

appear as quartzo-phyllades, quartzites, and other more or less crystalline rocks which were at one time supposed to belong to the "Archæan" series, but in which recognizable Devonian fossils have been found (ante, p. 1028). At numerous places, also, they have been invaded by masses of granite, quartz-porphry, or other eruptive rocks, round which they present the characteristic phenomena of contact-metamorphism (pp. 1003-1005). These changes may have led to the subsequent development of the abundant mineral veins (Devon, Cornwall, Westphalia, etc.), whence large quantities of iron, tin, copper, and other metals have been obtained.

**Russia.**—In the northeast of Europe the Devonian and Old Red Sandstone types appear to be united, the limestones and marine organisms of the one being interstratified with the fish-bearing sandstones and shales of the others. In Russia, as was shown in the great work "Russia and the Ural Mountains," by Murchison, De Verneuil and Keyserling, rocks intermediate between the Upper Silurian and Carboniferous Limestone formations cover an extent of surface larger than the British Islands.<sup>150</sup> This wide development arises, not from the thickness, but from the undisturbed horizontal character of the strata. Like the Russian Silurian deposits, they remain to this day nearly as flat and unaltered as they were originally laid down. Judged by mere vertical depth, they present but a meagre representation of the massive Devonian graywacke and limestone of Germany, or of the Old Red Sandstone of Britain. Yet, vast as is the area over which they constitute the surface-rock, it probably forms only a small portion of their total extent; for they rise up from under the newer formations along the flank of the Ural chain. It would thus seem that they spread continuously across the whole breadth of Russia in Europe. Though almost everywhere undisturbed, they afford evidence of terrestrial oscillation immediately previous to their deposition, for they gradually overlap Upper and Lower Silurian rocks.

The chief interest of the Russian rocks of this age, as was

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<sup>150</sup> Besides the great work of these three pioneers the student will find much recent information regarding Russian geology in the *Memoires du Comite Geologique of Russia*. See for Devonian data T. Tschernyschew, vols. i. iii. (a detailed memoir on the lower, middle and upper divisions of the system in the Ural region).