

strata with shells or other fossils filled up with liquid petroleum, but in these cases we also find the seams, joints and other open or porous parts of these strata impregnated with the same fluid, showing plainly that it is a secondary product of infiltration and replacement. Many other substances have thus filtered through the strata and petrified or mineralized the fossils, such as calcite, silica, pyrites and a great many other, including such metals as copper and mercury. In all such cases there can be no implication of a community of origin between the infiltrated products and the organisms. Yet many geologists often quote some of these rare occurrences of petroleum in hard parts of organisms and use them as evidence bearing in favor of the derivation of it from these organisms, whether fish, mollusk or other organisms. For instance, in a recent memoir on the natural hydrocarbons by Frank Wigglesworth Clarke (<sup>48</sup>), I find the following:—"Dieulafoy observed that the copper shales of Mansfield are strongly impregnated with bitumen and also rich in fossil fish. The petroleum of Galicia is always associated with menilitic schists in which fish remains are peculiarly abundant . . . . G. A. Bertels, on the other hand attributes the Caucasian petroleum to the decomposition of mollusks. In the Kuban district, the oil, accompanied by salt water, exudes directly from beds of molluscan remains, which occur in enormous quantities." I wish to point out in answer, that in the great majority of cases even traces of fossils of any kind are impossible to find in the prolific oil- and gas-sands of the United States and of the other parts of the world at large, and therefore that one is arguing the rule from the exception when he relies on such rare cases as cited above for his proofs of the organic origin of the petroleum; also that in the copper shales of Mansfield, there is as much reason to attribute an organic origin to the copper as to the petroleum; also that in Galicia the petroleum is found in much greater quantities, than it is in the menilitic schists, in sands without any fossil fish, and that it is found also in very large quantities, as ozokerite, in parallels and branching veins cutting lower strata than the menilitic schists; and finally, that the salt water which exudes with the oil from the mollusks in the Kuban district must also have its

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