

**ECONOMIC  
GEOLOGY: ABSTRACT  
OF LECTURES**

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Economic Geology: Abstract of Lectures by S. G. Williams

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**S. G. WILLIAMS**

**ECONOMIC  
GEOLOGY: ABSTRACT  
OF LECTURES**



*From the Author,*  
*Febr. 13, 1894*

# ECONOMIC GEOLOGY

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ABSTRACT OF LECTURES

BY

*received  
Nov. 11, 1885*  
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CORNELL UNIVERSITY

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ITHACA, N. Y.:  
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1885.

## Economic Geology.

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1. Defined—as that department of Geology which treats of such products of the Earth's crust, and such structural characters, as minister to human wants, or tend to civilization and culture.

2. It aims :

*a.* At a knowledge of those structural characters which must be taken into account to make human efforts more effective.

*b.* At an accurate and extended knowledge of those special geological deposits which have practical utility.

*c.* At ascertaining the practical and often essential relations which these deposits bear to each other; e. g., ores to fuels and fluxes.

*d.* At knowing the relations they bear to the currents of human industry and to present or prospective human needs; e. g., ease of access and transportation; means of smelting; means of profitable utilization; e. g., Petroleum vs. Seneca oil; Pyrites past and present; Nickel since used for plating.

3. Requisites for profitable study :

*a.* Knowledge of geological structure of the earth and its rocky masses, and of their arrangement.

*b.* Elementary knowledge of Mineralogy and Lithology.

*c.* Knowledge of geography.

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### STRUCTURE.

1. Earth's structural characters are an evolution of the varied, the complex, the specialized, out of the simple, uniform, general,—as to outlines of land, relief-forms, climate and productions :

*a.* Illustration of first two points leading to idea of plains and mountains, resting on a foundation of rocks.

*b.* That the loose materials resting on these arise from the dis-aggregation of rocks; agencies of frost, CO<sup>2</sup> etc.

*c.* That these loose materials resting in place, or deposited on land, constitute soils.

*d.* That those carried and deposited layer on layer in water, form rocks whether hard or soft. How consolidated.

*e.* That hence most rocks are not simple things, but more or less indefinite aggregates.

*f.* That also most rocks originated as sediments, mechanical, organic or chemical, and carry proof of this in their character and contents. (See beyond.)

2. Structure and arrangement of rock masses (Dana 79: Lec. 20 and 170):

The first thing that is apt to strike an observer is that the vast majority of rocks are arranged in successive sheets piled one on another. Note:

(1) Structure of sheets as (thin or thick—economic import; massive or laminated—economic import.

(2) Their texture as fine or coarse or compact—import.

(3) Their varying composition of sand, clay, lime.

(4) Their contents, water marks, fossils, etc.

3. Illustration of above by showing how rocks are now forming:

*a.* By wear and solution.

*b.* By deposition (mechanical or chemical) and assimilation.

4. Structural characters of economic importance.

*a.* Jointed, relation to—1. Ease of quarrying. 2. Size of forms.

*b.* Concretionary, an ill to be avoided.

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POSITION, ETC.

1. Original position of stratified rocks, horizontal.

2. Changes from this original position, uplifts, etc., and how caused.

3. What happens to rocks when uplifted. Denudation and effects on accessibility (Leconte, 260.)

4. Terms to be mastered arising from uplifts:

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11. 12. 2019

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13. 2. 2020

14. 3. 2020

15. 4. 2020

16. 5. 2020

17. 6. 2020

18. 7. 2020

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20. 9. 2020

21. 10. 2020

22. 11. 2020

23. 12. 2020

24. 1. 2021

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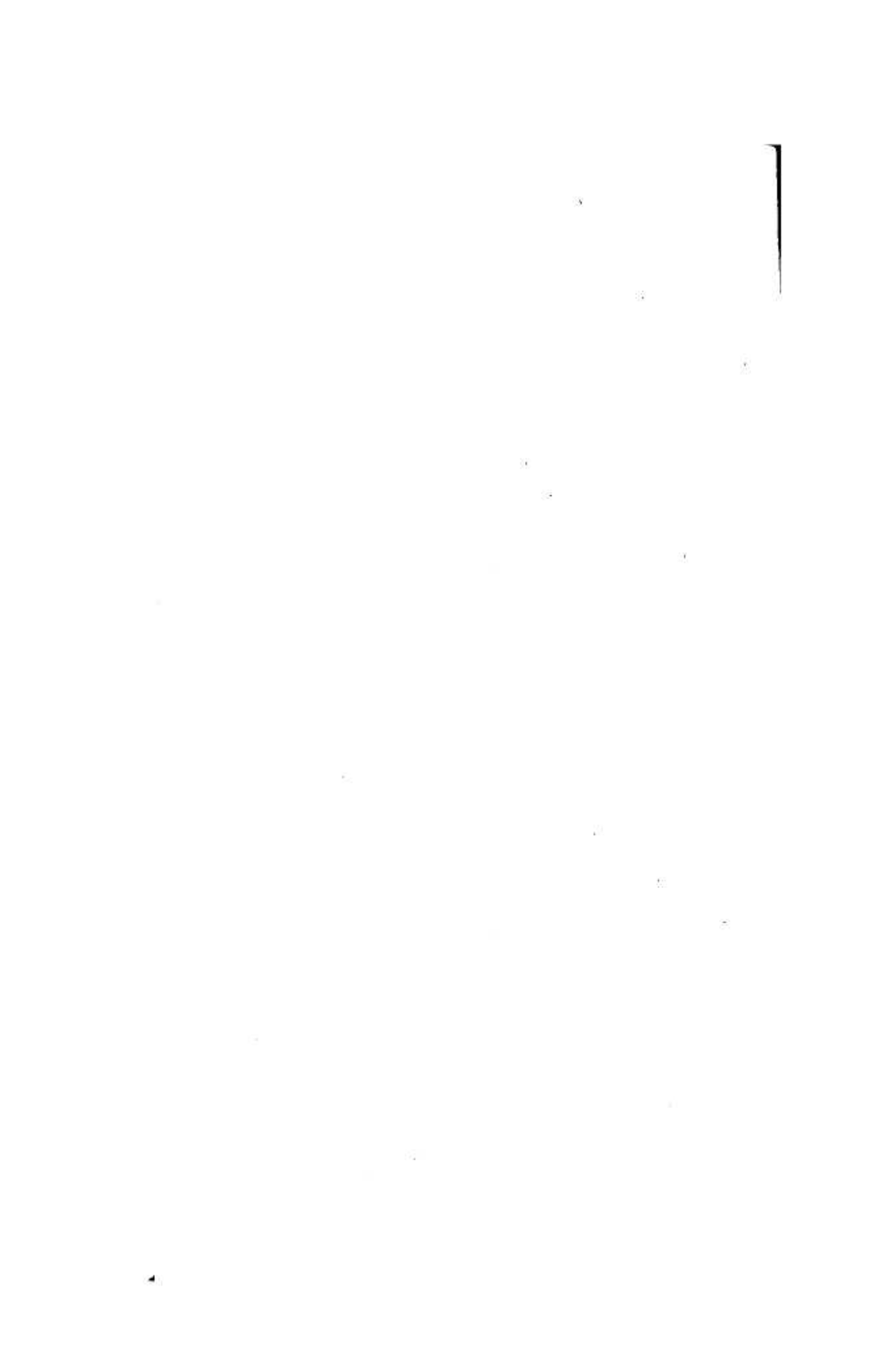
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- a.* Dip, effects on accessibility and width of outcrop.
- b.* Strike.
- c.* Anticlinal- synclinal- monoclinal folds.
- d.* Faults, economic aspects, law of.
- e.* Conformability (Dana, 91; Leconte, 171-179.
- 5.** Relative age of stratified rocks, determined :
  - a.* By superposition.
  - b.* By rock characters.
  - c.* By fossils (Dana, 101; Leconte, 195-200; Geikie, 614-622.)
- 6.** Geological column (Dana, 139-143; Leconte, 201.)

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## Crystalline Rocks.

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- 1.** Condition and how consolidated (welded, interlocked, felted.)
- 2.** Mode of occurrence :
  - a.* In layers more or less distinct, but usually folded or tilted up at high angles—Metamorphic.
  - b.* Massive or unstratified—all marks of deposit obliterated; often squeezed into fissures in other rocks; e. g., Granite, etc.
  - c.* Dike-form; fissures filled with melted rock.
  - d.* Veins; fissures filled by watery deposit, etc.
- 3.** Texture of these, crystalline, or earthy from decomp.
  - a.* Coarse crystalline; e. g., mica mines.
  - b.* Fine crystals, important for durability and strength.
  - c.* Glassy, sometimes in dikes, cause of.
  - d.* Aphanitic, imperceptibly small crystals.
  - e.* Porphyritic, crystals imbedded in aphanitic base.
- 4.** Structural characters of economic import :
  - a.* Schistose (foliated) and massive : economic relations.
  - b.* Jointed; economic relations.
  - c.* Slaty cleavage, in what rocks; economic relations.
  - d.* Columnar, relation to joints : economic relations.
  - e.* Banded, of veins.
- 5.** Relative age of unstratified rocks, dikes, and veins shown by:
  - a.* Superposition or overflow.

- b.* Intrusion or cutting, with 1. Alteration of cut rock. 2. Faulting of cut rock.
- c.* Included fragments of older rocks.
- d.* Mineral characters and relative decomposition.
- e.* Organisms, in volc. tuffs or beds overflowed by volcanics.
- f.* Metamorphics usually older than other stratified rocks, underlying them unconformably.
- g.* Veins younger than country rock or than veins they cut.

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## Vein Structure and Ore Deposits.

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1. References: Dana, 770; Leconte, 225; Lyell, 605; Raymond Rep., 1870, p. 447-468; C. King, Vol. 3; Von Cotta, Erzlagerstätten, p. 102-190.

2. Valuable mineral deposits and ores occur, as:

*a.* Stratified, *i. e.*, bedded (1. Placers or other superficial deposits. 2. Forming entire strata, coal, iron. 3. Disseminated in, Mansfeld copper schists; L. Superior S. S.'s. 4. Segregated from, clay iron.)

*b.* Stöcke: irregular veins or beds, or fillings of cavernous spaces found in rocks.

(1) Gash veins and caverns only in Limestone; e. g., lead deposits of Mo., Wis., and Ill., filled from surrounding rock: called rakes and sometimes pipes.

(2) Quasi Veins, chambers or pockets (Newberry): filling irregular chambers in lime, connected with deep-seated fissures through disturbances, and filled from below; e. g., Eureka mines; Emma mine.

(3) Contact deposits: along planes of contact between rocks of different kind; e. g., Leadville deposits are chambers at junction of porphyry and underlying lime; also flats of Flintshire are in chambers of S. S. lying over lime and connected with fissures. All such deposits have pretty definite outlines, however irregular they may be.