PRELIMINARY REDUCTION.

Date.	t_1.	t_2.	$S'_1-S'_2$ residuals.	$Z'_1-Z'_2$ residuals.
1881.	°	°	μ	μ
Mar. 14, 9.40 A. M.	39·74 F.	39·82 F.	−1·0	−2·3
" 15, 9.39 P. M.	40·58	40·67	−3·8	−5·2
" 16, 3·36 P. M.	41·79	41·80	−8·9	−2·5
" 17, 9.27 A. M.	41·90	41·90	−9·7	−2·4
Tube 1 from Mar. 17, 9.30 A. M. to Mar. 18, 9.15 A. M., was kept at a temperature between 70° and 80° F.				
	°	°	μ	μ
Mar. 18, 8.15 P. M.	46·51	45·12	−10·1	−58·9
" 19, 9.44 A. M.	44·25	43·69	− 8·4	−46·8
" 19, 2.32 P. M.	44·02	43·52	+ 0·9	−38·8
" 19, 8.08 P. M.	43·88	43·50	+ 2·7	−42·1
" 20, 9.39 A. M.	43·66	43·37	+ 4·6	−33·5
" 20, 8.35 P. M.	43·70	43·45	− 6·4	−38·8
" 21, 10.23 A. M.	43·47	43·33	+ 3·5	−35·3
" 21, 8.17 P. M.	43·51	43·32	+ 1·1	−33·4
" 22, 9.12 A. M.	43·33	43·12	+ 2·6	−28·8
" 22, 8.43 P. M.	43·03	42·90	− 4·9	−26·4
" 23, 9.18 A. M.	42·76	42·59	− 0·6	−29·7

An examination of the residuals shows that the mean residual of $S'_1-S'_2$ before heating was $-5^{\mu}\cdot8$, and allowing forty-eight hours to cool, that the mean residual from 9^h 39^m A. M., March 20, to 9^h 18^m A. M., March 23, was $0^{\mu}\cdot0$, differing $5^{\mu}\cdot8$ from the previous value, a quantity too small, in view of the very large residuals before heating, to indicate a change in $S'_1-S'_2$. But the mean residual of $Z'_1-Z'_2$ before heating was $-3^{\mu}\cdot1$, and after heating, between March 20, A. M. and March 23, was $-32^{\mu}\cdot2$, a change of 29^{μ}.

It seems, then, that the heating from 41° F. to 75° F., and subsequent cooling to 43° F., increased the length of the four-meter zinc bar about 29^{μ}. This would give a change of 7^{μ} per meter for a temperature change of 30°, or about half the change found for the zinc bar of the meter (M. T. 1876) for a temperature change from −3° to +75°.

Sufficient data have not yet been obtained to determine the time required for a zinc bar to lose this probably temporary change of length. In the case of glass thermometers it is known that sub-permanent changes of form lasting for many weeks occur on heating them.

The question at once occurs, whether bars of other metals may have sensibly differing lengths at the same temperature.

U. S. Lake Survey Office, Detroit, Mich., April 30, 1881.

ART. V.—*Restoration of* DINOCERAS MIRABILE; by Professor O. C. MARSH. With Plate II.

THE order of extinct gigantic mammals discovered by the writer in 1870, in the middle Eocene of Wyoming, and named *Dinocerata*, has now been investigated, and all the more important characters of the skeleton carefully determined. In this peculiar group of Ungulates, there are three well-marked genera: *Dinoceras* Marsh, the type genus, *Tinoceras* Marsh, and *Uintatherium* Leidy. These will be fully described by the writer in an illustrated monograph now nearly ready for publication. This memoir will be based upon the remains of more than one hundred and fifty distinct individuals of this order, now deposited in the Museum of Yale College.

The type species of the *Dinocerata* is *Dinoceras mirabile* Marsh, and especial pains have been taken to work out the osteology of this animal, as a key to the structure of the group. Almost every bone in the skeleton is now known by various specimens, and this affords ample material for a restoration which will represent very nearly the osseous framework of the animal when alive. Such a restoration has been attempted for the memoir in preparation, and in the present article a much reduced figure of this is given (Plate II), which shows the general proportions of the type species.

Among the points of special interest suggested by the restoration of *Dinoceras* here presented are the following:

(1.) *The absence of a proboscis.* There is no evidence in the skull of the existence of such an organ, and the proportions of the neck and fore limbs certainly rendered its presence unnecessary.

(2.) *The "horn-cores" of the skull.* An examination of a large number of these, from individuals of various ages, indicates that the posterior pair, on the parietals, were sheathed with thickened integument, which may have developed into true horn, as in the Pronghorn (*Antilocapra Americana*). The surface of the osseous protuberances is very similar in both cases. The pair of elevations on the maxillaries are equally rugose, and bear evidence of a similar covering. The small tubercles on the nasals are usually smoother, and were probably without horn-like sheathing. The three pairs of elevations are present in both sexes, but are proportionally smaller in the females.

(3.) *The canine tusks*, also, are common to both sexes, but those of the males only are large and powerful.

(4.) *The dependant processes of the lower jaw* correspond in size with the canine tusks, and are evidently adapted for their protection. In the females, these processes are but slightly developed.

(5.) *The sternum* is composed of flat horizontal segments, not compressed and vertical, as in Perissodactyls.

The material now available for a restoration of *Tinoceras grande* Marsh, is sufficient to show that this animal was similar in general proportions to *Dinoceras mirabile*, but of much larger size. The few specimens that can at present be referred to *Uintatherium* leave many points in its structure undecided. The type specimen of this genus is from a lower horizon than that of either *Dinoceras* or *Tinoceras;* and the evidence now at hand seems to indicate that *Uintatherium* is the oldest and most generalized form of the *Dinocerata.* One specimen in the Yale Museum from near the original locality, and agreeing, so far as the comparison can be made, with the type, has four lower premolars. This character will serve to distinguish *Uintatherium* from *Dinoceras*, to which it has various points of resemblance. *Tinoceras* is from a horizon higher than *Dinoceras*, and is much the most specialized genus of the group.

Yale College, New Haven, June 14th, 1881.

ART. VI.—*On the Torbanite or "Kerosene Shale" of New South Wales;* by A. LIVERSIDGE.*

The so-called "kerosene shale" does not differ very widely from cannel coal and torbanite. Like cannel coal, it usually appears to occur with ordinary coal in the form of lenticular deposits. Like cannel coal also, when of good quality it burns readily without melting, and emits a luminous smoky flame. When heated in a tube it neither decrepitates nor fuses, but a mixture of gaseous and liquid hydro-carbons distils over.

In color it varies from a brown-black, at times with a greenish shade, to full black. The luster varies from resinous to dull. When struck it emits a dull wooden sound. The powder is light brown to gray; the streak shining.

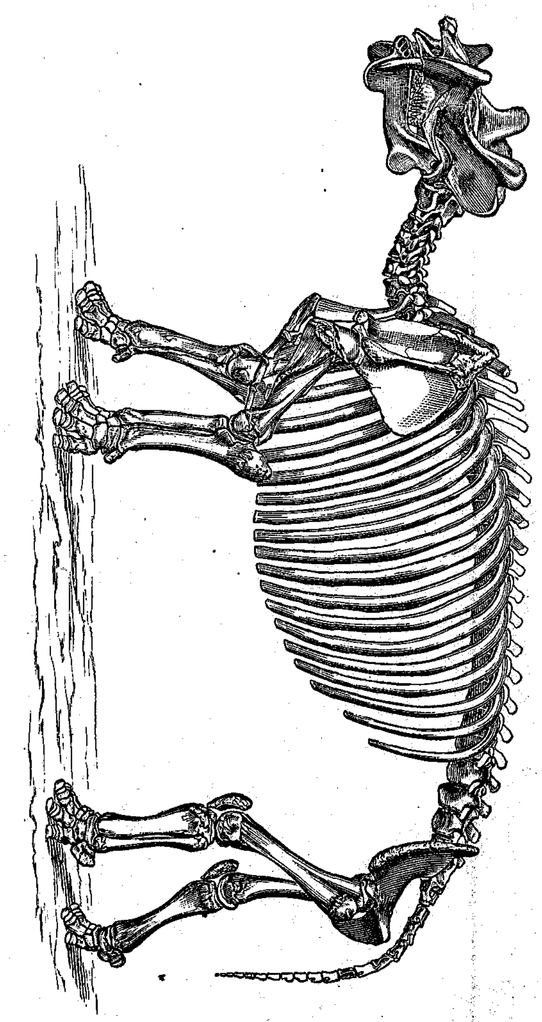
Professor Silliman proposed the name of *Wollongongite* for the mineral; but this has not come into general use, neither is it an appropriate name, since the specimen sent to him was not from Wollongong, but from Hartley.

Analyses afforded:—1, 2, 3, From Joadja Creek, color black, brownish, sp. gr. 1·103, 1·054 and 1·229; 4, From Murrusundi, dark-gray, but with white clayey specks.

Loss at 100° C.	1·160	·440	·040	1·165
Volatile hydro-carbons	73·364	83·861	82·123	71·882
Fixed carbon	15·765	8·035	7·160	6·467
Ash	9·175	7·075	10·340	19·936
Sulphur	·536	·589	·337	·549

A specimen from the Hartley seam, where most free from mineral matter, having sp. gr. 1·052, afforded: Moisture and volatile hydro-carbons 82·24, fixed carbon 4·97, ash 12·79=100. An ultimate analysis of the same, dried at 100° C., gave: Carbon 69·484, hydrogen 11·370, oxygen, nitrogen, and sulphur 6·356, ash 12·790 =100.

* Abstract from paper in Proc. Roy. Soc. N. S. Wales, Dec., 1880.



Restoration of DINOCERAS MIRABILE, Marsh; one twenty-fifth natural size.