

which he used. Although in all essential features he adopted the same succession of Alpine Trias which Richthofen had established in his memoir on Vorarlberg and North Tyrol, the names and divisions in Gümbel's work differ considerably from those used by all previous authors. All the Alpine deposits are arranged under the three German divisions—Bunter, Muschelkalk, Keuper, and the names given to the sub-groups are in keeping with the fundamental idea of parallelism. Gümbel assigns to *Bunter strata* the Werfen shales together with the salt and gypsum intercalations at Berchtesgaden, Hallein, and in the Salzkammergut; to *Muschelkalk* the Guttenstein limestones and the Virgloria limestone, from which Gümbel enumerates thirteen species identical with extra-Alpine Muschelkalk species; to *Keuper*, Gümbel assigns all the other Triassic strata as follows:—

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| Upper Keuper or
Rhætic Group. | { | 8. Dachstein limestone.
7. Strata with <i>Avicula contorta</i> (<i>Gervillia</i>
strata or Kössen beds). |
| Middle Keuper or
Main Dolomite
Group. | { | 6. Calcareous flags.
5. Main dolomite.
4. Rauchwacke. |
| Lower Keuper or
"Lettenkohle
Group." | { | 3. <i>Cardita</i> strata of Pichler (<i>Raibl</i> strata
of Richthofen).
2. Wetterstein limestone and Hallstatt
limestone.
1. Partnach strata. |

These sub-divisions, erected by Gümbel in 1864 on the basis of his Bavarian studies, have undergone two important modifications in subsequent researches. The "Partnach Strata" of Gümbel were afterwards identified by Wöhrmann as typical *Raibl sandstones and shales*. And the Hallstatt limestone, regarded by Gümbel as a local facies of the Wetterstein limestone, has been proved to be distinctly younger than the Wetterstein limestone.

The views of Austrian geologists regarding the Triassic sub-divisions in their territories were subject to great variations. From the year 1856, Pichler devoted himself with enthusiasm to the study of the Alpine Trias. In his first publication, in 1856, on the north-eastern limestone Alps of Tyrol, he had described above the Bunter sandstone a *Lower* dark-grey