9. Fimbristylis, *sp.* Rush, growing densely over soft springs, forming a compact mass.

10. Eragrostis, *sp.* A grass about two feet six inches high.

11. Schoenus, *sp.* Grass, two feet high, in large, strong bunches, growing over the hot springs and through the water.

12. Phragmites Roxburghii, *Kunth.*

Some springs with similar characteristics are found about ten miles north of Gamboola Station, on the Mitchell River, with Pandanus growing very plentifully through them.*

A spring on the Ennasleigh River, about thirty miles from Georgetown, is hot enough to maintain a state of ebullition. This last occurs near a great outflow of lava, and may be accounted for by assigning the same cause to both it and those of the Flinders.

* Mr. Mar, the Government Analyst, reports as follows, on a rather earthy sample of the saline incrustation from these springs :—

	Per Cent.
Soda	.. 37·54
Lime	. 2. 8
Oxide of iron	. 2·19
Sand	.. 31·72

The acids are undertermined, but carbonic acid is chiefly represented. The water of the spring is alkaline carbonated.

THE MOA (DINORNIS) IN AUSTRALIA.

By C. W. DE VIS.

(Plates III. and IV.)

Though now for nearly fifty years it has been known that Australia of yore, like New Zealand of late, was the home of massive flightless birds, our knowledge of that dead race has not hitherto gone beyond the opening stage. The existence of one such bird in our post-pliocene age was first declared in the year 1836 by Sir Richard Owen. His judgment was delivered upon a thigh bone, 13 inches long, from the Wellington Valley, so broken, crushed, and cased by its stony matrix that nothing could be said of it more than that it had belonged to a large bird of the Ostrich family. Thirty-three years subsequently Queensland yielded up from a well sunk on the Peak Downs another

struthious femur, and one sufficiently well preserved to enable Sir Richard Owen to discern its affinities and make it the subject of a memoir in the transactions of the Zoological Society of London for 1873. As the result of that examination the ancient bird of Australia was pronounced to be more nearly akin to the living Emu than to the extinct Moas of New Zealand, to which it had been previously referred by the late Mr. Krefft; and the enquiry so encouraged Sir Richard Owen in the opinion which he had long held, namely, that the struthious types of New Zealand had never extended to the adjacent islands, much less to the far away continent of Australia, that he added in a foot-note (Trans. Zool. Soc., vol. viii., pt. 6, 383) "I can now in 1872 repeat with more confidence the remark in my memoir of 1846, "no remnant of a Dinornis has yet been found in any of the contiguous islands, and I have in vain searched for such in the post-pliocene fossils of Australia." It appears to be beyond dispute that the bone which led Sir Richard Owen to maintain that the occurrence of a Dinornis in Australia would be so exceptional an extension of the New Zealand fauna as to be looked upon with doubt, does in its external characters more resemble a bone of the Emu, Dromœus, than of the Moa, Dinornis, but, in all diffidence, it may be questioned whether in naming this bird Dromornis, (Emu bird), the describer did not too greatly subordinate the important structural difference between the fossil bone and that of the Emu, the comparative absence of an air chamber in the former, for this certainly points to a lower grade of the whole bird economy, such as obtained in the Moas, but is left behind by the Emus. That the bird was not a Dinornis is quite clear, but that it was so foreign to Dinornis as to make it probable that Dinornis would never be found in Australia is not equally clear. However that may be, the palœontologist has ever since the discovery of Dromornis been expectant of other low forms of the Struthionidœ among the bird relics of our bone-bearing drifts, since it is hardly probable that so vast an area inhabited at the present time by at least three ostrich-like birds should in older and more prolific days have nurtured but one. It was therefore with more interest than surprise that part of a struthious femur was recognized in a collection of bones from King's Creek, presented to the Queensland Museum by Mr. J. Daniels, late of Pilton. Surprise, however, took the upper hand when, as the little adhering matrix was removed from the bone, Dinornine characteristics grew apparent. But it is not easy to rid ourselves at once of the preconception that a bone such as this is more likely to a be third

example of the femur of Dromornis than anything else. It is therefore a matter of regret that a cast of the Dromornis femur cannot be placed, for purposes of comparison, beside the fossil under examination. The original is in the Sydney Museum, and Mr. Haswell courteously regrets that he has not a facsimile at command. However, in the figure given of it by its describer, we have a sufficient corrective to any bias in favour of its identity with the fossil before us. This bone is in much the same peculiar state of mineralization as the great majority of the Darling Downs fossils. It consists of somewhat more than the upper third of the left femur, minus the upper part of the head (h) and trochanter (t.ma.) These have been lost by abrasion while projecting above the surface of the creek bed. It measures five inches in breadth anteriorly from the head to the lower end of the great trochanter, four inches posteriorly from the head to the upper angle of the trochanter, and five inches externally across the trochanter. These are precisely the measurements yielded by a specimen of Dinornis crassus, *Owen*. The shaft, at its place of fracture, is rather more rounded than in D. crassus, measuring two inches two lines in breadth, and half an inch ten lines in fore and aft thickness. Its section is a full, irregular oval, as in D. elephantopus, very dissimilar to the pure oval of Dromornis, but somewhat less unlike that of the emu's femur, in which the inner side is rather more convex than the outer. The base of the head presents a strong annular constriction (a.c.) which, as in Dinornis, renders the head quite distinct from the neck (n.), and contrasts it with the subsessile heads of Dromœus and Dromornis. The depression for the ligamentum teres is in the emu scarcely perceptible, the ligament in this bird being attached to the centre of the almost continuously convex articular surface of the head; behind it a smooth concave tract slopes down towards the pneumatic foramen. In Dinornis crassus there is a subcentral pit nearer to the hinder part of the periphery of the head, and excavated to a moderate depth. In the fossil (L. ter.) it is in a similar position, but deeply sunken, and its hinder edge is raised into a rough ridge. In neither D. crassus nor in the fossil is there a concave slope behind the ligament pit. The neck (n) of our subject is distinctly longer and narrower than in D. crassus, and consequently more divergent in both respects from that of Dromœus. The neck at its junction with the epitrochanterian surface (ep. t.) is far more deeply hollowed than that in the emu, and therefore conspicuously unlike that of Dromornis, in

which the upper outline is nearly horizontal. The saddle so formed is in fact more deeply seated than in D. crassus. The outer surface of the trochanter (ect. t.) is nearly flat, devoid of the submarginal convexity shown in Dromœus, and the muscular attachments (m) are in two shallow depressions raised above the level of the bone by tubercular outgrowth, as in Dinornis, instead of into two excavations from the surface, separated by a bridge, as occurs in the emu. The mode of origin of the great trochanter of the fossil strongly resembles that of the moa—it rises abruptly from the shaft, and forms immediately a prominence, which curves over towards the inner aspect of the bone, and overlooks the markedly concave anterior surface between it and the head. In the subject of Sir R. Owen's figure of Dromornis the form of this surface is obscured by mutilation, but in the recent Dromœus it is comparatively flat and the trochanter rises from the shaft by a gradual and smoothly rounded increment; and it is only near its upper end that it forms a re-curved edge. The large air channel into the interior bone of the Emu, so intimately connected with the excursive habits of the typical birds, is wanting in all the fossils under consideration, but in the moa and in our fossil alike it is foreshadowed by three small foramina just beneath the hinder edge of the neck. Commensurate with these feeble means of communication with the outer air the internal chamber (*cav.*) is but feebly developed within the substance of the shaft. The linear dimensions of its section are less than a fourth of those of the whole section enclosing it. In Dinornis the lesser trochanter is hardly appreciable, it is represented by a mere thread on the surface of the shaft; in the Emu it is a well-developed outstanding ridge. The upper part (*t. mi.*) of this linea aspera, as it exists in the Moa, is preserved in the fossil. There is in Dinornis a large oval rugosity for muscular insertion nearly in the centre of the inner and concave surface between the head and the origin of the trochanter major (*t.ma.*) This feature also is very evidently repeated in the Australian fossil, whereas in the Emu we perceive but a faintly rough surface much nearer to the head. In an ordinary case it would have been sufficient to point out the several characters of the object under review in order that we might arrive at a judgment upon its systematic claims, but since those claims tend to modify the experience of the most eminent of modern palæontologists it is expedient that we should briefly revert to the grounds on which they appear to rest. The chief particulars in which the femur in question differs from that of Dromornis, are a long

sloping neck, constricted at its junction with the head, a full and irregularly oval shaft and a broad outer trochanterian surface. These are precisely the characters by which the corresponding part of the thigh bone of Dinornis is differentiated by Sir R. Owen from that of Dromornis, and in all of them our fossil agrees almost exactly with the femurs of D. crasus and D. elephantopus. It is needless to recapitulate its differences from Dromæus since the divergencies of Dromæus from Dromornis are but exaggerations of those of the latter from Dinornis. With Dinornis in direct comparison it agrees not only in the salient features referred to, but in most of its subordinate characters, for example, in the linear condition of the lesser trochanter, (*t. mi.*) and the three foramina beneath the hinder edge of the neck. At the same time our fossil has distinguishing marks of its own. Of similar dimensions to D. crassus and similar massive form to D. elephantopus it differs from the former sufficiently in its slenderer head and neck and deeper saddle between the head and trochanter, and from the latter abundantly in detailed measurements. These differences from its nearest allies taken in conjunction with its continental habitat, leave us, we may conclude, no alternative but to regard it as specifically distinct from any Dinornis on record. Its habitat emboldens us to propose for it the name D. Queenslandiæ not with any idea that it was a species restricted in its range to north-east Australia, but merely that the name, like that of Nototherium Victoriæ, may remind us of the colony that gave the first hint of its existence.

The moas have lived in New Zealand almost down to our own days, and the presence of Dromornis and Dinornis in Australia shows that on the main land this heavy-limbed branch of the struthious stock is comparatively ancient. It has, indeed, a molluscan longevity. It was a contemporary of fresh water shells which were here before the surface of the land was modernized, and are here now while we examine the feathers and tendons of the last of the moas. The Australian species were in all likelihood exterminated long ages ago, for we nowhere find their remains strewed and heaped on the surface, nor their destruction traceable to human agency. The absence of carnivorous mammals has been held sufficient to account for their longer survival in New Zealand, but how is that absence itself to be explained, more especially now that we find on the continent bones of Dinornis, Thylacinus, Sarcophilus, and of the dog lying in apparently the same drift. The migration of the beasts of prey was surely as easy as that of the sluggish, wingless birds.

Have New Zealand and Australia, or at least its eastern ranges, ever been parts of the same land, with a fauna like that of New Zealand? Geology is as yet far from favouring the supposition, which moreover would compel us to assign to the moas an enormous duration. We must await more light. Meanwhile it is not without interest that we see so distinct a breach open in the wall of exclusiveness surrounding the New Zealand fauna.

TUESDAY, 11TH MARCH, 1884.

THE VICE-PRESIDENT, J. BANCROFT, M.D., IN THE CHAIR.

DONATIONS.

"Transactions and Proceedings of the Royal Society of South Australia," vol. vi., Adelaide, 1883. From the Society.

"Journal and Proceedings of the Royal Society of New South Wales," vols. xiv., xv., xvi., Sydney, 1881-1883. From the Society.

The following papers were read :—

WATER SUPPLY: SPRINGS AND THEIR ORIGIN.

By JOHN FALCONER, C.E.

(PLATES V. to X.)

CLASS I.—Natural Springs caused by the inclination and dislocation of the Strata.

SPRINGS of this class exist in the Cape Colony, on the inner slopes of the Main Range (plate V. fig. 1) which is situated about the same distance from the sea as the Coast Ranges in this Colony. In the Cape of Good Hope the sedimentary rocks dip from the high table land in the interior of the Continent towards the Coast Range, and about one hundred miles from the top of this Range the formation commences to rise again, thereby damming the water back into the strata. Part of this water finds its way to the surface through dislocations at the change of inclination,