

On the dorsal region of the vertebral column of a new dinosaur (indicating a new genus, *Sphenospondylus*), from the Wealden of Brook in the Isle of Wight, preserved in the Woodwardian Museum of the University of Cambridge / by H.G. Seeley.

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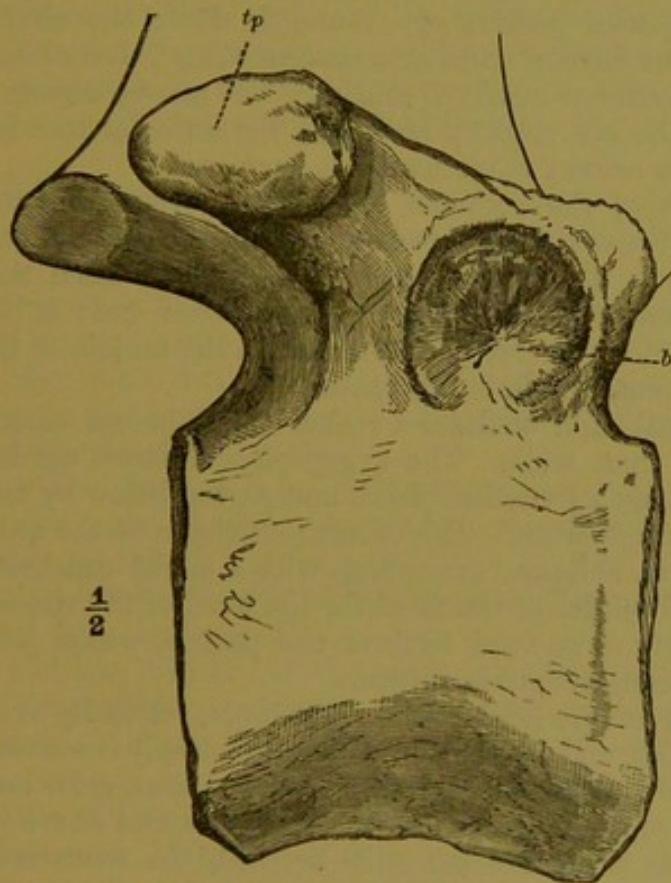
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On the DORSAL REGION of the VERTEBRAL COLUMN of a new DINOSAUR (indicating a new Genus, SPHENOSPONDYLUS), from the WEALDEN of BROOK in the ISLE OF WIGHT, preserved in the WOODWARDIAN MUSEUM of the UNIVERSITY of CAMBRIDGE. By Prof. H. G. SEELEY, F.R.S., F.G.S., &c., Professor of Geography in King's College, London.

THIS small series of six vertebral bones is remarkable for the great lateral compression of the centrum and the depressed form of the neural arch, and, as exhibiting the characters of the dorsal region in a new generic type, seems to me worthy of some notice.

Fig. 1.—*Dorsal Vertebra of Sphenospondylus, right side of type specimen in Woodwardian Museum. (One half nat. size.)*



b. Facet for head of rib.

tp. Transverse process.

The centrams of the vertebræ have an average length of 9 centim. each; the transverse width of the articular faces is about 7 centim., with a vertical depth of at least 8 centim.; but the lower part of the centrum is much compressed from side to side, so as to have a wedge form, and terminates inferiorly in a sharp longitudinal ridge. The articular margins of the centrams are moderately elevated. The transverse processes of the neural arch are at first directed back-

ward, but soon become directed transversely outward, and retain their upward direction. The facet for the head of the rib is at first large, and at the base of the transverse process, and bounded posteriorly by the sharp ridge which runs below the transverse process to the hinder margin of the neural arch; but after a time the rib-head rises higher, so as to be chiefly above the zygapophysial facet; and then it becomes smaller, the ridge behind it more or less disappears or rounds away, and the transverse process, which was at first triangular in section, becomes vertically compressed and thin.

The interest of the series is in exhibiting the gradation of characters as the bones extend backward, though, as the surfaces are invested with a thin argillaceous layer, and the bones have lost the neural spines, there is still something to be desired in their condition.

In the 1st vertebra the anterior face of the centrum is flattened, but somewhat concave, except towards the margin, which is convex. The basal outline of the face is rounded, the sides are subparallel, and the superior corners are rounded, while the neural canal is concave. The median vertical measurement is 7.4 centim., the transverse measurement nearly 7 centim. The measurements of the posterior surface are slightly less; but the articular face is more concave, and its convex outer border is narrower.

The sides of the centrum are concave from front to back, and moderately convex from above downward, becoming closely approximate towards the base, so as to form a blunt basal ridge or keel, which is most developed towards the anterior end: it is concave in length. The transverse measurement in the middle of the centrum below the neural arch, is 5.3 centim.

The neural arch encloses a rather small neural canal, which is not higher than wide. The zygapophysial facets are inclined at a right angle, are $2\frac{1}{4}$ centim. broad, and parted below by an interspace about 1 centim. wide. The external surfaces of the anterior zygapophyses are oblique, extending, with a slight concavity, back to the elevated border of the facet for the head of the rib, and extending concavely downward to form the pedicle, which joins the centrum by an imperceptible suture.

The facet for the head of the rib is large, vertically oval, less than 4 centim. deep, and $3\frac{1}{2}$ centim. wide; it is deeply concave, in advance of the middle of the side, 8 millim. below the anterior border of the transverse process, which extends behind it, and above its posterior half. These facets are not quite vertical, the transverse measurement over their upper parts being more than the measurement at the base. Below the base of this rib-facet there is a slight convexity on the line of the neurocentral suture.

The transverse processes are strong and directed upward and outward, almost at the same angle as the zygapophysial facets, but they are also directed a little backward. The superior surface is flattened, smooth, looks inward and upward, 7 centim. wide at the base, with the margins compressed and gently concave in length, though the concavity is deeper on the posterior side, where it

terminates above the posterior zygapophyses. At the terminal facet for the tubercle of the rib the width of the process is about 3 centim. Inferiorly the transverse process is compressed into a strong ridge, the base of which is rounded; this ridge descends posteriorly behind the facet, for the head of the rib to form the anterior margin of the canal for the intervertebral nerve, while at the free end of the process it expands to assist in forming the transversely ovate tubercular articular facet. The anterior and posterior inferior surfaces of the process are concave channels, which deepen as they descend, the posterior enlarging into a considerable excavation between the vertical buttress and the posterior zygapophysis. The transverse width over the transverse processes, as preserved, is about 17 or 18 centim.

The base of the neural spine is about 9 centim. long. It is broken away, but was compressed, widening posteriorly, where it is about 1 centim. thick at the fracture. It there descends, widening in an A shape, with the lateral part concave; and the flattened posterior surface extends backward, to terminate inferiorly in the ovate posterior zygapophysial facets, which are divided behind by a slight concavity, which becomes narrower as it extends between them inferiorly. The transverse width over the two facets is 5 centim.

As is usual in dorsal vertebræ, the superior border of the centrum is a little longer than the inferior border, indicating a slight arching of the back.

The 2nd vertebra differs chiefly in having the anterior articular face flatter, and in having a more elevated ridge margining the anterior border of the articulation for the head of the rib, while the ridge below the transverse process is directed less backwards, and more obviously curved.

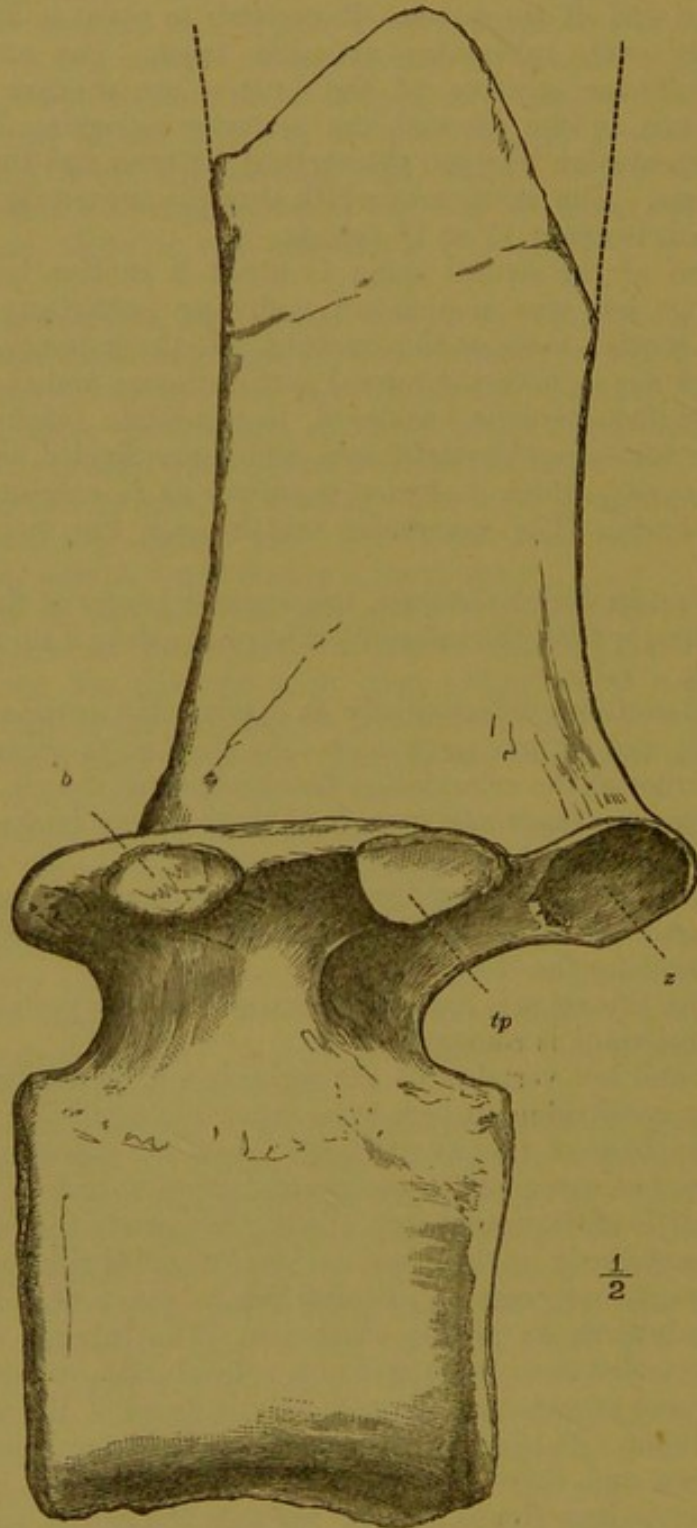
In the 4th the inferior ridge of the transverse process is nearly transverse, and more obviously forms the posterior border for the articular facet for the rib.

In the 5th this ridge is inclined backward, and the posterior border of the neural spine is rounded.

The 6th and last vertebra of the series is a little crushed, so that the inferior basal ridge appears to be either obliterated or less developed. The base of the neural arch below the transverse process has now become a somewhat compressed area, rounding anteriorly into the pedicle of the neural arch, slightly concave in the middle, and margined posteriorly by the broad flattened rounded ridge descending from the transverse process. Behind this ridge is a deep impression like a thumb-mark on plastic substance. The tubercle for the rib has now ascended so as to be quite on a level with, or rather above the transverse process, and immediately in front of it; and it has become smaller. It is wider than deep; and the measurements are between two and three centim. Its superior surface is convex; and the convexity extends inward towards the neural spine. The greater part of it rises above the level of the zygapophysial facet,

external to which it projects laterally more than a centimetre. The facet is still concave, with a central pit.

Fig. 2.—Sphenospondylus, *left side of a Dorsal Vertebra.* (Fox Collection, Brit. Mus. $\frac{R}{142}$.) One half nat. size.



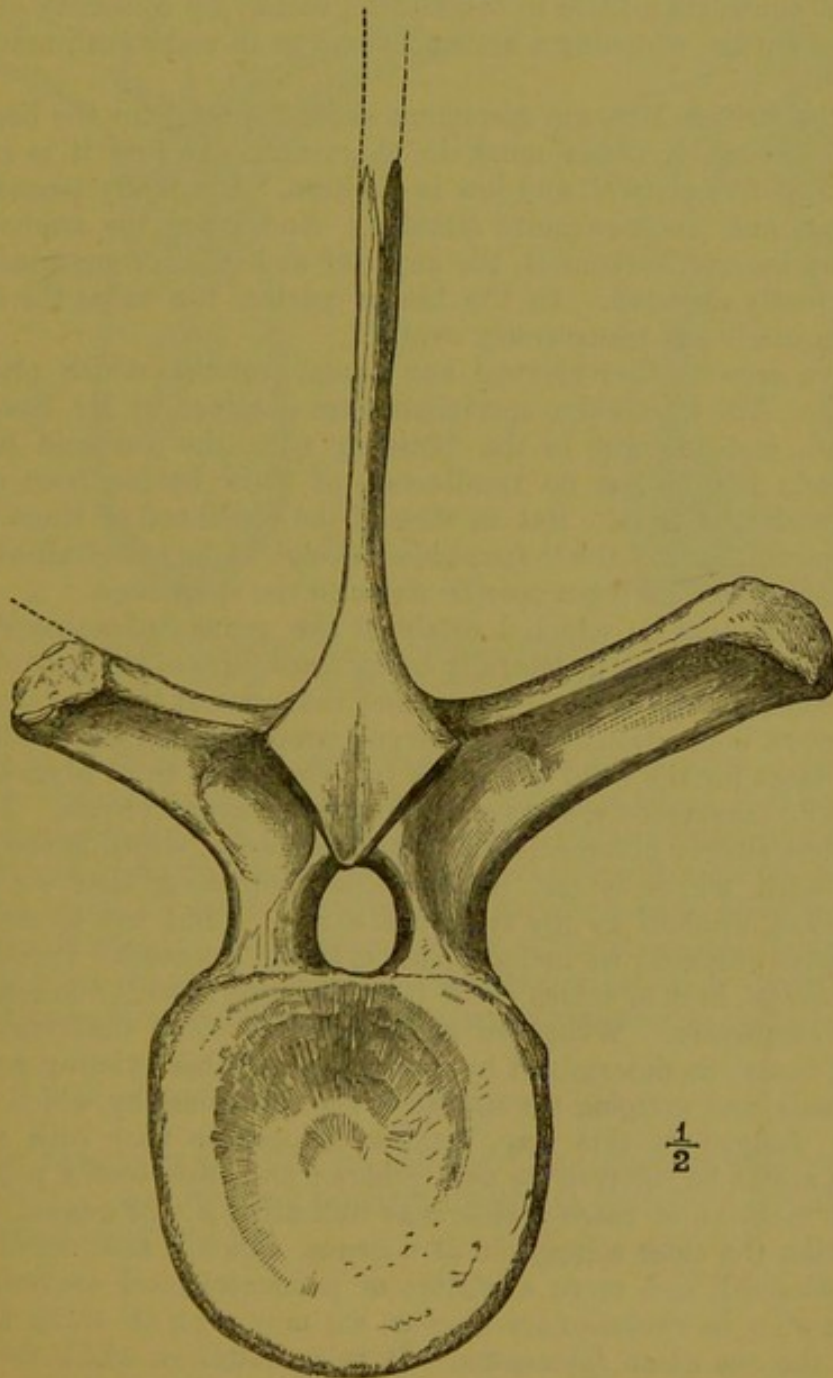
b. Facet for head of rib.
z. Postzygapophysis.

tp. Transverse process.

The anterior zygapophyses do not reach so far forward as to be quite level with the anterior face of the centrum.

I have long been seeking for specimens with which this series might be compared; and although the old collection of the British Museum contains but one centrum of this type, Mr. Davies, of the British Museum, on seeing these vertebræ, at once drew my attention to a series of more than a dozen in the Fox Collection, $\frac{R}{142}$, which belong to the same species (fig. 2). I am inclined to think that many of them may have been part of the same individual with the

Fig. 3.—*Posterior Aspect of Dorsal Vertebrae of Sphenospondylus.*
(Fox Collection, Brit. Mus. $\frac{R}{142}$.) One half nat. size.



$\frac{1}{2}$

Cambridge bones. The length of the centrum is the same, and its wedge-like character identical. The surface behind the transverse processes, which is not clearly seen in the Cambridge bones, is found to form a wedge with lateral excavations, which extend forward under the posterior expansions of the transverse processes.

In several vertebræ there are slight pits at the base of the anterior margin of the neural spine, and well above the large deep depression bordered by the zygapophysial facets, between which the sharp anterior margin of the neural spine is prolonged. The notch between the zygapophyses only extends for their anterior third.

A few vertebræ have the neural spine preserved, but it is not perfect. In one (fig. 2) it is $16\frac{1}{2}$ centim. high, 9 centim. wide at the base; it contracts a little in the middle, chiefly by concavity of the posterior border, widening a little above, so as to make both margins concave.

All the British-Museum specimens show the facet for the head of the rib, though it varies much in character. At first it is small (*b*, fig. 2, p. 58) vertical, and low in position. Gradually ascending, it widens and becomes more circular. And when the transverse processes become horizontal, the superior and anterior margins become greatly elevated. In the hinder part of the series the facet becomes small and transversely oval.

I have seen neither cervical nor caudal vertebræ which present this type. The Cambridge specimens were obtained by Mr. Keeping in 1866, and brought to the Museum with the coracoid lately described; but he has no recollection of their having been associated with that bone. But in view of the likelihood of these vertebræ pertaining to the "*Iguanodon Seelyi*," I have refrained for the present from giving a specific name to the specimens.

The characters on which I establish the genus *Sphenospondylus* for these remains are the laterally compressed form of the base of the dorsal centrum, the depressed form and character of the neural arch, the upward inclination of the transverse processes, and the condition of the facet for the head of the rib in rising so as to be placed between the transverse process and the anterior zygapophysis. These characters clearly differentiate it from *Iguanodon*, which is the only genus with which it can be compared, supposing that we take *Iguanodon Mantelli* as the type (figs. 4 & 5). But the genus has since been enlarged to include such types as *Iguanodon Prestwichi* and *I. Seelyi*, both of which differ from the type in well-marked and varied characters. What the significance of those differences is may, I fancy, be determined by comparing together existing genera of animals, and noticing the nature of the characters by which they differ. Judged in this way, I think it possible that both these species might be referred to new genera; and from such a point of view I conceive of these vertebræ as indicating a new genus. But if we take the older conception of a genus, which is anatomical and not zoological, and more a matter of palæontological convenience than a step in evolutionary history, we may rank all these forms under the one name *Iguanodon*. It is a matter on which there is

Figs. 4 & 5.—*Posterior and left lateral view of Dorsal Vertebra of Iguanodon Mantelli.* (From the specimen figured by Prof. Owen, in the 'Wealden Reptiles,' suppl. ii. pl. vii. figs. 4 & 5.) One eighth nat. size.

Fig. 4.

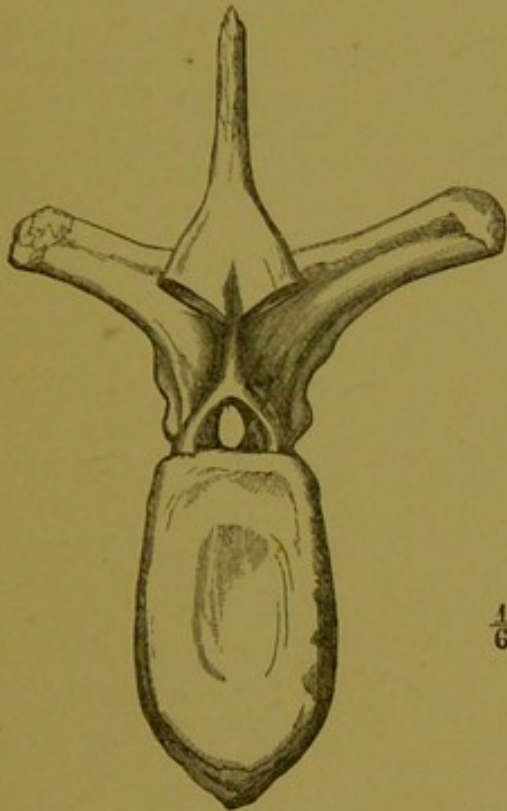


Fig. 5.

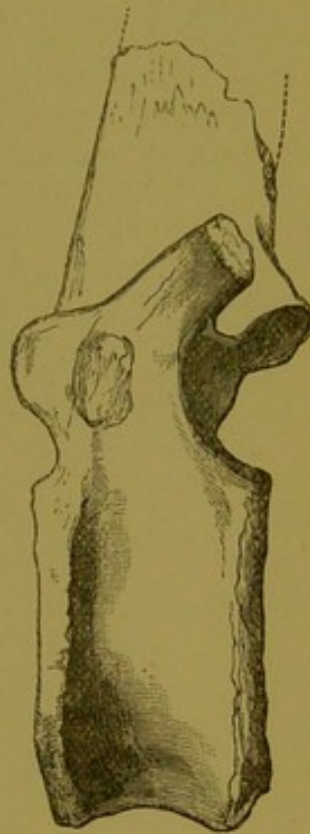

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Fig. 4. Posterior view, for comparison with fig. 3.

Fig. 5. Lateral view, for comparison with figs. 1 & 2.

likely to be difference of opinion for some time to come. And if I lean towards defining genera so as to make them small, it is because I believe that characters are in this way better appreciated, and because the groups of fossils become better comparable with existing natural-history types. I have compared the vertebræ here described with those of *Iguanodon Prestwichi* and other available named *Iguanodons*, and believe that the character of the neural arch justifies my distinction, though the types have some characters in common.

DISCUSSION.

The PRESIDENT said that he had been long familiar with vertebræ of this type, and had had a strong suspicion that they would prove to belong to *Iguanodon*.

