and, as for *Dactylopius vastator*, I trust the danger is over, as we have already sent several colonies of its enemies."

When the late Agricultural Conference was sitting here I endeavoured to bring this question of scale parasites before it, and I understand that a resolution was again passed asking the Government to appoint "an entomologist." In Auckland lately a similar conference passed a similar resolution; but there they went further, and suggested that a certain gentleman should be so appointed. I have not the least desire to make any ungracious remarks, nor have I a word to say against that gentleman as an entomologist, but it is my duty to repeat what I said three or four years ago in my memorandum to the Minister of Lands: there is not in New Zealand an entomologist of the kind required for this purpose. Either the thing is worth doing properly or it is not worth doing at all. The Hawaiian people think it worth their while, and they import a trained expert. Their example should be a lesson for New Zealand.

I regret very much to inform the Society that the leading economic entomologist of the world, Dr. C. V. Riley, of Washington, has lately been obliged, from ill-health and other causes, to resign the position of head of the United States Agricultural Department in that branch. Dr. Riley is one of the honorary members of the New Zealand Institute. Farmers and cultivators of every kind in every country of the globe owe him a great debt of gratitude for what he has done for them in the last thirty years, and I am sure that this Society, although not personally acquainted with him, will join with me in feeling deep regret that the official services of so ardent a friend to all agriculturists should for the future be lost to the world.

Art. XXXIII.—*On the Anatomy of Flight of certain Birds.*

By Sir James Hector, F.R.S.

[*Read before the Wellington Philosophical Society, 25th July, 1894.*]

The mechanism of the flight of birds is an attractive subject, and its various modifications afford some of the strongest arguments in favour of the views of those who hold that the structure of animals is wonderfully plastic. It is beyond doubt that the outward form and even the internal structure of birds changes readily under the constraint of changing environment and function, as, for instance, in domestic poultry. I have recently made two observations which may be worthy of record, as throwing further light on this subject.

1. THE ANTIPODES PARRAKEET (*Pezoporus fairchildii*).

A comparison has been made of the structure of the sternum and scapular appendages with those of the red-topped parrakeet, which is also found in the Antipodes Island, but is conjectured to have been a more recent introduction. The anatomical peculiarities bear out this view. In the New Zealand form, which is smaller in size, the sternum has a larger keel, but the marginal area external to the supporting ridge is largely developed, while in the Antipodes Island form this marginal area is almost wanting. On the other hand, the body of the sternum is more massive, broader, and more complete than in the New Zealand red-topped *Platycercus*, the large foramina being almost obliterated. The shape and angle of articulation of the acromions and scapulæ are the same in both, but there is a marked difference in the representative of the clavicles. The true furculum formed by the thorough anchylosis of the clavicles in the mesial plane is well known to be totally absent in *Platycercus* and its allies, but it is represented in some forms, such as *Pezoporus*, or the ground-parrakeet of Australia, by a band of fibrous tissue that braces the sternum to the distal extremity of the coracoid, thus supporting the articulation of the wing. It thus performs one function of the furculum, but not its chief function, which is that of a powerful spring, reacting against the downward stroke of the wing in powerful flight.

Now, in the Antipodes Island parrakeet there is a marked development of the fibrous bond between the sternum and the coraco-humeral articulation, and, following in the same direction, we find in the kakapo (*Stringops habroptilus*), which is a parrot without proper flight, that the keel of the sternum is almost obliterated, while the fibrous sterno-coracoid has been enormously developed and ossified, so that it forms a wide bony process, which on each side is attached to the sternum. If, as is probable, and has always hitherto been accepted, these processes represent clavicles, then it must be conceded that this clavico-sternal form of articulation more resembles that of animals which use the fore-limb for progression by thrust rather than by flight.

If this view be correct, there is good ground for supposing that the Antipodes Island parrakeet is an ancient form which has in some degree lost its power of flight, and has degenerated toward the condition of the kakapo.

2. WING-BONES OF THE ALBATROS.

The means by which the albatros maintains its remarkable flight for long periods and at all various angles to the wind without any apparent recovery of its initial velocity by the flapping of its wings has been the subject of much controversy. It has always appeared to me that it might not be altogether a subject in the domain of mathematical physics, as has been assumed, but rather that it might be a difficulty for the anatomist to solve with his scalpel. In 1871 I made some attempts, assisted by my friend Sir Walter Buller, to dissect, after injecting the arteries and veins, the wing of the albatros, conjecturing that, as such birds are rarely obtained in the flesh in the Northern Hemisphere, some structural differences might have escaped notice. We were not very successful on that occasion, excepting that I believe we discovered that the long tendon extending from the extensor muscles that control the folding-up and expansion of the wing (*extensor plica alaris*) terminated in tendinous fibres which, supplemented by muscular fibres, grasped the quills of the large pinion-feathers, and might perhaps impart to them a reciprocal motion like the feathering of an oar.

It was difficult to conceive how these muscles could perform two such difficult functions as were involved in the expansion of the wings as a whole and at the same time to exercise a control over its distal appendages. I was therefore not surprised when the result of the dissection of several fine specimens in the flesh preserved in spirit, and which I submitted through Sir Walter Buller to authorities in London, pronounced against there being any anatomical structure present.

Lately I have had an opportunity of re-examining the wing of a large albatros in the flesh, and find the following peculiarities, which, so far as I know, have not been hitherto recorded: The extensor muscular tendon, instead of being attached as in other birds only to a fixed process at the distal extremity of the humerus, is also attached by a subsidiary offset to a projecting patelloid bone which is articulated with the process, and thence proceeds to the radial carpal bone, and thence onward along the radial aspect of the manus, where it expands into fibrillæ that embrace the quills. When the wing is fully extended the thrust of this projecting process on the elbow-joint causes a slight rotation of the ulna on the humerus, so that the joint becomes locked, which renders the wing a rigid rod as far as the wrist-joint. At the same time the slight play permitted by the articulation of the patelloid bone on the process allows of the transmission of the muscular pull from the shoulder to the manus without unlocking the joint. By this mechanism the sustaining diameter of the bird is enormously increased without any increase of weight. In an albatros of ordinary size the rigid surface presented to the atmosphere like a parachute would have an extension of 10ft. Beyond this on either side is the true efficient pinion of the bird, erroneously called the tip of the wing, which, as all who have closely watched the flight of this wonderful bird know, is ever in motion, sometimes flapping on the surface of the sea as it dips to a wave, or elevated as it turns in the force of the gale, and, though no doubt difficult to observe, it is in constant quiver of slight rotation of the broad plumes, opening and closing like Venetian blinds. We have in the mechanism thus described a sufficient source to sustain the prolonged, and to the casual observer apparently effortless, flight of the albatros. The locking of the elbow-joint in the albatros is exactly analogous to the locking of the knee-joint of the human skeleton by which man maintains without fatigue that erect attitude which proclaims his supremacy.

It is very much to the point that the only other bird which posseses a patelloid bone controlling the elbow-joint as the patella does the knee-joint is the penguin, and in this case the wing-bones have also to be kept rigid during the penguin's flight under the water.

Art. XXXIV.—*Further Contribution to a Knowledge of the New Zealand Sponges.*

By H. B. Kirk, M.A.

[*Read before the Wellington Philosophical Society, 28th November, 1894.*]

Plates XXIV.-XXVI.

In my former paper on New Zealand sponges I expressed an intention of describing the New Zealand sponges in something like their natural order. I think it best, however, to describe at once the two very interesting sponges that form the subject of this paper. I also abandon the intention of copying, except in rare instances, the descriptions of New Zealand sponges already published.

Sycon dendyi, n. sp. Plate XXIV.

The genus *Sycon* is thus defined in Dr. Dendy's "Synopsis of the Australian Calcarea Heterocœla": Sycettidæ with "radial chambers not inter-communicating; articulate tubar skeleton; the distal ends of the chambers provided each with a tuft of oxeote spicules."

The definition above given, taken with that of the family Sycettidæ, did not contemplate the inclusion of such a sponge as forms the subject of this paper—a sponge that has a well-developed cortical skeleton of large oxea, through which the