"The facts observed at this locality appear to show that the petroleum, or substance which has given rise to it, was deposited in the beds in which it is now found at the formation of the rock. We may suppose in these oil-bearing beds an accumulation of organic matters whose decomposition in the midst of a marine calcareous deposit has resulted in their complete transformation into petroleum, which has a lodgment in the cavities of the shells and corals immediately near. Its absence from the unfilled cells of corals in the adjacent and interstratified beds forbids the idea of the introduction of the oil into these strata, either by distillation or infiltration. The same observations apply to the petroleum of the Trenton limestone; and if it shall be hereafter shown that the source of petroleum, as distinguished from asphalt, in other regions is to be found in marine fossiliferous limestones, a step will have been made towards a knowledge of the chemical conditions necessary to its formation. . . . . In opposition to the generally-received view, which supposes the oil to originate from a slow destructive distillation of the black pyroschists belonging to the middle and upper divisions of the Devonian, I have maintained that it exists ready formed in the limestone below."

Professor J. P. Lesley also urges the view that petroleum is derived—at least, in some conspicuous instances—from vegetable remains that are still found associated with it in the rocks, but he does not base his theory as to whether it results from primary or secondary decomposition, and that petroleum and gas have been gathered in the sandstones that now contain them from some lower source. Professor J. C. White also supports the view that the petroleum of the third oil-sand of Venanga County, Pennsylvania, in the United States, is indigenous to this rock, basing his belief on the abundance of vegetable remains that he finds in the outcrop of this sandstone in Erie County, Pennsylvania.

Scientists who hold that petroleum is of organic origin differ as to whether it is derived from a primary decomposition of organic matter stored in, or associated with sandstone which now contain it, or whether it is derived from a secondary decomposition of organic matter stored in the rocks—that is, the original vegetable and animal matter having suffered a partial transformation, is now held as hydrocarbon compounds, from which, by a process of distillation, oil and gas are derived. The bituminous shales are counted the chief sources of these products. After distillation it is held that the gas and oil are mainly carried up by hydrostatic pressure to some overlying porous stratum which serves as a reservoir.

Professor J. S. Newberry and Mr. S. F. Peckham hold the view that petroleum is derived from a secondary decomposition of organic matter stored in the rocks. Newberry, in referring to its origin in the extensive deposits of Devonian and Sub-Carboniferous shales, and particularly black shales that underlie the productive districts in which oil is found in America, considers petroleum and gas the products of a slow, spontaneous distillation of the organic matter of the shales, and regards the process of their formation a continuous one. In speaking of the rock-oil of Ohio, he says,—

"The precise process by which petroleum is evolved from carbonaceous matter contained in the rocks which furnish it is not yet fully known, because we cannot in ordinary circumstances inspect it. We may fairly infer, however, that it is a distillation, though generally performed at a low temperature." Again, he says, "The origin of the two hydrocarbons—petroleum and gas—is the same, and they are evolved simultaneously by spontaneous distillation of carbonaceous rocks." Mr. S. F. Peckham, when referring to the oils of Pennsylvania and adjacent territory, states, "These oils are undoubtedly distillates, and of vegetable origin. The proof of this statement seems overwhelming. Pennsylvania petroleum was examined in 1865 by Warren and Stover in this country, and in 1863 by Pelouze and Cahours in France, who found the lighter portions to consist of a certain series of hydrocarbons identical with those obtained in the distinctive distillation of coals, bituminous shales, and woods, when the operation was conducted at a low temperature." And, again, he states, "Too little is known about petroleum at this time to enable any one to explain all the phenomena attending the occurrence of petroleum on any hypothesis, but it seems to me that the different varieties of petroleum . . . . . are products of fractional distillation, and one of the strongest proofs of this hypothesis is found in the large contents of paraffin in the Bradford oil under the enormous pressure to which it is subjected. If this hypothesis . . . . . really represents the operations of Nature, then we must seek the evidence of heat-action at a depth far below the unaltered rocks in which the petroleum is now stored."

In the eighth annual report of the United States Geological Survey, Edward Orton, in referring to the different theories, states, "That the different statements, inadequate and incomplete as they appear, are probably the most careful and extended that have been made upon the subject. They bring before us the main views as to the origin of petroleum, viz.:—

"(1.) Petroleum is produced by the primary decomposition of organic matter, and mainly in the rocks that contained the organic matter. Of this view Hunt is one of the chief advocates.

"(2.) Petroleum results from the distillation of organic hydrocarbons contained in the rocks, and has generally been transferred to strata higher than those in which it was formed. Newberry and Peckham supports this general theory. Newberry holds that a slow and constant distillation is in progress at low temperature. Peckham refers the distillation of the petroleum of the great American fields to the heat connected with the elevation and metamorphism of the Appalachian Mountain system.

"These views as to the date of the origin of petroleum and gas are seen to cover almost all the possibilities in regard to the subject. Hunt believes it to have been produced at a time when the rocks that contain it were formed once for all. Newberry believes it to have been in the process of formation, slowly and constantly, since the strata were deposited. Peckham refers it to a definite and distinct time in the past, but long subsequent to the formation of the petroliferous strata. He supposes it to be stored in its subterranean reservoirs from that time to the present. In these several statements as to origin two questions are seen to be especially prominent, namely: (1) What particular kinds or classes of rocks are the sources of petroleum; (2) what is the nature of the chemical processes involved in its production.