pared the index for 1904, and will hope that he may have time next year to make a more complete index for the 1905 volume.

CLIMATE OF JERUSALEM.

PROFESSOR G. ARVANITAKIS, in the *Bulletin de l'Institut Égyptien* (4th ser., No. 49), has published a series of meteorological observations taken at Jerusalem, as well as some notes on the climate of that region. The winds from the east are extremely dry, coming as they do from the Arabian deserts. Rain comes from the western quadrants. Hail is noted as being fairly common in Palestine, and a source of injury to the fruits. The observer says that he seldom saw a heavy rainfall unaccompanied by hail. Cisterns and reservoirs supply water during the dry season of summer, and the heavy dews are very beneficial to vegetation. These dews are characteristic of Palestine, and must be seen to be fully appreciated. The climate is not described as very healthful. Dysentery, fever and rheumatism are not uncommon at Jerusalem, especially during the summer months.

MARINE METEOROLOGICAL SERVICE OF CHILE.

THE meteorological work carried on at the coast stations of Chile, from Arica in the north to the Strait of Magellan in the south, is under the direction of the so-called 'Direccion del Territorio Maritimo' of Chile. Up to the year 1899 this work was in charge of the central observatory at Santiago. An annual volume (*Anuario*) is issued, giving complete tabulations of the data for each of the eighteen stations, and including monthly and annual summaries. Thus far (1903, Vol. V., issued 1904) no discussion of these observations has been included. These littoral stations of Chile have the great advantage of varying but little in their longitude, and of being very near sea level, so that there is much uniformity in these respects. The great climatic interest of Chile, which results from its peculiar position with reference to the Cordillera of South America, and from its extraordinary contrasts in rainfall between the arid north and the rainy south, lends exceptional value to any such data as those included in the volumes here considered.

R. DEC. WARD.

NOTES ON FORESTRY.

WHY PRAIRIES ARE TREELESS.

IN a paper by Alfred Gaskill read before The Society of American Foresters, February 23, the theory that forest fires are responsible for the treeless condition of the prairies was advocated. In support of this by no means new theory, Mr. Gaskill cited some geological, physiographical, climatological and silvical facts which, in his opinion, point most emphatically to the fire origin of all true prairies. He divides the treeless area in the United States into plains and prairie. The former are treeless, primarily because of deficient moisture, and were so from time immemorial. It is different, however, with the prairies; they offer conditions favorable to tree growth and, therefore, their treeless condition presents a riddle clamoring for solution. The great prairie of the United States occupies an irregular area bounded on the east by a line that follows in a general way the ninety-fifth meridian and on the west by a line roughly extending along the ninety-seventh meridian. The eastern boundary is most irregular, its shape corroborating the fire origin of the prairie. In the north it makes a great bend eastward, enclosing half of Iowa, more than half of Illinois, and portions of Wisconsin and Indiana. Along its whole extension the prairie forms lobes and long tongues thrusting eastward into the forest. Since it is proved by the records of the Weather Bureau that the western boundary is within the limit of sufficient rainfall, capable of supporting tree growth, the whole area now occupied by the prairie is situated where forest ought to be, for there is neither lack of rain nor any condition in the soil or the vegetation that will account for the absence of trees. Mr. Gaskill assumes, therefore, that something not entirely normal caused the forest to retreat from its proper position. After a careful and detailed study of the records of forest and prairie fires in the states of Montana, Wyoming, Colorado, Texas, South

Dakota, Nebraska, Kansas, etc., he found that most of the fires occur there in the fall when the prevailing winds are from the west, and the vegetation of the plains lying to the windward of the area now prairie is exceedingly dry and combustible. The habit of the Indians of setting fire to the grass of the plains at that time of the year and its annual occurrence are matters of history. These annual fires, driven by strong westerly winds and finding no obstacle to their progress in the flat or gently rolling land, spread eastward until they reached the green timber. Year after year these fires ate their way a little farther into the forest, making the dense forest first more open and eventually entirely consuming it. The irregular projections of the prairie eastward into the forest are considered by Mr. Gaskill as the result of the work of the fires. Another evidence of its influence in causing the prairie he finds in the fact that with the settlement of the country and gradual elimination of fires the forest commenced to gain again on the prairie.

The prairies in other countries were also considered from the same point of view, and the speaker suggested that local students would probably confirm his opinion that fire has been an active agent in all such regions.

PRINCIPLES INVOLVED IN DETERMINING FOREST TYPES.

On February 23 Mr. Raphael Zon read before The Society of American Foresters a paper on forest types. These he identified as tree associations in the ecological sense, and not mere aggregations of trees as they often are conceived to be. Few will dispute the statement that the forest type is the cornerstone of silvics, and that the proper recognition of types in any forest is the first and most important question that a practical forester has to answer. "* * * The division of a forest into natural types of growth, however, is not such a simple thing as it may appear at the first glance. Stands differ from each other in many respects; they may be pure or mixed, even-aged or irregular, dense or open, of seedling or sprout origin, etc. Which of these features justifies the subdivision of the forest into types of growth, and what must we call a natural forest type? * * * When we attempt to trace to some definite causes the differences between stands composing a large forest, we finally come to two main ones: first, external physical conditions, such as climate, soil, moisture in the ground, topography, exposure, etc.; and second, interference by man, and natural accidents, such as fire, wind and so on. * * * It does not take very long to realize that segregating stands into types based on density, age or mode of origin can not be justified, since such features are not permanent and can not be characteristic of any definite forest type. * * * A forester who mistakes any such temporary forest growth for the original natural types of growth, thus failing to understand the natural evolution of the forest, will always have nature against him in all his operations, instead of being aided by her. * * * The physical conditions of the situation then are the main factors which determine the whole character of a forest type. Of these physical factors, climate undoubtedly has a marked influence upon plant life, if we compare vegetation of different latitudes. * * * Soil, moisture in the ground, and topography, to which in mountain countries must be added altitude and exposure, are the main factors which determine the character of forest growth in a forest region, and, therefore, must be accepted as the basis for the division of the forest into natural types of growth. A natural forest type then is an aggregation of stands which may differ from each other in age, density and other secondary features, but have the same physical conditions of situation, like soil, topography, exposure, etc. * * * The relationship between the physical conditions of the situation and the character of growth upon it is so constant and characteristic that by the given physical conditions of a situation, like soil, topography, and so on, one can describe the general character of its forest, the predominant species, habit of trees, reproduction, undergrowth and, *vice versa,* by a given type of the forest growth one can describe the physical conditions of growth, soil, situation, etc. * * * A forest

type is the result of a long struggle for existence between different species, in which only those possessing the greatest vitality and best fitted to the physical conditions of situation succeed in occupying the ground and form tree associations having a distinct physiognomy. One of the most important characteristics of a forest type is its stability, its resistance to invasion by other plant forms. * * *"

THE FOSSIL ARACHNIDA OF BOHEMIA.

WE are indebted to Professor Dr. Anton Fritsch for another important contribution on the Permian and Cretaceous fauna of Bohemia entitled 'Neue Fische und Reptilien.' This takes the form of a quarto appendix to his previously published volumes, and is illustrated by nine plates. The Cretaceous forms described are new teleosts, plesiosaurs, mosasaurs and pterosaurs.

In 1904 there appeared from the pen and brush of this ardent paleontologist a fine monograph on the Paleozoic arachnida, consisting of eighty pages of text and fifteen plates. The conclusions reached in this monograph are most striking, especially as to the very great antiquity of modern forms. The author observes "If we examine the entire series of the forms described we must recognize that there are many which present no very striking differences from the Arachnida of to-day. They are to be regarded as the direct ancestors of families now existing in part as lateral branches which have later become extinct." This is true of members of six families described. The scorpions of the Silurian period show in their foot structure a primitive form suggesting that of the Crustacea whereas those of the Carboniferous and Permian formations exhibit close resemblance to the foot structure of the modern types.

H. F. O.

EXTENDED EXPLORATIONS OF THE ATMOSPHERE BY THE BLUE HILL OBSERVATORY.

ACCOUNTS of the first experiments in this country with *ballons-sondes,* for the purpose of ascertaining the meteorological conditions at great heights above the American continent, appeared in SCIENCE, Vol. XXI., pp. 76–77 and 335. During the months of January, February and March, 1905, nine more ascents were made from St. Louis and every balloon but one was found and, with the attached instrument, was returned to Blue Hill in accordance with the instructions on each. Like the previous balloons, all of these fell within the eastern half of a circle having its center at St. Louis and a radius of 285 miles. The German expanding rubber-balloons, filled with hydrogen generated by the vitriolic process, were again employed, as were the French self-recording instruments, which gave at least partial records of barometric pressure and air-temperature in seven of the nine ascensions, although another record was obliterated by the finder. On January 25, when a high barometric pressure prevailed at the ground, a temperature of —111° F. was recorded at the height of 48,700 feet, this being one of the lowest natural temperatures ever observed. The experiments last winter were conducted by Mr. Clayton, under the direction of Mr. Rotch, and their success induced Professor Langley, secretary of the Smithsonian Institution, to grant Mr. Rotch $1,000 from the Hodgkins Fund, in order to continue the experiments this summer at St. Louis. These, like the first, will be conducted by Mr. Fergusson, of the Blue Hill Observatory staff. Soundings of the atmosphere made at different seasons should reveal the annual variation of temperature at great heights above the American continent, which is at present unknown.

However, kites are not neglected at Blue Hill, for, besides the flights made there each month on the days fixed by an international committee, they are also being employed to ascertain the conditions above the Atlantic Ocean in the trade-wind region. Thus the investigation which was first proposed by Mr. Rotch in SCIENCE, Vol. XIV., pp. 412–413, and which has been persistently advocated by him since, is now in progress, and this was rendered possible through the cooperation of the well-known French meteorologist, M. L. Teisserenc de Bort, who placed his steam-yacht at the disposal of Mr. Rotch, on condi-