As shown in the illustration the stem of a bolt with a large flat head is passed through a one-hole rubber stopper. A substantial washer is then placed over the stem of the bolt and above this a cylindrical metal sleeve which serves to carry the wing nut away from the mouth of the bottle affording greater freedom in tightening down on the rubber stopper. After such a stopper has been pushed into place, a few turns of the nut compress the rubber longitudinally and bring about a lateral expansion which holds the stopper in place and gives a sufficiently tight seal for any ordinary purpose.

FRANK M. EATON

BUREAU OF PLANT INDUSTRY

THE FINDING OF PLEISTOCENE MATERIAL IN AN ASPHALT PIT AT CARPINTERIA, CALIFORNIA

IN February, 1927, on the Lucien Higgins ranch in Carpinteria in southern Santa Barbara County, California, a steam-shovel which was taking out road material over a deposit of asphalt disclosed some bones. These were brought to the attention of Mr. Norton Stuart, curator of the Santa Barbara Museum of Natural History. Mr. Stuart at once began an investigation of the field and after several unsuccessful attempts to locate the source of the earlier finds, at last discovered a mass of material which extends to a depth that has not yet been measured. Here Mr. Stuart found a great number of bones of birds, mammals and rodents, together with pine cones, leaves and other plant material.

Mr. Stuart was able to identify some of the bones as those of *Teratornis*, others as those of a horse, close to *Equus occidentalis*, and the cones as those of the Monterey Pine, *Pinus radiata*.

The Santa Barbara Museum of Natural History then invited Mr. Chester Stock and Mr. Ralph Chaney to examine the material which had been discovered, and has arranged with the Carnegie Institution to continue the excavation and the study of the material disclosed.

The discovery of this interesting material exemplifies the value of a local natural history museum on whose staff are men who can grasp the significance of such local discoveries.

RALPH HOFFMANN,
Director

SANTA BARBARA MUSEUM
OF NATURAL HISTORY

PLEISTOCENE FAUNA AND FLORA

ALTHOUGH bituminous deposits along the coast of southern California, between Santa Barbara and Ventura, have been known for a number of years, the early mining operations for asphalt in this region apparently never brought to light the presence of fossil remains in these accumulations. Recently the discovery of vertebrate and plant materials of Pleistocene age in an asphalt bed south and east of Carpinteria, made as a result of excavations for road materials, has directed the attention of the Santa Barbara Museum of Natural History to this locality.

The deposit in which the fossil organisms are found has been described and referred to by several authors. It was considered in some detail by Eldridge[1] in his extensive report on the asphalt and bituminous rock deposits of the United States. In 1907 Arnold[2] showed the extent of this deposit on the geological map of the Summerland Oil District, Santa Barbara County, California, and discussed its occurrence in the report on the geology and oil resources of the Summerland region.

Through the kindness and cordiality of Mr. Ralph Hoffmann, director of the Santa Barbara Museum and Mr. Norton Stuart, curator, the Carnegie Institution of Washington and the California Institute of Technology have been invited to explore the locality and to cooperate with the Santa Barbara Museum.

The geological section is well exposed in the sea-cliff one half to three quarters of a mile southeast of Carpinteria and is essentially that described by Eldridge. The Pleistocene deposits containing the vertebrates and plants lie unconformably above highly inclined Tertiary (Miocene) shales and sandstones, resting upon a surface apparently developed as a result of marine planation of the older rocks. The Pleistocene formation is practically in horizontal position and reaches a thickness in cliff-section of 10 to 12 feet. It consists of sharp sand and some gravel and has been thoroughly impregnated by petroleum. The sand is sometimes cross-bedded. Eldridge records the finding of an occasional shell in this stratum.

Overlying the bituminous sand and gravel is a white or brownish sand which is at least two and one half feet thick and may be somewhat thicker. This sand has not been penetrated extensively by petroleum and, as compared with the underlying formation, may be regarded as practically free of such penetration. That the unimpregnated sand accumulated after a second period of erosion during which a part of the bituminous sand was removed and the bed containing the remains of land organisms

[1] Eldridge, G. H., 22nd Ann. Rpt. U. S. Geol. Surv., Pt. I, pp. 444–445, pl. 58, 1901.

[2] Arnold, Ralph, U. S. Geol. Surv. Bull., pp. 33–35, pls. 1 and 3, 1907.

was truncated is suggested by the relationships of the two deposits.

Above the white or brownish sand is a dark earthy material reaching a thickness of at least six feet. In the vicinity of the fossil occurrence the soil layer contains many marine shells and shell fragments and these are strewn also over the surface of the ground. Indian remains and implements have been found in the soil stratum, pointing quite unmistakably to the fact that the locality has been occupied in recent time as an Indian site.

The Pleistocene mammals, birds and plants found in the bituminous layer appear to be concentrated in a relatively small area, but further exploration may reveal a more extensive accumulation of remains. The occurrence is unique in that it has furnished a large representation of plant remains. The plant assemblage is discussed below by Dr. Ralph W. Chaney and Mr. Herbert L. Mason, and the birds by Dr. Loye Miller.

The mammals occurring at the Carpinteria locality include the following forms:

Aenocyon, near dirus Leidy
Canis, probably ochropus Esch.
Urocyon, near californicus Mearns
Mephitis, sp.
Odocoileus, sp.
Equus, near occidentalis Leidy
Lepus, sp.
Eutamias, sp.

The mammals include types found also at Rancho La Brea and at McKittrick. The single exception is the chipmunk which is not recorded at the Los Angeles locality and thus far has not been recognized at McKittrick. The assemblage contains certain elements suggestive of a forest environment, thus presenting the possibility of ecologic conditions which differ somewhat from those prevailing at Rancho La Brea and at McKittrick during the period of their accumulation. The time relationship of the Carpinteria fauna to those from the asphalt stations mentioned above may be more definitely stated when further collections are obtained.

An important feature of the occurrence is the apparent clearness with which the relationship of time of accumulation of the animal and plant remains to the geological record of this region can be established.

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BIRD REMAINS

THE bird remains examined total eighty determinable specimens which are distributed on preliminary examination among fifteen species, all of which have been reported from Rancho La Brea and all but two of which are common to Rancho La Brea, McKittrick, and the new horizon under discussion.

Four of the species are extinct, namely *Teratornis, Parapavo, Neophrontops,* and *Neogyps.* A fifth species, *Polyborus,* is foreign to the region in Recent time. *Parapavo* and *Gymnogyps* do not occur at McKittrick. Thus the fauna shows closer affinity with Rancho La Brea than with McKittrick, suggesting that the San Diegan region was distinguishable from the San Joaquin Valley Region by faunal differences as it is to-day. Such a form as *Parapavo* might naturally be expected to conform to the physiographic barrier of the Lliebre and the Tejon Mts. even though less elevated than at present. That the strong flying *Gymnogyps* should have been so restricted is difficult to believe.

List of species and specimens of birds. The asterisk (*) indicates a species extinct in the region to-day.

	Specimens
Anas platyrhynchos (?)	2
**Parapavo californica*	17
Lophortyx californica	1
Gymnogyps californianus	4
**Teratornis merriami*	1
Aquila chrysaetos	28
Buteonid hawks	15
**Neogyps errans*	1
**Neophrontops americanus*	1
**Polyborus cheriway*	2
Bubo virginianus	2
Colaptes cafer	2
Geococcyx californianus	1
Corvus corax	2
Small passerine species	1
	80

The single species of swimmer and the total absence thus far of waders coupled with the occurrence of such species as the road runner and the California peacock would indicate a coastal plain quite independent of strand influence.

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FOSSIL PLANTS

ANY facts that bear upon the subject of the origin and distribution of endemic floras are particularly welcome. This field of science has at its command very little in the way of evidence that is concrete or convincing. Therefore the finding in the geological record of fossil materials that prove the existence of a flora in past time in a locality remote from its

present distribution is most significant. Such is the recently discovered flora of the Pleistocene Brea deposits at Carpinteria, Santa Barbara County, California.

This flora as now known represents a forest assemblage dominated by coniferous trees with a heavy undergrowth of shrubs and herbs. Following is a list of fossil plants thus far found in the deposit:

Pinus radiata Don.
Pinus muricata D. Don.
Cupressus goveniana Gord.
Arceuthobium, sp.
Chorizanthe, sp.
Platanus, sp.
Amelanchier, sp.
Arctostaphylos, 3 species.
Numerous other small elements not yet identified.

Two hundred miles northward there exists to-day a relict flora limited to the coastal slopes in the vicinity of Monterey Bay. Small groves occur northward and southward over a total distance of about fifty miles. This forest flora is dominated by the Monterey Pine (*Pinus radiata* Don.) and has associated with it the Bishop Pine (*Pinus muricata* Don.), the Monterey Cypress (*Cupressus macrocarpa*), and the Gowen Cypress (*G. goveniana* Gord.). The ground cover of this forest is composed largely of shrubs of Manzanita (*Arctostaphylos*) and California lilac (*Ceanothus*), there being several species of each. Aside from these there are many other less common shrubs and a host of herbaceous plants. It is this forest flora that existed in Pleistocene time in the vicinity of Carpinteria, practically as it exists to-day on the slopes back of Monterey Bay.

The preservation of the fossil material is particularly fine and the completeness of the specimens is unique. The conifers are all represented by wood, leaves, ovulate and staminate strobile; the mistletoe is represented by twigs, scale-leaves, staminate and pistillate flowers, and fruits; the Manzanitas by wood, leaves, flowers and fruits. Particularly noteworthy are the flowers of Amelanchier and of the Manzanitas, in which minutest details as to pubescence, surface markings and stamen peculiarities are plainly discernible. Epidermal layers of leaves show remarkable structure of tissue and stomata. Sections of much of the wood show mycelial threads of parasitic fungi as well as the borings and remains of beetles. The threads of fungi, preserved and stained by petroleum, stand out in striking contrast to the tissues of the wood.

The absence of Ceanothus in the fossil deposits is noteworthy, as it occupies such an important position in the living forest. However, further excavation is expected to bring to light other species and it is reasonable to suppose that Ceanothus may be among them.

In comparing the flora with that of the other tar deposits of California it is significant to note that there is but one species in common with each of them. *Pinus muricata* is found also at Rancho La Brea and one species of Arctostaphylos occurs in the McKittrick deposit. The La Brea flora contains a Cypress specifically distinct from that at Carpinteria. It is associated with elements indicating a drier habitat such as *Juniperus* sp., *Quercus agrifolia* Nee, *Celtis* sp. and other elements of a similar nature. The La Brea flora appears to be ecologically comparable to the openly wooded hills of the inner California Coast Ranges, whereas the Carpinteria flora is obviously coastal. The McKittrick flora has not yet been studied but in all probability is of the inland type.

From the fact that all the fossil plants from Carpinteria are identical or similar to species now living in California it seems proper to refer this flora to the Pleistocene. The assemblage indicates a climatic change in the region since Pleistocene time involving a lessening of the rainfall, an increase in the evaporation rate, and a considerable lessening of the amount of summer fog.

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SPECIAL ARTICLES

THE AXIAL GRADIENT IN PARAMECIUM

IN work on the effect of crowding in *Paramecium caudatum* it was noticed that individuals from the same parent, under identical conditions, divided at different rates. Further, it was found that in the isolated fission products of animals which had divided in the morning the anterior piece had a more rapid rate, but in those isolated in the evening after division, the posterior piece divided first. This suggested a temperature effect. To test this the exact time of division of fission products was recorded for three filial generations at three temperature ranges; in fifteen cases at 26 to 30 degrees, in fourteen cases at 18 to 22 degrees, and in twelve cases at 13 to 17 degrees Centigrade. The experimental animals were transferred from room temperature, 18 to 22 degrees, to the high or low temperature for the period of the experiment. Constant attention was required in the experiments, for approximately forty-eight hours at highest temperature and over seventy-two hours at