series (and according to Zittel especially the Nubian sandstone) have been made to yield the sand which, drifted and sifted by the winds, has taken on the form of dunes. The slightest breeze is enough to make the surface “smoke” with dust; and at times the weird singing of the sands, waxing louder and louder, tells the scientific traveller that the motion is not confined to the superficial particles. @@1 How important a part the winds may play in the redistribution of the lighter particles is probably shown by the clouds of red dust which were noticed by Edrisi as frequently obscuring the Atlantic sky between Cape Verd and the American coast, and which have recently been referred by Dr Gustav Hellemann to the African Sahara, whence Professor Tacchini also derives the similar clouds of dust observed in many parts of Italy (comp. Tchihatchef).

But even such a river-system as that supposed combined with all conceivable atmospheric agencies would only account for the minor phenomena of erosion. Dr Zittel in dealing with the Libyan Desert finds it necessary to assume violent freshwater floods proceeding from the south, though, as he confesses, this only shifts the difficulty a stage further back, as it involves an enormous change of climate. To render such a change of climate a probable hypothesis various recent speculations combine ; and Dr Theobald Fischer and Dr Oscar Fraas agree in believing that the desiccation has markedly increased in historic times. Evidence derived from ancient monuments combined with the statements of Herodotus and Pliny are held to prove that the elephant, the rhinoceros, and the crocodile existed in North African regions where the environment is now utterly alien, and on the other hand that the camel is a late introduction. Humboldt sought to attribute the desiccation of the desert region of Asia and Africa to the effects of the north-east trade-wind ; but Dr Lenz, who points out that in North Africa the wind seldom blows from the north-east but generally from the north or north­west @@2 (the latter of course from the Atlantic, in the western parts, but farther east from the European regions of precipitation), argues that one of the principal causes has been the destruction of the forests on the highlands. The dry winds from the Sahara are known in Europe as the Scirocco and the Föhn or Fön.

Botanically the Sahara is the meeting-ground of representatives of the “Mediterranean” and the “Tropical” floras which have managed to accommodate themselves to the peculiar climatic conditions. The line of demarcation between the two floral areas, almost coinciding in the west with the Tropic of Cancer and in the east dipping south towards the meridian of Lake Tchad, assigns by far the greater portion of the area to “Mediterranean” influences.@@3 Uniformity, in spite of differences of altitude and soil, is a general characteristic of the vegetation, which outside of the oases consists mainly of plants with a tufty dry stiff habit of growth. The oases are the special home of the date-palm, of which there are about 4,000,000 in the Algerian oases alone. In company with this tree, without which life in the Sahara would be practically impossible, are grown apples, peaches, oranges, citrons, figs, grapes, pomegranates, &c. During the months from December to March wheat, barley, and other northern grain crops are successfully cultivated and in the hotter season rice, dukhn, durra, and other tropical products. Altogether the oasal flora has considerable variety; thirty-nine species are known from the Kufra group, forty-eight from the Aujila group.

Zoologically the Sahara is also a debatable territory, partly Mediterranean, partly Tropical. Apart from the domestic animals (camels, asses, &c., and very noticeably a black breed of cattle in Adrar), the list of fifteen mammals comprises the jerboa, the fennek or fox, the jackal, the sand rat *(Psammomys obesus),* the hare, the wild ass, and three species of antelope. In Borku, Air, &c., baboons, hyaenas, and mountain sheep are not uncommon. Without count­ing migratory visitants, about eighty species of birds have been registered—the ostrich, the *Certhilauda deserti* or desert-lark (which often surprises the traveller with its song), *Emberiza Saharæ,* three species of *Dromolea,* &c. Tortoises, lizards, chamaeleons, geckos, skinks, &c., of fifteen different species were collected by the single Rohlfs expedition of 1873-74 ; the serpents comprise the horned viper, *Psammophis sibilans, Ccelopeltis lacertina,* the python, and several other species. The edible frog also occurs. *Cyprinodon dispar,* a fish not unlike *Cyprinodon calaritanus,* is found in all the brackish waters of north Sahara and swarms in the lake of the Síwa oasis. The brine-shrimp has been described in the article Fezzan.

The present population of the Sahara consists almost exclusively of Arabs, Berbers, and Negro tribes. The Berbers (Tuareg or Tuarik, &c.) occupy the west central region almost exclusively, appear sporadically in the western, and stretch northwards into Morocco and Algeria ; the Negro tribes form a compact block in the east central region northwards and north-eastwards from Lake

Tchad ; and the Arabs are in possession of all the rest of the country. Politically the Sahara belongs partly to Morocco (Tafilet, &c.), partly to Algeria and Tunis (and thus to France), and partly to the Turkish empire (Tripolis, Egypt, &c.). France especially has been steadily pushing south with the purpose of forming a junction ultimately with her colony on the Senegal. The spirit of independ­ence among the Mohammedan populations has been crystallized and stimulated by the remarkable confraternity of Sidi Mohammed ben 'Ali es-Senusi, founded about 1837, and now possessing about 120 convents or zawiga (mostly in the Saharan region), with its headquarters at Jerabub. @@4 With this organization the French have already come into conflict in their southward progress. To estab­lish their influence they propose the construction of a trans-Saharan railway and the opening up of the region to the south of Algeria and Tunis by the construction of an inland sea. According to M. Roudaire, the author and protagonist of this scheme, which is familiarly but deceptively styled the ‘ ‘ flooding of the Sahara, ” @@ 5 it is possible by proper engineering works to create an inland sea to the south of Algeria and Tunis with an average depth of 78 feet and an area of 3100 square miles, or about fourteen times the size of the Lake of Geneva. A Government commission decided that the excavation of the necessary canal would not be difficult, and that, in spite of silting-up processes, the work would at least last 1000 to 1500 years. M. de Lesseps, M. Roudaire’s principal sup­porter, visited the district in 1883 and reported that the canal would cost five years’ labour and 150,000,000 francs. The scheme, which has met with persistent hostility on the part of M. Cosson and others, is based on the following facts. The Gulf of Gabes is separated by a ridge 13 miles across and 150 feet high from Shott al-Fejej, a depression which extends south-west into the Shott Jerid, which in its turn is separated from the Shott Rharsa only by a still narrower ridge. Shott Rharsa is succeeded westwards by a series of smaller depressions and beyond them lies the Shott Melrir, whose north-west end is not far from the town of Biskra. What we know about such inland seas as the Caspian and the Aral seems to cast serious doubt on the probability of any increase of the rainfall in the Sahara by the formation of Roudaire’s sea.

The commerce of the Sahara is not inconsiderable. Among the more important trade routes are—(1) from Morocco to Cairo by Insalah and Ghadames, which is followed by the pilgrims of Western Africa bound for Mecca; (2) from Kuka to Murzuk and Tripolis ; (3) from the Sudan to Tripolis by Air and Ghat ; (4) from Timbuktu to Insalah, Ghadames, and Tripolis ; (5) from Timbuktu to Insalah and thence to Algeria and Tunis ; (6) from Timbuktu to Morocco. The two great products are dates and salt. Full details of the date trade will be found in Fischer’s *Die Dattelpalme,* 1881. The principal sources of salt are the rock-salt deposits of the Juf (especially Taudeni), the lakes of Kufra, and the rock-salt and brine of Kawar (Bilma).

See, besides the works already quoted, Vatonne, *Mission de Ghadames,* 1863 ; Duveyrier, *Les Touaregs du Nord,* 1864 ; ville, *Explor. géologique du Mzab, &c.,* 1867 ; Pomel, *Le Sahara,* 1872 ; Rohlfs, *Quer durch Afrika* (1874), *Drei Monate im libyschen Wüste* (1875), and *Kufra* (1881) ; Largeau, *Le pays de Rirha-Ouargla,* 1879 ; Nachtigal, *Sâhărâ und Sudan,* 2 vols., 1879; Rolland, “Le Crétacé du Sahara Septentrional ” (with geological map of the Central Sahara), in *Bull, de la Soc. Géol. de France,* 1881 ; Roudaire, *Rapport sur la dernière exped. des Chotts,* 1881 (and other reports by the same author) ; Tchihatchef, “ The Deserts of Africa and Asia,” in *British Association Reports* (Southampton, 1882) ; Derrécagaix, “ Explor. du Sahara : Les deux missions du Lieut.-Colonel Flatters,” in *Bull, de la Soc. de Géogr.,* 1882 ; Lenz, *Timbuktu : Reise durch Marokko, &c.,* 1884 ; and Reclus, *Nouv. Géographie Univ.,* xi., 1886, which contains an admir­able *résumé.* (H. A. W.)

SAHÁRANPUR, or Seharunpoor, a British district of India, in the Meerut division of the lieutenant-governor­ship of the North-Western Provinces. It lies between 29° 35' and 30° 21' N. lat., and between 77° 9' and 78° 15' E. long., and is bounded on the N. by the Siwálik Hills, separating it from the district of Dehra Dún, on the S. by the district of Muzaffarnagar, on the E. by the Ganges, and on the W. by the Jumna. Saháranpur forms the most northerly portion of the Doáb, or alluvial tableland, which stretches between the valleys of the Ganges and the Jumna. The Siwálik Hills rise precipitously on its northern fron­tier ; at their base stretches a wild submontane tract, with much forest and jungle. Cultivation generally in this part is backward, the surface of the country being broken by wild and magnificent ravines. South of this tract, flanked on the east and west by broad alluvial plains, lies the Doáb, with fertile soil and good natural water-supply. This portion of the country is divided into parallel tracts

@@@1 See Lenz’s chapter on this phenomenon.

@@@2 Comp. Derrécagaix, “ Le sud de la province d’Oran,” in *Bull, de la Soc. de Geogr.,* Paris, 1873.

@@@3 Comp. Drude, *Florenreiche der Erde,* 1884; and Cosson, *Com­pendium Florae Atlanticæ,* 1881, &c.

@@@4 See list in Duveyrier’s paper, *Bull. de la Soc. de Geogr.,* 1884.

@@@5 In this connexion it is enough to mention Mr Mackenzie’s scheme for flooding the Western Sahara; see *Flooding Sahara,* 1877, and Ravenstein, “The Western Sahara,” in *Geog. Mag.,* 1876.