

by having all the imbedded fossil shells identical with species now living, whereas even the Newer Pliocene, or newest of the tertiary deposits above alluded to, contain always some small proportion of shells of extinct species.

These modern formations, thus defined, comprehend not only those strata which can be shown to have originated since the earth was inhabited by man, but also deposits of far greater extent and thickness, in which no signs of man or his works can be detected. In some of these, of a date long anterior to the times of history and tradition, the bones of extinct quadrupeds have been met with of species which probably never co-existed with the human race, as, for example, the mammoth, mastodon, megatherium, and others, and yet the shells are the same as those now living.

That portion of the post-pliocene group which belongs to the human epoch, and which is sometimes called *Recent*, forms a very unimportant feature in the geological structure of the earth's crust. I have shown, however, in "The Principles," where the recent changes of the earth illustrative of geology are described at length, that the deposits accumulated at the bottom of lakes and seas within the last 4000 or 5000 years can neither be insignificant in volume or extent. They lie hidden, for the most part, from our sight; but we have opportunities of examining them at certain points where newly gained land in the deltas of rivers has been cut through during floods, or where coral reefs are growing rapidly, or where the bed of a sea or lake has been heaved up by subterranean movements and laid dry. Their age may be recognized either by our finding in them the bones of man in a fossil state, that is to say, imbedded in them by natural causes, or by their containing articles fabricated by the hands of man.

Thus at Puzzuoli, near Naples, marine strata are seen containing fragments of sculpture, pottery, and the remains of buildings, together with innumerable shells retaining in part their color, and of the same species as those now inhabiting the Bay of Baiæ. The uppermost of these beds is about 20 feet above the level of the sea. Their emergence can be proved to have taken place since the beginning of the sixteenth century.\* Now here, as in almost every instance where any alterations of level have been going on in historical periods, it is found that rocks containing shells, all, or nearly all, of which still inhabit the neighboring sea, may be traced for some distance into the interior, and often to a considerable elevation above the level of the sea. Thus, in the country round Naples, the post-pliocene strata, consisting of clay and horizontal beds of volcanic tuff, rise at certain points to the height of 1500 feet. Although the marine shells are exclusively of living species, they are not accompanied like those on the coast at Puzzuoli by any traces of man or his works. Had any such been discovered, it would have afforded to the antiquary and geologist matter of great surprise, since it would have

\* See Principles, Index, "Serapis."