groups, and pass into the base of the Devonian system.[114] The graptolites include many species found in the Stockdale shales of the Lake District, so that the Llandovery group is well represented in this part of the continent.[115] Among the Harz mountains certain graywackes and shales containing land-plants (lycopods, etc.), trilobites (Dalmanites, etc.), graptolites, etc., are regarded as of intermediate age between true Upper Silurian and Lower Devonian rocks.[116]

Among the Alps, the band of ancient sedimentary rocks, which, flanking the crystalline masses of the central chain, has been termed the "graywacke zone," has in recent years been ascertained to contain representatives of the Silurian, Devonian, Carboniferous, and Permian systems.[117] In the eastern Alps, a belt of clay-slate and graywacke, with limestone, dolomite, magnesite, ankerite, and siderite runs from Kitzbühel in the Tyrol as far as the south end of the Vienna basin. About twenty species of fossils (Orthoceras, Atrypa, Cardiola, etc.) found at Tienten, near Werfen, belong apparently to the substage *e*2 of Barrande's Stage E. In this band, the strata have been changed into crystalline schists (p. 1035). As the fossils are Upper Silurian, a large part of the adjacent unfossiliferous schistose rocks may represent older parts of the Silurian system; but no Lower Silurian fossils have yet been found in them in the northern Alps.

In the southern Alps (Carinthia), above the older Palæozoic masses which have not yet yielded fossils, the following subdivisions have been given by Stache in descending order:

Limestones (1000 to 1500 feet) with Silurian forms of Pentamerus, Spirifer, Rhynchonella and Atrypa, and Silurian and Devonian corals=Stages, F, G, H, of Barrande.

Dark clay-slates and sandstones with plant-remains, yel-

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[114] Richter, Zeitsch. Deutsch. Geol. Gesell. xxi. p. 359; xxvii. p. 261.

[115] Marr, Geol. Mag. 1889, p. 414. Tornquist, Geol. För. Stockholm Förhandl. ix. 1887.

[116] Lossen, Zeitsch. Deutsch. Geol. Ges. xx. p. 216; xxii. p. 284; xxix. p. 612.

[117] Von Hauer, "Geologie," p. 216. Stache, Jahrb. Geol. Reichsanst. xxiii. p. 175; xxiv. 136, 334; Verh. Geol. Reichs. 1879, p. 216. Stache divided the graywacke zone of the eastern Alps into five pre-triassic groups: 1, Quartz-phyllite group; 2, Kalkphyllite group; 3, Kalkthouphyllite group; 4, Group of the older graywackes (Silurian and Devonian); 5, Group of the Upper Coal and Permian rocks.