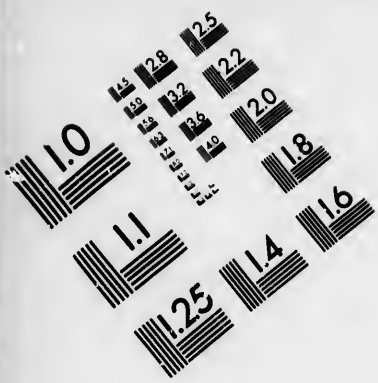


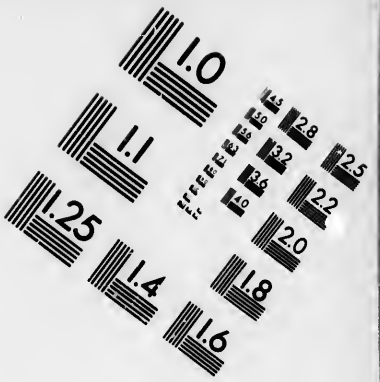
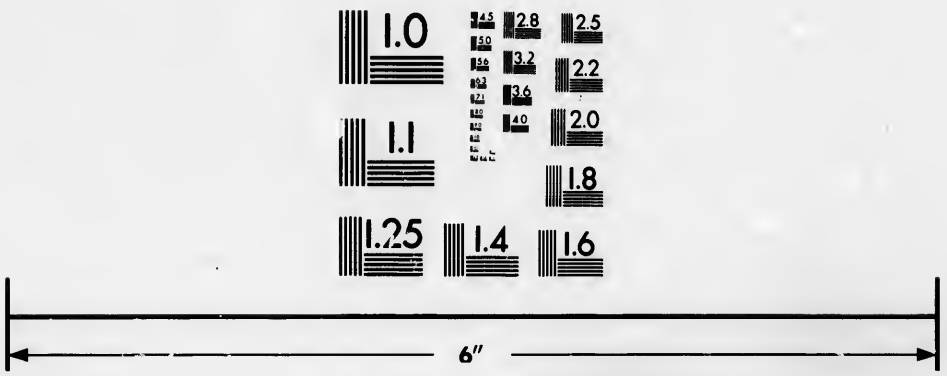
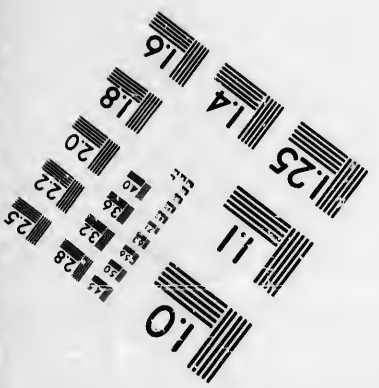
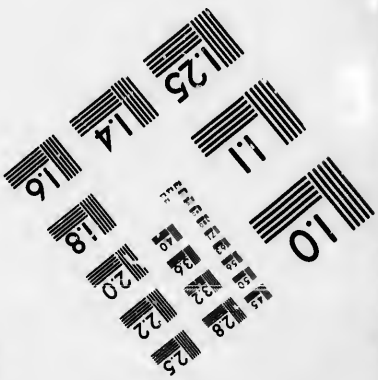


IMAGE EVALUATION
TEST TARGET (MT-3)







Photographic Sciences Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

Technicel end Bibliographic Notes/Notes techniques et bibliographiques

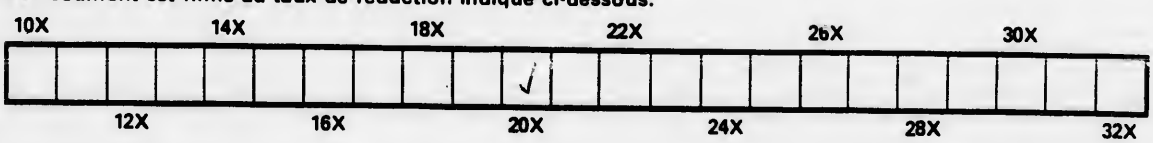
The Institute has attempted to obtain the best original copy available for filming. Feetures of this copy which may be bibliographicelly unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

- [x] Coloured covers/ Couverture de couleur
- [ ] Covers dameged/ Couverture endommagée
- [ ] Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- [ ] Cover title missing/ Le titre de couverture manque
- [ ] Coloured meps/ Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- [ ] Bound with other material/ Relié avec d'autres documents
- [ ] Tight binding may cause shadows or distortion along interior margin/ La re liure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- [ ] Blank leaves added during restoration mey appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- [ ] Additional comments:/ Commentaires supplémentaires:

L'Institut e microfilmé le meilleur exeinplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- [ ] Coloured pages/ Pages de couleur
- [ ] Pages damaged/ Pages endommagées
- [ ] Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- [x] Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- [ ] Pages detached/ Pages détachées
- [x] Showthrough/ Transparence
- [ ] Quality of print varies/ Qualité inégale de l'impression
- [ ] Includes supplementary material/ Comprend du matériel supplémentaire
- [ ] Only edition available/ Seule édition disponible
- [ ] Pages wholly or partially obscured by errate slips, tissues, etc., have been refilmed to ensure the best possible image/ Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.



The copy filmed here has been reproduced thanks to the generosity of:

Législature du Québec
Québec

The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche shall contain the symbol → (meaning "CONTINUED"), or the symbol ▽ (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagrams illustrate the method:

L'exemplaire filmé fut reproduit grâce à la générosité de:

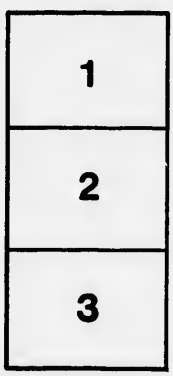
Législature du Québec
Québec

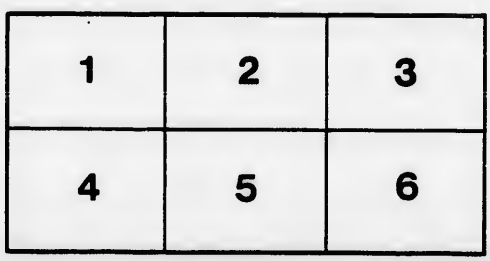
Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole → signifie "A SUIVRE", le symbole ▽ signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.





2

REPLY

TO THE

CRITICISMS OF JAMES D. DANA

BY

JULES MARCOU.

INCLUDING

DANA'S TWO ARTICLES

WITH A LETTER OF LOUIS AGASSIZ.

ZURICH

PRINTED FOR THE AUTHOR, BY ZÜRCHER & FURRER.

1859.

CRITIC

V

PRIN

REPLY

TO THE

CRITICISMS OF JAMES D. DANA

BY

JULES MARCOU.

INCLUDING

DANA'S TWO ARTICLES

WITH A LETTER OF **LOUIS AGASSIZ.**

ZURICH

PRINTED FOR THE AUTHOR, BY ZÜRCHER & FURRER.

1859.

REPLY

TO THE CRITICISMS OF **JAMES D. DANA.**

Different views of a question are desirable and beneficial in order to elucidate scientific observations and theories, but it is not the same with controversial writings, which are usually a disgrace to science and scientific men. Fully convinced that geology has never been advanced a single step by such means, I have been very reluctant to engage myself on this irritating ground, although many opportunities have been presented to me. But though such discussions are generally useless and even injurious, there are cases in which silence may do harm; for if the attack rest without reply, many persons may believe the charges advanced to be true, and so the progress of science will be checked, and unjust blame and discredit be thrown where they are not due. It is to avoid being placed in this position, that I now reply in a few words to the two articles of James D. Dana in *Silliman's Journal*, which contain so severe an attack on my observations.

The criticisms of my opinions on American geology in *Silliman's Journal* commenced in 1854, and have since continued with every opportunity; as yet I have not replied to them, unless it can be called a reply to have reprinted them in full in my *Geology of North America*, without a word of comment.

I was silent, first, because at the time the first article against me appeared,[1]) I was in the deserts of California; secondly, because the attack was anonymous, and I dislike fight-

1) *Silliman's Journal*, vol. xvii, March 1854; *Notice of a Geological Map of the United States*, etc.

ing in the dark; and thirdly, from entire want of faith that any good could result from such personal controversy.

The review of a portion of the Geological Map of the United States and British Provinces, published in *Silliman's Journal*, Nov. 1856, by W. P. Blake, contains statements that I cannot possibly consider as seriously presented. Besides, Mr. Blake received, without my knowledge, my specimens to describe, and my notes to publish; and from motives of delicacy should have been the last person to attack my observations in the Far West, instead of which he began directly, giving my specimens into unfriendly hands for description, and publishing, contrary to my desire, all the scratches and pencil marks to be found among my notes. The following is an example of his consideration for my observations. In his travels for the Pacific Railroad Exploration, Mr. Blake crossed my route only at *one locality*, the Cajon Pass near San Bernardino, California. In his report upon my collection, Mr. Blake says: «Mr. Marcou states that he saw rocks in the Pass «precisely similar to those found between Rough and Ready, «Grass valley and Nevada city, which contain veins of auri«ferous quartz. To me the rocks of the lower portion of the «Pass appeared to be chiefly metamorphic, while those bear«ing the quartz veins at Grass valley and vicinity were evi«dently in great part of erupted greenstone. The specimens «which Mr. Marcou notes as coming from the Cajon Pass were «*most probably brought through there* from Armagosa mines in «the Great Basin.» (See: *Pacific Railroad Explorations*, vol. III, *Report on the Geology of the route of Lieut. Whipple*, pag. 97, 4° edition.) In reply to this, I say that I saw the rocks in the Cajon Pass forming immense dykes, and my specimens were taken from the rocks *in situ*. Mr. Blake describes the Cajon Pass in his report of his exploration, and I looked eagerly to find the facts on which he grounded his flat contradiction of my observations; but I only found the following: «This part of the valley was *past in the night* and it was there«fore impossible to make detailed observations on the varie-

« ties and peculiarities of the granitic rocks. » (See: *Pacific Railroad Explorations*, vol. V, *Geological Report of routes in California*; Cajon Pass; p. 88. 4° edition.)

The last two articles, contained in the numbers for November 1858 and January 1859, are signed by James D. Dana, one of the two proprietors of the *Silliman's Journal* and the chief editor of the Geological part, and must be considered as confirming all the previous ones. To these I wish now to reply, although the only serious objections in Dana's criticism are made by another person, who is not named. The following is the first of Dana's reviews.

* * * * * * * * *

(Extract from the *Silliman's Journal of Science*, second series, vol. XXVI, n° 78, November 1858, p. 323 etc.)

Review of Marcou's „Geology of North America",[1] by James D. Dana.

The volume on American Geology just published by Mr. Jules Marcou, demands more than a passing notice. Coming from a Professor in the Federal Polytechnic School of Switzerland, who is known to have traversed this country widely, and whose memoirs and American geological map form part of the publications of the Geological Society of France besides being distributed through several European journals, it is of interest to all to inquire into the character of the work and the reliability of the author's conclusions.

It will be remembered that former writings of the author on the same topic have been noticed in this Journal; and as he takes exceptions to the statements which have been made, it is the more incumbent on us to reconsider the subject with his later volume before us. We wish only to seek out the truth, that we may honor it, and here register it for the use of the science.

---

1) Geology of North America, with Two Reports on the Prairies of Arkansas and Texas, the Rocky Mountains of New Mexico, and the Sierra Nevada of California, originally made for the United States Government; by JULES MARCOU, Professor of Geology in the Federal Polytechnic School of Switzerland, formerly United States Geologist, etc. 144 pp., with three maps and seven plates. Zurich, 1855.

With regard to the title of „United States Geologist," we remark for the enlightenment of foreign readers, that there is no such office under the Government, and no national Geological Corps. When an expedition for exploration and survey is organizing, some person is usually associated with the party for scientific research, by appointment from the Department in charge of the survey. Those selected are sometimes good geologists and sometimes otherwise.

The work on the Geology of North America contains, (1) an account of the author's researches in America; (2) a general review of the geology of the continent with reference to the geological map; (3) a classification of the mountains of part of North America; (4) a review of his reviewers; (5) a history of the progress of American geology. The question important to geologists — to European more than American — is, whether American geology is correctly represented.

I. History of Geology. — Mr. Marcou commences by republishing the observations of Maclure on the Geology of the United States with the accompanying map, from vol. VI. of the Transactions of the American Philosophical Society, doing full justice to this earliest of American explorers. He reviews the labors of many who have followed him, making honorable mention, as he should, of Vanuxem, one of the ablest of our geologists, of Hitchcock, Owen, and others. But we are sorry to see imperfections in the history, which evince that personal disappointments have warped the author's judgment. Professor Hall's connection with American palæontology is well known to the world. Mr. Marcou, enumerating in a paragraph the cultivators of palæontology in America, mentions «Lesueur, Harlan, Jefferson, Say, Green, Bigsby, Rafinesque, Troost, Morton, Redfield, Lea, and Hitchcock;» then, Conrad and Leidy, as taking the lead of all, the «best palæontologists in the United States,» and ends with what he calls «the young palæontologists of the present day,» «Dr. Shumard, Holmes, Newberry, Meek, Wyman, Billings, etc.»; Hall's name is not included. He has honored him, however, with a separate paragraph, in which he speaks of the «Palæontology of the State of New York by James Hall,» as «a very useful work;» and then closes a disparaging sentence with, «the best part of it being the plates drawn by Mrs. Hall, and also the geological order.» Conrad and Leidy are highly appreciated. But in his treatment of others, the author shows that he has himself been reviewed. This is apparent also in the closing sentence of this brief History of American Geology. «Maclure, Vanuxem, Hitchcock, Taylor, Conrad, Emmons, Lyell, de Verneuil, and David Dale Owen, are the *only discoverers*; other geologists have extended and detailed the just views and grand ideas that these illustrious savants were the first to divulge:» — an association of names that will surprise, by its omissions if not otherwise, those who know much of science in America and little of the influences that have operated upon the author of this history. Mr. Marcou shows again that he has had reviewers, in the remark that he makes about «the half dozen hieroglyphical pamphlets» published as the

Geological Report of Progress of the Canada Survey.[1]) He evinces that his American conclusions have met with opposition, also, by his slight of Foster and Whitney's investigations in northern Michigan, and of the various researches of the Professors Rogers, and by his studied neglect of others.[2])

There are also imperfections in the History arising from a partial acquaintance with the subject and the science. Thus he speaks of Mr. E. James as having been the first to recognize the «New Red Sandstone» on the slopes on the Rocky Mountains, when all he had any knowledge of was *a red sandstone*. He speaks of the knowledge of the geographical extension of the «New Red» being due to Dr. D. Houghton and others for Lake Superior, when no evidence of its existence in the Lake Superior region is yet known or was ever detected. He speaks of the discovery of the «Old Red» by Taylor, when the so-called «Old Red» is only the upper part of the American Devonian.

Without further specifications, it is plain that in this history the author has neither dealt fairly with others or the subject.

II. Review of the Reviewers. — We refer to this chapter merely to add, that the personal feeling above attributed to the author, is here acknowledged. We are very sure, that only the belief that Mr. Marcou was propagating in his publications erroneous views abroad, led to the notices of his memoirs and former map that have so chafed him. On no other ground than a desire to promote the interests of science have the pages of this Journal been open to the criticisms.

III. Mountain Systems. — The author describes the mountain systems of North America and their ages, as he supposes they must

---

1) „As to the survey of the two Canadas, it was honored at the two Great Uni„versal Exhibitions of London 1851, and Paris 1855, with medals, decorations of the „legion of Honor, and even with a Knight's title from the Sovereigns of England „and France, and its Director General W. E. Logan, aided by T. Sterry-Hunt, mi„neralogist of the survey, has shown to the scientific world, with so much modesty „and talent, the *grand results and discoveries* of their joint survey, that nothing re„mains for others to say, but to express their admiration and gratitude for the half „dozen hieroglyphical pamphlets they have published, under the title of *Report of „Progress of the Geological Survey of Canada*."

2) Mr. Marcou says, with characteristic self-complacency, and with evident irritation because others do not call „New Red," what he does: „The brothers Rogers and James Hall try their best to suppress the New Red Sandstone formation in America," &c.; and after making various absurd statements and suggestions, bringing in Logan for a share of his attempted ridicule, he adds respecting them, „I would advise these honorable savants to consider if one of these determinations would not be preferable.."

be according to the theoretical views of Elie de Beaumont. A determination of the age and relations of each by means of observed facts would be positive knowledge and of some service to the science.

IV. Researches. — The points in the explorations of the author which give his work special prominence, are the assumed identification —

(1.) of Triassic rocks in the Lake Superior region;

(2.) of the Permian Formation over the slopes of the Rocky Mountains;

(3.) of Triassic rocks in the same Rocky Mountain regions;

(4.) of Jurassic rocks in the same region.

We should take pleasure in claiming for the author the establishment of either one or all these points, if we could justly do it. The progress of American geology is largely due to foreign geologists — to Lyell of England, and De Verneuil of France; and they are honored for their labors. They were wise men: appreciating geological evidence, they used it cautiously and surely, and made each step a step of real progress. They did not conclude, when they came across *a* red sandstone, that it was *the* «New Red» or *the* «Old Red;» or on the discovery of a *magnesian* limestone, that it was *the* magnesian limestone of the Permian. They knew, with all other geologists, that mere color and mineral characters were the very worst test of equivalency between the rocks of the two continents; that the test will not answer even for the United States alone; that an appeal to such characters in this period of geological science betrays great want of experience. They came to the country expressly to subject all such considerations to the higher test of organic remains, and in this their great merit consists. Mr. Marcou, we regret to see, has taken the course which they rejected and which science long since repudiated. It is true the region he examined was nearly destitute of fossils. But there was so much the more reason for doubting, as all others had done before him.

1. *Triassic Rocks in the Lake Superior Region.*

The only evidence that these rocks are Triassic, given by the author, is of the superficial kind just referred to. He has not claimed to find a fossil in the beds or any proof that decides the question. He remarks that Dr. Jackson «confirmed the justice» of the view by finding beds with *Pentamerus oblongus*, an Upper Silurian fossil, on Keweenaw Bay. But it is known that the strata of Keweenaw Point overlie the red sandstone; and Hall has shown them to be Lower Silurian from the fossils collected there by Foster and Whitney.

(See F. and W.'s Report, Part I, p. 118.) Even if the red sandstone were above the Silurian, this would not make it Triassic, according to any known rule of geological reasoning.

The similarity of the beds and the associated trap to the Connecticut River rocks, led early to the *supposition* that both migt be of the same age, but it was no basis for such knowledge as Mr. Marcou claims. Foster, Whitney, Hall, Logan, and others, have been over the same ground, and argue from the fossils and superposition that the rocks are as old as the Potsdam Sandstone. And yet Mr. Marcou still maintains, against all the investigations more recent than his own, and on evidence which geologists know to be worthless, that the rocks are *Triassic*. Mr. Marcou states that these geologists hold the *old* opinion, when on the contrary his view is the old one, and the only one current until the evidence became known which these geologists themselves brought forward.

2. *Permian Rocks in the Rocky Mountains.*

In the «Itinéraire Géologique du Fort Smith et Napoléon, (Arkansas) au Rio Colorado de Californie,» in 1853,[1]) Mr. Marcou states, in his notes for Dec. 22, after describing what he calls the *New Red Sandstone* of the region, «Puis on a au-dessous un calcaire magnésien ou dolomitique épais à stratification régulière de ½ à un pied d'épaisseur, plongeant au nord sous un angle de 10 à 15°, en stratification concordante avec le *New Red*, et quelques assises du *magnesian limestone* alternant avec le grès rouge à la base. Dans ce *magnesian* on a une couche avec fossiles très-mal conservés; je crois reconnaître des fragments de *Belemnite?* un *Nautilus?* un *Pteroceras?* Quatre milles après avoir marché sur ce *magnesian* on a la lave du volcan qui la recouvre; et nous campons sur la lave, non loin des cones secondaires du grand volcan. Pas de diluvium.» And the «Résumé» by himself, published in the same volume, says respecting these observations: «Shortly after quitting the Colorado Chiquito we found here, with the last beds of the red clay of the Trias and in concordant stratification, a magnesian or dolomitic limestone, with very regular strata from half a foot to one foot in thickness. Several beds contain fossils badly preserved; among which I recognised, however, a *Nautilus*, a *Pteroceras*, and a *Belemnites*. This formation, which is placed between the Carboniferous and the Trias, corresponds, without doubt, to the magnesian limestone of England, and is a new member which I add to the series of secondary rocks in North America. «This magnesian limestone has only four miles of

1) Published in the Pacific Railroad Reports, vol. III.

extent in the place where we crossed it, and disappears beneath lava and volcanic ashes. I have observed it farther to the west, and it appears also to occupy eastward one of the lesser chains of the Sierra de Mogoyon.»

In the new work, this paragraph remains the same, except that in the place of «a Pteroceras, a Belemnites,» it reads «a Gasteropoda, and perhaps a Belemnites;» and after the words magnesian limestone, in the line before the last, «(Permian)» is inserted.

When the discovery of Permian fossils west of the Mississippi was announced, a few months since, before the Geological Society of France, Mr. d'Archiac put forward Marcou's claim to the first discovery of the Permian in the Rocky Mountains, basing it upon this very observation, stating that this *magnesian limestone* was compared by him with the magnesian limestone of England, but that the fossils were too imperfect for determination.[1])

Here then, although the Permian magnesian limestone of one part of England is not represented by a similar limestone in all other Permian regions of Britain, nor in a great part of the Permian region on the Rhine and in Russia; although Murchison says, «In the exploration of Russia, geologists were taught by the diversified Permian group not to dwell on the local mineral distinctions of central or western Europe, but to look to the wide spread of certain fossil remains, which, in vastly distant countries, occupy the same horizon;» although in North America, magnesian limestones are known of all ages, of the Potsdam, Trenton, Upper Silurian, Devonian, and Carboniferous eras; and although it is very common in all formations that limestones are equivalents, even on the same continent, of sandstones and shales; yet we have the decision that *a magnesian* limestone in the Rocky Mountains, lying beneath what is regarded as the «New Red Sandstone,» is the equivalent of *the* magnesian limestone of England. This certainly cannot be regarded as a safe deduction from geological evidence. The fossils were too imperfect to be identified. Yet among them, «a *Nautilus*, a *Pteroceras*, and a *Belemnite*» were recognized; or as stated in his new work «a *Nautilus*, a *Gasteropoda* [he meant to say *Gasteropod*, the singular number], and perhaps a Belemnite.» Now «a Nautilus» proves nothing as to its being *the* magnesian limestone; «a Pteroceras» is direct testimony against it; and «a Belemnite»? according to all authors, affords the idea no more encouragement. «A Nautilus, a Gasteropod, and a Belemnite?» prove this magnesian limestone to be Cretaceous, or Jurassic, and not older than Jurassic, if the evidence may be used at

1) See this Journal, this volume, p. 260.

all. The cautious geologist would have certainly doubted his «New Red» or Triassic, if he found it overlying beds containing what was probably a Belemnite. The evidence, if worth anything, abolishes both the Triassic and the Permian together.[1])

We conclude, therefore, that credit cannot be claimed by or for the author, with regard to the discovery of the Permian in the Rocky Mountains.

3. *Triassic Formation in the Rocky Mountains.*

Mr. Marcou observes that «this formation, which I was the first to notice and recognize in the West, (see ***A Geological Map of the United States and the British Provinces of North America***; Boston, 1853, p. 42.) attains a very considerable development, and according to my observations has a thickness of four or five thousand feet.» Three divisions are made out by him, (1) the lower, the equivalent of the ***Bunter Sandstein***; (2) the middle, of the ***Muschelkalk***; (3) the upper, of the ***Variegated Marls*** or ***Keuper***. Here, then, we have not only the Trias identified, but even its European subdivisions — though with an acknowledgment that the divisions are not «very certain.» We think it was a risky conjecture, for he found no fossils whatever to sustain the division into ***Keuper***, ***Muschelkalk***, and ***Bunter Sandstein***. This off-hand settling of a problem that requires great care even among the fossiliferous beds of Europe, was a bold exploit in geological gymnastics.

But as to the great Triassic formation itself, the only palæontological evidence is from a specimen of fossil wood, met with in latitude 35° 42′ 32″ N., and longitude 99° 36′ 10″ W., «a full grown tree with branches, very much resembling the ***Pinites Fleurotii*** of Dr. Mougeot which is found in the New Red Sandstone of the Val d'Ajol in the Vosges;» after which he adds, «and this establishes a connection between the ***New Red*** of France and that of America.» Thus one single fossil — that one, a species of Pine, and only «very much resembling the ***Pinites Fleurotii*** of Dr. Mougeot», ***establishes***. This is a very strong word for a geologist to use on evidence so small

1) This attempt at the identification of Permian beds in the Rocky Mountains, is in strong contrast with the method of research of Professor Emmons in North Carolina. Prof. Emmons's discovery in that State of Thecodont Saurians, the same group of Reptiles that characterizes the Permian in Europe, constitutes a strong argument in behalf of the existence there of this formation. And if a full survey of all the fossils, both of plants and animals, and a comparison with those of Europe, lead to a modification of the view, it is no discredit to him. He has the honor of aiding in bringing about the comparison and helping on towards the final result. Mr. Marcou's dashing style of work is equally in contrast with the mode of investigation which has at last resulted in detecting Permian strata west of the Mississippi.

and so uncertain, with the fate of four or five thousand feet of rock at stake, and with the beds next beneath containing «perhaps Belemnites.» The prudent observer would have said, «establishes nothing;» and such is the fact. The gypsum, the marls, red color, and other such characteristics are also mentioned to sustain the parallelism. But it is now well known that gypsum, marls, and red color occur both in the Cretaceous and Permian of the west, well illustrating the remark, that such proofs are worse than useless: they have always been a fertile source of error; they might have warranted a bare suggestion but no more, and as far as suggestion goes, that of James had long the precedence.

On *such* evidence, a region over the Rocky Mountains which is one thousand miles from north to south and eight hundred miles from east to west. is for the most part colored on the map as Triassic, or «Terrain du Nouveau Grès Rouge.» Such a region—1000 miles by 800—would take in quite a respectable part of the continent of Europe.

The Triassic will probably be identified over the Rocky Mountain Region. But this going ahead of discovery shows more eagerness than good judgment or science.

4. *Jurassic Rocks in the Rocky Mountains.*

The strata referred by the author to the Jurassic age were observed by him over the Llano Estacado and other regions in the vicinity. The identification in the case of these beds rests upon organic remains, as it ought; yet there is the same faith in mineral coincidences that has before been pointed out. The species mentioned are the *Gryphea dilatata* var. *Tucumcarii*, an Ostrea very near *Ostrea Marshii*, a *Trigonia* and a species of *Astarte*; but the identification rests mainly upon the *Ostrea* and *Gryphea*, which are figured on plate 4. Great importance, therefore, attaches to the right determination of these species; for if not Jurassic, if associated in other strata in the west with well known Cretaceous species, they serve as credentials for the Cretaceous instead of the Jurassic.

The bearing of the evidence from these fossils has been discussed in this Journal by Wm. P. Blake,[1]) who has pronounced them Cretaceous; and this conclusion was previously arrived at by Professor Hall. But these persons are among the reviewers whom the author discredits, and we have consulted another able palæontologist, highly commended by Mr. Marcou. The following are the views on the subject, which he has furnished us:

---

1) This Journal, [2], xxii, 383, 1856.

«The species which Mr. Marcou refers to *Gryphea dilatata* Sowerby, is the true typical form of the Cretaceous species, *Gryphea Pitcheri* of Morton, as is shown by Conrad in the Mexican Boundary Report, vol. i, p. 155, pl. vii, fig. 3 and pl. x, fig. 2; see also Professor Hall, in the Pacific Railroad Reports, vol. iii, plate 2, figs. 1 to 6; and Dr. B. F. Shumard in Marcy's Report on the Exploration of the Red River, plate 6, p. 205. As it is known to range through a considerable thickness of rocks in the Southwest, containing numerous well-known Cretaceous fossils, (on which Dr. G. Shumard in the Transactions of the St. Louis Academy of Sciences, vol. i, p. 289, may also be consulted), we may safely conclude that it is distinct from Sowerby's Jurassic species. A glance at Morton's figure (Synopsis Organic Remains, plate 15, fig. 9), drawn from the original specimen from Arkansas, will satisfy any one of its identity in species with Mr. Marcou's figure (plate 4, fig. 2).

«The Oyster figured on the same plate as the *O. Marshii* Sow. is the shell described by Dr. B. F. Shumard in Captain Marcy's Red River Report (p. 205, and fig. 2, plate 5), under the name of *Ostrea subovata*. It occurs in the Cretaceous at Fort Washita, along with *Ammonites vespertinus* Morton, *Gryphea Pitcheri* Morton, (G. dilatata of Marcou), and species of *Exogyra*, *Pecten*, *Astarte*, etc. Both of these species, the *Ostrea* and *Gryphea*, were found extensively through the Cretaceous formation west of the Mississippi by Dr. G. Shumard.»

According, therefore, to the best recent authorities, the fossils supposed to be Jurassic are really Cretaceous, and no evidence of Jurassic rocks in the great west is published as such by Mr. Marcou. This is bad luck for the Jurassic, Triassic and Permian of the Rocky Mountains, on which his claims to a place among the «discoverers» rests. His results, reduced to the simple facts ascertained, amount only to this—that the geology of the Rocky Mountain region includes Cretaceous and Carboniferous rocks—a fact that was quite well known before.

Whoever than may identify true Permian, true Triassic, or true Jurassic strata, beyond the Mississippi, will not have borrowed from Mr. Marcou, and can owe him no credit.

But the subject is not one of mere credit to any person; for it is unfortunate in its bearing on the progress of geological science to have false views about some 500,000 square miles of territory, and much more besides, spread widely abroad through reputable Journals, and Transactions of distinguished European Societies.

We might here leave the author's researches. A few other topics, however, may have a brief word. And while criticising his labors, we would say that his work contains many observations that are better than his inferences.

We cite, at first, from our excellent palæontologist again respecting some Cretaceous and Carboniferous fossils. «The large *Gryphea* or *Exogyra* (plate 3, fig. 1) referred to *G. sinuata* of Sowerby, I am strongly inclined to believe is *E. ponderosa* of Rœmer, (Kreide von Texas, plate 9, fig. 2), which is only a variety of *E. costata* Say, as has been shown by Conrad in the Mexican Boundary Report, page 154, plate 9, fig. 1. The figure given by Rœmer represents a small individual, but he mentions that it grows to a great size. The only difference between *E. ponderosa* and *E. costata*, is that the latter is generally marked by distinct radiating costæ, while the former has none, or is but very obscurely marked in this way. There is, however, every intermediate gradation in this respect, between the two varieties. Both varieties occur in New Jersey, Alabama, and Tennessee, as well as in the Southwest. Sometimes the var. *ponderosa* attains a very large size, and it is not unfrequently from two to three inches in thickness.»

«The *Gryphea Pitcheri* of Marcou (plate 5) has well marked differences from his *Gryphea dilatata* (the true *G. Pitcheri* of Morton). In referring the shell to *G. Pitcheri*, he follows Rœmer, who also fell into the same error, (Kreide von Texas, p. 75, pl. 9, fig. 1). These differences are seen in the figures. Compare figure 5, plate 4, with that of his *G. dilatata* and Morton's figure of the true *G. Pitcheri*: the beak of the latter is truncated while that of the former is angular and laterally curved. This peculiar form has been noticed by Conrad (Boundary Survey Report, vol. i, plate 9, fig. 2 *a b*) as a variety of *G. Pitcheri* and designated *G. Pitcheri* var. *navia* (see also Hall, Pacific Railroad Reports, vol. iii, p. 100). I feel convinced that it is distinct from the true *G. Pitcheri* of Morton, (Marcou's *G. dilatata*).»

«The shell figured on plate 7, fig. 3, as *Spirifer striatus*, is the *S. cameratus* of Morton, (Amer. Jour. Sci., xxix, 1836, p. 150, pl. 2, fig. 3) as has been determined by Prof. Hall. Rœmer described it under the name of *S. Meusebachanus* (Kreide von Texas, p. 88, pl. xi, fig. 7), and in Stansbury's Report (Expedition to the Great Salt Lake) it is named *Sp. triplicatus* by Hall. Owen referred it to *Sp. fasciger* Eichwald. It is very common in the west, ranging from Ohio to the Rocky Mountains, and from Nebraska to New Mexico; Mr. Hayden found it in the Black Hills. It is known to range up nearly to the base of the Permian in Kansas; but I have no knowledge of its having ever been found in *Lower* Carboniferous rocks. Figure 2 on the same plate also referred to *S. striatus*, I am inclined to believe is not that species; some four or five American species appear to have been confounded by different authors under that name. There are many other American Carboniferous species set down as identical by Mr.

Marcou and others, but it is well known to American palæontologists that the whole subject requires careful revision.»

«Mr. Marcou, on page 67, in a note, mentions that fossils from Vancouver's Island, have been determined as Cretaceous by F. B. Meek; but he thinks the determination an error, and that they are Jurassic. In the paper referred to (Trans. Albany Institute, vol. iv, p. 37), Mr. Meek speaks of the fossils placed in his hands by Dr. Newberry as belonging apparently to two rocks. Part of them he pronounced decidedly as Cretaceous—among them a *Baculite*, which is not distinguishable from *B. ovatus*. As regards the rest, which were the larger part, he gave no decided opinion. Subsequently, (but before the publication of Mr. Marcou's work) he mentioned to Dr. Newberry that the latter were probably Jurassic, and so it is stated by Dr. Newberry in the Pacific Railroad Report, vol. vi, p. 66.»

On page 64, Mr. Marcou speaks of the *Coal Measures* at Umpqua in Southern Oregon, where they are not known. He has overlooked the Eocene Tertiary of California. He makes the strata in California, from which Dr. Trask describes Baculites and Ammonites, Jurassic, when they are obviously Cretaceous. But it is not necessary to enter into further details.

V. Geological Map. — This map is open to most of the objections noticed in the former reviews in this Journal,[1]) and we need not repeat. With regard to the region beyond the Mississippi, we refer again to the palæontologist whose opinions we have cited, as he is well acquainted with that part of the continent. He observes respecting the great yellow (Triassic) area on the map, of more than 500,000 square miles: «We now know beyond any reasonable doubt that all the country from the Platte to the British Possessions, and from the Missouri to the Black Hills is occupied by Cretaceous and Tertiary rocks. And as regards the region from the Platte southward to the Red River; very far the larger part is known to be *not* Triassic, while it is possible that the Trias may occur in some parts of it.»

«The surface formations of the Llano Estacado, instead of being Jurassic, are Cretaceous; this is plain from the section of Pyramid Mountain, and also from numerous other facts collected by recent explorers. If the Jurassic rocks exist there, which I am inclined to believe is the case, they are, as at the Black Hills, an *underlying* and not an overlying rock.» Again, «over the region, north of the Llano Estacado which on the map is colored as Jurasssic, the Cretaceous and Tertiary probably extend; but the Jurassic may be looked for over a narrow outcropping belt along the east side of the crest of the mountains.» These observations are by one who has facts as

1) Volume xvii, p. 199, 1854, and xxii, p. 383.

a basis for his conclusions, and who admits a doubt until it is fully removed by investigation.

In conclusion, we would say that our reconsideration of the labors of Mr. Marcou in America has not raised our estimate of their value. We know well that if any American geologist had mapped out strata and synchronized those of America and Europe on such data as have satisfied the author of the «Geology of North America,» he would have been deemed young in the science, with much yet to learn before he could have a sober hearing. 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 the judgment of our ambitious Rocky Mountain explorer. Finally, our readers must be fully persuaded, that «Marcou's Geology of North America,» is not «good authority,»—except with regard to the author and his style of work.

J. D. DANA.

UNITED STATES GEOLOGISTS. — Mr. Dana commences by «enlightening foreign readers with regard to the title of *United States Geologist*,» and says there is no such office under the government. A sufficient answer to this statement is found in Dana's address as President of the *American Association* for the year 1854, on retiring from the duties of President, entitled: *On American Geological History*; New Haven, 1856; at page 5, I find J. W. Foster and J. D. Whitney *United States Geologists*. The quarto report of a *Geological Survey of Wisconsin, Iowa, und Minnesota*, 1852, is signed by David Dale Owen, *United States Geologist*. The octavo *Report of a Geological Reconnaissance of Wisconsin in* 1848, is signed by D. D. Owen, *United States Geologist for Wisconsin*. The *Report on the Geology of the Lake Superior Land District*, 1850—51, in two parts and two volumes, is signed in each by J. W. Foster and J. D. Whitney, *United States Geologists*. The *Report on the Geological Survey of the Mineral Lands of Michigan*, 1850, is signed by Charles T. Jackson, *United States Geologist*.

These examples show that the title of *United States Geologist* is sufficiently common and well understood, and although there is no national geological corps, the United States government employs geologists who then become *United States Geologists*.

HISTORY OF GEOLOGY. — In the Introduction to my *Geology of North America* are these words: « Strange notions « upon the geological discoveries that have been made in « America, and some facts quite distorted and misrepresented, « having found admittance into several works, especially an « address: *On American Geological History*, by James D. Dana, « and in the text of a « *Geological Map of the United States and* « *British North America* », by Henry D. Rogers, where there « is a paragraph entitled: *History and Literature of Geological* « *Research in the United States*; I thought it would be more just « to those who made these discoveries, to cite from their own « works, giving the *official date* of their publications, so that « each one may be able to judge for himself of the truth and « value of their discoveries. To this end I have given a Chapter « entitled: *A Synopsis of the History of the Progress and Discov-* « *eries of Geology in North America*, in which I have placed « quotations taken from all the official sources to which I have « had access. »

Mr. Dana has devoted a page of his *Review* to this *Synopsis*, and concludes by the following sentence: « Without further specifications it is plain that in this History the author has neither dealt fairly with others or the subject. » The History of Geology is a matter of *facts* and dates, beginning in 1809, an epoch quite near, and therefore easily verified. I gave all the discoveries with the date at which they were made, as I believed truly and impartially; — if Mr. Dana thought I had dealt unfairly with « others and the subject », he had only to give facts and dates to show this, — but not at all; he contents himself with personal abuse, and says at the conclusion of the article that I have « *expunged names from American geological history.* » Happily for me, Messrs. Dana and Rogers published severally an *American Geological History*, in 1856, and it will be easy to show by comparison, who merits the charge of having *expunged names from American Geological History.*

Mr. Dana places Mr. B. Silliman Senior among the leaders of Geology in America, putting his name immediately after

that of Maclure, the Father of American Geology. Mr. Silliman is certainly a friend and promoter of science; he was formerly a good lecturer on *popular* geology, and originated the *Journal of Science and Arts*, which he carried through the whole of the *first series* with much more ability, tact, and justice, than have been latterly shown in its management; but this does not constitute him a leader of American Geology, or give him a right to the second place among the discoverers.

Dana says: « Morton was the *first* to distinguish the North American *Cretaceous* beds. » This claim in favor of Morton is not only false and unjust towards the true discoverer Vanuxem, but against the printed opinion of Morton himself, who in several publications says: « Mr. Vanuxem was the *first* to distinguish the *Chalk* formation in America. » In Dana's history the name of Vanuxem is *expunged from among Cretaceous observers*, and also that of Conrad.

The exclusive credit given by Dana to James Hall and Henry D. Rogers for all that has been done on the Palæozoic strata of North America, calling their labors the « *keys* », « a standard of comparison for the whole country and even for the world, » is by far *too* exclusive; the *keys* possessed by these two geologists, if any they have, must be those of Vanuxem, Emmons, Conrad, Mather, Whelpley, Henderson, Lesley, Taylor, etc. I have shown by dates in my *Synopsis* the part taken by Hall and Rogers in the classification of the American Palæozoic strata, and although Mr. Dana may think they did the whole, their share in truth is *far below* that of Vanuxem, Conrad, D. D. Owen, Emmons, Taylor, de Verneuil, Troost, Safford, and Swallow.

Dana *expunges* from the investigators of Canada and the British Provinces *all the names of the first pioneers*, such as: Capt. Bayfield, Baddeley, Richard Brown, J. B. Jukes, Bonnycastle, and Gesner, imitating the example of Messrs. Logan and Hunt, who in their works on British America never give credit to anybody but themselves. For example I cite the following phrase. « Pour les faits géologiques et pour ce qui se rapporte à la structure physique du pays, *tout est dû à M. Logan*;

la minéralogie, ainsi que la chimie des roches métamorphiques et des eaux minérales sont les résultats des travaux de M. Sterry-Hunt, qui a rédigé ce mémoire.» See: *Esquisse Géologique du Canada*, by Logan and Hunt; p. 14. Paris, 1855.

Besides the names already given, Dana *expunges* from American Geological History those of Edwin James, Byrem Lawrence, Thomas Nuttal, Rafinesque, Godon, de Castelneau, Daniel Sharp, Yandell, Koch, Ducatel, Alexander, Booth, Tyson, Cozzens, Featherstonhaugh, Lieber, White, etc. etc., all which are given, with an account of their labors and discoveries, in my *Geology of North America*, and will show to the impartial reader who merits the accusation of «a partial acquaintance with the subject» and of having «*expunged names from American Geological History.*»

In a *History and Literature of Geological Research in the United States*, by Henry D. Rogers, names are *expunged* from American Geological History not only now and then, as it is the case with Dana, but they are swept out *en masse*, until there remain hardly any to support the two brothers Rogers, who seem to have performed by far the greater part of the researches themselves. For instance he *expunges* from the Paleozoic formations the names of Vanuxem, Conrad, D. D. Owen, Emmons, Mather, de Verneuil, Troost, Safford, Swallow, Tuomey, Norwood, etc., in fact all the names connected with these rocks, except Eaton, Taylor, Gesner, and Dawson. The name of Vanuxem is *expunged* as a matter of course from the history of the *Cretaceous* strata, as it is in Dana's account.

As for the New Red Sandstone formation, Mr. Rogers not only *expunges* all the names of geologists connected with it, but the rocks themselves, Permian, Bunter Sandstein, Muschelkalk, and Keuper, are *expunged* from American deposits.

Lastly Mr. Rogers *expunges* from the Tertiary formations the name of Dr. Leidy! and from the Quarternary and Modern formation the name of Agassiz!!

TRIASSIC ROCKS IN THE LAKE SUPERIOR REGION.—Mr. Dana says that my view as to these rocks is «the old

one and the only one current, until the *evidence* became known which Foster, Whitney, Hall, Logan, and others brought forward.» I beg Mr. Dana's pardon, but I find in «*Outlines of the Geology of Lake Superior*», by Capt. H. W. Bayfield, published in 1829, that this illustrious pioneer of Canadian geology synchronized the *Red Sandstone* of Lake Superior with the *Old Red Sandstone*, taking care at the same time to mention, that he thinks it older than the sandstone containing gypsum and salt of the northern part of New York (*Onondaga Salt Group and Medina Sandstone*). At that time the Silurian was undiscovered, and the Old Red Sandstone were the *oldest stratified rocks known*; so Bayfield evidently meant by his suggestion to say that the *Sandstones* of Lake Superior were the *oldest stratified rocks*, which Hall, Logan, Whitney, and Foster have given twenty years later as a *new opinion.*

NEW RED SANDSTONE AND JURASSIC ROCKS IN THE ROCKY MOUNTAINS. — The objections made by Mr. Dana to my observations on these formations consist of negations merely, no facts being adduced to invalidate my opinions. He admits that other geologists give facts as a basis for their conclusions; but mine are only «*hazardous guesses*», «*geological gymnastics*», and the «tests of equivalency» given by me, «science has long since repudiated.» In order to give more weight to his criticism, Mr. Dana has consulted an able palæontologist, «highly commended by me», one «who has facts as a basis for his conclusions, and who admits a doubt until it is fully removed by investigation.» The name of this able palæontologist is not given, but as he is said to be «*well* accquainted with the region beyond the Mississippi», it can be no other than Mr. J. B. Meek, whose personal acquaintance with «that part of the continent» is *not very extensive.*

Messrs. Hall, Meek, and Dana in the determination of the relative age of strata, admit only palæontological evidence, for them all geognostical characters must disappear before the test of fossil remains; *lithology* is good for nothing, and «an appeal to such characters in this period of geological science

betrays great want of experience», says Mr. Dana. «Knowing as we do that lithological characters are of no value whatever as a guide in drawing a parallel between these formations and those of the old world», say Messrs. Meek and Hayden; see: «*On the so-called Triassic Rocks of Kansas and Nebraska; Silliman's Journal*; Jan. 1859, vol. xxvii, p. 34. As for the *stratigraphical* characters, they do not even mention them. My way of observing, or *guessing* as they call it, is wholly different. I consider *stratigraphy* as the *first* of all the characters, and I spare no pains to ascertain it by direct and numerous observations; then come *fossil remains*, and lastly the *lithological* characters. I always try as far as possible to use these three different series of characters together, and when one or even two of them fail completely, I apply myself with more care to examine the one or two that remain. That is, I follow the method pursued by all practical geologists. I regard the stratigraphical characters, as I said above, in their full significance; superposition, discordance, inclination, direction, etc., as *superior* to the *two other series of characters*; then come the organic remains, and lastly the lithological characters, which are the least important, but still useful when considered by a geologist of great practical experience.

I will remark, by the way, that when Messrs. Dana, Meek, Hall, and Blake admit only the palæontological characters, and say «that the region I traversed was nearly destitute of fossils,» they take great care to reject the determination of the few fossils I was able to gather, saying «that they are not determined right» — notwithstanding their determination by de Koninck, de Verneuil, Agassiz, d'Archiac, etc. So if they admit the characters of fossil remains, it is with the curious and modest condition, that nobody else but themselves can rightly interpret them. It would have been much easier for these learned observers to say at once that I am not a geologist, and that they will pay no attention to my writings, than to deny my observations in detail as they have done.

I have already replied to the objections of Mr. J. B. Meek

as to my determinations of fossils, in a *Letter on some points of the Geology of Texas, New Mexico, Kansas, and Nebraska*, Zürich 1855, therefore I will now consider only the views which Mr. Meek did not think best to communicate to me in his letter of 22. Aug. last, declining my frank request for his opinion, on the ground that he had no time to study as carefully as he should wish my *Geology of North America.*

Mr. Dana was more favored; Mr. Meek tells him, that my *Spirifer striatus* var. *triplicatus* is the *Sp. cameratus* of Morton, — the figure and description of *Sp. cameratus* in *Silliman's Journal*, 1st series, vol. xxix, p. 150, are so imperfect that it is not possible to decide to what species that fossil belongs — and that my *Spirifer striatus* is not that species. I differ from Meek, Hall, and Morton as to the propriety of creating a species under the name of *Sp. cameratus* for that fossil, and I think, in accordance with de Koninck, who has investigated the subject, specimens in hand, that it is only a variety of the true *Spirifer striatus.* As for the *Sp. striatus*, fig. 2, pl. vii of my *Geology of North America*, I maintain that it is that species, not only from my own determination, but also from the determinations of de Verneuil and de Koninck. In speaking of my *Spirifer striatus* var. *triplicatus* Mr. Meek says that «he has no knowledge of its having ever been found in Lower Carboniferous rocks», and he repeats that assertion with regard to the *Terebratula Uta*, *Terebratula Mormonii*, *Terebratula subtilata*, etc., in his last publication entitled: *Geological Explorations in Kansas*, Philadelphia 1859. This may be the case with Mr. Meek, who places the *upper part of the Lower Carboniferous rocks* of the Far West *above* the *coal measures*, a mistake arising probably from the neglect of stratigraphical characters, but that does not prevent others from finding these fossils where I place them, *below* the *coal measures*, in the upper part of the Mountain Limestone. Further, Mr. Meek says: «There are many other American Carboniferous species set down as identical by Mr. Marcou and others (what does he mean by others?), but it is well known to American palæon-

tologists that the whole subject requires careful revision.» Mr. Meek, by referring this question to *American palæontologists*, seems to wish to create *national prejudices*, that happily do not exist in science; for geology does not recognize boundary lines of any kind, and *a Geologist*, *when among rocks, is always at home.*

Mr. Meek says: «We now know beyond *any reasonable doubt* that all the country from the Platte to the British Possessions, and from the Missouri to the Black Hills, is occupied by Cretaceous and Tertiary rocks.» As Mr. Meek is one, according to Dana, who «has facts as a basis for his conclusions, and who admits *a doubt* until it is fully removed by investigation,» I will remark that I regard his *Lower Cretaceous No.* 1, as not belonging to the Cretaceous at all, but as *Triassic*, *Permian*, *Jurassic*, and *Miocene*; that Meek and Hayden have completely overlooked the geognostical characters of what they call *Lower Cretaceous No.* 1, mixing the strata together without regard to stratigraphy, lithology, or even palæontology; and that there are many very *reasonable doubts* with regard to that part of their geological notions for the country north of the Platte river. Further, what Messrs. Hayden and Meek call *Miocene* of the Tertiary basin of White and Niobrara rivers (*Explanation of a Second Edition of a Geological Map of Nebraska and Kansas*, p. 13) is only *partly* Miocene, at least a good *half* of it is *Triassic* and even *Jurassic*; such are their beds C., D., and E. They will never succeed in persuading geologists acquainted with the Prairies of the West, that the Sand Hills between the Platte, Niobrara, and White rivers, and the mounds, columnar, and pyramidal masses of the Mauvaises Terres, are formed by strata of *Miocene* or *Cretaceous* ages.

Mr. Meek adds: «And as regards the region from the Platte southward to the Red river, very far the larger part is known to be *not* Triassic, while it is possible that the Trias may occur in some parts of it.» I can assure Mr. Meek from my direct and personal observations that the larger part of that region *is* Triassic.

«The surface formations of the Llano Estacado, says Meek,

instead of being Jurassic, are Cretaceous; this is *plain* from the section of Pyramid Mountain and also from numerous other facts collected by recent explorers.» Here, certainly, Mr. Meek does not admit «facts as basis for his conclusions,» for I am the *only geologist* who has visited Pyramid Mount, and from the section observed and described by me there *I am sure* that the surface of the Llano Estacado is Jurassic, and I can vouch for it with the same degree of certainty, that I can say the Jurassic forms the mountains around Salins in the Jura.

As for a «narrow *outcropping* belt of Jurassic along the east side of the Rocky Mountains,» and the «*underlying* and not overlying rocks» for the Jurassic, all this is only a supposition of Mr Meek based on erroneous observations; I have seen with my own eyes the Jurassic strata an *overlying* rock, forming a large belt of one hundred miles at least on the eastern side of the Rocky Mountains.

If Messrs. Meek and Hayden had not relied so exclusively upon fossils, putting entirely aside the *stratigraphical* and *lithological* characters, they would probably have been more successful in determining the relative age of strata, and not be obliged to give such conflicting interpretations of their *Lower Cretaceous No. 1* and the *non-existence* of *Jurassic* and *New Red Sandstone rocks.*

JAMES' DISCOVERY OF NEW RED SANDSTONE IN THE PRAIRIES. — Mr. Dana does not admit the claim of Edwin James as discoverer of the New Red Sandstone in the prairies of the Rocky Mountain region, but *expunges* his name, without ceremony, from American geological history. He speaks of imperfections in my *Synopsis* «arising from a partial acquaintance with the subject and the science,» and continues: «Thus he (Marcou) speaks of Mr. E. James as having been the *first* to recognize the *New Red Sandstone* on the slopes of the Rocky Mountains, when all he had any knowledge of was *a red sandstone.*» Further, in rejecting my determination of the Triassic formation in the Rocky Mountains, Dana says:

«And as far as suggestion goes, that of James had long the *precedence.*» These are rather contradictory statements. The truth of the matter is, that Ed. James, vol. II of *Expedition to the Rocky Mountains under Long*, Philadelphia, 1823; p. 399, compares his *red sandstone* and *argillaceous or gray sandstone* to the *New Red Sandstone of English Geologists*; and more, he admits the false view of Mr. Weaver and others, considering it as *inferior to the coal strata*, and giving it that position in his *Vertical Section on the Parallel of Latitude* 35° *North, intended as a continuation of Maclures' fifth section*; (see: *Maps and Plates*).

I established Mr. James precedence with great pleasure, being enabled thus to rescue him from the «studied neglect» with which he had been previously treated.

NEW RED IN NORTH CAROLINA AND VIRGINIA. — In *Silliman's Journal*, vol. xxiv, second series, p. 428, the editor says: «Prof. O. Heer has carefully examined Prof. Emmon's «*North Carolina Report*, as well as specimens, and forwarded «his conclusions and corrections, which are now before me.» The truth is, that I gave to my friend Heer for examination *my own specimens, picked up by me in* 1849, in the Virginia coal field of Chesterfield county, at the same time putting into his hands all the publications on the subject by Emmons, Bunbury, W. B. Rogers, and R. C. Taylor; and that Heer sent me his conclusions and corrections, which were made for the benefit of my *Geology of North America*, then in press. Having mentioned this precious manuscript of Heer in a letter to Prof. Emmons, he requested a copy, on the ground of the immense interest he had in the subject. I complied at once with his request, being very far from supposing the information would be used in such a manne by the *Silliman's Journal*: that my name would be *expunged* from it.

GEOLOGICAL MAPS BY ROGERS, HALL, AND MARCOU. — «We know well,» says Dana, «that if any *American* geologist «had mapped out strata and synchronized those of America «and Europe, on such data as have satisfied the author of the «*Geology of North America*, he would have been deemed young

«in the science, with much yet to learn before he could have «a sober hearing.» Messrs. Henry D. Rogers and James Hall have «mapped and synchronized American strata,» *since* the publication of my *Geological Maps* in the two following works: *Geological Map of the United States and British North America*, 1856, and *Map illustrating the general geological features of the country west of the Mississippi river*, 1857. Future geologists can decide which of the three authors was «satisfied with the best data for mapping and synchronizing the American strata.»

AGASSIZ' REPLY.

On reading the criticism of Dana in the number of *Silliman's Journal* for November 1858, Agassiz sent the following answer:

On Marcou's „Geology of North America;" by Prof. Louis Agassiz.

(Extract from the *Silliman's Journal of Science*, second series, vol. xxvii, n° 79, p. 134 etc., January 1859.)

I have not yet seen Marcou's latest publication on American Geology, but I have now open before me, his paper in the Proceedings of the Geological Society of France, and that in Petermann's «Geographische Mittheilungen,» both bearing date 1855, as well as the Geological Map of the United States and British North America by H. D. Rogers, also bearing date 1855, and Hall's and Leslie's Map of the country west of the Mississippi river, published with the 1st vol. of Emory's Report in 1857. I take it that it will be no injustice to either Rogers or Hall to go to an earlier publication of Marcou's, in a comparison of their respective claims to correct illustration of our Western Geology. Let me premise by saying that as far as the geology of the East is concerned, from Iowa to the Atlantic coast, I acknowledge that to Hall is due, unquestionably, the credit of having settled by extensive comparisons, and by personal examinations, the true geological horizon of the vatest extent of our continent, not only by an examinatien of the superpositiou of the rocks, but also by the most minute and most extensive study of the fossils.

We all know also how much the Rogerses have done to elucidate the physical geography, the orography, and the order of succession of the formations of Pennsylvania and Virginia, which has thrown much light upon the general geology of the eastern part of the continent. It is equally well known how much the special state surveys have added to the details in this general investigation of the Geology

of North America. But when we go west of the Mississippi valley to the Pacific shores the case is very different. The maps of Rogers, Hall and Marcou, are a compilation and an attempt at coordination of surveys which cover only a very small portion of the ground. They are, as it were, the reading of the authors of these different maps, of investigations made by others, though Marcou has here unquestionably the advantage of having gone himself over the ground.

A comparison for instance, of the manner in which the volcanic rocks are dotted over New Mexico, Sonora, and Lower California, as well as in California, Oregon and Washington Territories by Hall and Rogers, with Marcou's representation of the same cannot fail to show to a geological reader, that they are more natural in Marcou's map than in the two others. When a region is not more minutely surveyed than the whole western half of our continent, of which we have not even accurate geographical maps, it is not possible to expect accuracy in detail, and the critic must consider the general connection rather than special points.

I do not see, for instance, how the omission of State boundary lines which in a former review of Marcou's map in the Journal, was made a prominent objection to his representation of American geology, can be of any importance in such a general survey of the subject. Rogers in his map does not give these boundaries any more than Marcou.

But I now come to the essential point. What is the true geological character of those five hundred thousand square miles of land, extending between the Mississippi, west of Arkansas and Missouri, and the great Salt Lake Basin? Rogers colors it uniformly with Cretaceous rocks, and the well known Tertiary deposits, adding metamorphic rocks, flanked with Carboniferous in the mountainous tracts. Hall does the same only making in addition, a distinction between the upper and lower Cretaceous, while Marcou distinguishes further between Permian, Triassic and Oolitic beds. I do not suppose that he, any more than Hall and Rogers, imagines that the boundaries he assigns to any of these groups are any more accurate than those assigned by Rogers and Hall to the groups they distinguish. These appear to me simply in the light of the respective readings of isolated facts recorded in the way they have struck the authors of these different maps. When in his paper to the Geological Society of France, Marcou speaks of himself as a travelling geologist who «brings his little stone to the great edifice» (page 3) it does not appear to me as vain-glorious boasting, and we ought to take gratefully the contributions of a Frenchman, using language after the fashion of his nation, even though it be not the way in which we would have ex-

pressed ourselves. Now I confess that after reading the condensed Review of American Geology which Marcou has given, in Petermann's Contributions, I find in it a more comprehensive account of the general features of the orography and geology of the Western half of our continent, than in the other representations I have read upon this subject. I think that even now a translation of that paper would be welcome to every English student of American geology, and that far from circulating false impressions, it would greatly contribute to bring before the mind the grand features of that remarkable country, and to connect in an intelligible way the geology of the West with that of the East. The middle tract of our continent is unquestionably occupied by deposits younger than the coal; I do not allude to the Lake Superior Sandstone respecting which I believe Marcou to be mistaken, — but the five hundred thousand square miles of questionable character as to the details, certainly belong to those from recent formations.

Now it appears to me that the geology of our Atlantic States furnishes data upon which theoretical inferences, bearing upon the question which Marcou's assertions call forth, may be founded. We know that the Cretaceous formations extend from the Atlantic slope of the Alleghany range round their southern spur into the great geological gulf now occupied by the Mississippi valley. We know further that along the eastern slope of the Alleghanies, beginning with the Connecticut valley, there extends, between the axis of elevation of that chain and the Cretaceous deposits at its Atlantic foot, a series of deposits referred respectively to the Triassic and the Oolitic series.

We know also that to the south of North Carolina, these lower secondary deposits are covered over by the Cretaceous. Now, since the upheaval of the Alleghanies is anterior to the deposition of the Trias, does it not appear natural to suppose that Triassic and Oolitic formations must have been deposited at the foot of the western slope of the Alleghanies as well as upon its eastern slope, and that the Cretaceous deposits overlap them in the Mississippi gulf in various ways, as along the Alleghany chain, and that, following various routes, the different geologists who have gone across the continent must have seen, here Trias, then Jura, and then again Cretaceous beds, overlaid by Tertiaries, in a number of points, already determined, though the relative extent of all these beds, over a surface of 500,000 square miles, remains yet to be ascertained.

The circumstance that Marcou has colored in yellow the whole middle tract of the continent, can express nothing but his conviction that the whole Mississippi gulf is lined with Triassic beds, overlaid with more or less extensive Jurassic, Cretaceous and Tertiary de-

posits. In such a theoretic representation of the geological features, where the details are wanting, provided the existence of the Trias and Jura is made out somewhere, there is no more inaccuracy than in coloring a map of our eastern geology, where the drift covers the greatest extent of the surface, as if it were altogether occupied by Paleozoic rocks.

I take it that such things are, by this time, understood by all those who examine schematic maps,—at least they should be. Moreover, the discoveries by Professor Swallow and Mr. Meek of Permian beds in Kansas, along the eastern border of the great Mississippi gulf, and by Professor Hall in Iowa, furnish a very unexpected confirmation of the broad statement first made by Marcou, that while the Eastern part of our continent consists of Paleozoic rocks, the middle part is occupied by the Mesozoic series. I truly believe that, at some future period, the general outline of our western geology by Marcou, which by the way, has the priority over the others, will stand before a complete survey of the whole in the same light as Maclure's old map now stands, when compared to the well-known eastern geology.

In this connection, I cannot but remember that, with Thurmann, Mandelslohe, Gressly, Quenstedt, Römer, d'Orbigny, and Oppel, Marcou is one of the geologists who knows the Jurassic formation best; that he has published a masterly paper upon the Jura Salinois in the Transactions of the Geological Society of France; and that it seems hardly credible to me that he should have been so completely mistaken in his identification of Oolitic beds in the west. I have myself, in my collection, a large number of specimens of the Cretaceous fossils of Texas and of New Jersey, among which is a beautiful series of the Exogyra, characteristic of the Cretaceous period, and I have seen the Exogyra and the Ostrea which Marcou brought from his excursion across the continent, and I distinctly remember that I could not identify them with the Cretaceous species, but rather thought them allied to Jurassic species.

Whoever has read Marcou's paper on the Jura must have seen that he knows, as well as any geologist living, that lithological characters are of no value in identifying geological horizons. But after having presented the general evidence, as far as it goes, for the presence of Triassic and Oolitic beds in the middle tract of our continent, I cannot find that there is any reason for blame, with his familiarity with the Triassic and Oolitic rocks of Europe, in his pointing out the lithological resemblance there may be between them, any more than there is ground for blaming the American geologists who, after identifying certain beds in New Jersey as Cretaceous, have

also alluded to their mineralogical resemblance with the Green Sand of Europe; for this is, after all, a remarkable fact which runs over immense tracts of geological deposits belonging to the same horizon.

Mr. Dana's love of the *truth* and *duty to science* obliged him to decline publishing this article in my favor without alterations, which the author refused to make, not wishing to pass under Mr. Dana's editorial scissors, and Mr. Agassiz was obliged to threaten the withdrawal of his name from the *Journal*, to induce Mr. Dana to modify his views of duty sufficiently to publish the article as it was written. He consoled himself however by *reviewing* Mr. Agassiz on the *very next page*, as follows:

Reply to Prof. Louis Agassiz on Marcou's „Geology of North America;" by James D. Dana.

(Extract from the *Silliman's Journal*, second series, vol. xxvii, n° 79, page 137, January 1859.)

I regret in such a case as this to have to differ from Professor Agassiz. The amount of difference is however not as great as at the first reading may appear; for an important part of the positions in my paper are untouched, and an explicit dissent from some of the views of Mr. Marcou is expressed.

The statements in Professor Agassiz's remarks to be especially noted are the following:

1. That Professor Agassiz had not read the work reviewed, but had seen the earlier papers by Mr. Marcou and examined his geological map.

2. That while, as regards the geology of the East from Iowa to the Atlantic coast, «to Mr. Hall is due unquestionably the credit of having settled by extensive comparisons and by personal examination the true geological horizon of the vatest extent of our continent, not only by examination of the superposition of the rocks, but also by the most minute and most extensive study of the fossils;» and that while the «Professors Rogers have done much to elucidate the physical geography, the orography, and the order of succession of the formations of Pennsylvania and Virginia, and have thrown much light upon the general geology of the eastern part of the Continent,» — west of the meridian of Iowa their observations have not extended, and Marcou has thence the advantage of them.

3. That the maps of the region west of the Mississippi by Rogers, Hall, and Marcou are mainly compilations from the results of various

surveys, and that Marcou in extending the colors of the Triassic formation over the 500,000 square miles of the Rocky mountains, and laying down also the Permian and Jurassic over the same region, was no more culpable than Hall or Rogers in covering it with Cretaceous.

4. That Marcou is mistaken in regarding the Lake Superior Sandstone as Triassic.

5. That it is hardly credible that Mr. Marcou should have been so completely mistaken in his identification of Oolitic beds in the west; and that the two species collected by Marcou from the beds are most allied, in Professor Agassiz's opinion, to Jurassic species.

6. That Mr. Marcou knows that lithological characters are of no value in identifying geological horizons; and that adding these characters to other general evidence for the Triassic and Oolitic rocks is not blameable.

The claims which Mr. Marcou has put forward in his work are: (1) the correct determination of the Red Sandstone of the Lake Superior region; (2) the identification, for the first time, of the Permian over the Rocky Mountain region; (3) the same, of the Triassic; (4) the same of the Jurassic. I have presented evidence proving, as I believe, that he was wrong in each case; and hence, that the claims of prediscovery which he is now urging over Europe are groundless. Besides this, I have pronounced the work abusive of such men as the Rogerses, Hall, Whitney, Logan, Hunt, and many others, and grossly unjust to American science and geological history, while full also of groundless personal claims. I review some of these points.

Supposed Triassic of Lake Superior.—Prof. Agassiz admits that he believes Mr. Marcou to be wrong with respect to the Triassic («New Red») character of the Lake Superior Sandstone, and thus we do not differ as to this one of the claims.

Now this question of the Lake Superior Sandstone is the one that especially calls out Mr. Marcou's opinions of American geologists. Making these rocks, and the Connecticut river and Virginia beds, as well as 500,000 square miles of territory over the Rocky Mountains, «New Red,» he is indignant that Hall, Whitney, Logan, Professor Rogers, etc., do not follow in his track. After giving a one-sided view of opinions on the different rocks which he classes together as *undoubted* «New Red» he says:

«In accord with the geologist James Hall, the brothers Rogers refer all the *Red Sandstone Formation* along the Atlantic slope (see: *Geological Map of the United States*, by Henry D. Rogers, page 32; in the *Physical Atlas of Natural Phenomena*; Edinburgh, 1856) to the Jurassic epoch. Their opinion, however, is not explained by H. D. Rogers in a very clear and concise manner. In page 29, he says

positively «*Jurassic*; represented in Virginia and North Carolina by a group of bituminous coal-measures, and in the valley of the Connecticut and on the Atlantic slope, from the Hudson to North Carolina; and again, in Nova Scotia and Prince Edward Island, by belts of a red shale and sandstone. *Triassic* and *Permian*, not represented by any known American deposits;» and in page 32 Rogers says: «the Continent (North America) embraces an extremely small extent of the Older Mesozoic or *Triassic and Jurassic* formations.» Further; «Geographical distribution. — Commencing at the North-East, the first tract of *Triassic or Jurassic* red sandstone, etc.» I call the attention of the reader to the expressions first Triassic *and* Jurassic, and next Triassic *or* Jurassic; *and*, *or*, are two different words. A few lines further on he says: «The red rocks of Prince Edward Island pertain probably to both the Coal period and to the *earliest Jurassic*, etc. . .»; and also: «The vegetable fossils in the Connecticut sandstone, display such alliances with those of the *Jurassic* coal rocks of Eastern Virginia as to place the *early Jurassic* or *late Triassic* age of the deposit beyond a question.» — Is Keuper *early Jurassic?* or Lias *late Triassic?* the author is silent on these two questions. — And also « . . . in the *Liassic* coal rocks of Eastern Virginia, etc. . . .»; also «The few organic remains hitherto procured from this Carolina (Deep River) coal field are identical with forms found either in the Virginia *Jurassic* coal strata, or in the Virginia Middle Secondary red sandstone, of *nearly coincident Jurassic date*».»

«It is difficult to present an age of strata in a manner more ambiguous and *empatée*. *The brothers Rogers and James Hall try their best to suppress* the New Red Sandstone formation in North America; but they do not know exactly what to do with these five or six thousand feet of strata. On the Geological Map of H. D. Rogers, the New Red Sandstone is unknown in the Magdalen Islands; on the north-east of the Baie des Chaleurs it is colored as Jurassic Red Sandstone, though the *Honorable Sir William E. Logan, Chevalier of the Legion of Honor*, calls it Carboniferous Sandstone. In Prince Edward Island, Connecticut valley, New Jersey, Pennsylvania, Maryland, Virginia and North Carolina, the New Red is colored as older Mesozoic (Jurassic coal and Jurassic red sandstone). In Lake Superior it grows older, and the New Red is colored Cambrian, (Primal, Auroral and Matinal). In the Praries, Texas, Rocky Mountains, New Mexico, etc., the «New Red,» that seems to change its age with Protean facility, has once more renewed its youth and is colored as Cretaceous, and sometimes also as umbral and vespertine, or in ordinary language as Lower Carboniferous.»

«*They have not thought of putting the New Red in the Upper Silurian*

or the Tertiary. I would advise these honorable savants to consider if one of these determinations would not be preferable.»

The *jumble* here is of Mr. Marcou's making, and it comes of his own errors about the «New Red.» We let the style of criticism go without remark, satisfied for the present with italicizing only some of the more characteristic parts.

While on this topic, Mr. Marcou, noticing that Dr. D. D. Owen had within a few years taken the same ground with Prof. Hall and other geologists, says, «why Owen changed his views is quite a mystery.» He will now regard the case of Dr. Owen not the only mystery.

Permian of the Rocky Mountain Region. — I pointed out in my review that Mr. Marcou had distinguished as Permian, rocks that contained fossils which he set down in his *Field notes* and *Résumé* with a query as a *Belemnite* and a *Pteroceras* (the latter word changed in the recent work to *Gasteropod*), although no Belemnite or Pteroceras is known to occur below the lower Jurassic (Lias). Disregarding or defying the hints from the imperfect fossils, he made the beds Permon *lithological characters* and superposition alone.

On the Permian of Mr. Marcou, Prof. Agassiz says nothing. The use made of lithological characters in its determination is far from sustaining the opinion cited above in paragraph 6.

Triassic of the Rocky Mountains. — My review states that Mr. Marcou established the existence of the Triassic on one fossil, and that an uncertain species of pine wood: this one doubtful fossil wood, and the *lithological characters* make up the evidence in favor of the discovery: and on *lithological characters* and superposition alone he based his queried subdivision of it, into *Bunter*, *Muschelkalk*, and *Keuper* — thus again badly misusing lithological evidence. He mentions also the discovery of a *Cardinia*, but says that Cardiniæ occur in rocks from the Jurassic to the Carboniferous.

Professor Agassiz brings forward nothing against my conclusion that the Triassic was not identified in the Rocky Mountains by Mr. Marcou.

Jurassic rocks in the Rocky Mountains. — The evidence which I cited that Mr. Marcou's Jurassic is really Cretaceous, was based on the determination by Hall, Conrad, Shumard, and others, that his supposed Jurassic fossils are Cretaceous, and that they occur at localities in the west along with known Cretaceous species. Morton's figure of the *Gryphea Pitcheri* (Morton) I understand was made by Conrad, so that Conrad is certainly good authority as to the identity between it and Mr. Marcou's species. Dr. Newberry, who has recently returned from the Rocky Mountains confirms these conclusions; for he says (see this volume page 33):

«I may say in confirmation of the assertion that your fossil plants [species of Alder, Beach, Credneria, Ettingshausinia, etc.] are Cretaceous, that I found near the base of the yellow sandstone series in New Mexico, considered Jurassic by Mr. Marcou, — a very similar flora to that represented by your specimens, one species at least being identical with yours, associated with *Gryphea*, *Inoceramus*, and *Ammonites* of lower Cretaceous species.»

With such evidence, even the exact identification of the two fossil shells is of little importance. The Cretaceous is the lowest formation in which leaves of any dicotyledons have been found.

Professor Agassiz states that Mr. Marcou is a good Jurassic geologist. But this does not affect the case in hand. For he had but two or three fossils about which to use his Jurassic judgment; and if this judgment has pronounced fossils to be Jurassic that really occur in the west associated with Cretaceous species, or if his knowledge of rocks in Europe has led him to think he can tell Permian, Triassic, or Jurassic rocks by their lithological characters, when he sees them in America, it has served him badly.

We regard it therefore as still true that Mr. Marcou's Triassic of Lake Superior, is not Triassic; and in the Rocky Mountain region, his Permian is not proved to be Permian, his Triassic not Triassic, and his Jurassic not Jurassic. Where are then his discoveries?

Map. — As regards the geological map-making, there is little resemblance between the cases of Rogers and Hall and Mr. Marcou. The former do not claim to be discoverers over the Rocky Mountain region, and Mr. Marcou does. Mr. Marcou, while remarking that the colors to the north and south of the course he followed are only approximative, says, «*I am sure of the limits of the formations on the line I have explored near the 35th parallel of latitude*;» and guided by this *sure* determination, he marked the Triassic on his map, and then, at a hazard, influenced by his views of earlier explorations, he spread the Triassic color far north over the 500,000 square miles. Now if his identification of the Permian and Triassic was in each case an error, what shall we say of the 500,000 square miles? and what of his map, if this is all wrong, and in addition his identification of Triassic in the Lake Superior region? He cannot rightly shield himself behind any geologist, or the common usage of following the best compiled results for fixing the lines.

Theoretical inferences may be good by way of suggestion; but too eagerly followed they lead to just the errors Mr. Marcou has made. But his system for the West has not even the show of probability in its favor. It is well known, and Mr. Marcou admits it, that Cretaceous fossils and rocks occur about the very summit plains of the

Rocky Mountains. The natural inference is, therefore, that when in Cretaceous times these summits were under water, the sea also extended over what are now the eastern slopes of the mountains, and might have covered them with Cretaceous beds; and that thus the Cretaceous should be expected to be the surface formation, (it is understood that the question relates to the *surface* formation, as the colors refer in all cases to this,) and that any Jurassic, Triassic, and Permian, if they exist, should be covered by it. This, I say, is what should naturally be expected. Moreover, this is what all researches since Mr. Marcou was over the region are tending to prove; they sustain Hall and others in coloring the greater part of the Rocky Mountain slope Cretaceous. The inferior beds, as the Palæontologist quoted from in my paper states, may be looked for as outcropping beds about the base of the ridges or crests of the mountains. Mr. Marcou's map is hence not only at variance with recent researches, but also with reasonable views of western geology.

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.

Professor Agassiz knows well our American geologists and appreciates their labors; and he writes about them in a different style from Mr. Marcou. But on this point it is not necessary to dwell.

As to this last attack I have only a word to say. — First: Mr. Dana thinks Agassiz' difference of opinion as to the age of the Lake Superior Sandstone will be a *mystery to me*. But we visited Lake Superior together in 1848, and have often since discussed the question without being able to agree, a difference of opinion that each is willing to allow the other, however strange it may seem to Mr. Dana. Secondly: Mr. Dana speaks repeatedly of my ill treatment of the *American Geologists*, and as this may create a prejudice against me I will say, that *I honor and respect* the labors of American Geologists, as I think I have shown in my *Geology of North America*. But because my views differ from those of Messrs. Hall, Rogers, Blake, Logan, Hunt, Meek, Whitney, Foster, and Dana, is no reason for their *speaking in the name of the American Geologists*. Besides, I have never considered the accident of birth as having any relation to geology, and I have not

enquired, if H. D. Rogers of Glasgow is a Scotchman, or Mr. Dana a native of Buncombe, if Hall is a subject of the Pope, or Logan an Englishman; for these matters have nothing to do with their geological opinions and views.

It is almost needless for me to repeat that *I maintain my observations to be rigorously exact.*

The arrogant tone of superiority assumed by Mr. Dana is unfortunately but poorly adapted to «fully persuade» his readers as he desires. To accomplish this object the merits of my *Geology of North America* should have been calmly considered, and its unworthiness have been proved by facts and dates. As it is, I have good hope that the highly seasoned articles of Dana relieved by the remarks of Agassiz, may serve to stimulate the appetite of the impartial geological reader, to discover for himself where the *truth* lies, and I cheerfully leave the result to his decision.

Zurich (Switzerland), March 1859.

LETTRE RELATIVE A LA PUBLICATION DES NOTES DE SON EXPLORATION DES MONTAGNES ROCHEUSES ET DE LA CALIFORNIE;

par JULES MARCOU.

(Extrait du *Bulletin de la Société Géologique de France*, 2e série, tome XV, p. 533, seance du 17 Mai 1858.)

M. Delesse présente, de la part de M. J. Marcou, un ouvrage relatif à la géologie de l'Amérique du Nord (*Geology of North America*); il donne ensuite lecture de la note suivante qui lui a été adressée par M. Marcou.

Zurich, le 20 avril 1858.

La Société géologique de France ayant eu l'extrême obligeance d'insérer, dans les tomes VI, VIII, XI et XII de la 2e série de ses *Bulletins*, la plus grande partie de mes observations sur l'Amérique du Nord, je viens aujourd'hui, en lui offrant un exemplaire de ma *Geology of North America*, la prier de m'ouvrir encore ses colonnes pour une petite protestation.

Par suite de circonstances complétement indépendantes de mon libre arbitre et de ma volonté, et qu'il me serait pénible d'être obligé de rappeler ici, les deux cahiers de notes géologiques que j'avais écrits pendant mon exploration des montagnes Rocheuses et de la Californie, et la plus grande partie de mes collections, m'ont été enlevés de force, et remis, sans ma participation, entre les mains d'un nommé William P. Blake, de New-Haven (Connecticut). Cette personne m'ayant écrit de son propre mouvement pour me consulter *officieusement* sur l'opportunité qu'il y aurait de publier ces deux cahiers de notes *tels qu'ils étaient*, je me suis opposé à cette publication en m'appuyant: 1° sur ce que ces notes étaient écrites au crayon, en abrégé, avec beaucoup de signes conventionnels et en langue française; 2° sur ce qu'il y avait des parties à retrancher; 3° sur ce qu'il y avait beaucoup à ajouter pour les rendre compréhensibles; 4° et enfin sur ce que, ne connaissant pas lui-même la route que j'avais parcourue, il ne pouvait pas suppléer par sa propre expérience à des notes qui ne pouvaient être compréhensibles qu'à celui même qui les avait prises. En même temps, j'ajoutais: 1° qu'il pouvait publier un rapport en forme de *Résumé*, que j'avais adressé au commandant de notre expédition en juillet 1854; 2° que ma collection était en bon état, et que je ne voyais aucune objection à ce qu'il en donnât une description détaillée, aux deux conditions toutefois qu'il préviendrait que j'étais étranger à cette description, et qu'il ne ferait pas décrire les fossiles par James Hall, d'Albany.

Comme M. Blake me disait dans sa lettre qu'il aurait égard à mes désirs, et que c'était seulement pour assurer la publication officielle des résultats géologiques auxquels j'étais parvenu qu'il avait consenti à entreprendre ce travail, j'ai été fort surpris de voir que, non-seulement M. Blake n'a eu égard à aucun de mes désirs, mais bien plus qu'il a fait tout ce qui dépendait de lui pour annuler mes observations et nier mes découvertes; et je suis aujourd'hui à me demander quels sont les motifs qui ont pu pousser M. Blake à m'écrire une lettre, dont il avait évidemment pris la résolution d'avance de fausser tous les termes.

Une première publication des résultats principaux des diverses explorations pour l'établissement d'un chemin de fer entre la vallée du Mississippi et la Californie à été faite à Washington, en 1855, dans le format in-8, avec atlas in-folio. Dans ces rapports se trouvent deux mémoires avec ma signature; ce sont: 1° *Résumé of a Geological reconnaissance extending from Napoléon at the junction of the Arkansas with the Mississippi, to the pueblo de los Angeles in California*; 2° *Geological notes of a survey of the country comprised between Preston, Red river, and El Paso, rio Grande del Norte.* Ces deux mémoires, qui

ont été en grande partie publiés dans les tomes XI et XII du *Bulletin de la Société géologique*, renferment, avec des détails suffisants pour les mettre hors de doute, tous les résultats auxquels j'ai été conduit par mes recherches géologiques. Cette publication, in-8, a été limitée à un petit nombre d'exemplaires, à peu près trois cents, et pour l'usage exclusif du Congrès américain.

Depuis lors, une seconde publication, dans le format in-4, avec illustrations, etc., a été entreprise et se trouve aujourd'hui dans le commerce. Le tirage est de 11,000 exemplaires, et depuis 1856, sept gros volumes ont déjà paru. Le volume II contient le *Report near the thirty-second Parallel of North Latitude, from the Red river to the Rio Grande*, par le capitaine John Pope. Dans ce beau travail, Pope cite exclusivement mes notes géologiques sur son voyage, spécialement dans son chapitre VI, au sujet des puits artésiens à établir sur le Llano Estacado. Par une partialité que je suis loin d'attribuer au capitaine Pope, car je sais qu'il a fait tout ce qui lui était possible pour empêcher l'injustice dont j'ai été victime, on a omis complétement mes *Geological Notes* sur cette exploration, et à leur place on trouve un *Report on the Geology of the route*, par William P. Blake. Dans ce travail, M. Blake ne parle de mes *Geological Notes* que pour dire que je me suis trompé sur l'existence: 1° du *jurassique* qui pour lui est du *crétacé*; 2° du *trias* qui pour lui est en partie du *crétacé*, en partie du *carbonifère*, et en partie une époque géologique inconnue qu'il nomme avec beaucoup de sagacité *gypsum formation*, et enfin que ma suggestion, relativement à la possibilité de percer des puits artésiens à de grandes profondeurs, sur le Llano Estacado, est une impossibilité et une utopie. M. Blake a le talent de remplir une page in-4 avec ce que d'autres ont le défaut de dire dans une seule ligne, et son rapport au capitaine Pope n'est rien autre qu'une *compilation* déguisée, fortement étendue, et surtout torturée de mes *Geological Notes* de l'édition in-8, compilation qu'il n'avoue pas, et qui explique suffisamment le rejet de la publication, dans cette édition in-4, de mes *Geological Notes*.

Le volume III est exclusivement rempli par les rapports de l'expédition du capitaine Whipple dont j'ai été le géologue. J'aime à rappeler ici les relations amicales et d'intimité qui n'ont cessé d'exister entre Whipple et moi, depuis le jour où nous nous sommes réunis sur le pont d'un bateau à vapeur, au fort Smith, et les efforts de toute espèce qu'il a bien voulu faire pour m'assurer la publication du rapport géologique complet de notre expédition. Si ses persévérantes démarches n'ont pas été couronnées de succès, du moins il a fait tout ce qui lui était possible, et je sais qu'il ne s'est arrêté que devant une volonté supérieure et devant laquelle un militaire est

toujours obligé de fléchir. Je ne l'en remercie pas moins de ses nobles efforts qui se sont continués du reste jusqu'à la fin de la publication de ce volume III, et qui ont fini par faire insérer dans la dernière feuille du volume, après un premier rejet assez brutal, mon *Résumé* de l'édition in-8. Je suis heureux de pouvoir citer ici cette phrase d'une lettre qu'il m'a adressée dernièrement en m'envoyant ces volumes: «J'espère qu'en parcourant ces volumes vous vous »apercevrez que j'ai essayé qu'on ne vous fît pas d'injustices. Mon »opinion est que vos ennemis, par leur conduite, se sont nui à eux-»mêmes dans l'estime du monde scientifique.»

Un tiers du volume III est rempli par le *Report on the Geology of the route*, rapport divisé en deux parties: le n° 1 ou *General Report upon the Geological collections*, par William P. Blake, et le n° 2 ou *Résumé and field Notes*, par Jules Marcou. Je prie tous les géologues de considérer mon nom comme effacé du rapport n° 1, où M. Blake s'en est servi presque à chaque phrase pour nier, annuler ou mutiler mes observations; je ne reconnais rien dans ces dix chapitres par Blake et James Hall comme provenant de moi. Quant au prétendu *Itinéraire géologique du fort Smith et de Napoléon (Arkansas) au Rio Colorado de Californie*, original par Jules Marcou et traduction anglaise par William P. Blake, qui se trouve dans la partie n° 2, je déclare que ce document n'est pas de moi, et que M. Blake, en le publiant contre ma volonté expresse, à commis un acte d'indélicatesse sans exemple jusqu'à présent en géologie.

Je ne parle pas de la carte géologique et du profil exécutés par M. Blake, d'après, dit-il, les notes et collections de M. Jules Marcou: les cartes géologiques et le profil que j'ai publiés dans dans le *Bulletin de la Société géologique* et dans ma *Geology of North America* répondent suffisamment à ces productions que je ne considère pas comme sérieuses. La seule partie de ce n° 2 et de tout le volume III que je reconnaisse comme étant de moi est le *Résumé of a Geological reconnaissance*, etc., et les citations que mon ami le capitaine Whipple en fait dans ses divers rapports; car je rappelle ici avec plaisir que ni Whipple ni Pope n'ont fait usage dans leur rapports des résultats et des rédactions de M. Blake: toutes leurs citations géologiques, minéralogiques et paléontologiques sont empruntées *exclusivement* à mes deux mémoires.

Je regrette d'être obligé de présenter une pareille protestation; mais un géologue pratique ne possède que sa réputation d'observateur, et mes adversaires ont fait tout ce qui dépendait d'eux pour la ruiner.

J'ai essayé dans les limites de mes forces et de mes faibles talents de faire mon devoir; et il est triste, surtout après avoir comme

moi perdu sa santé par les fatigues de toutes sortes que j'ai eu à supporter pendant mes voyages, de se voir, non seulement privé de la récompense de la publication officielle de ses recherches, mais bien plus de voir que la personne qui a eu la mission de les publier s'est appliquée, avec un courage peu enviable, à torturer, dénaturer et nier même des observations qui m'ont coûté les plus rudes fatigues auxquelles un géologue puisse être soumis.