THE BEECH TREE

By ALEXANDER L. HOWARD

Hinc olim juvenis mundi melioribus annis,
Fortunatarum domuum non magna supellex
Tota petebatur; sellas, armaria, lectos,
Et mensas dabat, et lances, et pocula Fagus.

Hence, in the world's best years, the humble shed
Was happily and fully furnished:
Beech made their chests, their beds, and the join'd-stools:
Beech made the board, the platters, and the bowls.

COULETUS.

JULIUS CAESAR, after visiting Britain, returned home and reported that he had seen vast forests containing oak, ash, elm, and other trees in great abundance, and as he mentioned the trees by name, omitting the beech, it was thought that this tree was not indigenous to the country. C. A. Johns suggests that like some other explorers Julius Caesar was given to exaggerate the importance and extent of his travels, and conveyed the impression that he had penetrated farther into the country than was actually the case. Since he only traversed part of Sussex and Kent, and was in England only a few days, his report was of little account. Elwes, in "Timbers of Great Britain and Ireland", dismisses the subject once and for all by his pronouncement as follows:

"The beech is indigenous to England. Remains of it have been found in neolithic deposits at Southampton Docks; Crossness, in Essex; in Fenland; in pre-glacial deposits in the Cromer forest bed; and at Happisburgh, Norfolk. Names of places of Saxon origin, in which the word beech occurs, are very common, as Buckingham, Buxton, Boxstead, etc. . . . The beech is not believed to be indigenous in Scotland and Ireland, and no evidence is forthcoming of its occurrence in prehistoric deposits in those countries."

Johns, telling a story which he considers may be a fabrication, says:

"Among the many anecdotes connected with the history of printing which have come down to us, that related by Hadrian Junius deserves to be noticed in this place. About the year 1441, Lawrence Koster, a citizen of Haarlem, 'walking in a suburban grove, began first to fashion Beech-bark into letters, which being impressed upon paper, reversed in the manner of a seal, produced one verse, then another, as his fancy pleased, to be for copies to the children of his son-in-law'. This hint he subsequently improved upon, and finally invented blocks of lead and tin, and printed books. Among his workmen was John Faust, who, having been initiated in the art, although sworn to secrecy, decamped, carrying with him his master's stock in trade, and set up as a printer on his own account at Mayence. I should add that, although many literary men have credited this account, it bears, on close examination, internal evidence of being a fabrication, either of Hadrian or his informant."

The beech tree (*Fagus sylvatica*) with a smooth green trunk and a massive crown, covered in the early spring with vivid light green leaves, which darken as the year advances, changing in the autumn to a golden tint, is one of the most beautiful of all our forest trees.

The shade which it provides has been gratefully accepted by all people for two thousand years, and probably longer.

Pliny says:

"There is a little hill named *carne* within the territory of Tusculum, not far from Roman Citie side, clad and beautiful with a goodly grove and tuft of Beech trees, so even and round in the head, as if they were curiously kept cut and shorne artificially with garden shears: . . .

In it there was one especial faire tree above the rest, which *Pabienus Crispus*; a man in our daies of great authoritie . . . cast a fancie and extra ordinarie liking unto: insomuch as he was wont not onely to take his repose and lie under it, to sprinkle and cast wine plentifully upon it, but also to clip, embrace and kisse it other whiles."

Strutt says:

"The Beech will grow in the most stoney and barren soil. In sheltering exposed situations it is particularly desirable on account of its retaining its leaves until the very end of Autumn, and indeed many of them throughout the winter. Their delicate green gradually fading to a modest brown, then to golden orange and at last to the more appropriate red."

In France it has been no less highly esteemed. Elwes says:

"in the North of France it attains perfection and forms very large forests . . . the finest beech forest in France is that of Retz which contains 37,000 acres . . . the beeches contain 329,433 c. ft. of timber, and reach a height of nearly 150 ft. with clean stems of 80 to 90 feet. Their age in 1895 was 183 years, and they were considered (then) to have reached their maximum development."

Later he mentions one of the finest beeches in France called "La Bourdigalle" in the Forêt de Lyons, which is supposed to be 375-575 years old. It is generally considered that in England the beech tree lives for about 250-400 years, probably reaching its prime in less than 200 years, after which time it gradually declines, invariably, as in the case of many trees, becoming hollow.

Strutt mentions the King Beech, in Knole Park, which in 1830 was "105 ft. high, 24 ft. in girth at 13 ft.", and it is interesting that Elwes mentions the same tree as follows: "in 1905 100 ft. by 30 ft. in girth at 5 ft. It has the largest girth of any beech I know of now standing in England". Mr. Mason, kindly instructed by Lord Sackville, has sent me the following note under date of May 18, 1944, regarding this tree:

"The Beech is now very much the worse for wear, only one of the main arms now being left. I have measured this at 13 ft. and it measures 37½ ins. quarter girth (150 in. circumference), I have also measured the main bole at 5 ft.; this now measures 32 ft. in circumference. The height of the remaining portion of the tree is about 90 ft. It is now in full leaf."

It is interesting to notice that Pliny, 1,500 years ago, records the practice of the Greeks and the Romans who found themselves unable to resist the temptation of carving their names on the beech trees, and that the same habit is continued up to the present day.

While the beech, with its dense overhead crown, affords a welcome shade and a cooler temperature on hot summer days for the traveller, it is a greedy occupant of the surrounding ground. Unlike the plane, and the alder, its dense shade prevents flowers or grass from growing under it. The only compensation is one of which advantage is taken by the more thrifty people in Europe, extending from France to the confines of Italy and Greece. This consists of the truffles and morels which thrive beneath the beech tree. In Germany and France these fungi are eagerly collected and form an important food. Truffles were originally valued in England, and dogs were especially trained for finding the fungus, which grows somewhere under the surface of the ground; a practice which, of late years, seems to have almost completely disappeared. On

the Continent, especially France, pigs are still used for this purpose.

Johns, speaking of the truffle, says :

"It possesses a strong but agreeable smell, and is generally found by dogs and pigs trained to search for it: but, in those countries where truffles abound, in October (which is their season for ripening) all the inhabitants repair to the woods, slightly stirring, or rather scratching the ground in those places which experience points out to them as the most likely to contain the tubers. The high price of, and constant demand for truffles, both in France and other countries, renders this a very lucrative employment, and experienced hunters are rarely deceived in the places where they make their search."

Berkeley quotes an instance of a poor crippled boy who could detect truffles with a certainty superior even to that of the best dogs, and so earned a livelihood. And as regards morels :

"In England they are comparatively rare, but Mr. Berkeley states that he has known them to be so abundant in Kent, as to be used for making a sort of catsup."

Forty-four years ago, in Norfolk, Sir Hugh Beever took me with him on a search for truffles, which proved successful.

The great importance of the beech tree is not limited to its beauty and shade or even to its immense value for timber, but in addition it is recognized as one of the most important of those trees which help and foster the growth of all other forest trees. Step, who refers to the beech by the title of "Mother of Forests", very mistakenly says that "the timber has little importance", but he is quite correct in acknowledging "his heavy indebtedness to this Nursing Mother". Curiously, however, in later life, it is aggressive and overbearing, so that any woodland of mixed trees, even including oak, will be dominated and eventually expelled by the beech.

Of late years demand for this timber has exceeded all bounds, and among the forests and woodlands of England no tree has been more ruthlessly cut down.

Only a few years ago the country around High Wycombe seemed to provide an inexhaustible supply of beech trees suitable for chair and furniture manufacture. The industry is so old that it is difficult to discover when it first started, but until quite lately the early primitive pole lathe could be seen turning the chair legs in the beech woods, exactly as it was used hundreds of years ago. The pole lathe, together with the other tools employed in the work, was well illustrated in the issue of the *Woodworker* of May 1939. This consists of an upright or similar stake, to which a pole is attached at right angles. Thonging is attached to the pole and this is taken to the lathe. "The thonging passes round the work and causes it to revolve as the treadle moves downwards. The spring of the pole causes the treadle to be drawn up again ready for another stroke. The cut is made on the down stroke only." The supply of beech trees at High Wycombe which seemed at one time to be inexhaustible has vanished, and for some years past those engaged in the trade have had to go farther and farther afield for their timber, and even to import immense quantities from southern Europe.

Among many large sales, especially during the War of 1914-18 and up to the present, in every district where beech trees were available, one transaction stands out noticeably. This concerned one single sale of beech trees at Goodwood, when no less a sum than £55,000 was paid by the purchaser. I have been informed that most of this timber was sold in High Wycombe. I have also been informed that the

destruction of these glorious woodlands was necessitated by the incidence of taxation to meet death duties. While this may be perhaps the largest single case on record, it is in no manner the only case, as the same thing has been happening in every part of Great Britain for a great many years past. Successive Governments, while wholly neglecting to make any provision for the reafforestation of the country, have at the same time brought about the deforestation year by year, so that to-day the situation has become dangerous to the welfare of the community.

Every account during 1,500 years has emphasized the usefulness and good qualities of the timber of beech, and for the last hundred years it has perhaps been only second or third in importance in our wood-working industries.

The wood is of a light brown colour, tough but soft, with a straight grain, easily worked, and presenting a smooth surface from both machine and hand tool, whether on the transverse, longitudinal, or across the grain. The extensive fine medullary rays, radiating from the centre to the outside, show when cut in multitudinous flecks. The shrinkage in seasoning is moderate, and with good air or kiln-drying presents even surfaces. Although beech when properly ventilated is fairly durable, if unventilated it rapidly decays, but under water, or ground where there is moisture, it is very durable. About thirty-five years ago, when the underpinning of Winchester Cathedral was necessary, round beech trees and oak were removed which were perfectly sound. The trees had been secured with pegs, some of beech wood, which were sound after more than five hundred years in position. Round piles of beech were taken up from the foundations of Waterloo Bridge, sound after sixty to seventy years of immersion in the bed of the Thames.

Beech has been a favourite wood with chair-makers for two hundred years and perhaps more. The higher-class makers working with walnut, oak, or mahogany, satinwood, etc., generally used beech for the frames; but it is noticeable that Chippendale never employed it. Many fine specimens of artistic design and clever craftsmanship have been lost as the beech framework used was attacked by the *Lyctus* or *Zestobium* beetles, or both, the framework rapidly turning to dust, and the chairs breaking up. The Master's chair, presented to the Glass Sellers Company in 1702, is a superb specimen constructed of walnut and beech; it is still in perfect preservation; but the beech framework had to be replaced this year to prevent collapse. Three other Jacobean chairs of exquisite English marquetry were similarly affected.

Immense quantities of the wood have been used for making a cheaper class of chair for halls, kitchens, and the well-known wheel-back chairs. This trade has been carried on extensively at High Wycombe and elsewhere. Innumerable articles have been made of beech, such as brush-backs, bowls, bread trenchers, and all kinds of domestic utensils. Many of these and also bedposts have been carved with the wheat-ear and other designs. Indeed, throughout the ages civilized man has recognized the merits and usefulness of this wood, for Pliny tells us :

"As touching the beech, the grain of it runneth rosse two contrarie waies like combe teeth; but in old time the vessels made of that wood, were highly esteemed. As for example Marius Curius having subdued his enemies, protested and bound it with an oath, That of all the bootie and pillage taken from them, he hath not reserved anything for himselfe, but only a cruet or little ewer of Beeche wood, wherewith he might sacrifice unto the gods."

Since the present War, the beech tree has come into prominence for the manufacture of ply-wood, with such success that the demand is likely to increase beyond expectation. The Ministry of Supply has now given instructions that all beech being felled in the British Isles shall first be inspected and suitable butts reserved for this purpose.

The very beautiful and ornamental tree generally known as the copper beech is a variety of the purple beech (*Fagus sylvatica* var. *purpurea*). The origin of this tree is doubtful. Elwes says:

"Mention is made of a beech wood at Buch, on the Irchel mountain in Zurichgau (commonly called the Stammberg) which contains three beech trees with red leaves, which are nowhere else to be found . . . and the legend is stated that according to popular belief five brothers murdered one another on the spot where the trees sprang up. Offspring of these trees were carried into a garden, where they still retained their purple colour."

As to the romantic origin above-mentioned, there may possibly be a difference of opinion. This tree can be found widely distributed and is highly prized in innumerable places throughout Great Britain and on the Continent. Its highly decorative appearance in parks and gardens should ensure its future success and planting. Within the last twenty-five years, on two separate occasions I have heard of the successful transplantation of two splendid fully-grown trees—a significant illustration of its appreciation by the respective owners. Elwes mentions that the largest tree which he had found was in the park at Dunkeld, Perthshire, which measured 86 ft. high, with a girth of 15 ft. 3 in.

Nor must we overlook among numerous varieties of this beautiful tree the fern-leaved beech, sometimes called the 'cut-leaved' beech, for which a number of different botanical names have been used, but which Elwes names var. *heterophylla*: the origin of this variety is unknown. This tree is far too little known; but its ornamental character and the decorative beauty of its foliage should recommend it for more general cultivation.

CHEMICAL RESEARCH IN THE U.S.S.R.

RECENT Russian publications received contain many papers of considerable interest dealing with chemical and physico-chemical subjects. Only a small number of them can be mentioned here.

Although polonium belongs to Group VI in the Periodic System, no compounds in which it shows a valency of six were known, although compounds of lower valencies have been described. A. G. Samartzewa¹ examined the co-precipitation of polonium with salts of telluric acid, containing 6-valent tellurium, and found that polonium crystallizes isomorphously with salts of orthotelluric acid. This suggests that polonium forms an ion PoO_4^{4-} in which it is hexavalent.

The Debye formula for the dipole moment of a molecule in terms of the dielectric constant is restricted to gases and to very dilute solutions of polar substances in non-polar solvents. In the case of pure polar liquids the effective orientation polarization is less than the ideal orientation polarization,

$$P_i = \frac{4}{9} \pi N \frac{\mu^2}{kT}$$

which, if known, would give the dipole moment μ .

The difference is probably due to the internal local field in the liquid. J. K. Syrkin² has found two formulae which give the relation between effective and ideal polarizations, from which the dipole moment μ for a pure liquid can be determined if its refractive index n , density d , and dielectric constant ϵ are known (N is Avogadro's number, k is Boltzmann's constant, M is molecular weight, T is absolute temperature):

$$\frac{4}{3} \pi N \frac{\mu^2}{3kT} = \frac{(\epsilon - n^2)(\epsilon + 2)}{(n^2 + 2)(2\epsilon - 1)}$$

A formula for mixtures is also given, and can be used when the substance is soluble only in a polar solvent.

The relation between colour and structure of organic compounds has often been dealt with both theoretically and experimentally. A theory based on quantum-mechanical resonance was proposed by Sklar³. An increase in the number of conjugated bonds is accompanied by an increase in the number of resonance structures, which probably tells upon the absorption spectrum and colour. M. A. Kovner⁴ has considered quantitatively the energy-levels and spectrum of hexatriene, and gets good agreement with the known absorption band.

Among the many suggestions for the structure of boron hydrides, one by M. E. Dyatkina and J. K. Syrkin⁵ supposes that there are no single electron bonds but resonance between the states $> \text{B}^+$ and $> \text{B}^-$, and the structure of B_2H_6 is represented as follows. Two atoms of boron and four of hydrogen are in one plane and the remaining two hydrogens are on a line perpendicular to this plane and passing through the middle of the line $\text{B}-\text{B}$ at equal distances from the plane. This model represents two distorted tetrahedra having a mutual edge. The model is discussed in the light of the electron diffraction measurements of Bauer and, in the opinion of the authors, is consistent with them. Structures for metal borohydrides are also proposed.

The mechanism of discharge of hydrogen ions has, as is well known, attracted a considerable amount of attention in recent years, and different theories have been proposed. A paper by A. Frumkin⁶ gives a survey of his experiments. The lack of agreement of data on the over-voltage on mercury is traced to the deposition of impurities, especially near the electro-capillary maximum. The results with high current densities obtained by other workers are critically considered and shown to be really in agreement with Tafel's equation. Measurements with very low current densities are very difficult, on account of the possibility of depolarization by dissolved oxidants, and the danger of adsorption of surface-active substances. For very low current densities the time lag in charging the double layer also comes in. There is some disagreement with Bowden and Kenyon's results, but not much. The results with dropping electrodes are considered in detail. The shift of half-wave potential with concentration found by Tomeš was not confirmed. A very detailed discussion of the structure of the double layer is given, and, among other conclusions reached, it is shown that results cannot be explained on the assumption that the potential depends only on the distance from the mercury surface.

¹ *Compt. Rend., U.R.S.S.*, **33**, 498 (1941).

² *Compt. Rend., U.R.S.S.*, **35**, 43 (1942).

³ *J. Chem. Phys.*, **5**, 669 (1937).

⁴ *Compt. Rend., U.R.S.S.*, **35**, 51 (1942).

⁵ *Acta Phys. Chim., U.R.S.S.*, **14**, 547 (1941); *Compt. Rend., U.R.S.S.*, **35**, 180 (1942).

⁶ *Acta Phys. Chim., U.R.S.S.*, **18**, 23 (1943).