http://www.geology.19thcenturyscience.org/books/1859-Lyell-Elements/README.h

that, the older the stratum, the greater is the chance of its being non-fossiliferous, even if it has escaped all metamorphic action.

It has been also objected to the metamorphic theory, that the chemical composition of the secondary strata differs essentially from that of the crystalline schists, into which they are supposed to be convertible.* The "primary" schists, it is said, usually contain a considerable proportion of potash or of soda, which the secondary clays, shales, and slates do not, these last being the result of the decomposition of felspathic rocks, from which the alkaline matter has been abstracted during the process of decomposition. But this reasoning proceeds on insufficient and apparently mistaken data; for a large portion of what is usually called clay, marl, shale, and slate does actually contain a certain, and often a considerable, proportion of alkali; so that it is difficult, in many countries, to obtain clay or shale sufficiently free from alkaline ingredients to allow of their being burnt into bricks or used for pottery.

Thus the argillaceous shales and slates of the Old Red sandstone, in Forfarshire and other parts of Scotland, are so much charged with alkali, derived from triturated felspar, that, instead of hardening when exposed to fire, they sometimes melt into a glass. They contain no lime, but appear to consist of extremely minute grains of the various ingredients of granite, which are distinctly visible in the coarser-grained varieties, and in almost all the interposed sandstones. These laminated clays and shales might certainly, if crystallized, resemble in composition many of the primary strata.

There is also potash in fossil vegetable remains, and soda in the salts by which strata are sometimes so largely impregnated, as in Patagonia. But recent analysis may be said to have settled the point at issue, by demonstrating that the carboniferous strata in England,† the Upper and Lower Silurian in East Canada,‡ and the clay-slates (of Cambrian date?) in Norway,§ all contain as much alkali as is generally present in metamorphic rocks.

Another objection has been derived from the alternation of highly crystalline strata with others having a less crystalline texture. The heat, it is said, in its ascent from below, must have traversed the less altered schists before it reached a higher and more crystalline bed. In answer to this, it may be observed, that if a number of strata differing greatly in composition from each other be subjected to equal quantities of heat, there is every probability that some will be more fusible than others. Some, for example, will contain soda, potash, lime, or some other ingredient capable of acting as a flux; while others may be destitute of the same elements, and so refractory as to be very slightly affected by a degree of heat capable of reducing others to semi-fusion. Nor should it be

* Dr. Boase, Primary Geology, p. 819.
† H. Taylor, Edin. New. Phil. Journ. vol. i. 1851, p. 140.
‡ Hunt, Phil. Mag. 4 ser. vol. vii. p. 237.
§ Kyersly, Norsk, Mag. for Naturvidenp. vol viii. p. 172.