The map is from the geological chart of C. H. Hitchcock, with changes from later publications. The blank area on the eastern border comprises Archæan, Cambrian, and Lower Silurian rocks, not yet having their limits defined.

The progress of the life of the globe is one of the two great subjects that come before the student, in the following part of this Manual, treating of HISTORICAL GEOLOGY. By way of introduction to it, a short chapter on its system of structures is here introduced.

BRIEF REVIEW OF THE SYSTEM OF LIFE.

GENERAL CONSIDERATIONS.

1. *Life.* — Some of the distinctions between a living organism and inorganic or mineral substances have been mentioned. Recapitulated, with additions, they are: —

(1) The *living being* has, as the *fundamental element* of its structures, visible cells, containing fluids or plastic material.

(2) It *enlarges* by means of imbibed nutriment, through a process of development; and not by mere accretion or crystallization.

(3) It has the faculty of converting nutriment into the various chemical compounds essential to its constitution, and of continuing this process of assimilation as long as the functions of life continue; and it loses this chemical power when life ceases.

(4) It passes through successive stages in structure, and in chemistry, from the simple germ to a more or less complex adult stage, and finally evolves other germs for the continuance of the species; instead of being equally perfect and equally simple in all its stages, and essentially germless.

There is, therefore, in the living organism, something besides mere physical forces, or the chemistry of dead nature — something that ceases to be when life ceases. There is a *vital condition*, in which molecules have powers that lead to resulting seed-bearing structures, widely different from those of inorganic nature, and standing on altogether a higher level. There is a power of development, an architectonic power, that not only exalts chemical results, but evolves a diversity of parts and structures, and a heritage of ancestral qualities, of which the laws of material nature give no explanation.

2. *Vegetable and Animal life.* — The vegetable and animal kingdoms are the mutually dependent sides or parts of one system of life. The following are some of their distinctive characteristics: —

(1) Plants take nutriment into the tissues by absorption; animals have a mouth, and receive food into a sac or stomach. Exceptions to this feature occur in animal life only in the lowest microscopic forms and certain parasitic kinds; and the most of these extemporize a mouth and stomach whenever any particle of food comes in contact with the outer surface, so that even here the food is digested in an interior cavity. Certain insectivorous plants "digest" animal material, but the process is not necessary to growth, with small exceptions.

(2) Plants find nutriment in carbonic acid, appropriate the carbon, and set free oxygen, a gas essential to animal life; animals use oxygen in respiration, and set free carbonic acid, a gas essential to vegetable life. (The amount of carbonic acid given out by plants in respiration is too small to need consideration here.)

(3) Plants take inorganic material as food, and turn it into organic; animals take this organic material thus prepared (plants), or other organic materials made from it (animals), finding no nutriment in inorganic matter.