

material. The thermal portion of space must therefore be material that is occupied by matter. There can be no absolute void or pure space between us and any visible star, no matter how remote; even though its distance be so immense that the courier ray that now announces to our senses its existence, may have started on its errand thousands of millions of years ago, travelling all that time at the rate of a hundred and seventy thousand miles a second, still in the immense, the inconceivable space so run over by the luminous messenger, no absolute void could have existed, otherwise the star must be invisible to us.

Mr. Mackie is therefore right in stating "that if heat be confined to matter, how can we speak of hot and cold regions of space?" but he should have added pure or empty space where no matter exists, as I only meant those portions of space occupied by matter surrounded by and floating in a thermal ocean; for whether heat be a fluid or a wave, we cannot expect to find the causes of telluric changes of temperature by travelling into regions of space where nothing exists, where there is no entity but nought, "where death is life." Mr. Mackie says (last number of 'Geologist'), "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." It is evident that the portions of space so traversed by our solar system at the rate of $57\frac{1}{2}$ miles a second, moving towards the constellation Hercules, must be material, for so far as we can see any object in the universe, between us and that object there can be no absolute void or pure space, otherwise it must be invisible. Now it is clear that the regions of space occupied by matter cannot be of the same temperature, as the causes that generate light and heat are neither uniform in intensity nor distance. The path traversed by our solar system in space therefore cannot be isothermal.

It is not likely that our solar system is travelling through space surrounded by the same ethereal envelope, as Mr. Mackie seems to think, for this would be, supposing that outside this ethereal envelope nothing existed but pure space, an assumption quite opposed to the facts and reasons already stated. Besides, whether heat be a fluid or a wave, in either case it must be subject to the ordinary influences of physical agencies; therefore the same condition of matter constituting uniformity of temperature could not follow and surround our solar system in its travels through space.

DAVID LESLIE, M.D.

Tunbridge, July 19th, 1863.

The Portland Fissures.

SIR,—I hope you will allow me to correct a mistake which you have made in your remarks on my last letter, in saying that my theory was that of "the deposition of the extinct animals in caves before the caves existed." On the contrary, I said that I was of opinion that all bone-caves were only formed by the animal remains embedded in the limestone deposit before its consolidation, and, consequently, before the existence of any caves in it.

The question with respect to the Portland and Oreston fossils is entirely dependent on the truth of certain facts. First, with respect to the Portland fossils, can the statement of Captain Manning, of the 'Willis's

Current Notes,' and of the article in the 'Times,' relating to the new fortifications in Portland, be disproved, that human and animal bones have been found mingled together in fissures of the rock which do not extend to the surface of the rock? If this statement is correct, as I believe it to be, it necessarily follows that the human and animal bones must have been embedded in the calcareous deposit when it was soft, and consequently before the existence of fissures in it; and the men and animals to whom the bones belonged must have previously inhabited some other dry land which probably no longer exists. Again, if the assertions of Dr. Buckland, in the 'Reliquiæ Diluvianæ,' and of Mr. Joseph, mineralogist, of Plymouth, in his letter to me, are correct, that the caves at Oreston, which were only discovered by working away the body of a rock in a quarry, had no apertures, it necessarily follows that the animal remains must have been embedded in the calcareous deposit before its consolidation, and consequently before there were any caves in it, and therefore the animals must have previously inhabited some other dry land. I think it is certain, from the statement of Dr. Buckland, that all bone-caves which have been discovered with apertures through which the remains of large animals could have passed are situated in the face of cliffs, produced, as he says, by diluvial denudation, and that all other caves have only been "laid open by the accidental operations of a quarry or mine." He says, "the existence of caverns is an accidental occurrence in the interior of the rock, of which the exterior surface affords no indication when the mouth is filled with rubbish and overgrown with grass, as it usually is in all places, excepting cliffs and the face of stone-quarries;" that is, in fact, where no mouths have existed but what have been made by the formation of a quarry. For instance, as stated by Dr. Buckland, the bone-caverns in Yorkshire, Devon, Somerset, Derby, and Glamorganshire "were all laid open, with the exception of the caves at Paviland, by the accidental operations of a quarry or mine." The caves at Paviland are in the front of a lofty cliff, produced, according to Dr. Buckland, by diluvial denudation, and there is no evidence that they ever had any other mouths than those which were made by the formation of the cliff.

Your obedient servant,

THOS. D. ALLEN.

Rectory, North Cerney, Cirencester, July 9th, 1863.

[It is perfectly futile to argue upon such bases as Mr. Allen persists in bringing forward. Men who, like myself, have useful duties to perform in life, cannot waste their time in arguing on imaginary bases. Mr. Allen's fundamental base of argument, if not absolutely false, as I and every rational man in the present state of science must believe it to be, is unfounded and unproven. There is *no proof whatever* that the fissures do not extend to the surface: indeed the very good observations of Mr. Fisher distinctly show that they *do extend* to the very surface. Nobody denies that human bones and mammalian bones have been found in the fissures. So have halfpence with human and other bones in caves; but such an association would only lead to an erroneous inference if the circumstances of the association were not examined and explained. If this were not done, we might infer that the mammoth was a contemporary of George II. We really will not print any more "ifs." We distinctly challenge Mr. Allen to prove that the fissures at Portland do not extend to the surface, and, until this is done, we will print nothing more from him on the subject. The theory of the formation of caves by the generation of the gases of decomposition of animals embedded in soft mud is too absurd to attack,—for the volume of gas so generated, if powerful enough to have forced open any large body of earth in forming a cavern would have formed a spherical cavity or gigantic bubble. No such gigantic bubbles of air could ever have formed long, narrow, irregular, flat fissures such as those of Portland. In some of the German caves it has been calculated, from the bones extracted, that they belonged to three times as many individuals as, with

their flesh on, the cave could contain. And this and many other arguments have been used expressly by Dr. Buckland to prove the caves were inhabited by the fossil animals while they were living. Mr. Allen can never reconcile these facts with his bubble theory. As to caves having no mouths, it is certain they must have, or have had, if we find anything in their stomachs. It would be equally consistent to argue that the flies found in the crop of a swallow must have produced the stomach in which they were found as to argue that caverns could be filled by bones of beasts without any orifice for the beasts or the bones to get in by.—ED. GEOL.]

The Portland Fissures.

SIR,—Though I should be sorry to do anything which would prolong the discussion on the Portland ossiferous fissures, I am induced to notice a statement, by Mr. Allen, in your July number, p. 253; namely, that a Plymouth correspondent informed him “that there was no aperture in the cavern” (discovered at Oreston in 1859), “and that some of the bones were embedded in ‘compact rock.’”

In some sense each of these assertions is correct:—

1st. The cavern when discovered certainly had no aperture; it was easy however to discover where there had been one. The so-called *cavern* was more correctly a *fissure*, originally open at the top; but which, after the receipt of its varied contents, had been closed up with coarse breccia, consisting of large angular masses of limestone, which, from time to time, had fallen in from above and become cemented with carbonate of lime.

2ndly. Some of the bones were embedded in stalagmite, which might truly enough be termed “compact rock,” but could not possibly be confounded with the true limestone. The quarrymen invariably gave it the distinct local designation of “callis.”

It is undesirable further to occupy your space, and indeed, it is unnecessary to do so, as this subject has already been discussed in your Journal. See ‘Geologist’ for 1859, p. 439, etc.

I am, truly yours,

W. PENGELLY.

Lamorna, Torquay, July 17th, 1863.

The Bone Spear-head from the Essex Coprolite Pits, figured in the ‘Geologist’ for 1861, page 558.

SIR,—As the remains of man or his works, in any geological formation, is one of the most interesting discoveries of the present age, no manufactured article of decidedly geological age, be it ever so rude, should be cast aside or consigned to the cabinet without there being first brought forward all the evidence possible as to its age and its origin.

Therefore when a specimen is procured, we should first show it to be one actually worked, and not formed by chance; secondly, prove from what stratigraphical formation it has been taken; and, thirdly, ascertain how far back in the scale of geological time this formation dates.

The specimen which induces me to make the first inquiry is a bone spear-head, which, about five years ago, I procured from a heap of coprolites belonging to Messrs. Rhodes, Smith, and Co., manure manufacturers, of Selby, along with sharks' teeth, *Fucus contrarius*, oysters, and various pieces of bone, all of which seem to be of the same geological age. This