flint implements, an abundance of pottery, and portions of several skeletons. Unfortunately the bones of bed No. 2 seem to have occurred near the contact between the two beds, if they do not belong to both beds. This seems to me to present a great difficulty. If the dividing line between the beds is not certain (a point which I have shown before to be still unsettled), then we may not be sure these remains belong to the bed to which they were assigned. If the bones are of the age of the deposit, this confusion makes considerable difference in the possible interpretations of the facts. If the bones belong to one bed, they are certainly of Pleistocene age, while if they belong to the other, they are only probably of that age.

Here one might say that Sellards found the dividing line "distinct and unmistakable" and Chamberlain said that the bed No. 2 "contains human bones essentially *in situ* beyond reasonable doubt." It was only after it was definitely proved that this bed was of Pleistocene age that there was any doubt as to its line of separation with bed No. 3. In other words, it was the apparent clash of the facts with previously held theories which lead to the doubts. These theories and pre-suppositions will be discussed later in this paper.

The remaining evidence of the presence of man during the formation of bed No. 2 is less conclusive. The flint flakes may be intrusives from the layer above. Moreover although they probably have been chipped by man, they do not certainly belong to the class of humanly made artifacts. The single fragment of a bone needle may likewise have been an intrusive from the upper bed, where such bone implements are numerous. Furthermore the scratches on certain bones which have been considered as the work of man may not be such.

However, if these are rejected the case for man belonging to bed No. 2, is strengthened rather than weakened. For in that case, the difficulties in the question of the line of separation of beds No. 2 and No. 3 vanish. For we have a definitely marked cultural stratification. Then all the flints, all the pottery fragments, and all the bone implements belong to the upper layer. It is then definitely marked off from the lower layer, and so we would expect observers to distinguish the two beds by their contents if they were unable to do so by their appearance or the presence of an unconformity. Moreover one of the arguments of the anthropologists against the find is no longer valid. They have objected that the presence of pottery shows too high a civilization for middle Pleistocene man. If pottery and all other artifacts of a superior order occur only in the upper layers, this argument is of no effect. Lastly if the abundance of pottery and flint implements in the upper layer can exist without the intrusion of a single specimen or only a few specimens into the lower layer, then the probability of the larger bones of the human skeleton being thus intruded by natural means is very small.

We now come to the question of intrusion by human agency. It has been claimed, however, without evidence that the skeletons in bed No. 2 represent burials. It seems to me that the supporters of the finds have definitely disproved this hypothesis. They have shown that there was a definite stratification above the remains and that this showed no signs of disturbance such as would be necessary in case of a burial. Furthermore certain fossil plants were discovered above the human remains, and these likewise were undisturbed.

We come now to certain implied arguments, drawn from generally held theories, but of which the legitimacy is open to grave doubts. In the first place, it has been held that the cultural status was too high for Pleistocene man. Secondly it is claimed that the artifacts and bones resemble so closely the modern Indian of the vicinity that they cannot be very old. Both of these arguments are based on a preconceived theory of the nature Pleistocene man must have. There has been set up artificial standards to which the finds must conform, although these standards are based upon no evidence whatsoever. Until we know what the skeletal type of Pleistocene man in America was and the kind of implements he made, we have no right to base any argument upon type. If we do, we will notice that the Sussex man, for example, has many features similar to modern Englishmen, and the implements with him resemble some used by the modern Tasmanians, and therefore we must conclude that he is only a couple of hundred years old in spite of all the stratigraphic evidence to the contrary. Thus we must insist that all arguments advanced shall be geological rather than technological or somatological.

A further argument has been advanced that this represents an isolated case and therefore proves nothing. Hay has shown that by the same argument many other finds of glacial man have been repudiated, and that while one of them might be an isolated case, the whole group together are not so. It might be added further that all facts of science are isolated cases if you examine them separately and that if this argument is carried to its

logical conclusion, no science whatsoever is possible.

Hay has further pointed out that all the cases for glacial man in America so far discovered associate man with a fauna belonging to the Aftonian interglacial epoch. I may say that I have made extensive search in Aftonian beds myself. I have never found anything conclusively human in those beds although I have discovered many things which possibly show human workmanship.

In conclusion, I think we are justified in saying that the supporters of Pleistocene man at Vero have shown the probabilities to be in their favor although they have not absolutely proved their case.

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Some Reactions of Acetylene

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It is well known that acetylene polymerises, mainly to benzene, when heated in a closed or partially closed vessel at 120°–150° C. At higher temperatures and pressure above normal, and especially at varying pressures, acetylene decomposes into carbon and hydrogen.

The gas can, however, be passed, at a moderate speed, through a glass or silica tube heated to 600°–800° C. either alone or diluted with an inert gas as nitrogen or hydrogen chloride or coal gas, for a moderate time (20–60 minutes) before any serious deposition of carbon occurs. The nature of the glass has a decided influence on the rate of decomposition. Silica has less effect than sodaglass.

Various metals were heated to temperatures from 100° to 1,060° C. in a stream of acetylene for like time periods. Cadmium, zinc, lead, tin, copper, aluminium, and others showed no particular action at temperatures up to their melting points. No change was found in the physical state of the metals, and no carbon was taken up by them, and the carbon deposited burnt off without residue.

Iron, nickel, cobalt, and to a lesser extent manganese, tungsten, platinum, and palladium, almost in this order, showed a decided reactivity when heated, in some cases

¹Temperatures were controlled by melting points of metals or by Rh-Pt pyrometer.

to very moderate temperatures (*e. g.*, 200° C.), in acetylene, either pure or diluted.

Under favorable conditions of temperature and supply of the gas, the metal, if in moderately small pieces as wire, frequently glowed, the glow passing along the whole mass of metal employed. Carbon deposited on the metal and, after attaining a moderate thickness, the layer peeled off and another formed.

In the case of iron the strength of the metal was retained—in fact somewhat increased; in the case of nickel and cobalt (and to a lesser extent some of the metals before mentioned) a great physical change was observed. They became quite brittle, breaking up on attempting to bend them, and also showed very decided corrosion and pitting. This action (with nickel) commenced at comparatively low temperatures, *e. g.*, 200° C., and became rapid at 600° C.

In the case of iron, a more or less deep carburization resulted. With nickel and cobalt carburization was also observed.

The most remarkable part of this action of acetylene is that as the carbon of the acetylene enters the metals (Fe, Ni, Co), some metal enters into and is contained in the soot-like deposit around the metal. This extrusion or volatilization of the metal was found to occur to a maximum extent with nickel, followed in order by cobalt and iron. A nickel wire (No. 14) was in fact entirely dispersed or disseminated into the sooty deposit by heating for a few hours in the gas stream.

The amount of metal contained in this black deposit was found to vary considerably in different experiments. The cause of variation is not yet quite determined.

In some cases as much as 15 per cent of nickel was obtained, in others about 5 per cent. With iron 3 per cent and more has been observed. Dilution of the acetylene was found not to stop the wandering of the metal, but simply to reduce the rate a little.

The carburizing of iron by heating in acetylene is very rapid, especially at temperatures above 800° C., and many observations indicate that it reaches a maximum just below 1,000° C. The type of carburization is quite peculiar, the carbon showing distinct diffusion into the metal. The accompanying photomicrographs are of iron carburized by heating in acetylene for different periods at 1,050° C.

Ammonia was used to dilute acetylene in some experiments on metals because it prevented to a remarkable degree the deposition of carbon from acetylene by heat, and also because the flame of the mixture was nearly smokeless.

In this gas mixture, iron, nickel and cobalt were found to be more rapidly carburized than by acetylene alone, and the amount of extraneous carbon, or soot, reduced.

It was imagined that the cause of the more rapid absorption of carbon by the metals might be due to the simultaneous formation of a nitride and possibly its further reaction with the acetylene.

Iron (or other metal) was heated in ammonia to 800° C. At something below this temperature fine iron wire was quickly converted into nitride, Fe₃N.

Ferrous nitride heated in acetylene lost its nitrogen and the iron became highly carburized. Unfortunately, the physical change on conversion into nitride was not altered by the subsequent heating with acetylene. The iron remained brittle. On heating to bright redness and quenching, the steely structure of a highly carburized iron was obtained.

Further experiments showed that when ferrous nitride was heated in acetylene, ammonia was formed, but the matter was not followed up quantitatively.

Amines, as aniline, etc., have been found to act as very rapid carburizing agents on iron and nickel.

Many benzenic compounds (benzene, toluene, phenol, aniline, naphthalene, and others), when passed as vapor over nickel or iron, were found to act in a manner somewhat similar to acetylene—that is, a deposition of soot formed on the metal and a quantity of the metal was found to have wandered into this soot. In some cases the amount of nickel in the "soot" (benzene, aniline, phenol) was greater for the same time and temperature of heating than with acetylene.

Iron and other metals were observed to act in a similar manner, but not to the same degree as nickel.—*Jour. Soc. Chem. Ind.*

Tanning

CRYSTALLINE aromatic compounds containing a sulphonic or carboxylic group or both, soluble in water, and capable of precipitating glue and gelatin from solution, are used for tanning, instead of the amorphous materials hitherto used. Several examples are given. For instance, dihydroxyditolylmethane is treated with sulphuric acid, the sodium salt of the sulphonic acid produced is precipitated with common salt, and the aqueous solution of the sodium salt used for tanning in the ordinary way, after the addition of a little sulphuric acid.—Note in *Jour. Soc. Chem. Ind.* by J. L. JOHNSON.