genes in other respects; both are incapable of reproduction outside of living cells, they produce similar effects, as, for instance, variegation or mottling, in plants, and they are, under natural conditions, capable of mutating to new forms which retain the ability to reproduce themselves. The virus differs from genes in being able to move from cell to cell and in being capable of inoculation into the cells of healthy plants. The fact that tobacco-mosaic virus is inactivated by radiant energy of the x-ray and ultra-violet[4] bands in a manner similar to that of genes suggests an alteration in the virus particles comparable to that which takes place in genes.

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VERTEBRATE REMAINS FROM CENOZOIC ROCKS

VERTEBRATE remains from the sediments filling the Rio Grande Basin of northern and central New Mexico are fairly common, yet they are not so common as to deserve no notice when new bones appear. Moreover, fossils from these sediments always lend assistance in the interpretation of the complicated history of this great trough. Although good exposures of valley fill are plentiful in Socorro County, fossil remains from the fill are very scarce.

In April, 1935, the writer unearthed the complete lower jaw of a four-tusked mastodon from the fill about six and one half miles northeast of Socorro, along the south bluff of Arroyo de la Parida. The material in this exposure is unconsolidated sand and gravel, light in color, poorly sorted and highly cross-bedded. The pebbles are much waterworn and are made up of a wide variety of igneous and metamorphic rocks, with a few fragments of sedimentary rocks. Unquestionably, the material was laid down by a river flowing in the basin near Socorro.

Photographs of the jaw and a plaster cast of the teeth were sent to Dr. C. L. Gazin, of the United States National Museum, for study. Dr. Gazin has kindly reported that the jaw apparently belongs to the genus *Rhynchotherium* and that its age is certainly upper Tertiary, probably upper Pliocene.

In February, 1936, Mr. Martin Dykers, a senior in the New Mexico School of Mines, discovered a horse tooth in the same exposure. The tooth was reported by Dr. Gazin to be a lower left molar and is tentatively referred to the genus *Plesippus*. The age, Dr. Gazin states, is apparently upper Pliocene.

Thus, some of the basin deposits near Socorro, generally referred to the Santa Fe formation, are rather definitely proved to be upper Pliocene in age.

About 14 miles south of the above locality, the writer obtained another small collection of bones from the base of a bed of pumicite. This bed is located about three and one half miles northeast of San Antonio, Socorro County, along the east bluff of the Rio Grande. It is underlain by some thirty feet of light-colored gravel and sand and buff silt, typical of the Santa Fe formation as developed east of the Rio Grande near Socorro.

The bones from the pumicite were kindly determined by Dr. A. Wetmore of the United States National Museum to be parts of the humerus, ulna and radius of the turkey, *Meleagris gallopavo,* not distinguishable from those of the modern turkey. According to Dr. Wetmore, this species of turkey has not been reported anywhere from Pliocene deposits, and from Pleistocene deposits only in Pennsylvania, Tennessee, Arkansas and Florida.

Professor Kirk Bryan, after a recent visit to this exposure, expressed an opinion, based on stratigraphic and structural evidence, that the pumicite might be a part of the upper Pliocene deposits. The fossil evidence, however, favors the Pleistocene for its age, although there is no reason why this species of turkey should not occur in Pliocene deposits. The relation of the pumicite to the underlying and overlying sediments and, consequently, the age of the bones can be determined only after more careful field work in the vicinity. In any event the bones are as old as early Pleistocene and hence are a contribution to the paleontology of the Southwest.

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CONTAMINATION AND COMPACTION IN CORE SAMPLING

FOR a number of years marine sediments have been sampled by means of coring instruments of various types. The cores obtained have been sectioned; mechanical and chemical analyses have been made; and in some cases, micro-fossil studies have been undertaken. This detailed work has been accomplished with little regard for the contamination of the materials which may have taken place as the core sample was obtained. Also, the vertical extent of the material being dealt with before coring was not considered. Therefore, an investigation of this method of sampling seemed desirable.

An opportunity to carry out such a study was obtained during the summer of 1936 spent at the Woods Hole Oceanographic Institution with the helpful guidance of Mr. H. C. Stetson. The magnitude of the contamination taking place was determined by a num-

[4] W. C. Price and John W. Gowen, in press.

ber of simple laboratory experiments. Samples of a bright red clay, a fine green glauconitic sand and a buff-colored clay were slaked down and layered in a glass-sided aquarium tank, two and one half, by three, by two feet in dimension. The buff clay was placed on the bottom, the green sand over that, and the red clay as the surface material. Mechanical analyses were made of the fine green sand and the buff clay, which gave median diameters of .129 mm for the sand and .062 mm for the clay. The red clay presented a problem in obtaining deflocculation of the finer particles; and as time was short, the median diameter was not determined. However, the texture appeared to approximate that of the buff clay. Cores were then taken in these layered sediments by plunging the instruments in by hand. The two types of instruments which are most commonly used were tested, a brass tube, one and one half inch in diameter, and a three quarter inch glass tube which is inserted in a metal pipe when in actual use. In every case observed the soft red clay surface material was found to have smeared the entire length of the outer surface of the core, which left only a part of this material in its original position at the upper surface of the core. The base of the green glauconite layer showed a sharp, clean-cut contact, while the top of this green glauconite layer presented a zone of contamination from one half to one inch wide in which the red clay was mixed with green glauconite grains.

The second phase of the problem, the compaction which results from the instrument plunging into the sediments, was studied by actually obtaining core samples of the numerous types of bottom materials present in the vicinity of Woods Hole and Massachusetts Bay. The outer surface of the coring instrument was carefully cleaned and coated with shellac before each core was taken. In that manner the exact depth of penetration of the instrument could be determined as particles of the sediment clung fast to the sticky shellac. The length of the core was determined before removing it from the instrument, and the amount of compaction could then be calculated. The figures given below in Table I are averages of not less than six cores taken in each type of material. The fact that the relative depth of penetration and the length of core remained constant in a particular type of sediment indicated that a true picture of the compaction taking place was obtained.

TABLE I

ILLUSTRATING THE COMPACTION TAKING PLACE DURING CORE SAMPLING. PENETRATION WAS DETERMINED BY SHELLACKING OUTER SURFACE OF CORING INSTRUMENT

Character of bottom	Penetration	Length of core	Compaction
Soft mud over sand	5′ 11.25″	3′ 2.85″	2′ 8.4″
Soft mud	6′ 8.6″	3′ 2.4″	3′ 6.2″
Soft mud (Lowering tube slowly)	4′ 1.3″	1′ 10.6″	2′ 2.7″
Sand bottom	1′ 8.1″	1′ 1.6″	6.5″
Sandy silt	2′ 9″	1′ 5″	1′ 4″

CONCLUSIONS

The results obtained from the experiments on contamination suggest three points which should be observed when taking samples from a core.

(1) The outer surface of the core should be eliminated from the sample. This may be done by simply drying the core and scraping off the outer surface or slicing the core lengthwise and removing the sample from the center.

(2) The presence of the zone of contamination between the layers of fine sand and the red clay indicated the possibility of contamination at the contact of two sediments of varying texture. Taking samples close to such a contact should be avoided.

(3) If the surface material is of fine texture any analyses such as a mechanical analysis of the material being deposited under present-day conditions or the determination of the food value for sea life in the material at the bottom of the sea could not be done accurately by analyzing the material at the top of such a core sample. The surface material would be smeared down the length of the core and compacted.

From the figures given above it is clear that the vertical extent of material being dealt with in a core is much greater than the apparent extent shown by the length of the core itself. The exact extent, however, can not yet be shown; as it seems reasonable to believe that the material say two feet below the surface will compact less than the material at the surface as the instrument penetrates it. Thus, the true vertical extent of the material dealt with could be determined only after a curve showing the decrease of compaction taking place in a coring tube with depth has been established.

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