



Scientific News

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## SCIENTIFIC NEWS.

**5. Notes on the Paleontological Laboratory of the United States Geological Survey under Professor Marsh.**

If there is any truth left under the sun then judgment must fall on the scientist who walks the halls of the Yale Museum armed with a wet sponge. Why a wet sponge? you say. Perhaps it was to wipe the dust from some noble fossil? Far from it! but rather to wash the purity of a truth out of the blackness of a falsehood. A kind of organized touchstone that distinguishes the little gold from the bulk of dross, which when deftly swept across the surface of a restored fossil, discloses the real and the unreal. For plaster of paris is porous, and absorbs more readily than the denser fossil any moisture from the sponge. So the blackened sepulchres yield up their grewsome skeletons. Veritable sepulchres they necessarily seem to those who have seen these fossils "black-washed" from centrum to spine, from shaft to extremities, reducing the whole to a uniformity of color that wiped out absolutely every vestige of the truthful white plaster, leaving mankind in doubt as to what is real, what conjectural. This is illegitimate restoration in the eyes of the whole world, and these old bones, restored to deceive rather than to instruct, must sooner or later stand as monuments of reproach to the man who has so far deceived the world and himself that he can only study them with a wet sponge.

To those scientists in foreign lands, especially Germany, who have marveled at the exceptional beauty and perfect preservation of Prof. Marsh's specimens, let it be said that although you cannot apply the sponge test to his faultless, fractureless plates, you can to the specimens from which they were drawn. But to see any man year after year calling for a wet sponge to assist him in determining whether a suture or a fracture were real or imitations wrought cunningly in the plaster by skilled labor, is to believe him worthy of the unqualified distrust of science, wherever that word is spoken. One feels this the more keenly when he knows that all his assistants to a man have repeatedly advised with him, and cried out against this abuse, warning him of the criticism inevitably resulting from such a stubbornly unscientific and misleading course. His assistants are asked, not how nearly they can approximate the truth, but instead, "How closely can you imitate the color and texture in that missing part?" which being translated is, How cunningly can you deceive? "That part looks too smooth; can't

you work in a crack or two to give it a natural look?" "Just run a suture along here, and scrape that process there to make it look like the roughnesses for cartilaginous or ligamentous attachment."

At first the plaster worked badly, for many of the bones were black, and to get that color in white plaster it was necessary to add such quantities of lamp-black (with alcohol to make it mix with the water) that the restored parts were soft and crumbled away. To overcome this, glue water was added, which gave hardness, but like all glue was treacherous, drying, cracking, scaling off and pulling away from its moorings, thus exposing too clearly just where the fossil left off and the fraud began. It was not until he had learned how to combine plaster, bone-black, and gum acacia, that a mixture capable of unlimited possibilities was adopted. Were it possible, I would say, Verify these words,—but you can't. Stand straight before these restored specimens, in the full and truthful light of day, and you can't distinguish between the rusty, frost-cracked, weather-beaten, moss and lichen effects, craftily wrought in the plaster, and the conditions wrought by time on the specimens themselves. But if critical study can reveal—without the helpful sponge—the restored parts in some bones, it can't in others, some of which were prepared by myself, at his direction, in my earlier days on the Survey, and are so craftily modeled and colored that I cannot myself distinguish at arm's length the real fossil from the plaster. Of course the deceits and falsities of the specimens thus tampered with were naturally enough transmitted to the drawings, and the old deceits and falsehoods were enacted anew—compromising that pre-eminently reliable Journal. Yes, still a third time, in the costly plates of the government monographs, thence to be copied and repeated in other ways, how often who will say?—for a falsehood is prolific and self-propagating. If the deceptions thus practised were confined to the specimens themselves, and not transmitted to paper and then distributed throughout the world, it would not seem so serious an evil. As it is, the Geological Survey must necessarily suffer reproach either now or in the future.

Geologists abroad who cannot acquaint themselves personally with the facts, may find in the above an explanation of the striking absence in Professor Marsh's plates of those conventional bars, light shading, and simple outlines which fair-minded scientists universally use to honestly indicate missing parts. In very marked contrast to his course is that of foreign geologists, and our own paleontologists. Their plates show things as they actually are, and are not daubed with plaster to enlarge, distort, or conceal anything at the caprice of the

author. (Figs. 1, 2.) Another phase of this extensive restoration business is worthy of notice, and is thoroughly culpable. Professor Marsh gave tacit and oft-repeated directions "not to do a stroke on a Government fossil that was not absolutely necessary." "I am not doing missionary work for the Government," "They can do the fancy work at the National Museum; we will only work them out just enough to see what they are, and they can do the rest there." But bear in mind that all this time he was doing home missionary work on his own private collections, and at Government expense too; restoring, and embellishing, and mounting them on plaster bases and other supports ready for exhibition. "Life was too short" to give a Government specimen more than a lick and a promise, but quite long enough to devote months and years of Government time and money in beautifying his own private collections, and that too when they had all been drawn, and lithographed, and all the measurements had been

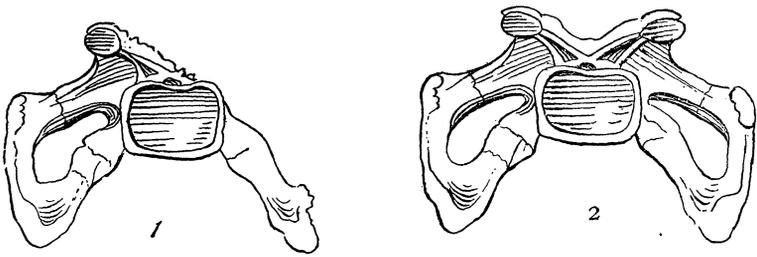


FIG. 1.—Cervical vertebra of "*Apatosaurus*" *laticollis* as it appeared when drawn. Take notice, it hadn't been plastered up when the drawing was made.)

FIG. 2.—The same as it appears now in geologies, scientific papers, and elsewhere, after it was doctored up. (Notice the slight differences on the two sides, a thing that heightens the realistic effect of the missing parts.)

taken, and the necessary notes made, so that not a single excuse remained for squandering the Government appropriation in garnishing and adorning his own particular specimens for impressive display in his own particular museum. This abuse of public trust led us to frequent and spirited disagreements and our relations became exceedingly strained, and still more so when I refused to add to the crime of misappropriating Government time that of deceiving in the restorations. For he not only wished to have the deceptive plaster used in the restorations, but insisted on having the bones so modeled as to exactly correspond with the lithographic plates already drawn, and that too after being repeatedly informed that to secure this similarity would necessitate distorting and even breaking the fossils.

Once when I frankly gave him my opinion of this wholesale misuse of the Government men and money for his own personal benefit, he

declared that the power vested in him as Paleontologist was such that it enabled him to apply his appropriation in collecting recent Birds or Mammals in South America, or in hiring musicians for his entertainment while at work, if need be. On another occasion when I rose in opposition to this same wrong his reply was so strikingly characteristic that it seems worth while to reproduce it from my note-book, to whose unerring memory I entrusted all such matters. \* \* \* "On one occasion when I complained to him frankly that it seemed wrong to employ so many of his force on private work, and that too much of that sort of thing was done by him daily, and cited as one of several instances the time when so many were engaged for more than a year in making a restoration in papier-mache of his (so-called) *Dinoceras*, he said, "Now I simply say this to you, I *have a contract direct with the Government for the restoration of Dinoceras*. What do you say to that?" There was nothing for a gentleman to say to so straightforward a statement, but I could scarcely believe my senses a moment later, when he explained that he had asked me as a favor to help him out,—that the time required for the completion of these restorations had been so gravely miscalculated that it had taken twice as long as they had judged to finish them, and he was sick and tired of the whole matter. "Besides it had cost tremendously, and, *every cent comes out of my own pocket*." Then I suggested that heads of departments with "contracts direct with the Government" didn't pay for things out of their own pockets. He declared several times that I didn't understand. "You see it is this way; I am going to make the restorations, and the Government assures me it will pass a bill to pay for them, so you see it is all right." The strikingly characteristic part of it is that he really hadn't a contract when he said he had. When the investigating committees shall have inquired into the exact price the Government has paid for one paper model of *Dinoceras* (and a frail one at that) some interesting figures will surely come to light. His zeal to out-rival all others in the startling size of his fossils has led him to send out casts of heroic stature, and you natives and foreigners who have the great saurian femur ("*Atlantosaurus*" *immanis*) "exceeding eight feet in height," may saw off a two-foot back-log from the same, and then it will stand as high as it does in the Yale Museum to-day. And you authors of manuals of Geology, written in all sincerity for the honest and reliable instruction of the youthful mind, may lop off the same amount of plaster from your clean text. Neither was the huge Saurian one hundred feet long, nor was its great thigh bone over eight feet in

length. It should be further stated for your information that the author of this greatest of femora allowed this mistake to remain uncorrected in the proof of Dana's Manual of Geology, which was submitted to him, after he and all around him could not help knowing it was false. [Figs. 3, 4.] And you students in universities and colleges throughout the world may turn to page 433 of Dana's Manual of Geology (third edition) or to page 462 of LeConte's Elements of Geology, or to page 779 of Geikie's Elements of Geology (not to mention other authors, for who can follow a deception through all its infinite ramifications!) and may draw your merciless pen through "more than eight feet high" and write "more than six."

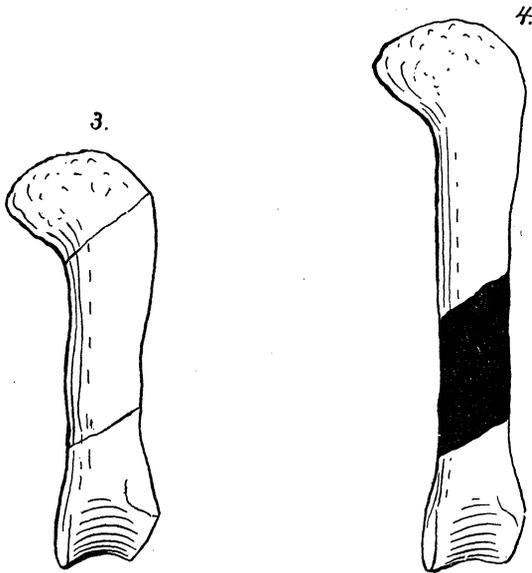


FIG. 3.—Femur of "*Atlantosaurus*" *immanis* as it stands in the Peabody Museum to-day (more than six feet high).

FIG. 4.—Cast of femur of "*Atlantosaurus*" *immanis* (more than eight feet high), sent out to the museums of the world.

In ordinary cases the world would relegate this to the category of mistakes, but when the fragments refuse absolutely to go together, and when a skilled foreign modeler tries for days to reconcile fact with fiction, and tells his employer so, and when he "must match the pieces" by building them up with modeler's clay, then it is that the mistake looks so deliberate that the world withdraws its mantle of charity.

Plaster in bulk is cheap we know, but, when misused, will cost a man his reputation. When Professor Marsh made his notorious "*Bison*" *alticornis* blunder,—describing, for a second time at least, a reptile as a mammal,—the horns as they came in from the collector were not satisfactory,—from a bison standpoint,—and were straightway broken apart, straightened up, and given the "proper sweep."

All the ugly chinks were filled with the ever-ready mixture, and the helpless old "*Bison*" *alticornis* came out of it all with a nobility of front creditable to the king of bisons himself, but with his personal appearance so touched up withal that he couldn't tell himself whether he was a bull bison from the Tertiary, or an outraged reptile from the Mesozoic. Nor could anyone for that matter. But when future generations shall have chiseled away the plaster from the cavities, foramina, and sutures, its real identity may be re-established (Figs. 5 and 6).

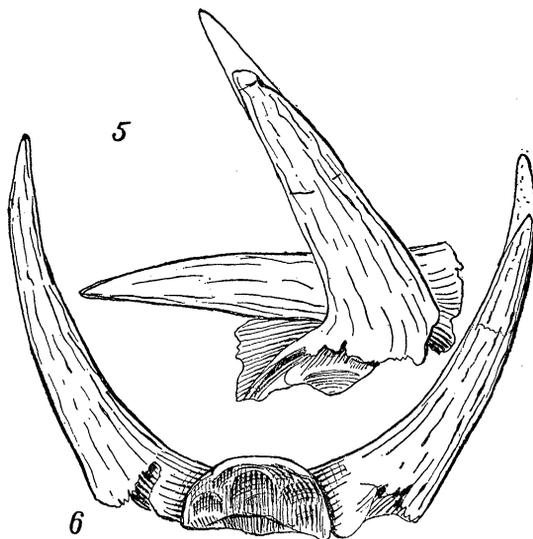


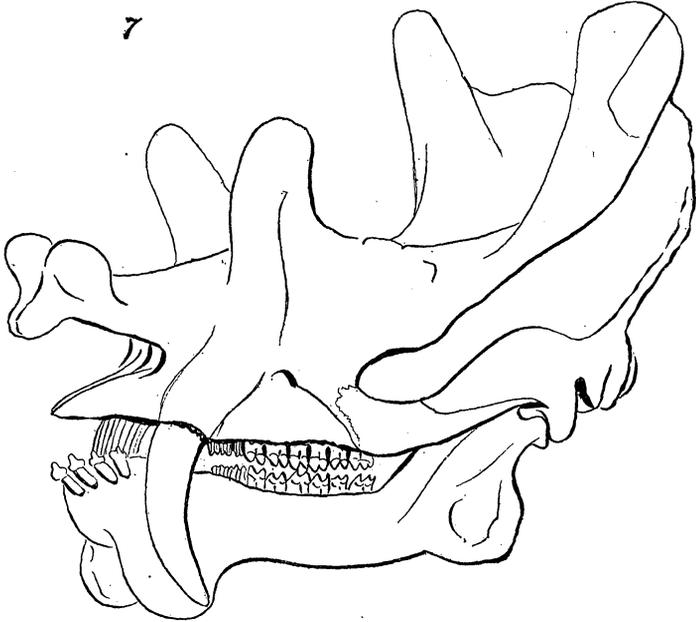
FIG. 5.—The horns of "*Bison*" *alticornis* Marsh, as nearly as they appeared when received as is possible in their present condition. Colored plaster, once applied to a specimen, cuts off much that is worth knowing.

FIG. 6.—The same as they appear in the illustration, with no hint of the colored plaster. See *American Journal of Science*, Vol. XXXIV., October, 1887.)

But in the mean time illustrations of the "*Bison*" horns go out to the world (see *American Journal of Science*, Vol. XXXIV., October, 1887), but without the slightest intimation of the plaster hiatus there. Now that it turns out a horned reptile, and not a bison at all, he neither represents the live animal, nor the specimen as it came from the quarry.

Fortunately, a plaster of Paris deception, once set, is just the hard and lasting, and perfectly tangible sort of falsehood that Science, without reserve lays rough hands on. And the day has at last come, we hope, when specimens from the plaster of Paris formation will no longer be accepted by science as fossils, and the "Plasterosauri,<sup>1</sup>" and "Plasterotheria" will be things of the past.

In his great antedated volume on the Dinocerata, the figures of his so-called *Dinoceras* and *Tinoceras* are plump with plaster. Why, in these plates of the Dinocerata many of the skulls and bones show not a trace of their construction! How strongly contrasted with this are the methods of all other American and foreign geologists, both as regards the specimens themselves, and the illustrations of them. These true paleontologists figure what they have, and do not figure what they have not (Figs. 7 and 8).



FIGS. 7 and 8.—Skulls of the Dinocerata, introduced to illustrate differences of treatment by different authors. FIG. 7.—Skull of *Loxolophodon ingens* Marsh, illustrating fairly the whole work on the Dinocerata. It will be noticed that the figure is free from anything suggestive of the blemishes covered up with colored plaster.

Speaking of *Dinoceras* and *Tinoceras* brings to mind that interesting time when his review of the Dinocerata, admittedly prepared by

<sup>1</sup> Plasterosauri not original. A name facetiously applied (to the great merriment of the force) by a Yale professor, to whom Professor Marsh was showing his various *Sauri*.

himself, was signed by the initials of his type writer amanuensis, after it had been rejected by two of his assistants ; facts that were generally known and commented on by his assistants at the time. But where are the bones of *Tinoceras*? I have not seen them myself, save a skull, and one or two foot bones, and possibly a pelvis, and assistants best informed on this group declare that but few existed at all. Yet the superb plate shows not a missing bone save a few caudals. Every vertebra, every rib, all the limb bones to the smallest bones of the feet, are perfect. Such a complete specimen was never known. There is a hole in the saucepan somewhere. Then too, it is my distinct and positive recollection that when preparing the restoration of

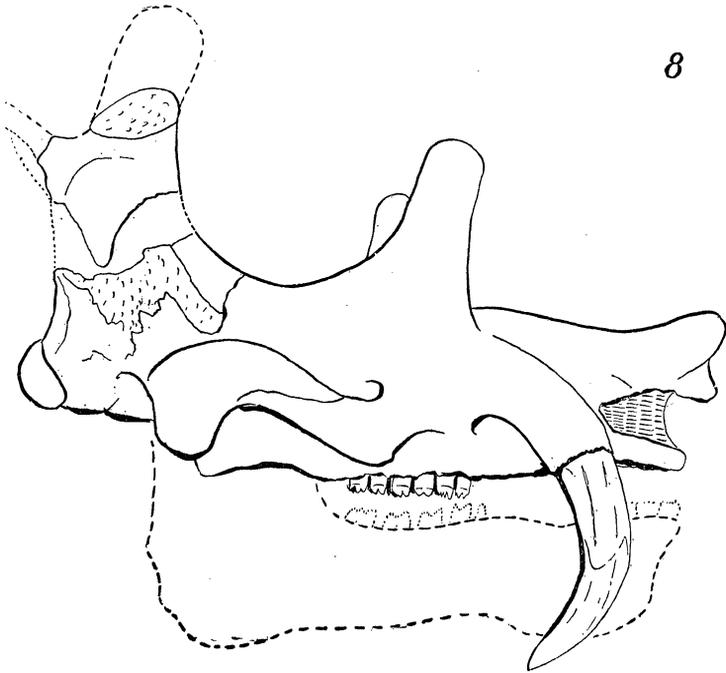


FIG. 8.—*Loxolophodon cornutus* Cope, from Cope's plate in the Tertiary Vertebrata.

*Tinoceras* he gave directions that the drawings of *Dinoceras* be enlarged one-fifth, and have a three-quarter view instead of side view, so that it wouldn't look too much like *Dinoceras*. These facts were rather freely criticised at the time, leading us often to mirthful considerations of the unusual elasticity of conscience which a Government paleontologist must have to stick the head of one individual on the

enlarged carcass of another, and to found thereon a new genus and species for publication in an official monograph. Out of all this is evolved a paleontology so untrammled by scientific conventionalities that it is free and spotless from those ugly cross-bars, light shading, and simple outlines indicative of missing parts, and quite as free from acknowledgment of priority, and recognition of the works and discoveries of others. But high art paleontology, not content with the omission of tell-tale bars and outlines, goes, with its long acquired momentum, still farther, and produces plates with such ingenious similarities and differences that the very elect are deceived by the realistic effects shown in the missing parts. These are flanked with text fraught with such subtleties and ambiguities that highly-plastered up impressions are easily conveyed.<sup>2</sup>

In substantiation of the frequent charges that Professor Marsh pre-empted land to shut out other geologists, I am ready to add my weight of testimony. More than that, he himself tells of putting hindrances in the way of younger geologists, for when one of his workmen said one day that "Professor Osborn had published a paper with a restoration of Brontotherium," he came to my room greatly agitated, declaring that Professor Agassiz had simply played him false, having promised that Professor Osborn should not see the collections at Harvard at all, and then he not only let him see them, but also describe them. When a former assistant secured a desirable position, Professor Marsh vowed if he had only "known it sooner the man would never have gotten that place." Not only does he avoid helping his assistants to better positions in geological fields, but he often hinders them by trampling on their good names when gone. We assistants watched the evolution of a falsehood from his lips, from the day when he said, "that man has resigned" to the month when he said, "I had to let him go; he was a bad lot," until still later he "dismissed him because he was unreliable and light-fingered." Thus it happens that some judicious assistants on resigning have shown commendable forethought in requiring of him papers, showing that they were not dismissed, as protections for their character against evil words and insinuations. Then by his ever-recurring, never-ending expressions of hatred and distrust, Professor Marsh methodically tries to fill to saturation the minds of his young assistants with prejudice against his contemporary in paleontology (Professor Cope). These are but allusions to his

<sup>2</sup> When one writes that "the diplosphene has long been known," the uninitiated might never suspect that the word had been coined for the occasion, to overthrow a name "hyposphene," proposed by a contemporary for a new osteological point.

hindrances put in the way of others in his attempts to monopolize paleontology in the East and West.

Can the people see the Government specimens? No, they cannot! and in all justice to the present management, possibly there is no reason, as he claims, why they should. After Professor Silliman and Professor Cope "went through" his collection, as Professor Marsh charges, we were directed not to admit even Professor Silliman or any of the Yale faculty, much less a stranger,—a demand so unjust that I for one refused, once for all, absolutely, to do anything of the sort. Newspaper men were particularly guarded against, even the editors of the college papers. Professor Benjamin Silliman was not only a member of the Yale Faculty, but was also one of the trustees of the Yale Museum, and I am one of the "two witnesses" who saw Professor Cope, at the invitation of Professor Silliman, "commit his depredations" on Professor Marsh's "private specimens," by walking through his open rooms. Professor Silliman and Professor Cope spent but a few minutes in each room. I saw them come and go. Professor Cope scarcely looked at the specimens, and didn't touch or uncover one, as I will testify under oath, Professor Marsh notwithstanding. So the scandalous half column devoted to the "depredations" and "outrages," and other designedly damaging statements, has only the most visionary foundation on fact. That his connection with politics should lead him to stoop from the high plane of a scientist to that of a scheming demagogue is a disgrace worthy of publicity. It is just such traits of character as this that have cost him the friendly support of all his assistants. A certain faithlessness runs through all his doings, so it is not to be marvelled at that it crops out in cuts and text. One important assistant, on private pay, not independent at the time (drawing a small salary, not half his just deserts), was asked as a favor to be listed on the Government pay-roll, to which he readily agreed as a matter of accommodation, only to find, the next quarter, that his salary had been cut down two hundred dollars. These facts, and many that are necessarily suppressed for the nonce, in consideration of the present members of his force, coupled with his insincerity in scientific work, will help to explain why the *personnel* of his force undergoes such constant and rapid change. High-spirited young men, college graduates, cannot and will not tolerate such associations and environments.

In the matter of drawings, Professor Marsh sacrifices veracity and honor to secure high art in his illustrations, and the Government pays the bill. Not only does he assiduously avoid combining figures on the

plates, but he makes all drawings on a large scale, necessitating many double and quadruple folded plates.

He even goes to an extreme that is simply culpable, and makes some drawings natural size. To be specific, one such plate, representing a full-length drawing of an enormous caudal vertebra of "*Brontosaurus*" *excelsus*, is not far from three feet wide by four feet long, nearly equaling sixteen plates of ordinary size. Any lithographer can tell you about what the Government doles out for luxurious display of this sort. One plate would have given a very liberal space indeed for the figure of this unimportant caudal. The idea that to be scientific drawings must be full length! Let us rejoice that Professor Marsh is not called upon to write up, at the expense of the people, the natural history of the whale. But the cost of gorgeous plates is a mere bagatelle to the public treasury compared with the waste resulting from his natural indolence and mismanagement. Just think of leaving a large force of men without superintendence; no one to direct or advise! As a matter of practical business experience such a method is simply disastrous, and right here we may look for a rational explanation of the fact that Professor Marsh accomplishes but little, although his force is large and competent. He actually compels the men to hunt for work, instead of so appointing it as to secure their best efforts, and in general manages with such culpable deliberation that Government contracts for monographs lapse unnecessarily,<sup>3</sup> and in twenty-five years two monographs only appear to show for the talent and appropriations expended! But Ease finding itself outwitted by Industry, ingeniously catches up with all rivals by an antedate,<sup>4</sup> and we record one more quibble in the growth of a monograph.

On consulting my books I find myself writing indignantly about this matter as much as four years ago, and mentioning his spending every moment on trivial details which concerned the workmen only, instead of inspiring greater effort, or urging on the work as a whole. Or, as Mr. Harger has often told me, to illustrate Professor Marsh's eye for the small things, "I have seen him sign his approval to a plate having the name spelled wrong, and even the bone upside down, without seeing either mistake, but a comma with a broken tail had been carefully marked." (The entire edition of two plates was printed with the bones wrong end up.) Countless petty things

<sup>3</sup> As the author remembers it, each of three contracts for monographs have lapsed, been renewed, and lapsed a second time.

<sup>4</sup> The reference is, of course, to the Dinocerata, antedated to keep pace with the Tertiary Vertebrata, published in 1885, but before the Dinocerata.

detained him from the museum, such as buying Jersey cows, orchids, etc. A calving cow has detained him till dark—that, too, at a time when he was to leave the next day to be gone a fortnight. With even moderate industry his Sauropoda contract could not have lapsed, nor could his Stegosauridæ and Brontotheridæ contracts have shared a like fate. In all justice, however, to Professor Marsh, it should be stated that the best interests of the Survey demand that he should have the utmost freedom in going, coming, or absenting himself outright from the laboratory. But this does not excuse him for leaving his force without some one to systematize, plan, and direct the work effectively. Then his inefficient business methods as regards the salaries of his assistants lead to endless friction and general dissatisfaction. Not only does he dole out the pay quarterly,—not monthly, as the Government does,—but often, even then, postpones the pay-day from two or three days to as much as three weeks, and then at the end of this time makes matters still more annoying by all sorts of petty quibbles, and what we called “Marsh’s tricks.” On one occasion, during my earlier experiences on the Survey, he handed me the vouchers and a receipt in full, all of which were duly signed. He in turn signed a check for payment in part (deducting some fifty dollars), which he handed over, explaining in all candor that “the balance would be made good at the end of the year.” “It’s a way they have on the Survey.” But as it was a way I didn’t have, and “though his word was as good as his bond,” another check was forthcoming. Forgetting this failure, the same untrue and unfair game was tried again later with like results.

His unpardonable neglect of proper superintendence costs the Government far more than all his sumptuous high art works on paper and in plaster. The only time when Prof. Marsh does show signs of real industry is when he rushes precipitately into the description of a “new genus.” Utterly disregarding the advice of his ablest assistants, and neglecting those thorough investigations which might check his growing list of useless generic names, he describes his specimen on the first impulse, and his list is swelled by one more name. A sacrum comes in “consisting of only three vertebræ” (the other two knocked off): he sees in it a “totally different genus,” and though it is contrary to all probability and to the advice of his assistants, he industriously finds a new genus and species on it. (See *American Journal Science*, Vol. XVII., January, 1879; also text-books of geology.) Should the Geological Survey by any chance be crippled by the recent overhauling of Prof. Marsh’s methods, it would be a national loss, but it is

certain that the present paleontologist deserves such a reprimand that he will be forced to adopt methods recognized as legitimate by scientists. Whether such men as Prof. E. D. Cope, Prof. Persifer Frazer, Dr. T. Sterry Hunt, Dr. F. M. Endlich, and others, are moved by envy, malice or hate in agitating this geological controversy, matters little—that is precisely the cheap kind of retort the world expects; yet the fact remains that Prof. Marsh's assistants and others are marshalled against him also. No man engaged in scientific pursuits, however flanked by wealth and influence, can possibly hope for the support of high-minded, honorable men, if his course is such as to lay him plainly open to charges of trickery, plagiarism, illegitimate methods, disregard of the works of others, the rights of priority, and incompetence in general. Although the present paleontologist may, by the very weight of his official position and influence, avoid the scrutiny of an investigating committee, which in common justice he should not escape, he cannot but be weighed in the balance by scientists and found wanting.—ERWIN H. BARBOUR, PH.D.

*Iowa College, March 15, 1890.*

**Die Spinnen Amerikas.**—The death of the German araneologist, Count Keyserling, made a large breach in the little circle of working araneologists. It was known that he had left a large amount of manuscript for the concluding parts of his work, "Die Spinnen Amerikas," and this, it was feared, would be lost to science. But the publishers, with praiseworthy enterprise, have resolved to complete Keyserling's work as far as possible after the original plan. They failed, however, to find any one in Europe who would edit the finished manuscripts and complete the fourth volume, which treats of the Epeiridæ. In this emergency they solicited the aid of Dr. George Marx, of Washington, D. C., who has at last consented to undertake the task. Being a thorough German scholar and a well-furnished araneologist, Dr. Marx is admirably equipped for this duty. A large part of Count Keyserling's manuscript, which was in a good degree of forwardness, has already been edited, and will soon be ready to transmit to Germany. Dr. Marx will then edit the notes upon the Orbiculariæ, and add descriptions of the species which Keyserling had not reached at the time of his death. He will thus contribute about one-third of the matter in what will constitute Volume IV. of "Die Spinnen Amerikas."—HENRY C. MCCOOK.