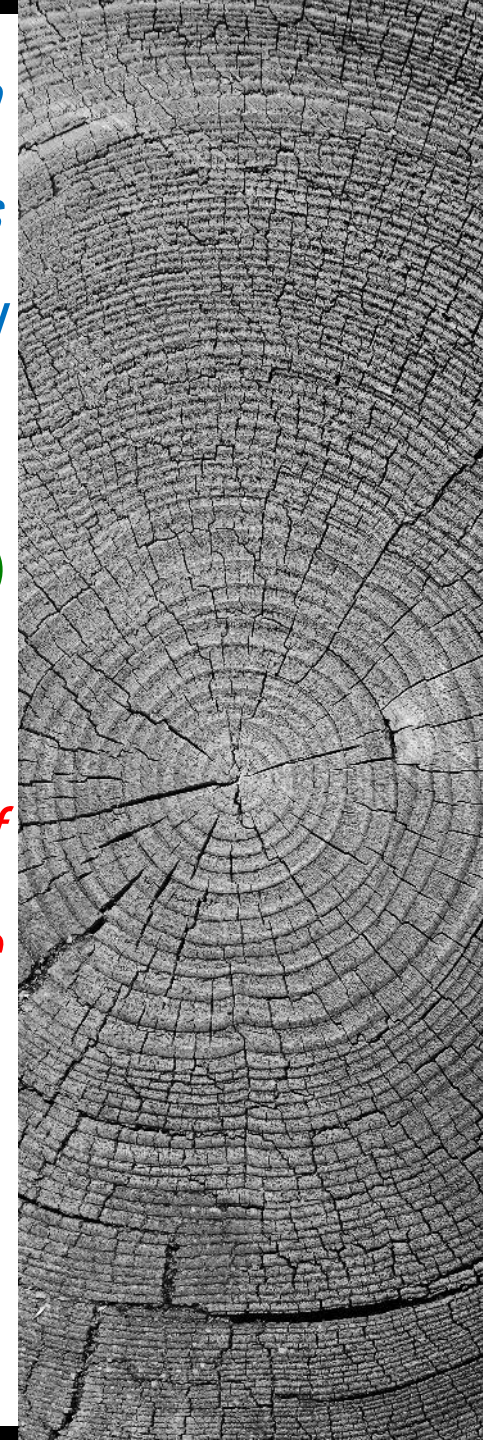
**18. Al-Demashquy, Al-Misri, Ibn Al-Awwam** (the last half of the 6th century A.H. - 12th A.C.) who wrote elaborately on minerals, rocks and soils; most of their original writings could not be located but has been reviewed by a large number of subsequent writers.

**19. Al-Sweedy** (died 601 A.H. - 1291 A.C.) who wrote a book on gems and gemstones.



**20. Al-Teefach (died 651 A.H. - 1253 AC.)** who wrote two treatises on geology, one dealing with minerals and rocks ( mainly with gems and gemstones) and the other on the observations of natural phenomena.

- ✓ His mineral book was shortened and published by Raphius (1784) in Utrecht, Holland.
- ✓ The book was previously translated into Latin and a number of other European languages since the early days of the Renaissance.



✓ A copy of this Arabic text with an Italian translation was published in Florence, Italy in the year 1818 A.C. under the supports of Count Antonio Reineri, and was reprinted in Boulogne, Italy in 1906 A.C. Copies of the manuscript are kept in Leiden, Paris, Guteh, Cairo and Kuwait.

**21. Al-Toosy (died 672 A.H. - 1274 A.C.) who wrote a book on rocks.**

**22. Al-Qabajaky (died towards the end of the 7th century A.H. - 13th century A.C.) who wrote a book on rocks, recognizing the magnetite mineral and advocating the use of the magnetic needle.**





**23. Al-Qazweeny (died 682 A.H. - 1283 A.C.) who wrote at least 6 treatises in areas related to Earth Sciences including: gold and gemstones. The latter is an encyclopaedic work that discusses many things on Earth and in the universe.**

✓ **It was published by Wustenfeld (1848) in Germany, and was partly translated into German by Hermann Ethe (1878), and by Ruzka (1896) and by Wiedmann (1911), and into French by Mercier, and by both Chezy & De Sacy.**

**23. Al-Kamily (the 7th century A.H. - the 13th A.C.) who wrote monumental work on minting the Egyptian coins, where various metallurgical aspects are discussed. The book was reviewed by Holmyard (1931).**

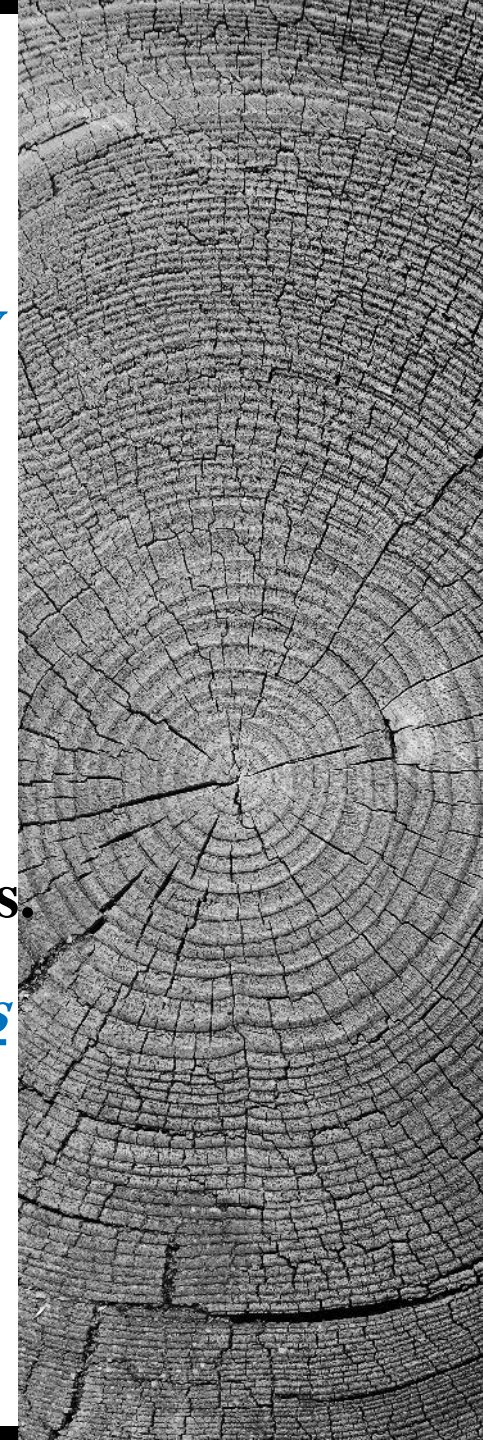


**25. Al-Kashany (died 700 A.H. - 1301 A.C.)** who wrote a manuscript on precious stones, essences, pottery ceramics and china, where a large number of minerals and rocks are discussed. The book was reviewed by Mieli (1938).

**26. Al-Demashqy, Al-Soufy (died 726 A.H. - 1326 A.C.)** who wrote a selection on peculiarities of both land and sea, where 700 minerals and rocks are described.

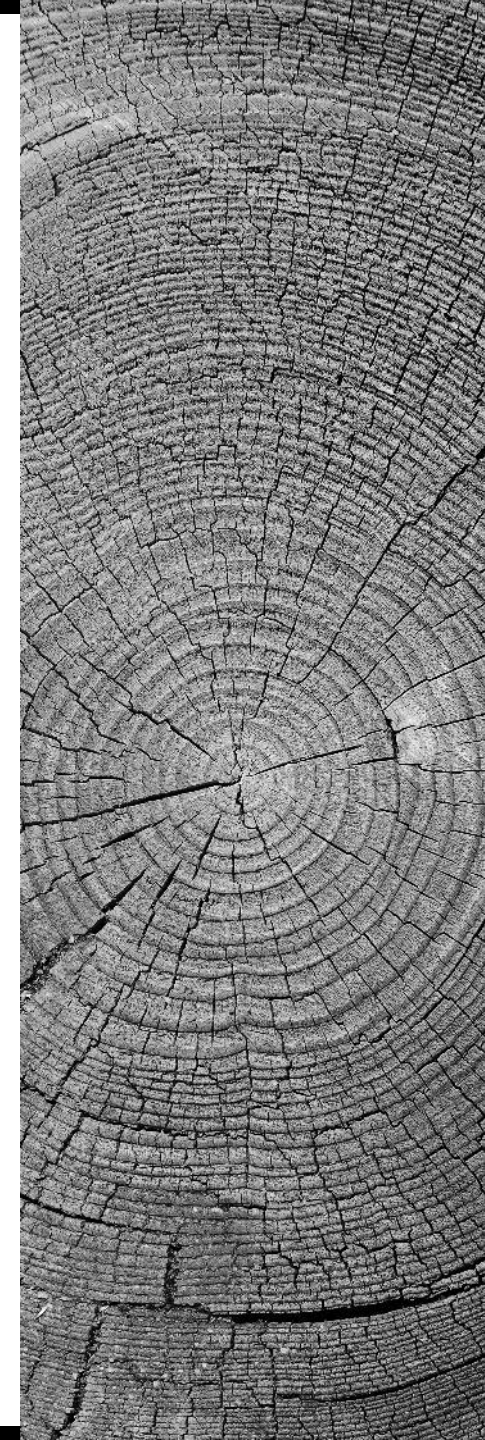
**27. Al-Jaldaki (died 743 A.H. - 1342 A.C.)** who wrote a manuscript on rocks.

**28. Ibn Al-Akfany (died 749 A.H. - 1348 A.C.)** who wrote a treatise on gems and gemstones.



**29) Al-Telemsany Al-Miqury (died 1041 A.H. - 1631 A.C.),** who wrote a book on minerals in Andalusia.

✓ **Other scholars mentioned under Astronomy, as most of the Muslim astronomers had interest in the Earth**



**THANK YOU**

