6. *On the TERMINATIONS of some AMMONITES from the INFERIOR OOLITE of DORSET and SOMERSET.* By JAMES BUCKMAN, Esq., F.G.S., F.L.S., &c. (Read June 23, 1880.)

DURING the progress through the press of D'Orbigny's '*Paléontologie Française*, "*Terrains Jurassiques*," I was busily engaged in collecting the fossils of the Inferior Oolite and Lias in the neighbourhood of Cheltenham. In both of these rocks I had the good fortune to find a somewhat large series of Ammonites, the greater proportion of which I could readily identify from D'Orbigny's figures*.

But as these fossils were in bad condition, especially when compared with the French drawings, I was at first almost led to think that these latter had been somewhat unjustifiably made up or, as we should say in plain English, "fudged."

Thus, in reckoning up the plates of admitted Inferior Oolite Ammonites in the '*Paléontologie Française*,' we find them to be thirty-eight, out of which no less than twenty species (a little over two thirds of the list) are drawn with the mouth of their shells more or less perfect; and yet, strange to say, I do not recollect a single example of their Cotteswold prototypes having occurred to me in this perfect condition.

Since those days of scepticism, however, D'Orbigny's book has become my constant and trusted companion, as the specimens in our Dorsetshire list of Ammonites appear to be in much the same condition as those figured by that talented author.

During the last seventeen years my lot has been cast in the pleasant county of Dorset; and, curiously enough, the farm that I have occupied is situate on the Inferior Oolite; the Halfway-house quarry is within a mile of my own residence; whilst a quarry in one of my own fields, within a hundred yards of my house, has proved to be one of the richest in England, if not in the world, in Oolitic fossils, and especially in the species of the Cephalopoda and Gasteropoda, in each of which great classes we may safely reckon as many as from sixty to seventy species. From this quarry and the surrounding district, there have been determined as many as twenty-eight species of Brachiopoda; and I probably possess nearly, if not quite, a hundred forms of Lamellibranchiata, which, not to name other remains, cannot but be considered as a goodly list.

If, again, we consider that the greater part of the individuals of these lists occur in a bed varying from 2 to 3 feet in thickness, the surprise becomes still greater; and not only are the species so numerous, but it is one mass of specimens, as, instead of our merely finding an Ammonite here and there (as in the Cotteswolds), this particular bed is a mass of them, so that several species will be huddled together in a small space; and, in so far as the Ammonites are

* The part on the "*Céphalopodes*" was finished in 1849.

concerned, on the same slab will be representatives of several of the zonal divisions of different authors. This may be judged from the fact that on the surface of slabs from this bed other Ammonites besides the following have been noted.

Ammonites jurensis, <i>Ziet.</i>	Ammonites Gervillii, <i>Sow.</i>
— Sowerbyi, <i>Miller.</i>	— Brongniarti, <i>Sow.</i>
— Humphriesianus, <i>Sow.</i>	— subradiatus, <i>Sow.</i>
— Braikenridgii, <i>Sow.</i>	— læviusculus, <i>Sow.</i>
— linguiferus, <i>D'Orb.</i>	— discus, <i>Sow.</i>
— Sauzei, <i>D'Orb.</i>	— Parkinsoni, <i>Sow.</i>

Some species prevail to such an extent that hundreds of individuals may be found in a square yard of the bed, one species prevailing at one quarry, and another at other quarries.

So numerous are individuals in some quarries, and so varied do they seem, that it is hardly possible to escape the conclusion that the family must have hybridized to a considerable extent. Anyhow, under such circumstances, it is exceedingly difficult to accurately define species—much more so than in the Cotteswold district, where it would be difficult to find more than half a dozen forms in a day.

But besides this, when we compare the Dorset and Somerset Ammonites with the Gloucestershire forms, we find that the former are usually sharp and well preserved, while the latter are considerably rougher and more fragmentary. Thus it is that shells with their terminations are rare in the latter county, while with us they are comparatively common.

The specimens laid before the Society are a sufficient evidence of this fact; and they are fast increasing, now that this matter is being more carefully investigated, the truth being that collectors seem to have vied with each other in squaring up the mouths to make them neat and tidy. Many among them, indeed, would cut away *all* of the outer chamber, preserving only the inner chambers, which, being more or less filled up with carbonate of lime, were said to be *alive*, whilst the outer one, filled up with indurated mud, was pronounced to be *dead*, and so was removed as useless.

But not only do we find our Dorset specimens to be much like the French ones (as figured by D'Orbigny) in condition and state of preservation, but the species from the two sides of the Channel are almost identical: thus we have within *four* of the whole of D'Orbigny's figured specimens from the Inferior Oolite of France.

But, besides this, there are several species in our own Cephalopoda-bed, now admitted to be high up in the Inferior Oolite, which D'Orbigny has allocated to the Lias. This, we take it, has been mainly due to the fact that this bed has been confounded with the one at the base of the Inferior Oolite in Gloucestershire.

In this list are the following:—

Ammonites insignis, <i>Schübl.</i>	Ammonites Germaini, <i>D'Orb.</i>
— variabilis, <i>D'Orb.</i>	— jurensis, <i>Ziet.</i>
— Murchisonæ (?), <i>Sow.</i>	— cornucopia, <i>Young & Bird.</i>
— discoides, <i>Ziet.</i>	— torulosus, <i>Schübl.</i>

Now as to the forms which up to this time we have found with terminations to their shells, we may state that as yet we have only met with fourteen; but it happens, as a rule, that the species so distinguished number several individuals, though some three or four of them have only yielded single specimens.

Our list, then, includes the following species:—

<i>Terminations.</i>	
Lanceolate	1. <i>Ammonites concavus</i> , Sow.
	2. — <i>subradiatus</i> , Sow.
	3. — <i>Edouardianus</i> , D'Orb.
	4. — <i>Braikenridgii</i> , Sow.
Ovate-lanceolate or spatulate.	5. — <i>linguiferus</i> , D'Orb.
	6. — <i>Sauzei</i> , D'Orb.
	7. — <i>Martinsii</i> , D'Orb.
	8. — <i>subcostatus</i> , Buckman, MS.
Delphinulate, semicircular.	9. — <i>Gervillii</i> , Sow.
	10. — <i>Brongniarti</i> , Sow.
	11. — <i>Manselii</i> , Buckman.
Waved.....	12. — <i>Humphriesianus</i> , Sow.
	13. — <i>Moorei</i> , Lycett.
	14. — <i>boscensis</i> , Regnès.

Here, then, we have given fourteen species of *Ammonites* with their terminations more or less complete; and for these we have attempted to make a provisional classification.

So far as we have been enabled to examine these more complete specimens of *Ammonites*, we arrive at the conclusion that the terminations to the shells are capable of greatly aiding in the determining of species, as trimmed-up examples of *A. linguiferus*, with their broadly oval or spatulate mouths, are difficult to distinguish from *A. Humphriesianus*; but when we have the semicircular rugose mouth of the latter for comparison with the former the difficulty vanishes. Thus, again, the lanceolate termination of the discoid *A. subradiatus* is very different from the spatulate or ovato-lanceolate ending of *A. subcostatus* (Buckm.); and yet these two forms have been referred to one species by different authors.

The delphinulate mouth in *A. Gervillii* is a complicated termination when compared with the plainer semicircular terminations of *A. Brongniarti* and *A. Humphriesianus*; and yet without this knowledge we had always confounded the first two forms.

From these remarks it seems but reasonable to conclude that the terminations of *Ammonites* may become important in the distinguishing of species, though, from what we have seen, their preservation is of somewhat rare occurrence; at the same time our own experience seems to point to the fact that many fine examples of more complete shells have been lost from the want of due observation upon the subject. We may further mention that, with the vast numbers of *Cephalopoda* which are everywhere around us and which are so perfect in other respects, we have not yet seen a single example either of *Rhyncholites* or *Trigonellites*. Mr. S. P. Woodward, however, has figured an *Ammonite* with the operculum from Dundry*. The shell

* See 'Geologist,' vol. iii. p. 328.

is referred to *A. subradiatus*; but it is very different from that which is now recognized by this name,—*A. Brightii*, which it is said to resemble, being an Oxford-Clay fossil, while the Dundry Oolite is the exact equivalent of the Dorset Cephalopoda-bed. I hope therefore some day to see this specimen in its place at the British Museum.

I now proceed to pen a few notes on these fourteen forms which we have observed to present more or less perfect terminations to their shells; and in doing so I would express the hope that ere long other forms will be met with to enable us more clearly to understand the value of a more complete structure, while at the same time it may not be too much to express a hope that better specimens may yet be found than those we already possess or, through the kindness of friends, have had access to.

NOTES ON THE SPECIES.

Fig. 1.—*Termination of Ammonites concavus*, Sow.

1. AMMONITES CONCAVUS, Sowerby, pl. 94, fig. 2. (Fig. 1.)

This is a very common shell in the Cephalopoda-bed in Dorset and Somersetshire, occurring less frequently in the same horizon in Gloucestershire. It is a very variable shell; and hence its synonyms are unusually numerous.

In this district we have usually named it *A. subradiatus*; and it is here only retained because *A. concavus* was figured by Sowerby from a specimen obtained from this neighbourhood.

Fig. 2.—*Termination of Ammonites subradiatus, Sow.*

2. *A. SUBRADIATUS*, Sow. pl. 421. fig. 2; D'Orb. pl. 118. fig. 3 (now 1 & 2); also D'Orb. pl. 129. fig. 3. (Fig. 2.)

The difference insisted upon seems to be that in *A. concavus* the curved radii are seldom branched, whilst in *A. subradiatus*, the radii are either branched or have short intermediate ones between the longer ones. There is, however, so much variation in this respect that we still hold these to be mere varieties.

We have now several complete examples of the termination; but the first specimen was obtained by Captain Kennedy from our own quarry so perfect that it might have sat for the portrait given by D'Orbigny, pl. 129. fig. 3. It is a very common fossil, and in some quarries occurs mixed with the former so thickly that hundreds of examples could be got in a day; and yet a specimen with even the base of the termination is very rare.

3. *A. EDOUARDIANUS*, D'Orb. pl. 130. figs. 3-5.

Is found sparingly with the examples just quoted. Our two specimens are the only ones we have met with in the Bradford-Abbas quarry; and, curiously enough, they have both indications of the termination.

4. *A. BRAIKENRIDGII*, Sow. Min. Conch. t. 184. (Fig. 3.)

This shell was figured by Sowerby in the second volume of Min. Conch., which bears date 1818; the specimen, a very imperfect one, was from Dundry, near Bristol. In his description he has the following remarks* :—

“Perfect terminations of the Ammonites are scarce. I have, however, met with several specimens indicating the form of the lip; but none of them exhibit much out of the usual way, excepting some French ones and those now before us: in one of the French specimens the aperture is much contracted by the lip; in another the lip forms a single arched lobe slightly bent inwards.”

* Min. Conch. vol. ii. p. 187.

Fig. 3.—Termination of *Ammonites Braikenridgii*, Sow.

Our Cephalopoda-bed is on the same horizon as the bed from which the Ammonite just quoted was obtained, Dundry being the extreme western extension of the Oolitic system which prevails in Dorset and Somerset, which latter has so much resemblance, as evidenced by fossils, to the Inferior Oolite of France.

This fossil is usually found most abundantly at Clatcombe, near Sherborne, where examples with the curious terminations are not uncommon; and it illustrates one of those cases in which a different species of the genus occurs at one quarry from that which prevails at another. It is occasionally found at Bradford Abbas, where the prevailing Ammonites are *A. concavus* and *A. Sowerbyi*.

The terminations in this species are among the most perfect, as well as the most frequently met with. The spathulate projection varies greatly both as to length and breadth.

5. *A. LINGUIFERUS*, D'Orb. pl. 136. figs. 1 & 2.

Has a neat form and a less broad spathulate termination than the preceding, though closing up the aperture of the shell more by reason of its bending inwards. It is thinner in the whorls; and the ribs are in threes at the back of the shell, uniting into one, with a tubercle in front. Sometimes there is an intermediate rib between a pair, with three-ribbed vaultings.

This shell is by no means so frequent as *A. Braikenridgii*, but occurs in the same places, intermixed with it.

6. *A. SAUZEI*, D'Orb. pl. 139. figs. 1-3.

The termination of this shell is much like the former; but its ribs are much larger, and the shell broader. It is also inclined to be unsymmetrical, and has but few whorls.

This is not uncommon with the termination both near Sherborne and at Bradford Abbas.

These three last species are admirably figured by D'Orbigny; and yet we are happy to think that our Dorset examples are quite up to the perfection of the French ones.

7. *A. MARTINSII*, D'Orb. pl. 125. figs. 1, 2.

Is not uncommon; but the small specimen we have sent is the only case in which we have observed the terminal lip. It seems to have been the first lip formed; and if fig. 3 of D'Orbigny's plate represents the lip of an older specimen, it would tend to show that the lips vary very much with age. Our specimen is from Bradford, where the species is not uncommon.

8. *A. SUBCOSTATUS*, Buckman, MS.

This shell, from near Sherborne, belongs to the discoid section of Ammonites, and is therefore only placed here on account of its spatulate termination, which differs so much from that of the shell with which it has been confounded, namely *A. subradiatus*.

Probably this is the *A. subradiatus* of D'Orbigny, T. J. pl. 118. figs. 1 & 2.; but if so it differs so much from his *A. subradiatus* previously referred to that we feel justified in proposing a fresh name for it. Our specimen is the only example we have met with with the termination: still it is not an uncommon fossil near Sherborne, though it occurs very sparingly at Bradford Abbas and Halfway House.

Fig. 4.—Termination of *Ammonites Gervillii*, Sow.

9. *A. GERVILLII*, Sow. p. 184, tab. A. fig. 3; D'Orb. pl. 140. figs. 1-7. (Fig. 4.)

This is a shell with a very curious and interesting termination, which we have named delphinulate, because its side view is so much like that of the head of the classic Dolphin. Sowerby says, "This

species occurs in a marly limestone which is replete with grains of iron ochre. It is from Bayeux, in Normandy" *.

Fig. 5.—*Termination of Ammonites Brongniarti, Sow.*

10. *A. BRONGNIARTI*, Sow. t. 184 A, fig. 2; D'Orb. pl. 137. figs. 1-5. (Fig. 5.)

The lip of this shell is so decidedly distinct from the preceding that we cannot help separating them, although we at one time inclined to a different opinion. It is not at all so complicated, but is of a semilunar or, rather, semicircular shape, with a deep depression beneath, but without the elaborate form of the lip of *A. Gervillii*. It is met with at Bradford Abbas and other places near Sherborne.

11. *A. MANSELI*, Buckman, n. sp.

Is perhaps related to the *A.-Brocchii* group; but the fineness of its ribs and the absence of tubercles is a sufficient distinction. We have in one single example the usual deep depression before the terminal semicircular depression. We possess several examples of this shell from Bradford, Chalcombe, and other places; but only the one sent is an example of the termination.

12. *A. HUMPHRIESTANUS*, Sow. t. 500. fig. 1; D'Orb. pl. 133 & 134. (Fig. 6.)

This is a very variable shell, sometimes having few (perhaps five) thick whorls, at others from eight to ten, exceedingly slender and delicate; yet the markings are the same, and the termination of both, starting from a deeply contracted furrow, is simply semilunar in shape, and is the same in both large and small examples.

This is a common shell about Sherborne, but is rarely met with at Bradford or Halfway House.

* Sowerby, Min. Conch. vol. ii. p. 190,

Fig. 6.—*Termination of Ammonites Humphriesianus, Sow.*

13. A. MOOREI, Lycett, 'The Cotteswold Hills,' pl. i. figs. 2, 7.

The flexure of the mouth of the shell, with its elegantly curved line, like that of a modern Nautilus, is distinctive of this shell. It is common to the sandy part of our Oolite below the usual Cephalopoda-bed. The mouth is simply a termination of a flat slightly ribbed shell, without any previous depression. It is a common shell in the limestone bands below the Cephalopoda-bed; but the specimen sent is the only one in which we have observed the completion of the mouth of the shell.

Fig. 7.—*Termination of Ammonites Moorei, Lycett.*

14. A. BOSSENSIS (?), Reynès.

We quote this, with some degree of hesitation, from Beneke, inas-
Q. J. G. S. No. 145.

much as we have only a single specimen. This, however, is from the Cephalopoda-bed of Bradford Abbas, and in some points it is so much like the *A. Moorei*, both in its form and the outline of the mouth, that even now we must confess to feeling great difficulty in the matter.

Note.—Since the above was in type, we have found other species and examples with terminations. These, with the new forms, will be described in a paper now preparing for the Society.

DISCUSSION.

Mr. CHARLESWORTH called attention to the early work in this direction of the late Mr. Channing Pearse, who studied the Ammonites of the Oxford Clay of Christian Malford. That author was led to believe that the peculiar prolongations of the mouth were periodically absorbed and reproduced.