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THE TWO DINOSAURS OF GALVE
(PROVINCE OF TERUEL, SPAIN)*

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S U M M A R Y

Paleontological description of dinosaur bones discovered in 1958 near Galve (Teruel), in two localities each of which contain notable remains of a single individual. The first animal, represented by 18 vertebrae, 28 neurapophyses, 4 chevrons, an ilium, and an ischium, is attributable to *Iguanodon bernissartensis*. The second would be a new genus of sauropod, of which were found 8 caudal vertebrae, important portions of the forelimb (complete ulna and radius measuring 82 and 79 cm respectively), and bones from the pelvis and hindlimb (112 cm long femur). The localities are situated in the lower part of the Wealden, in other words the lowermost Cretaceous, and reach some hundred million years.

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INTRODUCTION

The attention of paleontologists at the present time turns with a particular interest toward the search for fossil vertebrates. However, terrestrial vertebrates are generally encountered in continental sediments: limestones, clays, or sandstones of lacustrine or fluvial origin. Thus it is that the Miocene lacustrine basin of Teruel has been known for a long time (cf. Vilanova, 1863) for its richness in mammal remains; and recent methodical prospecting by the alumni of the Universidad de Utrech has demonstrated that the Tertiary localities of Concud and La Fontana (Fig. 2) are still productive. But if one looks for the Secondary Epoch, this is, in much older terrains, where the fossils are smaller, the terrestrial vertebrates were mainly reptiles, not only mammals. Thanks to the paleontological discoveries, an extremely varied world of carnivorous and herbivorous animals has appeared little by little to our view, freed of the fog of this passed distance, the Age of Reptiles.

It is in this sense that our prospecting has been oriented for some years, studying the Lower Cretaceous in central Spain, which exactly presents a beautiful development of continental formations. These are comparable enough to those of England or Belgium, which have been designated with the name of "Wealden" and that, precisely, have produced the most important dinosaur remains. But what is to be understood by dinosaurs?

The dinosaurs are great terrestrial reptiles that lived on the continents in the Secondary Epoch. They are known from the Middle Triassic up to the end of the Upper Cretaceous, that is during a period of around 140 million years (Fig. 1). The discovery of two dinosaurs in Galve, in the province of Teruel, deserves to be announced to the scientific public, and we have the satisfaction of publishing it in this review.

We also express our sincere thanks to the people who have facilitated this study, and in the first place to Dr. D. Dimas Fernández-Galiano, who personally collected all the bones in Galve, deposited them in the Museo Provincial de Teruel, and freely offered them to us to study. To Mrs. Purificación Atrián, who with her archeological ability greatly facilitated our study in Teruel and took care to make photographs and drawings. To Dr. José M.ª Herrero, of Galve, the discoverer of the dinosaurs, who spent many of his hours working for science. To Dr. Gregorio Gómez, lastly, who with patience and security knew to unite and complete a great number of dispersed pieces.

CHAPTER I

THE LOCALITIES

In 1954 we had previously made a rapid reconnaissance of the regions of Camarillas, Mora de Rubielos, and Aliaga, where the Wealden is presented in vast outcrops. In 1958 we entrusted to four students, Jean-François Allard, Bernard Barbé, Yves Derréal, and Michel Rowland the raising of the Villarluengo plate number 543 at 1/25,000 scale; we recommended that they examine with great attention the continental Wealden and Albian formations, and that they carefully investigate all hints of fossils.

In this same summer an inhabitant of Galve, Dr. José María Herrero, discovered large reptile bones in two localities, situated respectively to the east and north of the village. The bones were brought together in the Museo Provincial de Teruel by the diligent care of Dr. D. Dimas Fernández-Galiano (1958), Chief of the Natural Sciences Section of the Instituto de Estudios Turolenses. The localities are today found on Alfambra plate number 542, but very near the edge of the Villarluengo plate; this is the reason why Yves Derréal, whose terrain was bordering, also visited them in September, 1958. In 1959 Y. Derréal extended his searches to the Galve region (1959). There, a magnificent, nearly circular syncline (Fig. 3) contains a great development of Wealden red clays and sandstones. This series rests on the marine Jurassic, which is terminated by the Portlandian floor. In the Galve syncline, the Wealden is only covered discordantly by conglomerates dated to the Italic Miocene (Fig. 4). But more to the east, further onto the Bullesteros anticline, the section is more complete and shows the marine Aptian, with *Orbitolinas* and *Toucasia*, resting on the Wealden. Next comes the Albian, with its lignite-bearing formations. In this manner, between the Portlandian and the Aptian, the Wealden corresponds with all certainty to the Neocomian and Barremian floors. The localities with reptile bones, situated toward the base of the continental series, could be attributed to the lowermost Cretaceous.

In September, 1959 we went ourselves to visit the discovery sites in the company of Mrs. Purificación Atrián and Dr. Gregorio Gómez. Dr. José María Herrero led us to the points with his customary enthusiasm, and taught us in fact three localities of dinosaur bones in the vicinity of the village of Galve (Fig. 3).

1) The locality called La Maca is found 2.5 kilometers ESE of Galve (Fig. 3). It is the first that was discovered; it has provided the bones of an *Iguanodon*. We also found there some fragments of crocodile and turtle bones, bluish scales of a fish of the genus *Lepidotes*, and, lastly, numerous Unios which have been entrusted to study by Miss Denise Mongin.

2) The locality called Las Zabacheras was situated hardly a kilometer NNE of the village, in the slope of the tunnel from Galve to Cañada. The beds, strongly inclined toward the center of the syncline, dip toward the SE. Large bones were found in this

place in red clays. On the other side of the tunnel were noted surfaces of micaceous sandstones with ripple marks; behind these was recognized the heavy trunk of a silicified tree.

3) A third fossiliferous point was recognized 800 meters east of Galve, on the edge of a road. Reptile bones are seen there, apparently badly enough preserved, in a red clay. An excavation needs to be made in this place, because it is possible that we are in the presence of a true locality.

When we came to Teruel in September, 1959 we found the mixed bones from the first two localities deposited in the Museo Provincial de Teruel. This disgraceful circumstance was due to the fact that, before the arrival of the geologists, the inhabitants of Galve had taken them to their homes, and it was necessary to make delicate arrangements so they could be reunited in Teruel. Nevertheless, patient work permitted us to distinguish with certainty the pieces from each one of the localities. Then we truly recognized the existence of two very distinct animals: on the one hand, an *Iguanodon* from the La Maca locality; on the other, a large sauropod from Las Zabacheras. In both cases there is one individual, whose remains must have floated and been deposited finally in the slime on the bottom of a lake. As is natural, many of the bones disappeared during the course of the fossilization process, and we are far from having complete animals, the rarest things in paleontology. Nevertheless, these two sets are truly interesting and new enough for Span.

CHAPTER II

THE IGUANODON OF LA MACA

Iguanodon bernissartensis Boulenger

A good number of bones from the vertebral column and pelvis of a single animal comes from the red clays subjacent to the sandstone banks, on the eastern fact of a small crest; like the strata searched toward the west (Fig. 4), erosion has made the other bones disappear. By itself, the form of the vertebrae immediately indicates that it is a large *Iguanodon*. Here is the paleontological description of the pieces recognized in the La Maca locality.

VERTEBRAL COLUMN

Cervical vertebrae.—There are four slightly elongated, strongly opisthocoelous vertebrae, very characteristic of the neck of *Iguanodon*.

The three largest are not identical. The first (Plate I, fig. 9), very rounded in front and concave behind, measures 11 centimeters long by 16.5 wide. Even if one considers that it must have suffered a slight flattening in the course of fossilization, resulting that its extended length indicates an anterior cervical vertebra. The beginnings of the two rami of the neural arch are wide and fairly little elongated (5 centimeters long). The neural canal has an aperture of 4 centimeters.

The second (Pl. I, fig. 7), 11 centimeters long, with a neural canal aperture of 3.5 centimeters, has a neural spine strongly thrown backward.

The third (Pl. I, fig. 10) measures 12 centimeters long by 12 wide, and is still much more excavated posteriorly; it must pertain to the center of the neck. The beginnings of the rami of the neural arch are much more elongated: 8 centimeters long. The neural canal has a 3.5 centimeter aperture in this piece.

Sacral vertebrae.—One sacral vertebra solidly fused to a portion of another is well articulated with the first caudal. The posterior face is flat, and its diameter is 17 centimeters.

Caudal vertebrae.—There comes in continuation a series of fourteen tail vertebrae, sensibly flat in front and behind, of very typical aspect. The size does not vary much from one to another: the length goes from 13 to 11.5 centimeters, while the diameter of the circular disc is between 17.5 and 16 centimeters. The are perhaps the middle caudal vertebrae (Pl. I, figs. 1-6), and we have no examples attributable to the posterior caudals. We mention the piece numbered $V^{14–15}$, which represents two coossified vertebrae (Pl. I, fig. 3), whose total length is 22.5 centimeters; the first of the

two shows the beginning of the haemal arch in two fairly slender laminae; the second has a fairly well preserved neural arch. This phenomenon of ossification has been noted on various occasions in dinosaur vertebrae.

Neurapophyses.—A high number of neurapophyses or spinous processes from caudal vertebrae are recognized in La Maca. Eighteen of them can be assigned to fairly anterior caudal vertebrae. The lamina has a width of 10 centimeters, and its maximum thickness is 6 centimeters. They can be ordered placing first the thickest and down to the flattest. Another ten neurapophyses can be fairly well referred to middle caudal vertebrae, located farther back. Five of them can be aligned with their corresponding vertebrae, which are, ASI, rather complete pieces (V^6, V^7, V^{11}, $V^{12,}$ and V^{16}). The length varies from 42 to 33 centimeters. The largest vertebra (Plate I, fig. 4) measures 62 centimeters in total height, slightly surpassing the size of the vertebrae of *Iguanodon bernissartensis*.

Two other neurapophyses are complete, but separated from their vertebrae. They measure, respectively, 40 and 36 centimeters. The width of the lamina is 8 centimeters. The smaller of this lot has a lamina width of 6 centimeters (Pl. I, fig. 5).

Let us add four fragments, which are bases of neurapophyses of caudal vertebrae.

Haemal arches.—In principle we have three proximal portions of haemal arches, from middle caudal vertebrae, with a transverse bridge of 8 centimeters at its greatest width (Pl. I, fig. 8). In addition, two notable fragments and a small piece of the middle part of other haemal arches. All these pieces are of the type of the haemal arches of *Iguanodon*.

Among the La Maca bones there are also numerous narrow and rather slender bases. They cannot be referred to ribs, which in *Iguanodon* are wide and flattened. Neither do we think that they are crocodile ribs, and one is inclined to think that they are undoubtedly ossified tendons, as suggested by Dr. D. Dimas Fernández-Galiano. These curious bony formations are well developed in *Iguanodon*, where they seem to have the role of solidly uniting the neurapophyses of the dorsal vertebrae and those of the beginning of the tail.

Ribs.—The fragments of thoracic ribs are rather numerous. Let us indicate fourteen distal ends, which show a strong thickening for the insertion of muscles.

PELVIS

Two pelvis bones were found in the same place as the vertebrae that have just been described.

Ilium.—The entire upper part of the left ilium is represented by a preserved bony piece, 80 centimeters (Fig. 5); the total length must reach nearly one meter. This elongated ilium is very comparable to that of *Iguanodon bernissartensis*. It lacks the distal end of the postacetabular process, accidentally broken. The preacetabular process, in good condition, is horizontal and not recurved ventrally, as indicated in the classic restoration of *Iguanodon* by de Pauw (1902; cf. Dollo, 1883, Pl. V). But one will notice

in Plate III of this same publication that Dollo (1883) figured this process as hardly curved for *I. bernissartensis* and horizontal for *I. mantelli*, following Hulke; so that one can doubt the exactness of the restoration on this point. The curvature of this specimen and of some others in the Museo de Bruselas would rather have been an accident of fossilization.

Pubis.—The distal end of a left pubis of bird-hipped type is recognized immediately: it has the form of a squashed and widened racquet; its width reaches 15 centimeters. The piece is preserved for a length of 33 centimeters. In its distal end it taken in ten ribs in relief, like the pubis of the Bernissart *Iguanodon*. This rugose surface must have served as a solid muscular insertion (Pl. I, fig. 11).

RELATIONS AND DIFFERENCES

Although the attribution of these bones to the genus *Iguanodon* is quite clear, it could be, however, more delicate, with incomplete material, to specify the species. Nevertheless, this does not present too many undoubted difficulties because the species of *Iguanodon* can be reduced at the moment to three: *I. bernissartensis* Boulenger, *I. mantelli* Meyer, and *I. atherfieldensis* Hooley.

However, the pieces from La Maca all indicate a very large animal, the size of *I. bernissartensis*, the largest of the three. In addition, we note along the same lines the following relations:

— Caudal vertebrae larger than those of *I. mantelli*, of equal size to those of *I. bernissartensis*.

— Neurapophyses larger and longer than those of the species *mantelli*.

— Haemal arches seem closer to those of *I. bernissartensis*.

— The ilium is the size of that of *I. bernissartensis*.

— The racquet-shaped ischium is not as wide as in *I. mantelli*, nor as rounded.

The differences with the species *atherfieldensis*, of much smaller size, are entirely more marked. Finally, we cannot establish comparisons with *I. orientalis* Rojd., which is only known from a mandible, scapula, and some ribs, and which is perhaps not a different species from *I. bernissartensis*.

We think, then, that the La Maca animal must be designated as *Iguanodon bernissartensis* Boulenger; it must be 8 meters long and 5 meters tall.

It is the first time that so many bones of *Iguanodon* are described from the Iberian Peninsula. This ornithopod dinosaur was already known, but only from very fragmentary remains:

— in Utrillas (Teruel province), in the Albian, some bones of an indeterminate species (Vilanova, 1873);

— in Mora de Rubielos, in the Wealden, a phalanx (?) (Royo y Gómez, 1927);

— in Morella (Castellón province), in the rather higher Wealden (= Barremian?), bones of an *Iguanodon* Royo y Gómez, 1927L a vertebra in the Museo de Madrid);

— in Boca do Chapim (Estremadura province, Portugal), in the Aptian–Albian, *I. mantelli*, represented by five teeth, five more or less complete vertebrae, and a femur (Sauvage, 1897; Lapparent and Zbyszewski, 1957).

From now on will be added Galve (Teruel province) in the lower Wealden (= Neocomian?), *I. bernissartensis* with twenty vertebrae, twenty-eight neurapophyses, and four haemal arches, fourteen ribs, an ilium, and a pubis.

This revision leads us to indicate on a map the *Iguanodon* localities, which are hardly a dozen; as such a document has never been published, we give it here (Fig. 6). One sees immediately, because of their placement, the importance of the description of the *I. bernissartensis* in Galve.

CHAPTER III

THE SAUROPOD OF LAS ZABACHERAS

I have here the description of the large bones from the Las Zabacheras locality and preserved in Teruel. They all seem to pertain to a single individual, because none of them are duplicates.

VERTEBRAL COLUMN

We have eight vertebrae very characteristic of the tail of a very large sauropods.

Anterior caudal vertebrae.—The largest of all is an anterior caudal in the shape of a circular disc, of 25 centimeters diameter; its length is thirty centimeters (Fig. 7). The contact point of the two haemal arch rami is well marked above and below, which easily permits orienting it. It is flat on its anterior face, and slightly concave posteriorly. According to the comparisons we have been able to do with other sauropods it must have been preceded by two or three vertebra in the direction of the sacrum; its place, then, could be located between the third and fifth anterior caudals. The vertebra has broken in three pieces, the largest of which is missing; the preserved parts now weigh 14 kilograms, and we calculate the weight of the complete petrified vertebra as 20 kilograms.

Two additional very incomplete fragments of another, slightly smaller anterior caudal vertebra have been found.

Middle caudal vertebrae.—There are four vertebrae from the middle of the tail, of which three are vertebral centra in good condition (Pl. II, figs. 1-3). Two of them are of equal size, measuring 13.5 centimeters long, with a circular anterior disc of 14 centimeters diameter. They are more excavated posteriorly than anteriorly. The facets for insertion of the haemal arch are well marked posteriorly. A third is a little smaller, being 13 centimeters long. These would be placed between the 20th and 25th in the tail of large sauropods.

Posterior caudal vertebrae.—Two posterior caudals are recognized by their very marked elongation; they are flat posteriorly and somewhat excavated anteriorly. One of them, broken in its middle, has an anterior disc that measures 9 centimeters tall by 9.5 wide. The second is more complete and a little smaller, having a disc 7 centimeters tall by 8 wide; the length of this vertebra is 12 centimeters (Pl. II, fig. 4). These two caudals would be placed between the 40th and 45th in the tail of sauropods.

Ribs.—Ten fragments of ribs are distributed in the following manner:

One fragment of cervical rib (Pl. II, fig. 6); two portions of thoracic ribs that measure, respectively, 6.5 and 8 centimeters wide (Pl. II, fig. 5); another seven fragments of wide, flat ribs.

SCAPULAR GIRDLE AND FORELIMB

Scapula.—A deteriorated scapula could be recognized only by its ends, and of them it has not been possible to ;earn much. We simply note that the proximal part, thick and heavy, measures 27 centimeters in diameter. The distal portion is flat, and has a width of 24 centimeters.

Forearm.—This part of the left forelimb is represented by two bones, large and well preserved.

The ulna, complete and undeformed, measures 82 centimeters long; the minimum diameter of the shaft it 10 centimeters. The proximal end has a width of 25 centimeters; the fossa destined to lodge the radius has an aperture of 22 centimeters. Regarding its distal end, covered with large rugosities, it measures 18 by 14 centimeters (Fig. 8, and Pl. II, fig. 11).

The corresponding radius is 79 centimeters; and its shaft has a minimum diameter of 9 centimeters. The ends are very rugose; the proximal has a greater width of 17.5 centimeters, and the distal, 17 centimeters (Fig. 9, and Pl. II, fig. 10).

Manus.—One carpal bone and a large piece, rugose on both sides, that measures 14 by 18 centimeters; its thickness varies from 4.5 to 8 centimeters.

Several metacarpals are recognized (Pl. II, figs. 7 and 8). Nevertheless, none of them are complete, because these bones, solid at their ends, have a rather slender shaft, exposed to be easily broken during the course of fossilization. One can distinguish five proximal and three distal portions of metacarpals.

Currently we have identified two incomplete phalanges. One of them is of flattened shape, and measures 7 by 4.5 centimeters on its proximal end; the other, small and broken, has an articular surface with a diameter of 4.5 by 4.5 centimeters.

PELCIS AND HINDLIMB

Ischium.—A proximal portion of the left ischium is preserved along a length of 24 centimeters. The acetabular cavity and the surface for contact with the ilium can be recognized on it.

Pubis.—The left pubis is a strong bone, 90 centimeters long (Fig. 10). The proximal part, which is triangular, measures 24 centimeters in its greater diameter. An excavated portion is noted on it, which contributes to forming the acetabular cavity. The distal portion, thick and rugose, measures 37 centimeters wide by 20 centimeters thick.

A fragment of flat bone shows an articular face of 34 centimeters length, and whose thickness diminishes progressively from 8 to 2 centimeters. We interpret it as a fragment of this pubis: it would be the articular process for the ischium.

Left leg.—A 112-centimeter-long femur at first sight relates our animal to the large Jurassic and Cretaceous sauropods. The distal part is 31 centimeters wide. Although complete, the piece is not very well preserved (Fig. 11).

A portion of the shaft of a large bone, 17 centimeters in diameter, is referred by us to a tibia.

Finally, the left fibula is represented by its ends. The proximal is flattened and smooth, but its upper border is adorned with extraordinarily strong rugosities (Pl. II, fig. 9). The distal is triangular, measuring 15 by 11 centimeters.

RELATIONS AND DIFFERENCES

The bones from Las Zabacheras indicate with certainty one of the large sauropod dinosaurs, known during the Jurassic and toward the end of Cretaceous times. But it has always been difficult to classify them in a satisfactory manner, because they are rather similar to each other in their skeleton. Currently, the Lower Cretaceous sauropods are particularly poorly known, because we have only fragmentary remains of them. Nevertheless, a comparative study has led us to the following results:

The Galve animal is clearly removed from the Jurassic families of cetiosaurids, brachiosaurids, and diplodocids. It has more relationship with the camarasaurids, on the other hand, an artificial family. One will note the enormous pubis, a character also encountered in *Brontosaurus*. The long bones are hardly significant by themselves: of the femur, and including the complete ulna and radius, one can hardly derive precise conclusions, except that the forelimb seems to have been more slender and almost as large as the hindlimb. That would approach *Camarasaurus* more than *Brontosaurus*. None of the bones from Galve is truly comparable to those of *Camarasaurus* or those of *Brontosaurus*, genera that, for their part, are exclusively Jurassic.

We attribute a certain importance to the form of the middle caudal vertebrae; they are no flattened dorsoventrally, but, on the contrary, are a little taller than wide. This characteristic well differentiates them from those of various Lower Cretaceous genera: the sauropod from Pays de Bray (Lapparent, 1946), *Rebbachisaurus* from the Sahara (Lavocat, 1952; Lapparent, 1960), and the titanosaurids, represented by various genera across the entire Cretaceous. We add that the posterior caudal vertebrae are also relatively little flattened.

Judging by the measurements, which we can compare with other sauropods, it may be estimated that our animal could be 16 to 18 meters long; therefore it did not reach the size of the giants of the group, which reached 25 meters.

Therefore we think that the Galve sauropod pertains to an undescribed genus. But we believe it is more prudent not to propose a new name before having more complete pieces. At least, here are its characteristics:

Sauropod of large size (16 to 18 m long), but not gigantic. First anterior caudal vertebrae having a circular disc of 25 centimeters diameter. Middle caudal vertebrae a little taller than wide, and laterally flattened. Posterior caudal vertebrae elongated but slightly flattened. The ulna, radius, carpus, and metacarpals indicate a relatively slender forelimb almost as long as the hindlimb. Pubis enormous and strong.

CONCLUSION

Two dinosaurs, then, have been found in the neighborhood of Galve, in the continental formations of the Lower Cretaceous. These sediments of Wealden type correspond here to the lower part of the Neocomian floor. Each of the two localities, La Maca and Las Zabacheras, contains the dislocated and incomplete cadaver of a single animal.

These two animals are very representative of the two great groups that are united, a bit artificially, under the term *dinosaur*, the "terrible lizards," according to the etymology. These fossil reptiles are divided, in effect, into two orders, characterized by the arrangement of the pelvic bones. The saurischians have a pelvis with three rami, following the normal type of saurians; they include the carnivorous theropods and the herbivorous sauropods. The ornithischians have a pelvis with four rami, which resembles, by simple convergence on the other hand, the pelvis of birds: the ilium is very long, and the pubis is composed of a ramus directed forward and a process directed backward, called the postpubis. In Galve we have proof of the existence of these two orders.

To conclude this study it would be well to indicate that the description of the two Galve dinosaurs was completed by the discovery of theropods in Teruel province. We note that in Utrillas, in the Albian lignites and not the Wealden, Vilanova (1873) gave account of a tibia from a carnivorous theropod. In Mora de Rubielos, in a very prominent Wealden, we recognized in 1954 a tooth of *Megalosaurus* (unpublished description).

Thus, in the Lower Cretaceous Period, there were, in an ancient world 80 to 100 million years old, three types of dinosaurs living in these regions where the Teruel mountain ranges were formed:

Theropods, carnivores, ran in search of prey on the emergent terrains.

Heavy sauropods, herbivores, frequented vast marshes, in which they encountered at the same time abundant food and protection against carnivores (Pl. III, fig. 2).

Large *Iguanodon* frequented the edge of the water courses and the lakes nourishing itself on the foliage of trees, whose trunks are still in the Wealden, while the carbonized remains of other trees gave origin to the lignites of Utrillas and Aliaga (Pl. III, fig. 1).

One can reasonably hope that more intense prospecting of these regions of Spain will bring even new elements: they will make better known what the living world was like during the Age of Reptiles.

(Translation by Dimas Fernández-Galiano)

CATALOG OF THE PIECES
preserved in the Museo del Teruel

Iguanodon from La Maca

4 cervical vertebrae.....	$V^{1–4}$ (1)
2 sacral vertebrae.....	V^{5}
14 caudal vertebrae.....	$V^{5bis–1}8$
28 neurapophyses.....	$V^{41–55}$
5 haemal arches.....	$V^{19–22bis}$
numerous ossified tendons..	To
14 ribs (fragments).....	Co
1 ilium.....	Il
1 pubis.....	Pu

sauropod from Las Zabacheras

8 caudal vertebrae.....	$V^{1–8s}$ (2)
10 ribs (fragments).....	Co^{s}
1 scapula.....	Om^{s}
1 ulna.....	Cu^{s}
1 radius.....	Ra^{s}
1 carpal bone.....	Car^{s}
8 metacarpals.....	$Mc^{1–8s}$
2 phalanges.....	Ph^{1-2s}
1 ischium.....	Is^{s}
1 pubis.....	Pu^{s}
1 femur.....	Fe^{s}
1 tibia.....	Ti^{s}
1 fibula.....	Ul^{s}

(1) These indicators were written on each of the pieces. Some indeterminate bones bear the mark X.
(2) The letter S indicates the sauropod bones.

BIBLIOGRAPHY

[Not included.]

FIGURE CAPTIONS

Fig. 1.—Diagram of the distribution of dinosaurs in the geological periods. The figures are given in millions of years (m.a.).

Fig. 2.—Map of the Teruel region indicating the vertebrate localities. Points: Tertiary mammals; crosses: Mesozoic dinosaurs.

Fig. 3.—Geologic map detailing the Galve syncline (according to the 1/25,000 scale sheet of Y. Derréal, 1959). t, Triassic chalk; l, Lias; Jm, Middle Jurassic; Js, Kimmeridgian; Jp, Portlandian; Cw, Lower Cretaceous (Wealden); Ca, marine Aptian; Cb, Albian; Cs, Upper Cretaceous; m, Miocene conglomerates; a, alluvia; A, rubble of slope.

Fig. 4.—Geological section of the Galve syncline (according to Y. Derréal, 1959). (The same legend as in figure 3).

Fig. 5.—*Iguanodon* from la Maca: left ilium.

Fig. 6.—Map indicating the localities with *Iguanodon*. Points: Wealden localities (= Neocomian–Barremian); triangles: Aptian–Albian localities. 1, Weald (*I. bernissartensis*, *I. mantelli*); 2, Weald (*I. mantelli*); 3, Isle of Wight (*I. bernissartensis*, *I. mantelli*, *I. atherfieldensis*); 4, Dorset (*I. mantelli*); 5, Bernissart (*I. bernissartensis*, *I. mantelli*); 6, Hannover (*I.* sp.); 7, Isla Brioni (*I.* sp.); 8, Boca do Chapim (*I. mantelli*); 9, Utrillas (*I.* sp.); 10, Galve (*I. bernissartensis*); 11, Mora de Rubielos (*I.* sp.?); 12, Morella (*I.* sp.); 13, Remada (*I. mantelli*). N.B. Out of the limits of this map can be added the localities of the Gobi (*I. orientalis* = *I. bernissartensis*) and China (*I.* sp.).

Fig. 7.—Las Zabacheras sauropod: very anterior caudal vertebra (V^1).

Fig. 8.— Las Zabacheras sauropod: ulna (X 1/6).

Fig. 9.—*Idem*: radius (X 1/6).

Fig. 10.— Las Zabacheras sauropod: left pubis (X 1/6).

Fig. 11.—*Idem*: femur, posterior face (X 1/6).

PLATE I

IGUANODON FROM LA MACA

Fig. 1. Caudal vertebra (V^{6}), left side.—Fig. 2. Caudal vertebra (V^{9}), posterior face.—Fig. 3. Two coossified caudal vertebrae ($V^{14–15}$), right side.—Fig. 4. Caudal vertebra (V^{7}), left side.—Fig. 5. Caudal vertebra (V^{11}), anterior face.—Fig. 6. Caudal vertebra (V^{12}), left side.—Fig. 7. Haemal arches of the caudal vertebrae: upper part with transverse bridge.—Fig. 8. Cervical vertebra (V^{2}), anterior face.—Fig. 9. cervical vertebra (V^{1}), anterior face.—Fig. 10. Cervical vertebra (V^{3}), posterior face.—Fig. 1.. Left pubis, distal end.

PLATE II

SAUROPOD FROM LAS ZABACHERAS

Fig. 1. Middle caudal vertebra (V^{3}).—Fig. 2. *Idem* (V^{4}).—Fig. 3. *Idem* (V^{5}).—Fig. 4. Posterior caudal vertebra (V^{8}).—Fig. 5. Fragments of thoracic ribs.—Fig. 6. Fragment of cervical rib.—Fig. 7. Metacarpal, distal end.—Fig. 8. *Idem*, proximal end.—Fig. 9. Fibula, proximal end.—Fig. 10. Left radius.—Fig. 11. Left ulna.

PLATE III

Fig. 1.—Reconstruction of a Wealden landscape: *Iguanodon* in the foreground, sauropod in the background (painted mural from the Geological Survey and Museum, London).

Fig. 2.—Reconstruction of *Diplodocus*, a large Jurassic sauropod; the animal from Las Zabacheras is also a sauropod (painting from the American Museum of Natural History, New York).