of earth? They were extremely small, and the largest of them so small that one hundred millions could be packed within a cube whose side was equal to the diameter of a coarse human hair, and there were from ten to twenty less than this. This group were amenable only to the most powerful microscopes. It was known long ago that they carried on putrefaction; now they knew that the process was a fermentation. Dr. Dallinger then went on to contrast ordinary saccharine fermentation, like that of yeast, producing carbonic acid and alcohol, with the fermentation produced by these saprophytic organisms, and showed that both could be prevented by taking care to keep away any of the germs of the fermentation, that both could be arrested by the action of heat, and that both tended to break up the organic matter into simpler forms. In the case of the saprophytes, water and carbonic acid were produced eventually from the decaying mass on which they dwell, and thus by the vital functions of these organisms the chemical elements in the animal body were restored to nature, to become once more part of the protoplasm of living things. There were, however, two things in which these saprophytic ferments were different from ordinary ferments; in the latter a special organism produces a special product, whereas in the former there was no such definite product, and in the saprophytic ferment the final process was produced, not by one definite organism, but by a series of organisms. He did not think that these ferments destroyed one another; but between the beginning and the end of the putrefaction there was a definite incoming and disappearance of many forms. In from 50° to 60° north latitude, he believed these organisms were limited to ten forms, and of these eight were definitely determined, and their life-history made out. There were some present everywhere, and they acted at once. Dr. Dallinger said the object of his study was biological, and not pathological. Some of the results he discovered some time ago, but the large progress of recent years was due to the great improvements in our instruments. These organisms were all different, no two of them behaved alike. He said that if they added a very small quantity of putrescent fluid to a speck of water on a slide kept at 65° F., it was very easy to find some of these organisms almost directly, using a lens magnifying 1000 diameters; and they would be found to increase with a rapidity that no description could suggest. He then showed on the screen the first kind of organism that appears, and mentioned that when seen in reality, they were in a constant state of movement, and that the saprophytic ferment begins to split up and break down the organic tissues. This first organism, *Bacterium termo*, would produce profound changes in the putrefying tissues, and prepare the way for other organisms. It would be seen that this organism would be densest round the mass that was being broken up, forming a felt-like covering or garment to it; soon a new organism of a spiral form would make its appearance (this was shown on the screen), while *Bacterium termo* would become less abundant, and be diffused over the entire fluid. The new one, like *Bacterium termo*, would be densest next to the putrid matter, and would form a covering to it. The decaying tissue would now rapidly change, and would give off noxious gases. This form would continue for an indefinite time, and be succeeded by one or two new forms. (These were shown on the screen.) One of these new forms would have a single flagellum, and the other would have two; and they would move rapidly about and glide continuously over the decomposing matter. They increased very rapidly, one method of increase being by a process of division. In another method two bodies would unite together, and an amœboid condition ending in the *fusion* of two forms resulting in a sac from whence spore was produced, giving rise to new generations. Their rate of increase was inconceivably rapid, and it was not surprising that the putrid tissue was surrounded by a garment of these organisms. They had in all probability their food and suitable conditions for their life produced by the functions of their predecessors. Then a time came when this form died out, and a very remarkable organism appeared which also invested the putrid matter with a garment of living organisms; they stuck to the mass and waved to and fro. These were shown on the screen as they would be seen in the microscope, clustering round the matter. With this was shown the next organism—a most wonderful one. It has a rigid flagellum armed with a hook and a long trailing flagellum. The animal swims about, and when it comes to a piece of decaying tissue, it often anchors itself by the trailing flagellum, which is coiled into a spiral; then it darts up and down upon the decaying matter. The action of this was shown by a mechanical slide, the up-and-down motion and the coiling and uncoiling of the flagellum being seen. These were succeeded by a group which had a free flagellum without any hook, and which fastens itself down by means of its trailing flagellum, and hammers the decomposing tissue by throwing itself against it. This process was also shown on the screen by means of a mechanical slide. Dr. Dallinger said that this occurred at about the middle of the putrefactive action, the greater part of which is accomplished by this. The mass now gradually broke up. The next kind, which was also shown on the screen, and its process explained by a mechanical slide, has two trailing flagella by which it anchors itself; it then springs up and darts down, and further promotes the decomposition. At the close of this stage there is little left of the original tissue but some water charged with carbonic acid, and a slight deposit of fragments. Dr. Dallinger said that four years ago he found a new organism which acts as a gleaner, and gathers up the fragments of the *débris* left by the others. It is armed with six flagella, and swims about in the liquid, and when it comes within a certain distance of the solid remnants twists its middle flagella together, and springs up and down on the *débris*, removing entirely tiny particles. They move in a most beautifully rhythmic manner up and down. He showed a picture of these on the screen, and also a mechanical slide of a group of three, with their pretty rhythmic action. And thus the organic tissues were broken up into their ultimate elements. Dr. Dallinger mentioned that the last form was comparatively rare, and was more frequent in warm countries. It was clear, he said, that different climates had somewhat different forms. In conclusion, he said that twenty years ago, when in a state of ill-health, he took to this research, and found all these beauties and a thousand times more; and he urged those present to take up some field of microscopical research, and seek for the hidden beauties of Nature. They would find much pleasure in the doing of it. They need not be appalled by the high powers he had used; there were many facts to be found by the help of far lower powers. If they did this they would find that life would have a pleasure it had never known before.

HIGHLAND PLANTS FROM NEW GUINEA.

As we have already noted, Baron von Mueller contributes to the Transactions of the Royal Society of Victoria (vol. i., Part 2) some important records of observations on Sir William MacGregor's highland plants from New Guinea. The following are his general conclusions:—

"The memorable expedition, so valiantly and circumspectly carried out by His Excellency Sir William MacGregor, the Governor of British New Guinea, for the ascent and exploration of the Owen Stanley's Ranges, has for the first time brought also the flora of the temperate and the sub-Alpine zone of that great island within the reach of elucidation. In a brief preliminary report, written in July last, attention was drawn to the extraordinary commigration, by which plants of Asiatic, of far southern and even of sub-Antarctic types had mingled together in the Papuan highlands. From the material thus brought together only a commencement could be made to study the vegetation of the higher mountains regarding geographic points of view; in order to obtain a full insight into the Papuan Alpine flora, it would require to explore the hitherto inaccessible more central culminations in the island, where on tiers still some few or perhaps several thousand feet higher in yonder latitudes, according to varied physical conditions, a glacier flora would be more fully reached. To form extensive conclusions on the nature of the Papuan Alpine flora would at present be premature; but from what we have now seen, it promises to be eminently interesting. On this occasion I shall merely group these highland plants on geographic principles, with a hope that it may yet fall to my own share to carry on these comparisons more amply at some future time from fuller material, the total sub-Alpine and Alpine flora of New Guinea in all likelihood comprising several hundred species of vascular plants. Such future researches will be to myself all the more fascinating, as from 1853 to 1855 the whole flora of the Australian Alps became elucidated by field-work of my own, it being utterly unknown before. In these pages is alluded only to those plants, which Sir William MacGregor gathered in altitudes between 8000 and 13,000 feet, therefore in the region above the mountain zone, involved in almost permanent clouds.

"Of the 80 plants, specifically and distinctly recorded in these pages as emanating from the most elevated regions, nearly half the number seems endemic, so far as hitherto can be judged, while not yet all the highlands of South-Eastern Asia are explored, and while we yet remain in uncertainty about the constancy of some of the characteristics on which the adopted new specific forms are systematically established. Of these restricted Papuan plants, two—namely, *Ischnea elachoglossa* and *Decatoca Spencerii* represent new genera, the one allied to the exclusively Italian Nananthea, the other to the Australian and chiefly Alpine Trochocarpa. Of the other endemic plants 17 are of Himalayan types—namely, *Hypericum Macgregorii, Sagina donatioides, Rubus Macgregorii, Anaphalis Mariæ, Myriactis bellidiformis, Vaccinium parvulifolium, V. amblyandrum, V. Helenæ, V. Macbainii, Gaultiera mundula, Rhododendron gracilentum, R. spondylophyllum, R. culminicolum, R. phæochiton, Gentiana Ettingshausenii, Trigonotis Haackei*, and *T. oblita*, though some of these show also a touch of the Sundaic vegetative element; and here at once may be alluded to the extensive display of Ericaceous (inclusive of Vaccinaceous) plants, which forms of vegetation are in Australia so very scantily developed, and then only in Alpine regions. Contrarily, however, we now perceive otherwise almost a preponderance of upland Australian or New Zealandian or sub-Antarctic types in the highlands vegetation of New Guinea, so far as already revealed; this is demonstrated by the endemic occurrence of *Ranunculus amerophyllus, Metrosideros Regelii, Rubus diclinis, Olearia Kernotii, Vittadinia Alinæ, V. macra, Veronica Lendenfeldii, Libocedrus Papuana, Phyllocladus hypophyllus, Schœnus curvulus*, and *Festuca oreobaloides;* furthermore this repetition of the features of the southern flora so far north is rendered still more expressive and significant by the occurrence of numerous plants absolutely identical with our southern species—namely, *Epilobium pedunculare, Galium australe, Lagenophora Billardierii, Styphelia montana, Euphrasia Brownii, Myosotis australis, Sisyrinchium pulchellum, Astelia alpina, Carpha alpina, Carex fissilis, Uncinia riparia, U. Hookerii, Agrostis montana, Danthonia penicillata, Festuca pusilla, Lycopodium scariosum, Gleichenia dicarpa*, and *Dawsonia superba*—most of these being now shown for the first time to approach so near to the equator. Four Borneo plants, hitherto only known from lofty altitudes of Kini-Balu, have now been traced to the Papuan highlands also, viz. *Drimys piperita, Drapetes ericoides, Rhododendron Lowii, Phyllocladus hypophyllus*, three being of far southern type. Even a few of such British plants, not almost universally cosmopolitan, have now come like messengers from home before us from New Guinea as there also indigenous; thus, *Taraxacum officinale* and *Scirpus cæspitosus*, these being wanting even in the Malayan islands and in continental Australia, irrespective of the widely distributed *Aira cæspitosa, Festuca ovina, Lycopodium clavatum, L. Selago*, and perhaps *L. alpinum*, as well as *Hymenophyllum Tunbridgense* and *Aspidium aculeatum.* For the familiar northern genus Potentilla a truly indigenous position in the southern hemisphere has been gained now for phytogeography, as well as for Myriactis and Trigonotis, while Astelia, Uncinia, and Dawsonia are now seen to enter equinoctial regions in the eastern hemisphere. The *Styphelia montana*, the Astelia, and the Carpha mentioned indicate the commencement of a truly Alpine flora.

"On the Finisterre Range, the ascent of which was accomplished by Mr. Zoeller and his party during 1888 (this enterprise being inspired by myself in a lengthened interview with the leader), tree vegetation exists to the summit, therefore up to 11,000 feet, as indeed already telescopically ascertained by M. Mikluho Maclay. I can, however, furnish no data, which might assist our present purpose, on the nature of the vegetation there, as—against my expectation—no botanic specimens whatever, resulting from that courageous exploit, came to me as one who since many years has been engaged occasionally on connected elucidations of the Papuan flora. Sir William MacGregor found the arboreous vegetation to cease on the Owen Stanley's Ranges at 11,500 feet (despatch, July 1889, p. 10), and this cessation was not due to a change of geologic formation. The limits of tree vegetation may, however, on some other Papuan culminations under altered physical conditions be somewhat higher so near to the equator, in comparison to zones of vegetation in the Himalayas at and near the verge of the tropics.

"As regards prospective utilitarian gain from the world of plants likely to emanate from this expedition, we may look forward to the acquisition of the 'cypress' (*Libocedrus Papuana*), which constitutes the principal forests on the summit of Mount Douglas and Winter's Height, for arboreta even of countries of the cool temperate zone, and with this cypress-like tree could doubtless be associated in parks far outside of the tropics also the tall 'bamboo' (see Sir William MacGregor's despatch, p. 8), with which the dry region above the nebular zone begins at (about 8500 feet). The several hardy and gaudy rhododendrons could aptly be consociated by dissemination with the many Sikkin species, now so frequent as garden favourites. The dwarf raspberry would give us an additional table-fruit. How far the Korthalsia palm would bear actual frigour, remains to be ascertained. The species of Papuan highland grasses are rather gregarious than numerous.

"Why so many plants from cold southern latitudes suddenly reappear on the Papuan and perhaps also on the Bornean highlands in evidently coæval forms of common origin; why the highest regions, and these almost only, should, like in New Zealand, reiterate plant-life, otherwise typical of Tasmania, of continental Australia, of islands in the Southern Ocean, and also of Fuegia and Patagonia; whether this indicates a continuity of portions of the Papuan Island with a once vastly extending southern land, now mostly submerged; what clues can be obtained for all this from the study of glacial drifts occurring during former enormous telluric changes, such as geologic science endeavours to explain; what part possibly could have been taken by any migratory birds in effecting so wide a dispersion of some of these plants even into so exceptional isolations; all this and other momentous considerations involved in these questions must be reserved for future discussions and generalizations in a special essay, perhaps under the advantage of access to ampler working material, and at not too distant a day."

SCIENTIFIC SERIALS.

THE *American Meteorological Journal* for July contains an article by Prof. H. A. Newton on the late Prof. E. Loomis, of Yale College, U.S. (see NATURE, vol. xl. p. 401). In early life he paid much attention to terrestrial magnetism, and published the first magnetic charts of the United States; but his most important contributions were to meteorology. In a discussion of the storms of 1842, he adopted the use of synchronous charts very much like those now generally employed. The later years of his life were spent in discussing the materials collected by the Signal Service, and he published twenty-three memoirs upon them, entitled "Contributions to Meteorology." A large portion of his estate was bequeathed to the endowment of an astronomical observatory.—Prof. H. A. Hazen has an article setting forth the observations most needed in the study of tornadoes. He points out that, after fifty years' observations, our knowledge of this subject is very unsatisfactory.—Lieut. Finley gives tornado statistics for the States of Florida and South Carolina. The observations for the latter extend over 128 years. The month of greatest frequency in Florida is September, and in South Carolina, March.—M. H. Faye continues his articles on trombes and tornadoes, dealing especially with their action upon forests, and the carrying of heavy *débris* to great distances.—Prof. W. A. Rogers continues his article concerning thermometers, dealing principally with the pulsatory movements of a mercurial column found to exist in nearly all the thermometers investigated.—The last article is devoted to American opinions on the relation of the influenza epidemic to meteorological conditions, being abstracts of papers read at the meeting of the American Medical Association in May last.

SOCIETIES AND ACADEMIES.

LONDON.

Entomological Society, August 6.—Captain H. J. Elwes, Vice-President, in the chair.—Prof. Meldola, F.R.S., exhibited a male specimen of *Polyommatus dorilis*, Hufn., a common European and Asiatic species, which had been taken at Lee, near Ilfracombe, in August 1887, by Mr. Latter. At the time of its capture Mr. Latter supposed the specimen to be a hybrid between *Polyommatus phlœas* and one of the "Blues," and had only recently identified it as belonging