

The relations to *Limulus* are at once suggested by the form and expression of these carapaces, while the large prominent eye-tubercles hold relatively the same position as the small approximate oculiform tubercles or spots on the anterior part of the shield in *Limulus* (and also in *Eurypterus*). The carapace is proportionally flatter than in *Limulus*, and has, like that, a strong thickened border; the posterior angles rounded. The margin is impressed or sinuate in front, and there are slight indications of longitudinal grooves on each side of the central, leaving a median lobe proportionally wider than in *Limulus*. The eyes, though imperfect, remind one somewhat of the eyes of *Trilobites*, and are remarkably prominent.

There is a single fragment of what appears to have been an articulation of the thorax, or a portion of some appendage analogous to the branchial feet of *Limulus*; it has a flattened, curving, pointed extremity. Another fragment I infer may have been the caudal extremity, it is comparatively thick and strong; but the specimen is too imperfect to be determined. The first specimen I obtained is a straight spine-like body, and I infer that the animal may have been provided with a caudal spine, as in *Limulus*.

Such, in general, are the characters of this crustacean. Whether this may have been the animal which made the peculiar tracks in the sandstone, I cannot say, but I have so inferred. The first specimen was found at a distance of thirty miles or more in a north-westerly direction from the locality of the tracks of Black River, and in higher beds of the sandstone. The last found specimens are from a more distant locality, in a southeasterly direction, and also from beds above those of the tracks. All this, however, cannot furnish matter for argument against the origin of the tracks, in the present state of our knowledge of a country which has been comparatively but little explored.

Whatever may be proved hereafter in this respect, it does not diminish the great interest attaching to so new and remarkable a form of crustacean from the unequivocal primordial zone of the north-west.

CORRESPONDENCE.

Causes of Cosmical Changes of Temperature on our Planet.

It is the essential character of space to be infinite. It can have no end. The negation of limit becomes the transcendental affirmative of the infinite. Not so of matter; matter is finite, its position in space being regulated and determined by universal resultants, the effects of its mass and attractions. Heat can only exist in that portion of space which is occupied by matter; for whether caloric be a fluid or a wave, it can have no existence in pure space where no matter exists, pure space being a negation of everything that is material. It necessarily follows that the thermal portions of space must be material.

Mr. Mackie's supposition, in the last number of the 'Geologist,' that the cosmical temperature of space should be the real zero, or absence of all heat, is correct, inasmuch as the absence of matter implies the necessary absence of heat; in the chemical sense, however, it is not a zero, but a mere negation; the real zero as a material condition can never be ascertained. It has been asked "on what grounds the idea of hot and cold regions of space can be maintained," etc., for I brought forward this theory as a solution of the glacial periods in the temperate latitudes of our earth.

Every fact goes to prove that thermal intensity, whether it be a wave (a vibration) or a fluid, is not uniform. Light and heat cannot be uniformly distributed through space, for the causes that generate them are not uniform in regard to intensity and distance.

The outside limit of the thermal ocean in space must be almost infinitely attenuated, and there is no evidence that refrigeration proceeds in a uniform ratio from the centre to the circumference of the material universe, nor is there any proof that our system revolves in a circle equidistant from the cosmic centre. There is therefore no evidence whatever that our path through space is isothermal. It has also been stated by the editor of the 'Geologist,' that to say, that the present meteorological changes on our earth are insufficient to explain the glacial eras, is merely a dogmatic assertion. In reply I have only to say, that if it be a dogmatic assertion, it is founded on faith in the invariable certainty and sequence of natural law. Have we not the wonderful and hitherto unexplained fact, that the polar regions once enjoyed the climate of Italy?—that the *Sequoia Langsdorfi* (a Californian plant), the walnut, the plane-tree, and the vine once flourished within the Arctic Circle? (Steenstrup and Beer.) Is it not an incontrovertible fact that Mount Lebanon was once covered with ice and snow? I think it will be universally admitted that these facts are incapable of explanation by any known laws of our present telluric meteorology, and also that our path through space is not isothermal, which latter supposition, supported as it is by physical facts, will fully explain all the phenomena of terrestrial glaciation.

In reply to the question in the last number of the 'Geologist,' "what is the presumed temperature of the old cosmical space through which our globe is so hypothetically supposed to have passed in the glacial age?" I have to say that the solution to this query can only be found in vital thermometry,—in the changes north and south of the isozoic zones. For it is quite clear that during the period the earth was passing through the cold regions of space the isozoic zones moved towards the equator; and that while it was passing through warmer regions of space, the isozoic zones descended nearer the poles. Therefore from the changes of the isozoic zones on the earth's surface, an approximate calculation might be made of the various cosmical temperatures through which our solar system passed during the glacial geological periods so clearly recorded on the earth's surface.

[If heat only exist where matter is, it must be subject to the laws of matter, and as a physical force would be in direct correlation with the other physical forces; and if heat be confined to matter, how can we speak of hot and cold regions of space, where by that very admission neither heat nor cold can be? Again, if confined to matter, it will, as far as our earth is concerned, be confined to that matter with which our earth is in contact, *i. e.* the great sphere of ethereal matter surrounding the sun, which is warmed by his rays and lit by his light, put in motion by his attraction or repulsion. If the sun moves on with his surrounding worlds, these will all travel onwards together in the same ethereal material envelope; and therefore, unless the supposed hot and cold regions of space have temperatures of much higher or much lower degrees than the general temperature of the solar region, the effect would be imperceptible. In this event, must we not suppose a radiation inwards of heat from space towards the sun, and consequently, one would suspect, a stoppage of all radiation from the earth? But heat is a form of motion, and motion seemingly necessitates the existence of matter. If so, therefore—if heat exist in space—all space without end must be material. Can heat or cold exist in *void* space? There is no cause whatever, no physical action, that I know of, that should either produce or accumulate heat in space or produce heated masses of space. Chemical combinations and chemical decompositions of matter might produce spheres of heated material space, but we have no data yet for such an assumption.—ED. GEOL.]

The Portland Ossiferous Fissures.

SIR,—The Rev. T. Allen's letter on the Portland fissures in your last number, induces me to send you a second communication upon that question. I have visited Portland during the present month, and descended one of the fissures, in which a large number of bones were found some months ago by a warder of the name of Maddock. I obtained all the information I was able from Mr. Maddock on the subject, and saw most of the bones. They are deposited in the Government Office at the Vern Fort. Lieutenant Home, R.E., was kind enough to allow me to examine them thoroughly, and gave me much information and assistance in investigating the phenomena of the gullies.

I must premise that I did not examine any gullies in that portion of the island where the Portland beds are overlaid by the Lower Purbeck calcareous shale.

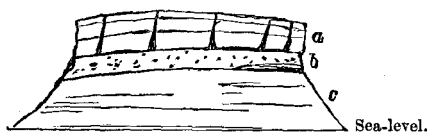


Fig. 1.—Section showing the Portland fissures.
a, stone, fissured; b, sandy clay; c, shaly clay.

They extend as nearly as possible in the direction of the length of the island; and are possibly connected with the last great movement, which affected the configuration of that part of the coast. This movement seems to have been posterior to the outspread of gravel on the heights to the north of the Ridgway fault: for the elevated beds to the south of the fault are bare of gravel.

On the west side of the northern end of Portland the beds are much broken and tumbled seawards, the gullies being very numerous. Slips occur on this side of the island. On the whole, I conclude that Portland is the remnant of an oblong mass of strata brought into its present position by the disturbances alluded to. There is a very curious miniature model of the island between Upwey and Bincombe, formed by the combined effects of faulting and denudation, and in the same series of beds that occur at Portland itself.

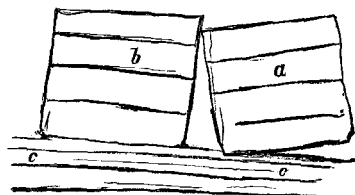


Fig. 2.—Ideal section showing nature of slip of beds in forming a fissure: a, b, masses of stone-rock, subsiding on the unequally-yielding bed of sandy clay, c.

to be closed. Yet they are not so entirely. Often they seem to be roofed by fragments that have fallen in from their sides, and have got jammed, and subsequently smaller fragments and rubbish have accumulated upon

I saw at a glance that the explanation I offered in a former communication to your Journal was incorrect. *Shrinkage* will not account for these fissures. They appear to arise from a ponderous stone-structure being raised by nature on a bad foundation.

The general structure of the gullies seems to be due to a slip of such a kind that they are more open at the bottom than at the top. (Fig. 2.)

One side has usually slightly sunk a foot or so. The jagged edges of broken stones and flints correspond on the two sides of the fissure. The rock seems a good deal shaken on both sides of the larger fissures.

With regard to the question of the fissures being open or closed at the top, the above description of them will show that, on the whole, they tend

these. Certainly at the present day there are no gaping chasms on the surface of the island, and this may have led to its being commonly said that the gullies are closed at the top. It seems probable that, where the massive Portland rock is capped by slaty stone, the latter may have continued to roof the fissures, and, as a rule, the fissures may not affect the Purbecks; but I cannot speak on this point from observation.

In the fissure which I entered I was stopped by a true talus of surface-mould, abounding in *Helices* and *Cyclostomæ*, with a few splinters of bone. These materials had most evidently been gradually introduced through some orifice in the upper surface by the action of rain. I may have traversed the fissure for about fifty yards. The true bottom was not visible; for a quantity of loose stones had been cast into it. The part of it where the bones were found is now choked up. I should conclude, from the description which Mr. Maddock gave me, that the bones, in falling from above, lodged upon a ledge of rock; and probably, if the base of the fissure were reached, many more would be found there.

Among these bones were no human bones. I did not see any such that had been found in the fissures in the Government works, but I saw a sling-stone, formed of Portland flint, which Lieutenant Home assured me he had himself taken from a gully, at a depth of 80 feet from the surface. He also told me that he had once in his possession a brecciated mass of bones, containing among them human bones; and that it had been found in a gully in making the ditch of the fort, but that it had been stolen.

The explanation given above of the cause of the formation of the fissures is that which commends itself to the intelligent persons engaged upon the Government works, and was suggested to me in the first place by Mr. Home. I subjoin a sketch of the top of a gully on the north-west side of the Vern Hill, looking north.

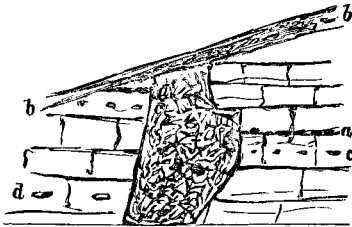


Fig. 3.—Section of gully, N.W. side of Vern Hill, Portland.

In this case the gully was evidently once open, though now filled with rubble. The beds have sunk about two feet on the east side.

I remain, Sir, faithfully yours,

O. FISHER.

Elmstead, Colchester, June 17th, 1863.

The Portland Ossiferous Fissures.

SIR,—With reference to Mr. Allen's letter in your number for last month, I beg to say that I do not doubt the truth of his statement, but merely the soundness of the inferences drawn therefrom. I presume he is aware that in what he says about the "deluge" and the bones of extinct animals he is opposed to some of the most advanced geologists of the present day, in the opinion of whom the idea of a "universal deluge" must be given up, and who also think that the fossil remains of elephants, rhinoceroses, etc., belonged to species peculiarly adapted to exist in a temperate and even a comparatively arctic climate, of which the "Siberian mammoth" and woolly rhinoceros mentioned by Professor Owen, in his 'History of British Fossil Mammalia,' are appropriate examples. Hoping you will excuse my thus trespassing on your valuable space,

I remain, yours truly,

CHARLES JECKS, JUN.

Woodlands, Thorpe, near Norwich, June 8, 1863.