

frequent the hollows of logs and tree-trunks, or in open country the crevices of rocks. Stone walls are favourite hiding-places, no doubt on account of the secure shelter they afford. They are easily distinguished from the ordinary house-rat when running about on account of their rufous-grey colour, sometimes of a yellowish tint. The limbs and feet especially being of a dull yellowish shade, there is no difficulty in identifying the animal. It has a wide distribution, and is exceedingly active, running very quickly for short distances, and it is remarkable how easily they can hide in a small crack or fissure in a tree, which apparently seemed too small to accommodate them.

## EXHIBITS.

By Mr. F. G. A. Barnard.—Zeolites, &c., from Clifton Hill Quarry excursion.

By Mr. C. J. Gabriel.—Marine shells found on south-west corner of Coode Island, viz.:—*Cytherea kingii*, Gray, *Chione nitida*, Q. and G., *C. strigosa*, Lam., *Spisula parva*, Petit, *Arca trapezia*, Desh., *Nassa labecula*, A. Ad., and *Natica conica*, Lam.; also the following shells from an excavation on the island:—*Tellina deltoidalis*, Lam., *Pecten medius*, Lam., *Mytilus planulatus*, Lam., *Solen vaginoides*, Lam.; *Trophon paiva*, Crosse, and *Diloma odontis*, Wood.

By Mr. F. Pitcher.—Remarkable growth of Bathurst Burr, *Xanthosium spinosum*, L., from basalt near Melbourne; also fresh specimens of the introduced weed *Euphorbia pepylus*, L., the Petty Spurge, a native of Europe, Western Asia, and Africa, referred to in the current *Naturalist*.

By Mr. P. R. H. St. John.—Specimens of "Blue Peppermint Gum," *Eucalyptus dives*, Schauer, collected about three miles west of Mount Blackwood, 29th May, 1911.

By Mr. J. R. Tovey.—Specimens of Globe Chamomile, *Matricaria globifera*, Fenzl., *Mesembryanthemum angulatum*, Thunb., and *Tetragona decumbens*, Mill., all natives of South Africa, collected at Coode Island; also of *Solanum elaeagnifolium*, Cav., from tropical America, collected in railway reserve, North Melbourne.

By Mr. H. B. Williamson.—Photographs of palms at Cabbage-tree Creek in illustration of paper.

After the usual conversazione the meeting terminated.

THE many friends of the late Mr. O. A. Sayce will regret to learn that his widow passed away on the 24th June, just eight weeks after her husband's death. Her death was to a great extent due to the shock occasioned by the loss of her husband.

## EXCURSION TO SYDENHAM, BULLA, AND DIGGERS REST.

FOURTEEN members of the Club and half-a-dozen geological students from the Continuation School caught the 6.42 a.m. train for Sydenham on Monday, the 24th April (Eight Hours Day), to take part in a geological trip in the neighbourhood of Bulla. The party was increased in number at Bulla by three other members, one of whom had missed the early train and had walked out from Essendon, while the other two had motored out from Brighton. The features examined during the day are to be found on Quarter Sheet No. 7, S.E., of the Geological Survey of Victoria, and some notes as to the geography of the district will be found in the report of an excursion made by the Club some years ago (*Vict. Nat.*, vol. xvii., p. 120).

From Sydenham railway station we walked across to the Saltwater River, taking a course north-westerly along the railway line at first for about a mile, and then almost north across the paddocks for another mile and a half. We first noticed the deeply-sunk valley of the Saltwater River, about 230 feet below the level of the basalt plain. On the outpouring of the basalt sheets the pre-basaltic drainage system was obliterated. The new rivers wandered about on the fairly level basalt plains as they made their way to the sea. This meandering course, once attained, was to a great extent persisted in, the rivers gradually trenching their channels deeper and deeper, until now they flow in a sinuous course at the bottom of very young valleys, which they are still actively corrodng as well as laterally eroding. The basalt of the plains near here is very vesicular, one vesicle we measured being over 15 inches in length. About 400 yards west of the famous "Organ Pipes," which have been so admirably described by Dr. T. S. Hall in the excursion report previously mentioned, were to be seen the tops of partly denuded basaltic columns, showing by the angles they made with the horizontal, that just at this locality a pre-basaltic river channel must once have existed. The sides of this ancient river-channel were mantled with argillaceous sand overlying shales, probably Ordovician in age, having a general northerly strike and a high angle of dip. After viewing the "Organ Pipes," a mass of basalt columns forming a river-cliff on a concave bend of the Saltwater River, we climbed out of the valley and passed over the basalt plain to the north-east for a distance of slightly less than two miles. Here we met with the entrenched meander on Deep Creek figured in Professor Gregory's "Geography of Victoria," on p. 152. This feature is about a mile and a half south of Bulla. Usually, entrenched meanders are due to the revivification of a stream causing a new young channel to be cut down in the



old flood-plains laid down at an earlier stage in its history when it was a more mature stream. But in this case it seems that the river has cut down through a thin capping of basalt on to the Tertiary sands and clays. Through these the stream has corraded its channel into the underlying Palæozoic strata, and not into a previously deposited alluvium. The variation in slope of the valley sides at different heights is noticeable. The highest parts of the valley walls are very precipitous where they consist of basalt, but the lower parts have a gentle slope where they consist of the softer Tertiary sediments. At the north of this meander a tributary valley running along the junction between granitic rock and metamorphosed Palæozoic strata mouthed at a height of about 80 feet above the level of Deep Creek, giving a good example of a hanging valley. The cause of the presence of this valley, as at Werribee Gorge, where a fine example in a syncline is to be seen, is that the tributary rarely has very much water flowing down it, and so cannot corrade its valley at anything like the rate the main stream does. The main stream continues to flow at lower and still lower levels, leaving the tributary to debouch over a ledge as a waterfall at a more and more badly adjusted level. This goes on until the main stream becomes mature, and almost ceases further corradating its valley. The tributary continues gradually corradating its valley until it enters at main stream level, the river system then becoming mature. A hanging valley is always an indication of immature physiographic conditions and of bad adjustment of the various parts of the drainage system. This hanging valley practically marked the boundary between basalt on the upper part, with Palæozoic strata on the lower part of the west side, and granite on the east. The Palæozoic strata consisted mainly of hornfels—a rock the product of intense metamorphism caused by the intrusion of the granite—a plutonic igneous rock. Into these strata had been intruded many small acid igneous tongues and veins from the main plutonic mass. In one case a compact fine-grained granitic apophysis, about 20 feet wide, was examined. This had been squeezed in between the strata along the bedding planes. In the creek-section the amount of dip of the strata is  $65^\circ$ , with a direction E.  $20^\circ$  S., the strike being N.  $20^\circ$  E. The strike of the strata continued, with no deflection whatever, right up to the granite. This seems to point to the conclusion that the plutonic rock, as it came up, quietly ingested and altered the sediments that overlay it, instead of pushing them up into an arch or dome. Daly calls this "magmatic stoping." These highly metamorphosed strata consist mainly of hornfels, a very fine-grained rock consisting of cordierite, secondary brown mica, secondary white mica (sericite), secondary quartz,

tourmaline, and andalusite. On passing west down Deep Creek the hornfels beds gave place to beds of a very tough conglomerate, very much like the Kerrie conglomerate near Riddell. The pebbles were dented in such a way as to show the immense pressures to which these conglomerates had been subjected in consequence of protracted earth movements. From lithological comparisons with similar conglomerates, these are probably of Upper Ordovician age, although they may be basal Silurian. On leaving this spot a traverse was made north for a mile and a half over the granite, whose highest portion stood about 110 feet above the basalt plain around. This granite outcrop must once have been at a much higher level, as evidenced by the huge tors or monoliths left outstanding on the topmost portions. On arrival at the Bulla school-house, Master Moore, son of a local resident, had provided milk and hot water for the party. These were very acceptable, and enabled us to enjoy a cup of tea with the lunches we had brought. After lunch we inspected sections of great masses of kaolinized granite near Bulla. This shows itself to be a much decomposed granite, in which the biotite has completely chloritized, or even become quite bleached, while the quartz remains loosely embedded in a mass of kaolin from the complete hydration and carbonation of the feldspars. This kaolinization may be due to the gradual attack of surface waters bearing carbon dioxide, in which case an analysis of the material should reveal the presence of carbonates. On the other hand, the decomposition of the granite in this area may be due to the operation of vapours containing fluorine, boron, and, perhaps, to a less degree, chlorine, which attack the granite during the latest stages of its intrusion. This process of alteration by hot vapours is known as pneumatolysis, the results being well shown in the carclazyte or kaolin deposits of Cornwall. A recent paper by Mr. J. H. Collins (Q.J.G.S., vol. lxx., No. 258, p. 155) records an interesting example of pneumatolytic action on a granite. With regard to the Bulla area, the kaolinized granite is distinctly local, and seems to have some connection with the fact that it occurs in that portion of the granite which is, or has been, covered by the basalt flows, while the higher portions of the granitic mass, which have presumably never been covered by the basalt, have escaped kaolinization. The process may have begun by carbonated water soaking in along that portion of the granite just overlapped by the basalt, and may have extended downwards, and in under the basalt, from the junction. The apparent absence of fluorite and tourmaline from the kaolinized granite does not favour the pneumatolytic theory, as one would expect to get these minerals formed where hot fluorine, boron, and



chlorine vapours had been acting on the granite. This matter, of course, requires working out carefully before a definite cause for the kaolinization can be assigned. From Bulla we walked almost west for about four miles to the graptolite beds on a natural section formed by a river-cliff on the Saltwater River, about a mile and three-quarters north of Diggers Rest. Here we were successful in procuring great numbers of easily-identifiable graptolites, which showed the rocks to be Upper Ordovician in age. Amongst others, good specimens of the following were obtained:—*Dicranograptus ramosus*, *Dicellograptus elegans*, *Nemagraptus gracilis*, *Diplograptus*, sp., *Climacograptus bicornis*, *Lasiograptus*, sp., *Cryptograptus*, sp., and *Glossograptus*, sp. The beds in which these were obtained consist of dark blue slates striking a little E. of N. and dipping westerly at high angles, varying from 65° to 80°. After spending about an hour at these fossil beds we arrived at the Diggers Rest station in ample time to return in the train that left at 6.37 p.m. for town.

Dr. C. S. Sutton has kindly handed me the following notes on the botany of the outing:—"The members more particularly interested in plant life had good reason to be pleased with their botanical findings during the excursion. The late season had been so favourable that, out of over 100 species noted, quite 40 (most of which, in other years, would not have been so conspicuous) were now in flower; and although by one of us with an experience of 20 years in the locality nothing new was discovered, the occurrence of some species was a pleasant surprise to the others. The plants met with roughly fell into two categories—those on the exposed basalt plains and those in the river gorges. On the basalt the vegetation, which it is safe to say has presented much the same appearance ever since its first establishment, is a grass formation containing also a fair variety of other plants not exceeding it in height, and with a marked absence of tree growth. Similar vegetation, with little variation, also covers the greater part of the other basalt plains extending nearly to the western border of the State. The principal grasses were the 'Wallaby Grass,' *Danthonia penicillata*, and the 'Kangaroo Grass,' *Anthistaria ciliata*, with sparsely-scattered saltbushes, such as the 'Hairy Blue-bush,' *Kochia villosa*, the 'Berry Saltbush,' *Atriplex semibaccata*, the 'Barrier Saltbush,' *Euchylana tomentosa*, and the 'Nodding Saltbush,' *Rhagodia nutans*. Of the other small plants, the 'Yellow Wood-Sorrel,' *Oxalis corniculata*, whose capsules were continuously in evidence, the 'Maiden's Blush,' *Convolvulus erubescens*, the 'Common Rib-weed,' *Plantago varia*, the 'Common Woodruff,' *Asperula oligantha*; and, among a goodly number of Composites, *Vittadinia australis*

*Brachycome calocarpa*, the 'Desert Daisy' (both in flower), and *Lagenophora emphysofus*, the 'Short-scaped Bottle Daisy,' were those most frequently recurring. Of the less common species, *Rutidosia leptorhynchoides*, *Helichrysum rutidolepis*, *Brachycome radicans*, the 'Rooting Marsh-daisy,' *Ptilotus macrocephalus*, the 'Foxtail,' and *Pimelea serpillifolia*, the 'Coast Rice-flower,' were also flowering. The common rock-fern, *Cheilanthes tenuifolia*, was the only one met with here, in the driest places, and far from any rocks. A much more interesting collection of plants was found in the deep, sheltered river gorges. Fringing the waterside at Saltwater River were *Hymenanthera Banksii*, *Callistemon salignus*, the 'River Bottle-brush,' and *Leptospermum lanigerum*, the 'Woolly Tea-tree,' all of which also occurred in the Deep Creek. Among the rocks the little 'Creeping Spurge,' *Euphorbia Drummondii*, and the Sickle Fern, *Pteris falcata*, were collected. The Hop-bush, *Dodonaea viscosa*, the Elder, *Sambucus Gaudichaudiana*, the 'Sea Celery,' *Apium prostratum*, the 'Sweet Tobacco,' *Nicotiana suaveolens*, the 'Indian Weed,' *Siegesbeckia orientalis*, were, except the first, all blossoming. Two alien plants, *Salvia verbenacea*, and the 'Thorn Apple,' *Datura stramonium*, were freely growing near the 'Organ Pipes.' Trees occurring here were the Red Gum, *E. rostrata*, Yellow Box, *E. melliodora*, Ironbark, *E. leucoxydon*, and the Blackwood, *Acacia melanoxylon*. In the Deep Creek the plants were still more varied and interesting. The 'Mutton-wood,' *Myrsine variabilis*, raised itself above the edge of the cliff. Trees, in the shape of those already mentioned and the 'Drooping Sheoak,' *Casuarina quadrivalvis*, were more numerous. The 'Rue Fern,' *Grammitis rutifolia*, was growing robustly and profusely in situations moister than usual. The 'Coast Clematis,' *C. microphylla*, *Bursaria spinosa*, and *Cassinia aculeata*, were also present, and the 'Rosy Storks-bill,' *Pelargonium Rodneyanum*, the Verbena, *V. officinalis*, the 'Austral Indigo,' *Indigofera australis* (all three flowering), and the 'Dwarf Skullcap,' *Scutellaria humilis*, were collected. Crossing the granite country to Bulla, the 'Lightwood,' *Acacia implexa*, was dominant. The little Rat-tail Fern, *Asplenium flabellifolium*, was found in large masses at the bases of the boulders, and the trailing Latrobe Glycine was added to our list. From Bulla to the graptolite beds nothing of special interest was seen, but here again in the Deep Creek our interest was quickened by the appearance of well-grown examples of the 'Murray Pine,' *Callitris verrucosa*, the two *Myoporum*s—the 'Boobialla,' *Myoporum insulare*, and the 'Turkey-bush,' *M. deserti*; the Acacias—the 'Gold-dust,' *A. acinacea*, and the 'Hedge' or 'Kangaroo Acacia,' *A. armata*; the



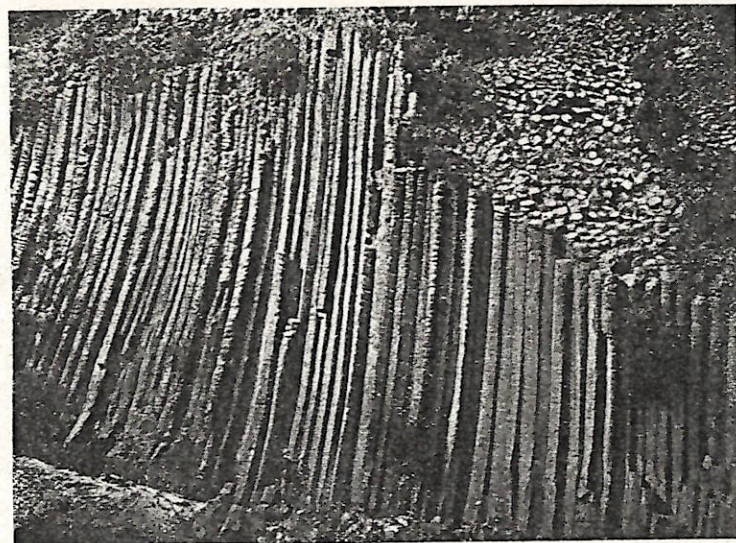
'Hop-bush,' *Dodonaea viscosa*, the Grey Box, *E. hemiphloia*, and last, but by no means least, the charming 'Desert Cassia,' *C. eremophila*. This plant, which is said to have occurred freely along the creek just here, is now only to be seen in situations where it is out of the reach of stock. The 'Coast Twinleaf,' *Zygophyllum Billardieri*, *Eutaxia empetrifolia*, and *Calycotrix tetragona*, mentioned by Mr. C. French, jun., in an account of a previous Club excursion (*Vict. Nat.*, xvii., p. 122) to this creek, were not noticed by us.—C. S. Sutton and P. R. H. St. John."

I am indebted to Mr. J. Twyford for the excellent photographs of the "Organ Pipes" and other features of the excursion exhibited to-night. If the picture of the basalt columns be compared with the plate published in the *Naturalist* of November, 1900 (vol. xvii., p. 120), it will be seen that some alteration has taken place in their appearance during the interval of ten and a half years. The flood waters of the Salt-water River have undermined the bases of several of the columns in the centre of the picture, with the result that the whole columns have slipped down at least thirty feet along the vertical joint planes. This picture should be worth reproducing in the *Naturalist* for the sake of comparison and reference.

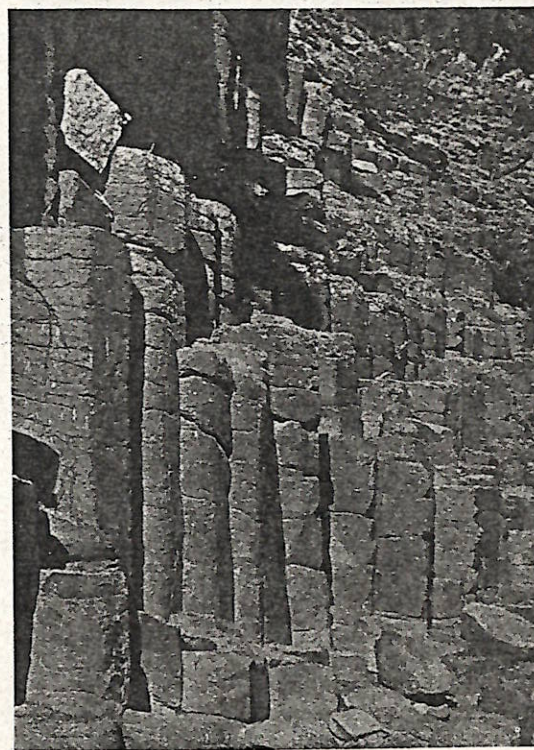
The weather was perfect for such an outing, and altogether I think that, although the walk amounted to nearly fifteen miles, we had a thoroughly enjoyable and profitable day. The botanical members of the party were delighted to find that the season, although autumn, had caused wild flowers to bloom as if it were spring.—R. W. ARMITAGE.

[At the request of Mr. Armitage, the committee decided to reproduce the picture mentioned above, and also a nearer view of some of the columns shown in the lower right-hand corner of the same picture, which clearly illustrates the regular character of the vertical and cross joints, and which eventually become weathered surfaces like piles of cheeses.—ED. *Vict. Nat.*]

An interesting supplement, entitled "Hints on the Cultivation of Trees, Flowers, and Vegetables, and on the General Improvement of School Grounds," was issued by the Education Department with the *May Education Gazette and Teachers' Aid*. It consists of articles by different teachers on the several sections of the subject, prepared under the direction of Mr. J. P. M'Lennan, Supervisor of Agriculture, Education Department. Much of the information given will be found useful by the average amateur gardener.



BASALT COLUMNS, SYDENHAM.



BASALT COLUMNS, SYDENHAM.

(Nearer view.)

Photos. by J. TWYFORD.