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✻ **PART 4.**

PRICE 1s. ✻

RESEARCHES

ON

FOSSIL BONES,

IN WHICH ARE ESTABLISHED

THE CHARACTERS OF

VARIOUS ANIMALS

WHOSE SPECIES HAVE BEEN DESTROYED

BY THE REVOLUTIONS OF

The Globe;

BY

BARON CUVIER,

Great Officer of the Legion of Honour, Counsellor of State, and Member of the Royal Council of Public Instruction, One of the Forty of the French Academy, Perpetual Secretary to the Academy of Sciences, Member of the Academies and Royal Societies of London, Berlin, Petersburg, Stockholm, Edinburgh, Copenhagen, Gottingen, Turin, Bavaria, Modena, The Netherlands, Calcutta, and of the Linnæan Society of London, &c. &c. &c. &c.

FOURTH EDITION,

Revised and Completed

BY ADDITIONAL NOTES,

AND A

SUPPLEMENT LEFT BY THE AUTHOR.

*Triomphante des eaux, du trépas, et du temps,
La terre a cru revoir ses premiers habitans.*

DELILLE.

IN FOUR VOLUMES.

LONDON:

G. HENDERSON, 2, OLD BAILEY, LUDGATE-HILL.

AND SOLD BY ALL BOOKSELLERS.

1834.

J. HENDERSON,]

[WHITE-FRIARS.

THE HAWAIIAN

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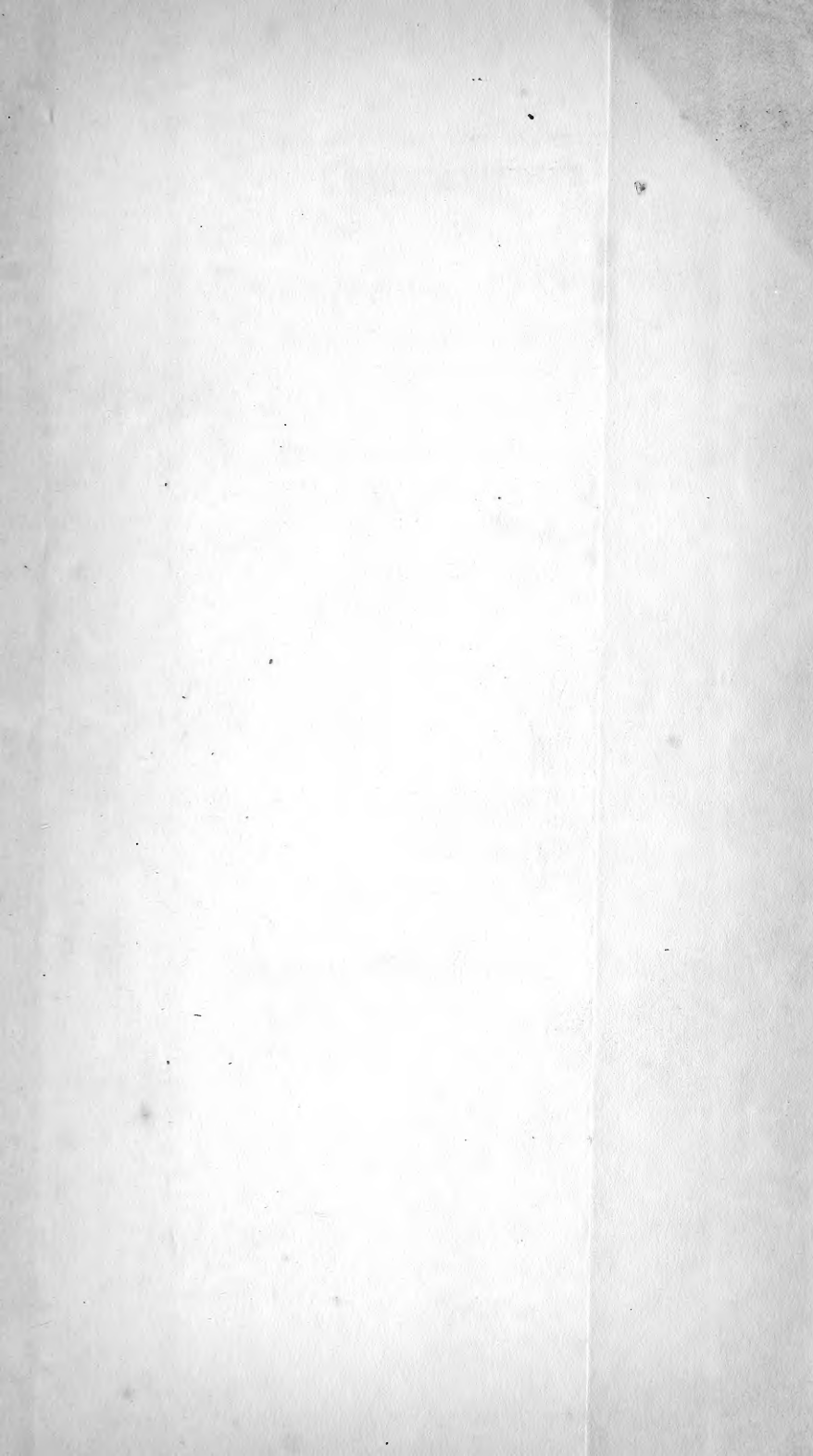


Fig. 1. ^{1/2}

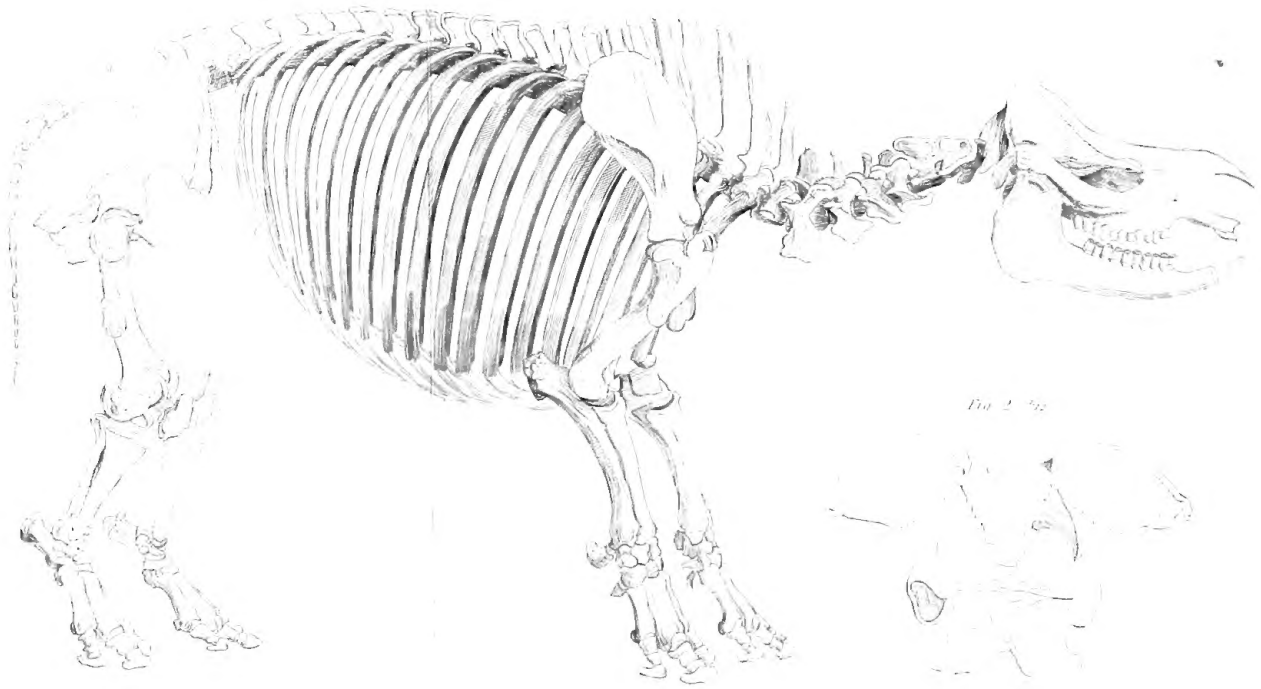
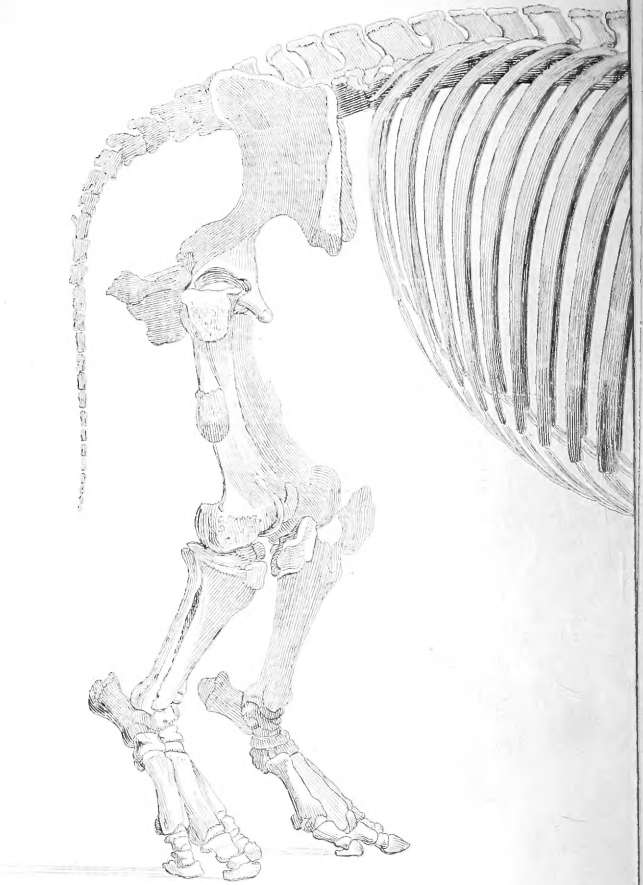


Fig. 2. ^{1/2}



RHINOCEROS. PL. XVII. *Melton of the One to the Rhinoceros of Asia.*





RHINOCEROS

Fig. 3. $\frac{1}{6}$

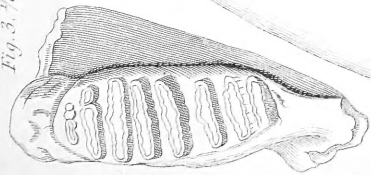


Fig. 4. $\frac{5}{8}$

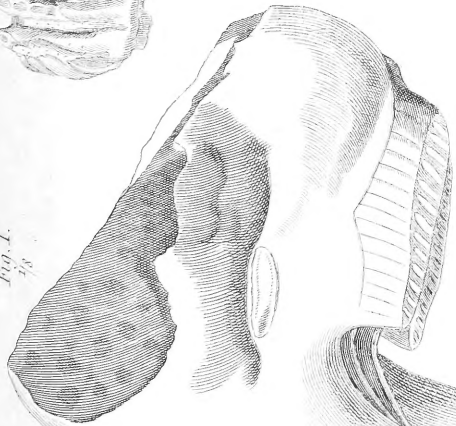


Fig. 4. $\frac{1}{2}$



Fig. 2. $\frac{1}{8}$

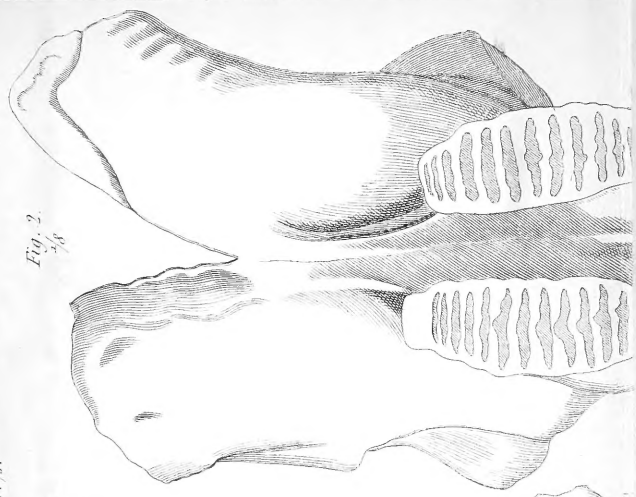
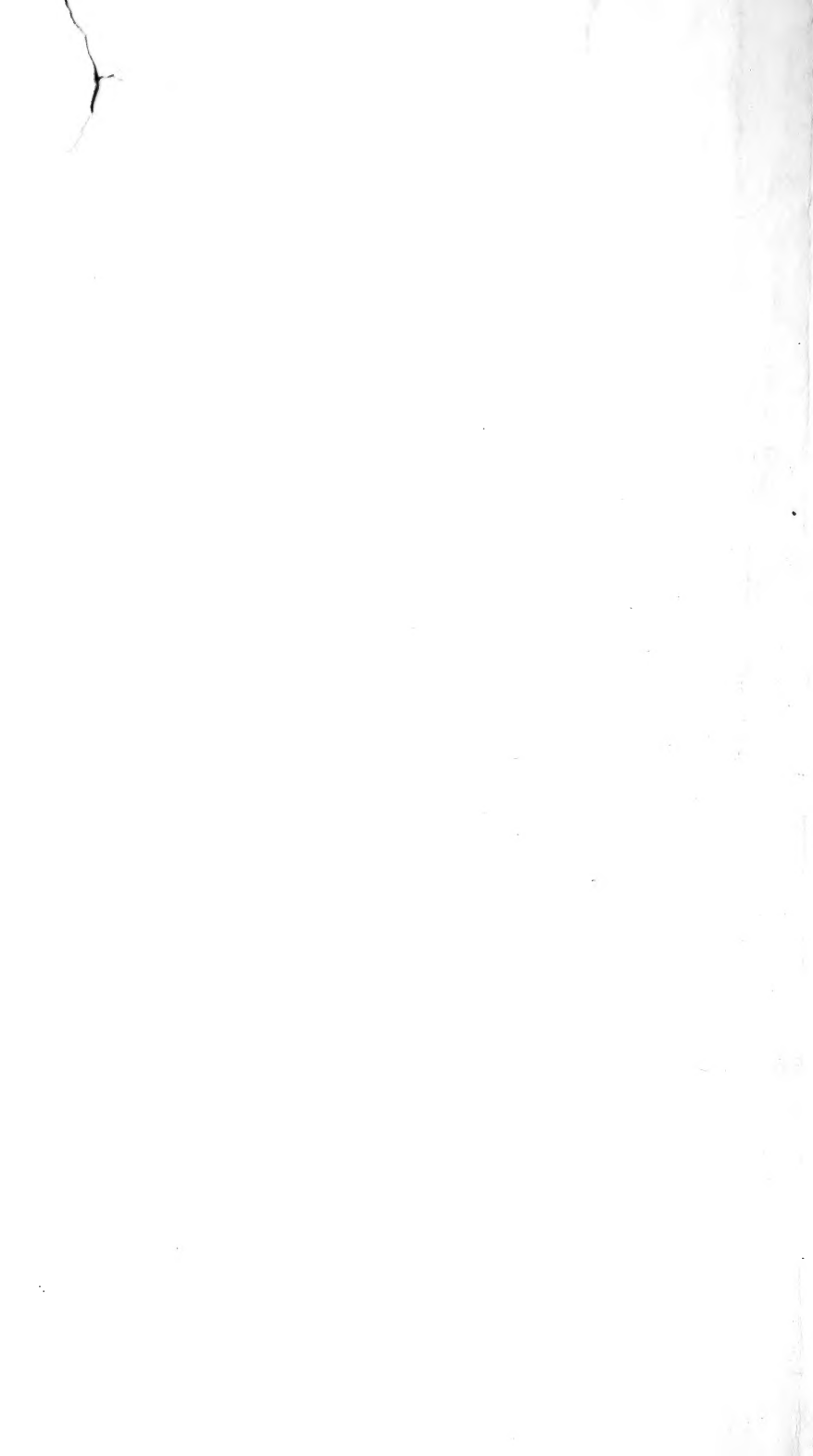


Fig. 5. $\frac{1}{6}$

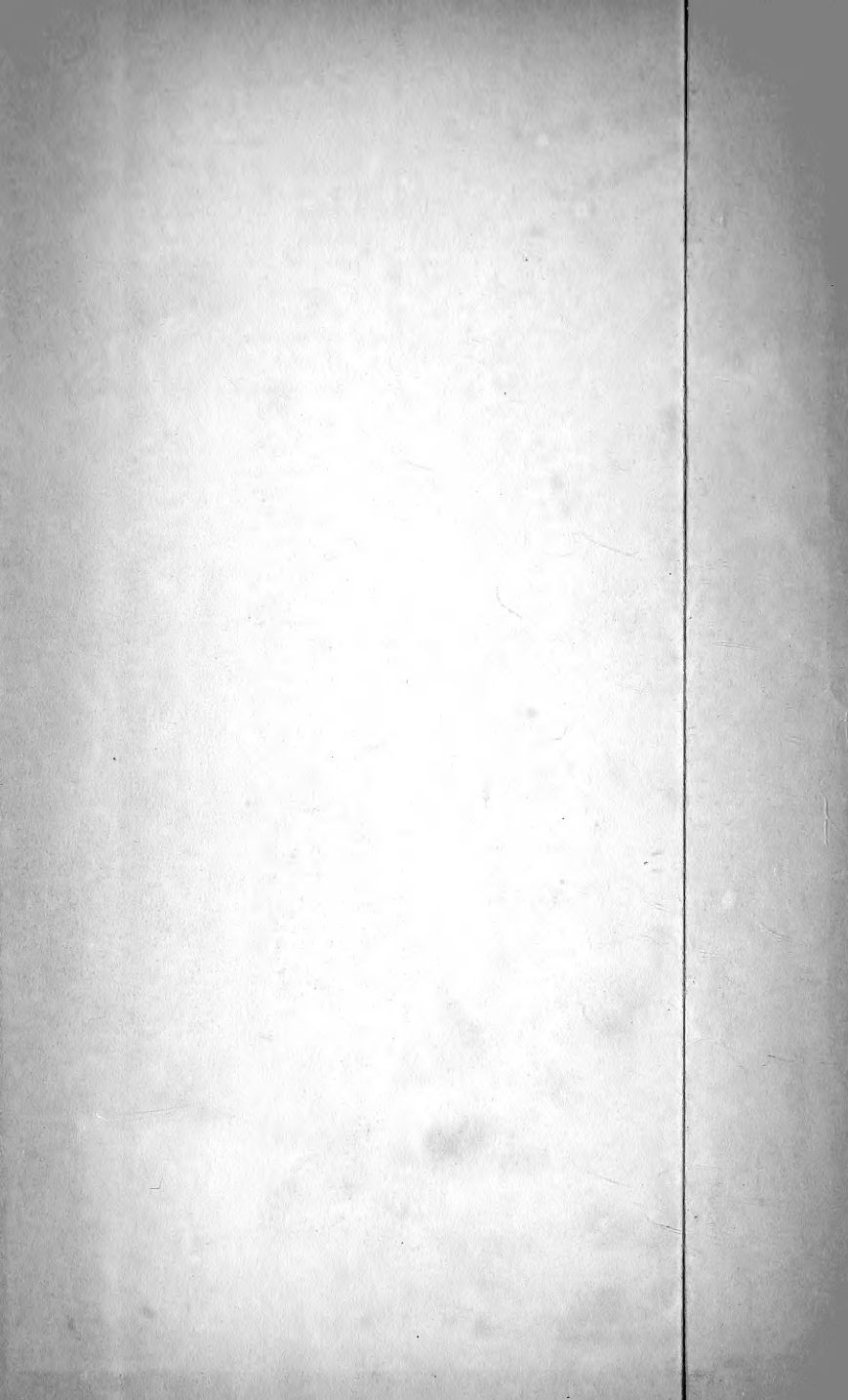


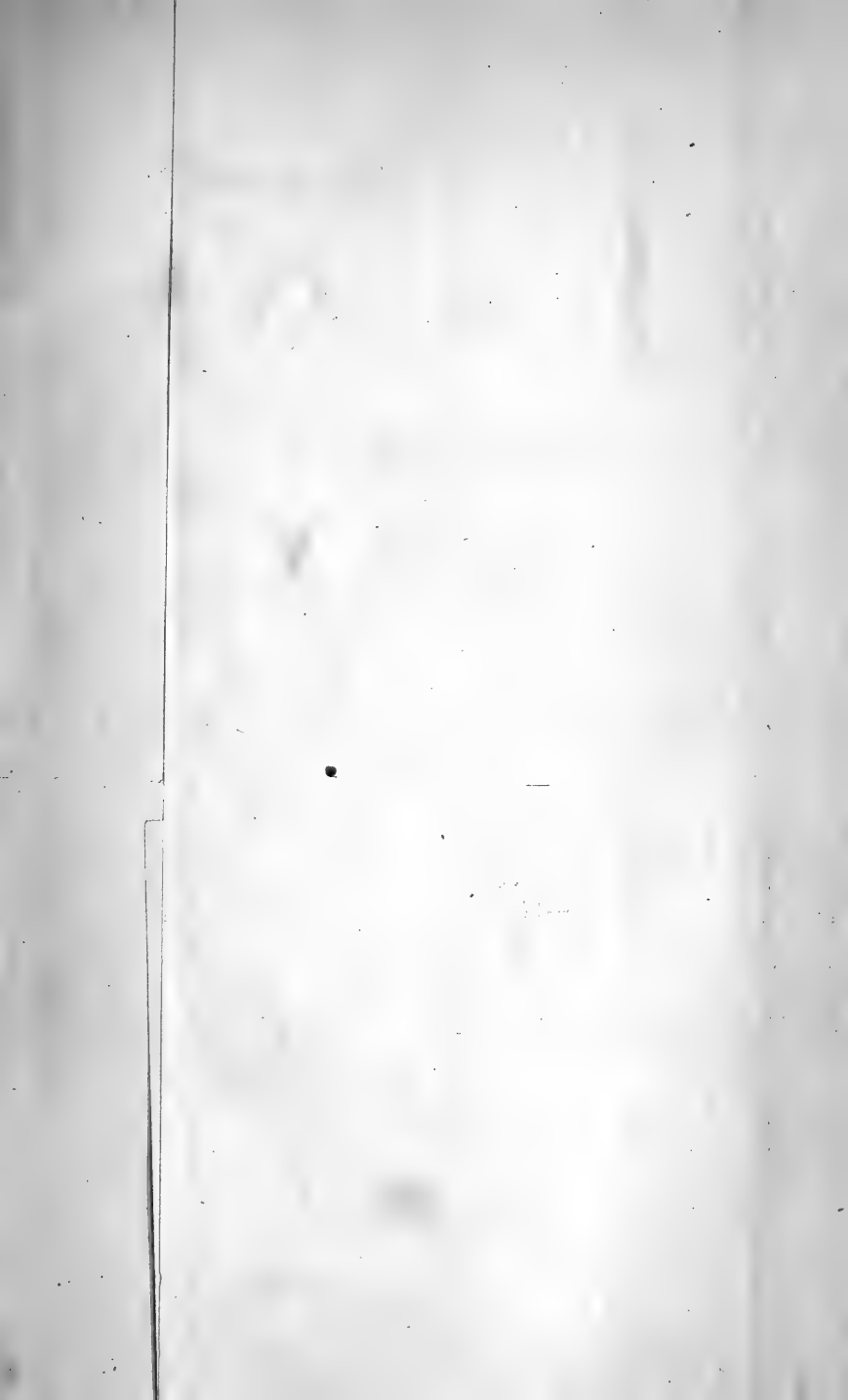
SCULPTURED BY J. H. BARNES





ELEPHANT'S. PL. IX.





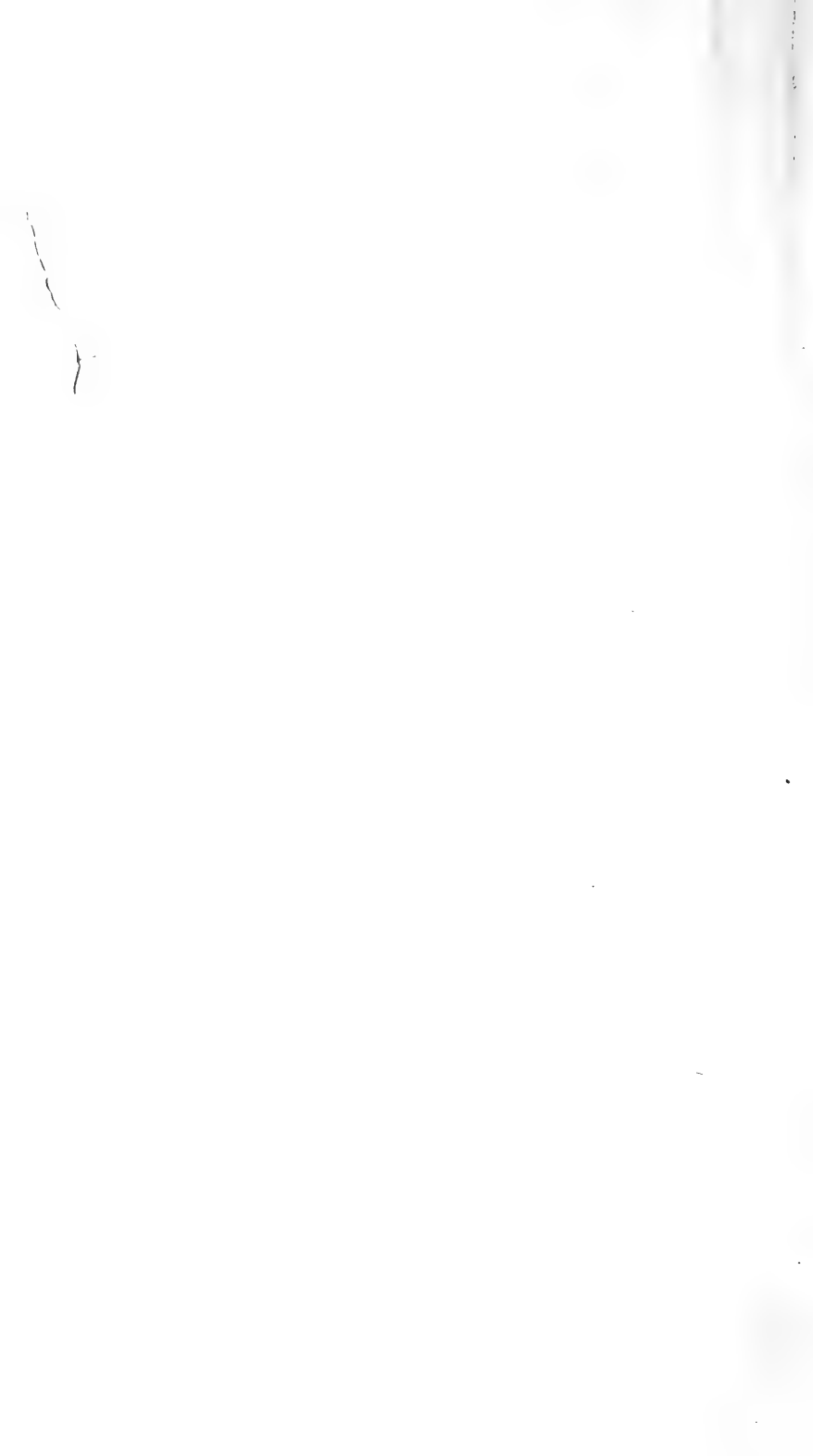


TABLE of the Extent of ZODIACAL CONSTELLATIONS, as they are drawn on our Globes, and of the Times which the Colures employ in traversing them.

ARIES.				LIBRA.			
Stars.	Longitudes in 1800.	Year of the Equinox.	Year of the Solstice.	Stars.	Longitudes in 1800.	Year of the Equinox.	Year of the Solstice.
γ	1° 0' 23' 40"	— 389	—6869	1 α	7° 11' 0' 44"	—14113	—7633
β	1 1 10 40	— 441	—6921	2 α	7 12 18 0	—14246	—7926
α	1 4 52 0	— 710	—7190	β	7 16 35 0	—14514	—8034
η	1 5 18 50	— 742	—7222	γ	7 22 20 34	—14929	—8449
2 δ	1 6 14 16	— 810	—7290	γ scorp.	7 27 41 0	—15312	—8832
ζ	1 19 8 50	—1739	—8219	ξ	7 28 30 15	—15372	—8892
2 τ tail	1 20 51 0	—1862	—2342	"	" " "	"	"
Duration	20 27 20	1473	1473	Duration	17 29 31	1259	1259
TAURUS.				SCORPIO.			
ξ	1 19 6 0	—1735	— 8215	1 λ	7 28 50 6	—15396	—8916
η	1 27 12 0	—2318	— 8798	β	8 0 23 48	—15508	—9028
α	2 6 59 40	—3024	— 9504	α	8 6 57 38	—15980	—9500
β	2 19 47 0	—3944	—10424	ζ	8 12 35 30	—16387	—9907
ζ	2 22 0 0	—4104	—10584	λ	8 21 47 27	—17049	105569
A Coch.	2 24 42 40	—4300	—10780	"	" " "	"	"
Duration	35 36 40	2565	2565	Duration	22 57 21	1653	1653
GEMINI.				SAGITTARIUS.			
Propus	2 28 9 20	—4547	—11027	γ	8 28 28 20	—17530	—11050
η	3 0 39 0	—4727	—11207	λ	9 3 32 56	—17895	—11415
γ	3 6 18 40	—5134	—11614	ζ	9 10 50 28	—18421	—11941
δ	3 15 44 0	—5813	—12293	\downarrow	9 14 15 15	—18667	—12187
Castor	3 17 27 30	—5937	—12417	ω	9 23 2 19	—19299	—12819
Pollux	3 20 28 9	—6154	—12634	σ	9 25 39 25	—19487	—13007
ϕ	3 22 27 10	—6926	—12776	"	" " "	"	"
Duration	24 17 40	1749	1749	Duration	27 11 50	1957	1957
CANCER.				CAPRICORNUS.			
1 ω	3 24 21 55	—6475	+ 45	1	9 29 39 15	—19775	—13295
ζ	3 28 32 0	—6734	— 254	2 α	10 1 3 58	—19877	—13397
β	4 1 28 20	—6906	— 426	β	10 1 15 30	—19891	—13411
γ	4 4 45 0	—7182	— 702	γ	10 14 53 30	—20872	—14392
1 α	4 10 18 50	—7583	—1103	γ	10 18 59 28	—21166	—14586
2 α	4 10 50 50	—7621	—1141	μ	10 23 1 12	—21458	—14978
κ	4 13 23 0	—7804	—1324	"	" " "	"	"
Duration	19 1 5	1369	1369	Duration	23 21 17	1683	1683
LEO.				AQUARIUS.			
κ	4 12 30 0	—7740	—1260	ϵ	10 8 56 0	—20444	—13964
α	4 27 3 10	—8788	—1908	β	10 20 36 30	—21285	—14805
δ	5 8 50 0	—9612	—3132	α	11 0 34 0	—22001	—15521
β	5 18 50 55	—10357	—3877	ζ	11 6 7 0	—22400	—15920
"	" " " "	"	"	2 \downarrow	11 13 56 12	—22963	—16483
"	" " " "	"	"	5 Δ	11 18 3 28	—23260	—16780
Duration	36 20 55	2617	2617	Duration	39 7 28	2816	3816
VIRGO.				PISCES.			
ω	5 19 2 22	—10371	—3891	β	11 15 49 0	—23095	—16615
β	5 24 19 0	—10750	—4271	λ	11 23 49 0	—23675	—17195
η	6 2 2 40	—11307	—4827	δ	12 11 22 0	—24939	—18459
δ	6 8 41 40	—11786	—5306	σ	12 24 26 0	—25879	—19399
α	6 21 3 15	—12676	—6196	α	12 26 34 58	—26034	—19554
λ	7 4 9 50	—13620	—7140	"	" " " "	"	"
μ	7 7 17 40	—13845	—7865	"	" " " "	"	"
Duration	48 15 18	3474	3474	Duration	40 45 58	2939	2939
Mean Duration	30 0 0	2160		Sirius	3 11 20 10	—5487	—1847

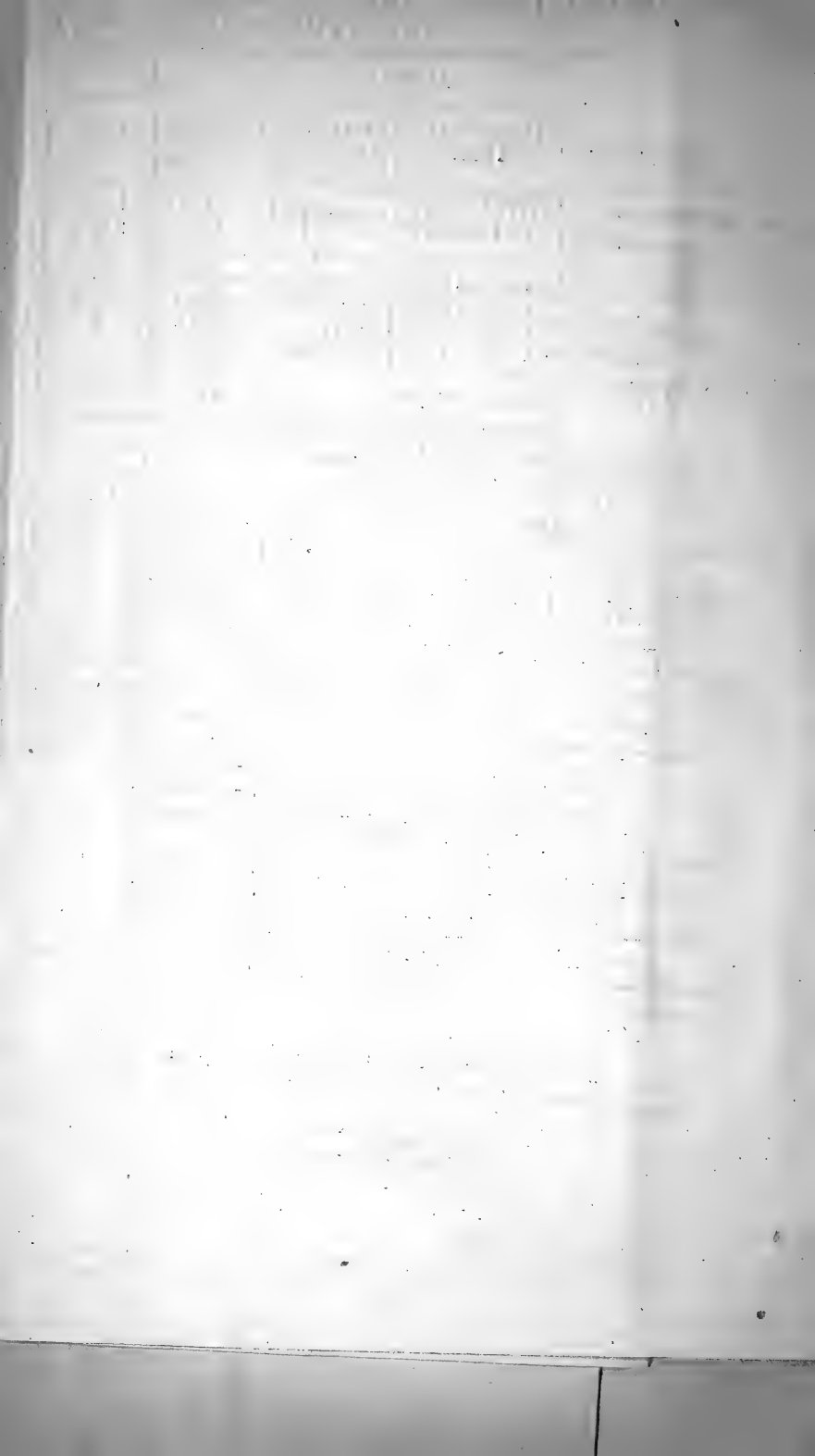


TABLE OF GEOLOGICAL FORMATIONS IN THE ORDER OF THEIR SUPERPOSITION. BY M. AL. DE HUMBOLDT.

Alluvial deposits.		Tertiary formations.
Limestone formation, with millstone (meulières).		
Sandstone and sand of Fontainbleau.		
Gypsum with bones. Siliceous Limestone.		
Coarse limestone. (Clay of London.)		
Tertiary sandstone, with lignites (brown coal).		
Plastic clay. Molasse. Nagelfluhe.		
Chalk,	white, soft (tuffeau). chloritic.	<i>Ananchites.</i>
Green sand.	Weald clay.	Secondary sandstone with <i>lignites</i> .
	Ferruginous sand.	
<i>Ammonites.</i>	Limestone of Jura.	Slaty beds with fish and crustacea.
<i>Planulites.</i>		Coral rag.
Quadersandstein, or white sandstone, sometimes above the lias.		Dive clay.
		Oolites and Caen limestone.
	Muschelkalk.	Marly or calcareous lias with <i>graphæa arcuata</i> .
	<i>Ammonites nodosus.</i>	
Marls with fibrous gypsum.		Saliferous variegated sandstone.
	Arenaceous layers.	
	Product. aculcat.	(Alpine limestone.)
Magnesian Limestone.	Zechstein.	
		Coppery slate.
Quartziferous porphery.		Co-ordinate formations of porphyry, red sandstone and coal.
<i>Transition formations.</i>		Intermediary Formations.
Slates with Lydian stone, greywacke, diorites, euphotides.		
Limestone with <i>orthoceratites</i> , <i>trilobites</i> , and <i>evomphalites</i> .		
<i>Primitive formations.</i>		Primitive Formations.
Clayey slates (Thonchicfer).		
Mica slates.		
Gneiss.		
Granites.		

[To face page 136.]



Beneath the chalk are green sands, the lower layers of which have some organic remains. Still deeper are ferruginous sands. In many countries, both these are strongly marked with sandstone layers, in which are also found lignites, amber, and relics of animals.

Under this is the vast mass of strata composing the chain of Jura and the mountains which form its continuation into Swabia and Franconia; the main ridge of the Appenines, and a vast many beds in France and England. It consists of calcareous slates, rich in fish and crustaceous animals; extensive beds of oolites, or of a granular limestone; marl, grey limestone, having pyrites characterised by the presence of ammonites; oysters with bent valves, termed gryphææ; and of reptiles more and more singular in construction and character.

Extensive layers of sand and sand-stone, often bearing vegetable impressions, support all these beds of Jura, and are themselves supported by a layer of limestone, which is so replete with numerous shells and zoophytes that Werner has called it by the too common name of *shelly limestone*, and which other sandstone strata, of the sort called variegated sandstone, separate from a limestone still more ancient, not less incorrectly called *Alpine limestone*; because it composes the high Alps of the Tyrol, but which in fact is found in our eastern provinces, and throughout the whole south of Germany.

It is in this limestone, termed shelly, that the vast masses of gypsum and rich layers of salt are deposited; and beneath it are thin layers of coppery slates, very rich in fish, and amongst which are also found fresh-water reptiles. The coppery slate is supported by a red sandstone of the period when those famous layers of coal were deposited, the resource whence the present generation is supplied, and the remains of the earliest vegetable productions which ornamented the face of the globe. We find, from the trunks of ferns, whose impressions they have preserved, how much these ancient forests differed from the present.

We next arrive at those transitive formations in which primæval nature, a nature inanimate and solely mineral, seemed still to contend for empire with animated nature. Black limestone, and slates which only present crustacea and shells of species now extinct, are presented alternately with the remains of primitive formations, and announce to us the fact of our having reached the most ancient formations that it has been permitted to us to discover; those ancient foundations of the actual coating of the globe, the marble and primitive slates, the gneisses, and finally the granites.

Such is the exact arrangement of the successive masses with which

nature has enveloped this earth. Geology has detected it by combining the lights of mineralogy with those furnished by the sciences of organic structure and existence; an order so new and pregnant with fact, that it has only been acquired since the actual proofs offered to observation have been preferred to fantastic systems, and contradictory conjectures on the primary origin of the globe, and all those phenomena, which in nowise resembling those to which we are accustomed, could neither detect therein, to throw a light on the facts, materials to produce it, or a touchstone to try and prove. Some years since, the majority of geologists might be compared to historians who were only interested in the history of France with regard to what passed amongst the Gauls before Julius Cæsar; but yet these historians, in composing their romances, availed themselves of their acquaintance with subsequent facts, while the geologists alluded to entirely neglected the posterior occurrences which alone could cast any light on the obscurity of former times.

In conclusion, it only remains for me to present the result of my individual researches, or in other words the summary of my great work. I shall enumerate the animals that I have discovered, in an order the reverse of that which I have followed in enumerating the formations. By going deeper and deeper into the series of layers, I got more and more remote as to the epochs of time. I shall now commence with the most ancient formations, and mention the animals found in them, and passing from epoch to epoch, point out those which successively present themselves, in proportion as they approach more nearly to the present age.

Enumeration of the Fossil Animals detected by the Author.

We have seen that zoophytes, mollusca, and certain crustacea begin to appear in the transition formations; there may be even at that period bones and skeletons of fishes; but they are at a very considerable distance from the epoch in which we discover the remains of animals which live on the earth and breathe the air of nature.

The vast beds of coal, and the trunks of palms and ferns, of which they retain the impressions, although already evidencing dry lands, and a vegetable thereon, do not yet show any bones of quadrupeds, nor even of oviparous quadrupeds.

It is only a little above, in the coppery bituminous slates, that we discover the first traces of them; and what is very remarkable, the first quadrupeds are reptiles of the lizard tribe, very much like the large monitors now existing in the torrid zone. Several individuals of this

species are found in the mines of Thuringia, in the midst of innumerable fishes of genera now unknown, but which, in their correspondence with the genera of the present times, appear to have lived in fresh water.

We know that the monitors are also fresh-water animals. A little higher is the limestone called Alpine, and above it the shelly limestone, so rich in entrochites and encrinites, which forms the basis of a great part of Germany and Lorraine.

It has produced skeletons of a large sea tortoise, whose shells might be from six to eight feet in length; and those of another oviparous quadruped of the lizard tribe, of great size, and with a sharp pointed nose.

Ascending through the sandstones, which only offer vegetable imprints of large arundinaceæ, bamboos, palms, and other monocotyledonous plants, we reach the different layers of the limestone called limestone of Jura, because it forms the principal nucleus of this chain.

Herein the class of reptiles develops itself fully, and manifests itself in various forms, and of gigantic size.

The middle part, composed of oolites and lias, or of grey limestone with gryphææ, has had in deposit the remains of two genera the most extraordinary of all, which have united the characters of the class of oviparous quadrupeds with the organs of motion similar to those of the cetacea.

The *ichthyosaurus* discovered by Sir Everard Home has the head of a lizard, but extended into a pointed muzzle, armed with conical and pointed teeth; enormous eyes, of which the sclerotica is strengthened with a bony case; a spine composed of flattened vertebræ, like the pieces used at the game of draughts, and concave on both sides like those of fishes; the ribs slender, the sternum and shoulder-bones like those of lizards and ornithorynchi; the pelvis small and weak; and four limbs, of which the humeri and femora are short and thick, and the other bones flatter, and set nearer each other, like the stones of a pavement, so as to compose, when enveloped in skin, fins all in a piece, and scarcely able to be bent; in a word, analogous, both in its use and construction, to those of cetacea. These reptiles lived in the sea; on land they could at best only crawl along like seals; and at the same time they breathed elastic air.

The remains of four species have been discovered.

That most extensively found (*I. communis*) has blunt conical teeth, and is sometimes twenty feet long.

The second (*I. platyodon*) at least as large, has compressed teeth, with round and swelling roots.

The third (*I. tenuirostris*) has slender and pointed teeth, and the muzzle slim and lengthened.

The fourth (*I. intermedius*) has teeth of a medium nature between the last species and the first. The two latter species do not attain half the size of the two former.

The *plesiosaurus*, discovered by Mr. Conybeare, must have appeared even more monstrous than the ichthyosaurus. It had similar limbs, but rather more elongated and flexible; its shoulder and pelvis were stronger, its vertebræ were nearly assimilated to those of lizards; but what distinguished it from all oviparous and viviparous quadrupeds, was a slender neck as long as its body, composed of thirty vertebræ and upwards, a number greater than that of the neck of all other animals, rising from the trunk like the body of a serpent, and terminated by a very small head, in which are to be found all essential characteristics of those of lizards.

If any thing could justify those hydras and other monsters which are so often drawn on the monuments of the middle ages, it would assuredly be this *plesiosaurus*.

Five species are already known, the most generally distributed (*P. dolichodeirus*) is more than twenty feet long.

A second (*P. recentior*) found in recent strata, has flatter vertebræ.

A third (*P. carinatus*) has a prominence on the lower surface of the vertebræ.

A fourth, and lastly a fifth (*P. pentagonus*) and (*P. trigonus*) have respectively five and three prominences.

These two genera are everywhere distributed in the lias. They were discovered in England, where the lias is exposed in cliffs of great extent, and they have been also found in France and Germany.

With them there existed two species of crocodiles, whose bones are also deposited in the lias, amongst ammonites, terebratulæ, and other shells of this ancient sea. We have skeletons of them in our cliffs at Honfleur, where are found the remains from which I have drawn their characters.

One of the species, the *long-nosed gavial*, has a muzzle longer and the head sharper than the *gavial*, or long-nosed crocodile of the Ganges; the body of its vertebræ is convex in front, whilst in the crocodiles now existing they are so behind. It has been found in the lias of Franconia as well as in those of France.

A second species, the *short-nosed gavial*, with a muzzle of middling length, less pointing than that of the *gavial* of the Ganges, and more so than the crocodiles as now seen in San Domingo. The vertebræ were slightly hollowed at the two extremities.

But these crocodiles are not the only animals which have been found in these beds of secondary limestone.

The fine oolite quarries of Caen have produced a very remarkable one, of which the muzzle, as long and as pointed as the long-nosed gavial has a head wider behind, with the fossæ of the temporal bones larger. It was, by reason of its stony scales, with round cavities, the best armed of all the crocodiles. The teeth of the lower jaw are alternately longer and shorter.

There is another species in the oolites of England, but it is only known by some parts of its cranium, which is not sufficient to afford a perfect idea of it*.

Another very remarkable genus of reptiles, whose remains, although also found in the concretion of lias, abound particularly in the oolite and the higher sands, is the *megalosaurus* properly so called, for, with the shape of lizards, and particularly of the monitors, of which it has also the cutting and indented teeth, it was of so enormous a size, that in assigning to it the properties of the monitors, it would exceed seventy feet in length. It would be a lizard as large as a whale. It was discovered in England by Mr. Buckland, but we have them also in France, and some of its bones have been found in Germany, if not of the same species, at least of a species which cannot be classed with any other genus. We are indebted to M. de Sœmmerring for the first description of it. He discovered the remains in the superior strata of the oolites, in the calcareous schists (slates) of Franconia, long celebrated for the numerous fossils with which they have supplied the cabinets of the curious, and which will be made still more useful by the services which their peculiar adaptation for the purposes of lithography will enable them to render to the arts and sciences.

Crocodiles also are found in these limestone-schists, and always those with the long muzzle. M. de Sœmmerring has described one (the *C. priscus*) of which the entire skeleton of a small individual was preserved almost as well as it could have been in our cabinets. It is one of those which resemble the real gavial of the Ganges; but the united portion of its lower jaw is not so long; the lower teeth are alternately and regularly longer and shorter, and it has ten additional vertebræ at the tail.

But the most remarkable animals which are deposited in these limestone-schists are the flying lizards, which I have named *ptero-dactyli*.

They are reptiles with a very short tail, a very long back, a muzzle

* We expect a full explanation of it from the researches of Mr. Conybeare.

greatly extended and armed with sharp teeth; supported on high legs, the anterior extremity has an excessively elongated claw, which probably supported a membrane which sustained it in the air, together with four other toes of ordinary size, terminated by hooked claws. One of these strange animals, whose appearance would be frightful, was about the size of a thrush, and the other that of a common bat; but from fragments we find that there existed a much larger species.

A little above these calcareous schists is the limestone (nearly homogenous) of the ridge of Jura. It contains also bones, but always those of reptiles—crocodiles and fresh-water tortoises—of which it produces an abundance in the environs of Soleure. They have been there discovered and scrutinized with much care by M. Hugi; and from the fragments already collected we can easily recognize a considerable number of the species of the *fresh-water tortoise*, or *emydes*, which ulterior discoveries only can determine, but many of which have been already distinguished by their sizes and shapes from all kinds of known *emydes*.

It is among these numerous oviparous quadrupeds of all sizes and forms; in the midst of these crocodiles, of these tortoises, of these flying reptiles, of these immense megalosauri, of these monstrous plesiosauri, that some small mammifera are said to be first detected. It is certain that jaw bones, and some bones discovered in England, belong to this class, and particularly to the family of didelphides, or those of insectivorous animals.

It may however be suspected, that the stones which encrust them have originated from some local recomposition subsequent to the epoch of the formation of these layers. However that may be, we find still that the reptile tribe predominated exclusively for a long time.

The ferruginous sands placed in England above the chalk, abound with crocodiles, tortoises, megalosauri, and particularly with a reptile which presents the singular character of using his teeth like our herbivorous mammifera.

Mr. Mantell, of Lewes, in Sussex, discovered this peculiar animal, as well as other large reptiles, in the sands beneath the chalk. * He named it the *iguanodon*.

In the chalk itself there are only reptilia: we find remains of tortoises and crocodiles. The famous soft sandstone quarries (*carrières de tuffau*) of the mountain of Saint Peter, near Maestricht, which belong to the formation of chalk, have given, beside the very large sea tortoises, and a vast quantity of shells and marine zoophytes, a genus of lizards not less gigantic than the megalosauri, which has become famous from the researches of Camper, and by the figures which Faujas has given of its bones in his history of this mountain.

It was upwards of twenty-five feet long; its great jaws were armed with very strong teeth, conical, rather arched and ridged, and it had also some of these teeth in the palate. There were more than a hundred and thirty vertebræ in its spine, convex in front and concave behind. Its tail was high and broad, and formed a large vertical oar. Mr. Conybeare has recently proposed to call it the *mosasaurus*.

The clays and lignites, which are above the chalk, have only produced crocodiles; and I have every reason to conclude that the lignites in Switzerland, in which have been found the bones of the beaver and mastodon, belong to a more recent period. It is only in the coarse limestone which rests on these clays that I have first found the bones of mammifera; and even these belong to marine mammifera, to unknown dolphins, to lamantins and morses.

Amongst the dolphins, there is one whose muzzle, more lengthened than in any known species, had the lower jaw united to an extent nearly equal to that of a gaval. It was found near Dax, by the late President of Borda.

Another of the rocks in the department of Orne, has also a long muzzle, but rather differently shaped.

The whole genus of lamantines is now marine, and inhabit the seas of the torrid zone; and that of the morses, of whom we have but one living species, is confined to the icy sea. However, we find the skeleton of these two species together in the layers of the coarse limestone of the middle of France; and this union of species, of which the most similar are now in opposite zones, will again occur in our researches more than once.

Our fossil lamantins differ from the known lamantins, by having a head more elongated, and otherwise constructed. Their ribs, easily recognised by their rounded thickness and by the density of their texture, are not rare in our different provinces.

As to the fossil morse, we have as yet only fragments insufficient to characterise the species.

It is only in the layers which have succeeded the coarse limestone, or at most in those which might have been formed at the same time with it but deposited in the fresh-water lakes, that the class of land mammifera begins to show itself in any abundance.

I regard as belonging to the same age, and as having lived at the same time, but perhaps in different situations, those animals whose remains are buried in the molasse and the ancient beds of gravel in the south of France; in the gypsum layers mingled with limestone, similar to those in the environs of Paris and Aix, and in the marly

deposits of fresh water, covered by the marine beds of Alsace, the province of Orleans, and of Berri.

This animal population has a very remarkable character in the abundance and variety of certain genera of pachydermata, which are unknown amongst the quadrupeds now existing, and the characteristics of which are more or less nearly related to tapirs, rhinoceroses, and camels:

The genera, whose discovery is entirely due to me, are—the *palæotheria*, the *lophiodonta*, the *anoplotheria*, the *anthracotheria*, the *cheropotami*, and the *adapis*.

The palæotheria resemble the tapirs in the general form, in that of the head, and particularly in the shortness of the bones of the nose, which proves that they had, like the tapirs, a small proboscis; and also in having six incisores and two canine teeth in each jaw; but they resembled the rhinoceros in their grinders, of which the upper ones were square, with prominent ridges differently shaped, and the lower ones shaped like double crescents, and their feet in like manner were divided into three toes, while the fore feet of the tapir have four divisions.

It is one of the genera, the most distributed and numerous in species, that are found in the layers of its particular period. Our gypsum quarries in the environs of Paris are crowded with them. The first (*P. magnum*) as large as a horse. Three resemble swine, but one (*P. medium*) has narrow and long feet; one (*P. crassum*) with larger feet; one (*P. latum*) with feet still larger and much more short; the fifth species (*P. curtum*) of the size of a sheep, is much lower, and has feet still larger and shorter in proportion than the last; a sixth (*P. minus*) is of the size of a small sheep and has slim feet, the lateral toes of which are shorter than the others; and finally there is one (*P. minimum*) not larger than a hare, which has also long and slender feet.

They have also been found in other provinces of France; at Puy in Velay, in the beds of gypseous marl, one species (*P. velanum*), very similar to the (*P. medium*), but differing from it in the formation of the lower jaw; in the vicinity of Orleans, in the layer of marly stone, a species (*P. aurelianense*) distinguished from the others by having the returning angle of the lower grinders with the crescent cleft into a double point, and by some difference in the prominences of the upper grinders; near Issel, in a layer of gravel, or molasse, along the declivities of the Black Mountain, a species (*P. isselanum*) characterised like those of Orleans, but smaller; but principally in the molasse of

the department of the Dordogne, the palæotherium occurs not less abundantly than in the gypsum quarries of Paris.

The Duke de Caze has discovered in the quarries of one field, bones of three species, which appear different from all those of our environs.

The *lophiodons* resemble the tapirs still more closely than the palæotheria do, as their lower grinders have transverse prominences like the tapirs. They differ from them, however, because they have the front-teeth more simple, and the back one of all has three prominences, and the upper ones are rhomboidal and ridged similarly to those of the rhinoceros.

We are ignorant of the form of their muzzle and the number of their toes. I have discovered exactly twelve species, all in France, embedded in the marly stones, formed by the fresh-water deposits, and filled with *lynneæ* and *planorbis*, shells which are peculiar to pools and marshes.

The largest was found near Orleans, in the same quarry as the palæotheria. It closely resembles the rhinoceros.

There is another smaller species in the same place; a third is to be found at Montpellier; a fourth near Laon; two near Buchweiler, in Alsace; five near Argenton, in Berri; and one of the three is again found near Issel, where there are two others. There is also a very large species near Gannat.

These species differ in size, which in the smallest is scarcely equal to that of a lamb three months old, and in details in the formation of their teeth, which it would be tedious to enter upon here.

The *anoplotheria* are at present only found in the gypsum quarries in the environs of Paris. They have two characteristics not observed in any other animals; feet with two toes, of which the metacarpus and metatarsus are distinct, and not joined in one solid piece, as in ruminating animals; and teeth in a continuous series, without any space intervening. Man alone has teeth so closely placed without any gap between. Those of the *anoplotheria* consist of six incisores in each jaw; one canine and seven grinders on each side, as well above as below; their canine are short, and resemble the exterior incisores. The first three grinders are compressed; the other four are, in the upper jaw, square, with transverse ridges, and a small cone between them; and in the lower jaw, shaped like a double crescent, but without any prominence at the base. The last has three crescents. Their head is oblong, and does not announce that the muzzle has terminated either with a proboscis or a snout.

This extraordinary species, comparable to no species now existing, is subdivided into three sub-genera. The *anoplotheria*, properly so called, the anterior grinders of which are still tolerably thick, and the posterior of the lower jaw have a plane ridge in the crescent. The *xiphodons*, whose anterior grinders are thin and cutting, and whose posterior in the lower jaw have, immediately opposite to the concavity of each of their crescents, a point which by use assumes the form of the crescent, so that there the crescents are double, as in ruminating animals. The *dichobunes*, whose exterior crescents are also pointed at the beginning, and which thus have points arranged in pairs on the back grinders of the lower jaw.

The *anoplotheria*, the most common in our gypsum-quarries (*A. commune*), is an animal as tall as a wild boar, but much larger, and with a very long and very thick tail, so that as a whole it has nearly the properties of the otter, but much larger. It is probable that it swam well and frequented lakes, at the bottom of which the bones have become incrustated by gypseous deposites. We have one smaller species, but otherwise quite similar (*An. secundarium*).

We have as yet found only one *xiphodon*, a very remarkable animal, which I have named *An. gracile*. It is slender and slightly formed, like the most beautiful gazelle.

There is one *dichobune*, nearly the size of a hare, which I call *An. leporinum*.

In addition to its sub-generic characteristics, it differs from the *anoplotheria* and *xiphodons* by having two small and slender toes on each foot on the sides of the two large toes.

We are not aware whether these lateral toes existed in the two other *dichobunes*, which are small, and scarcely exceed the Guinea pig in size.

The genus of *anthracotheria* is nearly the medium between the *palæotheria*, the *anoplotheria*, and hogs. I have thus named it, because two of its species have been found in the lignites of Cadibona, near Savone. The first was nearly as large as the rhinoceros; the second was smaller. They are also found in Alsace and Velay. Their grinders are similar to those of the *anoplotheria*, but they have projecting canine teeth.

The genus *cheropotamus* is found in our gypsum quarries, together with the *palæotheria* and *anoplotheria*, but it is much more rare. The back grinders are square at top, rectangular at bottom, and have four large conical projections, surrounded by some smaller. The front grinders are short cones, slightly compressed, with double roots; its canine teeth

are small. We are not yet acquainted with its incisores nor its feet. I have only one species, of the size of a Siam hog.

The genus *adapis* has in the same way but one species at most, not larger than a rabbit. This is also found in our gypsum-quarries, and must have had a close alliance with anoplotheria.

Thus we have mentioned nearly forty species of *pachydermata*, belonging to genera now quite extinct, to the sizes and shapes of which we have no closer existing resemblance than in the tapirs and a daman.

This great number of *pachydermata* is the more remarkable, as the ruminantia, now so numerous, in the genera of stags and gazelles, and which attain so vast a size in those of oxen, giraffes, and camels, are rarely to be found in the strata to which we have been alluding.

I have never detected the smallest relic in our gypsum-quarries, and all that has come to me consists of some fragments of a stag, of the size of the roebuck, but of another species, collected from the palæotheria of Orleans, and in one or two other small fragments from Switzerland, both perhaps of equivocal origin.

But our *pachydermata* were not consequently the only inhabitants of the countries where they lived. In our gypsum-quarries, at least, we find with them carnivora, glires, many sorts of birds, crocodiles and tortoises, and these two latter also accompany them in the molasse and marly rock of the middle and south of France.

At the head of the carnivora I placed a bat very recently discovered at Montmartre, and of the proper genus *vespertilio**. The existence of this genus at so remote an epoch is the more surprising, as neither in this formation, nor in those which follow it, have I been able to discover any trace either of *cheiroptera* nor of *quadrumana*. No bones, no tooth of monkey nor maki, however, presented themselves to me in my long researches.

Montmartre has also produced for me the bones of a fox different from ours, and equally different from the jackals—isatisis, and the various species of foxes which are known in America; also the bones of a carnivorous animal a-kin to the racoon and coatsies, but larger than any of the known species; those of a peculiar species of civet cat; and of two or three other carnivora which could not be determined for want of parts sufficiently perfect.

What is yet more singular is, that there are skeletons of a small sarigue, a-kin to the marmoset, but different, and consequently of an animal whose genus is now confined to the new world. We have also

* I am indebted to the Count de Bournon for my knowledge of this; and as it is not described in my great work, I give drawings of it in Plate 2, figs. 1 and 2.

collected skeletons of two small glires, or the genus of the dormouse³ and a head of the squirrel genus.

Our gypsum-quarries are more prolific in bones of birds than any of the other layers, either anterior or subsequent to its deposite. We find whole skeletons, perfect skeletons, and parts of at least ten species of all the orders.

The crocodiles of that age resembled our common crocodiles, in the form of the head, whilst in the layers of the epoch of the Jura formation, we only discover the species a-kin to the gavial.

There has been found at Argenton a species remarkable for its compressed teeth, with sharp edges cutting like the dentated teeth of certain monitors. We also see some remains in our gypsum-quarries.

The tortoises of this age are all of fresh-water production; some belong to the sub-genus of emydes; and there are some as well at Montmartre as in the molasse of the Dordogne, of a greater magnitude than any now existing; the others are trionyces, or soft tortoises.

This genus, which is easily distinguished by the vermiculated surface of the bones of its shell, and which now only exists in the rivers of hot countries, such as the Nile, the Ganges, and the Orinoco, was very plentiful in the same formations as the palæotheria. There are a vast quantity of these remains at Montmartre, and in the molasse sandstone of the Dordogne, and other gravelly deposite of the south of France.

The fresh-water lakes about which these animals lived, and which received their bones, nourished, besides tortoises and crocodiles, some fishes and some shelly animals. All that have been collected are as foreign to our climate, and even as unknown in our present waters, as the palæotheria and other contemporary quadrupeds.

The fish even belong partly to unknown species.

Thus, we cannot doubt but that this population, which may be termed that of the middle age,—this first great production of mammifera, has been entirely destroyed; and in fact, wherever we discover their remains, there are above them vast marine deposite, so that the sea must have overwhelmed the countries which these races inhabited, and has covered them for a very considerable period.

Were the countries thus inundated vast in extent? The investigation of the ancient beds formed in their lakes has not yet enabled us to decide this question.

To the same epoch I attribute our gypsum beds, and those of Aix many of the quarries of marly stones, and the molassic sandstones, at least those of the south of France. I am also disposed to assign to the same period, portions of the molasses of Switzerland, and the lignites

of Liguria and Alsace, in which are found quadrupeds of the families above described; but I do not learn that any of these animals are found in other countries. The fossil bones of Germany, England, and Italy, are all either older or more recent than those we have enumerated, and belong either to that ancient race of reptiles of the Juraic and copper-slate formations, or to the deposites of the last general deluge—the diluvial layers.

We may then believe, as there is no proof of the contrary, that, at the epoch when these numerous pachydermata existed, the globe only afforded them, as habitations, a small number of tolerably fertile plains, wherein they could multiply; and perhaps these plains were isolated regions, separated by considerable spaces of lofty chains, where we do not find that our animals have left any vestiges of their existence.

We have, through the researches of M. Adolphe Brongniart, become acquainted with the nature of the vegetables which covered these few countries. In the same layers with our palæotheria are collected trunks of palm trees, and many other beautiful plants, whose genus is now only to be found in hot climates; palm trees, crocodiles, and trionyces are always found in greater or lesser numbers wherever the ancient pachydermata are discovered.

But the sea, which had covered these countries and destroyed their animals, left great deposites, which still form, at a trifling depth, the basis of our great plains; then it retired again, and yielded vast surfaces to a new population, of which the relics are to be found in the sandy and muddy layers of all known countries.

It is to this tranquil deposit of the sea that we should ascribe some cetacea very much like those of the present time—a dolphin similar to our epaulard, and a whale very similar to our rorquals—both exhumed in Lombardy by M. Cortosi; a large whale's head found in the very centre of Paris, and described by Lamanon and by Daubenton; and a genus entirely new, which I discovered and named *ziphius*, and which at least consists of three species. It is allied to the cachalots and hyperoodons.

In the population which fills our post-diluvial and superficial strata, and which has existed in the deposite we have just mentioned, there are no longer palæotheria, anoplotheria, nor any of this peculiar genus. The pachydermata, however, still were found there; the gigantic pachydermata, elephants, rhinoceroses, hippopotami, accompanied by innumerable horses, and many large ruminantia. Carnivora of the size of lions, tigers, and hyænas, desolated the new animal kingdom. Its

general character, even in the extreme north, and on the banks of our Icy Sea, was similar to that now only presented by the torrid zone; and yet there was no species exactly similar to those of the present day.

Amongst these animals, in particular, was the elephant, called by the Russians the mammoth (*elephas primigenius* of Blumenbach) from fifteen to eighteen feet in height, covered with a coarse red wool, and long black bristly hairs, which formed a mane along its back: its enormous tusks were implanted in alveolæ longer than those of the elephants of our times; otherwise it was very similar to the elephant of India. It has left thousands of its carcasses, from Spain to the borders of Siberia, and has been discovered throughout North America; so that it was spread over the two coasts of the Atlantic ocean, if indeed the ocean was at that time in the place where it now flows. It is well known that its tusks are still so well preserved in cold countries, that they are used for the same purpose as new ivory; and, as we before remarked, individuals have been found with the flesh, skin, and hair, which had been frozen since the final catastrophe of the globe. The Tartars and Chinese have imagined it to be an animal which lives under ground, and perishes whenever it appears in daylight.

After it, and nearly equal to it, came also, in the countries forming the two present continents, *the narrow-toothed mastodon*, which resembled the elephant, being armed, like it, with enormous tusks, but these tusks covered with enamel; lower in the legs, and with grinders mamillated and cased with a thick and shining enamel, which have long supplied what is called the occidental turquoise.

Its remains, so common in the temperate parts of Europe, are not found so generally in the north; but we discover them in the mountains of South America, with two kindred species.

North America has an immense quantity of the remains of the *great mastodon*, a species still larger than the preceding, as tall in proportion as the elephant, with tusks not less enormous, and whose grinders, full of sharp points, have caused it to be taken for a carnivorous animal.

Its bones were very thick, and had much solidity; even its hoofs and stomach are said to have been found in good preservation, and easily recognizable. It is asserted that the stomach was filled with the crushed branches of a tree. The savages believe that this race was exterminated by the gods, lest they should destroy the human race.

With these enormous pachydermata existed two genera rather less than the rhinoceros and hippopotami.

The hippopotamus of the period was common enough in the coun-

tries which now form France, Germany, and England, and particularly in Italy. Its resemblance to the present African species was such that it requires an attentive scrutiny to ascertain the distinguishing characteristics.

There was also, at this period, a small species of hippopotamus, of the size of a wild boar, to which we have at present nothing similar.

The rhinoceroses of large size were at least three in number; all double-horned. The species most distributed over Germany (*viz. Rh. tichorhinus*), and which, like the elephant, is found to the very shores of the Icy Sea, where entire individuals are to be discovered, had a long head, the bones of the nose very strong, supported by an osseous junction of the nostrils, not simply cartilaginous, and wanted incisores.

Another species, rarer and belonging to a more temperate climate (*Rh. incisivus*), had incisores like the present rhinoceros of the East Indies, and particularly resembled that of Sumatra. Its distinctive characteristics were to be found in a different formation of the head.

The third (*Rh. leptorhinus*) wanted incisores, like the first and the Cape rhinoceros of the present day; but it was distinguished by a muzzle more pointed and limbs more slender. In Italy particularly, its remains are found in the same strata as those of the elephants, mastodonta, and hippopotami.

Lastly, there is a fourth species (*Rh. minutus*), furnished, as the second, with incisores, but of lesser size, and scarcely larger than a hog. It was undoubtedly rare, for its relics have only been collected in some places in France.

To these four genera of large pachydermata may be added a tapir, equal to them in size, and consequently twice or thrice as large in the linear dimensions as the American tapir.

We find its teeth in many parts of France and Germany, and generally accompanied with those of the rhinoceros, mastodon, and elephant.

There is still another to be added to these, which occurs, however, in very few places,—a large pachyderma, of which only the lower jaw has been found, and whose teeth were doubly crescented and modulated. M. Fischer, who discovered it amongst the bones from Siberia, has named it the *elasmotherium*.

The genus of the horse also existed at this period. Thousands of its teeth are found with those which we have just described, in nearly all their deposits: but it is impossible to say whether it was or was not of the same species as that now existing, because the skeletons of

this species so much resemble each other, that they cannot be determined from isolated fragments.

Ruminating animals were infinitely more numerous than at the epoch of the palæotheria; their numerical proportion even must differ but little from what it now is; but we are convinced that there were many different species.

This we may confidently assert with respect to the stag, of superior size even to the elk; which is common in the marl deposits and turf bogs of Ireland and England, and of which remains have been disinterred in France, Germany, and Italy, in the same beds which contain the bones of the elephant. Its large and branching antlers extend twelve or fourteen feet from one point to the other, in allowing for the curved portions.

This distinction is not so clear with respect to the bones of deer and oxen which have been collected in certain rocks; they are (and particularly in England) sometimes accompanied with the bones of the elephant, rhinoceros, and hippopotamus, and those of a hyena, which are also met with in many layers of alluvial deposits, together with the pachydermata: consequently they are of the same age; but there is yet much difficulty in deciding how they differ from the present breeds of similar animals.

The clefts of the rocks of Gibraltar, Cette, Nice, Oliveta, near Pisa, and others on the banks of the Mediterranean, are filled with a red and firm cement, which envelopes fragments of rock and fresh-water shells, with many bones of quadrupeds, for the most part fractured, and which have been called osseous breccia. The bones which fill them sometimes present characteristics sufficient to prove that they have belonged to animals unknown at least in Europe. We find there, for instance, four species of deer, three of which have characteristics in their teeth observable only in the deer of the Indian Archipelago.

There is a fifth race known, near Verona, whose antlers exceed in spread those of the deer of Canada.

We also find in particular places, with the bones of the rhinoceros and other quadrupeds of this epoch, those of a deer so closely resembling the rein-deer, that it is difficult to assign distinguishing characters to it; and what is still more extraordinary, rein-deer are confined to the coldest climates of the north, whilst the whole genus of the rhinoceros belongs to the torrid zone.

There are in the layers of which we are speaking, remains of a species very similar to the fallow-deer, but a third larger, and quanti-

ties of horns very much resembling those of our deer, as well as bones very closely assimilating to those of the aurochs and those of the domestic ox, two very distinct species, which former naturalists had improperly confounded. However, the entire heads, like those of other animals, as well as the musk ox of Canada, which have often been dug up, do not come from positions sufficiently assured to enable us to determine that these species were cotemporary with the great pachydermata that we have above mentioned.

The osseous bracciæ, of the banks of the Mediterranean, have also afforded two species of *lagomys*, an animal now only existing in Siberia; two species of rabbits, lemmings, and rats of the size of the water-rat, and that of a mouse. They are also found in the caverns of England.

The osseous bracciæ, contain even the bones of shrew mice and lizards.

There are in certain sandy strata of Tuscany, the teeth of a porcupine, and in those of Russia, the head of a species of beaver larger than ours, which Mr. Fischer calls *trogontherium*. But it is principally in the class Edentata, that these races of animals, prior to the last period, assume a size much greater than that of the present congenerate species and attain even a gigantic size.

The *megatherium* unites one portion of the generic character of the armadilloes with a portion of that of the sloth, and in size it equals the largest rhinoceros. Its nails must have been of monstrous length and power; all its frame has vast solidity. It has yet only been found in the sandy strata of North America.

The *megalonyx* resembled it much in its characteristics, but was somewhat less; its nails were longer and sharper. Some of its bones and entire toes have been found in certain caverns in Virginia, and in an island on the coast of Georgia.

These two enormous edentata have only deposited their remains in America; but Europe possessed one which did not yield to them in bulk. It is not known by a single terminating toe-joint; but this is sufficient to convince us that it very much resembled a pangolin, but a pangolin is nearly twenty feet long. It lived in the same districts as the elephant, the rhinoceros, and the immense tapir; for we find its bones with theirs in a sandy layer near Darmstadt, not far from the Rhine.

The osseous bracciæ also contain, but very rarely, bones of carnivora, much more numerous in caverns, that is to say, in cavities larger and more complicated than the clefts or veins containing osseous bracciæ.

The Jura formation particularly is celebrated for them, in that part which extends into Germany, where for ages incredible quantities have been carried off and destroyed, because peculiar medical properties have been assigned to them, and there is sufficient remaining to astound the imagination. They are principally bones of a species of very large bear (*ursus spelæus*) characterised by a rounder forehead than that of any of our living bears; with these bones are mingled those of two other species of bears (*U. arctoideus et U. priscus*), those of a hyena, (*H. fossilis*) allied to the spotted Cape hyena, but differing in certain details of its teeth, and the form of its head; those of two tigers or panthers, those of a wolf, those of a fox, those of a glutton, those of weasels, civets, and other small carnivora.

We may remark here, that singular association of animals of which those similar live now in climates as distant as the Cape, the country of the spotted hyenas, and Lapland, the country of our gluttons. And we have thus seen in a cavern in France, a rhinoceros and a rein-deer beside each other.

Bears rarely occur in alluvial strata, though they are said to have been found in Austria and Hainault, of the large species discovered in caves, and there is one in Tuscany of a peculiar species, remarkable for its compressed canine teeth (*U. cultridens*); hyenas are found there more frequently. We have discovered them in France with the bones of elephants and rhinoceroses. A short time since a cavern was discovered in England which contained prodigious quantities of them, of all ages, and in the soil even the excrements were plainly to be recognized. They must have lived there for a long period, and they had dragged into their cave the bones of the elephants, rhinoceroses, hippopotami, horses, oxen, deer, and of various glires which are there mingled with their own remains, and bear evident marks of the tooth of the hyenas. But what must have been the soil of England when these enormous animals served as prey to these ferocious beasts? These caverns also contain the bones of tigers, wolves and foxes; but those of the bear are of extremely rare occurrence*.

However this may be, we see that at the period of the animal population, now under our consideration, the class of carnivora was numerous and powerful. It had three bears with rounded canine teeth; one bear with compressed canine teeth, a large tiger or lion, another of the felis tribe of the size of a panther, a hyena, a wolf, a fox, a glutton, a martin, or polecat, and a weasel.

* See Mr. Buckland's admirable work 'Reliquiæ Diluvianæ.'

The class of glires, composed generally of a weak and small species, has had but little notice from fossil collectors; and yet its remains, in the layers and deposites of which we are treating, have also presented unknown species, such in particular is a species of lagomys of the osseous bracciæ of Corsica and Sardinia, somewhat similar to the Alpine lagomys of the high mountains of Siberia; so true is it, that it is not in the torrid zone that we must always seek for animals resembling those of the epoch preceding the last general catastrophe.

These are the principal animals whose remains have been discovered in that mass of earth, of sand and of mud, in that *diluvium*, which everywhere covers our vast plains, fills our caverns, and chokes up the fissures of many of our large rocks. They formed most indubitably the population of the continents at the epoch of the great catastrophe which has destroyed their race, and which prepared the soil on which the animals of the present day subsist. Whatever resemblance certain of the species of the present day offer to them, it cannot be disputed that the total of this population had a totally distinct character, and that the majority of the races which composed it have been annihilated.

It is wonderful, that among all these mammifera, of which at the present day the greater part have a congregate species in the warm climates, there has not been one quadrumanous animal, not a single bone, or a single tooth of a monkey, not even a bone or a tooth of an extinct species of this animal.

Neither is there any remains of man. All the bones of the human race which have been collected along with those which we have spoken of, have been the result of accident*, and besides their number is extremely small, which it certainly would not be if men had then been established in the countries inhabited by these animals. Where then was the human race? Did the last and most perfect work of the Creator exist nowhere? Did the animals which now accompany him on earth, and of which there are no fossil remains to be traced, surround him? Have the lands in which they lived together been swallowed up, when those which they now inhabit, and of which, a great inundation might have destroyed the anterior population, were again left dry? On this head the study of fossils gives

* See, in Mr. Buckland's 'Reliquiæ Diluvianæ,' an account of the skeleton of a female found in a cave in Pavyland; and in my 'Recherches,' v. iv. p. 193, concerning a fragment of a jaw found in the osseous breccia, at Nice.

M. de Schlotheim collected human bones in the fissures of Kœstritz, where there are also rhinoceros bones; but he himself is doubtful as to the epoch of their deposition.

us no information, and in this Discourse we must not seek an answer to our question from other sources.

It is certain, that we are at present at least in the midst of a fourth succession of terrestrial animals, and that after the age of reptiles, after that of palæotheria, after that of mammoths, mastodonta and megatheria, the age arrived in which the human species, together with some domestic animals, governs and fertilizes the earth peaceably; and it is only in formations subsequent to this period, in alluvial deposites, in turf-bogs, in the recent concretions, that those bones are found in a fossil state, which all belong to animals known and now existing.

Such are the human skeletons of Gaudaloupe, incrusted in a species of travatine with land shells, slate and fragments of the shells and madrepores of the neighbouring sea; the bones of oxen, deer, roebucks, and beavers of common occurrence in turf-bogs, and all bones of the human race, and of domestic animals found in the deposites of rivers, in burial grounds, and in fields of battle.

None of these remains belong either to the vast deposite of the great catastrophe, or to those of the ages preceding that wonderful event.

APPENDIX

TO THE

DISCOURSE ON THE REVOLUTIONS OF THE SURFACE OF THE GLOBE.

DESCRIPTION OF THE BIRD CALLED THE IBIS BY THE ANCIENT EGYPTIANS.

EVERY one has heard of the Ibis, the bird to which the ancient Egyptians paid religious worship; which they brought up in the interior of their temples, which they allowed to stray unharmed through their cities, and whose murderer, even though involuntary, was punished by death*; which they embalmed with as much care as their own parents. To this bird was attributed a virgin purity; an inviolable attachment to their country, of which they were made the emblem—an attachment of such force, that they would die with hunger, if removed elsewhere; a bird which possessed sufficient instinct to know the increase and wane of the moon, and regulated accordingly the quantity of its daily nourishment, and the development of its young; which checked, at the very frontiers of Egypt, the serpents which would have carried destruction into this sacred land†, and inspired them with so much terror, that they even feared their feathers‡; this bird, whose form the gods themselves would have assumed, if compelled to adopt a mortal shape, and into which Mercury was really transformed when he desired to travel over the earth, and teach men the arts and sciences.

Not any other animal could be as easily recognizable as this one; for there is no other of which the ancients have left us, as they have of the ibis, such admirable descriptions, figures so exact and even coloured, and the body itself carefully preserved with its feathers under the triple covering of a bituminous preservation of thick linen, in many folds, and in vessels solid and highly varnished.

And yet, of all modern writers who have spoken of the ibis, Bruce alone—a traveller more celebrated for his courage, than the accuracy of his notions on natural history—has not been in error regarding the

* Herod. 1, 2.

† Ælian, lib. 2, c. xxxv and xxxviii.

‡ Ibid, lib. xxxviii.

true species of this bird; and his ideas in this respect, exact as they were, have not been adopted by other naturalists*.

After many changes of opinion concerning the ibis, it was apparently agreed, at the period when I published the first edition of this work, to give the name of ibis to a bird, a native of Africa, nearly the size of the stork, with white plumage, and the plumes of the wings black, perched on long red legs, with a long beak, arched with cutting edges, rounded at the base, jagged at the point, of a pale yellow colour, and with its face covered with a red skin, without plumage, which does not go farther than its eyes.

Such is the ibis of Perrault†, the white ibis of Brisson‡, the white ibis of Egypt of Buffon§, and the tantalus ibis of Linnæus, in his twelfth edition.

It was to this very bird that M. Blumenbach, at the same time confessing its rarity at the present day, at least in Lower Egypt, asserted that the Egyptians paid divine honours ||; and yet M. Blumenbach had an opportunity of examining the skeleton of a real mummy ibis, which he opened in London¶. I was in the same error as these learned men whom I have just mentioned, until I had an opportunity of examining by myself some mummies of the ibis.

This pleasure was first procured for me by the late M. Fourcroy, to whom M. Grobert, colonel of artillery, returning from Egypt, had given two of these mummies, both taken from the pits of Saccara. On unfolding them carefully, we perceived that the bones of the embalmed bird were much smaller than those of the tantalus ibis of naturalists; that they were but very little larger than those of the curlew; that the beak resembled that of the latter, only being somewhat shorter in proportion to its thickness, and not at all similar to that of the tantalus; in fact, that its plumage was white, with the plumes of the wing marked with black, as stated by the ancients.

We were then convinced that the bird embalmed by the ancient

* Bruce's French translation, in 8vo. v. xiii, p. 264, and Atlas plate xxxv, under the name *Abouhannes*.

† Description of an ibis, and two storks. Acad. des Sciences of Paris, v. iii, pl. iii, p. 61, 4to. ed. 1754, pl. xiii, fig. 1. The beak is represented as truncated at the end, a fault of the engraver.

‡ *Numenius sordide albo rufescens, capite anteriore nudo rubro; lateribus rubro purpureo et carneo colore maculatis, remigibus majoribus nigris, reatricibus sordide albo rufescentibus, rostro in exortu dilute luteo, in extremitate aurantio, pedibus griseis.* Ibis candida Brisson Ornithologie, vol. 5, p. 349.

§ 'Planches Enluminées,' num. 389. Hist. des Oiseaux, v. viii. in 4to. p. 14, pl. 1. The last figure is copied from Perrault, with the same fault.

|| Handbuch der Naturgeschichte, p. 203, of the edit. 1799, but in the edition of 1807, he has restored the name of ibis to the bird to which it belongs.

¶ Philosophical Transactions, for 1794.

Egyptians was certainly not the *tantalus ibis* of naturalists; that it was smaller, and that it must be of the curlew genus.

We learnt, after some research, that the ibis mummies opened before by other naturalists were similar to our own. Buffon expressly says, that he had examined many; that the birds they contained had the beak and size of curlews, and yet he blindly follows Perrault, in taking the *tantalus* of Africa for the ibis.

One of these mummies opened by Buffon is still in the Museum, and is similar to those which we have opened.

Dr. Shaw in the supplement to his travels (fol. edit. Oxford, 1746, plate 5, pp. 64 to 66), describes and depicts with care the bones of a similar mummy; the beak, he says, was six English inches in length, like that of the curlew, &c. In a word, his account exactly tallies with our own examination.

Caylus (*Recueil d'Antiquités*, vol. vi. pl. 11, fig. 1), represents the mummy ibis as only one foot seven inches high, including its bandages, although he expressly says, that the bird was then placed on its feet, with the head erect, and that no part of it had been bent in the embalming.

Hasselquist, who took a small black and white heron for the ibis, gives as his principal reason, that the size of this bird, which is that of a crow, corresponds very well with the size of the mummies of the ibis*. How then could Linnæus give the name of ibis to a bird as large as a stork? How indeed could he consider this bird as the same with the *ardea ibis* of Hasselquist, which, besides its smallness, had a straight beak? And how could this latter error of synonymy have been perpetuated in the *Systema Naturæ*, down to the present time?

A short time after the examination made with M. Fourcroy, M. Olivier, had the complaisance to show us some bones which he had brought from two mummies of the ibis, and to open two others with us. The bones there found resembled those of the mummies of Colonel Grobert, only one of the four was smaller, but it was easy to judge by the epiphyses, that it had belonged to a young individual.

The only drawing of the beak of an embalmed ibis, which does not entirely agree with those which we examined, was that of Edwards (plate cv); it is a ninth larger, and yet we do not question its accuracy; for M. Olivier shewed us also the length, an eighth or ninth longer than the others, in proportion of 180 to 165 equally taken from a mummy.

This beak only shows that there were among the ibis species, indi-

* Hasselquist *Iter Palestinum*, p. 249, magnitudo gallinæ, seu cornicis, and p. 250, vasa quæ in sepulcris inveniuntur, cum avibus conditis, hujus sunt magnitudinis

viduals larger than others, but proves nothing in favour of the tantalus, for it has not the same shaped beak as that; it precisely resembles the curlew; and, besides, the beak of the tantalus is a third larger than that of our large embalmed ibises, and two-fifths that of the smallest.

We are moreover assured that there are similar variations in the size of our European curlews, according to age and sex; they are still larger in the green curlews of Italy, and in our pewits (*barques*); and it appears that this is a property common to the greater part of the species of long-billed (*becasses*) birds.

Finally, our naturalists returned from the expedition to Egypt with a rich harvest of objects, ancient as well as modern. My learned friend M. Geoffroy St. Hilaire particularly occupied himself in collecting, with great care, mummies of every sort, and had brought a great number of those of the ibis, as well from Saccara as from Thebes.

The former were in the same state as those brought by M. Grobert; that is to say, that their bones had experienced a kind of half combustion, and were without consistency; they broke on the least touch, and it was very difficult to procure one entire, still more to detach them so as to form a skeleton,

The bones of those of Thebes were much better preserved, either from the greater heat of the climate, or from the greater care bestowed in their preparation: and M. Geoffroy having sacrificed several of them, my assistant, M. Rousseau, contrived, by the exercise of patience, skill, and ingenious and delicate methods, to form an entire skeleton, by stripping all the bones, and uniting them with a fine wire thread. This skeleton has been placed in the museum, of which it forms one of the most striking ornaments. We subjoin an engraving of it. *See Plate 4.*

We remark that this mummy must have been that of one kept in a state of domesticity in the temples; for the left shoulder has been broken and then united. It is probable that a wild bird, whose wing was broken, would die before it healed, for want of strength to pursue its prey, or power to escape from its enemies.

This skeleton enables us to determine unhesitatingly the character and proportions of the bird; we clearly see that it was in every respect a real curlew, rather larger than that of Europe, but with its beak thicker and shorter. We subjoin a comparative table of the dimensions of these two birds, taken, for the Ibis, from the skeleton of the mummy of Thebes, and for the Curlew, from a skeleton which was formerly in our anatomical galleries. We have added those of the parts of the ibises of Saccara which we have been enabled to obtain entire.

PARTS.	Skeleton of the Ibis of Thebes.	Skeleton of the Curlew.	Ibis of Saccara.	
			Larger.	Smaller.
Head and beak together.....	0,210	0,215	.....	.....
Head only.....	0,247	0,040	.....	.....
The fourteen vertebrae of the neck together.....	0,192	0,150	.....	.....
The back.....	0,080	0,056	.....	.....
The sacrum.....	0,087	0,070	.....	.....
The coccyx.....	0,037	0,035	.....	.....
The femur.....	0,078	0,060	.....	.....
The tibia.....	0,150	0,112	.....	0,095
The tarsus.....	0,102	0,090	.....	.....
The middle toe.....	0,097	0,070	.....	.....
The sternum.....	0,092	0,099	.....	.....
The clavicle.....	0,055	0,041	.....	0,04
The humerus.....	0,133	0,106	0,124	.....
The fore-arm.....	0,153	0,117	0,144	0,144
The hand.....	0,125	0,103	.....	.....

We see by this table that the ibis of Thebes was larger than our curlew; that one of the ibises of Saccara was of the 'medium' size between that of Thebes and our curlew; and that the other was smaller than this latter bird. We observe also, that the different parts of the body of the ibis have not the same proportions to each other as those of the curlew have. The beak of the former, for instance, is remarkably shorter, although all the other parts are larger, &c.

Yet these differences of proportion do not go beyond what may distinguish the species of the same genus; the form and character which are to be considered as generic, are precisely similar.

The true ibis, then, must be sought no longer amongst these tall tantali with a sharp beak, but amongst the curlews; and here we should note that by the word *curlew* (*courlis*) we do not mean the artificial genus formed by Latham and Gmelin, of all long-shanked (*echassiers*) birds, with a beak curved downwards, and a head devoid of plumage, whether their beak be rounded or sharp, but a natural genus, which we shall call *numenius*, and which will include all the long-shanked birds with beaks curved downwards, soft and rounded, whether their head be devoid of, or covered with plumage. It is the *curlew* genus, such as Buffon has imagined it*.

A glance over the collection of birds in the king's cabinet enables us to recognise a species which has not been yet either named or described by authors of systems, except perhaps Mr. Latham, and which, examined with care, will satisfy us as being the same with those which the ancient monuments and mummies have given as the characteristics of the ibis.

We add an engraving of it. See Plate V.

It is a bird rather larger than the curlew; its beak is curved in a manner similar to that of the curlew, but rather shorter, and much thicker in proportion, a little flattened towards the base, and marked at each side with a furrow which proceeds from the nostril to the extremity, while in the curlew the corresponding furrow is effaced before it reaches midway down the beak. The colon of this beak is more or less black. The head and two-thirds of the beak are entirely destitute of feathers, and the skin is black. The body feathers, those of the wings and tail are white, with the exception of the ends of the large wing-feathers, which are black; the four last secondary feathers have remarkably long beards, spread out, which fall upon the ends of the wings when closed; their colour is a brilliant black with a violet shade.

* We have definitely established this genus in our 'Regne Animal,' vol. i, p. 483, and it appears to have been adopted by naturalists.

The feet are black, the legs thicker, and the toes evidently longer in proportion than those of the curlew; the membranes between the bases of the toes are also more extended; the leg is wholly covered with small polygonal scales, or what are called reticulated; and the back of the toes even has only similar scales, whilst the curlew has two-thirds of the legs and the whole of the toes, scutulated, that is, furnished with transverse scales. There is a reddish hue under the wing, towards the commencement of the thigh, and on the covers of the large anterior wing; but this tint appears to be an individual characteristic, or the result of accident; for it does not appear in any other individuals otherwise precisely similar.

This first individual came from the collection of the stadtholder, and we do not know its native country. The late M. Desmoulins, assistant naturalist at the museum, who had seen two others, said that they came from Senegal. One of them must have been brought by M. Geoffroy di Villeneuve. But we shall presently find that Bruce* found this species in Ethiopia, where it is called *Abou Hannés* (Father John); and that Savigny saw it in abundance in Lower Egypt, where it is called *Abou Mengel* (Father of the Sickle.) It is probable that the moderns will not take the assertion of the ancients literally, that the ibis never quitted its own country without perishing †.

This assertion would besides be as contrary to the *tantalus ibis*, as to our curlew; for the individuals which we have in Europe came from Senegal. It was then that M. Geoffroy de Villeneuve brought that now in the museum of natural history; it is even much more rare in Egypt than our curlew, since no one after Perrault mentions having seen it there, or received one from thence.

An individual without the reddish hue, but otherwise entirely similar to the first, was brought home by M. de Labillardière, after his voyage in Australasia with M. d'Entrecasteaux.

We have since learnt that this sort of *numenius* has, when young, the head and neck furnished with feathers on those parts, which, as they advance in age, become denuded, and that the scapularies are less expanded, and of a paler and duller black. It is in this state that the late M. Peron brought one from Australasia, which did not differ from our own and that of M. de Labillardière, except in some black lines on the early feathers, and the first coverings of the wings, and the head and top of the neck were ornamented with blackish plumage. A young individual brought by M. Savigny from Egypt, and depicted in the

* Bruce, loc. cit.; and Savigny, Mem. sur l'ibis, p. 12.

† Ælian, lib. 2, cap. xxxviii.

first plate in his Memoir of the Ibis, and in the great work on Egypt "Birds," plate 7. The feathers of the head and back of the neck are rather grey than black, and those of the front of the neck are white. Finally, Bruce's drawing, in his Atlas, plate 35, was also made from a young individual seen in Abyssinia, and nearly similar to that of M. Savigny.

We have received from Pondicherry, by M. Leschenault, an individual resembling that of Peru, of which only the head, and a small part of the back of the neck, are covered with white feathers; but it is not less certain that all these birds have the head and neck bare when they reach their full growth.

The late M. Macé sent from Bengal to the museum, many individuals of a species closely allied to this, of which the beak is rather longer and less curved; the first feather only has a little black on two sides of its extremity, and the secondary feathers are also rather extended and lightly tinged with black.

According to M. Savigny (page 25 of his work) it appears that M. le Vaillant has observed another, which has also the secondary feathers extended, but which always preserves its feathers, and whose face is of a red colour.

The same M. Macé also sent a tantalus, closely resembling that which naturalists have regarded as the ibis, but the small wing-covering of which, and a large band below the breast, are black, speckled with white. The lower secondary feathers are lengthened, and of a white colour. We know that in the tantalus ibis of naturalists, the small wing-coverings are speckled with lilac, and that the under part of the body is entirely white.

We add a table of the parts of some of these birds, which we have been able to measure accurately in stuffed individuals. If we compare them with those of the skeletons of the ibis mummies, we shall judge how impossible it was for an instant to believe that these were the mummies of the tantalus.

PARTS OF THE BODY.	Tantalus Ibis of Naturalists.	Tantalus of India of Macé.	Numenius Ibis; according to us the real Ibis of the ancients.	Numenius Ibis, measured by Savigny.	Numenius of Macé.	Numenius of Labillardière.	Numenius of Peron.	Numenius of Leschenault.
Length of the beak from its commencement to the tip.	} 0,210	0,265	0,125	0,154	0,148	0,165	0,131	0,132
Length of the naked part of leg.	} 0,130	0,150	0,041	0,056	0,055	0,040	0,034	0,044
Length of the tarsus.	0,190	0,250	0,085	0,097	0,095	0,084	0,080	0,093
Length of the middle toe.	} 0,105	0,115	0,080	0,092	0,088	0,086	0,078	0,086

If we examine the books of the ancients and their monuments, and compare what they have said concerning the ibis, or the figures they have left of it, with the bird we have just described, we shall find all our difficulties vanish, and all testimonies agree with the best of all, that is, the body of the bird itself, preserved in its mummy state.

Herodotus says (in his *Euterpe*, No. 76), "The most common ibises have the head and front of the neck denuded, the plumage white, except on the head, on the nape of the neck, the ends of the wings, and the rump, which are black. The beak and feet resemble those of the other ibises;" and he had said of these "They are of the size of the crow, of an entirely black colour, and have feet like those of the crane, with a crooked beak."

How does it occur that the travellers of modern days do not give us descriptions of birds as accurate as that which Herodotus has made of the ibis?

How can this description be applied to a bird which has only the face denuded, and of a red colour, to a bird which has the rump white, and not covered as ours by the black feathers of its wings?

And yet the last characteristic was essential to the ibis. Plutarch says (*de Iside et Osiride*), that the form of a lunar crescent was to be found in the manner in which the white was cut by the black in the plumage of this bird. It was, in fact, by the union of the black of these latter wing-feathers with that of the two extremities of the wings, that there is formed in the white a large semicircular indentation which gives to the white the appearance of a crescent.

It is now difficult to explain what he meant, by saying that the feet of the ibis formed an equilateral triangle with its beak. But we can understand the assertion of *Ælian*, that when it draws back its head and neck into its feathers, it has something of the appearance of a heart*. It was thence, according to *Horus Apollo* (c. 35), made the emblem of the human heart.

According to what Herodotus says of the nudity of the throat, and of the feathers which covered the upper part of the neck, he seems to have had in his eye an individual of a middle age, but it is no less certain that the Egyptians knew also very well those individuals with the neck entirely denuded. We see such represented from sculptures of bronze in the collection of Egyptian antiquities of *Caylus* (vol. i, pl. 10, No. 4; and vol. v, pl. 11, No. 1). This latter figure so much resembles the bird given in pl. 5, that we may think it was taken from it.

* *Ælian*, lib. x, cap. xxix.

The paintings of the Herculaneum leave no species in doubt. The paintings, No. 138 and 140, of David's edition, and vol. ii, p. 315, No. 59, and p. 321, No. 60, of the original edition, which represent Egyptian ceremonies, have many ibises walking in the courts of the temples. They are exactly similar to the bird that we have pointed out. We recognize particularly the characteristic blackness of the head and neck, and we easily see by the proportion of their figure with the persons of the picture, that it must have been a bird of half a metre at the most, and not a metre or nearly so, as the *tantalus ibis*.

The mosaic of Palæstrina also presents in its middle part many ibises perched on the buildings; and they differ in no respect from those of the paintings of Herculaneum.

A sardonyx in the collection of Dr. Mead, copied by Shaw, App. pl. 5, and representing an ibis, seems to be the miniature of the bird we have described.

A medal of Adrian, in large bronze, represented in the Farnesian Museum, vol. vi, pl. 28, fig. 6, and another of the same emperor, in silver, represented in vol. iii, pl. 6, fig. 9, gives us figures of the ibis, which, in spite of their smallness, are very similar to our birds.

As to the figures of the ibis engraved on the plinth of the statue of the Nile, at Belvedere, and on the copy of it in the garden of the Tuileries, they are not sufficiently finished to serve as proofs; but amongst the hieroglyphics of which the Institute of Egypt has caused impressions to be taken on the spot, there are many which decidedly represent our bird. We give one of these impressions communicated by M. Geoffroy (*Plate 6*).

We particularly insist on this latter figure, because it is the most fully authenticated of all; having been made at the time and on the spot where the ibis was worshipped, and being cotemporaneous with its mummies; whilst those we have above cited, done in Italy, and by artists who did not profess the Egyptian worship, may not be so accurate.

We owe Bruce the justice of saying, that he detected the bird which he has described under the name of *abouhannes*, as the real ibis. He expressly says, that this bird appeared to him to resemble that which the mummy pitchers contained; he also says, that this *abouhannes*, or *Father John*, is well known and common on the banks of the Nile, whilst he never saw there the bird represented by Buffon, under the name of the white ibis of Egypt.

M. Savigny, one of the naturalists of the expedition to Egypt, also assures us that he never discovered the *tantalus* in this country, but he found many of our *numenius* near the lake Menzale, in Lower Egypt, and he brought their relics away with him.

The *abouhannes* has been placed by M. Latham in his *Index Ornithologicus*, under the name of *tantalus Æthiopicus*; but he makes no mention of the conjecture of Bruce on its identity with the ibis.

Travellers before and after Bruce appear to have all been in error.

Belon thought that the white ibis was the stork, thereby evidently contradicting all testimonies; and none have been of his opinion except the apothecaries, who took the stork for an emblem, confounding it with the ibis to whom they attributed the invention of clysters*.

Prosper Alpinus, who relates that this invention was due to the ibis, gives no description of this bird in his medicine of the Egyptians †. In his Natural History of Egypt, he only speaks of it from Herodotus, to whose words he only adds, doubtless after a passage of Strabo, to which I shall recur presently, that this bird resembles the stork in size and figure. He says, that he was told that they were found in abundance, both white and black, on the banks of the Nile; but it is evident by his expressions, that he did not think they had been seen ‡.

Shaw says of the ibis §, that it is now excessively rare, and that he had never seen one. His *emseesy*, or ox-bird, which Gmelin very improperly makes to correspond with the *tantalus* ibis, is the size of the curlew, white bodied and with red beak and feet. It is found in the fields near cattle; its flesh is not well flavoured, and soon decays ||. It is easy to perceive that it is not the *tantalus*, and still less the ibis of the ancients.

Hasselquist neither knew the white ibis, nor the black ibis; his *ardea ibis* is a small heron with a straight beak. Linnæus (tenth edition), has correctly placed it amongst the heron tribe; but he was in error, as I have already remarked, in afterwards removing it as synonymous with the *tantalus* genus.

De Maillet (Descrip. de l'Égypte, part 2, p. 23), conjectures that the ibis may be a bird peculiar to Egypt, and which is there called Pharaoh's fowl (*chapon de Pharaoh*), and at Aleppo *Saphan-bacha*. It devours serpents. There are a black and white species, and it follows, for more than a hundred leagues, the caravans going from Cairo to Mecca, to feed on the carcasses of the animals which are killed on the journey, whilst at any other season not one of them is to be seen on this route. But the author does not consider this as certain; he

* Ælian, lib. ii, cap. xxxv. Phil. de Solest. An. Cic. de Nat. Deor. lib. ii. Phil. de Anim. Prop. 16 etc.

† De Med. Ægypt. lib. i, fol. v. i. Ed. Paris, 1646.

‡ Recherches Égypt. lib. iv., cap. i, vol. i, p. 199, of the Leyden edit. 1735.

§ See French translation, v. ii. p. 167.

|| See Shaw's French translation, vol. 1, p. 330.

even says that we must give up the idea of understanding the ancients when they speak so as to seem unwilling to be understood. He concludes that the ancients have perhaps indiscriminately comprised under the name of ibis, all those birds which were serviceable to Egypt in clearing it of the dangerous reptiles which the climate abundantly produced; such as the vulture, falcon, stork, sparrow hawk, &c.

He was right in not considering his Pharaoh's fowl as the ibis; for, though the description is very imperfect, and Buffon believed that he detected the ibis in it, it is easily seen, as well as by what Poccoke says of it, that this bird must have been carnivorous; and, in fact, we see by the figure given by Bruce (vol. v, p. 191, of the French edition), that Pharaoh's fowl was only the *rachama*, or small white vulture, with black wings (*vultur perenopterus* of Linnæus) a bird very different from that which we have above proved to be the ibis.

Poccoke says, that it appears by the descriptions given of the ibis, and by the figures which he had seen of it in the temples of Upper Egypt, that it was a species of crane. I have seen, he adds, a quantity of these birds in the islands of the Nile; they were for the most part of a greyish colour (French translation, ed. 12mo. vol. ii. p. 153). These few words are enough to prove that he did not know the ibis better than the others.

The learned have not been more fortunate in their conjectures than the travellers. Middleton compares with the ibis, a bronze figure of a bird with a short curved beak, the neck very long, and the head ornamented with a small crest, a figure which never had any similarity to the bird of the Egyptians (Antiq. Mon. pl. 10, p. 129). This figure, besides, is not at all in the Egyptian style, and Middleton himself agrees that it must have been made at Rome. Saumaise, on Solinus, says nothing which relates to the real question.

As to the black ibis, which Aristotle places near Pelusium only*, it was long thought that Belon alone had seen it †. The bird described by him under this name, is a species of curlew, to which he attributes a head similar to that of the cormorant, that is to say, apparently bald, with red beak and feet ‡; but as he makes no mention of the ibis in his journey §, I suspect that it was only in France that he made this relation of the two, and by comparison with the ibis mummies. It is certain that the curlew with red beak and feet, was unkuown in

* Hist. Anim. lib. ix, cap. xxvii, and lib. x, cap. xxx.

† Buffon's Hist. Natur. des Oiseaux, in 4to. vol. viii, p. 17.

‡ Belon. Nat. des Oiseaux, pp. 199 and 200; and Portraits d'Oiseaux, fol. v. 44.

§ Observations de plusieurs singularités, &c.

Egypt*, but that the green curlew of Europe (*Scolopax falcinellus* of Linnæus) is commonly seen there, and is even more plentiful than the white numenius †; and as it resembles it in form and size, and that at a distance its plumage may appear black, we can hardly doubt but this was the real black ibis of the ancients. M. Savigny had a painting made of it in Egypt ‡, but only from a young individual. The figure of Buffon is from a full-grown bird, but the colours are too bright.

The mistake which at present prevails respecting the ibis, originated with Perrault, who was the first naturalist who made known the tantalus ibis of the present day. This error, adopted by Brisson and Buffon, has passed into the twelfth edition of Linnæus, where it is mixed with that of Hasselquist, which had been inserted in the tenth, forming together a most monstrous compound.

It was founded, under the idea that the ibis was essentially a bird inimical to serpents, and in this very natural conclusion, that a sharp beak was necessary to devour serpents, and more or less analogous to that of the stork or heron. The idea is even the only good objection that can be adduced against the identity of our bird with the ibis. How, it is asked, could a curlew, a bird with a weak beak, devour these dangerous reptiles?

Our answer is, that positive proofs, such as descriptions, figures and mummies, should always claim more belief than accounts of peculiar habits, too often devised without any other motive, than to justify the various worships paid to animals. We might add, that the serpents from which the ibises freed Egypt, are represented as very numerous, but not as very large. I believe, too, that I have ascertained decidedly, that the bird mummies, which had a beak precisely similar to that of our bird, were real serpent-eaters; for I found in one of their mummies the undigested remains of the skin and scales of serpents, which I have preserved in our anatomical galleries.

But, at the present time, M. Savigny, who has observed whilst living, and even more than once dissected our white numenius, the bird which everything proves to have been the ibis, asserts that it only eats worms, fresh-water shell-fish, and other similar small animals. Supposing that there is no exception to this, all we can conclude is, that the Egyptians, as has before occurred to them and others, gave a false reason for an absurd worship. It is true, that Herodotus said, that he saw in a place on the borders of the desert §, near Buto, a

* Savigny. Mem. sur l'Ibis, p. 37.

† Idem, *ibid.*

‡ See the great work on Egypt. Hist. Nat. des Oiseaux, pl. 7., fig. 2.

§ Euterpe. cap. lxxv. Herodotus says, *a place in Arabia*; but we cannot see how a place of Arabia could be *near the city of Buto*, which was in the western part of the Delta.

narrow defile, in which an infinite quantity of bones and remains, which he was told were the relics of winged serpents, which sought to penetrate into Egypt at the beginning of spring, and that the ibis stopped their progress; but he does not say that he witnessed their combats, nor that he had seen these winged serpents in a perfect state. The whole of his testimony consists then in having observed a mass of bones, which might have been those of this multitude of reptiles and other animals which the inundation destroyed every year, and whose carcasses it would naturally convey to the points where it stopped, to the borders of the desert, and which would accumulate more abundantly in a narrow defile.

Yet it is in consequence of this idea of the combat of the ibis with the serpents, that Cicero gives a hard and horny beak to this bird*. Having never been in Egypt, he figured to himself that it must be so by analogy.

I am aware that Strabo says, that some part of the ibis resembles the stork in shape and height †, and that this author ought to have known this well, since he assures us that in his time the streets and crossways of Alexandria were so filled with them, that they were a serious inconvenience; but he spoke from memory. His testimony cannot be received when he contradicts all others, and particularly when the bird itself is there to disprove it.

In like manner I shall not concern myself about a passage of Ælian ‡, who states (like the Egyptian enbalms) that the intestines of the ibis were ninety-six cubits in length. The Egyptian priests of all classes have given such extravagant descriptions of natural history, that we cannot make of much consequence whatever one of the lower order might assert.

Another objection may be made against me, drawn from the long extending and black feathers which cover the rump of our bird, and of which we detect some traces in the *abouhannes* of Bruce.

The ancients, it may be said, say nothing of it in their descriptions, and their figures of it do not represent them. But I have, to back my assertion, more than a written testimony or a traced image. I have found precisely similar feathers in one of the mummies of Saccara; I preserve them most carefully, as being at once a singular monument of antiquity, and a proof undeniable of the identity of the species. These feathers having an uncommon form, and not being found, I believe, in

* *Avis excelsa, cruribus rigidis, corneo proceroque rostro.* Cic. de Nat. Doer. lib. i.

† Strab. lib. xvii.

‡ Ælian, Anim. lib. x, cap. 29.

any other curlew, leave in fact, no doubt, of the accuracy of my opinion.

I conclude this memoir by a recapitulation of its results.

1st. The *tantalus ibis* of Linnæus should form a genus distinct from the *tantalus loculator*. Their character will be *rostrum læve, validum, arcuatum, apice utrinque emarginatum*.

2nd. The other tantili of the latter editions should form a genus with the common curlews, and may be called the *numenius*. Their character will be *rostrum teres, gracile, arcuatum, apice mutico*, for the special character of the subgenus of the ibises we must add, *sulco laterali per totum longitudinem exarato*.

3rd. The white ibis of the ancients is not the ibis of Perault and Buffon, which is a *tantalus*; nor the ibis of Hasselquist, which is an *ardea*; nor the ibis of Maillet, which is a *vulture*; but a bird of the genus *numenius*, or curlew, of the subgenus *ibis*, which has only hitherto been described by Bruce, under the name of *abouhannes*. I name it **NUMENIUS IBIS**, *albus, capite et collo adulti nudis, remigium apicibus, rostro et pedibus nigris, remigibus secundariis elongatus nigro violaceis*.

4th. The black ibis of the ancients is probably the bird known in Europe under the name of *green curlew*, or the *scolopax falcinellus* of Linnæus; it also belongs to the genus of curlews, and to the subgenus of *ibises*.

5th. The *tantalus ibis* of Linnæus, in the real state of synonymy, includes four species of these different genera, viz.

1. A *tantalus*, the ibis of Perault and Buffon.

2. An *ardea*, the ibis of Hasselquist.

3 and 4. Two *numenii*, the ibis of Bélon, and the ox-bird of Shaw.

We may judge by this example, and by many others, of the state in which this worst *Systema Naturæ* still remains, which it would be so important to cleanse gradually of the errors which throng it, and with which it appears continually to be loaded, by adding characters and synonyms and species, without just selection or competent judgment.

The general conclusion of my labour is, that the ibis still exists in Egypt as it did in the time of the Pharaohs, and that it is to the error of naturalists we are indebted for the belief so long prevalent, that the real species was lost or altered in its form.

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