

the River Belem), man has ever boldly ventured onward toward the discovery of unknown regions.

The second external and general covering of our planet, the aerial ocean, in the lower strata, and on the shoals of which we live, presents six classes of natural phenomena, which manifest the most intimate connection with one another. They are dependent on the chemical composition of the atmosphere, the variations in its transparency, polarization, and color, its density or pressure, its temperature and humidity, and its electricity. The air contains in oxygen the first element of physical animal life, and, besides this benefit, it possesses another, which may be said to be of a nearly equally high character, namely, that of conveying sound; a faculty by which it likewise becomes the conveyer of speech and the means of communicating thought, and, consequently, of maintaining social intercourse. If the Earth were deprived of an atmosphere, as we suppose our moon to be, it would present itself to our imagination as a soundless desert.

The relative quantities of the substances composing the strata of air accessible to us have, since the beginning of the nineteenth century, become the object of investigations, in which Gay-Lussac and myself have taken an active part; it is, however, only very recently that the admirable labors of Dumas and Boussingault have, by new and more accurate methods, brought the chemical analysis of the atmosphere to a high degree of perfection. According to this analysis, a volume of dry air contains 20·8 of oxygen and 79·2 of nitrogen, besides from two to five thousandth parts of carbonic acid gas, a still smaller quantity of carbureted hydrogen gas,* and, according to the important experiments of Saussure and Liebig, traces of ammoniacal vapors,† from which plants derive their nitrogenous contents. Some observations of Lewy render it probable that the quantity of oxygen varies percep-

* Boussingault, *Recherches sur la Composition de l'Atmosphère*, in the *Annales de Chimie et de Physique*, t. lvii., 1834, p. 171-173; and lxxi. 1839, p. 116. According to Boussingault and Lewy, the proportion of carbonic acid in the atmosphere at Audilly, at a distance, therefore, from the exhalations of a city, varied only between 0·00028 and 0·00031 in volume.

† Liebig, in his important work, entitled *Die Organische Chemie in ihrer Anwendung auf Agricultur und Physiologie*, 1840, s. 62-72. On the influence of atmospheric electricity in the production of nitrate of ammonia, which, coming into contact with carbonate of lime, is changed into carbonate of ammonia, see Boussingault's *Economie Rurale considérée dans ses Rapports avec la Chimie et la Météorologie*, 1844, t. ii., p. 247, 267, and t. i., p. 84.