habitants on the occurrence of this and previous paroxysms of their unquiet and disagreeable neighbour, is not very unreasonable.

Signor Palmieri, who watched throughout with creditable constancy the progress of the eruption, from his Observatory on the Crocelle, appears by so doing to have gained a character of almost superhuman heroism among the frightened population of Naples and its environs. The philosopher must have been much amused at the fervour of his extravagant admirers, who raised him almost to the level of their adored St. Januarius; knowing as he well did, of course, the very small amount of danger that he incurred while he remained at his post, under a substantial roof, above the possible reach of any lava-stream, in a building founded on a portion of old Somma, which has certainly never been seriously disturbed for the last 1800 years. He, better than any one, knows that the phenomena of the late eruption were by no means so exceptional as our newspaper correspondents would persuade us, but of the ordinary type of moderate Vesuvian paroxysms, such as the mountain has exhibited perhaps a dozen times within the last hundred years. That, indeed, is the judgment he is said to have passed upon it.

III.—MAN IN THE CRAG.

By T. McK. HUGHES, M.A., F.S.A., F.G.S.,

of the Geological Survey of England and Wales.

PARAGRAPHS have appeared in several papers announcing more or less distinctly the discovery of fossils in the Crag which bear upon them marks of human work. Having had considerable opportunities of looking into this question, I venture to offer some reasons for believing that there is not the slightest evidence for attributing the phenomena in question to the agency of man.

The case may be thus briefly stated:—Some of the Crag deposits being composed of phosphate of lime are used for the manufacture of artificial manure, and therefore a very large number of fossils are turned over. Among them we find, in various states of preservation, sharks' teeth and vertebræ, sponges, and concretionary masses of various symmetrical forms. Some of the teeth have been found perforated in such a manner that they might be strung together for ornaments, or arranged along the edge of an instrument like a saw; just as we find similar teeth employed by savage races at the present time. Spherical, oval, and pear-shaped bodies also are found with a hole through the centre such as gives them the appearance of beads or net-sinkers. The whole question then resolves itself into this: Is it impossible or improbable that nature produced these forms?—for on that assumption only can they be considered as evidence of the existence of Man in the Crag Period.

What then is the evidence? Only a few of the teeth have been found bored right through, and not nearly all of these have the perforation in the middle of the basal portion of the tooth (see Fig. 1).¹

¹ I have borrowed the specimens, figured on pp. 248 and 249, from my friend Mr. Etheridge, who entirely agrees with me in the views expressed in this paper.

but many, indeed most of them, have the commencement of similar perforations all over the tooth wherever the enamel has not extended or has been removed. (See Fig. 2.) Other fossils of the Crag, such as the ear-bones of whales and concretionary nodules, are bored in exactly the same manner. Similar phosphatic remains in other deposits, such as the so-called coprolite-bed near Cambridge, are found to have similar perforations.

Figs. 1. and 2. Water-worn teeth of *Carcharodon*, sp. from the Suffolk Crag.

Fig. 1. Perforated through near its base by *Lithodomus* Mollusk (or by a *Buccinum*?)

Fig. 2. Perforated partially by boring Mollusk.

Therefore there is not, in the position and manner of distribution of the holes, any evidence of design. Nor is there evidence of human workmanship in the character of the holes themselves. Though some of the holes are clean cut right through, the opening on one side is not always exactly opposite, or of the same size, as that on the other, and the interior of the cavity is often irregular, so that a perforating instrument, such as savages would be likely to use for the purpose, could not be pushed through from one side to the other.

Therefore the characters of the holes themselves do not point to human agency. But is there any direct evidence of other agents which may have produced the perforations? In the phosphatic deposits at the base of the Chalk it is not uncommon to find the shells of the lithodomi which have honeycombed an ammonite or other fossil. The cavities formed by these animals are easily recognized by their shape, which is something like a sodawater-bottle. I selected a tooth from the Crag which had a hole on one side only, but which was in other respects similar to some of those which ran through. (See Fig. 3.) Mr. J. B. Jordan cut it across for me with delicate machinery, and displayed the well-known form of the lithodomus cell. (See Fig. 3a.)

If such a borer attacked a thin tooth imbedded in clay at the bottom of the sea, it would drill a hole clean through the tooth into the clay below; or if the tooth were more or less enveloped in concretionary phosphatic matter, which is very commonly the case, the same result would be produced. When the encasing matter was

removed, the tooth would be found to be pierced by a clean-cut hole representing the middle portion of the lithodomus chamber. If the

Fig. 3. Large tooth of *Careharodon megalodon*, Agassiz, from Crag. Out-line restored by dotted line. *a b* line of section through the hole.

Fig. 3a. Section through lithodomus cell along the line *a b* of Fig. 3.

animal bored through the clay and only just touched the tooth, it would be eaten out into one of those basin or saucer-like cavities so common over most of these Crag fossils. Boring gasteropods, burrowing sponges, the wear and decomposition of the fossil along broken or softer and more soluble portions, must also be taken into account. From the nature of the case, therefore, we might expect to find sometimes regular, sometimes irregular cavities, as the hole was driven right through from one side only, or two holes from opposite sides were afterwards united.

Thus we have evidence that animals which could produce these holes did live in the Crag sea, and the exceptional cases where they bored through, or where the partition between two holes on opposite sides was broken through, can be easily explained.

With regard to the bead-like bodies, I may mention first of all a fact which has come under my own observation. A chalybeate spring emptied itself into a small stream which ran over a clayey bed into the marshes of North Kent. Many water weeds grew along this stream, striking their roots deep into the clay. Around these roots the iron formed concretions in the clay, especially when they were decomposing, and, when the root had perished, these concretions had the form of irregular cylindrical masses with a hole down the middle. Some of the perforated cylindrical bodies of the Crag may have had *mutatis mutandis* a similar origin. Again, sponges and other organisms are very apt to grow round stems of any kind, and when fossilized these would often preserve the cast only of the body around which they grew. A similar question has been raised before with regard to some remarkable forms derived originally from the Chalk, which are known to have been picked up and used as beads in later times.¹

To sum up. Those who would bring these perforated fossils forward as evidence of the existence of man in the Crag period must show—not only that they are like some objects known to have been the result of human agency—but also that Nature could not or was not at all likely to have produced similar forms.

On the contrary, however, it would appear that most of them are unlike human work, and that some of them were and all may have been produced by well-known natural agents.

IV.—ON THE DISCOVERY OF REPTILIAN FOOTPRINTS IN NOVA SCOTIA.

By ALFRED R. C. SELWYN, F.G.S.,

Director of the Geological Survey of Canada.

THE very fine series of fossil footprints which, at my request, Principal Dawson has kindly examined and described in the accompanying note, were discovered last summer, in Nova Scotia, under the following circumstances.

Mr. Scott Barlow, of the Canadian Geological Survey, was at the time engaged in geological explorations in the district of Spring Hill, Cumberland County, where he met Mr. Albert J. Hill, C.E., in charge of works at the bridge over River Philip, on Section viii. of the Intercolonial Railroad, and he informed Mr. Barlow that he had in his possession a slab of sandstone showing small footprints, which he wished to present to the Geological Museum in Montreal. Subsequently, on the 1st September, he informed Mr. Barlow that slabs with large and numerous footprints had been found, and were at the bridge. At the same time Mr. Hill informed Mr. Sandford Fleming, the chief engineer, of this highly interesting discovery, who at once took steps to have all the slabs with footprints preserved, and directed that they should be given to Mr. Barlow, for transmission to the Museum of the Geological Survey.

¹ James Wyatt and Rupert Jones, *Geologist*, vol. v., 1862, pp. 233, 236. See Lyell, *Antiquity of Man*, p. 119.