of fuchsin and had been experimentally investigated with great power by Kundt.[1]

Sellmeier himself somewhat marred[2] the physical value of his mathematical work by suggesting a distinction between refractive and absorptive molecules ("refractive und absorptive theilchen"), and by seeming to confine the application of his formula to cases in which the longest of the molecular periods is small in comparison with the period of the light. But the splendid value of his formula for physical science has been quite wonderfully proved by Rubens (who, however, inadvertently quotes[3] it as if due to Ketteler). Fourteen years ago Langley[4] had measured the refractivity of rock-salt for light and radiant heat of wave-lengths (in air or ether) from ·43 of a mikron to 5·3 mikrons (the mikron being 10^{-6} of a metre, or 10^{-4} of a centimetre), and without measuring refractivities further, had measured wave-lengths as great as 15 mikrons in radiant heat. Within the last six years measurements of refractivity by Rubens, Paschen, and others, agreeing in a practically perfect way with Langley's through his range, have given us very accurate knowledge of the refractivity of rock-salt and of sylvin (chloride of potassium) through the enormous range of from ·4 of a mikron to 23 mikrons.

Rubens began by using empirical and partly theoretical formulas which had been suggested by various theoretical and experimental writers, and obtained fairly accurate representations of the refractivities of flint-glass, quartz, fluorspar, sylvin, and rock-salt through ranges of wave-lengths from ·4 to nearly 12 mikrons.[5] Two years later, further experiments extending the measure of refractivities of sylvin and rock-salt to radiant heat of wave-lengths up to 23 mikrons, showed deviations from the best of the previous empirical formulas increasing largely with increasing wave-lengths. Rubens then fell back[6] on the simple unmodified Sellmeier formula, and found by it a practically perfect expression of the refractivities of those substances from ·434 to 22·3 mikrons.

And now for the splendid and really wonderful confirmation of the dynamical theory. One year later a paper by Rubens and Aschkinass[7] describes experiments proving that radiant heat after five successive reflections from approximately parallel surfaces of rock-salt and again of sylvin, is of mean wave-length 51·2 and 61·1 mikrons respectively. The formula which Rubens had given in February 1897, as deduced solely from refractivities measured for wave-lengths of less than 23 mikrons, made μ^2 negative for radiant heat of wave-lengths from 37 to 55 mikrons in the case of reflection from rock-salt, and of wave-lengths from 45 to 67 mikrons in the case of reflection from sylvin! (μ^2 negative means that waves incident on the substance cannot enter it, but are totally reflected).

A FOURTH SPECIMEN OF "NOTORNIS MANTELLI," OWEN.

NATURALISTS in New Zealand have this week been thrown into a great state of excitement by the capture of the fourth entire specimen of this very rare flightless Rail.

On August 8 I received a telegram informing me of the acquisition, and asking advice as to its preservation. Fortunately, a skilled taxidermist is attached to the Otago Museum, and I was able to arrange that the bird should be sent to that institution: it arrived two days later, and its remains are now in my care.

The last specimen of *Notornis* was captured twenty years ago; and it was almost universally considered by Maories, as well as by whites, to be extinct; hence the interest that attaches to the present specimen.

It may not be uninteresting to naturalists at home to be reminded of some facts in the history of *Notornis* as recorded in Buller's "Birds of New Zealand." The name was originally bestowed by Owen on some fossil bones discovered in the North Island, New Zealand.

Some years later (1849), Mr. W. Mantell was able to secure a freshly killed specimen, taken in the south-west of the Middle Island (the southern of the two main islands of New Zealand). This bird, the skin of which is in the British Museum, was declared by competent ornithologists at home to be identical with the fossil form. The second specimen was killed by Maories in 1851, and its remains are also in the National Collection. The third specimen was obtained nearly thirty years later, in 1879, and was purchased for the Dresden Museum. (From an examination of the bones Dr. A. B. Meyer declared it to be distinct from the fossil form, and named it *N. hochstetteri*.) These three specimens were killed at three spots about 100 miles apart, in very rugged country. Later, an incomplete skeleton was discovered, which is at present in the Otago Museum.

The bird recently killed is thus the fourth specimen seen in the flesh, and its future fate is at present uncertain. It was killed by a dog in the bush adjoining Lake Te Anau, in the same district as the other three specimens.

I have examined and made sketches of its viscera, which, like all parts of the bird, are carefully preserved for the owner. The specimen is a young female, in excellent health and splendid plumage.

During the present month I have been fortunate enough to obtain, on deposit, an egg of the Moa—the third or fourth, I believe, in anything like a complete condition. Although the egg is much broken, one side remains practically complete; the pieces of the other side had fallen inwards, and are embedded in the sand within the shell. The egg was discovered in a sandy deposit, and when it reached me was partially enveloped in sand. This has been removed, as far as safety would permit, from the more complete side of the egg, and the whole was thoroughly soaked in weak gelatine to bind sand and shell together. The specimen closely agrees in size and shape with the cast, which is familiar in all museums, and alongside of which it is now on exhibition. As in the case of the eggs previously discovered, it was one of a pair; the other was unfortunately broken, on handling, by those concerned in its excavation.

W. BLAXLAND BENHAM.

Dunedin, August 14.

A LIVING REPRESENTATIVE OF THE OLD GROUND-SLOTHS.

ALL naturalists will unite in congratulating Señor Florentino Ameghino on the remarkable discovery it has been his good fortune to make. It appears that several years ago he was informed by Ramon Lista—a traveller in Patagonia—of an encounter with a strange nocturnal beast, which, after being fired at and apparently hit, succeeded in escaping unharmed. It was described as like an Indian pangolin in size and form, but with the skin covered with greyish red hairs instead of scales; and from the rapidity with which it disappeared among the bushes, seemed to have been an animal of comparatively active habits. Till quite recently, nothing more had ever been heard of the strange creature seen by Lista in Santa Cruz; most of those to whom the story

1 Kundt, *Pogg. Ann.*, vols. 142, 143, 144, 145, 1871–72.

2 *Pogg. Ann.*, vol. 147, 1872, p. 525.

3 *Wied. Ann.*, vol. 53, 1894, p. 267. In the formula quoted by Rubens from Ketteler, substitute for $\mu\infty$ the value of μ found by putting $\tau = \infty$ in Sellmeier's formula, and Ketteler's formula becomes identical with Sellmeier's. Remark that Ketteler's "M" is Sellmeier's "$m\kappa^2$" according to my notation in the text.

4 Langley, *Phil. Mag.*, 1886, 2nd half-year.

5 Rubens, *Wied. Ann.*, vols. 53, 54, 1894–95.

6 Rubens, *Wied. Ann.*, vol. 60, 1896–97, p. 454.

7 Rubens and Aschkinass, *Wied. Ann.*, vol. 64, 1898.

was narrated receiving it with more or less marked incredulity.

A short time ago, however, Señor Ameghino was shown a number of fresh ossicles from Patagonia, of somewhat smaller size than coffee-berries, which he at once recognised as comparable with the somewhat larger bones commonly found in association with the remains of certain species of *Mylodon* from the pampean deposits of the Argentine, and which have always been regarded as indicating the presence of a dermal armour in those animals. These ossicles, it appears, were extracted from a badly preserved body-skin, which seems to have been exposed for some time to the action of the weather, and consequently to have become considerably discoloured. In thickness this skin measured about two centimetres; and its hardness and toughness were such that it could be cut only with a chisel or hatchet. In its deeper layer were embedded the ossicles; and in those places where it was least damaged it was covered with coarse reddish grey hair, from 4 to 5 centimetres in thickness.

The skin evidently belonged to an animal hitherto unknown to science; and, in spite of the absence of the limbs, the presence of the ossicles seems to afford decisive evidence that it indicates an existing small representative of the ground-sloths, more or less intimately related to the typical group of the genus *Mylodon*. Moreover, in the colour of the hair it agrees with Lista's description of his unknown animal, which he confidently asserted to be an Edentate. Señor Ameghino seems, therefore, to be fully justified in regarding the two specimens as pertaining to one and the same species, and that species to be a living representative of the *Megalotheriidæ*, hitherto known only in the fossil. For this animal the name of *Neomylodon listai* is proposed, but the specific title should be amended to *listæ*.

Dermal ossicles are only known to be developed in certain species of *Mylodon* and *Glossotherium*, and have not been detected among the remains of the smaller ground-sloths characteristic of the Patagonian formations. The presumption accordingly is that the new animal is more or less closely allied to these genera, from which, indeed, its right to distinction has yet to be demonstrated.

This animal is doubtless nocturnal, and also of rare occurrence, and some time may therefore probably elapse before a perfect specimen is obtained. Till that event happens naturalists must be content with the fact that a survivor of the old ground-sloths exists in the interior of Patagonia.

REPORT ON A NATIONAL PHYSICAL LABORATORY.

THE Committee appointed in August, 1897, to consider the desirability of establishing a National Physical Laboratory have issued their report. The Committee consisted of Lord Rayleigh, F.R.S. (chairman), Sir Courtenay Boyle, K.C.B., Sir Andrew Noble, K.C.B., F.R.S., Sir John Wolfe Barry, K.C.B., F.R.S., Prof. W. C. Roberts-Austen, C.B., F.R.S., Mr. Robert Chalmers, Prof. A. W. Rücker, F.R.S., Mr. Alexander Siemens, and Dr. T. E. Thorpe, F.R.S. The questions referred to them were as follows:—

"To consider and report upon the desirability of establishing a National Physical Laboratory for the testing and verification of instruments for physical investigation; for the construction and preservation of standards of measurement; and for the systematic determination of physical constants and numerical data useful for scientific and industrial purposes—and to report whether the work of such an institution, if established, could be associated with any testing or standardising work, already performed wholly or partly at the public cost."

The following are extracts from the report of the Committee:—

In general, the committee are of opinion that the appliances and facilities of the Standards Office and of the Electrical Standardising Laboratory are fairly adequate for the performance of their statutory duties. They understand, however, that on account of the want of means for the chemical analysis of the materials used in the construction of standards, those offices would find some difficulty, without extraneous assistance, with regard to any new standards that might be required.

They further desire to point out that many physical constants and data and numerical expressions are necessarily used in connection with standards and the standardising of instruments. Some of the data now in use at the Standards Office are known to require correction, and in the case of others further investigations appear to be desirable. There is, however, no legal obligation on the Board of Trade to establish new data and numerical expressions, and, in consequence of the smallness of the staff of the office the work of the Department is limited to that which is strictly enjoined by the Acts of Parliament. The Department is at the present time chiefly dependent for more exact knowledge on such investigations as may be undertaken at the Bureau International des Poids et Mesures at Paris, or by foreign institutions similar to that contemplated in this country.

There is much evidence that further facilities are needed by the public for standardising and verifying of instruments, both for scientific and commercial use; and also that it would be of great benefit to trade if means were provided for the public testing of the quality of certain classes of materials. In particular the committee desire to draw attention to the evidence which has been laid before them as to the difficulties arising in certain Government departments in their dealings with contractors and others which might be overcome by the establishment of an independent testing authority. It would neither be necessary nor desirable to compete with or interfere with the testing of materials of various kinds as now carried out in private or other laboratories; but there are many special and important tests and investigations into the strength and behaviour of materials which might be conducted with great advantage at a laboratory such as is contemplated in the reference. As illustrations we may mention investigations into the behaviour of metals and other substances under continuous or alternating stresses, which investigations are not, so far as we know, conducted at the present time at any testing institution in this country, and which could only be undertaken with satisfactory and authoritative results at a public laboratory.

For many years the testing of certain instruments has been carried out at the Kew Observatory under the direction of the Kew Observatory Committee of the Royal Society. There is much evidence that the existence of these tests has been of great benefit to both science and industry. On the one hand it enables the maker to give, or the purchaser to obtain, an independent and trustworthy statement as to the quality of the instrument. On the other hand, the existence of the tests has led in many cases to a marked improvement of the instruments; and similar results may be anticipated by an extension of these facilities to other branches of industry.

The Kew Observatory is a Government building leased to the Royal Society at a nominal rent, situate in the Old Deer Park, Richmond, which is Crown property. The institution has no endowment, the Gassiot Fund producing about 470*l.* per annum. From the Meteorological Office it receives annually 400*l.*, part of which is the ordinary grant made to a first-class meteorological station, the remainder being for scientific assistance. The fees received for the verification and testing of instruments amount to about 2000*l.* per annum. The institution is self-supporting, and has usually a small annual balance which is devoted to scientific investigation and to the extension of the work, including the erection of new buildings, when required. The funds at the disposal of the Observatory Committee are, however, quite inadequate to any considerable extension of its operations. The work done with restricted means has been very useful. The total number of instruments annually verified or tested is about 22,000. Among these are included watches, thermometers, sextants, barometers, and other apparatus used for scientific or industrial purposes. Evidence was given of the beneficial effect which Kew has exerted on the watchmaking trade, and it is noteworthy that this is due to the introduction of tests for which there was little or no previous demand on the