

Cassian, and Bleiberg strata, and a part of the carbonaceous deposits in the Vienna sandstone (Lunz strata). Hauer at that time regarded the Hallstatt limestone as younger than the Dachstein limestone.

The organised efforts of the Austrian Geological Survey rapidly extended the knowledge of Alpine geology. In 1853, the Survey Reports sub-divided the Triassic formation of North Tyrol into two groups: 1, *the Werfen strata and Guttenstein limestones* (equivalents of the Bunter sandstone and Lower Muschelkalk respectively); and 2, *the Hallstatt strata* (or Upper Muschelkalk). The salt deposits were said not to be intercalations in Alpine limestone, as Lill von Lilienbach had assumed, but, according to Stur and Suess, belonged to the Werfen strata. The Hallstatt strata were now said to repose on the Guttenstein strata and to be *succeeded by Dachstein limestone*, and on the evidence of Lipold the *Dachstein limestone* was united with the *Kössen* (Gervillia) strata and referred to Liassic age.

There still seemed no means of determining the stratigraphical position of the dolomitic rock in the north Alps. Hauer, in his report, mainly relied upon two valuable works, the first a memoir by Emmrich (1853) on the eastern part of the Bavarian Alps, and the other by Escher von der Linth (1853) on the geology of Vorarlberg.

With considerable insight, Emmrich had distinguished in the Bavarian Alps a series of well-marked life zones in the Mesozoic rocks:—

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| Cenomanian                                | - | 9. Orbitulina sandstone (cf. p. 244).  |
| Neocomian                                 | - | 8. Aptychus shales (cf. p. 405).   |
| Jurassic                                  | - | 7. Haselberg marble passing into the Tithonian group.  |
| Liassic                                   | - | 6. Amaltheus marls with <i>Amm. Amaltheus</i> , etc.   |
| Saliferous System and St. Cassian Series. | { | 5. Gervillia beds or Kössen strata with <i>Avicula contorta</i> , etc.<br>Oolitic limestones with <i>Koninckina Leonhardi</i> and other St. Cassian types. |
| Muschelkalk                               | - | 4. Lithodendron limestone (cf. p. 250).  |
|   | - | 3. Middle Alpine limestone with <i>Halobia Sturi</i> , etc.  |