

THE RADLEY DISTRICT:

ITS HISTORY, BOTANY,
ENTOMOLOGY AND GEOLOGY.

EDITED BY

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OXFORD:

Parker and Son,

27 BROAD STREET.

1912.

Archives

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R81744L0460

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PREFACE

THE object of this book is stated on the first page. General principles acquire much greater interest when they can be illustrated by local instances. Histories tell us a great deal about Ship-money. They do not tell us that Oxford and Abingdon were both assessed at £100.

I have to express my gratitude to my colleague Mr. Stone, my former colleague Mr. Carter, and my old pupil Mr. Odling, for the sections of the book that they have been good enough to write. For myself I have made so many notes from time to time that I find it difficult to trace their origin. Many of them came from the Standard County Histories and Guide-books. I feel bound, however, to acknowledge a conscious debt to the School Histories of Oxfordshire and Berkshire published by the Clarendon Press.

The book is intended for Radley boys. If others find it useful they will, I trust, forgive the expressions which indicate the original purpose.

T. FIELD.

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I

INTRODUCTION AND HISTORY

EVERY place, like every individual, has a character and a history of its own; it has some special features interesting not only for their own sake, but also as helping us in the history and geography of our country. I want, therefore, to put in the compass of a few pages the special story which Radley has to tell us of what went on hereabouts in the ages before we were born and the help that we may find in our immediate neighbourhood for the pursuit of various interesting studies.

There are few points in which boys differ more than in the natural instinct of observation, and of reasoning from what they observe. I have known boys living at the seaside who had not been told and had never noticed that high tide is on the average a little under an hour later every day; and many men do not know that it is, at any given place, high tide almost at the same time whenever it is full moon. It is high tide, for example, at London Bridge at full moon somewhere between one and two o'clock. Strange as it may appear, there are men who write books who have never noticed the reason of this, viz. that the moon rises on an average somewhat less than an hour later every night, having to complete the whole change of

twenty-four hours in a lunar month of twenty-nine days. I once saw in a novel a description of a sunset with the moon in her last quarter riding in the zenith, and soon after a reference to a new moon two days after Easter Sunday. There are many simple things in the heavens which are constantly before us and which yet we never notice. Lighting-up time varies thirty-four minutes in the first three weeks of March, and only two minutes in the first three weeks of December. The harvest moon in September rises for three nights at almost exactly the same time, e.g. in 1912, 5.47, 5.55, 6.6. The summer full moon rises at 9.10, on the preceding and following nights at 8.21 and 9.48. These are curious and puzzling things, and though the facts may be easily noticed, they are not so readily explained. It is somewhat easier to explain, if anybody chooses to take the trouble to think, why we do not see the stars in the same position two nights running, and must look out some four minutes earlier on any given night than we did the night before if we wish to see them in the same place.

So I have noticed some boys on a railway journey full of wonder and open-eyed curiosity. Waterloo Station, why Waterloo? Vauxhall, why Vauxhall? What is the pattern of the London & South Western engines? What is the length of a corridor carriage? What is the meaning of a fish-tailed signal? There is the Lollard's Tower of Lambeth Palace, there a line going off on the right, where does that go? Here we cross a river, is that the Wey? If so, where is Brooklands? What are those hills on the left?

Probably the North Downs. Presently the pace decreases, the engine evidently has to get up an incline, look out and see what the gradient is.

We listen to the beat of the carriages as they cross the joints of the rails—two in a second, that means about forty miles an hour; now the pace increases to three, and we are past Basingstoke and running down hill again. The cuttings are all chalk, and we are crossing the line of the North Downs. Now we see why Basingstoke is a junction, and why so much English history has centred round here. Simon de Montfort had a castle at Odiham, near by, and everybody ought to know the story of the defence of Basing House for King Charles. A really good map—the large map of the Thames basin which we have at Radley, for example—shows very plainly a line of depression in the North Downs through which the railway goes. When it has passed, it splits to Winchester one way and Salisbury the other.

We may treat our own railway and our own neighbourhood in this fashion. We shall see why Oxford is a junction, why Reading is a junction. We shall see how much history depends on the lie of the country and the way in which the roads follow the river valley. Every Radley boy ought to know and to love the valley of the Thames. From Boar's Hill we can almost see the line of the Cotswolds, on the south-east face of which the head springs of the river are found. There is the so-called Thames head near Cirencester, and the Churn and the Colne with places like Cricklade and Fairford, quite within

range for a summer day's excursion. Then there is the Ray from Swindon—for Swindon is in the Thames valley, and the Leach coming in at Lechlade, where the river becomes navigable, and the canal goes off to join the Severn below Gloucester. Many an Oxford man has followed the course of the 'upper river' from Lechlade to Oxford. He passes Radcot Bridge, where the Lords of the Merciless Parliament defeated the friends of Richard II in 1387. Then soon after he finds the Windrush coming in from its source near Daylesford, where Warren Hastings lay by its banks and determined to recover the heritage of his ancestors. It flows past Burford, with its priory, which Lord Falkland sold to William Lenthall, the Speaker of the Long Parliament, then on to Witney, with its blankets, and at last makes a picturesque junction with the Isis at Newbridge. This bridge was an old bridge when Waller forced his way across it to help Essex hem in Charles I at Oxford, and when the Levellers tried in vain to cross it five years later on their way to Burford. From this point the river makes such a wide curve to the north that Newbridge from Abingdon by road is only about eight miles, whereas it is twenty-one by river.

Our own hill is merely the south-east spur of the highland which causes this great sweep. This includes the country which Matthew Arnold has made famous in his poems, the green muffled Cumnor hills with their memories of Amy Robsart, the stripling Thames at Bablockhithe, the Fyfield elm, Godstow Bridge, by the priory, where Fair Rosamund was buried,

the Hinksey ridge and our own neighbourhood on the skirts of Bagley Wood. We see that on the south side of the Thames there is a ridge of high ground rising to the west in the striking landmark of Faringdon Clump. Northwards this ridge drops rather steeply down towards the river on a line marked by a string of villages like Longworth and Appleton. Southwards it slopes gently to the Vale of White Horse. In its eastward extension it rises prominently in the hills of Cumnor and Lord Abingdon's grounds at Wytham, pushing the river further and further to the north until it meets and takes up the north and south line of the Cherwell valley at Oxford. East of this there are the hills we see from the cricket-ground—Headington, Shotover,¹ and Garsington—falling down to the river at Nuneham, and pushing the river back westwards till at one point it comes so close to its course above Oxford that it was once proposed to cut a canal across. Next let us turn to the chalk hills which bound our view to the south. This side of them we have the Ock coming from Wantage way through Tom Brown's country and the Vale of White Horse. This joins the Isis at Abingdon, and the river then flows south-east until it meets the downs at Streatley, and forces its way between them and the Chilterns, with which they must at one time have formed a continuous range.² Flowing along the north-west side of the Chilterns is the Thame coming down from Aylesbury, past the town which bears its name, and joining at Dorchester the river which up to this point is often called the Isis, though what the

¹ See p. 119.

² See p. 117.

derivation of Isis is, few can say. On the far side of our Berkshire downs there is the Kennet, running from Marlborough, past Hungerford and Newbury, and joining the Thames at Reading.

For any one who wants to understand geography it is extremely useful to be able—as at Radley we are able, by bicycling a very few miles—to see so much of the course of so famous a river as the Thames—the Cotswold country, the Faringdon hills, the Cumnor and Wytham hills, the Shotover-Garsington line, and then the great ridge of the Berkshire downs. From the golf links on a clear day the Whiteleaf Cross on the Chilterns near Monks Risborough is easily seen, and from higher ground the gap between the Chilterns and Berkshire downs at Streatley, so what we see ought to help us when we come to study a map of the Thames as least as far down as Reading.

There are some general ideas which we can illustrate from our river.

1. *Its springs.* Nature sometimes is kind enough to make an illustration in the park to show us how springs work. After heavy rain sometimes water has gathered in Bounds ditch to a considerable depth. This worked underground and came up in the field in a strong spring and started Kishon flowing. Now if we could imagine this mass of water underground and renewed by an unfailing supply with the spring always working, this would give us a picture of what happens at all the sources of the tributary streams from the Seven Springs near Cheltenham, the real source, and Thames head, the

nominal source of our river, round to those which rise on the slope of the downs which face us. If you follow on a map the line of villages, Childrey, Ardington, West Hagbourne, along to Blewbury, you will see that they correspond exactly with the rise of the springs;¹ they grew up just there because people could get water, and the springs rise there because under the chalk there is a thick clay through which the water cannot sink, and consequently it comes out and feeds the brooks. Running near these villages we have one of the oldest roads in the country. We also see how towns are placed where a tributary joins a river, as e.g. Oxford, Abingdon, Dorchester, and Reading.

2. Another point of importance which the river illustrates here is the way that it has of making a steep bank one side and a flat one the other. In the northern hemisphere, owing to the revolution of the earth, rivers, and indeed all moving bodies, have a tendency to push to the right. We see this in the cliff which we mentioned between Radcot Bridge and Godstow. The river seems continually pressing against its right bank, just as it does at the second gate below Sandford. On the other hand, by the bridge where the boat-house stream enters the river, we see how it makes a promontory of sand and gravel on the inner side of a curve. Any coxswain of a boat should know on which side of a curve the current runs fastest. At a corner where the stream is slack inshore there will be a deposit of this kind.

3. Then, lastly, we must think of all the changes

¹ See p. 113.

that have happened since a river first began to run on the present line of the Thames valley. We have here a block of coral which was brought up from a depth of one hundred feet when our well was bored. This shows us that the ground we are now occupying was once covered with an ocean warm enough and clear enough for coral polyps to make their reefs.¹ Again and again the ground rose and sunk beneath the ocean, at each rise bringing up the deposits which, like chalk, had formed at the bottom of the sea. Some of these deposits at one time must have covered our own hill, but gradually they have been worn away, and the Thames has gradually eaten out for itself the valley where it now runs, the course of which is naturally determined by the hardness of some rocks, which instead of wearing away have presented an insurmountable obstacle. The river, therefore, at one time must have flowed at a considerably higher level than it does at present. It must have come over our park, for there is river gravel at the surface. The river carries to the sea every year about a million tons of solid matter. But still it takes eight hundred years to wear away an inch of soil all round, so we can imagine how many centuries it has taken for the Thames to cut its bed to its present depth, to say nothing of the vastly greater series of years that passed before there was any Thames or any arrangement of hill and dale corresponding to our Thames valley.

Nobody can say how long ago it was that man first appeared in Berkshire, but it is practically

¹ See pp. 99, 100.

certain that it was when England was joined to the Continent by a strip of land a little south-west of the Straits of Dover. Strange beasts lived in the country then. We dig up their bones in the river-deposits in the park. We find the stone implements of the Early Stone Age men in considerable quantities on the golf-course at Frilford, and not far from the White Horse there are remains of one of the long dish-cover shaped mounds under which the men of this period buried their dead. The place is familiar to readers of *Kenilworth* as Wayland Smith's cave. It is really a burial-place of a chief, made of huge stones with earth piled over them. The men in the later Bronze Age made their barrows round, and seem to have burned their dead, whereas their predecessors buried them. Not very far from Chipping Norton there is a ring of stones called the Rollright stones, which possibly indicate a burial-place; but the most interesting discovery of this sort was at Hagbourne, near Didcot, where a chief was found buried with the remains of his horse and his chariot. The White Horse which gives its name to the valley, and which can just be seen from the Great Western Railway, if you know where to look, has given rise to much discussion. Some people have thought it a memorial of Alfred's victory over the Danes, but as its shape corresponds to that of a horse on a British tin coin or token, it is now supposed to be of British origin.

Close by the White Horse is one of the many groups of earthworks which are found in the county. It is impossible to decide when, or by whom, they were

constructed. Many of them were no doubt held and altered by successive occupants—British, Roman, Saxon, and Norman. Consequently no attempt is now made to arrange them in chronological order, but they are classified according to their shape and position. Works of this kind are to be found in every county, and therefore we may use those nearest Radley as illustrations. The White Horse mounds are a very good specimen of the hill camp; there is another, called Letcombe Castle, just above Wantage, really visible from Radley; and most conspicuous of all, the Wittenham Clumps, by Dorchester, which can be seen from the Culham railway-bridge and for miles in many directions. The great terraces at Blewburton Hill, some think, were formed by ploughing, but the enclosure looks much more like a camp.

Then there are artificial mounds strongly fortified, some of them at a later period used for Norman castles. Such was the origin of the castles at Oxford and Wallingford. We have also in different places lines of dykes, with ditches, which can be traced for miles, to which the general name of 'Grim's dyke or ditch' is given in maps.¹ There is one such near the rifle-range at Churn. This may have marked the boundary of a tribe; some suggest it was a boundary of Wessex and Mercia at some time, but this is hardly likely. This brings us to the interesting study of the earliest roads in the county. The oldest of all runs just along the ridge of the hills which we see to the south, and is called the Ridge Way or the Icknield Way. Coming from the direction of Bath, it passes

¹ See also p. 118.

Uffington Castle and the White Horse as a broad grassy track with a mound 3 feet high on each side of it. It then drops to the Thames at Streatley, and then continues on the top of the Chilterns to Chinnor, and so into Suffolk. Both on the Chilterns and on the downs there was a road running roughly parallel with this, but a little lower down the hillside, called the Port Way. Hereabouts it runs on the line of the Wallingford-Wantage road, but it is not so old as the other. The Romans had a road, as a good map shows, running from Cirencester to Speen, i.e. Newbury, and then east to Silchester and London. From Silchester another road ran north to the Thames at Pangbourne. This probably joined somewhere, though exactly where we do not know, a road running north from Dorchester, east of Nuneham Park, to Bicester, or rather a place called Alchester, which was the Roman station from which the Akeman Street ran to Cirencester. These roads give us an indication of the position of the British tribes when Caesar came. There was a strong tribe north of the Thames, the Dobuni, who had their centre at Cirencester. South of the river were the Atrebates, whose stronghold was at Silchester. Silchester is one of the most interesting Roman sites in the country; it is somewhat out of our district, but the plan of the excavations and the articles found there are in the museum at Reading, while its position is of great importance for understanding the hold the Romans had on this district. The chief towns of the two tribes just mentioned were taken as the sites of the

Roman cities, Calleva (Silchester), and Corinium (Cirencester).

Beside the city of Silchester the chief Roman remains near Radley are the villas at Streatley, North Leigh, and Stonesfield. There was also one found at Frilford.

The period of devastation and anarchy between the departure of the Romans and the establishment of the Saxon kingdom is shown by traces of burnt buildings and buried hoards of coins; the most interesting discovery of which was made at East Hendred.

In 571, when the West Saxons were pushing northwards, we are told a chieftain called Cuthwulf took Aylesbury and Benson and Eynsham—so in that year Oxfordshire was part of Wessex. It was, however, always the scene of fierce fighting between Wessex and Mercia. In 626 the fierce old heathen Penda made a treaty with Cwichelm of Wessex, recognizing the Thames as the boundary between their dominions. The treaty, however, was not kept, and we find a king of Wessex gaining a battle as far north as Burford, and then the great Mercian king, Offa, gaining the whole of North Berks., and keeping it by a victory at Benson. The hill by Swinford Bridge, near Eynsham, seems to have been a Wessex fortress to guard the passage of the river, but Offa seized it, and built himself a house there. It is of these struggles that some think Grim's ditch by Blewbury may retain a memory.

The village of Benson, a little above Wallingford, on the Oxford side of the river, was a royal residence

of the Wessex kings, and the district round is full of interest in connexion with the conversion of Wessex. Not far away is Cholsey, the island of Ceol, the ancestor of the kings of whom we are going to speak. Everybody has heard of S. Augustine and Canterbury, but just as Pope Gregory sent Augustine to Kent, so Pope Honorius sent Bishop Berin or Birin to Wessex. His name should be honoured in Wessex, and particularly in this neighbourhood, where in the beautiful abbey church of Dorchester we can see fragments of his shrine. The local tradition is that on Churn Knob (the hill by the rifle-range, which is one of the highest points we see on the sky-line) he preached to Cynegils and his son Cwichelm, who reigned together as kings of Wessex. At the time there was a visitor at the court, Oswald, the saintly King of Northumbria, who had come to ask in marriage the hand of the princess, Cwichelm's sister. This Cwichelm had eight years before sent his henchman with a two-edged poisoned dagger to murder Edwin, the King of Northumbria, but one of Edwin's men had flung himself before the blow, and it is said that in thankfulness for his escape Edwin allowed the daughter born on that very night to be baptized, and promised to be baptized himself if he returned victorious from his expedition to punish the West Saxons. This he did, and the place of Cwichelm's defeat is said to be a hill about three miles from Churn, called Scutchamore Knob. Whatever its connexion with Cwichelm, it seems to be the hill mentioned in the chronicle as Cwichelm's law. As

a result of S. Berin's preaching, Cynegils and his son were baptized, and Oswald, as godfather, received from the font the man whose son-in-law he then became. Dorchester was given to S. Berin as his church, with land in the district for the support of it. S. Berin's name is preserved in Berin's Hill,¹ not very far from Benson, and perhaps in Bicester (Berinscester). Dorchester was a natural place for the bishop when the king was in residence at Benson, but as Winchester was the chief town of Wessex, the bishop before long moved there. Dorchester, however, became once more a cathedral city in 869, this time not of Wessex, but of Mercia, and so it remained until the see was transferred to Lincoln by William the Conqueror in 1085. It may be interesting to note that Radley was thus first in the diocese of Dorchester, then of Winchester. Then, in 909, there was a Bishop of Berkshire, with his church at Ramsbury, near Hungerford. From Ramsbury the bishop moved first to Sherborne, then to Salisbury, and in Salisbury diocese Berkshire remained until 1836. If we follow in the same way the fortunes of the opposite bank of the Thames, from 1085 it was in the diocese of Lincoln, which included all between the Humber and the Thames, till the dioceses of Peterborough and Oxford were cut out of it at the Reformation. Buckinghamshire actually remained in that diocese till it was joined to Oxford in the same year as Berkshire. Another point of interest in connexion with the Church is the growth of the abbeys. Radley formed part of the property of the Benedictine Abbey of

¹ See p. 118.

Abingdon, which was the greatest religious establishment in the county in Saxon times. It seems to have been founded, within forty years of the conversion of the Wessex kingdom, by Cissa, an under king of this district. His niece and nephew appear to have founded a small nunnery and monastery—the one on or near the site of S. Helen's in Abingdon, the other at Bayworth; but the monastery was soon moved to Abingdon, the nuns, on the other hand, in their desire for peace went up the Thames to Wytham. It is interesting to see how early we find the name of S. Helen, to whom the great church in Abingdon is dedicated. There was some legend of finding at Bayworth a cross made of nails of the true cross, and there was a Fraternity of the Holy Cross at Abingdon in quite early days. In the Pageant of the Church of England, performed at Fulham in 1909, there was a pathetic scene of the expulsion of the married canons from the church of Winchester, and the substitution of Benedictine monks in their places. This was part of Dunstan's policy for reforming the discipline of the Church of England. His great assistant was Ethelwold, who had been under him at Glastonbury, and was appointed Abbot of Abingdon. After doing much to enforce discipline there, he was made Bishop of Winchester, and it was from Abingdon that he took the monks to replace the canons there. There is one further point of early ecclesiastical history or legend which we must mention, as it is that with which the Oxford Pageant began, viz. the legend of S. Frideswide, which may

be read in one of the stained-glass windows at Christ Church. S. Frideswide was the daughter of a king who ruled at Oxford, and her hand was sought in marriage by Algar, King of Leicester. On her refusal he tried to secure her by force; but first his messengers and then Algar himself were stricken with blindness. It was round the nunnery which S. Frideswide formed at Oxford that first the town and then the University seem to have gathered. The priory church has become the chapel of Christ Church and the cathedral church of the diocese.

We must now make the most of the local associations which connect Berkshire with the greatest of our kings, Alfred the truth-teller. Wantage, his birth-place, is almost within sight of us, as is the field of his earliest victory—Ashdown. It is not certain at what point on the downs it took place, whether at the west end, near Lord Craven's park at Ashdown, or as some think, by Scutchamore Knob, or as is really more probable, further east, by Aston. But somewhere along the ridge it certainly was. There is a tradition that it was in the church of Aston Upthorpe that Ethelred, Alfred's elder brother, was hearing mass when the battle began, and the weight of the fighting fell upon Alfred. This was in the year 871. The Danes had formed a camp on the triangle between the Kennet and the Thames, part of the rampart of which existed near Reading station till the railway was made. They then marched westwards along the Ridge Way until they were met and defeated by Ethelred and his brother. But the

victory was not decisive. Ethelred died the same year, perhaps of wounds received in the battle. Alfred, soon after being chosen to succeed him, was defeated at Abingdon, although an image in the abbey, according to the legend, hurled stones from the wall against the invading heathen. It was in the next year that Alfred was forced by the increased hosts of the Danes to retreat to Athelney. At Athelney was discovered the famous Alfred jewel, which any one can and every one should see, in the Ashmolean at Oxford. Soon after the victory at Ethandune, which secured Berkshire for Alfred, he held a council at Shefford, which may be Shifford-on-Thames, near Newbridge, or Shefford, between Newbury and Lambourn. 'There sat at Shefford many thanes, many bishops, and many learned men, . . . and Alfred, England's herdsman, England's darling.' We are no longer permitted to believe that Alfred founded the University of Oxford, but there is quite enough material to connect him closely with Berkshire. His son, Edward the Elder, died at Faringdon.

The troubles from the Danes were not yet over. They destroyed Bicester in 912, and fortified Thame nine years later. Then, when the foolish Ethelred ordered the treacherous massacre on S. Brice's Day, 1002, the Danes took refuge in S. Frideswide's Church at Oxford, to which the mob set fire, leaving their unfortunate victims to perish in the smoke or by the swords of the assailants if they endeavoured to escape. Oxford had now become an important place. In 1912 it observed the millenary of its entry

into history by a commemoration of its being taken under his direct control by Edward, Alfred's son. It was probably he or his sister, the Lady of Mercia, who formed the great castle mound. This was not strong enough, however, to resist the vengeance of the Danes for the S. Brice's massacre. In 1006 Sweyn came, burning Reading, Cholsey, and Wallingford, and advancing along the old route of the Ridge Way as far as Cuckhamsley. Oxford was burnt three years later, and in 1013 it fell into the hands of Sweyn once more, along with Abingdon, Dorchester, Wallingford, and Benson. The struggle between English and Danes is a tangled tale of treachery, and much of it centres round Oxford. The stronghold of Danish rule was the district round Derby and Leicester, known as the Five Burghs. In 1015 a scoundrel named Eadric, alderman of the Oxford district, enticed the chief thanes of these burghs to Oxford, and slew them there. He then induced his son to murder Edmund Ironside, also at Oxford, by treachery. This did, however, secure peace for the time, as it paved the way for Canute to become unopposed king of the whole country. He held a great Council at Oxford, at which Danes and English agreed to live under the same laws. At his death, the Council, which divided the country between his sons, was held at Oxford, and at Oxford Harold was crowned. At Oxford he died. Of Canute there is an interesting memorial at Pusey, in Berkshire, viz. a horn with an inscription that it was given by King 'Knoud' as a sign of the grant of land. Now

Canute had married Emma, the widow of Ethelred, a woman who made trouble wherever she went. She was mother by her first husband of Edward the Confessor—born at Islip, near Oxford—and by Canute, of Harthacnut. With her son Edward she seems to have got on very badly; there is even a story that she had to stand trial at Winchester for misconduct, and only cleared herself by the ordeal of walking over red-hot ploughshares. This seems unlikely, and the story is related to explain how the bishops of Winchester had a palace at Witney, and the manor, given them apparently by Queen Emma. The only other point of interest before the Conquest is the meeting of the Council at Oxford, which deprived Tostig, Harold's brother, of Northumbria, and gave it to Earl Morkere. This brought about the battle of Stamford Bridge, when Tostig invaded England with the help of Harold Hardrada, King of Norway.

From the history of the neighbourhood we can illustrate the confiscation of the property of Harold's supporters and its transference to Norman holders. Lands at Fyfield and Kingston Bagpuize were held under the Abbey of Abingdon, the holders fought and fell at Hastings, and the lands were granted to Henry de Ferrars by the Conqueror. On the other hand, a certain Wigod of Wallingford, friendly to the Conqueror, allowed him to cross the Thames there after the battle of Hastings. His holding passed to Robert d'Oyley, who married his daughter and heiress, and who built the castles at Wallingford and at Oxford. Of the former, practically nothing

remains, of the castle at Oxford, there is much of interest, and the mound on which it stands is probably much earlier. The Chronicle of Abingdon Abbey gives us an account of the vexations and robberies which the monks suffered from this Robert d'Oyley. It adds that, in answer to the prayers of the monks, he was seized with a severe illness, and saw himself in a dream brought to trial before the Blessed Virgin and tortured for his wickedness. This produced a great change, and he then devoted himself to good works, building churches, and a bridge called Hythe Bridge, on the spot where a bridge now crosses the river on the road from the station, still called Hythe Bridge Street. Parts of two churches still remaining in Oxford probably represent his work; the crypt of the church by New College, called S. Peter in the East, and the extremely interesting tower of S. Michael's Church in the Cornmarket. This is often called a Saxon tower, and there are some features about it which make it possible that D'Oyley used some older work. This tower formed part of the city wall, and was close to the North Gate, called Bocardo. *The Radleian* is printed at the Bocardo Press. It was a nephew of Robert d'Oyley who founded Osney Abbey, part of the site of which is occupied by the Great Western Railway, near the station.

Henry I (Beauclerc), the fine scholar, was educated at Abingdon, and was much attached to the neighbourhood, for he built Beaumont Palace in Oxford, the name of which is preserved in Beaumont Street,

and also the royal hunting-lodge at Woodstock. From his funeral in the Abbey of Reading Stephen came straight to hold his great Council at Oxford. It was at another Council at Oxford that he ruined his cause by ordering the imprisonment of three bishops. Castle after castle was built round about for the king, one at Banbury, one at Middleton, where now Lord Jersey lives. Matilda held Wallingford and Woodstock, and the second Robert d'Oyley surrendered to her the castle of Oxford. Here she was besieged, and fled across the snow by Bagley Wood, and no doubt through what is now our park, first to Abingdon and then to Wallingford, where peace was made in 1153.

In Beaumont Palace Richard I was born; at Woodstock his youngest brother John, a son and daughter of Edward I, and four children of Edward III, including the Black Prince. The constant residence of the Court there was also the occasion of the meeting of various Councils. Of these the most noteworthy was that in 1163, when S. Thomas of Canterbury refused the payment of a tax which he considered the king was levying in an illegal manner. When he subsequently came to Woodstock to seek an audience with the king, he was driven from the door. There are three churches in Oxfordshire dedicated to S. Thomas, one in Oxford, one at Elsfield, and one at Goring. It was Henry II who granted a charter to Oxford, with liberties like those enjoyed by the city of London. The mayor was to have the privilege of acting as under-butler to the Lord Mayor

at the king's coronation feast, a privilege still claimed by mayors of Oxford, and acknowledged, but unfortunately the coronation feast is no longer held. Oxford no doubt had to pay its share of Richard's ransom money, and it was at Oxford the Council was held to decide the best means of raising it.

King John was often at Abingdon; he came just a month after granting Magna Charta, and the next year the Pope wrote a letter instructing the Abbot of Abingdon to excommunicate the barons who were opposing the king. If he did, they seem not to have been much the worse for the sentence. The country suffered much more from the way in which the Popes demanded English benefices for foreigners in the reign of Henry III, and of this we have interesting cases close to us. The Pope wrote and told the Abbot of Abingdon to give the living of S. Helen's to a Roman nominee. The king insisted on its being given to his half-brother—who had already more livings than he could count. The abbot obeyed the king, and then was summoned to and fined at the court of the Pope, and when the abbey bought the living of Sutton they were forced to present an Italian to it. One of the king's most hated foreign advisers, the Poitevin Peter des Roches, lived in the manor which we have seen the bishops of Winchester had at Witney.

Probably the most famous man ever born at Abingdon was the saintly Edmund Rich, Archbishop of Canterbury. He was the son of a merchant, and was educated at Paris; he taught at Oxford. As

archbishop he was in sympathy with the barons who opposed Henry III, though he excommunicated Simon de Montfort for his secret marriage with the king's sister. He was, however, of a nature ill-suited for troublous times, and retired from his great office to the monastery of Pontigny, where his shrine may be seen to this day. In the opposition to Henry III not the least important incident is the Parliament at Oxford in 1258, called the Mad Parliament. Simon de Montfort took Wallingford Castle, held by Richard, Earl of Cornwall, the king's brother, and at Wallingford both the Earl of Cornwall and Prince Edward were imprisoned after the battle of Lewes.

The reign of Henry III is marked by two other events also closely connected with us. First, the foundation of the earliest colleges in the University of Oxford, like Merton and Balliol; and secondly, the coming of the Friars. The two chief orders of Friars were the Black Dominicans and the Grey Franciscans. At Oxford both made almost their earliest settlements, the former in 1220, the latter in 1224. The story of the coming of the Grey Friars is singularly interesting, but too long to be told here. It is sufficient to say that they fixed their abodes in the poorest part of Oxford, and laboured there in a district where the name of the 'Paradise', part of their grounds, is still preserved in Paradise Square. The two orders were great rivals in the schools of the University, the Black Friars, from their leader S. Thomas, were called 'Thomists', the Franciscans 'Dunces', after

Duns Scotus. But they counted among their numbers some of the ablest men of the time, notably Roger Bacon, whose name has an inappropriate connexion with what is now called Folly Bridge. The 'Folly' was a building constructed on the remains of what was once called Friar Bacon's study.

In the reign of Edward I we note the growth of trade, of markets and fairs. The sheep fair at East Ilsley, still of great importance, possibly dates back to that time, and we find on the maps at Cholsey and at Henley, as well as at many other places, the 'Fair mile', where such fairs were held. The holding of markets was a valuable privilege, and for the control of the Abingdon markets the abbey continually obtained the royal grant. This was as often resented by the townspeople, and in an endeavour to secure control of the Monday market, with the assistance of men from Oxford, they sacked and looted the abbey in 1327, destroying property variously estimated as worth from ten to forty thousand pounds in value. Those guilty of this sacrilege were solemnly excommunicated at S. Paul's, and some of the property was recovered. A great deal, however, had been wantonly destroyed. The rioters spared a roll which tells us that in 1322 the abbey paid 10s. for stocking the fishponds on the Radley Road. Fifty years later it cost 8d. to clean them.

It was in the reign of Edward II that the great Order of the Templars, familiar to readers of *Ivanhoe*, was dissolved. One of their houses was at Cowley, still called Temple Cowley, and the farm by Sandford

is called Temple Farm, and has remains of the Templar buildings.

As Wallingford was connected with the opposition of the barons to Henry III, so it is of importance in the troubled reign of Edward II. It was held by his favourite, Piers Gaveston, and it was at a tournament there he nicknamed the Earl of Warwick the Black Dog. He also nicknamed the Earl of Pembroke, Joseph the Jew. To this Earl of Pembroke Gaveston was entrusted, and the earl was bringing him to Wallingford when the 'Black Dog' seized him and executed him near Warwick. The king then gave Wallingford to another ill-starred favourite, Hugh Despenser, but Isabella, the queen-mother, hanged him on a gallows fifty feet high, and took the castle herself. There she and Mortimer spent Christmas, 1326. The castle afterwards went to the Black Prince.

In Richard II's reign we have already mentioned the defeat of de Vere at Radcot Bridge by the Lords Appellant. In this reign also we must note the appearance of John Wiclif at Oxford.

At Woodstock, near the entrance of the park, there is a house called Chaucer's House, and it is quite possible that the poet Chaucer, who was attached to the household of Edward III, came to Woodstock at one of the visits of the Court. Probably, however, the house gets its name from Thomas Chaucer, who is buried at Ewelme, and who was, quite possibly, a son of the poet. Ewelme is a beautiful village at the base of the Chilterns, with church and alms-houses and school, forming one of the most

picturesque groups of buildings imaginable. They were founded by William de la Pole, Duke of Suffolk, the unfortunate minister of Henry VI, who was made the scapegoat for our failure in France and was beheaded in a boat off Dover. He had married Alice, the daughter of Sir Thomas Chaucer, and there are beautiful tombs of the duchess and her father and mother. Sir Thomas had fought at Agincourt, and his daughter, before marrying the Duke of Suffolk, had been the wife of the Earl of Salisbury, who appears in Shakespeare's *Henry V*. This battle was also the foundation of the fortunes of the Lenthall family from the ransoms of five knights there captured.

The confusion of the Wars of the Roses did not trouble our counties much, but Edward IV halted at Abingdon on his way to Tewkesbury in 1471, and after the battle Queen Margaret was brought to Wallingford Castle. Warwick the King-maker, the 'Last of the Barons', had just been buried at Bisham Abbey, on the Thames, near Marlow. His daughter, Anne Neville, had the manor of Stanford in the Vale, near Wantage, and the Neville crest of Bear and Ragged Staff may be seen in the church porch there; and this, it will be remembered, was the sign of the inn at Cumnor of which we read in *Kenilworth*. The only fight of note in this war was at Edgecote, near Banbury, on that line of hills made famous two hundred years later by the first battle of the Civil War. There the Lancastrian rebels in 1469 defeated and killed Herbert, Earl of Pembroke, who had captured Harlech Castle, the last stronghold of

Henry VI. We are more closely connected with the rebellions which marked the early years of Henry VII. The Lovels were a great family settled at Minster Lovel, near Witney, and during the reign of Richard III Lord Lovel had been one of the king's ministers, whose names are given an unpleasing notoriety in the rhyme:

The Cat, the Rat, and Lovel the Dog
Ruled all England under the Hog.

Lord Lovel, with several of the Fraternity of the Holy Cross at Abingdon, fought for Richard III at Bosworth, and escaped to the Continent, but came back to fight at Stoke for the son of the Oxford carpenter, Lambert Simnel. After the battle he was seen trying to swim his horse across the Trent. Then he disappeared. The probability is that he fled to his own house at Minster Lovel, and there remained hiding in a secret chamber. At all events a skeleton was afterwards discovered there of a man sitting at a table with pens and paper before him. The ruins of Minster Lovel are still one of the most picturesque features in the county. The John de la Pole, Earl of Lincoln, who was prominent in this rebellion and was killed at Stoke, had married the heiress of the old Berkshire family of Golafre, and with her had received the manor of Fyfield. This was subsequently granted to Catherine Gordon, the White Rose of Scotland, widow of Perkin Warbeck, whose tomb may be seen in the church. This manor close by us was, therefore, successively in the hands of the widows of two of the

claimants to the throne in the reign of Henry VII. A smaller man, one 'Humfrey Stafford', hearing of this mischance to the Lord Lovel, 'in a great dolor and agony,' fled and took sanctuary at Culham. But the King's Bench decided that such sanctuary could not avail a traitor.

The University of Oxford, after the time of the Friars and the foundation of the earlier colleges, seems to have somewhat declined in vigour and prosperity. In the reign of Richard II it was remarkable for the work of John Wiclif, who is said to have been Master of Balliol. The name of Humfrey, Duke of Gloucester, grandson of Wiclif's patron, John of Gaunt, is read in the list of benefactors of the University. He was founder of the University Library. Part of the Bodleian is still called Duke Humphrey's Library. At the end of the fifteenth century the revival of learning started the teaching of Greek at Oxford, and there was a printing-press at Oxford very soon after that started by Caxton at Westminster. One of the first results was the founding of Corpus Christi College instead of the monastery on which Bishop Foxe had first intended to bestow his benefaction. Of those who came under the influence of this new learning we may name Colet, More, Erasmus, the three Oxford reformers, as they have been called. The reformation which they desired to effect was a reformation of the Church from within, without any breach with the great traditions of the past or with Rome. Colet lectured on the Epistles of S. Paul, and exercised a strong influence on the great Dutch scholar Erasmus,

who learnt at Oxford, on his first visit to England, what he taught at Cambridge on his third. He also formed a great friendship with Sir Thomas More. On the downs within view of our windows is the village of East Hendred, with an old manor house which has been in possession of the Eyston family since 1450. The family was closely connected with Sir Thomas More, and his portrait and drinking cup are still preserved there with the staff on which Bishop Fisher, Sir Thomas More's fellow victim, supported himself on the scaffold. The family is Roman Catholic, and probably there is no other chapel where the Roman worship has been maintained so continuously as in that of Hendred manor. The Oxford reformers certainly sympathized with the suppression of some of the monasteries, and Wolsey was allowed to devote the revenues of some decayed foundations to his great college at Oxford. But they would not have approved of the abolition of all the great monastic houses, and certainly not of the tyrannical and unjust manner in which it was carried out. At Reading the abbot, Hugh of Faringdon, refused to surrender the abbey, and denied the king's authority over the property of the Church. He was hanged and quartered before the abbey gates. The Abbot of Abingdon was of a different temper, resigned the abbey, and was allowed to end his days in peace with a rich pension at Cumnor. Part of the monastic revenues were devoted to the establishment of new bishoprics and colleges or schools, e.g. the diocese of Oxford and Christ Church itself were so

endowed, the Abbot of Osney being the first bishop of the new see; but the greater part of the revenues were sadly squandered, and the king's agents in the work managed to secure some of the choicest of the spoil. The suppression in Oxfordshire was carried out by the High Sheriff, Sir John Williams of Thame, who secured some of the best Church lands, including Wytham Abbey. He subsequently proclaimed Queen Mary at Oxford, and there as sheriff superintended the burning of Ridley and Latimer. For these services he was raised to the peerage. He also had the custody of the Princess (afterwards Queen) Elizabeth at his house at Rycote, about eleven miles north of Oxford. He treated her with such courtesy that she remembered him with gratitude, and was his guest twice after her accession to the throne. Through his daughter the estate (as also Wytham Abbey) passed to the family of Lord Abingdon; it has quite recently been sold. Rycote House has disappeared, but the chapel remains almost as it was when Charles I visited the place in 1625.

Neither Berkshire nor Oxfordshire can rival Devon in their roll of Elizabethan worthies, but Sir John Davis, the navigator who gave his name to Davis Strait, is buried at Pangbourne, and perhaps Radley saw the beacon lit on the church tower of Hagbourne to announce the coming of the Armada. Then close by we have Cumnor, connected with *Kenilworth* and Amy Robsart. Cumnor Hall had formed part of the property of the Abbey of Abingdon, and had passed into the occupation of Antony Forster, who was

member for Abingdon, and apparently a man of some taste and education. He was Leicester's agent, but there seems no ground for charging him with the death of Leicester's wife, who was found with her neck broken at the bottom of a staircase. Copies of some of her letters are to be seen in Cumnor Church, and there is also the tomb of Forster. The Hall, like the house at Rycote, was demolished by the third Earl of Abingdon. Another feature of Elizabeth's reign comes home to us, viz. the Roman Catholic plots. The Eystons had their secret chamber at East Hendred, and the Yates at Lyford in the Vale. There the Jesuit, Edward Campion, was induced to come to celebrate mass, but he was betrayed, discovered in the hiding-place, and executed at Tyburn. One of the most famous of the bishops of Elizabeth's reign was Bishop Jewell of Salisbury, who was rector of Sunningwell, and built the curious porch at the west end of the church.

In the time of Charles I the ship-money assessment on the county of Oxford was £3,500, and Berkshire £4,000, this being the fifth or sixth richest county in the kingdom. Oxford and Abingdon were both assessed at £100. Hampden, the sturdy opponent of the tax, was owner of Great Hampden, a village on the Chilterns near Monks Risborough; he was at school at Thame, and was mortally wounded at Chalgrove Field, a place about eleven miles south-east of Oxford. William Lenthall, the famous Speaker of the Long Parliament, was a member of one of the oldest Berkshire families. His descendants still

possess the estate at Bessels Leigh. His son married a daughter of the Stonhouse family, of Radley Park, and is supposed to have given to the parish church the canopy over the pulpit which had been the canopy over the Speaker's chair.

The history of the Civil War is intricate, but we may understand it better by realizing what was going on in our neighbourhood. At first the king held the Salisbury road by the garrison at Basing House, also Reading, with its important roads to the west, one through Newbury to Bath and the West of England, commanded by Donnington Castle at Newbury, another through Wallingford to Abingdon, Faringdon and Gloucester, with Royalist garrisons at the three intermediate points. From Abingdon is the road to Oxford, Broughton Castle and Banbury. Broughton Castle is the extremely interesting seat of Lord Saye and Sele—a Liberal now as his ancestor was in King Charles's time. The first baron who held it was killed at Barnet; his father had been killed by Jack Cade. The first viscount was the chief organizer of resistance to Charles I., and invited Hampden, Pym, Essex, and others to meet at Broughton in a room still called the Council Chamber, and organized North Oxfordshire for the Parliament. The castle, however, with Banbury Castle, was occupied by the king after the first battle of the war at Edgehill, on the border of the county, and the king reached Oxford on October 29, 1642. The next year saw much skirmishing round Oxford, and it was in endeavouring to prevent Rupert's return after a raid

that Hampden was killed. Essex then retired from Wheatley to Aylesbury, and the queen came to Oxford on July 11. On July 6 there is an entry of several burials in Radley churchyard; it is not quite clear from what fighting they were the result. In the autumn the king had been obliged to raise the siege of Gloucester, and marching by Faringdon and Wantage, tried to intercept Essex at Newbury on his return to London by the Gloucester, Cirencester, Swindon, and Hungerford road. In charging through a gap in the hedge Lord Falkland was killed. He was buried at his home, Great Tew, in North Oxfordshire, a place where he had before the troubles constantly invited the most cultivated society of the time.

In the next year, 1644, the king's forces made the great mistake of abandoning Abingdon. Radley then must have been held as an outpost between the two armies. Rupert tried more than once to recover the abandoned position, but failed, and Abingdon remained with the Parliament till the end of the war. Meanwhile, two forces gathered to the attack of Oxford, one under Waller and one under Essex. Essex advanced from Abingdon, and managed to cross the Thames at Sandford. It is said that by Sandford churchyard are the traces of earthworks with which Essex protected the movement. Waller then moved westwards, forced his way over Newbridge, and then came towards Oxford as far as Eynsham. Essex, by this time, was at Islip, and the king was afraid that if the two armies joined and

besieged the city, its provisions would not last out. He therefore went out of the North Gate, across Port Meadow, by Wolvercote and Yarnton, and slipped between both armies without being noticed. Waller went in pursuit, and was defeated at Cropredy Bridge, some two or three weeks later (June 26, 1644). This battle made the Parliament most anxious to secure Banbury Castle, but it held out gallantly, and the siege was raised. But these successes did little to balance the defeat at Marston Moor (July 2), and the Parliamentary forces from Abingdon were pressing on the siege of Donnington Castle, which is on the hill just this side of Newbury. This siege the king marched to raise, and that was the cause of the second battle of Newbury. Cromwell was victorious over the royal left, but the centre and right held their ground. In the night the king withdrew, and Cromwell followed him as far as Hagbourne, near Didcot. The road to Oxford by Abingdon, of course, was closed, and the king had to go by Wallingford. He managed, however, to march back to Donnington, and to withdraw the crown, seal, jewels, papers, and artillery which he had left there. The reorganization of the Parliamentary army and the formation of what was called the New Model was directly due to Manchester's mismanagement of this matter, and the dispute caused thereby between him and Cromwell. From that day the cause of the king was doomed. The fighting of the next year is just a story of surrender of houses so far as this part of the country is concerned. The Royalists had captured Lenthall's

house at Besilsleigh, but lost it early in the year. Colonel Gage, the gallant commander of Oxford, was shot in an attack on Abingdon, by Culham Bridge, and was buried in the Cathedral at Oxford. Then Cromwell chased some regiments from Islip to Bletchington, now Lord Valentia's house, and there, it is said, on the entreaty of his young wife, Colonel Windebank surrendered. For this he was court-martialled and shot. The siege of Oxford was thus pressed, and the necessity of detaching troops to convoy provisions to Oxford seriously weakened the king's forces at Naseby. After that battle post after post was yielded. The brave Sir John Boys held Donnington till it was battered to pieces: nothing of the castle now remains except the gate-house. Cromwell stormed Basing House, bravely defended by the Marquess of Winchester, from whom the present Lord Lieutenant of our county claims descent. At Faringdon the church tower, shorn of its spire, bears witness to the Parliamentary cannon, and after resisting Cromwell himself, Faringdon House was compelled to submit. At last, in 1646, the king stole out of Oxford, and his troops were allowed to march out with honour of war on June 24. In Sunningwell Church there is the memorial of the rector, Dr. Fell, the Dean of Christ Church, who died on February 2, 1649, through the shock of the news of the king's execution.

Of the fortunes of this district during the Commonwealth there is not much to add, but it is interesting to note that Sir George Stonhouse, the owner of

Radley, and brother of the baronet buried in the church, had to pay the sum of £1,460 as composition for his estates, i. e. a fine for loyalty to his king. We must not forget that the name of the poet Milton is said to be derived from Great Milton, near Cuddesdon. His grandfather lived about four miles from Oxford, on Shotover Hill, of which he was said to be under-ranger, and at a neighbouring village, Forest Hill, Milton married his first wife. He must, therefore, have been familiar with the scenery of the district, and some people trace descriptions of it in his early poems. Mention has already been made of the Levellers, the mutinous socialists of the time, who tried to force their way across Newbridge, then went farther up the river, and succeeded in reaching Burford, where, however, they fell into the hands of Cromwell, and were shut up in the church. Three of them were shot, the rest were made to witness the execution from the church roof, and then pardoned.

We should not forget that Archbishop Laud was a Berkshire man, the son of a clothier of Reading. The University of Oxford owed much to his strong and careful administration. The porch of S. Mary's Church and the statue of the Blessed Virgin he placed there formed part of the charges brought against him by the Puritans. Christ Church Hall has the memories of two of the Parliaments of Charles II; one held in 1665, through fear of the plague in London, the other in 1681, the third of the short Parliaments, held there so that the Toryism of the University might check the Whig majority, who wished to exclude James II

from the throne. Within seven years James was to strain the loyalty of the most loyal body in the kingdom, by forcing Roman Catholic heads upon some of the colleges, and by ejecting the Fellows of Magdalen, who refused to elect his nominee as President. On October 25, 1688, repenting when it was too late, he restored them, but within a fortnight his nephew and son-in-law, William of Orange, was marching along the Kennet valley, by Hungerford to Reading.

At this point we may conclude our special survey. There are, however, just one or two lines of history on which some local light may be thrown. Such are the origin and growth of Parliament. We find a member for Abingdon summoned in 1338; but that was a time when to be summoned to Parliament was a burden to be avoided, not a privilege to be sought. It was not till 1555 that Abingdon had a regular member, and in that year it became a regular borough. Another thing is the development of trade, and its moving from one centre to another. The sheep-farming on the downs gave advantage for cloth manufactory. 'Abingdon stands by clothing' was said long ago, and there is still cloth made there. The manufactory has, however, almost died out in the villages on the edge of the downs, where once it flourished, like Blewbury and Hendred. The nature of the soil, however, does not alter, and this determines corn-land and pasture, and the stretch of cherry-orchards by Blewbury and Upton.

There remains one last note on architecture. Some slight knowledge of its principles adds much to the

interest of any bicycle excursion. It is not difficult to grasp enough to determine the probable date of various parts of a church, and to recognize the style of its chief features and their main points of interest. They must be sought in ordinary manuals of architecture. For the present purpose it is only possible to give the barest outline and some of the most notable instances of the various styles. Of work before the Conquest there is Upton Church, the tower of North Leigh, possibly the tower of S. Michael's, Oxford, and some bits of the Cathedral Church.

Of Norman or Romanesque, with its circular arches and square capitals and bases, we have one of the most beautiful examples at Iffley.

Of the transition to the simple lancets of the Early English we have an illustration at Dorchester, and the bottom of the front of S. Nicholas at Abingdon.

The Early English, or first pointed, itself is shown in the Cathedral Chapter House: in Northmoor Church and Stanton S. John it merges into the Decorated.

Of this the most beautiful example is Merton College Chapel, and, the most important in the neighbourhood, Dorchester. Great Haseley and Great Milton are also to be noted.

Perpendicular is to be found at Ewelme and S. Helen's, Abingdon. It is to be hoped that a list of the most interesting churches in the neighbourhood may be made, and placed with photographic illustrations in the Library.

II

BOTANY

THE system adopted in this account of the Flora of our neighbourhood will be classification according to habitat; those plants will be grouped together which are found in the same type of locality. At the same time no description of our flowers and trees would be of any value or interest which omitted all mention of family relationships. The result is therefore a compromise. When the general scheme is not affected thereby, members of the same family are grouped together. In those cases where this has not seemed advisable, the family of any plant can be ascertained by reference to the list at the end. In this list the first Latin name (i.e. the genus) of every flower and tree previously mentioned will be found in its proper family or 'Natural Order'.

The account is not intended to be exhaustive. Grasses and sedges, and the lowlier forms of vegetable life, the Cryptogams, are almost entirely omitted. Families among the higher plants which are difficult to disentangle, notably the Umbelliferae, are very sparingly treated. The object has been to direct attention to interesting plants, and to describe and name some of the commonest flowers and trees which

will be met with during walks and rambles in the neighbourhood of Radley. Some of these rambles will require a preliminary journey by train or bicycle.

Further information or help in identification can be obtained from standard works on Botany, such as Bentham and Hooker's *British Flora*, and Druce's *Flora of Berkshire*.

Plants will often be found in more than one kind of situation, some indeed are ubiquitous. In such cases they will be mentioned only where they seem to be most frequent, except in a few cases where repetition has seemed advisable.

A few preliminary remarks on general botany will be helpful.

The vegetable kingdom is divided by botanists into two great groups, Cryptogams and Phanerogams. Phanerogams produce seeds, Cryptogams do not. The Cryptogams comprise such plants as ferns, horsetails, mosses, liverworts, Fungi, and Algae (including seaweeds).

The Phanerogams are again divided into two groups, Gymnosperms and Angiosperms. The Gymnosperms are the Conifers, cone-bearing trees, pines and firs. The Angiosperms are the highest type of plant, and are by far the most numerous; they are the flowering plants, though the flowers are often inconspicuous. All the plants dealt with in this account belong to the Angiosperms unless otherwise described.

The Angiosperms are divided into two great groups, Monocotyledons and Dicotyledons. These

again into a number of Natural Orders or families. The names of these two divisions of the Angiosperms refer to the number of cotyledons or seed-leaves found within the seed. The group of Monocotyledons contains the grasses and some of our most beautiful flowers, orchids, lilies, tulips, daffodils, crocus. They may easily be distinguished by their grass-like leaves with parallel veins; and the parts of the flower are in threes. The Dicotyledons have various shaped leaves with network veins, and the parts of the flower are in fours or fives. Dicotyledons are much the most numerous.

MEADOWS

Some of the earliest flowers are most frequent in the park, where cowslips and orchids make a beautiful show in early spring. Cowslip is *Primula veris*. The orchid is the 'green winged' orchid, *Orchis morio*, so called in consequence of the green lines on the wings folding over on each side of the flower. Its colour varies from a dark purple to pure white, and it is only in the lighter coloured varieties that the green lines are clearly marked. The orchids are Monocotyledons.

In the park may also be found the curious little 'adder's-tongue' fern, *Ophioglossum vulgatum*, a Cryptogam; there is plenty of it, but it is easily overlooked. In 1910 was discovered a small patch of another little fern, moonwort, *Botrychium Lunaria*, quite close to college. It is similar to the adder's-tongue fern, but more elaborate. Moonwort used to grow in the park

near Upper Elm, and was ruthlessly dug up many years ago. Now that it has been rediscovered, it is hoped that this plant, which is probably our most precious botanical treasure, will be left undisturbed.

In the meadows down by the river the fritillary grows, *Fritillaria meleagris*, both at Nuneham and Sandford, generally in patches. It is most frequent in the Iffley Meadows, nearer Oxford. The fritillary is a Monocotyledon of the lily family, certainly one of our most beautiful wild plants. Owing to the spotted character of its purple flower, it is also called snake's-head. A pure white variety is found, but is not so common. The meadow saxifrage, *Saxifraga granulata*, grows at Nuneham (in a meadow on the further side of the railway bridge). Here also is cuckoo-flower, *Cardamine pratensis*, in abundance at this early part of the year, common in any damp meadow.

About the beginning of June another orchid makes its appearance in the park, the frog, *Habenaria viridis*. It has a green flower sometimes tinged with brown. Though not entirely absent from other parts of the park it is commonest about Middle Elm, where the extension of the cricket ground has already partially exterminated it.

Bugle, *Ajuga reptans*, is a very common late spring flower. Selfheal, *Prunella vulgaris*, which is often confused with bugle, comes later.

The meadows in summer have the usual two species of buttercup, *Ranunculus bulbosus* and *R. acris*; a third, *R. repens*, is common in damp

ditches; other very common plants in our hayfields are the yellow rattle, *Rhinanthus Crista-galli*, and the ox-eye daisy, *Chrysanthemum Leucanthemum*. This last belongs to the Composite family, in which the so-called flower is composed of a number of small distinct florets. Of the same family are knapweed or hardheads, *Centaurea nigra*; milfoil, *Achillea Millefolium*; and various dandelion-like plants; these are difficult to distinguish, but three at any rate may be easily identified: mouse-ear hawkweed, *Hieracium Pilosella*, with single lemon-coloured flower-heads, smaller than the dandelion; smooth hawk's-beard, *Crepis virens*, a tall plant with many small flower-heads, which swell to a conical shape after flowering; and goat's-beard, or John-go-to-bed-at-noon, *Tragopogon pratense*, with very beautiful parachute seed vessels; the flower closes early, generally before noon. Dandelion itself is *Taraxacum Dens-Leonis*.

Various clovers are found in fair quantity: common clover, *Trifolium pratense*; Dutch or white clover, *T. repens*; Alsike clover, *T. hybridum*, like the last, but branched and with a tinge of pink in the flower; hop trefoil, *T. procumbens*, distinguished by its hop-like head of seed vessels; its flowers, as well as those of another, *T. minus*, are yellow. These two small yellow clovers are very like black medick or nonsuch, *Medicago lupulina*, but the medicks may be easily distinguished by their spirally-twisted pods. Two other plants of the same family as the clovers are bird's-foot trefoil, *Lotus corniculatus*, the flowers

yellow, tinged with brown; and, in the late summer, rest-harrow, *Ononis arvensis*, with handsome pink flowers and a tough spiny stem.

Another meadow plant is wild carrot, *Daucus carota*, the centre flower of the umbel is generally purple, the rest white. Also Lady's or yellow bedstraw, *Galium verum*; scabious, *Scabiosa arvensis*, a purple flower, very similar to a Composite; ragged robin, *Lychnis flos-cuculi*, especially at Nuneham; and sparingly the handsome blue meadow geranium, *Geranium pratense*; in dry pastures, a tiny scorpion grass, with yellow flowers turning blue, *Myosotis versicolor*, and harebell, *Campanula rotundifolia*.

Two plants with brownish red flowers are very frequent, great burnet, *Poterium officinale*, in the hayfields round college; and sorrel, *Rumex acetosa*, mostly in the meadows by the river.

In autumn, meadow saffron, *Colchicum autumnale*, a rare plant of the lily family, has been found in the Nuneham meadows. It is like a purple crocus.

THE ROADSIDE HEDGES AND DITCHES

A curious little plant which is found on the hedge banks in early spring is muscatel, *Adoxa Moschatellina*. It is of delicate light green texture, with a still lighter green flower. Owing to its short life and unobtrusive nature, muscatel is but little known, though not uncommon. There are patches of it on the lower road towards Oxford, but it grows plentifully in the shrubbery and along the roadside before the first

turn on the Abingdon road. Another early plant is garlic mustard, *Alliaria officinalis*, with unpleasant garlic-smelling leaves. This is very common, and is quickly followed by one of the commonest plants of the neighbourhood, wild chervil or keck, *Cerfolium sylvestre* (or *Chaerophyllum*), an umbel. As soon as this arrives it seems to crowd out everything else. Later on another umbel, almost equally abundant, takes its place, hedge parsley, *Caucalis Anthriscus*. Lords-and-ladies or cuckoo-pint, *Arum maculatum*, is common in all wayside ditches; ground ivy, *Nepeta Glechoma*, is ubiquitous.

In June there are two interesting plants by the roadside, just beyond the farm on the way to the river, a rare species of thistle with small pink flower-heads, *Carduus pycnocephalus* (the thistles are Composite flowers); and hound's-tongue, *Cynoglossum officinale*. Comfrey, *Symphytum officinale*, soon follows, just before the path leading across the railway, and great willow-herb, *Epilobium hirsutum*.

Along Kennington lane are the greater celandine, *Chelidonium majus*, of the poppy family, with yellow latex (milky juice); and the lesser spearwort, *Ranunculus Flammula*, a buttercup.

The three common violets, *Viola canina*, *V. hirta*, and *V. odorata*, are all common. Only the last is scented; the white variety is very frequent. *Viola hirta* is found mostly in woods, and therefore does not properly belong here.

An attractive geranium, or crane's-bill, occurs along hedge banks, especially near the 'Fox' Inn, *Geranium*

lucidum, with shiny glabrous (hairless) leaves, and small bright pink flowers. The commonest geranium is herb Robert, *G. Robertianum*. Round-leaved crane's-bill, *G. rotundifolium*, though uncommon, has occurred of late years in some profusion along the Abingdon road. Cut-leaved geranium, *G. dissectum*, is handsome and common. Mountain crane's-bill, *G. pyrenaicum*, is rarely met with; it grows on the archery ground, and also at Cothill.

Of the vetches, the first to appear is bush vetch, *Vicia sepium*, with dull purple flowers, quickly followed by common vetch, *V. sativa*, with handsome reddish purple or crimson flowers. Later come tufted vetch, *V. Cracca*, with more numerous smaller flowers; and the smallest of all, tare, *V. hirsuta*, with hairy two-seeded pods. Smooth tare, *V. tetrasperma*, with flowers rather larger than common tare and four-seeded pods, is much less common. Milk vetch, *Astragalus glycyphyllos*, grows in one or two places; it has light yellow tufted flowers, which develop into very characteristic pods, rather like small bananas. The everlasting pea, *Lathyrus sylvestris*, and the grass pea, *L. Nissolia*, both grow near the 'Fox' Inn; the latter has a beautiful crimson flower, with leaves like grass. Meadow vetchling, *L. pratensis*, is a fairly common plant with handsome yellow flowers. Melilot, *Melilotus officinalis*, belongs to the same family; it has yellow flowers, and characteristic leaves which look as if they had been bitten all round.

Near the 'Fox' may also be found the poisonous hemlock, *Conium maculatum*, a large umbelliferous

plant, its stem covered with purple spots; and tansy, *Tanacetum vulgare*, a Composite with strong aromatic scent.

Dyer's-rocket, *Reseda Luteola*, one of the wild mignonettes, will be found near the base of the Radley Church font on the hill. At the bottom of this hill, on the Radley side, the hop grows in the hedge, *Humulus Lupulus*, of the stinging nettle family. The common stinging nettle, *Urtica dioica*, is only too common; the small one, *Urtica urens*, much less so.

White and red dead nettles, *Lamium album* and *L. purpureum*, are everywhere; so are woundwort, *Stachys sylvatica*, and black horehound, *Ballota nigra*. The yellow nettle or archangel, *Lamium Galeobdolon*, is fairly frequent, and hemp nettle, *Galeopsis Tetrahit*, less so. Wild basil, *Calamintha Clinopodium*; basil thyme, *C. Acinos*; and common calamint, *C. officinalis*, are strongly aromatic; wild basil is fairly common in late summer, the other two quite uncommon. Catmint, *Nepeta Cataria*, is another strong minty smelling plant; it is decidedly local, but occurs sometimes along the Abingdon road and at Cothill. Wild sage, *Salvia Verbenaca*, will be found occasionally. Betony, *Stachys Betonica*, is common in late summer.

Figwort, *Scrophularia nodosa*, occurs near the font base, and bartsia also later in the summer, *Bartsia Odontites*; foxglove, *Digitalis purpurea*, at Cothill; and germander speedwell, *Veronica Chamaedrys*, everywhere. Common toadflax, codlins-and-cream, *Linaria vulgaris*, is rather late in flowering.

The St. John's worts are well represented, the commonest being perforated St. John's wort, *Hypericum perforatum*, and hairy St. John's wort, *H. hirsutum*. *Hypericum pulchrum* occurs occasionally.

Of the pink family, the commonest are white and red campion, *Lychnis vespertina* and *L. diurna*; and bladder campion, *Silene inflata*. Also the stitch-worts, especially great stitchwort, *Stellaria holostea*, in early spring. Cerast, *Cerastium arvense*, with a flower very like great stitchwort, grows in patches along the Abingdon road. Common are lesser stitchwort, *Stellaria graminea*; chickweed, *S. media*; and a plant which is often mistaken for chickweed, *Arenaria trinervia*, one of the sandworts, which grows mostly in woods.

Three other umbels must be mentioned: parsnep, *Pastinaca sativa*, with yellow unpleasant-smelling flowers; cow parsnep or hogweed, *Heracleum Sphondylium*, a large coarse plant; and angelica, *Angelica sylvestris*, the largest of all, sometimes six feet high or more, a graceful and very attractive plant, to be looked for in late summer, in damp places.

Other Composites are succory or chicory, *Cichorium Intybus*, with fine blue flowers, more common along the roads on the downs; nipplewort, *Lapsana communis*; and ragwort, *Senecio Jacobaea*, both very common; also burdock, *Arctium Lappa*. Mugwort, *Artemisia vulgaris*, with an aromatic smell, is one of our commonest late-flowering wayside plants. Ox-tongue, *Helminthia echioides* is rare; it grows in 'willow lane'.

The two commonest mallows are everywhere, *Malva rotundifolia* and *M. sylvestris*. Musk mallow, *M. moschata*, with fine pink flowers, is less frequent.

Of the rose family, avens, *Geum urbanum*, is a common spring flower; cinquefoil or potentil, *Potentilla reptans*, and silverweed, *P. anserina*, come later; and agrimony, *Agrimonia Eupatoria*, is later still.

The two small willow-herbs, *Epilobium montanum* and *E. parviflorum*, occur, though not so commonly as great willow-herb. The largest, rosebay willow-herb, *E. angustifolium*, grows in Kennington lane.

Of the bedstraws, great bedstraw, *Galium Mollugo*, heath bedstraw, *G. saxatile*, a smaller plant, and the well-known cleavers or goose grass, *G. aparine*, are universally distributed. Crosswort, *G. Cruciata*, does not occur in the near neighbourhood, but grows on Shotover and White Horse Hill.

Three other plants deserve mention: nettle-leaved campanula, *Campanula Trachelium*, with fine large flowers, decidedly rare; the well-known teasel, *Dipsacus sylvestris*; and creeping Jenny or moneywort, *Lysimachia nummularia*, a charming plant of the primrose family, growing at the bottom of 'willow lane.'

HEDGE TREES

The trees of which the hedges are made show at their best in autumn, when berries and seed-vessels are ripening. Spindle, *Euonymus europaeus*, is the most attractive, with green stems and pink berries shaped like a biretta, which open when ripe to show

orange-coloured seeds within. Guelder rose, *Viburnum Opulus*, has very beautiful autumn-colouring with red berries; it is not so frequent as *Viburnum Lantana*, the wayfaring tree, with mealy leaves, and berries which turn from red to purplish black when ripe. Elder, *Sambucus nigra*, and dogwood or cornel, *Cornus sanguinea*, both have berries turning black; the leaves of dogwood have very marked veins. Dwarf elder or Danewort, *Sambucus Ebulus*, is very rare; it appeared a few years back along the Kennington avenue. Privet, *Ligustrum vulgare*, has sickly smelling flowers developing into clusters of black berries. Buckthorn, *Rhamnus catharticus*, also with black berries, is less common. Blackthorn, *Prunus spinosa*, is the earliest hedge shrub to flower, and produces the well-known sloes in autumn; the damsons and plums of our gardens are believed to be varieties of the sloe produced by long cultivation. Crab-apple, *Pyrus Malus*, occurs in a few spots. The commonest rose, *Rosa canina*, with scented flowers, is everywhere, and the unscented, *Rosa arvensis*, is not uncommon. Blackberry is *Rubus fruticosus*.

A variety of elm with corky bark, *Ulmus suberosa*, grows in the hedges; hazel, *Corylus avellana*; beech, *Fagus sylvatica*; and many species of willow, *Salix*. The common hawthorn or May is *Crataegus oxyacantha*. Maple, *Acer campestre*, has fine colours in autumn, and winged seed-vessels; it belongs to the same genus as sycamore, *A. pseudoplatanus*.

Several climbing plants are found in the hedges. The hop has already been referred to. Others are:

bitter-sweet or woody nightshade, *Solanum Dulcamara*, a poisonous plant with purple flowers, like the potato, which is *Solanum tuberosum*; bryony, *Bryonia dioica*, with stamens and pistils on separate plants (this is what *dioica* signifies), belonging to the same family as cucumbers and melons; honey-suckle, *Lonicera Periclymenum*; black bryony, *Tamus communis*, with shiny dark-green leaves, and red berries in autumn (it has no connexion with *Bryonia*); great bind-weed, *Convolvulus sepium*.

Forest trees are interspersed along the hedges, often clothed with ivy, *Hedera helix*. The commonest are the elm, *Ulmus campestris*, and wych elm, *U. montana*; the wych elm is the more beautiful tree, it is better shaped, though not so tall, and has larger leaves. The avenue to Kennington consists mostly of wych elms. Many people fail to observe the flowers of the elm; they appear in very early spring, and give the tree a fine reddish purple colour. The fruit follows quickly, and most of it has been scattered before the leaves begin to open.

The white beam tree, *Pyrus Aria*, is fairly common on the chalk, but rare in our immediate neighbourhood. There is one a mile along the road to Abingdon. The underside of the leaves is covered with a soft white down.

Other trees often occurring are oak, *Quercus robur*; and ash, *Fraxinus excelsior*; and occasionally the Scotch fir, *Pinus sylvestris*, a Gymnosperm. Our own Radley oak is probably the finest oak for many miles round.

WOODS

Primroses, *Primula vulgaris*, are the first to appear, quickly followed by a sheet of white wood-anemone or wind-flower, *Anemone nemorosa*. This is followed by a sheet of blue when the bluebells come into flower, *Scilla nutans*, of the lily family. Others of the same family appearing later are lily of the valley, *Convallaria majalis*, in Bagley; and three in the woods on the downs: Solomon's seal, *Polygonatum multiflorum*; ramsons, *Allium ursinum*, with penetrating garlic smell; and herb Paris, *Paris quadrifolia*. These are rare.

Scattered among the bluebells will be found a few early purple orchids, *Orchis mascula*, a taller plant than the green-winged orchid of the park, with its wings bent back. Other orchids appear later: tway-blade, *Listera ovata*, with ugly green flowers; butterfly orchid, *Habenaria bifolia*, a very handsome species with greenish white flowers, strongly scented at night; and later, the spotted orchid, *Orchis maculata*, with a crowded head of pinkish purple flowers, found also in pastures. In the beechwoods on the downs the birds'-nest orchid, *Neottia nidus-avis*, is found in May (it grows sparingly in a wood near the college also); white helleborine, *Cephalanthera pallens*, abundantly in late June; and broad-leaved helleborine, *Epipactis latifolia*, sparingly in August.

In some woods dog's-mercury, *Mercurialis perennis*, is a regular pest, and seems to crowd out everything else; it is an uninteresting plant, with inconspicuous

flowers. Others growing freely are: wood sanicle, *Sanicula europaea*; sweet woodruff, *Asperula odorata*, on the downs and Boar's Hill; wood sage, *Teucrium Scorodonia*; wood spurge, *Euphorbia Amygdaloides*; wood sorrel, *Oxalis Acetosella*; enchanter's nightshade, *Circaea lutetiana*; and bracken fern, *Pteris aquilina*, a Cryptogam; sparingly, wood loosestrife, *Lysimachia nemorum*, in Bagley; and columbine, *Aquilegia vulgaris*, on the downs. Goldilocks, *Ranunculus auricomus*, grows in the shrubbery, and also occasionally on hedge banks; it is a buttercup, of woods, with incomplete and irregular flowers.

WATER-PLANTS

Our neighbourhood is particularly rich in interesting water and marsh plants. The marsh at Cothill, which has been acquired by the Ashmolean Natural History Society of Oxfordshire, and named the 'Ruskin Reserve', is one of the most botanically rich spots in the midland counties; this marsh will be dealt with separately.

The commonest early spring water-plant is the marsh marigold or kingcup, *Caltha palustris*. Butterbur, *Petasites officinalis*, a Composite, is rather rare in our neighbourhood; it grows in some quantity by the riverside near Abingdon lock.

The beautiful buck-bean or bog-bean, *Menyanthes trifoliata*, of the gentian family, with feathery white flowers, appears in May; it grows abundantly in the marshy ground and water at Thrupp, and has been

planted in our pond. At Thrupp grow also the small valerian, *Valeriana dioica*, the male flowers larger than the female; red rattle, *Pedicularis palustris*; water-violet, *Hottonia palustris*, a handsome plant of the primrose family, its flower rather like cuckoo-flower rising from the water; water-soldier, *Stratiotes aloides*, with prickly leaves surrounding a single white flower; the flowering rush, *Butomus umbellatus*, a tall flowering stem with a large umbel of rose-coloured flowers; bladderwort, *Utricularia minor*, with irregular spurred yellow flowers and floating bladders; great spearwort, *Ranunculus Lingua*, a fine big buttercup, sometimes 6 feet high; water-dropwort, *Oenanthe fistulosa*, an umbel; great water-parsnep, *Sium latifolium*, a fine large umbel; water-milfoil, *Myriophyllum spicatum*, a small plant on the sides of ditches; two large veronicas, *Veronica Anagallis* and *V. scutellata*; marsh stitchwort, *Stellaria palustris*, with glaucous leaves, rather a rare plant; bistort, *Polygonum Bistorta*; common periscary or spotted snakeweed, *Polygonum Persicaria*; arrow grass, *Triglochin palustre*; marsh orchid, *Orchis latifolia*, a rather coarse orchid; bitter-cress, *Cardamine amara*, like cuckoo-flower, but with white flowers.

In the river and side streams are the two water-lilies, *Nymphaea alba* and *Nuphar luteum*; arrow head, *Sagittaria sagittifolia*; and occasionally *Limnanthemum peltatum*, which used to be called *Villarsia*, with handsome yellow flowers and round floating leaves, in late July; and another polygonum,

P. amphibium, with a fine pink head of flowers rising out of the water.

On the banks of the river grow winter-cress, *Barbarea vulgaris*, and two species of water-cress, *Nasturtium amphibium* and *N. sylvestre*, all three with yellow flowers (common water-cress is *N. officinale*, with white flowers); meadow-rue, *Thalictrum flavum*; water-stitchwort, *Stellaria aquatica*; St. Peter's wort, *Hypericum acutum*, a St. John's wort with square stems; meadow-sweet, *Spiraea Ulmaria*; great willow-herb, *Epilobium hirsutum*; purple loosestrife, *Lythrum Salicaria*; sneezewort, *Achillea Ptarmica*; water-figwort, *Scrophularia aquatica*, with square stems; gipsywort, *Lycopseuropaeus*; water-mint, *Mentha aquatica*; skullcup, *Scutellaria galericulata*, with fine blue flowers; marsh woundwort, *Stachys palustris*; yellow loosestrife, *Lysimachia vulgaris*, a very handsome plant, coming into flower towards the end of July; yellow flag, *Iris Pseudacorus*; sweet flag, *Acorus Calamus*, with wavy leaves strongly aromatic when rubbed; bur-reed, *Sparganium ramosum*; horse-radish, *Cochlearia Armoracia*, at Sandford; great valerian, *Valeriana officinalis*; and in August, hemp agrimony, *Eupatorium cannabinum*.

The surface of nearly all stagnant or slowly moving water, such as our pond, is covered with water-crowfoot, *Ranunculus aquatilis*, a white buttercup; various pond-weeds, *Potamogeton*; and the great water-plantain, *Alisma Plantago*.

On the banks of the pond are also celery-leaved crowfoot, *Ranunculus sceleratus*; forget-me-not, *Myo-*

solis palustris; water-bedstraw, *Galium palustre*; bur marigold, *Bidens tripartita*. The pond also contains one of the horsetails in great profusion, *Equisetum palustre*; the horsetails are Cryptogams just above the ferns in order. It has remarkable spores, with four arms, sensitive to moisture (hygroscopic); they should be examined under a microscope, and will be seen to curl up when gently breathed upon.

Kishon and other similar streams contain brooklime, *Veronica Beccabunga*, dangerously like watercress; and wet ditches abound with an umbel, common water-parsnep, *Apium nodiflorum*; where also in July fleabane is fairly common, *Pulicaria dysenterica*, a yellow Composite, with woolly stem and leaves.

Frogbit, *Hydrocharis Morsus-ranae*, occurs between Abingdon and Sutton Courtenay; and the beautiful snowflake or Loddon lily, *Leucojum aestivum*, grows freely in a spot by the riverside, near Wittenham, in spring.

THE RUSKIN RESERVE

It is a walk of $4\frac{1}{2}$ or a bicycle ride of 6 miles to reach the marsh ground, which the Ashmolean Natural History Society now possesses through private beneficence, in order that its treasures may be preserved undisturbed. It lies behind Cothill School. Only the more striking plants which occur there will be mentioned in this short account.

First look closely among the bog moss, *Sphagnum*; the mosses are, of course, Cryptogams. Here will be found sundew, *Drosera rotundifolia*, the best known fly-eating plant. The leaves of sundew are supplied

with upright hairs, each with a drop of sticky liquid at the end; a small fly settling on these is caught, and the leaf slowly closes up and secretes a digestive fluid, and so the edible part of the fly is absorbed by the plant. Here also grows another fly-eating plant, butterwort, *Pinguicula vulgaris*, a plant one associates more with the mountains of Wales and Scotland than the Thames valley. The flower is handsome, of a bluish purple colour, and the leaves yellowish green, with a soapy surface, which enables it to catch minute flies. Careful search discloses a very lovely little creeping plant, bog pimpernel, *Anagallis tenella* (of the primrose family), with delicate pink bell-shaped flowers. Another member of the same family here is brookweed, *Samolus Valerandi*, which grows, as a rule, near the sea, especially the west coast, and is very rare inland. Both bladderworts occur, *Utricularia vulgaris* and *U. minor*. A very rare water-plantain, *Alisma ranunculoides*, grows very sparingly. The smooth meadow thistle, *Carduus pratensis*, should be looked for.

Of the orchids, besides the common spotted and marsh orchids, the fragrant orchid, *Habenaria conopsea*, occurs. But the most characteristic orchid here is marsh helleborine, *Epipactis palustris*, a very beautiful plant. It comes into flower at the end of July, and is found in great profusion.

One of the most conspicuous plants here is cotton-grass, *Eriophorum latifolium*, and quantities of red rattle or marsh lousewort, *Pedicularis palustris*, catch the eye at once.

Growing at the bottom of the pond there is abundance of *Chara*, the highest member of the class of Algae.

In the drier portions are a species of broom, dyer's-weed, *Genista tinctoria*; milkwort, *Polygala vulgaris*; and eyebright, *Euphrasia officinalis*.

Lastly, in late summer, lasting often into the beginning of the Michaelmas term, the beautiful Grass-of-Parnassus, *Parnassia palustris*, appears in quantities. This grows also in the marshy ground on Frilford Heath.

THE DOWNS

Our pleasantest botanical excursions are to the chalk downs above Aston and Cholsey. Here we wander up and down soft grassy slopes, dotted with small juniper bushes, *Juniperus communis* (a Gymnosperm), enjoying the scent and invigorating air.

The earliest visit is in April or the beginning of May, to find the pasque-flower, *Anemone pulsatilla*. It grows in patches, so thick that the ground is almost a mass of purple, a rare treat for those who know where to go, a secret jealously guarded.

Our second visit is in the second week of June. By this time rock rose, *Helianthemum vulgare*, is out in all its profusion; and another yellow flower, horse-shoe vetch, *Hippocrepis comosa*, with a somewhat sickly smell, is also very characteristic of the downs. Milkwort, *Polygala vulgaris*, blue, pink, and white, is everywhere, and also salad burnet, *Poterium Sanguisorba*, a small edition of great burnet. The special

orchid on the open down at this period is the dwarf or burnt orchid, *Orchis ustulata*; and in another part of the downs in a wood we find *Ophrys muscifera*, so strangely like a fly.

A third visit at the end of June gives another crop of flowers. Great bushes of the deadly nightshade, *Atropa Belladonna*, skirt the woods or share the waste patches with another beautiful but poisonous and foul-smelling plant, henbane, *Hyoscyamus niger*. Here is also viper's bugloss, *Echium vulgare*, a very prickly plant with fine blue flowers developing from pink buds; candy-tuft, *Iberis amara*; and centaury, *Erythraea Centaurium*. On the open downs are cathartic flax, *Linum catharticum*; small scabious, *Scabiosa Columbaria*; dropwort, *Spiraea Filipendula*, a glorified meadow-sweet (growing also near our rifle-range, and looking strangely out of place there); and clustered bellflower or lesser throatwort, *Campanula glomerata*. Also three tiny plants in the grass: thyme, *Thymus Serpyllum*; squinancy wort, *Asperula cynanchica*; and bastard toadflax, *Thesium linophyllum*. This last requires a close search. The orchids are the bee, *Ophrys apifera*, the pyramidal, *Orchis pyramidalis*, and the fragrant orchid, *Habenaria conopsea*, growing in the driest places, as here, and also in marshy ground like the Ruskin Reserve. Near the White Horse yellow-wort, *Chlora perfoliata*, will be found. Along the roadsides on the chalk grow lady's-fingers, *Anthyllis vulneraria*, and creeping toadflax, *Linaria repens*, with pretty blue flowers.

WASTE AND DRY PLACES AND WALLS

The earliest of all flowers to appear in spring is the tiny whitlow-grass, *Erophila vulgaris* (or *Draba verna*), on paths and other dry places; but it lasts only a very short time. Soon follows one of the commonest of weeds, lasting throughout the summer, shepherd's purse, *Capsella Bursa-pastoris*. Fumitory, *Fumaria officinalis*, is also early.

Other common plants on waste ground which appear later are: matricary or Mayweed, *Matricaria inodora*; stinking chamomile, *Anthemis Cotula*; and a handsome thistle, *Carduus nutans*, all Composites.

Near Cothill grow gromwell, *Lithospermum officinale*, and vervain, *Verbena officinalis*; also a rare plant, white horehound, *Marrubium vulgare*; this also grows on a spot near the Abingdon roadside.

At Frilford stork's-bill will be found growing freely, *Erodium cicutarium*; and near the 'Fox' is an uncommon clover, *Trifolium striatum*. Here also is field bugloss, *Lycopsis arvensis*, with flowers of rich blue.

Two other poppies besides the common one occur, *Papaver dubium*, with long seed-vessels or capsules; and *P. Argemone*, a smaller plant, rather rare, with long capsules ornamented with a few stiff hairs.

A wild onion, *Allium vineale*, grows abundantly on a dry bank just off the Abingdon road.

Stonecrop, *Sedum acre*, grows freely in dry spots on the downs, and on walls. Another stonecrop,

with white flowers, belongs to walls, *S. dasyphyllum*; it has thick almost globular leaves.

Other wall plants are: great mullein, *Verbascum Thapsus*, on one of the walls in the garden; it is also found with black mullein, *V. nigrum*, on the downs; ivy-leaved toadflax, *Linaria Cymbalaria*; wall pellitory, *Parietaria officinalis*, belonging to the stinging nettle family; pennywort, *Cotyledon Umbilicus*, at Marcham, a very curious plant; the Oxford ragwort, *Senecio squalidus*, at Oxford in quantity and gradually spreading on walls and waste places; in spite of its name 'squalidus' it is the most handsome of the ragworts. Common groundsel is *Senecio vulgaris*; another groundsel, *S. sylvaticus*, slightly viscid or sticky, grows on Boar's Hill and on the Chilterns. Lamb's lettuce, *Valerianella olitoria*, is frequently met with on walls and waste ground.

A curious little Alga called *Nostoc* (a Cryptogam), like small lumps of green jelly, appears often on the gravel paths of the college after rain.

CORNFIELDS, &c.

This group may be called 'weeds of cultivation'.

Early in spring a yellow Composite appears with white cottony stem. This is colt's-foot, *Tussilago Farfara*; its large round leaves do not show themselves till later. The two commonest speedwells grow mostly in cornfields, and are in flower nearly the whole season, *Veronica Buxbaumii*, with handsome flowers, and *V. agrestis*, with very small flowers.

A tiny plant with star-like flowers of bluish pink colour is very common; this is field madder, *Sherardia arvensis*.

Other common plants which appear rather later are: henbit, *Lamium amplexicaule*; heart's-ease or wild pansy, *Viola tricolor*; scorpion grass, *Myosotis arvensis*; lesser bindweed, *Convolvulus arvensis*, a troublesome weed; pimpernel or poor man's weather-glass, *Anagallis arvensis*, a well-known favourite; knot-grass, *Polygonum aviculare*; sow-thistle, *Sonchus oleraceus*, a coarse Composite; dove's-foot crane's-bill, *Geranium molle*, a small uninteresting geranium; the common poppy, *Papaver Rhoeas*; two umbels, fool's parsley, *Aethusa Cynapium*, and shepherd's needle, *Scandix Pecten*; corn crowfoot or buttercup, *Ranunculus arvensis*, with seeds covered with prickles (it grows freely in cornfields on the way to Sunningwell); and two crucifers, mithridate pepperwort, *Lepidium campestre*, and penny-cress, *Thlaspi arvense*.

Rather less common is corncockle, *Lychnis Githago*, with fine purple petals, the sepals extending beyond them; and corn campanula or Venus's looking-glass, *Campanula hybrida*, may be occasionally seen.

A rare umbel, thorow-wax or buplever, *Bupleurum rotundifolium*, grows in cornfields near Cothill.

Sanfoin, *Onobrychis sativa*, and lucern, *Medicago sativa*, are both cultivated for fodder, especially in chalk districts. Stray specimens often occur. A very troublesome and abundant weed in cornfields, which is sometimes cultivated, is charlock or wild mustard, *Brassica sinapistrum*, a coarse crucifer. On the chalk

this is replaced by white mustard, *Brassica alba*, also called charlock.

The lesser broomrape, *Orobanche minor*, a horrible parasite, is only too common in clover fields.

Lastly, the corn marigold, *Chrysanthemum segetum*, comes into flower in September, and provides a glorious sheet of yellow in the cornfields near Sugworth.

PHANEROGAMS

ANGIOSPERMS

Dicotyledons

Ranunculaceae:—Ranunculus, Anemone, Aquilegia, Thalictrum, Caltha.

Nymphaeaceae:—Nymphaea, Nuphar.

Papaveraceae:—Papaver, Chelidonium.

Fumariaceae:—Fumaria.

Cruciferae:—Barbarea, Nasturtium, Cardamine, Sisymbrium, Alliaria, Brassica, Cochlearia, Eruphila, Thlaspi, Iberis, Capsella, Lepidium.

Resedaceae:—Reseda.

Cistaceae:—Helianthemum.

Violaceae:—Viola.

Polygalaceae:—Polygala.

Caryophyllaceae:—Silene, Lychnis, Arenaria, Holosteum, Cerastium, Stellaria.

Hypericaceae:—Hypericum.

Linaceae:—Linum.

Malvaceae:—Malva.

Geraniaceae:—Geranium, Erodium, Oxalis.

Aceraceae:—Acer.

- Celastraceae :—Euonymus.
 Rhamnaceae :—Rhamnus.
 Leguminosae :—Genista, Ononis, Medicago, Melilotus, Trifolium, Lotus, Anthyllis, Astragalus, Hippocrepis, Onobrychis, Vicia, Lathyrus.
 Rosaceae :—Prunus, Spiraea, Geum, Rubus, Potentilla, Poterium, Agrimonia, Rosa, Pyrus, Crataegus.
 Onagraceae :—Epilobium, Circaea.
 Lythraceae :—Lythrum.
 Cucurbitaceae :—Bryonia.
 Crassulaceae :—Cotyledon, Sedum.
 Saxifragaceae :—Saxifraga, Parnassia.
 Droseraceae :—Drosera.
 Haloragaceae :—Myriophyllum.
 Umbelliferae :—Sanicula, Apium, Sium, Bupleurum, Oenanthe, Aethusa, Angelica, Pastinaca, Heracleum, Scandix, Cerefolium, Caulis, Daucus, Conium.
 Araliaceae :—Hedera.
 Cornaceae :—Cornus.
 Caprifoliaceae :—Adoxa, Sambucus, Viburnum, Lonicera.
 Rubiaceae :—Galium, Asperula, Sherardia.
 Valerianaceae :—Valeriana, Valerianella.
 Dipsacaceae :—Dipsacus, Scabiosa.
 Compositae :—Eupatorium, Pulicaria, Bidens, Chrysanthemum, Matricaria, Anthemis, Achillea, Tanacetum, Artemisia, Tussilago, Petasites, Senecio, Arctium, Carduus, Centaurea, Tragopogon, Helminthia, Sonchus, Taraxacum, Crepis, Hieracium, Cichorium, Lapsana.

- Campanulaceae :—Campanula.
 Primulaceae :—Hottonia, Primula, Lysimachia, Anagallis, Samolus.
 Lentibulaceae :—Pinguicula, Utricularia.
 Oleaceae :—Fraxinus, Ligustrum.
 Gentianaceae :—Chlora, Erythraea, Gentiana, Menyanthes, Limnanthemum.
 Convolvulaceae :—Convolvulus.
 Boraginaceae :—Echium, Lithospermum, Myosotis, Lycopsis, Symphytum, Cynoglossum.
 Solanaceae :—Hyoscyamus, Solanum, Atropa.
 Orobanchaceae :—Orobanche.
 Scrophulariaceae :—Verbascum, Linaria, Scrophularia, Digitalis, Veronica, Bartsia, Euphrasia, Rhinanthus, Pedicularis.
 Labiatae :—Salvia, Lycopus, Mentha, Thymus, Calamintha, Nepeta, Prunella, Scutellaria, Marrubium, Stachys, Galeopsis, Ballota, Lamium, Teucrium, Ajuga.
 Verbenaceae :—Verbena.
 Polygonaceae :—Rumex, Polygonum.
 Santalaceae :—Thesium.
 Euphorbiaceae :—Euphorbia, Mercurialis.
 Urticaceae :—Urtica, Parietaria, Humulus.
 Ulmaceae :—Ulmus.
 Amentaceae :—Corylus, Fagus, Quercus, Salix.

Monocotyledons.

- Typhaceae :—Sparganium.
 Araceae :—Arum, Acorus.
 Naiadaceae :—Potamogeton, Triglochin.

- Alismaceae :—Butomus, Sagittaria, Alisma.
 Hydrocharidaceae :—Hydrocharis, Stratiotes.
 Orchidaceae :—Epipactis, Cephalanthera, Listera,
 Neottia, Orchis, Habenaria, Ophrys.
 Iridaceae :—Iris.
 Amaryllidaceae :—Leucojum.
 Dioscoreaceae :—Tamus.
 Liliaceae :—Paris, Polygonatum, Convallaria, Fritillaria,
 Scilla, Allium, Colchicum.
 Cyperaceae :—Eriophorum.

GYMNOSPERMS

- Coniferae :—Pinus, Juniperus.

CRYPTOGAMS

- Equisetinae :—Equisetum.
 Filicinae :—Pteris, Ophioglossum, Botrychium.
 Muscineae :—Sphagnum.
 Algae :—Chara, Nostoc.

III

ENTOMOLOGY

'LITTLE things please small minds', said a sarcastic friend not long ago, as he watched a fourteen-stone man engaged in pinning out the wings of a tiny moth. The remark produced no more violent answer than a grunt; for at first sight there was some truth in it, especially as in a recent Gaudy Day speech butterfly-hunting was mentioned as the harmless occupation of an infant or a dotard. But then the speaker did not know that the capture of that moth had necessitated a five-mile bicycle ride after the day's work was over, an hour's tramp through the deep silence of a wood, and the homeward ride over a rough road, with the prospect of a thunderstorm. Such had been the evening occupation of the big man, while the other had dozed in his chair. So the moth really wasn't such a little thing after all, for it represented to its owner the successful issue of a well-spent evening, and as such it would be remembered when it took its place in the cabinet of specimens that stood in one corner of the room.

Now nobody is more keen on the ordinary athletic pursuits of a schoolboy than the present writer. But he claims for Entomology that it is a never-failing interest, that will take a man into charming

country, introduce him to a multitude of living creatures who are utterly unknown to many men, while away the long winter evenings, and above all give him an object for his holidays and his leisure time, which age and diminishing activity will not seriously interfere with. There is in Entomology some little occupation for every day in the year. From April to October there is so much to be done that one must choose particular insects to hunt; one wants to be out every day during those months, and to seize odd moments for filling up the setting-boards and feeding a host of caterpillars. As out-of-door work is possible even in March and November, that only leaves the months of midwinter for arranging and cataloguing the season's plunder, making sundry alterations in the cabinet, and the many odd jobs that are incidental to any kind of collection. Still it is the hours in the open air that attract me most, and of them I wish to speak in the hope of drawing some disciples on to the byways of a fascinating hobby.

It was my privilege to have the right of entry into Radley Wood, and that became my chief hunting-ground. There is a particular 'ride' in that wood, the trees of which will bear the mark of treacle patches for many a long year. I used to slip away to that ride after dinner on summer evenings, and the sordid troubles of those last copies of Latin prose would be quickly forgotten. The wood is as full of wild life as any place I know. At early dusk in June the night-jar trills his peculiar long-drawn note.

While I busily snatched the last minutes of twilight in spreading the treacle on the trees, a frightened wood-pigeon would flap away from one of the oaks, giving me quite a start. Then a rabbit would scuttle through the undergrowth, annoyed at having its evening meal disturbed. Once too, I remember finding two hedgehogs puffing for breath in the interval of a sharp battle. Some evil spirit tempted me to smear the delicious treacle all over their spikey backs. I went back to look for them later on, but they had gone, and I only enjoyed the thought of the moths buzzing round them, and the ants, woodlice, and innumerable insects that would want to climb on to those spikes and lick off the treacle. That little anecdote just illustrates the cheerful and contented frame of mind with which Entomology is pursued. Ordinary people don't know the hedgehogs, and have no sympathy with the woodlice; perhaps they don't even know the night-jar's note, and have to be taken out to hear the nightingale. But such things are all part and parcel of a night's work to an entomologist. They compensate him for a poor show of moths, and put him in sympathy with the whole of nature's wonderful kingdom.

Then there is the scientific side of Entomology (you see, I am giving you reasons for joining our ranks). There is still a wide field for fresh and interesting discovery in insect life. Most people have heard vaguely that all animals, birds, and insects have developed means of protecting themselves against their natural enemies. This protection is

obtained chiefly by colour; as a general rule the coloration of insects is so adapted to their natural surroundings that their enemies cannot easily detect their presence. One does not advance far along the entomological road before reaching some proofs of this theory. I have a swallow-tail butterfly in my collection which will give some illustration of this point. It is a perfect specimen, save for a large piece cut out of each tail. Now I try to have my specimens perfect, but this particular one is an interesting exception; for the swallow-tail butterfly is a very succulent morsel for birds, and nature has provided the conspicuous tail, so that, when the butterfly sits with folded wings, the tail of the wing has all the appearance of being the insect's body. A bird snatches what it takes to be a body, and the butterfly flies away unharmed save for the loss of a bit of wing. That specimen of mine had saved its life once from a natural foe before it came into my net. Such instances could be multiplied again and again, and probably all insect coloration can be shown to be due to this instinct of self-preservation. But I only touch the border of a great subject to show that scientific theories owe a great deal to Entomology, and to assure you that there is still plenty of room for future investigation.

Now a word should be said about taking life, for it is a common charge against a collector that he has wantonly killed a number of beautiful living beings. Well, the best answer is that the genuine nature-lover takes as little life as he can, and uses the most humane

means possible to kill his specimens. Have you ever realized that nature herself gives and takes the gift of life with extraordinary prodigality? It would astonish the uninitiated to learn how small a chance insects have of reaching full maturity. A parent moth will lay on an average two or three hundred eggs, of which less than one per cent. are destined to reach the final stage of their existence. In each stage of its development the insect is a prey to every kind of natural foe. You may stand below a big oak-tree in the spring-time and actually hear the swarms of caterpillars munching away the fresh leaves. But if increase were not rigidly controlled, the whole world would soon become a wriggling mass of caterpillars. Now if you realize this, do you seriously object to the collector taking a small share? Of course there are collectors who kill indiscriminately as many insects as they can catch. Such are rightly to be abhorred for utter wantonness. But the real entomologist only kills a limited number of specimens, which he keeps for reference and comparison. On a good day he often comes across three or four hundred specimens, which are all set free. He likes to see them and to watch their habits, but his cabinet contains enough examples of these species, and he has no desire to kill any more. Sometimes he catches a female moth, which may lay a few score eggs in his box. It is of great interest to raise a fine set of insects from those eggs. The caterpillars when they emerge must be carefully fed and protected from their natural enemies, and if the brood is successful,

he will be able to select a set of specimens for himself and set free the remainder, none of which would probably have survived under natural conditions. Let it be remembered, too, that the perfect moth is in its final stage of insect life; its only duty is to perpetuate its species and then die. As a rule the eggs have been laid before the collector meets the moth, and if he requires it for his cabinet, he only shortens its life by a few days or hours. However, the guiding principle still holds true; do not kill any insect without sufficient reason.

Space forbids me the luxury of dwelling on the details of this fascinating pursuit. He who feels drawn to dip more deeply into the subject can find plenty of simple handbooks and elaborate treatises. My purpose here is only to set you on the road; for once started in earnest, I think you would move along of your own accord. Let me just pick out the doings of one day to show you what you may expect. My time at Radley was too fully occupied to allow me much leisure by day; in fact, most of my hunting was done after dark. But the Natural History Society always regarded Midsummer Day as sacred to a butterfly expedition, and one of these I will describe to you.

The destination of this expedition was the chalk-hills above Streatley. Getting away after school we detrained at Goring, and rode our bicycles through the quaint riverside village across the bridge to the Bull Inn. Sandwiches and ginger-beer sufficed for our internal wants, for no time was to be wasted if

we were to be successful. Above the Bull Inn there is a fine beech wood, which is the haunt of *Stauropus fagi*, the Lobster Moth. I have been many hours in that wood, but only found two specimens, so it was voted dull work for Midsummer Day, and we went further afield toward the golf-house. There the ground opens out on to ideal fields of rough downland, with a broad grass road. Just before reaching the latter, some one spied a white-looking web on a hawthorn bush. It proved to be a nest of caterpillars of *Bombyx neustria*, the Lackey Moth. The caterpillar is a pretty one, quite easy to rear, and the moths all come out satisfactorily in July. I urged our party not to fill their boxes with *neustria*, for he is a common creature, and better things were to be expected later. True enough, some small poplars at the side of the grass road were as productive as poplars always are. The ubiquitous Puss Moth caterpillar was found at once, with a few infant Poplar Hawks. But better still were some full-grown caterpillars of *Leucoma salicis*, the Satin Moth. This very handsome caterpillar spins a large cocoon by folding over the leaf of the black poplar, and most of them had already formed their cocoons, which were quite easily found. We stayed long enough to find a dozen *salicis* and as many 'pusses', and then wandered further in search of 'Blues'. These blue butterflies frequent chalk downs in great profusion, but unfortunately we came at rather a bad date for them. The glorious steel-blue *Corydon* (Chalk-hill Blue) flies towards the end of July, while the even brighter coloured *Adonis*

(Clifton Blue) is at its best in the first week of June. However, on this occasion we were successful in turning up a few specimens of *Lycaena minima* (Little Blue).

This most diminutive of all British butterflies flies about among rough grass, and is not easy to net, because it easily escapes notice when on the wing. It is generally to be found in company with Skippers, which also give a good deal of trouble to the collector; they are not only difficult to catch, but also extremely difficult to set satisfactorily. To carry out this operation successfully, be sure to have the insects perfectly relaxed by leaving them at least two full days after death in the cyanide bottle.

While some of the party were left catching Blues and Skippers, two of us went up to a wood on the hill-top, and beat the branches of overhanging trees for Geometers. These dainty moths hide by day on the leaves, and are easily disturbed with a stick. One can generally get a good variety along the borders of a wood, and we got, among others, one or two *T. advenaria* (Little Thorn), which is rather a local insect.

By the time we had worked along the whole edge of the wood, it was getting late in the afternoon, and the return train had to be thought of. So we picked up the others and strolled towards the bicycles. 'By the way, sir,' said one, 'is this a moth or a beetle?' With these words he produced a pill-box with two metallic green looking insects. 'Hullo,' I said, 'where did you get them? They are one of the Foresters, and probably *Ino Geryon* (the

Cistus Forester).' 'Oh,' he replied, 'there are plenty of them further back.' I had never seen this Forester before, and so was very anxious to capture a few. Happily we had still some time to spare, and back we hurried to a place on the slope of the Downs, where, sure enough, *Geryon* was flitting about in abundance. I filled my remaining boxes, for it is an insect which one does not often come across, and they proved to be in perfect condition.

After that fortunate episode we had to rush speedily for the train, and arrived hot but triumphant at the station. It had indeed been a successful day, with plenty of variety and a number of good specimens for the cabinets.

I realize all too keenly that this short sketch does not do justice to a well-spent day of pleasant memory. But if any reader is induced to try for himself the pleasures of a sunny June day on the Downs, armed with net and pill-box, I should be surprised if he did not forthwith become an entomologist. In the hope that some Radleians may be thus induced to adopt this hobby, these notes must now close, and it only remains for me to apologize for their shortcomings and to append a list of butterflies and moths which I have personally come across at Radley:

Pieris brassicae. This butterfly is always common in early summer. The larva is a great pest to the cabbages in the garden.

- | | |
|--|---|
| ✓ <i>P. rapae</i> (Small White). | { Both these species are abundant everywhere. |
| ✓ <i>P. napi</i> (Green-veined White). | |

- ✓ *Euchloe cardamines* (Orange Tip). Sugworth Lane at the end of May is a good spot for this butterfly. The female, which has black instead of orange tips to the wings, may easily be passed over for an ordinary white.
- ✓ *Gonopteryx rhamni* (Brimstone). On a warm day in March this gay butterfly is often seen; don't catch them, for they have hibernated, and cannot be in perfect condition. The female is egg-laying, and is sometimes worth following to collect the eggs. August is the month for newly-emerged specimens.
- ✓ *Argynnis Euphrosyne* (Pearl-bordered Fritillary). This butterfly is quite common in the woods near Radley about the time of the early bluebells.
- | | | |
|---|---|---|
| <i>A. Aglaia</i> (Dark Green Fritillary). | { | These two species occur sparingly in late July. <i>Adippe</i> is a true wood insect, and is commoner near Radley than <i>Aglaia</i> . |
| <i>A. Adippe</i> (High Brown Fritillary). | | |
- ✓ *A. Paphia* (Silver-washed Fritillary). This is the largest of the fritillaries, and a magnificent butterfly. It can be found about mid-July on the roads through Bagley Wood. Privet blossom always proves an attraction for *Paphia*.
- Melitaea aurinia* (Greasy Fritillary). This is an uncommon species, and perhaps the most noteworthy butterfly found in the Radley district. It is on the wing in early June in the marshy meadows at Cothill.

- ✓ *Vanessa urticae* (Small Tortoiseshell).
 ✓ *V. Io* (Peacock)
 ✓ *V. Atalanta* (Red Admiral).
- { All these members of the handsome *Vanessa* family put in an annual appearance, the first-named commonly, the last two in small numbers. *July & late June*
- ✓ *V. cardui* (Painted Lady) is an immigrant to our islands. In some seasons it is quite common, in others scarcely to be seen at all. I never saw more than two or three specimens at Radley. *July & August*
- Melanargia Galatea* (Marbled White). This butterfly is locally common, being generally confined to one or two fields. Round about Cothill are a few favourite haunts. Late July and August.
- Pararge Egeria* (Speckled Wood). I never saw this butterfly at Radley myself, but some boys showed me one which they had caught in the woods. It should be looked for in late July.
- ✓ *P. Megaera* (Wall). Not common, but may be met with on dry open ground in July and August.
- ✓ *Epinephele Janira* (Meadow-brown). This is probably the commonest butterfly which flies. Every hay-field abounds with them.
- | | | |
|---|---|---|
| ✓ <i>E. Tithonus</i> (Small Meadow-brown) | { | Both these insects are quite common in Sugworth Lane during July. |
| ✓ <i>E. Hyperanthus</i> (Ringlet). | | |
- ✓ *Coenonympha Pamphilus* (Small Heath). Abundant in dry meadow-land.
- ✓ *Thecla W-album* (White Letter Hairstreak). The history of this insect is curious. It occurred very

well-known moth, which, like the Bee Hawks, flies in the sunshine, is sometimes common in the Radley garden.

M. fuciformis (Bee Hawk). I have seen, but never caught, this moth in Radley Wood.

Trochilium apiforme
(Hornet Clearwing).
T. crabroniforme
(Lunar Clearwing).

The Clearwing larvae are wood-borers. Some poplar trees near Sandford have holes near the root which show the presence of *apiforme*. Search for and cut out the pupae in April. Similarly osier stems or sal-lows sometimes contain *crabroniforme*. The moth itself is not often seen on the wing. I once netted *crabroniforme* in mistake for a queen wasp!

Ino statice (Forester). One boy caught this species in the Park, but I never found it near Radley myself.

I. Geryon (Cistus Forester). We found this moth simply swarming near Streatley one midsummer day.

It is a very local species, and worth searching for.

Zygaena filipendulae (Six-spotted Burnet). Quite common in the Park and abundant on the Downs.

Hylophila prasinana (Green Silver Lines). Fairly common. The larvae should be beaten from oaks in the late summer.

H. bicolorana (Scarce Green Silver Lines). Not common; larvae should be got in May from oak.

Calligenia miniata (Rosy Footman). Not at all common at Radley.

Lithosia griseola (Dingy Footman). This moth was quite common one July; I also caught two specimens of the straw-coloured variety, which is generally considered a fen variety.

L. lurideola (Common Footman). Usually to be caught in July.

Euchelia jacobaeae (Cinnabar). Common towards Tubney, where its food-plant, ragwort, grows.

Callimorpha dominula (Scarlet Tiger). This moth turned up in profusion at Cothill in July, 1909.

Nemeophila plantaginis (Wood Tiger). Mr. Stone brought me a pair of these moths from the Downs; it is said to occur at Tubney.

Arctia caja (Garden Tiger). The famous 'woolly bear' caterpillars are far less abundant than formerly.

Spilosoma fuliginosa (Ruby Tiger). One flew into my room one night; the species was also abundant at Frilford Heath in 1908.

S. mendica (Muslin). Occasional specimens may be got; always keep a female for eggs, as they are easy to rear, and it is the only method of obtaining the males.

S. lubricipeda (Buff Ermine).
S. menthastri (White Ermine). { Both these Ermines
are common on
lamp-posts in May.

Hepialus humuli (Ghost).
H. lupulinus (Swift).
H. hectus (Gold Swift). { Generally common in the
lanes and fields at dusk
in June; *hectus* is less
frequently seen than
the other two.

Cossus ligniperda (Goat). There are some willows near Sandford infested with this larva; infected trees can be located by the peculiar goaty smell.

Porthesia similis (Gold Tail). The larvae of this species are plentiful in 'willow lane', chiefly feeding on hawthorn.

Leucoma salicis (Satin Moth). We once obtained a number of these conspicuous larvae off black poplars at Streatley.

Psilura monacha (Black Arches). One specimen in my cabinet is marked 'Radley'. It was attracted to the light in my room at the end of July.

Dasychira pudibunda (Pale Tussock). The beautiful caterpillars of the Tussock can be picked up quite frequently under trees in September.

Orgyia antiqua (Vapourer). Quite common. Look for the caterpillars on rose bushes or garden plants, so as to breed the wingless female.

Poecilocampa populi (December Moth). This moth has the distinction of appearing later in the year than any other. During November and December look out for them on the dark framework of lamp-posts.

Bombyx neustria (Lackey). The larva was a plague one summer. After that it almost disappeared.

B. quercus (Oak Eggar). I only found a few of these moths. The caterpillar, if looked for, would probably be found fairly plentifully.

Odonestis potatoria (Drinker). This persecuted species shares with the Puss Moth the doubtful honour of being the most familiar insect to the Radley Natural

History Society. By all means keep the larvae, O Reader, but set the moths free when they emerge. Else will that familiar caterpillar vanish from the roadsides.

Lasiocampa quercifolia (Lappet). Not very common; The huge caterpillars feed on blackthorn, and are well worth a diligent search.

Drepana falcataria (Pebble Hook-Tip). This moth occurs in the woods. It flies by day.

D. binaria (Oak Hook-Tip). This also flies by day, but is not common.

Cilix spinula (Chinese Character). This tiny cousin of the Puss Moth is attracted by light, and best obtained in that way.

Dicranura bifida (Poplar Kitten). Radleians have found the larvae of this moth on poplars in July.

D. vinula (Puss). Too well known to need any remark.

Stauropus fagi (Lobster). This is always a notable capture. It can be obtained in the beech-woods at Streatley by searching the tree-trunks in June. But think yourself lucky if you get one during an hour's search.

Pterostoma palpina (Pale Prominent). I considered this the commonest 'Prominent' to be got at Radley. Early June is the time for all the 'Prominents', and they are best obtained by light at night, or by searching tree-trunks in the day-time.

Lophopteryx camelina (Coxcomb Prominent). Occurs in the woods.

Notodonta dictaea (Swallow Prominent). Lamp-posts

on the outskirts of Oxford often produced specimens of this moth.

N. dictaeoides (Lesser Prominent). I once got one off a lamp in Oxford, when going to watch the 'Eights'.

N. ziczac (Pebble Prominent). These I found occasionally.

N. trepida (Great Prominent). The only one I ever found came from a lamp in Abingdon.

Phalera bucephala (Buff Tip). Larvae abundant; the perfect insect is not often seen, as it is a retiring individual, and not, I think, so susceptible to artificial light as most of the Bombyces.

Thyatira derasa (Buff Arches). { I used to get two or three of these each year, either at light or at sugar.

Cymatophora octogesima (Figure of Eighty). A rare moth. One specimen was shown in a Hall Prize collection in 1906. It was found in the Park.

C. duplaris (Lesser Satin Moth). An occasional visitor at sugar in Radley Wood.

NOCTUAE

Acronycta psi (Grey Dagger). Look for this moth on tree-trunks in June.

A. aceris (Sycamore). Occasional specimens on tree-trunks in June.

A. megacephala (Poplar Grey). Fairly common round black poplars. The larvae are sometimes plentiful in September.

A. ligustri (Coronet). This is always a good capture.

I caught two or three specimens at sugar in June.

A. rumicis (Knot-grass). To be obtained at sugar in June.

Diloba caeruleocephala (Figure of Eight Moth). The gay-coloured, rather bloated, larvae are usually common on the hawthorn hedges near the station.

Genus *Leucania*. This family is only represented, as far as I know, by the five common wood species—i. e. *conigera* (Brown line); *lithargyria* (Clay); *comma* (Shoulder-striped Wainscot); *impura* (Smoky Wainscot); *pallens* (Common Wainscot).

These may be commonly obtained at sugar during June and July.

Gortyna ochracea (Frosted Orange). Search for the pupae in early September. They are to be found in thistle-stems, always choosing a withered and sickly-looking plant. Like all internal feeders the moth is liable to get greasy, and should be 'doctored' with benzine.

Axylia putris (The Flame). Occasional specimens at sugar in June.

Xylophasia rurea (Clouded Brindle). Moderately common in early summer.

X. lithoxylea (Light Arches). { Fairly frequent visitors to sugar. The latter seemed most common in the Radley garden.

X. sublustri (Reddish Light Arches). }

X. monoglypha (Dark Arches). Few moths are more universal.

X. hepatica (Clouded Brindle). This is as common at sugar in the Radley garden as anywhere else.

Dipterygia scabriuscula (Bird's Wing). I have one specimen from Sugworth Copse.

Neuria reticulata (Bordered Gothic). Not at all common.

Cerigo matura (Straw Underwing). Sugar round College in July for this moth.

| | | |
|---|---|--|
| <i>Mamestra sordida</i> (Large Nutmeg). | { | These three species of this family can be got at sugar, but none of them can be called abundant. |
| <i>M. brassicae</i> (Cabbage Moth). | | |
| <i>M. persicariae</i> (The Dot). | | |

| | | |
|--|---|---|
| <i>Apamea basilinea</i> (Shoulder-Knot). | { | All are common, especially <i>didyma</i> , which has almost endless varieties of colour and markings. |
| <i>A. gemina</i> (Dusky Brocade). | | |
| <i>A. didyma</i> (Common Rustic). | | |

| | | |
|--|---|---|
| <i>Miana strigilis</i> (Marbled Minor). | { | Both these moths are common at sugar in June. <i>Strigilis</i> has a uniformly dark variety, called <i>Aethiops</i> . |
| <i>M. fasciuncula</i> (Middle-barred Minor). | | |

M. arcuosa (Dotted Buff). I once got a dozen specimens round one of the gas-lamps in College—but otherwise have seen very few.

Grammesia trigrammica (Treble Lines). Abundant at sugar.

Caradrina taraxaci (The Rustic). To my mind a dull moth; it is quite common at sugar.

C. quadripunctata (Mottled Rustic). Fairly common.

Rusina tenebrosa (Brown Rustic). Common at sugar in early June.

Genus *Agrotis*. This is an interesting family, better known to the coast collector than to Radleians. They can all be attracted by sugar at different seasons. Eight species of the family occur at Radley.

A. puta (Shuttle-shaped Dart). Occasional.

A. suffusa (Dark Sword-grass Moth). Fairly common in the late summer.

A. saucia (Pearly Underwing). September is the month to sugar for this species.

A. segetum (Turnip Moth). A regular plague to farmers, and abundant everywhere.

A. exclamationis (Heart and Dart). This is reckoned to be the commonest of all moths. I have counted eighty on one patch of sugar.

A. corticea (Heart and Club). By no means common.

A. tritici (White Line Dart). I have two specimens, both from College grounds.

A. obscura (Stout Dart). Rare at Radley. One night late in July there were hardly any moths at my sugar, but two were of value; one *obscura* and one *Triphaena subsequa*. I never saw any more of either species.

Genus *Noctua*. Nine species of this family are to be got at Radley. Sugar is the best means of obtaining them, though larvae can be found in May at night by the aid of a lamp.

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| <i>N. augur</i> . | { | Reasonably common in June and July. |
| <i>N. plecta</i> . | | |

- N. C.-nigrum* (Lettered Gothic). Common in June and September.
- N. triangulum* (Double-spot Clay). } All these moths are common at mid-summer, especially *festiva*.
- N. brunnea* (Purple Clay). }
- N. festiva* (Engrailed Clay). }
- N. rubi* (Small Square Spot). May and September.
- N. baja* (Dotted Clay). Not very common.
- N. xanthographa* (Square Spot Rustic). Abundant in September.
- Triphaena ianthina* (Less Broad-bordered Underwing). I have taken a few specimens at light in July.
- T. fimbria* (Broad-bordered Underwing). This is most easily obtained in the larval stage. Search low-growing birch bushes at night in May.
- T. subsequa* (Lunar-bordered Underwing). Rare. See note on *Agrotis obscura*.
- T. comes* (Lesser Yellow Underwing). Abundant. The larvae are plentiful in the hedges after dark in May.
- T. pronuba* (Yellow Underwing). This moth yields only to *A. exclamationis* in abundance.
- Amphipyra pyramidea* (Copper Underwing). } August,
A. tragopogonis (The Mouse). } at sugar.
Mania maura (Old Lady). }
- Pachnobia rubricosa* (Red Chestnut). One of the earliest visitors to sallow bloom in March.
- Genus *Taeniocampa*. This family appears on the wing earlier than any other of the Noctuae. Directly the sallows are in bloom, generally in the last half

- of March, these moths may be found in plenty feasting on the sweet-smelling blossoms after dark.
- T. gothica* (Hebrew Character). }
T. incerta (Clouded Drab). } These four
T. stabilis (The Quaker). } abound.
T. pulverulenta (The Small Quaker). }
- T. populeti* (Lead-coloured Drab) is very local. There are some poplars in Bagley Wood, round which it used to occur. It is not always easy to distinguish the species from *T. incerta*.
- T. gracilis* (Powdered Quaker) flies about a fortnight later than the others, and is less common.
- T. miniosa* (Blossom Underwing). You will be lucky if you get a couple in one night.
- Orthosia fissipuncta* (The Dismal). In June search for the larvae. They hide by day under loose bark of willow-trees at Nuneham.
- O. lota* (Red-lined Quaker). This moth and many of the following species frequent the blossoms of ivy in October. Ivy is often quite as attractive as sallow-blossom.
- O. macilenta* (Yellow-lined Quaker). Quite common at ivy one season, but afterward disappeared.
- Anchocelis rufina* (Flounced Chestnut). At sugar in the woods. Late September.
- A. pistacina* (Beaded Chestnut). Abundant at ivy-blossom or sugar in September.
- A. lunosa* (Lunar Underwing). } Fairly common at
A. litura (Brown-spotted Pinion). } ivy-blossom.
- Cerastis vaccinii* (The Chestnut). Common in autumn and also after hibernation.

C. spadicea (Dark Chestnut). This moth is not easily distinguished from *vaccinii*, but it occurs in the Radley garden.

Scopelosoma satellitia (The Satellite). An autumn moth. Beware of the larva, which is an inveterate cannibal.

Hoporina croceago (Orange Upper-wing). This is usually considered a worthy capture. Hibernated specimens used to occur on certain sallows in Sugworth Copse. Keep them for egg-laying, for the larvae are quite easy to rear on oak.

X. citrigo (Orange Sallow). I once caught a worn specimen in the garden; probably it is common in early September, for it frequents old lime-trees.

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| <i>X. fulvago</i> (The Sallow). <i>X. flavago</i> (Pink-barred Sallow). | { Sugar for these two pretty moths along the low sallow bushes of Sugworth Lane, at the beginning of the winter term. |
|--|---|

X. aurago (Barred Sallow). Very uncommon. I caught one on an ivy-bush outside chapel, and know of its presence near Woodstock.

X. gilvago (Dusky Lemon Sallow). This was quite common one year in the autumn.

X. circellaris (The Brick). A regular autumnal visitor.

Cirrhoedia xerampelina (Centre-barred Sallow). My pet species at Radley. The way to obtain this uncommon moth is to search for the larvae at dusk in May. They climb up the trunks of old

ash-trees, and are inconspicuous dirty grey larvae. I will not say which my favourite trees were, but I once got a dozen larvae in half an hour.

Calymnia trapezina (The Dunbar). Common in July. The larva, which feeds on oak, is an habitual cannibal.

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| <i>C. diffinis</i> (White-spotted Pinion). <i>C. affinis</i> (Lesser White-spotted Pinion). | { Occasionally found in July. |
|--|-------------------------------|

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|--|--|
| <i>Dianthoecia capsicola</i> (The Lychnis). <i>D. cucubali</i> (The Campion). <i>D. carpophaga</i> (Tawny Shears). | { These moths appear in May and early June. They can be caught while hovering over flowers at dusk, but I never found them common at Radley. |
|--|--|

Hecatera serena (Barred White). This was found quite commonly one year, resting on tree-trunks in July.

Polia flavicincta (Large Ranunculus). An autumn species, turning up occasionally at Radley.

Aporophyla lutulenta (Brown Dart). This is sometimes common at ivy-bloom.

Cleoceris viminalis (Shoulder-Knot). To be found at sugar in July.

Miselia oxyacanthae (Brindled Crescent). Common at ivy-bloom.

Agriopsis aprilina (Marvel-de-jour). This lovely moth occurs fairly commonly at sugar in the oak-woods. October is the month, although the name *aprilina* seems to say differently.

Euplexia lucipara (Small Angle-Shades).
Phlogophora meticulosa (The Angle-Shades).
 Both are common at sugar; *lucipara* in July, *meticulosa* in October.

Aplecta prasina (The Green Arches). I caught this moth on two occasions only, once three specimens and once seven. It occurs at sugar in June.

A. nebulosa (Grey Arches). Fairly common at sugar in June.

A. advena (Pale Shining Brown). Very uncommon. The few specimens I got were attracted by sugar round College.

Hadena protea (Brindled Green). Sugar for these in oak-woods during early October.

H. glauca (Glaucous Shears). Fairly common in June.

H. dissimilis (The Dog's Tooth). Uncommon.

H. oleracea (The Bright Line). Common.

H. thalassina (Pale-shouldered Brocade). Common.

H. genistae (Light Brocade). Local.

These four species of *Hadena* can all be got at sugar in early summer.

Xylocampa areola (The Early Grey). Occasionally found at sallow-blossom.

Calocampa exoleta (Sword-grass). One specimen only, at ivy-bloom.

Xylina ornithopus (Grey Knot). One specimen at ivy in the garden.

X. semibrunnea (Tawny Pinion). Always a good capture. It occurs at ivy-blossom, and one or two specimens each year would be good. Two of mine came from the garden.

Asteroscopus sphinx (The Sprawler). This species is to be found on street lamps in early November. Often quite abundant at Abingdon, where I have got as many as six from one lamp.

Cucullia verbasci (The Mullein Shark). If you find its food-plant, the soft-leaved mullein, search for the larvae in July.

C. umbratica (The Shark). I have caught it round honeysuckle at dusk in mid-June.

Gonopteryx libatrix (The Herald). Common at sugar.

Habrostola tripartita (The Spectacle). This may be caught flying round flowers at dusk in June. Aug to Oct

Plusia moneta (Gold Mark). The larvae can be found on delphinium plants in the garden. It is full-fed in June.

P. chrysitis (Burnished Brass).
P. iota (Golden Y).
P. gamma (Silver Y).
 These *Plusias* are best obtained on the wing round flowers at dusk. The first two occur in June; *gamma* flies pretty continuously all through the summer.

Heliaca tenebrata (Small Yellow Underwing). Flies by day in June.

Chariclea umbra (Bordered Straw). Occurs occasionally at sugar in June.

Acontia luctuosa (Four-spotted). This moth flies by day on the chalk-downs at Streatley.

Euclidia mi (Mother Shipton).
E. glyphica (Burnet Companion).
 Both are common on the Downs, and *mi* is also found near Radley. They frequent rough grass fields in June.

Catocala nupta (Red Underwing). During September this fine moth is often to be seen resting by day on telegraph poles. I have also found the larvae and pupae under willow bark at Nuneham.

Aventia flexula (Barred Scallop). This is considered an uncommon insect. My specimens were all caught in rooms at Radley, attracted by bright light, in July. The larva is a pine-feeder.

Pygaera cinctula — *Chocolate Tip. Caterpillars at 7 hump.*
GEOMETRIDAE

I never spent much time at Radley after this family of Lepidoptera. They fly at dusk, which was an inconvenient time for me; so that my knowledge of the number of Geometers which can be taken in the neighbourhood is very limited. Therefore I only append a list of those that I have met with at Radley; undoubtedly it could be greatly enlarged.

Ephyra punctaria (June). *Haiden's Blue*
E. trilinearia (Streatley, May). *Clay Triple Lines*
E. omicronaria.

E. pendularia (June). *High Moths*
Asthena candidata (June). *Small white wave*
Acidalia bisetata (July). *Small Tan-footed Wave*

A. imitaria (July). *Small Black-vein*
A. aversata (July). *Ritand Wave*

Timandra amataria (July). *Black vein*
Cabera pusaria (May). *Common white wave*

C. exanthemaria (May). *Common*
Corcyria temerata (May). ?

C. taminata. ?
Strenia clathrata (May). *Latticed Heath*

Panagra petraria (May).

Fidonia atomaria (May).

Abraxas grossulariata (July).

A. ulmata (June).

Ligdia adustata (May).

Lomaspilis marginata.

Hibernia rupricapraria (January).

H. Leucophaearia (February).

H. aurantiaria (November).

H. progemmaria (March).

H. defoliaria (November).

Anisopteryx aesculata (March).

Chimatobia brumata (December).

Oporabia dilutata (November).

Larentia didymata (June).

L. multistrigata (May).

Uropteryx sambucata (July).

Epione advenaria (Streatley, June).

Rumia crataegata (common).

Venilia maculata (May).

Metrocampa margaritaria (June).

Pericallia syringaria (garden, July).

Selenia illunaria (April, July).

S. lunaria (July).

Odontopera bidentata (May).

Crocallis elinguarina (July).

Ennomos tiliaria (October).

Himera pennaria (November).

Phigalia pilosaria (January).

Amphidasys betularia (May); var. *doubledayaria* (one specimen).

A. prodromaria (April).
Hemerophila abruptaria (May).
Cleora lichenaria (July).
Boarmia repandata (July).
B. rhomboidaria (July).
Tephrosia extersaria (June).
T. punctulata (May).
Geometra papilionaria (July). *Large Emerald*
Iodis vernaria (July).
I. lactearia (June).
Phorodesma bajularia (July).
Hemithea thymiaria (June).
Ephyra porata (June).
L. olivata (June).
Lobophora polycommata (March).
Thera simulata.
Ypsipetes impluviata (May).
Y. elutata (July).
Melanthia ocellata.
M. albicillata (June).
Melanippe rivata (June).
M. subtristata.
M. montanata (June).
M. fluctuata.
Anticlea rubidata.
A. badiata (March).
A. derivata (April).
Coremia munitata.
C. ferrugata.
C. unidentata.
C. quadrifasciaria (July).

Campptogramma bilineata (July).
Phibalapteryx vitalbata.
Scotosia dubitata.
S. vetulata.
S. rhamnata (July).
Cidaria miata (October).
C. corylata.
C. immanata.
C. populata (July).
C. fulvata.
Eubolia cervinaria (October).
E. mensuraria (July).
Anaitis plagiata.

IV GEOLOGY

As among the various readers of this book there will doubtless be some unacquainted with even the elements of Geology, it may be as well to begin with a few observations on the subject generally. Geology, as its name implies, is the science of the earth—the knowledge, that is, of its present condition as an outcome of the untold ages and changes through which it has passed; together with a knowledge of its history from the beginning, as deducible from the study of its present condition.

To achieve this knowledge of the earth and its history the geologist has to call in the aid of other sciences, such as Astronomy, Physics, Chemistry, Botany, and Zoology; and more especially, of the allied science of Physical Geography.

By observing the modern phenomena of volcanoes and earthquakes, and the present-day work of the sea, rivers, rain, ice, &c., the geologist is able to arrive at no uncertain proofs of the state of the earth in past times, and of the course of its development.

It is noticeable, for instance, that even hard rocks, under exposure to wet, frost, and other denuding

agencies, get more or less broken up; while rivers carry the detritus, often as a fine mud, into the sea—together with any coarser material slowly but surely worn away from their banks or brought into the river-flow by contributory streams.

But in addition to their disintegration as above, rocks are subjected to a process of dissolution. Water falling as rain or snow absorbs carbonic acid from the air, and acquires humus acids in its passage through the soil, whereby it is enabled to dissolve some of the rock-constituents from the rocks over or through which it flows, this charged water eventually finding its way into rivers and thence into the sea.

It is thus found that rivers, in addition to the suspended matter, or sediment as it is called, carry also dissolved rock-constituents into the sea. The sediments, settling to the bottom as sand or clay, gradually build up forms of rock such as sandstones, and compact clays. The dissolved matter, consisting largely of carbonate and sulphate of lime, together with indefinite silicates, gets withdrawn from the water by organic beings to build up their solid framework or skeletons.

On the death of these animals their skeletons, in the form of shells, bones, coral-rock, &c., get broken up, and accumulating at the sea-bottom furnish a calcareous mud, destined in course of time to become transformed into solid limestones.

And just as the student of architecture, by taking note of the configuration, carving, form of the windows, &c., is able to state at what period a

particular building was constructed, so the geologist, by examining the 'fossils', or remains of organic life, that he finds in the rocks, can assign to the respective rocks the particular period of their formation.

Further evidence is not wanting to show that the sea-floor has been raised many times above sea-level. On sinking again, fresh layers of sediment have been deposited one on top of the other, forming superimposed layers. In the process of elevation these layers are commonly found to have been more or less bent, folded, or tilted from their originally horizontal position, as is the case in this district.

The direction in which the layers of rock slope down is known as the direction of dip, which in this district is approximately from NNW. to SSE.

The geologist finds that he can divide the rocks into five great Eras, as follows, the newest being at the top.

Quaternary or Post Tertiary.

Tertiary or Cainozoic (Recent life).

Mesozoic (Middle life).

Palaeozoic (Ancient life).

Archaean, Precambrian, or Eozoic (Dawn of life).

These Eras he divides into Systems, which again he subdivides into Periods.

The district to be described is thirty-two miles square, with Oxford at the centre, and with the exception of the river gravels and alluvium, which are Quaternary, all the rocks met with belong to the

Mesozoic Era, which is subdivided into the following systems and periods.

| | | |
|------------|---------------|---|
| Cretaceous | Upper | Chalk { (Upper Chalk). (Middle Chalk). (Lower Chalk). |
| | | Lower Greensand and Gault. Lower Greensand. Wealden. |
| Jurassic | Oolitic | Purbeck. |
| | | Upper Portland Rock and Sand. Kimmeridge Clay. |
| | Middle | Corallian Limestones and Calcareous Grits. Oxford Clay and Kelloways Rock. |
| | | Cornbrash. Forest Marble. Great Oolite. |
| Triassic | Lower | Upper Fuller's Earth. Fuller's Earth Rock and Stonesfield Slates. Lower Fuller's Earth. Inferior Oolite. |
| | | Liassic { Upper Lias. Middle Lias. Lower Lias. |
| Triassic | Keuper Marls. | Muschelkalk (not in England). Bunter. |

In this district the rocks are so tilted that in passing from north to south we traverse these rocks in the reverse order, i.e. from the older to the newer systems.

Starting on the Marlstone of the Middle Lias, which, at Banbury, a little to the north of our district, has been extensively worked for iron, we pass over the clays of the Upper Lias, which, though only 16 feet thick, yield the fossils of all the subdivisions that are represented in Dorset and Yorkshire by 100 feet of rock, chiefly clay. Above comes the Inferior Oolite, of which only the top, or '*parkinsoni* Beds', are here represented by about 8 feet of rubbly oolitic limestones; the 200 feet of rock and 90 feet

of sands which in Gloucestershire separate the '*parkinsoni* Beds' from the top of the Lias, being entirely unrepresented.

Near Stonesfield we find beds of clay resting on the limestones, and on these clays the Stonesfield Slates. These are not slates at all in the geological sense, being composed of a remarkable fissile oolitic limestone, which is quarried in a tunnel 20 feet below ground. The quarried 'slates' are immediately buried to prevent them drying up, and after a few frosts are dug up and allowed to dry, when in the summer they are easily split into layers thin enough to be used for roofing. They are especially suitable for stone buildings, and so well do they wear that when the roof of Worcester College was being repaired some time ago, the 'slates' were found to be as good as new. They may be seen on the roof of the school and the parish church.

From these beds a number of mammalian jaws as well as numerous fossil ferns and other plants have been obtained, and other fossils are abundant.

Above the Stonesfield Slates come a series of limestones and marls, which, like the underlying clays, have an assemblage of fossils characterizing the Great Oolite as much as the Inferior Oolite—that is, we find what in architecture would be called a transition period.

Above comes the Great Oolite, which is not well seen in the west of the district, but in the centre, round Enslow Bridge, consists of compact limestones in beds from one to three feet thick; though only the upper beds are here visible, they are found to

be about three and a half times as thick as the corresponding beds at Ardley, near Bicester, to the north-west of the district.

It is from beds of this age that the well-known Bath stone is obtained, but in this district the stone is not of such an excellent quality, and the same bed, when traced from one end of a quarry to the other, is found to change its character completely.

From the Great Oolite at Taynton, near Burford, just outside our area, a very good building-stone has been obtained, which has been used in parts of the Cathedral, in Merton College and Chapel, and in Blenheim Palace. The new buildings of Magdalen College facing the High Street—St. Swithin's quadrangle—are also built of this stone.

Near Bletchington the stone is largely quarried, and when mixed with the clay from the overlying Forest Marble is burnt to yield the 'Oxford Portland Cement'.

From the Great Oolite near Enslow Bridge some huge bones have been discovered, belonging to an animal which from its size has been called the *Cetiosaurus*, and numerous jaws of *Teliosaurus*, an animal apparently differing but little from the Gavial or Gangetic crocodile.

Above the Great Oolite comes the Forest Marble, so called from the Forest of Wychwood in the north-west of this district, where these beds were formerly quarried for local mantelpieces, &c.

These beds are, of course, not marble at all in the geological sense, consisting, as they do, of flaggy oolitic limestones, commonly 'false bedded', and

bands of clay. Some of the beds make an excellent building-stone, but it is most largely used for the foundation of new roads and for the walls of large estates, for which it is admirably adapted. The walls near Bladon, at Weston-on-the-Green, and Middleton Park afford excellent instances.

In the east of this area, at Blackthorne Hill, near Bicester, the claybands are more pronounced, and the rock is only slightly oolitic; its thickness is about 20 feet, while at Witney it is 34 feet, and in Dorset 90 feet.

All the beds so far noticed become thicker when traced to the west, but the next bed, the Cornbrash, so called from its brashy or rubbly nature, and from the fact that it affords an excellent corn-land, is of a much more uniform thickness and character, and although only from 15 to 25 feet thick, can be traced right across England from Weymouth to Yorkshire. Round Oxford the thickness is usually not more than 10 feet. This appears to be of no economic value, and is only exposed in quarrying for the underlying Forest Marble and Great Oolite.

From Begbroke to Iffley, a distance of seven miles, we traverse a great sheet of clay, locally covered by alluvium, and the old gravels of the Thames. This, the Oxford Clay, is about 400 feet thick, while at Weymouth it is about 500 feet. It is largely responsible for the prevalent muddy state of the Oxford roads; by holding up the water it prevents the roads from drying up, except in windy or very hot weather. This clay is exposed in numerous pits, where it is

extensively dug for brickmaking, the resultant bricks being of a red colour.

The abundance of a large oyster (*Gryphaea dilatata*) is a source of considerable trouble, as it necessitates the clay being all picked over by hand, for if a small fragment remains in the clay it is disseminated by the machine through a number of bricks, and becomes burnt into lime, which, when the brick becomes wet, expands and cracks the brick, rendering it useless. Numerous other fossils occur in the form of casts in a variety of iron pyrites known as marcasite, which 'blows' the bricks in burning, but produces no further damage.

If the oyster is present, it bursts the brick some time after it is burnt, so that if the brick has not been stacked for some time, to enable it to crack before it is built into a wall, it is liable to split in the wall and damage it; but any damage done to a brick by the marcasite is seen immediately it is burnt, and so is detected before being used, and the brick is therefore not put into good work, or only the undamaged portion is used.

The fossils from the Oxford Clay are very numerous, and often very beautiful, and show that during this period a large number of strange creatures existed, such as *Ichthyosaurus* and *Plesiosaurus*, which often reached a length of 20 feet; they were evidently marine, and very voracious, and must have been responsible for an exceedingly high death-rate among the fish.

The *Ichthyosaurus*, or fish-lizard, resembles both fish and lizard in certain characters, and was first

known from specimens in the Lower Lias at Lyme Regis, hence the following :

Behold a strange monster, your wonder engages !
 If lizard or fish, your wit may defy !
 Some twenty feet long on the shore of Lyme Regis,
 With a Saw for a jaw and a big starting eye.
 A fish or a lizard ? An Ichthyosaurus !
 With a big goggle eye and a very small brain ;
 And paddles like mill wheels in chattering chorus,
 Smiting tremendous the dread sounding main.

The Plesiosaurus has a very small head and a long neck, and was named from the Greek, meaning, allied to the lizards ; i. e. more like a lizard than a fish, in contrast to the Ichthyosaurus.

On leaving the plain and climbing Shotover we meet with what are perhaps the most interesting series of rocks in the district, the Corallian Limestones and Calcareous Grits.

The latter consist of sands, which have been used for mortar, and where, as at Sandford, they are not calcareous, in the manufacture of bricks.

Above come a series of limestones, often compact, locally used for road metal and for burning into lime.

On Shotover and at Bullingdon they often consist almost entirely of corals, when they are known as the ' Coral Rag '.

Between Horspath and Bullingdon this bed is very prominent, but when we examine these beds at Wheatley we find that the rock consists entirely of small fragments of shells and corals, and hardly any recognizable fossils remain.

Further to the east, as at Lye Hill quarries, we find bands of clay among the limestone ; and still further the sands and limestones entirely die out and become replaced by clay, the Ampthill Clay ; and at Arngrove, on the county boundary, a peculiar bed, composed entirely of the spicules of sponges, separates the Ampthill Clay from the Oxford Clay ; this bed is called the Raxella 'Chert', after the name of the sponge, or Arngrove Stone, after the locality.

When we pass still further east, to Brill, even this is lost, and the Ampthill Clay rests directly on the Oxford Clay.

Limestones from the Corallian and the hard beds in the Calcareous Grits have been largely used in Oxford buildings ; but the stone is not durable as a whole ; the best was obtained from Headington quarries and near Wheatley. The stone has met with more abuse than it really deserves, since the way it has weathered is largely due to the fact that it was laid with its bedding-planes vertical instead of horizontal ; the reason being that a smooth face could be more readily obtained in this manner.

Above the Corallian series comes the Kimmeridge Clay ; the 24 feet of sandstones and clays, which at Weymouth constitute the Supra-Corallian, being entirely wanting. In Dorset the Kimmeridge Clay can be easily separated into four divisions, with a total thickness of about 1,000 feet. On Shotover, where the same divisions are easily recognizable, the total thickness is not above 100 feet.

This clay is largely used for brickmaking, as at Shotover, Sandford, Chawley Hurst, and Culham ;

from the last two the bricks used in the New Hall were obtained.

Bones of Ichthyosaurus and Plesiosaurus are common, and an oyster (*Ostrea deltoidea*), which is a great trouble to the brickmakers, occurs with crystals of selenite near the base. Above the Kimmeridge Clay comes 75 feet of sands, the Portland Sands, which are equivalent to the great mass of limestones and sands in the Isle of Portland.

These sands contain large spheroidal masses of stone, which are locally known as 'Crackers', and contain many well-preserved fossils.

On Shotover the sand is largely used in brickmaking.

A limited supply of good stone has been obtained from the Portland at Great Haseley; but it is now mostly worked out.

Slightly to the east of Brill these beds are also replaced by clay, the Hartwell Clay, so that we have four beds of clay superimposed and only distinguishable by their fossil contents.

This brings us to the close of the Jurassic Period, since the Purbeck beds are only very doubtfully represented in this district.

When we enter the Cretaceous Period we find that a great change has taken place in the condition of south-eastern England. The sea in which all the Jurassic beds, except the Purbeck, were deposited, has given place to land, through which a great river wends its way to the sea, forming in this district the Shotover Iron Sands, and to the south the great clays of the Weald.

In the Shotover Iron Sands we find a few fossils

exhibiting a freshwater fauna; the most conspicuous being a shell differing but little from the freshwater mussel (*Unio pictorum*), now living in the Thames, which, for instance, is abundant just below Sandford Lock, where on the sandy bottom they may be picked up by the dozen, and a species of water-snail, similar to the present *Paludina vivipara*, abundant in the streams running into the Thames.

Ochre of good quality was formerly obtained from these beds near Wheatley.

On the land again sinking below the sea, fresh deposits of a marine character were formed, and we find that while the land sank, the sea was engaged in planing off the underlying rocks, so that the lowest marine beds of the Cretaceous rest sometimes on one bed of the Mesozoic, sometimes on another.

At Nuneham Courtney, for instance, we find that the Lower Greensand rests directly at one place on the Portland, at another on the Kimmeridge Clay; or in geological words, the Cretaceous is unconformable on the older Mesozoic. This Lower Greensand is very often of a reddish colour, so that its name seems inappropriate, but it has received its name from the abundance of green grains of a mineral called glauconite scattered through the rock, and which are locally so abundant as to give the rock a greenish colour, which is more pronounced when it is struck or scratched with a hammer; the red colour is due to the oxidation of the iron in the glauconite.

This Lower Greensand is visible above the Kimmeridge Clay on Foxcombe Hill above Sunningwell,

where it is of a reddish colour, and contains no fossils ; but at Faringdon it consists of a very red gravel, with numerous glauconite grains, occasionally cemented into a hard rock, and crowded with sponges and sea-urchins.

This type is known only round Faringdon, so that this 'facies' or type of the Lower Greensand is known as the Faringdon Sponge Gravels.

Above the Lower Greensand lies a sheet of clay, the Gault, forming the plain extending from Culham to Didcot, and extending westward through the Vale of the White Horse, and overlain at its southern limit by a thin layer of Upper Greensand.

These two beds constitute one series, being in fact two wedges, the Gault with its apex in Devon, at Beer Head, the Greensand with its apex a little to the east of Didcot, thus showing that the sea was deeper to the east than to the west, since clays are formed in deeper waters than sands.

The Gault has been dug at Culham for brickmaking, but at present the Kimmeridge Clay, which here lies directly below it, is alone being worked.

Above the Upper Greensand comes the Chalk, which is almost entirely composed of the shells of very lowly organisms called Foraminifera, belonging to the Protozoa. The lower beds contain some clay, but later in the Chalk Period the sea was quite clear, and only pure chalk was formed.

The flints which occur so abundantly in the Upper Chalk were formed, after the chalk was raised into dry land, by the solution and subsequent redeposition of siliceous organisms, such as sponge spicules.

The nearest equivalent to chalk now forming in the

sea is the Globigerina ooze in the deep waters of the Atlantic.

Globigerina is one of the Foraminifera, and is found in the Chalk, though only subordinate to other forms, and there are good reasons for believing that the chalk was not formed in such deep water as the Globigerina ooze ; a warm and clear sea being all that is required for its formation.

As we meet with no trace of the great Tertiary formation in this area, though it occurs a little to the south of it, we have exhausted what is often known as the 'solid geology' of the district, and so pass on to the river gravels and alluvium of the Quaternary Epoch.

These gravels may be divided into two main groups. The oldest, or plateau gravels, which occur on the top of the higher hills as at Eynsham Hall Park, Bladon Heath, Picket's Heath on Boar's Hill, round Sunningwell and in Bagley Wood, and east of Great Milton, are at present of a very problematic origin, possibly due to ice, cannot be correlated with any of the present river systems, and contain doubtful flint implements called eoliths.

The newer or river gravels, which were formed when the rivers Thames, Cherwell, Evenlode, &c., had not cut their valleys to such a depth, were deposited in four terraces, the oldest, or 4th as named by the Geological Survey, being the highest.

In digging the foundations for a new house at Radley, the femur or thigh-bone of a mammoth, an extinct elephant inhabiting an arctic climate, was found in the clay, into which it had sunk from the

overlying 4th terrace; the 4th terrace does not seem to have yielded many fossils.

The 2nd terrace, about 50 feet lower, has been much more productive, remains of horse, ox, and stag being somewhat abundant at Wolvercote, and here at one time Mr. Bell obtained several fine examples of Palaeolithic implements.

The 2nd terrace is the most interesting, as it is well developed round Radley, in Sylvester's and the Abingdon gravel pits. From the former the following remains have been obtained—horse, ox, hippopotamus, stag—and in the end of November, 1909, a large portion of the upper jaw of the cave lion, which till then had only been recorded once, and doubtfully twice, in this district.

The Abingdon gravel pits have yielded molar teeth of mammoth, and the remains of rhinoceros, hippopotamus, and ox; the remains enumerated from both these pits are in the collection of the Radley College Natural History Society.

The 1st terrace is almost on a level with the present river, and is largely covered with the alluvium which is being formed when it is in flood; this alluvium often contains numerous freshwater shells, and bands of these shells are clearly visible in the banks of the Thames between Sandford and Nuneham.

The gravels at Stanton Harcourt and Church Hanborough are cemented into a hard compact stone, and have been successfully used for building purposes.

THE INFLUENCE OF GEOLOGY ON THE SCENERY OF THE DISTRICT

The industry of a district is chiefly dependent on its Geology; the nature of the rocks determining the suitability of the soil for crops or pasturage. The relations of the rocks also determine the water-supply, and hence the size and abundance of villages and towns; so that the Geology is as directly responsible for such of the scenery as is due to human influence as it is for that due to natural vegetation.

Wherever a porous rock, such as sand or much jointed limestone, rests on an impermeable rock, such as clay, a spring is thrown out; and if a well is sunk into such a bed, water will be obtained.

The Lower Oolites, with their alternations of limestones and clays, will supply many small wells, and therefore in that area villages are numerous.

The Calcareous Grits at their junction with the Oxford Clay yield copious supplies, so that round Shotover we find the villages of Cowley, Headington, and Littlemore.

The following sections of local wells may be here inserted:

A well on the golf-course was sunk, in 1904, to a depth of 48 feet, into the Calcareous Grits; the well contained 2 feet 6 inches of water, but has since been deepened.

There are two wells at Radley College, passing through the Kimmeridge and Upper Corallian into the Calcareous Grits.

WELL No. 1.

| | |
|-------------------|---------------------------|
| Gravel | 12 feet |
| Kimmeridge Clay { | Clay 30 feet |
| | Clay and Rock . . 34 feet |
| Corallian . . . { | Rock 24 feet |
| | Sand, with water { |

Depth . . 100 feet

WELL No. 2.

| | |
|---------------------------|---------------------------|
| Kimmeridge Clay | 81 feet |
| { | Sand and Rock . . 16 feet |
| | Hard Rock . . . 4 feet |
| Corallian . . . { | Sand, with water . 6 feet |
| | Hard Rock . . . 5 feet |
| | Sand and Clay . . 1 foot |

Depth . . 113 feet

A well sunk at Cothill School passed through the Corallian on to the top of the Oxford Clay, but owing to the fact that the Calcareous Grits were in the form of compact rock and clay, no water was met.

Towards the west of the area we also find such villages as Cumnor, Eaton, Bessels Leigh, Appleton, Fyfield, and Tubney.

But in the east of the district, where the Calcareous Grits are replaced by the Ampthill Clay, there are only two small villages, viz. Studley and Boarstall; the villages of Ickford and Oakley, though on the Clay, obtaining their supply from streams flowing from the Iron Sands and Portland beds of Brill.

The new suburb of Foxcombe Hill draws its supply from the Lower Greensands.

The gravels also afford a considerable supply of water, so that towns and villages are abundant on them. Oxford and Abingdon originally drew their supplies from them, but their growth and modern civilization have caused a demand for more and

better water, and thus have caused them to seek their supplies further afield. Among the villages supplied by water from the gravels are Bright-hampton, Standlake, Kidlington, part of Radley, Waterperry, and Waterstock.

It is well known that certain trees prefer certain soils—for instance, pines grow best on a sandy or porous soil; oaks, ashes, and elms flourish on a good stiff clay. Beeches grow to a large size on clay, but appear to be usually only isolated specimens, since beech woods are most commonly found on limestones and chalk.

Bagley Wood affords a good example of the change due to the nature of the rock. Where the clay is either at the surface or only covered with a thin layer of gravel, it is chiefly composed of oaks; but where the gravel is thick, larches and Douglas pines are more abundant.

If the scenery due to the large trees is marked, the influence of Geology on the smaller herbs is even more so.

Corn thrives in a soil which is clayey as well as stony; thus near Radley we find the cornfields situated where the plough mixes the bottom of the Kimmeridge Clay with the top of the Corallian, the same soil also suits mangels, lucerne, and horse-beans, and one of these last three crops is usually grown alternately with corn.

In the south, on the rolling downs of the Chalk we find a very dwarf vegetation, consisting of coarse grass abounding with numerous, usually brightly coloured, flowers.

On passing on to the Gault Clay, the rock being very soft, the river has cut out a very wide valley, through which it meanders, and here the land is almost entirely used for pasturage and hay, except round the river itself, where the gravels allow of corn being grown.

To the north the hills, with wide valleys between, expose numerous different rocks, so that the scenery exhibits continual changes. Shotover, for instance, affords an excellent example; at the base we find arable land, then pasturage and woods, and on the top rough ground with pines, which are also numerous where the Calcareous Grits come to the surface about half-way up. The great area of Oxford Clay is almost entirely pasturage, but on passing to the north, on to the Cornbrash, cornfields at once become predominant.

The alluvium of the Thames valley is almost entirely pasturage, and locally, as at Iffley, above Sandford and round Witney, one cannot omit to mention the abundance of the beautiful purple and white snake's-head (*Fritillaria meleagris*), so abundant in April and May, though rare in most parts of England.

The relative hardness of the different rocks has a great part to play in the sculpturing of the district. Ever since the river began to cut down its valley, rain, frost, and small streams have been doing their utmost to level the intervening high ground; clay, if unprotected, is quickly worn away, and limestones dissolved and broken up by frost; but still Shotover and Foxcombe Hill are over 300 feet above

the river-level, and on looking at a geological map we at once notice that a capping of sand in each case protects the underlying clay, which in its turn protects the limestones below.

The relative hardness of the rocks also affects the river-level; thus the fall of 12 feet in the river at Sandford is due to the hardness of the Corallian Limestone, which the river has been unable to cut through as fast as it has the Kimmeridge Clay lower down stream; the fall at Abingdon is probably due to a hard band in the Lower Greensand, and that at Culham to the difference in hardness between the Greensand and the Gault.

Before ending this description of the influence of Geology on the scenery, it should be mentioned that the narrow picturesque gap in the chalk at Goring, through which the Thames flows, was cut through by the river almost as fast as the land rose from the sea; that it did not quite keep pace with the rising land is shown by the fall of the river there.

The Oxford district is one of great historic interest to geologists, since here Geology may well be said to have had its birth, and with Oxford we must associate such names as William Smith (rightly called the father of Geology), Dean Buckland, and Phillips; Conybeare and Sir Charles Lyell were also Oxford men, the latter being a pupil of Buckland.

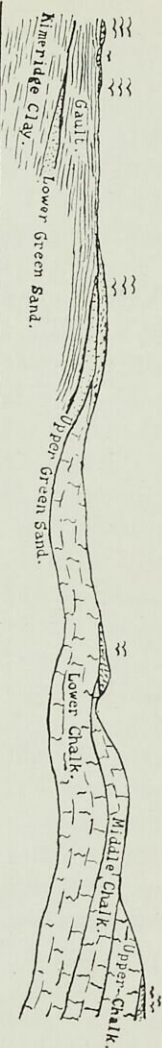
Subjoined is a section from NNW. to SSE., passing through Shotover, and a table showing the best exposures for the different beds, with a list of the commonest fossils; a glossary of the technical terms, unavoidably used, has also been added.

Based on the maps of H. M. Geological Survey,
with additions from the author's observations.

Clay with Flints.
Plateau Gravels.
Valley Gravels.
Alluvium.

Horizontal Scale. 1. 0. 1. 2. Statute Miles.

SECTION FROM UPPER HEYFORD TO BERIN'S HILL. (4 Miles East of Moulshford.)



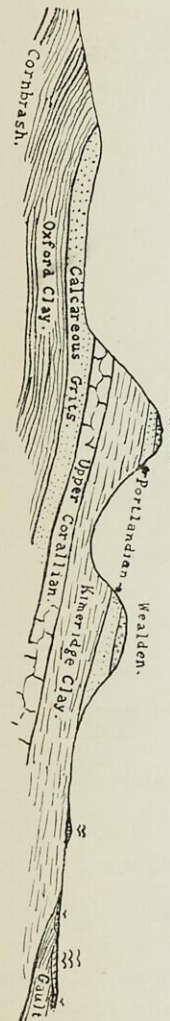
R. THAMES.

BENSON.

GRIM'S DITCH.

WARREN HILL.
447 Ft.

BERIN'S HILL.
500 Ft.



STON WOOD.
436 Ft.

BAYSWATER BROOK.

SHOTOVER HILL.
562 Ft.

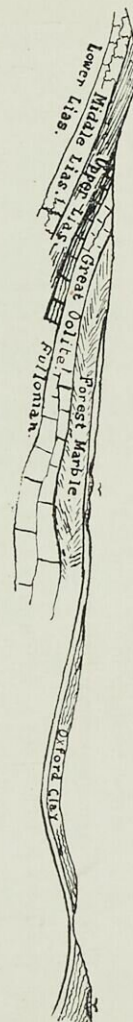
HORSPATH.

GARSINGTON.
400 Ft.

ROUND COPSE.
289 Ft.

R. THAMES.

R. THAMES.



UPPER HEYFORD.
358 Ft.

CAULCOTT.

AVE'S DITCH.

GALLOS BROOK.
GALLOS BROOK.
GALLOS BROOK.

WESTON ON THE GREEN.

NOKE.
200 Ft.

| | Formation. | Locality. | Commonest Fossils. |
|---------------|-----------------|--|--|
| Pleistocene | Alluvium | Along the banks of most of the rivers | Paludina vivipara Planorbis corneus Planorbis carinatus Neritina fluviatilis Limnaea peregrina Bithynia tentaculata Anodonta anatina |
| | River Gravels | Along the banks of the Thames, Long Hanborough, Pear Tree Hill, Wolvercote, Summertown, Radley, Abingdon | Elephas primigenius Bos primigenius Equus caballus Cervus |
| Cretaceous | Chalk | Near Goring and the Moulsoford Downs (no good sections) | (Nothing abundant) |
| | Gault | Culham brick-pit | Hoplites interruptus Desmoceras beudanti |
| | Lower Greensand | Foxcombe Hill (no fossils), Faringdon | Peltastes wrightii Cidarid faringdonensis Raphidonema faringdonensis Raphidonema macropora Oculospongia dilatata Bryozoa (numerous species) Ostrea frons |
| Upper Oolites | Portland | Shotover, Brill | Perisphinctes giganteus Perna mytiloides Ostrea expansa Pecten lamellosus Protocardium dissimile |
| | Kimmeridge Clay | Shotover, Chawley, Culham, Foxcombe | Perisphinctes biplex Cardioceras alternans Aptachus latus Protocardium striatum Ostrea deltoidea Thracia depressa Exogyra virgula |

| | Formation. | Locality. | Commonest Fossils. |
|----------------|------------------|---|--|
| Middle Oolites | Corallian | Shotover, Bullingdon, Wheatley, Wootton, Cumnor, Sandford | Exogyra nana Gervillia aviculoides Isastrea explanata Thecosmilia annularis Thamnastrea concinna Cidarid florigemma Pecten vagans Pecten vimineus Camptonectes lens Lima rigida Lima tumida Ostrea gregaria Alectryonia gregaria Perisphinctes plicatilis Belemnites abbreviatus |
| | Calcareous Grits | As above | Aspidoceras perarmatum Cardioceras vertebrale |
| | Amphill Clay | Brill | Cadoceras excavatum Serpula |
| | Raxella Chert | Arngrove | Cardioceras cordatum Pholadomya equalis Pinna lanceolata |
| | Oxford Clay | Wolvercote, Pear Tree Hill, Summertown | Cosmoceras duncani Cosmoceras ornatum Peltoceras annularis Peltoceras athleta Belemnites owenii Belemnites abbreviatus Belemnites hastatus Gryphaea dilatata Gryphaea bilobata Nucula elliptica Aulocothyris impressa Rhynchonella varians |
| Lower Oolites | Cornbrash | Hanborough, Enslow | Homomya gibbosa Avicula echinata Gresslya peregrina Pleuromya securiformis Terebratula intermedia Waldheimia obovata Pygurus mitchilini |

| <i>Formation.</i> | <i>Locality.</i> | <i>Commonest Fossils.</i> |
|--|--|---|
| Forest Marble | Hanborough, Bladon, Enslow | (fossils extracted with difficulty) Pecten vagans Modiola sowerbeyi Rhynchonella concinna Echinodem spines |
| Great Oolite | Enslow (a good section containing a much greater list of common fossils was exposed in the new G.W.R. cutting at Ardley) | Terebratula maxillata Lima cardiiformis Modiola imbricata Nerinaea funiculus Nerinaea eudesii Teeth of Hybodus and Strophodus |
| Upper Fuller's Earth & Fuller's Earth Rock | Ardley and Stonesfield (no sections now exposed) | |
| Stonesfield Slates | Stonesfield | Teeth of Hybodus Strophodus and Pycnodus Rhynchonella concinna Terebratula maxillata Gervillia acuta Trigonia impressa Modiola imbricata Lima cardiiformis Lima pectinoides Stigoceras micromphalus |
| Lower Fuller's Earth | Round Stonesfield (no good section; a good section was exposed in the Ardley cutting) | |
| Inferior Oolite | Fawler | Clipeus plotii Terebratula globata Terebratula submaxillata Rhynchonella subtetrædra Homomya gibbosa Lima gibbosa Pholadomya |
| Upper Lias | Fawler | Harpoceras falciferum Hildoceras bifrons Dactiloceras communis |
| Middle Lias | Fawler | Rhynchonella tetrædra Terebratula punctata Belemnites |

GLOSSARY OF TECHNICAL TERMS

- Archæan* : the most ancient rocks = Eozoic (Greek: ἀρχαῖος, ancient).
Arenaceous : consisting of, or containing sand (Latin: arena, sand).
Argillaceous : consisting of, or containing clay (Greek: ἀργιλλος, potter's clay).
Calcareous : consisting of, or containing carbonate of lime (Latin: calcarius, pertaining to lime).
Cetiosaurus : a huge extinct animal (Greek: κῆτος, whale, σαῦρος, lizard).
Dip : the angle between the slope of the beds of rock and the horizontal.
Eozoic : the period of the dawn of life (Greek: ἥως, dawn, ζωή, life).
False Bedding : the term used when the rock material has been deposited in layers which make various angles with the general dip of the rock. Characteristic of shallow-water deposits.
Ichthyosaurus : an extinct animal, somewhat resembling a dolphin, whose characters partake both of fish and lizard (Greek: ιχθύς, fish, σαῦρος, lizard).
Lias : a Dorset corruption of the word 'layers', from the fact that the rocks of this age are markedly built up in layers.
Mesozoic : the middle period in which fossils occur (Greek: μέσος, middle, ζωή, life).
Oolite : term applied to rocks, chiefly of mesozoic age, from their resembling the roe of a fish (Greek: ὠόν, egg, λίθος, stone).
Palæozoic : the oldest period in which fossils occur (Greek: παλαιός, ancient, ζωή, life).
Plesiosaurus : an extinct marine animal in the mesozoic, with a small head and long neck (Greek: πησιός, allied to, σαῦρος, lizard).
Quaternary : the most recent period, the fourth period containing fossils (Latin: quattuor, four).
Rock : an aggregate of minerals composing the earth's crust, including such forms as gravel, sand, and clay.
Tertiary : the third period in which fossils occur (Latin: tres, three).
Trias : the lowest division of the mesozoic, from its being typically divisible into three in Germany (Latin: tres, three).

