But the classical research of Liebig and Wöhler on oil of bitter almonds" in 1832, recalled investigators to the true paths of advance. By recognising the existence in a series of compound molecules of a group of elementary atoms—which group they called *benzoyl*—Liebig and Wöhler were able to bring together, and so to explain the properties of compounds derived from this oil compounds which to the less imaginative chemist appeared to belong to altogether different classes of bodies.

Thus was inaugurated the modern conception of compound radicle, a conception which, being much more elastic than that of the Berzelian radicle which preceded it, and being at the same time sufficiently precise, was destined to lead to that of a replacing value for each radicle, and so to be merged in the wider hypothesis of the chemical equivalency of elementary atoms.

But in other and different fields the influence of the work of Wöhler has also been felt. Called to the Professorship of Chemistry at Göttingen in 1836, for more than forty years Wöhler pursued his investigations into the properties of metals and metallic compounds. Do we not owe to him much of our knowledge of aluminium and of nickel? Was it not he who taught us how to separate cobalt from nickel and from manganese? Did we not learn from him much concerning the properties of chromium, tungsten, tellurium, arsenic, and titanium?

His researches have thrown light on the chemistry of palladium and iridium, of beryllium and yttrium, and largely on the properties of silicon.

In 1833 Wöhler published the "Grundriss der Chemie," a book which is known wherever chemistry is studied, and which has been translated into the English, French, Dutch, Swedish, and Danish languages.

In 1861 the publication of his "Mineral Analysis" enriched analytical chemistry with methods of rare accuracy and general applicability.

Wöhler's translations into German of the *Lehrbuch* and *Jahresberichte* of Berzelius brought those classical works within the reach of every chemist.

But what shall be said of the influence of this great student of nature on others? Many a chemist looks to Göttingen as to the place where he learned what research means.

He has lived long and nobly; he has seen chemistry grow from a feeble plant to a spreading tree, and to that growth he has in no small measure ministered.

M. M. P. M.

PALÆOLITHIC GRAVELS OF NORTH-EAST LONDON

DURING the present spring and summer several new and instructive sections through the beds containing Palæolithic implements have been laid open at and near Stoke Newington. For the first time in my memory sections have been exposed which show the real age of the beds near the valley of the Hackney Brook, together with the older deposits on which they rest. Stoke Newington, Highbury, and Hackney are now so much built over, and where not built over, the surface of the ground has been so much disturbed for market gardening, brick-making, and excavations for sand and gravel, that one might live near the place for a lifetime and never see a section of four feet which would show the true nature of the uppermost deposits.

In NATURE, vol. xxv. p. 460, I described the "Palæolithic Floor" lighted on by me at Stoke Newington. This "floor" is a place where Palæolithic implements and flakes occur in large numbers. They are found about four feet beneath the surface of the ground, and nearly all the examples are as sharp as knives. That this was really a working place where tools were made in Palæolithic times is proved by the fact of my replacing flakes on to the blocks from which they were originally struck Hitherto I have described this "floor" as belonging to the Hackney Brook, and Dr. John Evans, in his "Stone Implements of Great Britain," p. 523, says: "The Shacklewell gravel lies on the slopes of the valley of the Hackney Brook." This in one sense, is really the case, but recent sections show that the Hackney Brook is quite modern, that it has cut its way through the Shacklewell gravels and only slightly disturbed them; in some places it has washed the "Palæolithic Floor" quite away. The "floor" really belongs to the Thames and the Lea, and one part of it occurs at the point of the former confluence of the two streams at four miles north of the Tower of London. It is also older than the "trail" or "warp" of the Rev. O. Fisher which occurs just above the "floor." The "floor" I now find to be by no means restricted to the slopes of the Hackney Brook, for I have seen a good section of it with tools and flakes *in situ* at three-quarters of a mile to the east of the stream and quite removed from its slopes. The present Hackney Brook may possibly follow some old depression left by previous denudation on the north bank and bed of the ancient Thames, but that is all. I have no doubt that the unabraded implement found at the bottom of a sand and gravel pit at Highbury by Mr. Norman Evans ("Stone Implements," p. 525) and compared by Dr. John Evans to the tools from Hoxne, High Lodge, and the cave of Le Moustier, really belongs to the "Palæolithic Floor," for I have an example recently found by myself near the Highbury position, which I know came from the "floor," for I there saw the "floor" in section. The unabraded implements, from their character and position clearly belong to a recent Palæolithic period, and they agree partly with the Le Moustier examples, but the Hackney Brook is far more modern than the most recent of Palæolithic times. At first the evidence seemed to indicate that the men worked on the old banks of the brook; it is now clear, however, that it was on the immensely older banks of the ancient Thames, that the men really fabricated their tools.

As no section through the "Palæolithic Floor" has hitherto been published, the accompanying illustration, Fig. 1, engraved to scale, will give an idea of its nature. The upper part of the illustration shows a section, facing the east, 300 feet long from north to south. It is taken through the gardens between Alkham and Kyverdale Road and south of Cazenove Road—the latter is shown on Stanford's Library Map of London. It is north of, and close to Stoke Newington Common. The south end, nearest the brook, is 83 feet 3 inches above the ordnance datum, whilst the north end is 90 feet 6 inches, showing a rise of 7 feet 3 inches in 300 feet—the heights are my own. Varying at from 4 feet to 6 feet from the surface there is a thin stratum of sub-angular broken flints and other stones seldom more than 4 or 5 inches in thickness, and sometimes obliterated or with only a single thickness of stones. This is the "Palæolithic Floor," and it is indicated in the upper part of Fig. 1 by the letters A, A, A. At 8 feet below the "floor" and about 12 feet from the surface of the ground is a bed of gravel and sand about 8 feet in thickness containing implements of older date; this bed is shown at the base of both the upper and lower sections seen in Fig. 1.

To more clearly show the nature of the "floor," the 60 feet of the upper figure (where marked) is engraved below to a larger scale; B is the 12 feet gravel containing rolled fossil bones and abraded Palæolithic implements; C is fine buff-coloured sand, often full of fossil shells of land and freshwater molluscs, D D D is the "floor," with its numerous unabraded tools and flakes; in the part illustrated, the "floor" is in duplicate. After the men had made their tools on the "floor" where the lower D's occur, a slight flood of water covered up the tools with a thin coating of sand; the men then walked over the

newly-deposited material, and made other tools on the new "floor." The two white streaks on the top of the upper "floor" are London Clay mixed with sand. Sometimes the tools and flakes are to be seen in this clay, but of course they were washed into it in Palæolithic times by floods. Above the "floor" is sandy loam and loamy sand; the uppermost part, and sometimes the whole of the material above the "floor," is not water-laid; in other words, it is one form of "trail;" above this "trail," where the darker tint is engraved, is humus, with Neolithic celts and flakes.

When the material above the "floor" is carefully removed, as I have so had it removed for me several times, the surface of the old working place is exposed. The stones are chiefly subangular broken flints, under the average size, the crust sometimes ochreous, at other times grey, quartzite pebbles, pieces of sandstone, a few pieces of quartz, cretaceous fossils, and numerous small grey flint pebbles, with traces of chalk. Intermixed with these stones are large numbers of keen lustrous flakes and many implements, all sharp, and as a rule not without exceptions) small in size and well made, some so

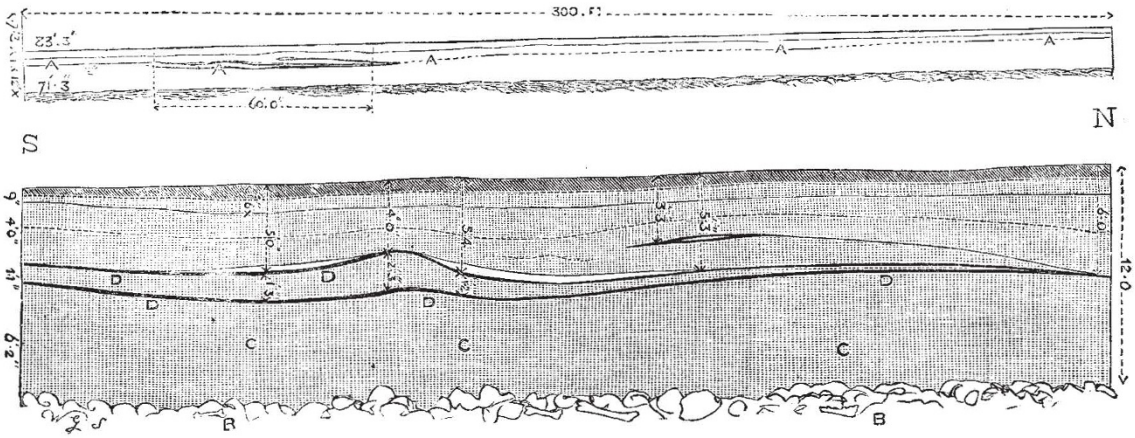


FIG. 1.

exquisitely made as to rival the best Neolithic work. With these tools, fossil bones, mostly broken, belonging to the mammoth, horse, bison, and reindeer, occur with broken tusks, teeth, and antlers of the same and other animals; human bones and teeth I have never been able to light on. I have, however, many times seen such tender things as leaves, small pieces of wood and small crushed branches, generally, especially is this the case with the leaves, very friable. Molluscan remains in immediate contact with the "floor" sometimes occur, and I have seen them both below and above it, and in contact with the bones and implements. Three or four feet below the "floor," shells are sometimes very common. Both under and above the "floor" are occasional seams and blocks of London clay, brought from a short distance to the north-west, where the clay comes to the surface. As a rule there are no very large blocks of flint or other large stones on the "floor." The non-waterlaid covering mass often disturbs the "floor," ploughs it up, and pushes underneath it. The twisting, contortion, and undulation of the material above the "floor" seems to prove that it was laid down by moving ice from the north. This ice-deposited "trail" is full of small whitish pebbles; fixed in the tenacious material at various angles. Abraded and whitened

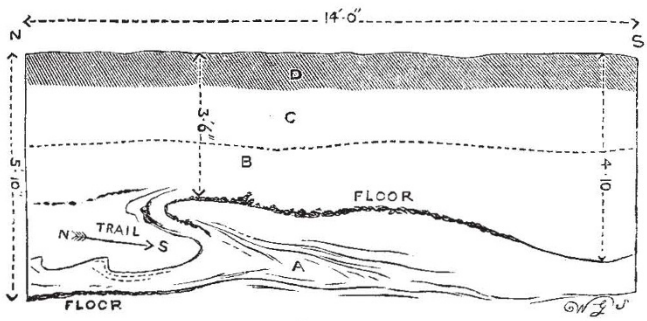


FIG. 2.

implements are also met with in the "trail," examples no doubt caught up from old exposed surfaces by the ice-sheet, and brought from a distance to their present position. No Palæolithic implements occur above the "trail," the "trail" seals up all the relics of the Palæolithic age, and as far as the evidence of north-east London goes, Palæolithic man had quite retired before the "trail" was deposited. When implements are found on the surface, the ground may have been denuded, and the implements exposed.

Fig. 2 is a measured section through the "floor" facing west; on the other side of the section, illustrated in Fig. 1, the "floor" is seen at from 3 feet 6 inches to 4 feet 10 inches beneath the surface, muddy trail, with sand and a few stones, is present at B and C, — D is humus. In the direction of the arrow, from north to south, the "trail" is seen pushing under and upheaving the "floor" with its implements; the Hackney Brook is towards the south, and a flooded brook to the south would hardly upheave the "floor" from the north; A is a mass of London clay and sand brought from a distance and pushed under the "floor" by the advancing "trail" from the north. Where the "floor" has been crumpled and disturbed, the implements show a very small amount

of abrasion, when the "floor" is covered by the stratified sand or mud of the river, the tools are all as sharp as on the day they were made.

It fortunately happens that very near the sections here illustrated, viz. at 270 yards west by north from Clapton Railway Station, and just south of Caroline Street (marked on Stanford's map), one or two other cuttings have quite recently been made, these show admirable sections of characteristic "trail." At Fig. 3 a section facing south is engraved to scale, and at Fig. 4 the end of the section is further enlarged to show the "trail" above and the stratification below. The section is 11 feet 6 inches deep, and just reaches the top of the stratum of gravel which contains implements intermediate in age between those of the "floor" above, and those found from 20 feet to 30 feet beneath the surface. The "Palæolithic Floor" on Fig. 4, if present, would be just above the hortozanal bands of stratification, but the "trail" at this spot has swept it away, it however occurs in a perfect state a few yards off. Beginning at the top, the reference-letter. R,

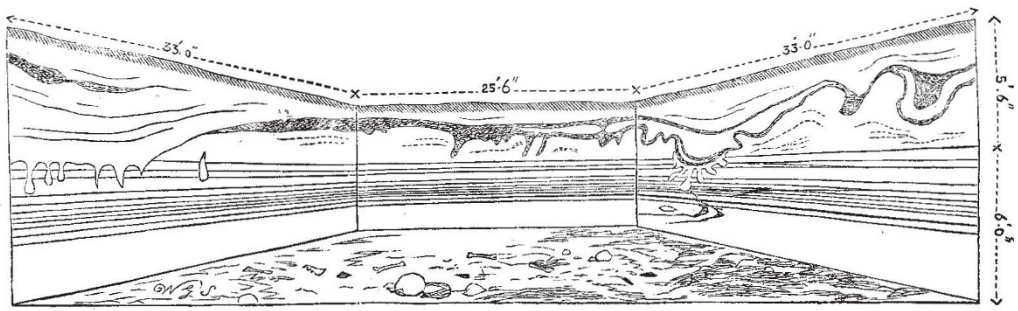


FIG. 3.

is humus; Q, mud belonging to the "trail"; O, "trail"; P, a pocket of London Clay; N, Palæolithic sand and loam crumpled and disturbed by the "trail"; M, dark sand and clays; L, light sand and clay; K, dark sand and clay; J, yellow sand; I, red sand; H, light sand and clay; G, dark sand and clay; F, red sand; E, yellow sand; D, red sand; C, sand, almost white; B, buff sand, sometimes full of the fossil shells of land and freshwater molluscs. These sands represent the sandy margin of the old Thames, now four miles distant from this spot. Some of the shells found in it by me have been kindly named by Dr. J. Gwyn Jeffreys; the series is probably very imperfect, as the time I have for geological matters is extremely limited, but no doubt the list is typical, as I have many times met with the species hereafter mentioned; other species may be more rare or local.

1. *Corbicula fluminalis*, Müll., extremely common.
2. *Hydrobia marginata*, Mich., not uncommon.
3. *Sphærium corneum*, Linn.
4. *Pisidium fontinale*, Drap.; var. *Henslowana*, Jen.

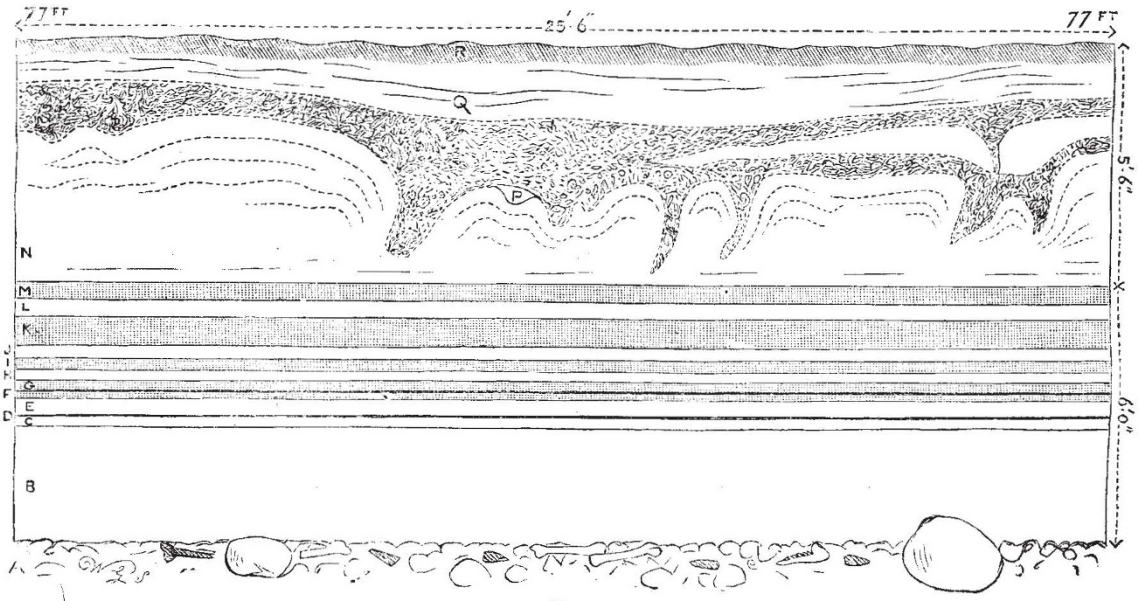


FIG. 4.

5. *P. amnicum*, Müll.
6. *Unio tumidus*, Phil.
7. *Bythinia tentaculata*, Linn, extremely common, with abundant free opercula.
8. *Valvata piscinalis*, Müll., var. *subcylindrica*.
9. *Planorbis albus*, Müll.
10. *P. complanatus*, Linn.
11. *Limnæa auricularia*, Linn.
12. *L. truncatula*, Müll.
13. *L. peregra*, Müll.
14. *Ancylus fluviatilis*, Müll.
15. *Helix concinna*, Jeffr.
16. *H. nemoralis*, Linn.

Dr. Jeffreys was good enough to add the following note:—"The occurrence of *Pisidium fontinale*, var. *Henslowana*, as well as the *tout ensemble* of all these fossil shells, induces me to believe that they had been thrown up by floods on the banks of a large river such as

the Thames." A mile to the west at Highbury, other molluscan genera are represented. A list of the Highbury shells is given by Dr. John Evans—"Stone Implements," p. 524.

I now come to the bed of gravel indicated at B (Fig. 1) and A (Fig. 4). It is found at an average depth of 12 feet, and descends to 20 or 30 feet from the surface; this drift contains, chiefly in its upper parts, lustrous sub-abraded Palæolithic implements of medium age. All these tools have been more or less moved and relaid by the agency of water; none are quite unabraded; bones, teeth, and tusks of the mammoth also occur, with other mammalian remains, driftwood, &c. This deposit has been described by Prof. Prestwich in the *Quarterly Journal of the Geological Society*, 1855, vol. xi. p. 107. The material is remarkable for containing immense blocks of sandstone, probably never moved by water alone, and sometimes weighing one, two, or more hundredweights; that these stones fell from blocks of drifting ice seems extremely probable. Some of them measure two feet across, and they must have been brought from the north long prior to the deposition of the trail, and probably long after the time when other immense blocks found at 20 feet and 30 feet at the bottom of the gravel were deposited. Some show glacial striæ. Generally in the deepest pits, the third and oldest class of implements is found, the examples are rudely made, massive, deeply ochreous in colour, with a thick ochreous crust, the ochreous tint not derived from the matrix they are now in; they are generally very much abraded, indicating transport from a long distance, or long dashing about in water with other stones, but as the three different classes of implements will be illustrated in my concluding note, and proved to be of totally distinct ages, far removed from each other, I need not refer to them at length here.

It commonly happens, that the higher the gravels above the present rivers, the older they are, but here we have an instance where the newer gravels and more recent implements are from 8 feet to 26 feet higher than the old.

WORTHINGTON G. SMITH

THE COMET

THE Astronomer-Royal has received, through Sir James Anderson, a telegram from Mr. Gill, in the following terms:—"Please inform Astronomer-Royal that comet's declination in my letter of September 11 should be 56 minutes 30 seconds south. Sudden disappearance of comet at ingress on sun's disc observed September 17 days 4 hours 50 minutes 58 seconds Cape mean time. Comet not visible on sun." Mr. Gill's remarkable observation is without a precedent, and an extraordinary illustration of the intense brilliancy which the comet attained at perihelion.

The Emperor of Brazil telegraphs thus to the Academy of Sciences of Paris:—"Rio, 26 Septembre, 10h. 20m. Note Cruls. Grande comète australe visible de jour observée aujourd'hui. Queue 30°. Présence sodium et carbone. 25 Septembre.—Visible de jour au sud de Rio 18, 19, 20. Vue par moi aujourd'hui de 4h. 10m. à 5h. 40m. matin. Splendide 26."

Mr. Ainslie Common, of Ealing, whose daylight observations on September 17 may have an important bearing on the theory of the comet, has furnished us with the following extract from his note-book on that date:—

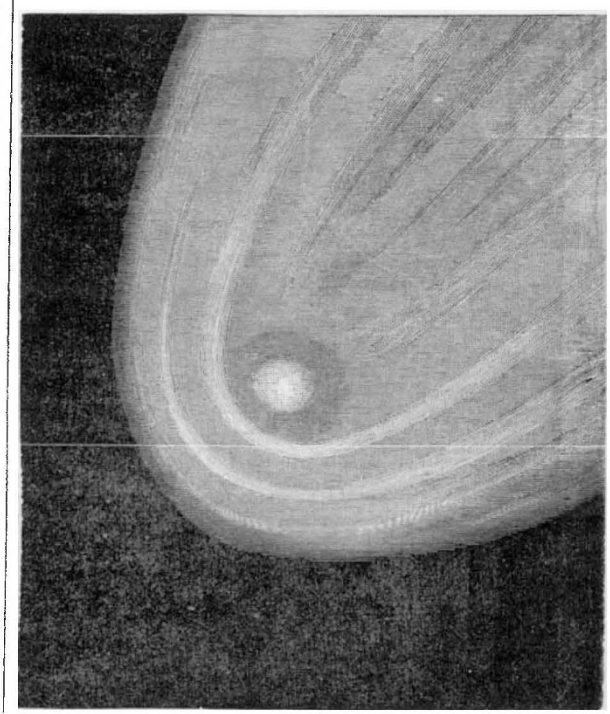
"10.45. Found bright comet. S.W. sun.

		Value.
10.59.	Comet precedes sun, 6m. 5cs., centre to centre	
11.10.	Comet south, sun's limb, 20R 50D = 18′ 8″ ...	3
11.47.	Comet precedes sun, 5m. 48s. (?)	
11.58.	Comet south, sun's limb, 16R 60D = 14′ 41″ ...	1
12.0.	Comet precedes sun, 5m. 44s. (good)	
12.6.	Comet south, sun's limb, 15R 55D = 13′ 45″ ...	3

Clouds came over shortly after this."

Mr. Common has corrected an error in reducing the last micrometrical difference of declination into arc: one revolution = 53″·1. He states that he made an immediate attempt to telegraph to Greenwich and Dun Echt, but the office at Ealing was unfortunately closed.

We have received several drawings from M. Bulard, of Algiers, showing the appearance of the comet as viewed with the naked eye, in one of which the tail is depicted with considerable curvature. Also a sketch of the head as seen in a powerful telescope, exhibiting the system of envelopes rising from the nucleus, which has characterised several recent bright comets (see Figure).



The following elements of this comet have been calculated by Mr. Hind from the Dun Echt and Coimbra meridian observations on September 18, a meridian observation at the U.S. Naval Observatory, Washington, on September 21, and an observation made at the Collegio Romano, at Rome, on the morning of October 2, obligingly communicated by Prof. Millosevich:—

Perihelion passage, September 17·2169, Greenwich M.T.

Longitude of perihelion	276° 14′ 36″	Apparent	
,, ascending node	346 6 58	equinox	
Inclination	37 58 59	Sept. 25.	
Logarithm of perihelion distance ...	7·906527		

Motion—retrograde.

These elements afford further indication of disturbance of the comet's motion near the time of passage through perihelion. At the moment when Mr. Gill observed the comet upon the sun's limb, when the distance from the sun's centre was consequently 16′·0, the orbit gives the central distance, as 10′·9, or the comet projected upon the sun's disc. Considering that Mr. Gill's observation was made less than one day previous to the accordant meridian observations at Dun Echt and Coimbra, it is not easy to see how such difference could arise from error of elements, which represent the middle position employed in their determination within a minute of arc.

The following expressions for the comet's heliocentric co-ordinates x, y, z, referred to the equator, are to be used in connection with the X, Y, Z of the *Nautical Almanac*, in the calculation of geocentric positions:—