XIX.—*On the discovery of Fossil Teeth of a Leopard, Bear, and other animals in a Crag Pit at Newbourn in Suffolk.*

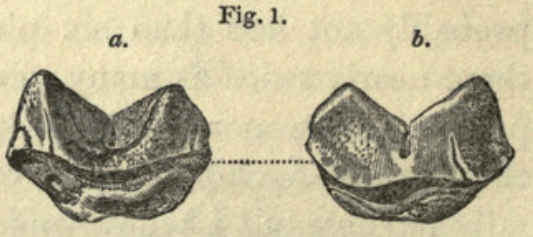
By Charles Lyell, Esq., F.R.S., V.P.G.S., &c.

During a late tour in Suffolk (June 1839,) Mr. Wm. Colchester of Ipswich pointed out to me in his collection of fossil teeth from the Red Crag of Newbourn near Woodbridge, one tooth which differed greatly from the rest, and which we, both of us, suspected to belong to a carnivorous mammifer.

On submitting the tooth to the inspection of Mr. Owen of the College of Surgeons, he found on comparison that it agreed precisely in size and shape with the posterior grinder of lower jaw (left side) of the Leopard, *Felis leopardus*, Linn. "This tooth," says Mr. Owen, "is so exactly similar in size and shape to the corresponding tooth in the Leopard, that even its specific identity could not be denied. At the same time the dental formula of the genus *Felis* maintains so close a correspondence in everything but size throughout the known species, that the identity of the fossil with any existing species could not be affirmed on the evidence of a tooth alone. The characteristic fragment from Newbourn affords however decisive evidence that a feline animal as large as a Leopard existed at the geological epoch indicated by the formation in which it was found."

The molar in question is imperfect; the crown and upper portion, so far as the enamel extends, is well preserved, but the base has lost the fangs, and has the appearance of having been worn and polished after the fangs had been broken short off. The two cusps on the crown still retain their points. (See fig. 1.)

Fig. 1.



Posterior molar (left side) of Leopard.
a. View of tooth from the inside.
b. View of the same from the outside.

This fossil resembles in colour that of many of the accompanying teeth of fishes, most of which belong to different species of the shark family, with which the palatal bones of the *Myliobates*, a kind of Skate, are intermixed. It is deserving of remark that in a great portion of the shark's teeth the softer or bony portion at the base has been worn away more or less

entirely as if by attrition, while the upper part, or that covered by enamel, has suffered but slightly. In a word they seem to have been subjected to the same mechanical action as the tooth of the Leopard.

Newbourn is a village on the west side of the estuary of the Deben, and about six miles S.W. from Woodbridge. In the large pit of red crag at the northern extremity of the village (Mr. Wolton's pit) the crag presents its ordinary character of a purely marine deposit, containing the usual shells, in great part comminuted. But the horizontal strata are traversed to the depth of about thirty feet by numerous fissures, which are from a few inches to a foot or more in width, and are filled principally with the detritus of red crag in which numerous fragments of shells are still preserved. Some of these rents terminate downwards, coming to a point, with no signs of fracture below. As at present our information simply extends to the fact that the Leopard's tooth was picked up together with those of fishes in this pit, it might be suggested that the mammalian relic was possibly derived from the contents of one of the fissures, the filling of which was an event certainly posterior and perhaps long subsequent to the æra of the deposition of the crag.

It is well known that teeth of the cave hyæna were found near Maidstone, in Kent, in a rent traversing the limestone called Kentish Rag, and it was not till many years afterwards that any other teeth or bones of quadrupeds were discovered in the superficial deposits of the same district.

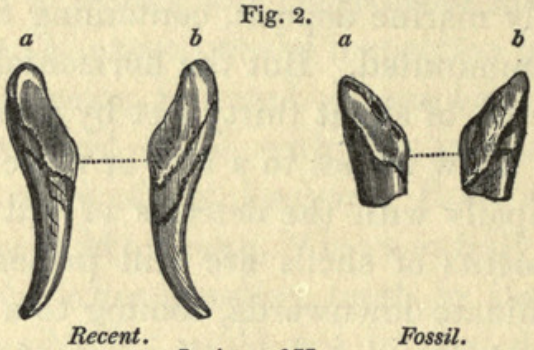
Mr. Searles Wood, to whom I communicated the result of Mr. Owen's examination of the Newbourn fossil, lost no time in carefully examining a large collection of fossil teeth from Newbourn, belonging to the Rev. Edward Moore, of Bealings, near Woodbridge. They belong chiefly to the fishes usually found in the Red Crag, but Mr. Wood selected from among them some which he supposed to be mammalian. Mr. Owen, after an attentive comparison of these, has been able to refer them to a Bear, Hog, and a large Ruminant of the size of the red deer.

The following are the notes on these specimens with which I have been favoured by Mr. Owen :—

"1. *Bear.*—The crown of the tooth of a species of *Ursus*. It is the antepenultimate molar, right side, upper jaw. The fossil indicates a species about the size of the common European bear, but not identical with that or any other existing species. It is smaller than the two large species of bear from the German bone caverns. I have not the means of comparing it with the smaller extinct species described by Goldfuss.

"2. *Hog.*—The external incisor of a young Hog: the tooth

Fig. 2.



Incisor of Hog.

a a. View of tooth from the inside. *b b.* View of tooth from the outside.

belongs to the lower jaw, right side, and very closely resembles the corresponding tooth of a young wild boar. (See fig. 2.)

"3. *Ruminant.*—Fragments of a fractured molar of a Ruminant as large as the red-deer."

The fossil teeth above described, like the tooth of the leopard, are all of them more or less broken and worn. We know not whether they were procured from the fissures or the regular strata of the large Newbourn pit, but I confess that, judging from their appearance, I incline to the opinion that they are all of the age of the red crag. They seem to have undergone precisely the same process of trituration, and to have been impregnated with the same colouring matter, as some of the associated bones and teeth of fishes which we know to have been derived from the regular strata of red crag. Had these mammalian remains been simply washed into fissures formed subsequently, we might have expected them to be in a different state from the crag fossils. It is true that in the formation last mentioned, throughout its range in the counties of Suffolk and Essex, no vestige of a terrestrial quadruped had previously been met with; but I may remind the reader that Mr. Wood found in the red crag of Butley, about seven miles north-east of Newbourn, a single specimen of a freshwater

shell, a variety of the *Planorbis marginatus*, and in the red crag of other places three individuals of an estuary species, *Auricula myosotis*. The same river which conveyed these shells, but especially the *Planorbis*, into the open sea, may also have carried down the carcasses or bones of land animals.

XX.—*On the occurrence of Fossil Quadrumanous, Marsupial, and other Mammalia in the London Clay, near Woodbridge, in Suffolk.* By Charles Lyell, Esq., F.R.S., V.P.G.S., &c.

In the summer of 1838 I was informed by Mr. Wm. Colchester of Ipswich, that he had obtained in the spring of the preceding year, from Kyson (or Kingston), near Woodbridge, in Suffolk, a tooth which he supposed to belong to a mammiferous quadruped, and that it was derived from a bed of sand which he conceived to belong to the London clay formation. In the following year, after having seen the tooth in question and recognized it as decidedly mammiferous, I requested him to take me to the spot, which is situated near the village of Martlesham, on the borders of the estuary of the Deben, about 1½ mile from Woodbridge, and at the distance of about 6 miles from the village of Newbourn mentioned in the preceding notice. I found the deposit at Kyson to consist of brown clay laid open to the depth of 12 feet, and below this sand in layers, yellow and white, which has been pierced to the depth of 12 feet without reaching the bottom. The clay and sand here are dug for making bricks; in the uppermost bed of this sand, precisely at the point where it is in contact with the overlying clay, I found numerous teeth of fishes of the Shark family, similar to others which Mr. Colchester had previously met with associated with the mammalian tooth.

As the clay at Kyson is covered by red crag at a short distance from the pits, and as I had seen clay of the same colour beneath the crag in the neighbouring cliffs of Bawdsey, and also at Felixstow and Harwich, containing Septaria, and as at Harwich the imbedded shells, fruits, and bones of Turtle, are such as characterize the London clay, I entertained no doubt that the Kyson formation belonged to the Eocene period.