Otidiphaps cervicalis, *Ramsay*, *Proc. Linn. Soc. N. S. W.* vol. iv. p. 470. No. 7. Taburi district. "Keo." Eyes red. "This ground-bird is only found inland, in high country. It has a long plaintive note in calling, which, when imitated, brings him towards one. He then stalks to and fro, with tail erect and spread, challenging the intruder. When disturbed he will fly into low trees and bushes, but is quickly away again. The nest is composed of a few twigs, scraped together at the foot of a large tree in a sequestered place." [*A. G.*]

The eggs sent by Mr. Goldie, two in number, were, as might have been expected, pure white.

Talegallus pyrrhopygius, *Schlegel.*—Talegallus (Æpypodius) pyrrhopygius, *Oustalet*, *Ann. Sci. Nat. Zool.* 1881, p. 41. No. 174. Choqeri district. "I-hu-hu." "Eyes dark brown; legs yellow, but dark brown in front; bare skin about the head livid, like Common Turkey. When obtained, the skin was light, with yellow, pinkish, and blue colours (faint) about it. These birds were obtained in exceedingly rough country, and flew into a low tree when disturbed. The nest is, like that of the Common Turkey, composed of leaves, but smaller, being only about 6 feet in diameter and 3 feet in height." [*A. G.*]

Megapodius Duperreyi, *Less.*; *Oustalet*, *Ann. Sci. Nat. Zool.* 1881, p. 77. No. 84. Choqeri district. "Rabugodi."

Tigrisoma heliosylos (*Less.*); *Salvad. Ann. Mus. Civic. Genov.* xiv. p. 133. No. 98. Choqeri district. "Essagi." Legs yellow. [*A. G.*]

On the Genus *Pleurechinus*, L. Agassiz: its Classificatory Position and Alliances. By Professor P. Martin Duncan, M.B. (Lond.), F.R.S., F.G.S., &c.

[Read June 15, 1882.]

Pleurechinus, a genus of the Temnopleuridæ, was established by L. Agassiz, in his monograph on the 'Echinodermes Scutelles,' in 1841. It included the species *Pleurechinus bothryoides*, Agass. (1841); and the following is the diagnosis of the genus given in the 'Revision of the Echini' (p. 464) by Alexander Agassiz:—

"Echini resembling *Temnopleurus*, but having a more ovoid outline, with simple pores arranged in straight or undulating lines. Actinostome small, scarcely cut. Tubercles imperforate,

indistinctly crenulated. The sutural impressions in the shape of deep disconnected pits, occurring not only in the angles of the plates, but sometimes three or four, even six, in a horizontal suture."

The species *Pleurechinus bothryoides*, L. Agassiz, was founded on a solitary specimen, which has a denuded test. A. Agassiz states, in the 'Revision,' p. 465 :—"It is unfortunately in such a condition that no specific description of any value can be made, and I can do nothing except to call attention to the species, totally unlike, as far as it goes, any other species of Temnopleuridæ known to me." There are four deep disconnected pits of about equal size along the sutures of the plates above the ambitus, and there are two pits in the ambulacral area. The poriferous zone is narrow and undulating. In the interradial areas, the primary tubercles form three vertical rows and are of uniform size; there are two outer rows of smaller tubercles separating the pits from the poriferous zone. The pits in the interradial areas are separated by the primary tubercles. In the ambulacra there are two principal outer vertical rows of primary tubercles, and two irregular median vertical rows of smaller tubercles. The test of the species is quite high, ovoid, with an outline recalling somewhat *Amblypneustes*.

Other forms were confounded with this species; but it is quite clear that no more than four pits occur in horizontal series in the interradials, and two in the ambulacra. The condition of the specimen probably prevented a distinct statement regarding the crenulation of the tubercles. The specimen was wrongly stated to have been derived from the Galapagos Islands; but Alex. Agassiz very properly remarks that it must have come from the East-Indian archipelago or the Philippines.

Alex. Agassiz states * that "this genus corresponds to the genus *Opechinus*, Desor, which was established to receive several very characteristic fossil species of Temnopleuridæ, which D'Archiac and Haime distributed in *Temnechinus* and in *Temnopleurus*." In order to clear the way for placing the genus *Pleurechinus* in its proper position, and to give it a proper classificatory value, it is necessary to consider this statement first of all.

Opechinus, Desor (1858), includes the above-mentioned Echini described by D'Archiac and Haime, and a small specimen forming

* 'Revision of the Echini,' p. 465.

the species *Opechinus percultus*, Desor, from the tertiaries of Java.

With regard to the Echini described by D'Archiac and Haime in 'Les Animaux fossiles de l'Inde,' the types of which are in the collection of the Geological Society, the condition of preservation is wretched; and those distinguished naturalists, in order to convey their meaning to their artist, inked the surface of the tests. Hence every depression along the sutural lines seems to be of great importance. Specimens of so-called Temnopleuridæ from the same geological horizon, now in course of description and publication by Percy Sladen, F.G.S., and myself, indicate the meaning of the multiplicity of depressions on the test. They are the normal depressions (the so-called pits, but not true pits) along the horizontal sutural lines of the test, and nothing more; but the ornamentation of the raised rib-like structure of the test, which carries the principal tubercles and several rows of minute ones, sometimes extends over the depression, and nearly or quite unites with the corresponding ornamentation of the neighbouring rib. When a specimen is slightly worn and inked, the impression conveyed to the eye is that there were two or more smaller depressions within the line of the normal large one.

There are always four depressions along a horizontal line above the ambitus in *Temnopleurus*, and normally there should be only two; but the two vertical rows of large primaries have their base continued over the horizontal sutural depression, and four depressions are formed.

The genus *Opechinus* is valueless, as its essential character, never generic, is due to the chances of growth of ornamentation.

It is remarkable that Desor should write about the species of *Opechinus*, that there were living and fossil species, the first inhabiting the tropical seas. Certainly no form like an *Opechinus* has ever been seen in a perfect and good state of preservation. It must be noticed also, that the type of L. Agassiz does not warrant the statement that there are six pits in horizontal series.

The next notice of the genus *Pleurechinus* is found in A. Agassiz's magnificent Report on the Echini of the 'Challenger' Expedition (p. 108, pl. x^{a}. figs. 1, 2). Specimens of the species *bothryoides* were obtained off Kobi, in Japan, in from 8 to 20 fathoms.

The following is the description:—"The 'Challenger' collected three small specimens of a Temnopleurid, which I am

inclined to refer to the subgenus *Pleurechinus*, Agass.; they are unfortunately not large enough to compare directly with the typical *Pleurechinus bothryoides*. They show clearly, however, that we may expect to find in the China Seas a species of *Temnopleurus* still retaining the principal features so characteristic of some of the Nummulitic species of India figured by D'Archiac and Haime (see pl. xiii. fig. 7, of *Temnopleurus Valenciennesi* of their work), to which the specimens of the 'Challenger' are most closely allied.

"The outline of the test even in these young specimens (measuring, the largest not more than 18 mm. in diameter) is high, resembling already somewhat the globular shape of such species of *Amblypneustes* as *A. griseus*, and differing from the other species of Temnopleuridæ, in which the outline of the test is quite conical at a corresponding age. The genital ring is narrow, compact, slightly pentagonal; the genital plates are of uniform size, with the exception of the madreporic genital, which is somewhat larger and rectangular in outline, the pores covering its entire surface with the exception of the space occupied by the ring of secondary tubercles, which runs along the inner edge of the genital plates, separating them from the anal system. In addition to this edging, the genital plates carry from two to three tubercles, irregularly placed on the plates, and a few miliaries. The genital openings are deep, crescent-shaped notches, cut out of the outer edge of the plates; the genital plates are united along the anal edge, and a distinct pit in the angle of the sutures between the genital and oscular plates separates the latter from the edge of the anal system. The anal system is covered by an outer row of large triangular plates, with smaller elongate plates arranged round the anal opening.

"In the interambulacral area there are two disconnected pits at the two extremities of the horizontal sutures separating the coronal plates. The coronal plates carry from one to three large primary tubercles, arranged in a horizontal row near the lower edge of the plate, with a somewhat undulating horizontal line of smaller secondary tubercles above that, the rest of the plate being filled with granules, miliaries, and secondaries irregularly arranged. In the ambulacral area the pits are only slightly smaller, but there is only a single large pit at the median end of the suture; the pit at the other extremity of the suture is reduced to a minute impression at the angle of the coronal plate adjoining the pori-

ferous zone. There is a distinct vertical row of primary tubercles on the outer edge of the coronal plates, extending along the whole length of the poriferous zone; the rest of the ambulacral plate is occupied by an inner and somewhat smaller tubercle, and an irregular horizontal line of secondaries with miliaries extending above the larger tubercle. The pores form very indistinct, irregular, vertical arcs of three pairs; the pores are separated by slight ridges, and the miliaries of the coronal plates sometimes encroach on the outer edge of the poriferous zone."

The delineations of the apical system, and of some interradial and ambulacral plates above the ambitus, are beautiful examples of correct art (Report on Echini, 'Challenger' Expedition, pl. x^{a}. figs. 1, 2).

It will be noticed that in this description of the species and its delineation there are no structures brought forward, or drawn, which would ally the form with the *Opechini*. The generic diagnosis requires, therefore, the abolition of the character of possessing more than the normal number of horizontal sutural depressions. Nothing is said, moreover, about the crenulation of the primary tubercles, and the drawing shows them to be non-crenulate.

The carefully-described and well-drawn apical system, with its circle of tubercles around the anus, and the depressions between the ocular plates and this row of tubercles, are new features. It is a truly Temnopleurid apical system; and the truth of this statement may be gleaned by examining young and old specimens of *Temnopleurus toreumaticus*, and then referring to the apices of the other recent species. A series of specimens of different dimensions of *Temnopleurus toreumaticus*, from the coast of Cutch, has been examined; and I find considerable variation in the ornamentation of the anal ring. But the depressions between the ocular plates and the circle of tubercles, or, rather, between the ocular plates and the junction of the generative plates, are perfectly distinct in some, but not in other specimens. The only distinction that can be drawn between the two forms is, that there are more tubercles around the anus (and a tubercular ornamentation on the generative plates) in *Pleurechinus bothryoides* than in the common *Temnopleurus*. However, there is a tuberculate ornamentation in the other species of *Temnopleurus* on the plates. The apical system of *Pleurechinus* will not, then, separate it from *Temnopleurus*.

The nature of the poriferous zone does not separate the genera. It is evident that every specimen of *Temnopleurus* presents crenulation of its primary tubercles, although it is often indistinct in some parts of the test. The tubercles of *Pleurechinus*, when carefully examined, do not show crenulation any more than specimens of *Temnechinus*, Forbes. What is seen in improperly denuded tests are the relics of the soft tissue which extended over the boss to the ring of the spine.

The examination of the construction of the test of *Pleurechinus bothryoides* should prove the classificatory position of the form in relation to the genera *Temnopleurus* and *Temnechinus*; and this proceeding was possible from the kindness of Dr. Günther, F.R.S., of the British Museum. Several specimens of *Pleurechinus bothryoides* are in the National collection. One, a denuded test, has been in the collection for years, and doubtless is a fellow of the type in Paris; others were dredged by the 'Alert' in the Japanese seas, and there are the specimens collected by H.M.S. 'Challenger.' Dr. Günther gave me his sanction to utilize one of the specimens, and I chose one of the forms from the 'Alert' collection. The first examination of the outside of the test enabled me to admire A. Agassiz's description and drawings of the species; the second proved that the smallest and almost miliary tubercles near the sutural depressions carried long stalked pedicellariæ resembling those of *Temnopleurus*, and that there were globose, slightly elongated sphæridia on short stalks at the edge of the actinal sutural depressions close to the peristome.

The third examination consisted in carefully breaking asunder the coronal plates and separating them from the poriferous zones of the ambulacra. This was done with the view of determining whether the test had true pits passing inwards and undermining the test at the sutural angles, besides the sutural depressions, which are such marked features and are usually called pits; also to make out whether or not there was any knob-and-socket suturing along the median line of the plates, and also on the horizontal edges actinally and abactinally. In fact, I was desirous to discover whether the form had any structural relations with *Temnopleurus*, *Salmacis*, and *Amblypneustes* *.

All the structural characters of the sutures of *Temnopleurus* were found in *Pleurechinus bothryoides*, more or less modified.

The depressions along the lines of horizontal sutures, called by

* Journal of the Linnean Society (Zoology), vol. xvi. 1882, p. 343, pl. viii.

Agassiz pits, are deep, and are increased by the elevated ridge-like ornamentation which carries the tubercles ; they are marked on their floor by the margin of the suture, or where two contiguous plates join; and they dip inwards at the sutural angle, penetrating and expanding slightly, and leaving but a thin layer of reticulate test between them and the interior of the test. On the edge of the plate, on either side of the true pits, are processes with knobs and sockets, and these are larger and fewer in number than in *Temnopleurus toreumaticus*. Between the interradial coronal plates and the tentaculiferous plates there is the same kind of suturing as in *Temnopleurus*. Knobs on the ambulacral edges, and sockets on the interradials, with considerable undermining of the true pits here and there. The knobs are larger, however, than in *Temnopleurus*. The horizontal sutures, actinal and abactinal, show the knob-and-socket arrangement very feebly; the knobs and sockets are few in number, and are not seen all along the adjoining plate-edges beneath the depressions, but only on the sutures where the raised ornamental ridges join. There a few sockets fit corresponding knobs on the other plate; the distribution, however, of the knobs and sockets is as it is in *Temnopleurus*, and there is the same difference in the relative position of the knobs and sockets in the interradial and ambulacral areas.

Finally, not only pedicellariæ with stout heads on long stalks are close to the depressions over the horizontal sutures, but there are rather long-headed pedicellariæ on short stalks immediately around the edge. There is often a definite indication that not only are these depressions and true pits lined with membrane which does not carry pedicellariæ or any structures, but that a layer of tissue covers in, more or less, the depressions, not at the level of their edge, but a little lower. It appears to be incomplete, and to have a slit-like opening in it, so that the deeper part of the depression and the true pit are more or less covered in. Neither ova nor young are found in these depressions, although their marsupial character is very present to the imagination.

In minute construction, there is a generic relation between *Temnopleurus* and *Pleurechinus*, and the only important distinction is the absence of crenulation in the last-named type. The value of this distinction is not great; but when certain series of forms have crenulate tubercles without exception, and one occurs, closely allied by its minute structures, having non-

crenulate tubercles, the distinction is of some classificatory importance.

The classificatory position assigned by A. Agassiz to *Pleurechinus* in the 'Revision' must be conceded, and it is a subgenus or section of *Temnopleurus*.

It might be contended that *Pleurechinus*, having non-crenulate tubercules, is identical with *Temnechinus*, Forbes; and A. Agassiz evidently considers it closely allied to the Nummulitic members of the Temnopleurid group described by D'Archiac and Haime.

But *Temnechinus*, Forbes, has no true pits at the sutural angles, and the depressions over the sutural margins do not therefore terminate in deep inward undermining or penetrations of the test.

A careful examination of the tests of the Crag *Temnechini* in the British Museum, the Royal School of Mines, and in the collection of the Geological Society, indicates that none of the remarkable minute structures of the test of *Temnopleurus* are present.

Forbes's determination of the lack of pits at the angles, depressions only existing, and of the absence of crenulation in *Temnechinus* holds good; and no forms can enter the genus which have true pits and crenulated tubercles.

Pleurechinus is therefore not synonymous with *Temnechinus*, and, as may be gleaned from my communication on the Temnopleuridæ to this Society (Proc. Linn. Soc., Zool. 1882, vol. xvi. p. 343), they belong to different genera.

The Temnopleuridæ from Sind, referred to by A. Agassiz, have no true pits; but the tubercles are crenulate. Their state of preservation and the absence of the apical system prevent their being satisfactorily classified. But amongst the Temnopleuridæ lately received from Sind there are forms with a remarkable apical system, and a condition of the outside of the test which brings them under distinct genera. It is probable that the forms described by D'Archiac and Haime will come under one of these generic divisions, so that the whole series will be in alliance with *Glyphocyphus* (Haime) and *Trigonocidaris* (Agass.).