The Uintatheres and the Cope-Marsh War

This feud is an interesting but unfortunate part of the history of science in 19th century America.

Walter H. Wheeler

The science of vertebrate paleontology is one of the more specialized branches of geology (or of zoology). Even today there are only a few score persons in the United States who are employed full time in the collection, preparation, or interpretation of fossil bones.

As with most sciences, the Victorian beginnings of vertebrate paleontology were dominated by a few strong personalities whose pioneer efforts provided a firm base for the modern work. It usually happened that these few scientists had strong convictions about their abilities and theories and were not especially tolerant of opposing viewpoints. It was an era of strong personalities, invective, and intense personal rivalry among supporters of various scientific or social views. Even so, the conflict between two American paleontologists, Edward Drinker Cope of the University of Pennsylvania and Othniel Charles Marsh of Yale University, emerges as the outstanding scientific feud of the 19th century.

Two major developments, the publication of Darwin's *Origin of Species* in 1859 and the opening of the American West after the Civil War, set the stage for the explosion of interest in fossil vertebrates in the 1870's. In the 1860's it was becoming increasingly evident that the collecting of fossil vertebrates in the western United States would be very rewarding. These fossils were wanted for their intrinsic value and for their bearing on the torrid question of vertebrate evolution.

The first American to publish extensively on fossil vertebrates was Joseph Leidy, a professor of anatomy at the University of Pennsylvania. Leidy had the field to himself for about 20 years prior to the late 1860's, when Cope, a former student, and Marsh arrived to provide competition of a rather overwhelming kind.

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Cope and Marsh

Edward Drinker Cope (1840–1897) (Fig. 1), who came from a well-to-do Quaker family, lived in or near Philadelphia all of his life. He was sent to a Quaker boarding school and was encouraged to work on a family-owned farm. Cope's father wanted him to be a practical farmer, but he declined his father's offer of a farm in order to attend Joseph Leidy's course in comparative anatomy at the University of Pennsylvania. Cope attended Haverford College and later, in the fashion of the well-to-do who sought an education in science, spent some time at universities in Europe.

Othniel Charles Marsh (1831–1899) (Fig. 2), born near Lockport, New York, was descended from colonial New England stock. An uncle, George Peabody, was a very prominent New England banker and philanthropist to whom "Marsh was indebted for his educational advantages and for his private fortune" (*1*). A paternal uncle, John Marsh, was an outstanding pioneer citizen of California and was instrumental in the movement that resulted in the admission of that state to the Union. O. C. Marsh was educated at Phillips Academy at Andover, Massachusetts, and at Yale College, and did graduate work at Yale's Sheffield Scientific School. He spent three years in Europe attending lectures and courses at Berlin, Heidelberg, and Breslau. In 1866 he was appointed professor at Yale and occupied the first chair of paleontology in this country.

Beginning of the Feud

Marsh undertook his first trip to the West in 1868. He was so greatly impressed by the richness of the fossil vertebrates that he later organized several Yale student expeditions, the first in 1870. At times these expeditions were accompanied by military escort for protection against hostile Indians.

Marsh, Cope, and Leidy were independently collecting in the Eocene beds of Bridger basin of Wyoming in the summer of 1872. Their competition that summer ultimately resulted in the break between Cope and Marsh and in Leidy's withdrawal from vertebrate paleontology.

All three sent letters back east which were published very swiftly as separates and mailed to all interested scientists. (In those days, such a procedure served to establish the date of publication of generic and specific names.) All three discovered specimens of large uintatheres (order Dinocerata) that summer. Bones of this extinct group of fossil mammals are found chiefly in Eocene formations in the Bridger and Washakie basins of Wyoming. The larger uintatheres were massive animals with small molars, small brains, large sabre-like canines, and three sets of protuberances or "horns" on the skull. Of all the fossils discovered in the Cenozoic strata of the United States none has been more remarkable than the remains of the uintatheres.

Leidy was the first to publish on a uintathere when he named *Uintatherium robustum* in a separate dated 1 August 1872. On 17 August Cope sent his famous garbled telegram from Black Buttes, Wyoming. This was published in Philadelphia as a separate only two days later and is probably the most bizarre of all paleontological notices. In it the intended name, *Loxolophodon*, was misspelled as *Lefalaphodon*. The next day (20 August) another notice was published for Cope in which he assigned the same material to a new genus and species, *Eobasileus cornutus*. (This is the valid name for the largest of the uintatheres.) Apparently Cope had mailed this second notice *prior* to the sending of his telegram. By 22 August the correct version of the tele-

graphed description had arrived in Philadelphia and had been printed. But Cope had already used the name *Loxolophodon* in another connection earlier that year, and it could not be validly applied to a uintathere. He was not notably respectful of the rules of zoölogic nomenclature.

Meanwhile, Marsh had found one of the best-known skulls of *Uintatherium*, to which he gave the name *Dinoceras*, a synonym for *Uintatherium* by virtue of Leidy's 19-day head start.

To judge from such haste, it would almost seem as if Leidy, Cope, and Marsh each knew of the fossil materials and intentions to publish of the others. This was probably the case. In the collection of Marsh's letters at Peabody Museum, Yale University, is a letter from B. D. Smith to Marsh written 5 July 1872. Smith had collected for Marsh in the summers of 1871 and 1872. He said: "I have . . . sacks of one skeleton the top part of the head is nearly hole both horns one tusk was all gon it was in hard rock and hard to get out I have done the best I could." In another letter, of 28 August 1872, he assures Marsh that "my motive in going with Cope was to ceep him off some places that I think is good bone contry close hear I did not intend to quit you long."

However, Cope felt that B. D. Smith was a big help, for he said in a letter to his brother that "our guide has been on 'bone expeditions' before, and is first rate" (*2*, p. 186).

Leidy was not the least bit secretive about his discovery of a uintathere canine tooth. In his letter to Marsh of 28 August Smith says further that: "whe got one tusk and part of the jaw nearly one foot long I think the same kind that Prof Lidy got part of the tusk of hear that he is blowing about." Somehow, one is left with the feeling that one did not lack for information when Mr. Smith was around.

Osborn has pointed out (*2*, p. 177) that "Marsh disputed Cope's right to enter the Bridger field and put every obstacle in his way . . . This began the intense rivalry in field exploration and the bitter competition for *priority of discovery and publication* which led to an immediate break. . . ." Leidy withdrew almost completely from vertebrate paleontology, regarding it as no longer a fit field of work for a gentleman.

The good uintathere skull which Cope found in the upper Eocene beds of the Washakie basin was an *Eobasileus*, whereas Marsh's Bridger basin

Fig. 1. Edward D. Cope. [From the 12 January 1890 edition of the *New York Herald*]

skull was a *Uintatherium*. But each thought the other had the same beast and regarded differences in their descriptions as errors in interpretation. It happens that Cope did make some mistakes. He called the tusks incisors rather than canines and stubbornly held to his mistaken view that the uintatheres were a kind of elephant. In a popular article in the June 1873 issue of the *Penn Monthly* he published a picture erroneously depicting the uintatheres as elephants (Fig. 3). Actually they are not remotely related to elephants, nor do they have any particular resemblance to them (Fig. 4). Marsh rather gleefully called these mistakes to Cope's attention in print and correctly interpreted the

Fig. 2. Othniel C. Marsh. [From the 12 January 1890 edition of the *New York Herald*]

uintatheres as members of a new order of mammals, which he designated as the Dinocerata.

Marsh's indignation over Cope's handling of the Dinocerata and over his supposed predating of publications grew very intense. One of Marsh's articles was so vitriolic that the editors of the *American Naturalist* actually refused to print it as part of a regular issue but permitted its publication as an appendix to the June 1873 issue. Said Marsh: "Cope had endeavored to secure priority by sharp practice, and failed. For this kind of sharp practice in science, Prof. Cope is almost as well known as he is for the number and magnitude of his blunders. . . . Prof. Cope's errors will continue to invite correction, but these, like his blunders, are hydra-headed, and life is really too short to spend valuable time in such an ungracious task, especially as in the present case Prof. Cope has not even returned thanks for the correction of nearly half a hundred errors. . . . he repeats his statements, as though the *Uintatherium* were a Rosinante, and the ninth commandment a windmill."

From August 1872 to June 1873 Cope and Marsh each published 16 different articles on uintatheres. Neither one paid any attention to the possible priority of the other's scientific names, and they both virtually ignored any priority of Leidy's. The result was nomenclatural chaos. After June 1873 they both tired of the matter, and the flood of articles about uintatheres was much reduced.

The United States Government was much concerned with the opening of the West, including its scientific development. Four separate geological surveys had been established by the mid-1870's, all dealing with the geology of the West. These were the United States Geological and Geographical Survey of the Territories, under Ferdinand V. Hayden; the United States Geological Exploration of the Fortieth Parallel, under Clarence King; the United States Geographical and Geological Survey of the Rocky Mountain Region, under John W. Powell; and the United States Geographical Surveys West of the One Hundredth Meridian, under G. M. Wheeler. Cope served as vertebrate paleontologist with the Hayden and Wheeler surveys, and Marsh worked with the Powell and King surveys. When the four surveys were sensibly combined in 1879 to form the United States Geological Survey, the first director was Marsh's friend Clarence King.

When King resigned after serving about one year, he was replaced by John W. Powell, who was another good friend of Marsh's.

Cope was out in the cold. The new survey did publish some of the work Cope had done under the old Hayden survey. In fact, the 1009-page volume with 134 plates was a most impressive work and is known affectionately as "Cope's bible." Its publication did not satisfy Cope, who had to watch Marsh's advantages grow as his own political and financial security diminished.

Feud Receives Nationwide Publicity

Cope received an order, dated 16 December 1889, from the Secretary of the Interior, J. W. Noble, directing him to deposit his fossils in the United States National Museum. According to Osborn (*2*, p. 402) "they were really Cope's personal possessions and had been secured through his private expenditure. [Cope's] compensation from the Hayden Survey had been in the form of publication, not salary, and he had expended about $75,000 of his private fortune in furthering the work and procuring fossil specimens."

Cope's indignation was almost unlimited. He needed a sympathetic ear, and he found it in William Hosea Ballou, an enterprising young newspaperman with the *New York Herald*. Cope gave Ballou an interview and several letters from his scientific friends. On 12 January 1890 Cope's grievances against Marsh and against John W. Powell, director of the U.S. Geological Survey, were detailed through nine columns (*3*).

Cope charged that Powell and Marsh were "partners in incompetence, ignorance, and plagiarism." He regarded the Survey as a "gigantic politico-scientific monopoly next in importance to Tammany Hall." He charged Marsh with locking away government collections in Yale's Peabody Museum and refusing to allow visiting scientists to see them, and with keeping such poor records that it was impossible to determine which specimens were which. He stated flatly that Marsh had retained the salaries of members of his field parties, and that Marsh's work was "in part that of his employees, the remainder being a collection of plagiarisms."

He stated that Marsh's genealogy of the horse was taken from the works of the Russian paleontologist O. Kowalevsky, that Marsh's monograph on the Cretaceous toothed birds was written by S. W. Williston, that the monograph on the uintatheres (Dinocerata) was written by Marsh's assistants, and that Marsh's paper on Cretaceous mammals was "the most remarkable collection of errors and ignorance of anatomy . . . ever displayed."

Following the account of Ballou's interview with Cope were excerpts from letters of some of Marsh's former assistants. One was from Samuel W. Williston, later a distinguished paleontologist at the University of Kansas and a world-renowned authority on fossil reptiles. According to Ballou, Williston had written the following to Cope: "During most of my time while in his employ I never knew [Marsh] to do two consecutive honest day's work in science. . . . The larger part of the papers published since my connection with him in 1878 have been either the work or the actual language of his assistants. . . . He has never been known to tell the truth when a falsehood would serve the purpose as well."

Another former assistant to Marsh, Otto Meyer, was quoted as follows: "The main part of his work is done by assistants. It is not allowed to assistants

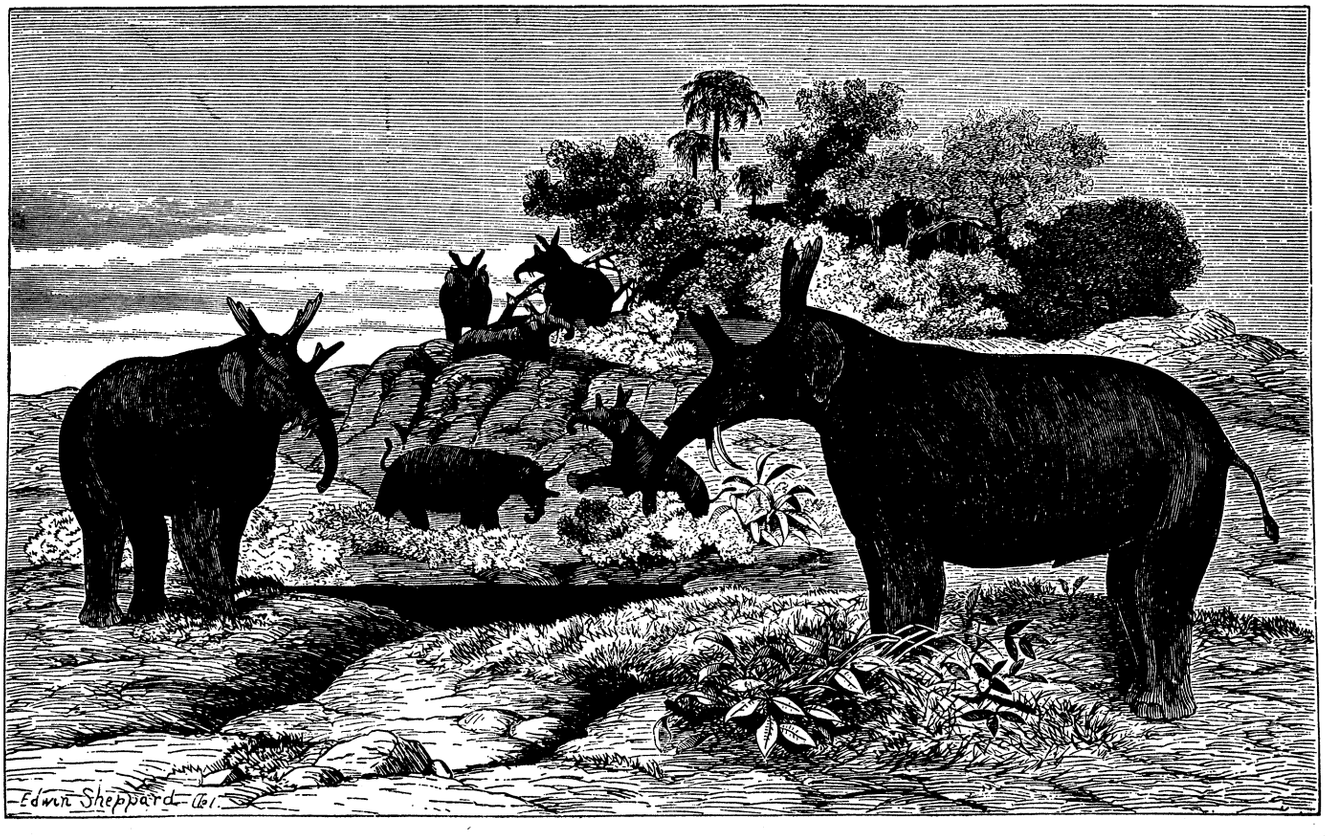

Fig. 3. A drawing made under the direction of E. D. Cope to show his conception of the uintatheres as elephants. [From *Penn Monthly*, August 1873]

of Marsh to publish, under their own names, any material concerning the government collections of fossils, even that which Professor Marsh has no intention to work upon."

Following these hair-raising statements the *Herald* article contained a dignified and effective reply by the director of the U.S. Geological Survey, John W. Powell, in which he denied all of Cope's allegations. In particular, he defended Marsh from the charge of keeping the salaries of his employees by noting that "Professor Marsh is not responsible for the payment of the men in his division. That function is performed by the disbursing officer in Washington, and all payments have been regularly and properly made."

Ballou's article closed with a section titled "They all deny," in which Henry Fairfield Osborn, Samuel W. Williston, John Bell Hatcher, George Baur, and William B. Scott all denied that they had "authorized" the use of their names in any written or oral attack on Marsh. These denials had been sent to Marsh and forwarded to the *Herald*.

Ballou proudly noted in his article of the following day, 13 January, that "It is a very pretty fight as it stands." He reported on another interview with Cope, who reiterated his charges. In a bit of unconscious humor Cope is quoted as saying, "I refuse utterly to have my criticism of Professor Marsh put on the low ground of a personal quarrel."

William B. Scott of Princeton University, not a former Marsh assistant, charged that Ballou had interviewed him, pretending to be a scientific man. "This man Ballou has not only violated the confidences of a private conversation and against my written protest, but he has put things in my mouth which I never uttered and never thought. It is an outrage." Yet he further comments: "Like Professor Osborn, I am glad that the subject has come out. . . . . But the attack on these men has been very much weakened by attaching falsehood and misrepresentation." One may note that the brash Ballou did not mind placing these adverse comments about himself in his own article.

Henry Shaler Williams of Cornell University was quoted as saying that "[Cope and Marsh] have been quarreling for a number of years. Both are able men and the difference of opinion is of a personal character brought about by scientific jealousies."

Marsh's reply appeared in the 19 January edition of the *New York Herald*, one week after Cope's original blast. According to Ballou's multiple headlines, "Marsh hurls azoic facts at Cope"; "Yale professor picks up the gauntlet of the Pennsylvania paleontologist and does royal battle in defense of his scientific reputation"; "Deft parrying of clever thrusts." Ballou presented the matter as it appeared to him—an entertaining duel. Marsh denied Cope's accusations one by one and made a few of his own.

The most surprising charge was that Cope had come to Peabody Museum on "a Saturday afternoon, when the workrooms of the museum were closed . . . accompanied by Professor [Benjamin] Silliman [Jr.]. . . . One door was accidentally open and by that [they] entered one of my private rooms, where the results of my labor were spread out ready for publication. Professor Cope began by uncovering the lithographic plates, which he examined attentively, and then passed into an adjoining room and made a close inspection of many valuable fossils which were my own property and unpublished.

"This outrage was reported to me the next day. . . . Professor Dana, the director of our museums, denounced the outrage in the strongest terms. . . . Professor Silliman expressed great regret that he should have been indirectly the cause . . . and at once wrote Professor Cope a letter requesting him to regard as confidential everything he saw.

". . . Had Professor Cope been a man of honor he would have been humiliated by what he had done and made prompt reparation. On the contrary, he boasted of his act and has since continued to publish the results of what he saw, with many falsehoods added. And yet Professor Cope has the audacity to complain that visiting scientists are not allowed access to the specimens now at New Haven!"

Marsh also accused Cope of stealing specimens from boxes awaiting shipment in Kansas. He stated that he received a letter from Cope dated 20 January 1873 in which Cope said: "I send you some small specimens I recently received from Kansas, as having been abstracted from one of your boxes. Of course they are yours." Marsh says that "the fossils returned were of little value, while those I lost in the transaction were important."

Marsh particularly takes up the matter of his monograph on the uintatheres (Dinocerata), denying emphatically that his assistant wrote it. He added that "during its whole preparation Harger was an invalid to whom exertion was an ever present danger. . . . He did all he could faithfully and without complaint." Marsh quotes a letter in which Williston says, "in all your published work you have treated Mr. Harger and myself with entire fairness." He then quotes another assistant, George Baur, as saying that "I did not dictate any of the generalizations of Professor Marsh's volume on the Dinocerata."

Marsh's accusations may lack the reckless zest of the charges by Cope. He kept a damper on his emotions in most of the article. He did, rather amusingly, let himself go in an attack on the unfortunate Russian scientist Kowalevsky. "I have already alluded to Cope's depredations on the museums of the scientific world. Kowalevsky's were of a similar character, although less known, but the cunning of his hand has been felt even in America.

"During the recent International Geological Congress in London . . . the cases of Cope and Kowalevsky were fully discussed and the extent and skill of their respective work were topics of lively interest. . . . The general opinion was that, as in many more honorable international contests, the American was a little ahead.

"Kowalevsky was at last stricken with remorse and ended his unfortunate career by blowing out his own brains. Cope still lives, unrepentant."

The Tetheopsis Problem

The name *Tetheopsis* is a by-product of Cope-Marsh warfare. In connection with a revision of the uintatheres (*4*), I have revived one of Cope's genera, *Tetheopsis*, as the name for a large uintathere, intermediate in size and character between the well-known *Uintatherium* and the gigantic *Eobasileus*.

Cope observed the figure of *Tinoceras stenops* in Marsh's monograph on the uintatheres and rushed into print to assign a new generic name. The name is from the Greek words *tethe* (grandmother) and *opsis* (appearance), in allusion to the supposed absence of lower incisors and canines. Shortly thereafter, Cope retracted this generic name on the basis of information from William B. Scott that the anterior end of the jaw was made of plaster of Paris. (It should be pointed out that Marsh's drawing shows quite clearly which parts are restored.)

Marsh's statements as to how Scott

came to his conclusion are of interest. In the 19 January *Herald* article Marsh noted that Scott had come to New Haven to see some of the type specimens. "During his visit he casually saw in one of the workrooms the same specimen type of *T. stenops* which Professor Cope had described, but made no examination of it, nor any reference to it in his conversation, as it was not one of the specimens he came to see. When the next number of the [*American*] *Naturalist* appeared a friend called my attention to a strange statement by Professor Cope about the specimen in question.

"As the statement was false in every particular, and as the information on which Professor Cope purported to have it could only be derived from a very recent visitor, I wrote Professor Scott a friendly letter, calling his attention to the false statements made [by Cope] in the *Naturalist*, and leaving it to him to make an explanation he might choose, if any were necessary.

"He promptly came to New Haven, acknowledged that Professor Cope received his information from him, and after examining the specimen fully acknowledged his error and promised to correct it at once in the *Naturalist*. His letter to the editor, which I give below, was a frank statement which speaks for itself."

The letter was actually from Scott to Cope but was also sent to the editor of the *New York Herald*. Scott said: ". . . having just reexamined the specimen with great care, I find that I was in error in a very important respect. It is true that the left half of the symphyseal region . . . is restored in plaster, but the right half is intact, and the restoration and drawing were made from that, a perfectly legitimate proceeding. . . . Hoping that you will give this correction a conspicuous place. . . ."

Thus did it happen that a generic name based on a nonexistent character and repudiated by its author turned out to be available as the only valid generic name ever applied to this genus of uintatheres, *Tetheopsis*.

The Battle Continues

Cope affirmed his charges in the 20 January issue of the *New York Herald*. Apparently Ballou judged that the news value of the fight was about used up, for, with one exception, that was all that the *Herald* carried. This exception was a letter to the editor of the *Herald* from a former Marsh assistant, Otto Meyer. Ballou titled this "Some more nuts for Marsh to crack." Meyer insisted that the uintathere monograph was mainly the work of Oscar Harger and accused Marsh of deliberately antedating the volume on uintatheres.

Fig. 4. "Four-toed horses and uintatheres," a painting by Charles R. Knight. [Courtesy Chicago Natural History Museum]

None of the persons complaining about the date of this monograph point out that Marsh had published a private edition, with larger margins and more elegant binding. There is no reason to assume that this private edition was not released somewhat in advance of the U.S. Geological Survey edition.

The pages of the *New York Herald* were not the only place where the attacks on Marsh were made. George Baur and Erwin H. Barbour, who had been Marsh's assistants at one time, published articles in the *American Naturalist* (which was owned by one Edward Drinker Cope) (*5*). Baur said flatly, "that the descriptive part of the Dinocerata was mainly the work of Mr. O. Harger, I know." He added that Marsh wrote a review of his own monograph for the *American Journal of Science* "and asked the signature of Mr. Harger and Dr. Williston for it without success, and had to accept instead the initials of the lady typewriter." (Barbour and Meyer both tell of this in their written attacks on Marsh, also.)

Erwin H. Barbour, who later had a distinguished career with the University of Nebraska, expressed his dislike of his former employer with truly amazing bitterness. He said, "If there is any truth left under the sun then judgement must fall on the scientist who walks the halls of the Yale Museum. . . ." He specifically accused Marsh of devoting "months and years of Government time and money in beautifying his own private collections. . . ."

Barbour correctly pointed out that the restoration of *"Tinoceras"* (actually *Tetheopsis*) in a superb plate in Marsh's monograph shows hardly a missing bone. He said, "it is my distinct and positive recollection that when preparing the restoration of *Tinoceras* [Marsh] gave directions that the drawings of *Dinoceras* [*Uintatherium*] 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 [lead] us . . . 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." All this was just a warm-up, for Barbour goes on to characterize Marsh as a "scheming demagogue" who was guilty of faithlessness, trickery, plagiarism, and incompetence.

Retrospect

This intense, bitter, and very personal conflict involved many of America's geologists and zoologists, whether willingly or unwillingly. To them the affair was not amusing. Seventy years later we can view the wrangle with a detachment which may be horrified or amused. The flamboyant and reckless accusations of Cope and his cohorts seem to have been made with a disdain for the laws of libel and without some of the restraint of good taste. But they make livelier reading than the stately and dignified replies of Marsh and Powell. It is on this account, and no other, that I have devoted more space to Cope's charges than to Marsh's denials or countercharges.

It is probably the consensus of modern opinion that Cope was the more brilliant of the two. However, Marsh was a more careful worker and unquestionably had better insight than Cope with respect to the uintatheres. Cope was competitive and militant, yet able to inspire the admiration and friendship of younger workers. Marsh was a reserved and formal bachelor who was jealous of his prerogatives and plainly did not inspire friendship among at least several of his assistants.

Cope and Marsh, together with Leidy, were the three great founders of vertebrate paleontology in America. The Cope-Marsh feud stands as a supremely unfortunate, but intensely interesting, part of the history of science in 19th-century America (*6*).

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An Archeological Pilgrimage to Santiago de Compostela

Romanesque European ornament of the 12th century suggests the probability of Indian influences.

Millard B. Rogers

This archeological pilgrimage resulted from the chance observation that many sculptural motifs on the main portal of the priory church at Moissac (about A.D. 1115–30) (Fig. 1.) in southern France were surprisingly similar to traditional architectural designs of the Buddhist and Hindu monuments of India. Comparisons between certain fantastic beasts at Moissac and those from the Hindu temples of the 12th century were so close that an investigation of possible connections between the medieval Christian art of Europe and the Hindu art of India seemed obligatory. Two complicated and distinctive motifs appeared to offer the best possibilities for comparison. Both are fantastic animal forms. One, always shown in profile, has wide-open jaws, often displaying sawtooth dentures, and has a trunk-like snout curling upward from its upper lip (Fig. 1). From the mouth of this beast a vine or tendril protrudes as if it were a prolongation of the beast's tongue. At times the head appears alone without a body; more often there is a fairly heavy body with four relatively short legs.

The second beast is always shown as a face or mask in frontal view, with

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