1

## X .- The Geological History of Serpentines, including Notes on pre-Cambrian Rocks.

## By THOMAS STERRY HUNT, M.A., LL.D. (Cantab.), F.R.S.

## (Presented May 23, 1883.)

- I.—Historical Introduction.—Discordant opinions as to the geognosy of serpentino; viows of various European geologists; of American geologists; geological survey of Canada. Origin of crystallino rocks; plutonism; metasomatic hypothesis; neptunism; aqueous origin of magnesian silicates. A fundamontal question in geogeny.
- II.—Serpentines in North America.—Laurentian and Huronian sorpentines; thoso with the younger gneisses and mica-schists. Serpentines of Chester Co., Pennsylvania; of Staten Island, Hobokon, Manhattan and New Rochelle; Taconian serpentines in Pennsylvania. Silnrian serpentino of Syracnse, New York; its history. Sepiolite and other hydrons magnesian silicates.
- III.—Serpentines in Europe.—The hypothesis of their ignoons origin. Nomenclature of serpentines and related rocks. Viows of some Italian geologists. Serpentines at the geological congress of Bologna.
- IV.—Rocks of the Alps and the Apennines.—Early views. Studies of Gastaldi, von Hauer and others. Ancient gneiss; pietre verdi or greenstones; newer gneiss; youngest crystalline schists. Four pre-Cambrian groups in the Alps defined. Rocks of the Apennines and the adjacent islands.
- V.—Italian Serpentines.—Their classification; plutonic and hydroplutonic theories of their origin. Sorpentines of Tuscany, Liguria and the Alps. Antiquity of the so-called tertiary serpentines.
- VI.—The Genesis of Serpentines.—Theories of plutonic and neptunian metasomatism; diagenesis. The derivation of serpentino from olivine, and the hydrophytonic hypothesis considered in relation to vulcanism. Theory of original deposition. History of olivine recks.
- VII.—Stratigraphical Relations of Screentines.—Their supposed intrusivo character considered. Stapff on the serpentines of the St. Gothard.

VIII.-Conclusions; followed by an analysis of the Contents of Sections and Note.

## I.-HISTORICAL INTRODUCTION.

§ 1. Few questions in geology are involved in greater obscurity or more contradiction, than the history of serpentine-rocks. As a preliminary to a discussion of certain observations by myself and others thereon, it seems, therefore, desirable to recall some passages in this history which may serve to show the differences of opinion now existing and, it is hoped, prepare the way for their reconciliation. These differences may be considered under two heads : namely, the geognosy of serpentine, or its relation to the other rocks of the earth's crust, and the geogeny, or the origin and mode of formation of serpentine.

Setting aside for the moment the question of the occurrence of serpentine as an accidental mineral disseminated in calcareous rocks, and considering only its occurrence in rock-masses, either pure or mingled with other silicates, the first question which presents itself is whether such massive serpentines are contemporaneous with the enclosing rocks, or whether they have been subsequently intruded among these :—in other words, whether serpentines are indigenous or exotic rocks.