

little air, which always contains carbonic acid as well as other ingredients, in addition to its nitrogen and oxygen (p. 64). Rain thus washes the air and takes impurities out of it, by means of which it is enabled to work many chemical changes that it could not accomplish were it to reach the ground as pure water.

Composition of Rain-water.—Numerous analyses of rain-water show that it contains in solution about 25 cubic centimetres of gases per litre.<sup>43</sup> An average proportional percentage is by measure—nitrogen, 64.47; oxygen, 33.76; carbonic acid, 1.77. Carbonic acid, being more soluble than the other gases, is contained in rain-water in proportions between 30 and 40 times greater than in the atmosphere. Oxygen too is more soluble than nitrogen. These differences acquire a considerable importance in the chemical operations of rain. Other substances are present in smaller quantities. In England there is an average of 3.95 parts of solid impurity in 100,000 parts of rain.<sup>44</sup> Nitric acid sometimes occurs in marked proportions: at Basel it was found to reach a maximum of 13.6 parts in a million, with 20.1 parts of nitrate of ammonia. Sulphuric acid likewise occurs, especially in the rain of towns and manufacturing districts.<sup>45</sup> Sulphates of the alkalis and alkaline earths have been detected in rain. But the most abundant salt is chloride of sodium, which appears in marked propor-

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<sup>43</sup> Baumert, *Ann. Chem. Pharm.* lxxxviii. p. 17. The proportion of carbonic acid found by Peligot was 2.4. See also Bunsen, *op. cit.* xciii. p. 20. Roth, *"Chem. Geol."* i. p. 44. Angus Smith, *"Air and Rain,"* 1872, p. 225.

<sup>44</sup> Rivers Pollution Commission, 6th Rep. p. 29.

<sup>45</sup> The occurrence of sulphuric and nitric acids in the air, especially noticeable in large towns, leads to considerable corrosion of metallic surfaces, as well as of stones and lime. The mortar of walls may often be observed to be slowly swelling out and dropping off, owing to the conversion of the lime into sulphate. Great injury is likewise done, from a similar cause, to marble monuments in exposed graveyards. See Angus Smith, *"Air and Rain,"* p. 444. Geikie, *Proc. Roy. Soc. Edin.* 1879-80, p. 518.