thought, the notions of social relation, traced as far into their abstract forms as it was possible for the human mind in that stage of development to conceive and express them.

This tendency is illustrated by the titles of some of his latest issues; as, *Vorgeschichtliche Schöpfungslieder in ihren Ethnischen Elementargedanken; Zur Mythologie und Psychologie der Nigritier in Guinea mit Bezugnahme auf Socialistische Elementargedanken; Wie das Volk Denkt; ein Beitrag zur Beantwortung sozialer Fragen auf Grundlage Ethnischer Elementargedanken*, etc.

These writings are all crammed with wide erudition and mature reflection; but, unfortunately, the author persists in following a literary style of expression which is certainly the worst of any living writer, intricate, obscure, sometimes unintelligible to a born German, as one of his own pupils has assured me. This greatly limits the usefulness of his productions.

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THE CONNECTICUT SANDSTONE GROUP.

The attempt to revive the abandoned name of Newark for the older designation of Connecticut, in its application to the Triassic terranes in the Atlantic geographic area, is supported by G. K. Gilbert and opposed by B. S. Lyman, in a joint discussion, in the *Journal of Geology*, Vol. II., No. 1. One would think that the considerations presented by me in the *American Geologist*, Vol. V., page 201, would have been sufficient to satisfy any one looking at the subject judicially and impartially, of the inadequacy of the name Newark to special recognition. In seeking a name for a terrane we should naturally inquire, *first*, where is the area which exhibits best the typical features? In answer to this we have the fact that in the Connecticut area the early exploration was the most thorough, the very unique occurrence of fossil footmarks was first recognized, and is the only one in which they have been thoroughly studied. At first these were thought to have been made by birds; but the later suggestion of deinosaurs has been verified by the masterly restorations of Anchisaurus by Prof. O. C. Marsh, obtained in the same Connecticut valley. Reptilian bones were known also from Pennsylvania, but no one has ever connected them with the tracks. Thus the feature which characterizes the American Trias is found in its perfection in the Connecticut and not in the Newark area. The fish are also more abundant in the first named area. The other features of importance are the coal and fossil plants, and these are best developed in a Virginia area.

Second. It is essential for the suitability of a geographical term, that the locality be one where the terrane should be exhibited in its entirety or maximum. The Connecticut valley has the whole series. The city of Newark 'does not contain one-fourth part of the thickness of this sandstone, and that which is visible is only a fraction of this fourth.' This early statement of mine is confirmed by Mr. B. S. Lyman, who says the exposures at Newark amount to 'one-tenth or one-twentieth of the beds to be included in the name.' Mr. Lyman has still later called attention to the probability that the Newark beds belong to the Permian instead of the Triassic.

Third. The name of Connecticut or Connecticut river sandstone has precedence over Newark. It was both in actual use before the suggestion of Newark, and was again proposed and used after 1856 and before 1892, because no one except Mr. Redfield employed the term Newark. The proposal was never accepted by the geological public.

In the early days of geology the use of local names was confined to the groups like

Silurian and Devonian. It was not until geologists found it necessary to specify the smaller divisions that it was discovered how convenient they were. The first users of names like Potsdam and Trenton did not make formal announcements that hereafter a particular name would be applied to a definite set of beds with special paleontological characteristics. It was the 'sandstone of Potsdam,' the 'limestone of Trenton Falls,' enunciated almost apologetically. We would not to-day question the validity of these early names because their authors did not set them forth in their perfection, like Minerva springing forth from the brain of Jupiter. I find the suggestion of Connecticut to have been made by E. Hitchcock in his report upon the Geology of Massachusetts in 1833, page 209. He says, 'the group which I denominate *new red sandstone in the Connecticut valley*' (the italics are mine). This was repeated in the Final Report, p. 441. Like his contemporaries he preferred the use of the European term of Trias, New Red or sometimes Liassic to the geographical one. We note that the expression of new red sandstone in the Connecticut valley is fully as definite as the later one of sandstone of Potsdam. This usage of Connecticut appears in all of E. Hitchcock's papers, and he distinctly included the terranes of New Jersey, Virginia and North Carolina. I quote later samples of its use. In the Ichnology of New England, 1858, page 20, may be found the following heading descriptive of an extended discussion; '5. Conclusions as to the Age and Equivalency of the Connecticut River Sandstone.' In 1859 he published in the Report of the Secretary of the Massachusetts Board of Agriculture a catalogue of the State Collection. The following is the headingused descriptive of the specimens from this terrane: "CONNECTICUT RIVER SANDSTONE. (*Liassic and perhaps Triassic and Permian sandstones and limestones.*)"

In 1860 Messrs. H. and C. T. Smith, 356 Pearl street, New York, published a wall map of Hampshire county, Massachusetts, based upon the surveys of Henry F. Walling. Hundreds, perhaps thousands, of these maps adorned the walls of houses belonging to citizens of that county. Upon it was placed a geological map of the county by Edward Hitchcock, and in explanation of the colors we have 'Connecticut River Sandstone, Lower and Upper,' and the words New Red or Trias do not appear at all. Thus the usage of the name Connecticut in the writings of this author has been constant and has passed from the employment of both the European and local terms conjointly to the use of the latter one exclusively.

Other earlier authors employed the geographical name in a geological sense. Thus Lyell in his Travels, 1845, page 100, Vol. 2, says 'the Connecticut deposits.' Dr. James Deane constantly speaks of the Connecticut river sandstone; and in his final work upon the footmarks, a quarto with 61 pages and 46 plates, published by Little, Brown & Co., Boston, in 1861, his title is 'A Memoir upon the Fossil Footprints and other Impressions of the Connecticut River Sandstone, by James Deane, M. D.'

Roderick Impey Murchison, in his anniversary address before the Geological Society of London, 1843, page 107, etc., speaks of the 'deposit in Connecticut' and the 'ornithichnite and Paleoniscus beds of Connecticut.'

Dr. John C. Warren, President of the Boston Society of Natural History, is reported as having given 'an historical account of the science of Ichnology, particularly as illustrated by the fossil footprints in the Connecticut River Sandstone;' Nov. 2, 1853, *Proc. B. S. N. H.*, Vol. IV., p. 376. Various remarks of his on these subjects were printed in 1854 in a book entitled '*Remarks on Some Fossil Impressions in the*

Sandstone Rocks of Connecticut River,' by John C. Warren, M. D., President of the Boston Society of Natural History.

Prof. W. B. Rogers, at a meeting of the Boston Society of Natural History, June 20, 1855, spoke of the discovery of the fern Clathropteris in the 'Connecticut River Sandstone.'

The use of the name Connecticut River Sandstone as applied to the rocks in question seems to have been universal among the members of the Boston Society of Natural History in the fifties, and it is applied as a matter of course in the index in Vols. V., VI., VII., etc. Mr. T. T. Bouvè also uses the expression prior to 1855.

A sufficient number of citations have now been made to prove the frequent application of the term Connecticut River Sandstone to the Triassic terranes before the proposal of W. C. Redfield in 1856 to apply the designation of Newark to the same. Others could be added. But I will in the next place call attention to the fact that no one had followed Redfield's suggestion till 1889, a period of a *third of a century*, until Mr. I. C. Russell proposed to revive the name of Newark. Every American geologist by his silence indicated his disapproval of the suggestion. Furthermore, the use of the expression Connecticut had become pronounced. In fact, its use, coupled with the rejection of Newark, is sufficient to establish the usage of the former without any regard to the usage previous to 1856. I will cite a few instances of its use. The catalogue of the Massachusetts State Cabinet in 1859, the Ichnology in 1858, the map of Hampshire county, 1860, and the title of Dr. Deane's book in 1861, belong to this category. H. D. Rogers, in the Geology of Pennsylvania, 1858, prefers the term 'older Mesozoic,' but certainly rejects the use of Newark, as he makes no reference to it, and uses the following expressions: 'The vegetable fossils in the Connecticut sandstone;' 'the organic remains in the Connecticut red sandstone.' A title, 'Red Sandstones of the Connecticut Valley.' Roswell Field 'made a verbal communication on the footmarks of the Connecticut river sandstones' before the Boston Society of Natural History, June 6, 1860. In 1859, at the Springfield meeting of the A. A. A. S., he discusses the ornithichnites of the 'sandstone of the Connecticut valley.' This paper was reprinted the following year in the *American Journal of Science.*

Prof. O. C. Marsh presents in a section illustrating the occurrence of vertebrate life in America the name of *Connecticut river beds* which includes all the Atlantic areas. This has been printed with his 1877 address before the A. A. A. S., the third edition of Dana's Manual of Geology, 1880, the monograph on the Dinocerata, 1885, etc.

Prof. Joseph Le Conte in his Elements of Geology, 1878, and later editions describes the eastern Jura-Trias under the head of *Connecticut river valley sandstone.*

Prof. J. P. Lesley in C 4 of Second Pennsylvania Survey, p. 179, 1883, says, "American geologists now write habitually of the *Triassic red sandstone* of the Connecticut valley and of North Carolina." Although the Newark area was through Pennsylvania he prefers to select the locality name from either of the other principal areas. There are two references to the want of acceptance of the term Newark. I had the pleasure of attending Prof. J. D. Dana's course of lectures on Geology at Yale College in 1856. I noted that he then mentioned the fact that Mr. Redfield had proposed the name of of Newark for the American Trias. But he has never used the name in any publication, evidently for good reasons. In a sketch of the Geology of Massachusetts with map in Walling's Official Atlas, 1871, the following is printed, written by myself: "W. C. Redfield proposed the name of Newark sandstones for the group; but besides being inappropriate, it was of later

date than the appellation of Connecticut."

This review of the usages of names for the trias shows that the name of Connecticut was distinctly proposed by E. Hitchcock in 1833, and was constantly used by the geologists specially interested in those works before 1856: W. C. Redfield proposed the name of Newark for the terranes in 1856: that instead of accepting the name geologists universally employed the name of Connecticut when using a local designation up to 1889: that in this period there were several unmistakable formal proposals of the use of Connecticut: and that there were in this period allusions to the fact that the name of Newark was not accepted. Even Mr. Russell, in his learned paper of 1878, used the name of Triassic in preference to Newark.

Mr. Gilbert mentions three 'qualifications of a geographic name for employment in stratigraphy, (1) definite association of the geographic feature with the terrane, (2) freedom of the term from pre-occupation in stratigraphy, (3) priority.' These are acceptable with the addition of a fourth, appropriateness of application. All of these qualifications are possessed by the term Connecticut, while the term Newark cannot satisfy a single one of them.

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LENGTH OF VESSELS IN PLANTS.

THE diameter of pitted and other vessels is easily measured upon the cross-section of any stem, but their length is less readily determined. Probably, if the question were put, a majority of botanists would say that they rarely exceed a few inches in length, especially if they still believe with Sachs that the water ascends through the walls of the vessels. As a matter of fact, the spiral and pitted vessels of plants often form open passageways of great length. Some experiments made upon woody stems by Strassburger (*Ueber den Bau u. die Verrichtungen der Leitungsbahnen in den Pflanzen*) seem to place this beyond dispute. His method of procedure was to fasten a glass tube to the upper end of a cut stem by a rubber band, insert a funnel into the upper end of the tube, and subject the cut surface to the pressure of a column of mercury kept at a uniform height of twenty centimeters, successively shortening the stem until mercury appeared at the lower end. Using this method, he obtained the following results:

(1.) In a branch of *Quercus rubra*, 1.5 meters long and about three centimeters thick, mercury ran out of thirty vessels on the lower cut surface almost as soon as it was poured into the funnel. When the branch was shortened to one meter fifty-four to fifty-six vessels were permeable. In a slender branch of *Quercus pedunculata*, one meter long, thirty-five vessels dropped mercury, and when this was shortened to one-half meter mercury came out of more than 100 vessels. Another branch five centimeters thick at the base and 3.6 meters long was tried, and drops of mercury fell in quick succession from eight vessels. In *Quercus Cerris* mercury came through seven vessels of a branch four meters long and six centimeters thick at the base. Shortened to 3.5 meters nine vessels dropped mercury; at three meters, twelve vessels; at 2.5 meters, numerous vessels. *Conclusion:* Vessels two meters long are quite common in the oaks, and it is probable that single vessels may be as long as the stem itself.

(2.) In *Robinia Pseudacacia*, a branch two meters long and three centimeters thick was impermeable and first let through mercury when shortened to 1.18 meters. Then it dropped from four vessels. Successively shortened mercury dropped from an increasing number of vessels as follows: One meter, nine vessels; fifty centimeters, thirty-eight vessels; twenty-five centimeters, fifty-seven vessels.