ART. XLVIII.—*The alleged Jurassic of Texas. A Reply to Professor Jules Marcou;* by ROBT. T. HILL.

APROPOS of personal criticisms and questions of fact concerning the validity of the work of myself and others upon the later Mesozoic formations in the Southwestern United States, made by Professor Jules Marcou* in many recent publications, such as the American Geologist,† Proceedings of the Boston Society of Natural History‡, Science,§ and especially the paper entitled "Jura of Arkansas, Kansas, Oklahoma, New Mexico and Texas," in this Journal for September, 1897 (pp. 197–212), I beg to submit the following statements.

In the month of September, 1853, Professor Jules Marcou, while accompanying a rapidly marching military expedition for the preliminary determination of a Route for a Pacific Railway Survey which was traveling up the valley of the Canadian River, through Oklahoma, the Panhandle of Texas, and Northeastern New Mexico, saw two small, outlying beds of the Lower Cretaceous formation.

The first of these localities, which he termed that of Comet Creek, then in Indian Territory, is in what is now known as G County, Oklahoma, west of the present town of Arapahoe. It has recently been revisited by Mr. T. Wayland Vaughan of the United States Geological Survey and described in this Journal for July, 1897. At this spot, Professor Marcou, according to his own statement, remained "only one hour."‖

The second locality was a detached outlier of the Llano Estacado, standing in the broad valley through which the Canadian winds its way through northeastern New Mexico. Here he remained "only three or four hours." Each of these

* In my writings I have always shown the greatest respect for Professor Marcou, and still have for him the most charitable and friendly feelings. Furthermore, I have always given and shall continue to give him the fullest credit whenever credit is due. The injustice of his attacks upon me and the incorrectness of his statements, which, if unanswered, would prove serious defacements of the scientific record, force me to take note of his accusations, and to add a line of controversy to geologic literature. Professor Marcou's attacks upon the validity of my work have been so direct, numerous and skillfully introduced into the geologic literature of the day under the guise of alleged scientific discussion, that I would deem it unjust not only to myself but to my co-laborers and the United States Geological Survey, with which organization I am connected, and the scientific world in general, not to correct some of his assertions It is also at the earnest solicitation of several of my co-laborers, who have read this manuscript, that it is submitted to the public.

† Growth of Knowledge concerning the Texas Cretaceous, August, 1894.

‡ The Jura of Texas, October, 1896, pp. 149–158.

§ Science, Oct. 22, 1897.

‖ "I was enabled on account of the rapidity of the march of my military escort, to remain at Comet Creek only one hour, and at Pyramid Mount only three or four hours."—This Journal, September, 1897, p. 198.

occurrences, from two to five feet thick at one place and less than fifty at the other, represents an outlying isolated, attenuated outcrop of the great body of Lower Cretaceous which has a development of over 2,000 feet in Texas, and from which they have been disconnected by prehistoric and recent denudation, and to which I have devoted thousands of miles of travel and careful study and field work during my lifetime.

At the first of these localities he collected from a "limestone five feet thick,"* one species of Ostreid ("*Gryphæa pitcheri*") and at the second from a bed given by him as 30 feet thick, two other species of the fossil Ostreidæ (called by him *G. dilatata* and *O. marshii*). These species, with two or three hundred molluscan forms, since reported by others, are now known to constitute the faunas of the Lower Cretaceous formations of Kansas, New Mexico, and Texas.

Upon the supposed resemblance of the fossil oyster from the first mentioned of these localities to certain forms in the Cretaceous of Switzerland, and the fact that it occurred as a shell agglomerate or "lumachelle" resembling in its lithologic facies similar "lumachelle" of Switzerland, he referred the beds containing it to the "Neocomian" epoch, and has since used this determination as a basis of his subsequent discussion of this system, as other workers discovered and delineated the great series of strata and its areal extent to which this single outcrop has proved to belong. Likewise on the supposed resemblance of the two fossil oysters from Pyramid Mount in New Mexico to forms from the "Oxfordian" and "Lower Oolite groups"† of England and France, he referred these beds to the Jurassic period—an opinion which he has since rigidly maintained and used as the basis for asserting the Jurassic age of various other and entirely distinct strata since discovered and described by later writers throughout the Texas region, and coloring vast areas of what we now know to be Lower Cretaceous and Tertiary, upon maps which he has compiled.‡

By his own statement, Professor Marcou has spent not over five hours of his life-time in observation of the formations under controversy. In fact he has never seen the main body of the Cretaceous in Texas or Indian Territory at all, and has never visited the localities, nor examined the vast collections subsequently reported. "I have explored only a very small part of Texas," he says, "only a simple road in the Panhandle,"§ and I might add, that his road lay entirely through the Permian of

* U. S. Pacific Railroad Explorations, 1853-54, vol. iv, p. 43, H. Doc. 129, Washington, 1855.

† Geology of North America, Zurich, 1858, p. 19, and in several other publications.

‡ "Geology of North America," Geological Map of the World, etc.

§ This Journal, September, 1897, p. 208.

the Canadian Valley and Tertiary of the Llano Estacado, which he called Triassic and Jurassic respectively, and nowhere touched upon the Cretaceous in the State of Texas. Professor Marcou by his writings has at several times conveyed the impression that he had seen the Cretaceous in Texas.* The various journals, itineraries and maps of the Pacific Railway Expedition as published by himself and others, giving a minute record of the progress of the party day by day, show that it nowhere encountered this locality or any other south of the Ouachita Mountains. The fossils from Fort Washita and the Cross Timbers of Texas described by him in his Geology of North America, were collected and sent to him by Dr. G. G. Shumard.

Each of his localities have since been thoroughly studied by specially equipped expeditions of the United States Geological Survey and the Texas State Geological Survey. The Tucumcarri region has been twice visited by me and the results of my observations published in Science† and in this Journal‡ and elsewhere.§‖ The Texas Geological Survey also made researches in this locality, and published extensively thereon.¶ Professor Alpheus Hyatt several years ago spent a season of minute field work upon the region, and his manuscript report thereon is in the office of this Survey. Thus we have, as opposed to the three hours spent by Professor Marcou, the observations of three independent parties, who have devoted days and months to the locality. Each of these parties (although both Professor Hyatt** and myself†† were at first predisposed towards Professor Marcou's conclusions, and made the mistake in print of partially supporting him) have all arrived, after careful and impartial study, at conclusions contrary to his. I *have shown beyond all doubt that the deposits which he called Jurassic are Cretaceous—not only Cretaceous, but of a Cretaceous horizon which I believe to be of the same general formation but of a horizon stratigraphically above the rocks which he, himself, collected at Comet Creek and called "Neocomian."* It is also extremely doubtful if the Comet Creek beds are homotaxially equivalent to the Neocomian, as he alleges.

* "I have seen and studied the strata of the Upper Greensand and Marly Chalk, in the bed of Little River," etc., "and also on the Elm Fork of Trinity river"—Professor Marcou in American Geologist, August, 1894, p. 100.

† July 14, 1893.

‡ September, 1895, p. 234.

§ Report on Underground Waters, Washington, 1892.

‖ Bull. Geol. Soc. Amer., May, 1894, p. 332.

¶ Third Annual Report, pp. 201 et seq.—A controversial article fully answered in Science, July 14, 1893.

** 11th Annual Report U. S. Geological Survey, Part 1, pp. 97–100.

†† Circular letter, Austin, Texas, 1888.

Professor Marcou established his Jurassic at Tucumcarri solely upon two species of fossil oyster. Each of these expeditions, in addition to the two fossil oysters found by Professor Marcou, collected large Cretaceous faunas of over a dozen species, similar to that which occurs in Grayson County, Texas, *above* the Comet Creek horizon (Preston Beds) which he has himself referred to the Cretaceous, and published lists thereof in the publications above mentioned.* His repeated assertion that his adversaries will not or have not published figures of these fossils is unjust. These fossils are mostly all well known species which have been fully illustrated by their authors and are in the United States National Museum, the State Capitol of Texas, and at Johns Hopkins University, where they are accessible to all interested, and have been, are being, or will be duly published at the proper time and place as the systematic work of publication of the Cretaceous stratigraphy and paleontology of Texas progresses.

Professor Marcou has said† that his "observations, instead of being accepted and used for further development of our knowledge of the Texas Cretaceous, were, on the contrary, opposed systematically." This statement is true except so far as the last words are concerned, for the opposition was largely based upon independent investigation of parties who, in some instances like the writer, were predisposed to accept his conclusions. Not only has Professor Marcou rigidly maintained the fundamental errors of his conclusions as to age, but has used them as a protext for assaulting the observations, often with crimination and misquotation, of every later worker who has since more thoroughly studied the field, or distorted their language into confirmations of his own erroneous conclusions.

The foregoing is a brief statement of the facts which gave rise to a controversy, which has pervaded geologic literature for nearly forty years, and which is marked by unparalleled bitterness and accusations of American geologists as a body on the part of Professor Marcou. This controversy will be again referred to in the later pages of this paper, after we say a few words in direct reply to his article in the September number of this Journal.

A most serious, but less important defect of his paper is the fact that he omits reference to most of the recent literature which shows the fallacies of his conclusion concerning Comet Creek and Tucumcarri, and these omissions leave the general reader, who may judge the work of others by his article, under a false impression concerning the questions involved. Sys-

* Lists of these fossils were published by me in Science, Sept 1, 1895, and this Journal. Sept. 1895.

† American Geologist, August, 1894, p. 100.

tematic observations on the stratigraphy of these formations, written by me, and, at my request, by Messrs. Stanton and Vaughan, can be found in this Journal from 1877 to the present year, in the papers to be enumerated presently. Within the past few years I have paid special attention to these isolated but related localities in Kansas, New Mexico and Trans Pecos, Texas, and their relations to the Central Texas region where the main area of the Cretaceous lies in continuous section. The three papers specially showing the identity of Professor Marcou's Jurassic of New Mexico with the beds of the Washita Division in Texas, are entitled "Outlying Areas of the Comanche Series in Kansas, Oklahoma and New Mexico," with *ex parte* paleontologic determinations by T. W. Stanton and F. H. Knowlton, published in this Journal of September, 1895; "Section of the Cretaceous at El Paso, Texas," by T. W. Stanton and T. Wayland Vaughan, this Journal, vol. i, p. 21, 1896; and Additional Notes on the Outlying Areas of the Comanche Series in Oklahoma and Kansas" by T. Wayland Vaughan, this Journal, July, 1897. These three papers cover every well known essential point concerning these regions and should be read by all who wish to know the true merits of Professor Marcou's determinations of the localities discussed.

Furthermore, two previous bulletins of the Geological Society of America,* written by me upon the paleontologic and stratigraphic relations of the Cretaceous formations of Indian Territory and Texas adjacent to Red River—the localities from which the Cretaceous fossils described by Professor Marcou, in his Geology of North America, were collected—set forth the details of the comprehensive section of the Cretaceous developed in that region by which the stratigraphic position of Professor Marcou's isolated outcrops can be located in the general section. Finally, concerning the paleontology of the entirely distinct Trinity Division as published in my Arkansas Report—the only one of my papers to which Professor Marcou refers,—I will state that the paleontologic descriptions and figures of that volume were fully revised and republished by me in a paper entitled "The Invertebrate Paleontology of the Trinity Division," published in the Proceedings of the Biological Society of Washington, vol. viii, pp. 9–40, Plates I–VIII, June 3, 1893, and that this later paper, not the Arkansas Report, represents my views of the fauna discussed. In this later paper the description of the form from Arkansas described by me under the name of *Ammonites walcotti*, is fully revised by Professor Hyatt and redescribed by me, and my previous generic and specific comparisons as quoted by Marcou (p. 199)† are abandoned and superseded.

* Vol. ii, pp. 503–528, 1891, and vol. v, pp. 297–338, 1894.
† This Journal, Sept., 1897.

Professor Marcou completely ignores this paper in his writings, and seems to present me to the public as having said things which were never intended.

Not only does he fail to set forth fairly the work of others, but he even appropriates from them their own substance and converts them to his own end. No better illustration of this can be found than the sentence on page 211 where he speaks of the "true Washita Division as I established it as long ago as 1853 when at Comet Creek near Fort Washita." This assertion that he established the Washita Division is absolutely untrue. The two feet of beds at Comet Creek which he saw in 1853 (and this locality is not near Fort Washita, as he states) were never called by him the "Washita Division" or aught else but "Neocomian," nor was the term ever used in scientific literature by him until after it had been invented by another. The classification of the beds of the Texas Cretaceous into "divisions" and the term "Washita Division" was originally made by me and published in this Journal for April, 1896, and amplified in my later papers. Marcou's "Neocomian," Comet Creek *bed*, is only a single horizon in one of the eight great formations composing the Washita Division, seven of which are shown in my paper entitled the "Geology of Parts of Texas, Indian Territory, and Arkansas Adjacent to Red River (Bull. Geol. Soc. of America, March, 1894) and one of which, the Grayson Marls, has been added by Cragin.

His article is also so full of conclusions with which few Americans will agree, that we can only point out at present a few of the scientific points of disagreement. He dismisses (p. 204) Mr. Knowlton's careful study and identifications of the Dicotyledons* with the assertion that "no conclusion can be drawn from such a meagre florula." Mr. Knowlton's florula enumerates five characteristic Dakota species. The occurrence of a Dakota-like dicotyledonous flora in Marcou's "Jurassic" beds both in Kansas and also at Gallisteo, New Mexico, as has been noted by Newberry,† is certainly against his hypothesis, but paleo-botanists and geologists in general, who are acquainted with the western United States, know that this flora is distinctly Cretaceous in its facies, and not Jurassic. Professor Marcou neglects to state, and I myself had overlooked the fact, that Newberry‡ many years ago noted in New Mexico the occurrence of dicotyledonous plants with Marcou's Jurassic oyster in sandstone called Jurassic by Marcou, near Gallisteo, New Mexico. The *cycad* which the latter mentions (p. 204) (*Cycadeoidea munita* of Cragin) was found in the

* Given in my paper in this Journal of September, 1895, p. 212.
† This Journal, vol. xxviii, 1859, p. 33. ‡ Ibid.

Tertiary Plains drift, and derived from a geological position unknown, and has been studied by Professor Ward. Even if it should prove of Purbeckian age it would still be from a much higher horizon than Professor Marcou's alleged "Oxfordian," "Oolitic," Jurassic of New Mexico.

On page 198 he accuses me "of making a clean sweep of the marine American Jura," and quotes a paragraph from me in which I stated that "there are reasons for suspecting that no marine Jurassic formations of Atlantic sedimentation have as yet been discovered north of Argentina on the present Atlantic slope of the American hemisphere." In quoting this paragraph Professor Marcou apparently forgets that he, himself, has distinctly said in italics (Geology of North America, p. 19), that "*the Jurassic rocks do not exist on the Atlantic slope of North America nor anywhere east of the Mississippi River.*" My assertion of practically the same proposition is maintained by every known fact, unless the Wealden beds, which are not positively known to be marine and which are classified with the Cretaceous by a preponderance of authority, are Jurassic as maintained by Marsh—(merely a question of classification, as I have recently shown in Science*). Furthermore, as he referred the Tucumcarri beds under discussion to the "Oxfordian" and "Lower Oolite"† of the Jura, they are in no manner to be confused with the Wealden, or "Jurassic" of Marsh. Neither does the sentence quoted from me make "a clean sweep of the American marine Jura," for it in no manner alleges that there is no Jurassic on the Pacific slope, or in the Black Hills of Dakota, where, as is well known, Jurassic formations, in no manner related to those of New Mexico, so-called by Professor Marcou, do occur.

Concerning his general classification and tabular view of the whole country south of the Arkansas, pp. 208–211, I will state that it has no value and cannot in any manner be fitted to known conditions. For instance, I have shown that the Cheyenne Sandstone of Kansas which he places at the base of his section, contains dicotyledonous flora and occurs stratigraphically about midway in the Lower Cretaceous of the Texas section, and does not belong to my Trinity Division at all, as at first supposed by Cragin. His "Tucumcarri Division (B) and "Neocomian Division," are synchronous formations, and embrace beds far more nearly allied to the Gault than Neocomian. His descriptions of these divisions are purely imaginary creations, stratigraphically incorrect, and altogether out of harmony with the natural occurrence of the rocks or the literature thereon. The whole table is ingeniously constructed by compilation of the works of the very authors he condemns.

* December 18, 1896, pp. 918–922. † Geology of North America, pp. 19–20.

Professor Marcou has long imagined that brief observations in these outlying areas have constituted him an authority on the greater Texas region which he has not seen, and made them the basis for creating, at his study at Cambridge, such tabulations as above mentioned and dictating where work should and should not be done in the Cretaceous region of Texas. This article under discussion is especially profuse in such suggestions. I can dismiss them in a lump as follows: The monograph on the fossils which have been called "*Gryphæa pitcheri*," was written and ready for the printer a year ago, and was transmitted to the Director for publication on January 13, 1897. When it does appear it will further show by the most conclusive stratigraphic and paleontologic data, together with a careful study of the development of the forms, the identity of his alleged Jurassic species from Tucumcarri with the forms called "*Gryphæa pitcheri*" in the Cretaceous of Texas, and the form which he names *Gryphæa kansana* (page 203) from Kansas. For the two or three specimens of the last mentioned form which he states that he possesses, and which I have seen in his studio at Cambridge, we possess hundreds of specimens showing every stage of the development. Futhermore Mr. T. W. Stanton is now solely engaged upon the descriptive paleo-zoology of the Cretaceous of Texas, a work which I had to abandon owing to pressure of other duties, and his work will be reliable and authoritative. Professor Lester F. Ward is likewise studying in a similar manner the paleo-botany.

Prof. Marcou's remark about "special need of investigation in the vicinity of Austin and Fredericksburg" can be fully answered by stating that in addition to my previously published papers on this region, there is in type for the Eighteenth Annual Report of the U. S. Geological Survey a large and comprehensive work upon this region by Mr. Vaughan and myself, giving every detail of its stratigraphy with maps and illustrations. Furthermore, we have in process of publication, four atlas sheets of this region. I have also personally conducted Mr. Stanton over this country, and he is illustrating and describing the paleontology as fast as accurate methods will permit. He has just returned from that region, where he has made additional collections.

We have already shown that his charges that his opponents will not visit his localities are unjust. Just one year ago when I lay at Muskogee, Indian Territory, upon what was then supposed my death-bed, I turned over my camp equipment to Professor Lester F. Ward and Mr. T. Wayland Vaughan, and requested them to visit the Kansas localities, which they did. Mr. Vaughan also thoroughly studied all the outlying areas to

the south thereof, including Professor Marcou's Comet Creek locality, and his results have been fully published in this Journal for July, 1897. Professor Ward, who accompanied Mr. Vaughan to the Kansas localities, is now again in the Kansas region,* studying the fossil flora. Professor C. S. Prosser has also lately published an excellent paper on the stratigraphy of the Kansas† localities, which confirms the conclusions of Professor Marcou's opponents. The invertebrate paleontology of the same region is in process of publication by Professor Cragin.

After all the complaints pervading Professor Marcou's papers against others who are working as hard and consistently as they can upon the problems of the region, for not publishing hastily, and charging that "poor stratigraphy and poor paleontology have long enough prevailed," etc., etc., he apparently sees no inconsistency in immediately creating in this article a new species of oyster (*Gryphæa kansana*) without one word of description or illustration.

His accusation (page 201) that Dr. Charles A. White changed "the generic and specific name" of his (Marcou's) *G. pitcheri*, alias *G. rœmeri*, etc., etc., to *Exogyra forniculata* is untrue. Marcou, himself, was the first to use the generic name *Exogyra* for this species, in his first paper in the original Whipple report and elsewhere,‡ and continued to use it for some time, as shown in the extracts from his writings given on a later page. Although I believe Dr. White's *Exogyra forniculata* may be identical with Marcou's *G. pitcheri*, there is still room for much doubt upon this subject.

Inasmuch as this Gryphæa and the thickness of the beds containing it is made the basis of many charges against others by Professor Marcou, it may be well to introduce here the following extract from his own writings concerning it which will be referred to later in this paper.

His record of the thickness of the Comet Creek beds and the various names which he gave to the fossil found there ("*Gryphæa pitcheri*") and which almost exclusively composes the rock, is as follows:

1855. "This limestone is only five feet thick; it is of a whitish grey color containing an immense quantity of Ostracea which I consider (provisionally) as the *Exogyra ponderosa* Roemer; having the closest analogy with the Exogyra of the neocomian of the environs of Neufchatel."—U. S. Pacific Railroad Explorations, 1853–54, vol. iv, p. 43, H. Doc. 129, Washington, 1855.

* Prof. Ward has returned since this was written, bringing with him over forty boxes of Cretaceous fossil plants.

† Report of Kansas State Geological Survey, pp. 96–181, 1897.

‡ Geology of North America, p. 17.

1858. "This limestone is only five feet thick; it is of a whitish-gray color, containing an immense quantity of fossil Ostracea, which I consider as identical with the *Exogyra* (*Gryphœa*) *pitcheri* Mort., having the closest analogy with *Exogyra couloni*, of the Neocomian of the environ of Neufchatel (Switzerland).—Geology of North America, Zurich, 1858, p. 17.

This passage purports (Geology of North America, p. 7) to be a "*verbatim*" copy of the preceding paragraph, and is copied from the chapter in the latter work (p. 9) entitled "Extract from Report of Explorations for a Railway Route, near the Thirty-fifth Parallel of Latitude from the Mississippi River to the Pacific Ocean, etc., Washington, 1855, H. Doc. 129." It should be noted that he here, as in the preceding quotation, refers the genus to *Exogyra*.

1858. In the literal copy and translation of Professor Jules Marcou's field notes by W. P. Blake, p. 131, vol. iii of the Pacific Railway Reports, quarto edition of 1856, the Comet Creek locality near Camp 31 is described as composed of "three or four broken beds with crinoids* disseminated here and there as if the ruins were formed of a lumachelle limestone of Neocomian age. This lumachelle is formed by the fragments of *Ostrea aquila* or *couloni* or a variety, for it is smaller . . . . the four beds of lumachelle are two feet."

Concerning these notes, however, Mr. Marcou later said: "I here declare that I know nothing of the publication of the edition in quarto of these reports, and that I decline all responsibility as to the use that may have been or may hereafter be made by others of my official note books," etc. (Geology of North America, etc., Zurich, 1858, p. 1.) Nevertheless he himself, now (1897) cites them as authoritative in his recent article, p. 205.

1858. On page 27 of the Geology of North America, Mr. Marcou says, in discussing his Neocomian in America, of which this is the only locality recorded as seen by him, that "its thickness varies from 6 to 50 feet."

1862. "I have never seen Morton's original specimen. . . . . I am led to believe that I did not meet with the true *G. pitcheri* of Morton in my explorations with Captain Whipple's party. Mr. Ferdinand Roemer having the opportunity of seeing, in the company of the late Dr. Morton himself, the original specimen at Philadelphia, I naturally followed his identification of *G. pitcheri;* and if Roemer has made a mistake I was misled by his description . . . Thus we shall have three species of *Gryphœa*: 1, the *G. tucumcarrii* of the Jurassic rocks of Pyramid Mount (New Mexico); 2, the false *G. pitcheri* of Roemer and Marcou, or the false *G. pitcheri var. navia* of Conrad and Hall of the Cretaceous rocks of the false Washita River (Texas) which may be called *G. rœmeri* in honor of its first discoverer, Mr. F. Roemer, and, 3, the true *G. pitcheri* Morton, which I have never seen, and, consequently,

* This word does not occur in the French version of the notes, in which *G. couloni* is also followed by a question mark.

on which I cannot give any information as to its stratigraphical position and association with other fossils.—Proc. Boston Soc. Nat. Hist., vol. viii, p. 95, 1862."

1889. "As to the *Gryphœa pitcheri* which Mr. Hall calls *var navia* it is the true *G. pitcheri* of Morton and Roemer found by me at Comet Creek near the false Washita river.—American Geologist, September, 1889, p. 163."

1896. "The first strata of this Cretaceous system contain at Comet Creek, Fort Washita, etc., an immense number of *Gryphœa rœmeri* Marcou (formerly called *G. pitcheri* by Roemer and Marcou). The *Gryphœa arcuata* are so numerous as to recall the 'Limestone of the Lias of England, France, and Germany.' These first beds, which may be called the 'Caprina and Gryphæa Rœmeri limestone; are the bottom beds of the American Neocomian or Lower Cretaceous."—The Jura of Texas by Jules Marcou, Proc. of the Boston Soc. Nat. Hist., vol. xxvii, p. 157, Boston, October, 1896.

The foregoing extracts show that he has successively called this Comet Creek species "*Exogyra ponderosa* Roemer," "*Exogyra pitcheri*" with analogy with "*Exogyra couloni*"; "*Ostrea aquila* or *couloni?*" "*Gryphœa pitcheri*," "*Gryphœa rœmeri*," "*Gryphœa pitcheri*" and *Gryphœa rœmeri.*"

The paragraphs in Professor Marcou's paper to which I personally take exception are such as that on page 199, in which he makes direct charges upon my veracity and the motives and correctness of my work, citing "an example of carelessness, not to use a stronger word, in quoting a plain paleontological fact," which "shows how unreliable Mr. Hill is when he writes on paleontology," and accusing me of endeavoring by "extraordinary alteration" and misquotation of D'Orbigny to make a certain species of Ammonite appear of Cretaceous instead of Jurassic affinities.

These accusations on Professor Marcou's part are absolutely without foundation, as anyone can see by comparing my original assertion with his extraordinary misrepresentation of it. What I said was as follows:*

Careful examination of the literature and specimens of the Boston and Washington libraries and museums failed to reveal any figured species with which this one can be identified. *It resembles* generically the group Harpoceratidæ (genus Ludwigia, Boyle), which is peculiar to the upper jurassic of Europe and also *Ammonites yo, D'Orb,* of the lower neocomian. The absence of this ammonite from the great mass of the Trinity strata, except in the place indicated, suggests that it may be an older fossil reimbedded in the Trinity, but its preservation and delicacy of structure would seem to render this impossible.

* Neozoic Geology of Arkansas, p. 128.

By omitting all the words of this paragraph except those in italics, which he brings together and by substituting the word "Cretaceous" for "Neocomian," he succeeds in establishing his remarkable construction of a proposition which I did not utter, upon which he could base his assertion that I "undertook to change the age of *Ammonites yo*," which cannot be explained otherwise than that I "wanted to sustain my classification of the Trinity Division in the Cretaceous, quoting in his (my) favor the great D'Orbigny." These charges are repudiated by every passage referring to the species of Ammonites to be found elsewhere in the volume referred to, in which I repeatedly present the Jurassic affinities of this form; but as he well knows, in another paper, the species was revised by me and the previous description in the work which he quoted was abandoned. All the other passages referring to the age of *Ammonites walcotti*, both in the Arkansas Report,* and the revision thereof are here reproduced in full, and I beg the candid reader to compare them with Professor Marcou's statement, in order to see if there is ground for his accusations.

Arkansas Report, p. 125.—Reviewing the stratigraphic evidence afforded by Trinity formation, it seems to be clearly older than any Cretaceous rocks hitherto described in this country, a fact which is verified by the paleontology as shown in the next chapter.

The stratigraphic position beneath the lowest Comanche series, which is of very early cretaceous (neocomian), and the extreme difference in the character of the sediments and fossils, confirm the opinion that the rocks are either uppermost jurassic, lowest cretaceous (Wealden) or transitional jura-cretacic. They are at least older than the oldest American cretaceous rocks hitherto known, and mark the littoral stages which characterized the beginning of the first grand subsidence of cretaceous times.

Proceedings of the Biological Society,† pp. 37–38: Only one specimen of this species has thus far been discovered. It occurred in association with *O. franklini*, *Vycaria lujani*, *Eriphyla arkansaensis*, and other mollusks herein described. The form very much resembles in outward appearance the figures of the genus *Oxynoticeras* of Hyatt, as given by Zittel and Steinman in their Manuals, but Professor Hyatt refers it to *Neumayria*, and contributes the following comments upon the specimen:

"Your *Ammonites walcotti* is probably a *Neumayria*. The aspect is Jurassic, but this group, Upper Jura, and the species

* Neozoic Geology of Southwestern Arkansas. By Robert T. Hill, Assistant Geologist.—Annual Report of the Geological Survey of Arkansas for 1888, vol. ii, pp. 125–128.

† Paleontology of the Cretaceous Formations of Texas. The Invertebrate Paleontology of the Trinity Division, by Robert T. Hill.—Proceedings of the Biological Society of Washington, vol. viii, pp. 37–38, June 3, 1893.

nearest *walcotti* occurs in the very top of the Jura of Central Volga stage, supposed by some to be similar to the Purbeck in the upturn at Malm. The obscuration of a portion of the sutures occurs over the most important part of the outer side, and the structure of the abdomen, which is rounded and has no keel, is not very consistent with the reference either to the *Neumayria* of the Jura or the so-called *Neumayria* of the Cretaceous. Nevertheless it agrees better with those of the Jura than the Cretaceous ones referred to the same genus by Nikitin."

Whatever may be the range of this genus in Europe, the writer is inclined to the belief, from the stratigraphy and association, that its occurrence in Arkansas is lowest Cretaceous, and Professor Hyatt's opinion serves to strengthen the position of the writer in his reticence in earlier papers in expressing a more definite assignment of the Trinity beds before minutely studying the accompanying faunas. The specimen was collected in the banks of Town Creek, one mile southeast of Murfreesboro, Arkansas. Named in honor of Mr. C. D. Walcott.

Nowhere in these writings do I quote or have I quoted D'Orbigny, and even my citation of a doubtful resemblance to a species of his (which citation was entirely abandoned in the revision of the species), cannot be interpreted as a quotation. The very first sentence of the paragraph upon which Professor Marcou constructs this charge distinctly shows that no identity between the species was intended. Whether Mr. Marcou's assertion that D'Orbigny's species came from the Jurassic and not the Cretaceous is true or not, I do not know (for no copy of D'Orbigny's *Paleontologie Française* is accessible to me to verify his references), but even if it is true, the matter is entirely secondary to the entire tenor of my writings and was set right by myself through its omission in the later publications.

Professor Marcou states on the same page that "he has shown with accuracy and details in the American Geologist, Dec., 1889, . . . that the whole fauna without a single exception is composed of Jurassic fossils." I am perfectly aware of the fact that in his paper cited,* he took the list of fossils illustrated by me, species for species, and asserted† their identity or resemblance, according to his fancy, with some Jurassic species of Europe, making them allied to forms from various horizons of Europe, such as the "Portlandian," the "French Jura," "Argovian," "Sequanian," the "Upper Lias," and the "Kimmeridian." These mere assertions are all the "accuracy and detail given." His identifications have so little basis of fact that I merely pass them by unnoticed and do not yet

* Jura Neocomian and Chalk of Arkansas; by Jules Marcou, American Geologist, December, 1889.

† Ibid., pp. 362–363.

accept them. This fauna is undoubtedly one of the oldest of the Comanche Series. In my Arkansas report I said that it resembled the Wealden and Purbeckian, a position which I still maintain, and Professor Marcou has proved nothing further concerning it. He has issued similar manifestoes upon the appearance of other lists of species from the Southwest, notably the one identified by Stanton and published by Dumble from the Washita Division at Kent.* Here he takes a dozen or more of the best known and commonest fossils, not of Wealden affinities, but from the uppermost division of the Lower Cretaceous, and refers each of them serially to Jurassic forms. His *ipse dixit* is all the basis there is for such correlations.

The following extracts from Professor Marcou's discussions of a species of Ammonites, a family of much more value for stratigraphic correlation than Ostreidæ, show that he, rather than others, used the peculiar methods in paleontological discussions which he has attributed to them. He found no Ammonites in the "Jurassic" Tucumcarri region, and noted their supposed absence. In his "Geology of North America" (p. 33, Plate I, fig. 1), he gave an excellent figure of a "*Cretaceous*" species which he named *Ammonites shumardii*, after Dr. George G. Shumard, here called by him "the learned geologist of Arkansas," who collected all the species from Fort Washita and Texas, near Red River. These localities, which Marcou has never seen, are several hundred miles distant from Tucumcarri, and judging from his writings he is ignorant of their stratigraphy, although they have been visited several times by the writer and made a special study by him.†

Furthermore, as I have seen, this species of Ammonite occurs by the hundreds in the Red River localities from which Marcou's type specimen was sent, in a horizon stratigraphically below beds containing the majority of the species now known to constitute the fauna of his alleged "Jurassic" of the Tucumcarri region, and *above* the horizon of his Comet Creek "Neocomian."

In 1888 Professor Alpheus Hyatt found this confessedly Cretaceous species of Professor Marcou's in the supposed "Jurassic" beds of the Tucumcarri region of New Mexico. Professor Marcou, since the latter event, endeavored to reconcile these facts in a most remarkable manner. Without awaiting publication by Professor Hyatt, and upon what authority we do not know—for Professor Hyatt has never published other than a brief administrative report‡ on his work so far as

* American Geologist, November, 1893.

† See papers previously cited.

‡ Eleventh Annual Report U. S. Geological Survey, Part 1, pp. 97–100.

I am aware — Professor Marcou immediately proceeded to announce, that* "The fauna of the upper part of the Jurassic strata of Pyramid Mount at the Tucumcarri, thanks to the collection made there in 1889 by Prof. A. Hyatt, is now well known."

Later, however, when he pressed Professor Hyatt, who has, perhaps wisely, kept out of the controversy, for an opinion concerning the age of the Ammonite, he received a very decisive answer as follows:† "I think there can be no reasonable doubt that it belongs to the Inflatus group of the genus *Schlœnbachia*, hitherto found only in the Cretaceous."

Not daunted by this decisive contradiction of the Jurassic age of this species by Professor Hyatt, Professor Marcou next proceeded to force the species into his Jurassic system, whether or no, by making a new paleontologic law to suit the case as follows: "When considered in connection with the surrounding fauna of the Tucumcarri area, the Schlœnbachia found there indicates that in America the genus appeared near the end of the Jurassic epoch, a fact constantly indicated for many other fossil forms which appeared sooner in America than in Europe."‡

To demonstrate the last proposition he asserts that he§ (Marcou), "received a very remarkable confirmation" of "his" opinion concerning "the appearance of the Jurassic genus *Schlœnbachia* during the Jurassic epoch in America," and says that Aguilera gives a description, with figure, of a Schlœnbachia "found among a whole Jurassic fauna" at Catorce. By consulting the work referred to‖ it is seen that no such statement is made, and that the Mexican Schlœnbachia is not reported with the other Jurassic fossils described by Aguilera, but is the only fossil found in the limestone of the upper part of the upper division of their section, and is referred by him to the upper part of the Lower Cretaceous.¶

The fact that he, himself, had originally given the Ammonite a Cretaceous position—an insurmountable obstacle to its alleged Jurassic occurrence in New Mexico—was further remedied as follows: Mr. Dumble found a specimen of *Ammonites leonensis* at Kent** in the same bed with the cognate of *G. pitcheri*, which Marcou confesses†† is his alleged

* American Geologist, August, 1894, p. 102.

† "The Jura of Texas," by Jules Marcou,—Proc. Bost. Soc. Nat. Hist., vol. xxvii, p. 155.

‡ Same publication as above, p. 155.

§ Proc Bost. Soc. Nat. Hist., p. 155.

‖ Boletin de la Commission de Mexico, Num. 1, pp. 49 and 50 (Mexico, 1895).

¶ Ibid., p. 49. ** Previously cited, p. 462.†† "The Jura of Texas," p. 153.

Jurassic *Gryphæa dilatata* of the Tucumcarri region. To offset this additional evidence of the Cretaceous age of the beds, Mr. Marcou, after showing to his own satisfaction that all the common species collected by Mr. Dumble from these uppermost beds of the Comanche Series are "Jurassic," erroneously says that the "*Ammonites leonensis* Conrad is not that species at all, but the *Ammonites shumardii* Marcou. "It is true that I placed this species in the Cretaceous of Texas, but I was impressed by its form. . . . If the specimen had come to me with a *Gryphæa tucumcarri*, I should not have hesitated to refer it to the Jurassic of Texas. But it came to my hands collected by a person not a geologist, who put together all the fossils obtained during a military march through Texas." It is needless to say that the two species of Ammonites cited are quite distinct. Such is an example of how he, himself, has by misquotation changed the geologic age of an Ammonite and thus gained support for his erroneous conclusions—an act identical with that which he has so skillfully tried to fix on me in the case of *A. walcotti.*

Another unfounded accusation is his assertion that I have misquoted him when I spoke of the Comet Creek bed "as being composed of a single bed of limestone five feet thick," which he alleges is "another example of want of exactness in quotation in Mr. Hill" (p. 205). The alleged quotation on my part is from the first two of the extracts from his writings previously given, wherein he distinctly says "This limestone" (not limestones) "is five feet thick." On the other hand, the only passage of Marcou's writings seen by me in which this formation is spoken of as more than one bed, is in Blake's publication of his (Marcou's) notes—the same which he has hitherto repudiated with such vehemence but which he now, for the first time in forty years, cites as authority as already noted. But in doing this he even misquotes these notes, which distinctly say that there are three or four of these beds, not five as Professor Marcou now alleges they state (p. 204). It is likewise apparent that Marcou in his various writings has himself variously given a thickness of "2, 5" and from "to 50" feet to these beds. The truth of the matter, as shown by Mr. Vaughan in his recent paper,* is that they are probably only two feet thick.

Such are some of the examples of Professor Marcou's perverted charges wherein he states that I, who, according to his own statement, am the only man in American science who has endeavored to treat him with courtesy and give his writings due credit, and who has tried to record facts truthfully, have misquoted and corrupted paleontologic facts with a motive.

* This Journal, July, 1897.

After perusing the foregoing pages one cannot but wonder why Professor Marcou should wrongfully accuse others of maliciously misquoting. Let the reader put side by side the two first abstracts we have given from his writings concerning the Comet Creek *Gryphœa* on pp. 17–18. The second of these was published by him as a verbatim copy* of the first, yet in this alleged verbatim copy he has changed the name of every species mentioned in the original and made other additions, and this, too, without one word of explanation. These instances together with the misquotations elsewhere given of Aguilera the Mexican Geologist, of himself and myself, are but a few of the many examples which could be given showing that he has certainly exceeded the ordinary limits of toleration in such practices, in which I have never, intentionally, indulged in, as he charges.

In the paper in the September number of this Journal, Professor Marcou also accuses Messrs. Hall, Roemer, Shumard, Gabb, Charles A. White, Hill, Cragin and Stanton of confusing species, and I can but consider it an honor that he should have selected my head, above all these distinguished authorities, upon which to pour the last and most concentrated dregs of his wrath. His many papers are bristling with similar assaults devoted to denouncing the scientific value of the work of James D. Dana, James Hall, J. S. Newberry, F. B. Meek, W. P. Blake, T. A. Conrad, J. D. Whitney, C. A. White, J. J. Stevenson, with side notes on nearly every American geologist of the past fifty years, against whom as a whole he has also launched certain epithets. It can be readily seen that his assaults upon me are felt less keenly when one considers the distinguished company with which I have been placed by him. This will be made still more apparent by the following brief résumé of the controversy which he has so long conducted.

The invalidity of Professor Marcou's conclusions concerning the Jurassic age of the New Mexican locality was early shown in many papers by the principal American geologists, of the decade of 1855–1865, among whom were W. P. Blake, B. F. Shumard, J. S. Newberry, F. B. Meek, T. A. Conrad, James Hall, James D. Dana, Lesquereux and others. The whole substance of the controversy and proof of the inaccuracy of Professor Marcou's conclusions, have been ably set forth by Professor Dana in this Journal for November, 1858, p. 323, and January, 1859, pp. 137–141. This was the original Marcou controversy, which died out in the year 1867. The later and detailed studies in the field by the present school of geologists, have confirmed by stratigraphic research that these

* See Geology of North America, p. 7.

older writers were correct in their affirmation of the Cretaceous age of the alleged Jurassic beds of New Mexico.

From 1867 to 1884 there was a cessation in the flow of publication from Professor Marcou's fertile pen, which did not resume until after the appearance of the writer's first papers on the geology of the Texas region, in 1886, after I had endeavored to give a résumé of Marcou's work in Oklahoma and New Mexico.* In attempting to give him credit, however, I apparently started Professor Marcou's pen again—which he resumed, after seventeen years of silence during which his history was a blank to me. Since this time his contributions have been as frequent and pointed as before. Time does not permit me to enumerate or refer to all of Professor Marcou's publications. They are all marked by similar statements to those given in the article which has brought forth this paper, only differing in the violence of the personalities indulged in.

His publications have been particularly severe in their denunciation of all American geologists. Professor James D. Dana, who has always been considered as the embodiment of honor and integrity, is accused of "distorting and misrepresenting facts,"†‡ of falsifying titles of his (Marcou's) papers,"§ of "persecuting‖ and waging war upon him," of having "filled up his Journal, since he is geological editor, with papers of controversial nature, without a single observation made in the field or museums" and charged with "persistent and blind resistance against progress," "opposition *a outrance* and his *parti pris* to ignore a system." He also states that Dana and Hall have not excuses of distance to travel over or want of facilities and opportunities to create their colossal error." "His (Dana's) efforts during 44 years have been directed to keeping life in wrong conclusions and in the opposite direction of the truth," and together with James Hall "has misled those who followed their views by various paleontological determinations and false classification."¶ He accuses Professor F. B. Meek—the ideal of exactness in paleontologic method—of "mixing strata together without regard to stratigraphy, lithology, or even paleontology," and states that Professor J. J. Stevenson makes use of language "such as it is impossible even to quote it."**

His assaults upon American geologists reached their climax, however, in his paper on "American Geological Classification

* Bull. 52, U. S. Geological Survey.
† "A Reply to the Criticisms of James D. Dana," by Jules Marcou, Zurich, 1859.
‡ Geology of North America, Zurich, 1858, p. 7.
§ American Geological Classification, by Jules Marcou, Cambridge, 1888, p. 9.
‖ Ibid., pp. 22, 23.
¶ Ibid., p. 39.
** American Geologist, Sept., 1889, p. 156.

and Nomenclature," published at Cambridge, 1888. This is a bitter attack upon nearly every American geologist of the past half century, all of whom except myself, of whom Mr. Marcou was then fulsome in his praise (for reasons elsewhere explained), are accused of outrageous personal conduct, such as "suppressing facts," "falsifying," "misquoting," "incompetent observations," etc., etc., and speaks of "the constant and utmost opposition" of Messrs. James Hall, T. Sterry Hunt, W. E. Logan, James D. Dana, the two Professors Rogers, and Professor C. H. Hitchcock, and to this list he adds in his own handwriting on page 8 of the copy sent to me, the name of Charles D. Walcott. Also, on page 11, he accuses Professor Dana "in accordance with his usual practice of giving credit to those to whom it does not belong, and pretending that the Lower Silurian is called Champlain by Mather." On page 17 he accuses Mr. Walcott of having been "misled by the erroneous notions constantly and perversely put forward by Mr. Dana."

I could quote from his various writings many other such denunciations, chiefly directed at Professor Dana as the head and leader of American geologists, just as he now assails me because I have been a pioneer in the late studies of the Mesozoic in the Texas region. I could fill a volume with similar attacks upon other men of science, such as his accusations of a like kind against Newberry, Hall, Stevenson and others. It was owing to the error of his deductions, his habit of absorbing to his own credit every new discovery in the Southwest, and printing imaginary geological maps of the United States, of persistently misquoting other writers, of accusing every one of paleontologic or stratigraphic incompetency, and of indulging in personal abuse and vituperation, that Professor Dana at one time demanded that the Boston Society of Natural History should investigate him, and in later years ignored him entirely.

So far as I am aware, his conclusions on the subjects discussed are not accepted by a single living geologist in this country or abroad, and he has hurled criticisms, similar to those now made against me, at the head of every prominent American geologist who has lived since he first came to this country. During the first few years of my studies I was inclined to believe that he might have been right in his conclusions concerning the Jurassic age of the beds of the Tucumcarri region, and committed this opinion to print. So long as I leaned to his opinions he was fulsome in his praise, bestowing upon me effusive compliments as to my ability, etc., etc., and even writing among others of a similar flattering nature, the following notice* of

* Jura Neocomian and Chalk of Arkansas.—Marcou. From the American Geologist, December, 1889, pp. 366–367.

the same Arkansas Report which, in the September number of this Journal, he so severely condemns:

"On the whole, Volume II of the Arkansas geological report for 1888 is a most creditable work, which reflects honor not only on its author, Professor Robert T. Hill, of the University of Texas, by far the best practical geologist who has ever studied Southern Arkansas and Texas, but also on Professor John C. Branner, the state geologist. The State of Arkansas must be complimented to have secured the services of such able observers."

In the American Geologist for September, 1889, p. 156, he also gives me credit as being "The only American Geologist who has quoted my Mesozoic fossils of Texas."* Later, however, after my second visit to Tucumcarri Mesa, where and when I was the first to discover and there to announce the well-developed Cretaceous fauna identical with that of the uppermost Lower Cretaceous beds of Denison, Texas, he immediately directed his epithets at me, in articles elsewhere cited, in the American Geologist, the Proceedings of the Boston Society of Natural History, Science, and this Journal, each attack being proportionately more personal and bitter, as increasing research more and more conclusively demonstrated the Cretaceous age of his New Mexican "Jurassic," and its stratigraphic position above the beds of Comet Creek which he, himself, had called Cretaceous.

I will admit that in the earlier years of my researches, when my papers were largely written in the field away from libraries, I have made occasional mistakes, (and who has not?) some of which are typographic, others slips of the pen, and others merely mistakes, but these papers have always been conscientiously written with a desire to state the truth, and in every instance have been of material advancement to our knowledge of the stratigraphy of the Texas region, and Mr. Marcou's insinuation, "not to use a stronger word," that I have endeavored to corrupt the record is false. No amount of abuse, misrepresentation or misquotation on the part of Professor Marcou can alter the essential facts of research, nor cover up his own misstatement of fact and imperfect and misleading quotations. Even though he should succeed in his attempts to prove me untruthful and a defacer of the geologic record—which he cannot do—this would in no way excuse him for distorting and imperfectly quoting every new scientific discovery in order to uphold an erroneous and untenable deduction, founded on self-confessed incomplete exploration.

* In a subsequent paper in the American Geologist for August, 1894, p. 98, in which he makes his first change of front towards me, it is interesting to note that his principal unspecified allegation against me is that I do "not always give credit where credit is due."

Finally, concerning his American geologic work, it can be said now, as was truthfully said by Professor Dana many years ago, that* "We cannot see, therefore, that Mr. Marcou's claims as a discoverer are in any one case sustained, or that his merits are in any respect enhanced by his American researches, and we certainly should not go to him for an exposition of American geology."† . . . "We cannot therefore think that his former reviewers and opponents deserve, because they differ from him, either to have their names expunged from American geological history, or thrown into discredit; nor do we believe that their reputations will seriously suffer from our ambitious Rocky Mountain explorer.‡ . . . Whoever may identify true Permian, true Triassic or true Jurassic strata will not have borrowed from Mr. Marcou and can owe him no credit."§

*This Journal, Nov. 1858, and January 1859. †Ibid., January 1859, p. 139.
‡Ibid., November 1858, p. 333. §Ibid., November 1858, p. 331.