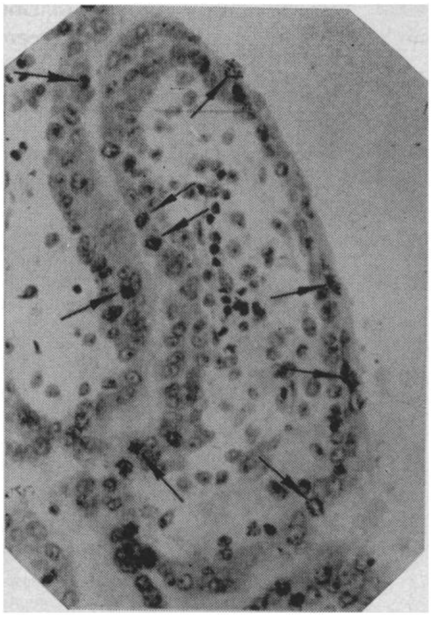

Fig. 2. Placental villi from a monkey 48 hours after it had received H^3-thymidine. A large proportion of labeled nuclei are now in syncytiotrophoblast (arrows).

this context our earlier immunohistochemical demonstration of human chorionic gonadotropin in the cytoplasm of human syncytiotrophoblast must indicate that syncytiotrophoblast synthesizes this hormone. Cytotrophoblast on the other hand contains no chorionic gonadotropin (*4*), is an embryonic form of trophoblast which divides rapidly, is ultrastructurally undifferentiated, and lacks the organelles for specialized function. Similar evidence demonstrating that human placental cytotrophoblast in vitro can differentiate into syncytiotrophoblast has been found (*9; 10*).

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Pleistocene Marine Microfauna in the Bootlegger Cove Clay, Anchorage, Alaska

Abstract. *Ostracods and Foraminifera, associated with molluscs, indicate a marine depositional environment for part of the Bootlegger Cove Clay. The definite Arctic and North Atlantic affinities of the microfauna suggest a possible migration through the Bering-Chukchi seaway during the late Pleistocene.*

Anchorage, Alaska, situated at the head of Cook Inlet, is built on a dissected gravel plain. Underlying these gravels and younger deposits, and exposed in bluffs along Knik Arm and Cook Inlet, is the Bootlegger Cove Clay. The depositional environment under which the clay was deposited has been the subject of debate. It may be lacustrine or freshwater, estuarine to marine, or, as some workers conclude, partly marine and partly lacustrine. Miller and Dobrovolny (*1*) state that its environment is unknown but favor a lacustrine environment. Karlstrom (*2*) and Trainer (*3*) recognize a vertically restricted middle marine zone in the Bootlegger Cove Clay. Karlstrom considers that this marine zone is underlain and overlain by lacustrine clay and silt. Discovery of a marine microfauna in the Bootlegger Cove Clay supports the view that, in part, the clay was deposited in a marine, or estuarine, environment.

The Bootlegger Cove Clay is of Pleistocene age and occurs between tills of Knik and Naptowne age. Its stratigraphic position and lithology were described in detail by Miller and Dobrovolny. They consider the Knik Glaciation to be of pre-Wisconsin age. Karlstrom believes that the Knik Glaciation was pre-Wisconsin but post-Illinoian (*2*). Peat beds appearing to occur at the same stratigraphic horizon as the Bootlegger Cove Clay have been dated as "older than 38,000 radiocarbon years" (*1*, p. 15). Shells within the Bootlegger Cove Clay were dated by ionium-uranium methods as 46,000 to 31,000 B.C. (*2*, p. 330).

A major point in the discussion about the origin of the formation has been whether fossil molluscan shells collected along the bluff have been washed up from the inlet, or whether they were in material that was "unquestionably undisturbed." The marine molluscs collected along the bluff in sections 22 and 23, T13N, R4W, S.M. by Miller and Cooley have been identified by F. S. MacNeil as *Buccinum* cf. *B. physematum* Dall, *Odostomia (Evalea)* sp., *Nuculana fossa* Baird, *Cardium ciliatum* Fabricius, *Macoma* cf. *M. sabulosa* Gmelin, *Saxicava pholadis* Linné, and *Mya truncata* Linné (*1*, p. 45).

Up to now, no reference has been made to any evidence of a fossil microfauna by any previous investigators. In July 1962 J. R. Williams of the U.S. Geological Survey and I revisited the exposures of the clay along Knik Arm. In a freshly exposed bluff in NW¼-SW¼ sec. 22, T13N, R4W, S.M., 5.7 km (3½ miles) southwest of Anchorage, a shell bed was clearly exposed in an undisturbed section of the bluff. The bluff, the top of which was approximately 15.3 m (50 ft) above water level at high tide, was channel-

Table 1. Sampled section along bluff of Knik Arm in NW¼SW¼ sec. 22, T13N, R4W, S.M.

Sample No. (from top to bottom)	Description	Thickness of bed * (m)
	Top stratum	
8	Clean gray sand and soil. No fossils.	0.14
	Bootlegger Cove Clay	
7	Silty clay, dark greenish gray, lighter gray laminations. No fossils.	1.68
6	Silty clay, dark greenish gray. No fossils.	2.54
5	Silty clay, greenish gray. Uppermost pelecypod fragment in outcrop. Foraminifera and Ostracoda rare.	1.37
4	Silty clay, greenish gray, with sandy partings. Foraminifera and Ostracoda present.	1.02
3	Silty clay, greenish gray, with sandy partings; contains small pebbles and occasional coal fragments. Molluscs abundant upper 1.3 m (50 inches), lacking lower 0.25 m (10 inches). Foraminifera and Ostracoda abundant.	1.42
2	Silty clay, dark greenish gray, containing angular pebbles and cobbles. Foraminifera and Ostracoda rare.	1.37
	Bootlegger Cove Clay but offset 3.6 m to east	
1	Silty clay, dark greenish gray, angular and rounded pebbles and cobbles. Foraminifera rare, no Ostracoda.	2.74
0	Remainder of bluff covered by slump to high tide level.	2.67

* English equivalents are as follows: sample 8, 0 ft, 5.5 in.; sample 7, 5 ft, 6 in.; sample 6, 8 ft, 4 in.; sample 5, 4 ft, 6 in.; sample 4, 3 ft, 4 in.; sample 3, 4 ft, 8 in.; sample 2, 4 ft, 6 in.; sample 1, 9 ft, 0 in.; and sample 0, 8 ft, 9 in.

sampled from top to bottom, except for 2.7 m (9 ft) at the base which was covered by slump. Ten samples were taken, covering intervals ranging from 1 m (40 in.) to 2.7 m (9 ft). The base of the shell bed was about 7 m (23 ft) above the water level at high tide. About 91.7 m (300 ft) west of the sampled section were freshly slumped blocks which had been broken away from the bluff probably 3 to 4 weeks previously during heavy rains. The shell bed was clearly seen on all sides of the slumped blocks. It was also seen on the face of the bluff from which the blocks had broken away, at the same stratigraphic horizon as in the channelled section.

These exposures, which are probably better than those seen by previous workers, leave no doubt that the molluscan shell bed is definitely in place and was not washed up by high tides and storm waves. Table 1 is an abbreviated field description of the section sampled and its fossil content.

Thus, the upper 4.3 m (14 ft) of the bluff contained no fossils, either megascopic or microscopic. Foraminifera were first seen in the next 7 feet, ostracods were seen rarely, and only a single fragment of a pelecypod shell was seen. The shell bed yielded an abundant microfauna, and Foraminifera were also found in the 4.0 m (13 ft) sampled beneath the shell horizon.

At the present time, the only other sample examined came from clay at a depth of 4.6 m (15 ft) in an auger hole in SW¼SE¼SW¼ sec. 8, T13N, R3W, S.M., 0.24 km (780 ft) N10°W of Ship Creek bridge on Post Road. Foraminifera, *Elphidium* spp., were in this sample.

The ostracods and Foraminifera in the Bootlegger Cove Clay are characteristic of marine environments. The following species of ostracods have been identified: *Normanicythere* sp., *N.* cf. *N. macropora* (Bosquet), *N. leioderma* (Norman), *Loxoconcha* sp., *Trachyleberis* cf. *T. rastromarginata* (Brady), *Palmanella* sp., and *Cytheropteron* sp.

The ostracod fauna is comparable with that of the marine Gubik Formation of Pleistocene age on the North Slope of Alaska (*4*). Several species appear similar to those illustrated, but not described, by Swain. The genus *Normanicythere* has previously been described only from Arctic and North Atlantic environments (*5*). This is the first observation of *N. leioderma* from the Pacific. It is abundant in this collection, and abundant in Recent sediments from the western Atlantic, but it is rare in the Pleistocene in England.

The following Foraminifera in the Bootlegger Cove Clay have been identified by Joyce Mumby of Anchorage: *Quinqueloculina seminula* (Linné), *Guttulina lactea* (Walker and Jacob), *G.* sp., *Globulina* cf. *G. glacialis* Cushman and Ozawa, *Elphidium incertum* (Williamson), *E. incertum* (Williamson) var. *clavatum* Cushman, *E.* cf. *E. bartletti* Cushman, *Elphidiella groenlandica* (Cushman), and *Protelphidium orbiculare* (Brady). These species have been described previously from Arctic and North Atlantic areas (*6*).

The presence of this fossil microfauna, with North Atlantic and Arctic affinities, may indicate that at the time the waters were invading the Cook Inlet area and depositing the Bootlegger Cove Clay, there might have been a seaway between Siberia and Alaska, that permitted free interchange of the Arctic, Atlantic, and Pacific faunas (*7*). It may also indicate that the fauna had free access earlier in the Pleistocene, and developed separately in each area. Until more work is done in the northern Pacific, this question cannot be resolved.

The presence of undoubted marine microfauna found in place does seem to lend considerable weight to the opinion that part of the Bootlegger Cove Clay was deposited under marine shallow water, or estuarine conditions, rather than in a lacustrine environment (*8*).

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Conditioned "Anxiety" and Punishment Effects on Operant Behavior of Goldfish (Carassius auratus)

Abstract. *Hungry goldfish learned to press a lever for worms on a 2-minute variable-interval schedule of reinforcement. Lever pressing was suppressed in the presence of a flashing light by (i) pairing the light with a brief electric shock ("anxiety") and (ii) punishing the lever-pressing behavior with electric shocks.*

Operant behavior of hungry animals can be suppressed markedly in the presence of a previously neutral stimulus (visual or auditory) that has been regularly terminated with a brief electric shock (*1*). Another method for inducing suppression of lever-pressing behavior involves punishing with electric shock any lever response made during the presentation of a previously neutral stimulus (*2*). Both methods have been employed extensively in experiments utilizing cats, rats, and monkeys (*3*). Their potential value as tools for evaluating pharmacologic agents also has been reported (*4*).

The present report describes the development of suppression of the lever-pressing behavior of hungry goldfish. The experimental apparatus consisted of a large plexiglass feeder (*5*) patterned after one designed by Longo and Bitterman (*6*). By the operation of a solenoid, the feeder automatically discharged a worm (Tubifex) from one of a series of medicine droppers.

The experimental chamber was an aluminum cubicle without a bottom so that it could be placed over a fish tank. In the front wall of the cubicle were mounted three miniature, red-covered, 28-volt lamp bulbs (GE 313), which served as house lights to signal the start of an experimental session. The far wall of the tank was covered with a translucent sheet of plexiglass, behind which was mounted a 12-volt, 4-ca-power bulb. Illumination of the bulb served as a conditioned stimulus. The fish could be shocked through two plexiglass electrodes (about 21 by 28 cm) affixed at right angles to the