theory much more in detail, and for the first time makes it complete. For this thoroughgoing treatment of the subject by the chief geologist, the excellent topographic and geologic work of Mr. Strong prepared the way.

Wisconsin is to be congratulated upon the successful completion of a work which in so many other states has had a different issue.

NORDENSKIÖLD'S ARCTIC INVESTIGATIONS.

WHEN Baron Nordenskiöld retired in April, 1882, from the presidency of the Royal academy of sciences at Stockholm, he took for the subject of his address the story of the Zeni brothers. This address was published in Swedish in 1883; and in the same year he laid before the Congrès des Américanistes, at their session at Copenhagen, three of the early maps, illustrative, as he thought, of an early acquaintance with Greenland, posterior to the so-called Northman discovery in the tenth century, and earlier than the period of Columbus. These were the Zeni map of 1380 (1390?); a map of 1427, found in a manuscript of Ptolemy at Nancy; and the Donis map of the edition of Ptolemy, printed at Ulm in 1482. In the German version of Nordenskiöld's papers, which has recently appeared as 'Studien und forschungen,' we have this same Zeni study in a language easier read by most inquirers. Those who believe in the substantial truth of the Zeni narrative will find Nordenskiöld on their side. He identifies the Frisland of the story with the Faröe Islands, makes the Zeni to have reached Greenland, and identifies the Estotiland and Drogeo of the Frisland fisherman with our American coast from Newfoundland south.

The botanical portion of the book has been contributed by three writers, — Nathorst, Kjellman, and Wittrock, — who treat respectively of the former botanical geography of high latitudes as indicated by the results of polar research, the biology of the arctic flora, and the vegetable life of the naked snow and ice. All of these articles are remarkably free from technicality, and form pleasant and instructive reading, the last being especially valuable because of its full references to the literature of the subject.

Fossil collections made from time to time in the arctic region, and, for the most part, elaborated by Heer, when compared among themselves, and with similar collections from Europe, show a remarkable uniformity in the early flora of the entire northern part of the world, until, scattered and driven southward along numerous lines of migration, it has left its descendants mainly on the eastern sides of the two great continents, as Dr. Gray has already shown in his history of Sequoia.

For the most part, the present arctic flora is composed of the descendants of tertiary alpine species, which, wandering from their original homes, — the Alps, the mountains of Greenland and Scandinavia, the Caucasus, and the Altai and Rocky mountains, — were driven back, at the end of the glacial period, to high elevations, or into the circumpolar region, by the warmer climate which succeeded. The collections made by the returning Vega party at Mogi, in Japan, are interesting because they indicate a certain, though relatively slight, reduction in temperature in that part of Asia corresponding to the glaciation of America and Europe, though, as is well known, no traces of inland ice occur there.

The arctic flora of to-day is a most interesting subject for study. While the ocean, at a short distance from shore, supports a growth of giant kelps and dark Florideae, which manifest continued activity the year through, vegetating in the short summer, and pushing their reproductive processes during the long winter night, the land-plants are all pygmies, apparently less because they cannot endure the intense cold of winter, than because they do not enjoy sufficient warmth in summer to assimilate enough organic matter for any considerable growth.

In a region where the average daily temperature for the least cold month of summer is but a few degrees above the freezing-point, and where vegetation is practically limited to about two months of even this slight warmth, interesting adaptations are met with on every hand. Annuals are as good as unknown, the season proving too short for the development of their vegetative organs, and the subsequent maturation of fruit. The entire flora is practically biennial or perennial; the plants rapidly pushing into bloom, like our spring flora, with the first abatement of the cold of winter, yet, unlike the latter, barely fruiting, and elaborating material for the next year's flowers before the short summer is succeeded by another winter. Indeed, the season is too short for the majority of even these precocious and hardy plants, many of which are forced to rely on vegetative reproduction except in the most favored situations, while nearly all are caught in the midst of flowering by the cold of autumn, which

Studien und forschungen veranlasst durch meine reisen im hohen norden. Von A. E. NORDENSKIÖLD. Autoriste ausgabe. Leipzig, *Brockhaus*, 1885. 9+521 p., illustr., 8 pl., and maps. 8°.

blights them as a sudden frost nips the tender exotics of our gardens.

Yet, despite the desolation of the land in all save the most congenial localities, and the difficulty with which the plants growing in these perform their necessary functions, even the bare ice and snow are not without their life, no less than forty-two species or well-marked varieties of ice and snow plants being now known. As might be inferred from their habitat, these are mainly algae, though the alga-like protonemata of several mosses are found, and the occurrence of putrefaction to a slight extent argues the presence of bacteria. The essential characters of this flora, are, in brief, that it consists almost exclusively of water-plants of low organization, propagating themselves chiefly by non-sexual processes. These plants are all microscopic; yet, as they are for the most part brightly colored, characteristic tints — red, brownish-purple, and green — are often given to extensive areas of snow and ice by the myriads of these minute beings which occur together.

Under the title 'Insect-life in arctic lands,' Dr. Christopher Aurivillius gives an account of the expeditions which have enriched our knowledge of arctic insects, of the number of species of each order of insects collected, and of the literature of the subject. He explains that the uniformity of the arctic fauna becomes more striking as the north pole is approached, but that three subdivisions are recognizable: these he terms the Scandinavian arctic, the Asiatic arctic, and the American arctic regions. A brief notice of the influence of the retreating glacial sheet, in the past, in leaving colonies of arctic insects on mountains, — of which Mount Washington, N.H., is especially mentioned, — is followed by a discussion of the difference in relative proportion of species of the different orders of insects in arctic and temperate lands, and the causes of this unequal distribution. Insect metamorphoses are stated to take longer time in arctic than in temperate lands; Oeneis Bore requiring two years to complete its changes, passing from five to six weeks as a subterranean pupa. The co-ordinate development of plants and insects in geological time, especially the correspondence in the development of suctorial mouth-parts of insects and of flowers with concealed or not easily accessible honey, is outlined; and the relationship of the distribution of arctic insects to the arctic flora is illustrated by a tabular synopsis of the nature of the flowers, and the distribution of different arctic plants. This synopsis shows that anemophilous flowers diminish in number toward the north, and that the flowers fertilized by flies, bees, and Lepidoptera, bear nearly direct relationship to the dipterous, hymenopterous, and lepidopterous fauna of each region. A few flowers, however, which are fertilized by bees farther south, are self-fertilized in the arctic regions: such are the flowers of the two species of Pedicularis found in Spitzbergen, where careful search has failed to discover humble-bees. The author uses this peculiarity of Pedicularis to show the inapplicability of Darwin's theory that the deterioriation of species by self-fertilization is an explanation of the origin of cross-fertilization by insects. Dr. Aurivillius shows, further, that the colors of arctic flowers tend to confirm what is known of the color-sense of the insects that visit them.

H. Hildebrand devotes nearly one hundred pages to a discussion of our knowledge of the art of the lower races of savage people, especially of the Chukchi, Eskimo, Bushmen, Australians, Melanesians, and the people of the stone age in western and northern Europe. He puts aside considerations based on physical or linguistic features, and discusses merely the aesthetic relations of the different people as evidenced by their more or less artistic productions. From this point of view, the people of Chukchi race, studied by the Vega party, are closely assimilated to the Eskimo; more so, indeed, than the pure race characteristics would justify: for it must not be forgotten that the bone-carvings and pictures of the so-called 'sedentary Chukchi' are mere copies borrowed from the art of the Eskimo, to whose mode of life the loss of their deer has driven a portion of a different people, whose normal development and culture away from the coast shows little or nothing of such art-work. Their stage of ethnic development is, however, much the same. The peculiarities of the art of people in this stage, whether exhibited by the quaternary specimens from the caves of Perigord, or those of the present day from Bering Strait, are to be ascribed to common features of aesthetic evolution in the mind of man, of which the rude pictures drawn by civilized children offer at once a reminiscence and an example.

In an article which covers ninety-four pages, Nordenskiöld himself considers the geological significance of the cosmical material which falls upon the earth's surface. The nebular hypothesis of Kant and Laplace is briefly outlined, and the arguments in favor of the existence of matter in the form of ether are advanced. The author believes that the

original etheriform mass of our solar system condensed to cosmical clouds; the solid particles aggregated, forming large rotating bodies like the earth, which continue to enlarge by the addition of cosmical material from without. It is claimed that many meteorites are simply aggregations of meteroic dust; and numerous examples of the precipitation of such matter are described. The suggestion that eruptive rocks may be derived from accumulations of this kind is of special interest, since by some authors meteoric and eruptive rocks are classed together.

NOTES AND NEWS.

In speaking of the benefit to be expected from the large telescope now building, Professor Asaph Hall recently said that we must not commit the common error of expecting too much from the use of such instruments. Measured by the relative amount of light gathered, the gain seems great; but, when we pass from a fifteen-inch objective to one of thirty inches in diameter, our gain in the visibility of stars is only one and a half magnitudes. It is true that the number of stars brought to view by the larger glass in the shell of our great celestial sphere is very great; but they are of the faintest kind, and the study of these stars is very laborious. And, moreover, all the obvious and striking discoveries of astronomy have been made long since.

— The fifty-fifth annual meeting of the British association, says *Nature*, will commence on Wednesday, Sept. 9, 1885, at Aberdeen. The president-elect is Sir Lyon Playfair. The vice-presidents are the Duke of Richmond and Gordon, the Earl of Aberdeen, the Earl of Crawford and Balcarres, James Matthews, Professor Sir William Thomson, Alexander Bain, the Very Rev. Principal Pirie, Prof. W. H. Flower; general treasurer, Prof. A. W. Williamson; general secretaries, Capt. Douglas Galton, A. G. Vernon Harcourt; secretary, Prof. T. G. Bonney; local secretaries, J. W. Crombie, Angus Fraser, Prof. G. Pirie; local treasurers, John Findlater, Robert Lumsden. The sectional officers are as follows: — *A. Mathematical and physical science:* president, Prof. G. Chrystal; vice-presidents, Prof. C. Niven, Prof. A. Schuster; secretaries, R. E. Baynes, R. T. Glazebrook, Prof. W. M. Hicks (recorder), Prof. W. Ingram. *B. Chemical science:* president, Prof. H. E. Armstrong; vice-presidents, Prof. A. Crum Brown, Prof. H. McLeod; secretaries, Prof. P. Phillips Bedson (recorder), H. B. Dixon, H. Forster Morley, W. J. Simpson. *C. Geology:* president, Prof. J. W. Judd; vice-presidents, John Evans, Prof. W. C. Williamson; secretaries, C. E. De Rance, J. Horne, J. J. H. Teall, W. Topley (recorder). *D. Biology:* president, Prof. W. C. McIntosh; vice-presidents, Prof. I. Bayley Balfour, Prof. J. S. Burdon Sanderson; secretaries, W. Heape, J. Duncan Matthews, Howard Saunders (recorder), H. Marshall Ward. *E. Geography:* president, Lieut.-Gen. J. T. Walker; vice-presidents, Professor James Donaldson, John Rae; secretaries, J. S. Keltie, J. S. O'Halloran, E. G. Ravenstein (recorder), Rev. G. A. Smith. *F. Economic science and statistics:* president, Professor Henry Sidgwick; vice-presidents, Prof. R. Adamson, Sir Rawson W. Rawson; secretaries, Rev. W. Cunningham, Prof. H. S. Foxwell (recorder), C. McCombie, M.A., J. F. Moss. *G. Mechanical science:* president, Benjamin Baker; vice-presidents, Prof. W. C. Unwin, Prof. H. C. Fleeming Jenkin; secretaries, A. T. Atchison (recorder), F. G. Ogilvie, E. Rigg, H. T. Wood. *H. Anthropology:* president, Francis Galton; vice-presidents, W. Pengelly, Prof. W. Turner; secretaries, G. W. Bloxam (recorder), J. G. Garson, Walter Hurst, A. MacGregor. The first general meeting will be held on Wednesday, Sept. 9, when Lord Rayleigh will resign the chair, and Sir Lyon Playfair, president-elect, will assume the presidency, and deliver an address. On Thursday evening, Sept. 10, there will be a *soirée;* on Friday evening, Sept. 11, a discourse by Prof. W. Grylls Adams; on Monday evening, Sept. 14, a discourse on 'The great ocean-basins,' by John Murray, director of the Challenger expedition commission; on Tuesday evening, Sept. 15, a *soirée.* On Wednesday, Sept. 16, the concluding general meeting will be held. The lecture to workingmen will be on the 'Nature of explosions,' by Mr. H. B. Dixon.

— There has just appeared an index to the first thirty volumes of Pflüger's *Archiv für die gesammte physiologie,* the most important physiological periodical of the world. The contributors include a large majority of the well-known professional physiologists of all countries, and number, altogether, in the neighborhood of six hundred. Most of the names are German, but a remarkable proportion are Russian. Among those whose articles are most numerous, we find W. Engelmann, Heidenhain, Hermann, Luchsinger, Pflüger, Valentin, and Worm-Müller. Although the *Archiv* has been edited with little supervision as to the real merit of the papers, and contains therefore an undue proportion of inferior essays, it still remains the most important single repository of modern physiological research; and the index will be of constant value in rendering the stores it contains more accessible. We commit, we hope, no breach of confidence in stating that the index is due to the well-applied skill and patience of an able American physiologist, who was long associated with Professor Pflüger at Bonn.

— A botanical congress will be held during the Antwerp exhibition, dealing principally with the plant kingdom of the Kongo district. With this view, a Belgian *savant* has drawn up a list of questions, and sent them to be answered at the various cultivation stations of the International society.

— The University of Nebraska is to have a new chemical laboratory, which will furnish accommodations for eighty students in the general laboratory, and for thirty-two in the laboratory for qualitative analysis, besides lecture-rooms and minor laboratories for quantitative work, gas analysis, and assaying.