Again, dikes of trap and other igneous rocks have undergone metachemic alteration through interior heated vapors which ascended with the rock, making the rock hydrous and producing other changes, and by the same means its vesicles have often been filled with secondary minerals made out of the materials of the rock.

Mineral springs are often referred to as a source of outside ingredients. But, for regional work, such springs should have a wide distribution; otherwise the effects would be local. One mineral spring, rich in salts of soda and magnesia, has already been mentioned as the great one of the world — the ocean. Nearly all the sedimentary rocks were made in it, or have at some time been submerged in it. Moreover, there is evidence that salt water has an extensive subterranean distribution, in the fact that a large part of the borings for gas and oil, which have been made in recent years, have encountered salt water below depths of 1000 or 2000 feet — depths too great to be made fresh by subterranean drainage. Further, formations of several geological periods contain great *beds of rock salt* that were beyond doubt of oceanic origin.

Associated with the salt, or in the same series of rocks, there are sometimes deposits of magnesian salts of like oceanic origin; and, more sparingly, of potash salts; and also of boron salts, for the magnesium borate, boracite, occurs in salt mines, and other boron salts exist in hot springs, sometimes in volcanic emanations, — facts that point to a marine source. Moreover, traces of borates have been detected in the ocean's waters. The beds of salt and the briny layers are interstratified, sometimes in many alternations, with shales, sandstones, and limestones; and it is natural, therefore, that the soda and magnesia should be forced to take part in any chemical changes the associated formations might undergo. Metamorphic work may have derived much soda from this source for making soda-lime feldspars, as *oligoclase* and *labradorite;* supplies of magnesia for forming hornblende and black mica; smaller supplies of potash for orthoclase-making; and still smaller of boron, yet enough to account for the wide distribution of tourmaline, whose constituents, apart from the boron, differ little from those of garnet, — a mineral that is common in mica and chlorite schists, crystalline limestone, quartzyte, and other rocks.

The wide distribution of alkaline waters over the Great Basin (page 119) suggests another available source of materials, and especially of soda and magnesia. But such regions are a consequence of the absence of drainage, and could exist only in great lands like continents; they, therefore, belong only to the latter end of geological time.

The following are examples of metachemic work in crystalline rocks. Massive talc, called rensselaerite, at Fowler, Dekalb, and other places in northern New York, made from pyroxene, whose cleavage it has; a pinite, called gieseckite, at Diana, N. Y., and in Greenland, made from crystals of nephelite, the form remaining; pinite also from scapolite, at Franklin, N. J. (algerite) and Arendal, Norway; chlorite in many localities, from garnet (crystals being sometimes chlorite outside only, and sometimes throughout), pyroxene, hornblende, etc.; mica and epidote from scapolite, at Arendal, Norway; and feldspar from scapolite, at Bamle, Norway; epidote from biotite-mica; diaspore, margarite, and other species, from corundum. In a large granitic vein at Branchville,

http://www.geology.19thcenturyscience.org/books/1896-Dana-ManGeol/README.htm