recently, I was only aware of its survival in the Bracebridge area. However, a *Philonotis* specimen collected by Mr P. Burgoine from Longmoor Pool bog on the opposite side of the park in August 1987 and sent to me for specific identification was very obviously *P. calcarea* as soon as I examined it and then confirmed my first impressions by subsequent microscopic study of the areolation (leaf cell pattern). Material collected in the Longmoor Valley by Mr M. Senior in September 1992 also proved to contain *P. calcarea* when I examined it, confirming its occurrence in this area.

In conclusion, I would like to emphasize that in view of the rare bryophyte taxa existing in the park bogs and woodlands, it is most important that these habitats should remain undisturbed.

A Natural History of Sutton Park

Part 2: Fungi, Lichens and Bryophytes

Edited by
Peter Coxhead and Harold Fowkes

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bryophytes. Small moss cushion growths (usually 1–3 cm high) consisting of numerous upright short shoots whose leaves are secund (bent over to one side) are usually those of *Dicranella heteromalla*. Other, often extended, low cushions whose shoot leaves are not secund are likely to be the moss *Orthodontium lineare*. This is often liberally covered with its stalked capsules (containing spores). *Orthodontium* is a very successful colonist in the British Isles (first record in Cheshire, 1922). The rare dicranums (*D. tauricum* and *D. montanum*), previously mentioned, can also occur on old stumps and rotting branches. Creeping mosses, either on the woodland soil or on decaying wood, which are composed of a prostrate stem adnate to the substrate and bearing leaves in two very obvious flattened rows, are likely to be species of *Plagiothecium*.

Heaths are another interesting locality for mosses in the park and typical taxa encountered on them are *Barbula convoluta*, *Barbula unguiculata*, *Bryum capillare* (with its very obviously cork-screw rolled leaves when dry) and *Bryum rubens*. The latter has interesting deep red pigmented gemmae (tubers) on its rhizoids. These are easily detached and serve for vegetative propagation. When the rhizoids are examined with a ×10 lens, these gemmae can be easily seen. Various species of *Campylopus* mosses also occur on the heathland areas. *Campylopus fragilis*, in particular, is uncommon in the botanical county of Warwickshire.

Philonotis fontana
A moss found in wettish places on boggy peaty soil. Bright yellow-green with reddish stems. Male organs have tiny flower-like tips.

As I mentioned previously, the outstandingly rare mosses in Sutton Park are the species of *Philonotis*. I have been very interested to note that these are extending their range within the bogs and also at the stream margins. This extension of range applies particularly to *Philonotis calcarea*. Until

Sphagnum bogs are now uncommon in the Midlands. In addition, there are the locally rare mosses *Rhizomnium pseudopunctatum*, *Climacium dendroides*, *Calliergon giganteum* and *Straminergon stramineum*. A group of very rare Midlands mosses continues to survive and increase (by vegetative propagation) in the park. These mosses are various species of *Philonotis*. The four which occur in the park are *Philonotis fontana*, *P. caespitosa*, *P. calcarea* and *P. arnellii*. This last is extremely rare in the Midlands.

A liverwort rare in the botanical county of Warwickshire which occurs in the Bracebridge bogs is *Chiloscyphus pallescens*. Another species of this genus uncommon in the botanical county is *Chiloscyphus polyanthos*. In 1960, I re-found the uncommon liverwort *Trichocolea tomentella* growing on rotting wood fragments around the base of an old stump in a boggy woodland area some distance above the level of Blackroot Pool. The original find of this very rare Warwickshire plant was by J. Bagnall, in possibly the same locality. His find is dated 1876. Sutton Park is the only locus for this liverwort in the botanical county. The appearance of the specimens is very distinctive. The plant is foliose with a pinnately branched stem which can exceed 5 cm in length. The leaves are so deeply segmented into fine filaments of cells that the stem looks superficially as though it is covered with the growth of an epiphytic filamentous alga. The colour of this intriguing bryophyte is a pale whitish-green. I noted that it was forming conspicuous patches on the rotting wood.

The woodland areas of the park also contain some notable rare mosses. Typical examples are two very uncommon species of *Dicranum*, namely *Dicranum tauricum* and *Dicranum montanum*. The first British specimen of the latter was found by J. Bagnall in one of the woodlands of the park. The find of *Dicranum tauricum* (synonym *D. strictum*) is my own. It forms a very interesting addition to the park list because it is so unusual. I found it in its normal habitat – growing on decaying wood. This moss is particularly interesting because it propagates vegetatively by means of fragile leaf tips. These develop rhizoids when they fall onto a suitable moist wood substrate; they then develop into new plants. After the fall of the leaf tips, the remaining portions of the leaf laminae show a characteristic bristle-like appearance which is unmistakable and very easily seen with a ×10 lens. I collected the material from old branches in a woody area of the park in August, 1963.

The uncommon *Polytrichastrum longisetum* can also occur on shaded ground beneath the trees. Besides these rare moss taxa, a large number of other more common types are found in the woodlands. For instance, *Kindbergia praelonga* (synonym *Eurhynchium praelongum*) can form extended flat carpets on the soil surface consisting of prostrate creeping shoots which give off numerous lateral branches. These branches decrease in length towards the stem apex and the whole impression of the growth form is a green, somewhat feathery structure usually about 6 cm in length. Cushions approximately 6 cm deep and often of a darker green than *Kindbergia praelonga* and either scattered on the woodland floor or growing amongst exposed tree roots are likely to be *Mnium hornum*. Tree stumps, especially when of some age, can provide good habitats for

Table of Contents

General Introduction (by Peter Coxhead)

Towards the end of the 1980s, the late Harold Fowkes first conceived the idea of producing a work on the natural history of Sutton Park. The prime intention was to make the available information more widely accessible, and so support the management of the wildlife of the park. With the assistance of Peter Coxhead, the first part of the work, on the vascular plants, was published in 1991, funded by the Sutton Coldfield Natural History Society. The original intention was to proceed in stages by producing booklets on separate aspects of the park's natural history, and then, after appropriate revisions, to combine these into one volume. The booklets were to consist of general introductions to the included taxonomic groups, followed by checklists of species considered to be present or to have been present in the park. In listing species of plants and animals, existing records and information would be used, particularly from the Biological Records Centre at the Warwickshire Museum, rather than new fieldwork.

Three booklets were produced between 1991 and 1997:

- Part 1, *Vascular Plants*, 1st edition 1991, 2nd edition 1997
- Part 2, *Fungi, Lichens and Bryophytes*, 1993
- Part 3, *Birds*, 1995

Work was underway to produce the fourth part, on the animals of the park, but was hindered by Harold Fowkes' ill health and subsequent death in 2005, and also by the realization that the sheer volume of the invertebrate records, particularly following a major survey in 1996–1998, meant that a printed work containing animal checklists would be impractical.

I decided to put all the checklists on the web (later followed by the individual records). They can be found starting at
http://www.spnh.scnhs.org.uk
However, this meant that the text of the three published booklets and of the unpublished animals booklet was not easily available, so it is being put online, although some material may now only be of historical interest.

Where not explicitly attributed to another author, the original text was by Harold Fowkes and Peter Coxhead. Revisions are by Peter Coxhead.

The Bryophytes of Sutton Park

Introduction (by J. H. Field)

Sutton Park is outstanding in the Midlands for the number of rare bryophytes which continue to survive and increase within it. My own studies of this Site of Special Scientific Interest have now extended for over thirty years. Previous intensive workers on the bryophytes of the park have been J. Bagnall and T. Laflin.

Bryophytes (other than the thalloid liverworts) generally have stems and leaves, although of a simpler structure than those of vascular plants. Root hairs (rhizoids) anchor the plant to the substrate. Bryophytes can reproduce either by spores or by vegetative means. Naturalists interested in plants will be aware that there are two main types of bryophyte, namely mosses and liverworts. These differ in a number of features, one being the way in which the spore capsule releases the spores. In most liverworts, the walls of the capsule split open into four valves; in the majority of mosses, the capsule has a 'lid' which becomes detached when the spores are ripe. Descriptive details of the species are available in the various modern textbooks dealing with the bryophytes of the British Isles.[4]

It has become very evident to the modern botanist that these non-flowering plants have evolved from algal ancestors in the remote past. They are not likely to be the ancestors of the ferns and flowering plants; on the contrary, they are likely to be independent lines of plant evolution which are certainly still actively evolving. The ancestors of the tracheophytes or vascular plants (ferns and flowering plants) are likely to have been other groups of ancient algae.

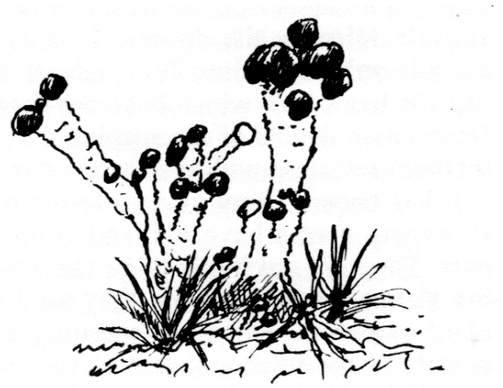
Liverworts (Hepaticae) can be either thallose or foliose. The thallose types such as *Lunularia* and *Marchantia* have a flat green leafless structure which extends and branches horizontally on the soil surface. This thallus is attached by simple root hair growths called rhizoids. The foliose liverworts look entirely different. They consist of a stem bearing small leaves which can be deeply segmented in some species. The leaves differ from those of most mosses in that they lack a well-defined central 'nerve' (vein) for water conduction. The leaves of mosses (Musci) are mostly instantly recognized in that they are not deeply segmented and they often possess a well-defined nerve for water conduction.

The number of bryophyte taxa in the park is likely to be between 130 and 160. About 75% of these are mosses. A checklist of species believed present is appended to this account. Some of the taxa recorded by Bagnall and Laflin have not been seen since and have been included in a separate 'lost' list.

By far the most fascinating habitats in the park for bryophytes are the bogs and stream margins. In this connection, the Bracebridge area is outstanding and the bogs there contain a variety of Sphagnum mosses.

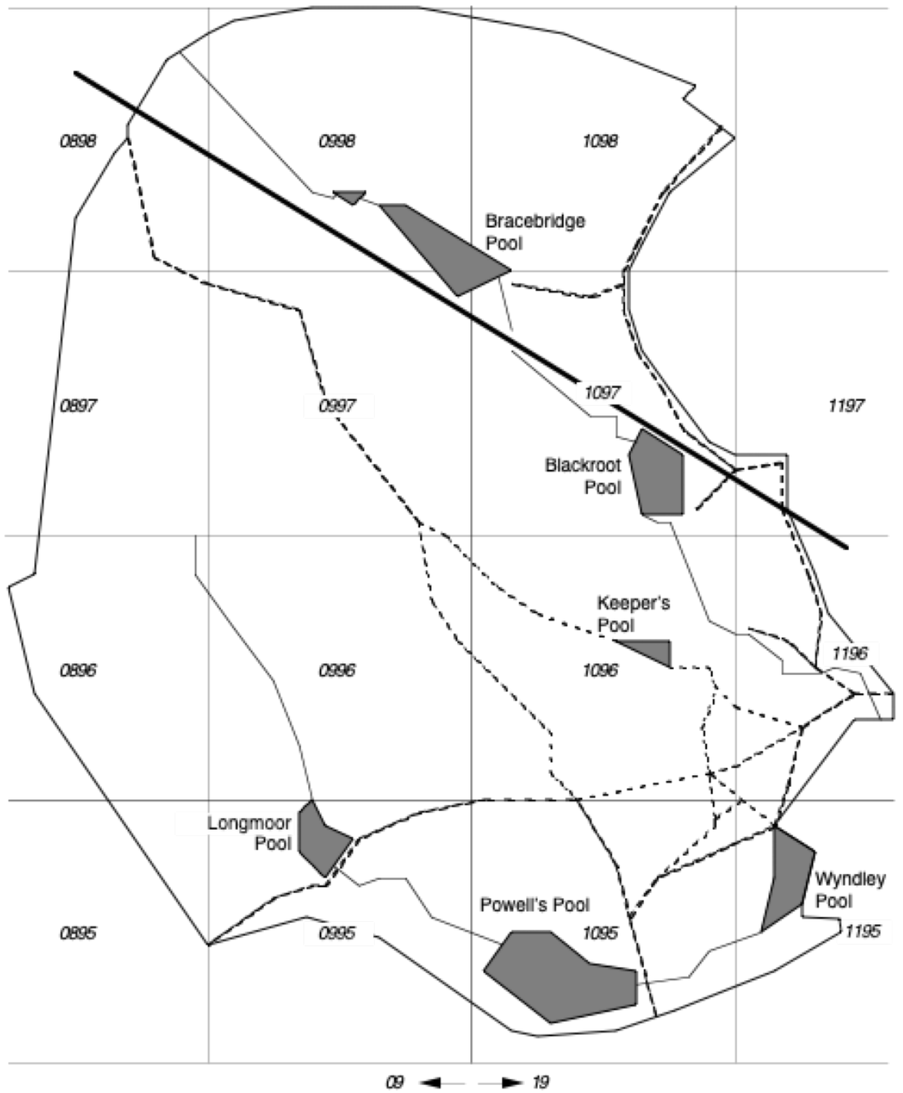
[4]For a comprehensive account, see *British Mosses and Liverworts* by E. V. Watson (Cambridge University Press, 3rd edition, 1981). See also the bibliography on p. 4.

increase was partly due to James' expertise as a professional lichenologist and partly due to changes in lichen taxonomy, but James also considered that reduction in sulphur dioxide levels was significant. The pollution-tolerant *Lecanora conizaeoides* has sharply declined in abundance, and is now described as "rather uncommon". Other species living on bark (corticolous species) have shown a dramatic increase, both in the number of species and in their abundance. However, heathland lichens have not fared so well, largely because of changes in vegetation, such as increased abundance of grasses and bracken, probably caused by the fertilizing effects of nitrogen pollution.



Cladonia floerkeana Common lichen on peaty moors, heaths. Grey stalks with scarlet spore-producing organs at the tips.

Sketch Map of Sutton Park



The boundary shown is the 'Park Pale'.

Grid Squares The sketch map shows the Ordnance Survey 1 km squares. These are assigned four-figure codes based on the grid references of their south west corners. County-wide Floras frequently use 10 km squares, which are assigned two-figure codes in a similar manner. For example the location indicated by the full six-figure grid reference SP098962 falls in the 1 km square 0996 (dropping the original third and sixth figures), and in the 10 km square 09 (further dropping the original second and fifth figures). Sutton Park is split between the two 10 km squares 09 and 19. Appropriately, it lies entirely in the 100 km square assigned the two-letter code SP.

Contributors

M. C. Clark, the author of the section on the fungi of Sutton Park (page 7), was a noted mycologist and the editor of *A Fungus Flora of Warwickshire*, the only fully detailed county Flora devoted entirely to fungi. His death before the publication of the first edition of the "lower plants" booklet was a sad loss to naturalists of all interests.

J. H. Field BSc FLS, the author of the introduction to the bryophytes of Sutton Park (page 11), was the Regional Recorder for Warwickshire for the British Bryological Society and an International Taxonomic Specialist on the moss genus *Philonotis*. His death after the publication of the first edition of the "lower plants" booklet greatly depleted the bryological expertise available in the Midlands.

Bibliography

Useful books which provide illustrations of the groups discussed here are: *Grasses, Ferns, Mosses & Lichens of Great Britain and Ireland* by Roger Phillips (Pan, 1980), which has photographs of almost 100 lichens and some 140 bryophytes, including location shots and close-ups; *Mushrooms and other Fungi of Great Britain*, by the same author (Pan, 1981); and *The Oxford Book of Flowerless Plants* by F. H. Brightman and B. E. Nicholson (Oxford University Press, 1966; Peerage Books, 1985) which has illustrations of fungi, lichens and bryophytes organized by habitat. More technical works are noted later as appropriate.

Future work

Reports which help to build up distribution information on species already known to be present or newly discovered can be sent to info@scnhs.org.uk. All information will be shared with appropriate local recorders.
Reports should give:

- Species name: ideally including the Latin name used in the online checklist.
- Location: try to give at least the 1 km square number; preferably give a six figure grid reference and add a brief description of the locality.
- Habitat: woodland, grassland, heath, waterside, water, etc.
- Date of the record.
- Name and address of the recorder.

The online checklist is accessible from
http://www.spnh.scnhs.org.uk/#chklists

The Lichens of Sutton Park

Introduction (by Peter Coxhead)

Lichens are a successful group of organisms, in which each 'species' is formed by the intimate association of a fungus with one or more true or blue-green algae. The fungus generally forms the 'structure' of the lichen, with algal cells packed among the fungal hyphae. The algal cells produce food for both partners by photosynthesis; the fungus provides water and mineral salts as well as a protective cover. The relationship between the partners is often said to be 'symbiotic', implying that each benefits equally from the association. However, unlike the alga, the fungal partner cannot survive alone, so the relationship is perhaps less than equal. What is certain is that the combination can form a very rugged, long-lived organism which can survive as a thin coating on a rock face that is alternately baked, desiccated, frozen and rained on.

Lichens reproduce in two ways. Firstly, they may form vegetative structures (soredia), containing both fungal and algal cells. After dispersal, these simply grow to form a new lichen. Secondly, the fungus may produce spore-bearing structures, containing only fungal cells. After dispersal, a new lichen can form only if the fungus encounters the right alga.

In principle, lichens could be classified by treating them as 'lichenized fungi', and then classifying the fungal partner in the same group as its non-lichenized relatives. However, the structure and life-cycle of the fungus is so changed by its lichenoid habit that it is often difficult to determine its relationships, and lichens have traditionally been named and classified as if they were single species.

Partly because of their way of life, many lichens are very sensitive to air pollution, particularly to sulphur dioxide, and this was reflected in the relatively poor lichen flora of Sutton Park recorded in surveys up to the 1980s, surrounded as it is by industrial areas of the West Midlands. Only about 40 species were known to be present, whereas woods in the south of Warwickshire may have more than 50 species of lichen growing on bark alone.[2] In the park, species were about equally divided between those that grow on walls, concrete and stone (e.g. *Lecanora muralis*, a common species forming a yellowish-brown crust with lobed edges); those that grow on soil, including heathland (e.g. *Cladonia floerkeana*, a heath and moor-loving species, which forms greyish patches with stalked structures bearing orange-red spore-producing bodies at their tips); and those that grow on bark and wood (e.g. *Lecanora conizaeoides*, then a very common species, which forms a pollution-tolerant grey-green crust).

In 2010, P.W. James and M. Powell published an article on the lichens of Sutton Park which included data from surveys James had led between 2008 and 2010.[3] This produced a list of 156 lichen taxa. The notable

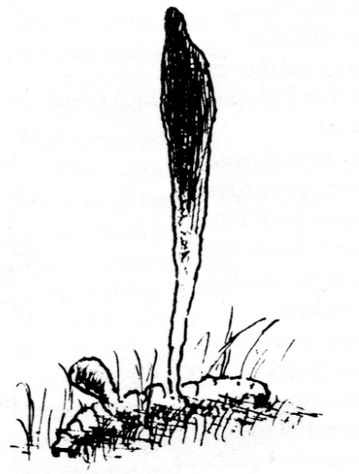
[2] D. C. Lindsay, in Clark (1980).
[3] P. W. James & M. Powell, "The Lichens of Sutton Park, Warkwickshire", *British Lichen Society Bulletin* (107), pp. 2–17, 2010.

as also is the cup-fungus, *Peziza limnaea*. Among the more specialized minute cup-fungi worthy of mention is *Pezizella eriophori* which, as its name suggests, occurs on decaying leaves of Cotton-grass on wet ground.

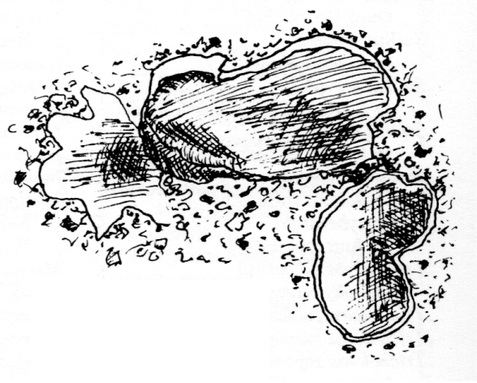
The wet woodland is very interesting. Probably the most spectacular toadstool is the brilliant yellow *Russula claroflava*. This was actually described as a new species by the great Warwickshire mycologist W. B. Grove from a Sutton Park collection. *Laccaria bicolor* and *L. proxima* grow in such areas as does the striking Bog Beacon, *Mitrula paludosa*, found in boggy ditches, with its orange-coloured clubs looking almost like a crocus. There are many small dingy brown toadstools to be found under alders, but they are rather difficult to distinguish and are a matter for the specialist.

The banks of the railway, where it runs through the woodland, have provided at least two interesting finds. A specimen of *Boletus fragrans* collected in 1968 was then the only known authentic record of this species in Britain. The striking *Sparassis crispa*, looking rather like the head of a cauliflower and growing at the base of pine trees, was another find from this habitat. Several *Cortinarius* species occur on the shaded banks. However, one must not encourage trespassing on the railway, even in such a worthy cause as adding to fungus records.

These brief particulars will, it is hoped, stimulate more interest in the fungi and result, eventually, in the addition of many more to the present list.



Cordyceps militaris
Scarlet Caterpillar Fungus, on pupae or caterpillars, usually buried under the soil.



Geopora arenosa
Seen above sandy or gritty surfaces when mature.

The Fungi of Sutton Park

Classification of the fungi (by Peter Coxhead)

Fungi are now generally considered to form one of the three major groups or 'kingdoms' of multi-cellular living things, being distinct from both plants and animals. The three groups can be distinguished by the way in which they typically obtain their food. True plants obtain their food by photosynthesis; the green pigment, chlorophyll, is used to capture the energy of sunlight and to turn raw materials, carbon dioxide and water, into sugars and oxygen. Animals obtain their energy by eating other organisms, and then digesting them internally. The larger fungi may superficially resemble plants in their fixed shape and lack of mobility, but like animals they feed on other organisms, differing in digesting them externally rather than internally. Studies of the genetic material (DNA) of the three 'kingdoms' show that fungi are more closely related to animals than to plants.

The vast majority of fungi are composed of a 'mycelium' made up of threadlike strands or filaments called 'hyphae'. The many-branched hyphae penetrate the medium in which the fungus is growing, absorbing nutrients over their surfaces. Throughout the year, the soil for example is full of fungal mycelia, some growing freely, some living in happy association with the roots of living plants, some attacking plants and animals, both living and dead. In order to reproduce, most fungi produce special 'fruiting bodies' in a variety of shapes – the familiar mushrooms, toadstools, bracket fungi, puff-balls, etc. The function of the fruiting bodies is to produce 'spores', which after dispersal can grow into new fungi.

Experts differ over the classification of the fungi, and a variety of schemes have been used at various times. Classifications are now based on genetic similarities and differences, rather than on appearance (morphology). The scheme used in *A Fungus Flora of Warwickshire*[1] and in the 1992 booklet is now well out of date. Two groups, water moulds and slime moulds, are no longer considered to be fungi; the former are more closely related to brown algae, the latter are part of Amoebozoa. They have been kept in the online checklist for consistency with older publications. The water mould *Peronospora grisea* has been recorded in the park. Slime moulds grow as small masses of 'jelly', which slowly creep about, digesting plant material. When mature, spore-bearing structures are formed. Some 30-odd slime moulds have been recorded in the park.

The true fungi fall into two main groups: the 'ascos' (Division Ascomycota) and the 'basidios' (Division Basidiomycota). A small number of fungi found in the park fall outside these main groups, including some 'moulds' (e.g. the Bonnet Mould, *Spinellus fusiger*). The ascos and basidios are distinguished by microscopic features, in particular the precise way in which the spores are formed. In ascos, the spores are formed inside a special spore-forming cell; in basidios, the spores are formed outside.

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[1] M. C. Clark (ed.), *A Fungus Flora of Warwickshire*, published for the Birmingham Natural History Society by the British Mycological Society, London, 1980.

The majority of the larger fungi recorded from the park can be classified into two Subdivisions:

Division Ascomycota – "ascos"
Subdivision Pezizomycotina – includes cup fungi and morels
Basidiomycota – "basidios"
Subdivision Agaricomycotina – includes most of the "typical" mushrooms and toadstools

The majority of the ascos are placed in Subdivision Pezizomycotina. Some species found in the park that belong to this group include Bachelor's Buttons (*Bulgaria inquinans*); Coral Spot (*Nectria cinnabarina*), forming pinkish dots on the surface of twigs, branches, fences, etc.; the Stag's-horn or Candle Snuff Fungus (*Xylaria hypoxylon*), growing up to 5 cm high on stumps and logs, with usually branched white bodies with a black base; and the terrestrial Orange Peel Fungus (*Aleuria aurantia*).

Basidios in the Subdivision Agaricomycotina include the species most usually thought of as mushrooms or toadstools. Their spores typically line the surface of gills or pores. The presence of gills versus pores was once used to classify these fungi, but genetics shows that related species can have either gills or pores. Members of the Order Boletales ("boletes") typically have pores (e.g. the Brown Birch Bolete, *Leccinum scabrum*), but the Brown Roll-rim (*Paxillus involutus*) has gills. The Common Earth-ball (*Scleroderma citrinum*) also belongs in this Order.

The Common Puff-ball (*Lycoperdon perlatum*) offers a good example of the way in which older morphological and modern genetic classifications differ. The fruiting bodies of puff-balls resemble those of earth-balls in appearance, and the two were once classified together, but puff-balls are now placed in the Order Agaricales, along with club-shaped fungi such as the Moor Club (*Clavaria argillacea*) and more typical toadstool-shaped fungi such as the Fly Agaric (*Amanita muscaria*). Russulas, such as the Yellow Swamp Russula (*Russula claroflava*), also have a typical toadstool appearance, but are placed in the Order Russulales.

Calocera viscosa
yellow/orange, on old conifer stumps, like antlers

Other species found in the park are placed in different Orders within the Agaricomycotina. These include the Birch Bracket (*Piptoporus betulinus*),

a very common parasite of birches; the Ear Fungus (*Hirneola auricula-judae*), which also grows on branches, usually elder, rather like a bracket fungus; the Yellow Stag's-horn Fungus (*Calocera viscosa*), which grows on the ground, forming upright orange branches up to 4 cm tall; and the Common Stinkhorn (*Phallus impudicus*), whose smell advertises its presence long before it is seen.

Rusts and smuts are also basidios. Considerable expertise is needed to identify many of them, and until recently few species had been recorded in Sutton Park.

Fungi of Sutton Park (by M. C. Clark)

Sutton Park is one of the 24 'coded sites' specified in *A Fungus Flora of Warwickshire*, that is to say it is one of the sites which received special attention during the survey of the fungi of the botanical county of Warwickshire (to which Sutton Coldfield belongs, although it is no longer part of the administrative county of Warwickshire). Each species recorded from Sutton Park during the survey is indicated by the symbol 'S'. No fewer than 360 of the species of fungus recorded in the survey were found in the park but undoubtedly many more remain to be found, particularly among the smaller ascos, but also among the rusts and smuts, and other groups. Though many of the species occur in the wooded parts, similar woodland is fairly frequent in other parts of Warwickshire so that, generally speaking, the woodland species are the ones which can be found elsewhere in the area. As in other groups, the particular interest of the park lies in the habitats which are unique in the Warwickshire botanical county, or can be found only in a few scattered and generally much smaller sites. These interesting features are the heathland, the boggy areas, the wet woodland and, to some extent, the open grassland (since most un-improved grassland has disappeared from other parts).

Referring first, however, to the woodland, the striking species *Amanita muscaria* (Fly Agaric), with its brilliant white-spotted scarlet cap, is something which always attracts attention. It is found round birch trees, not only in the woodland but also in the more open parts. Numerous *Russula* and *Lactarius* species are also amongst the larger 'toadstools' in the wooded areas. The myxomycetes (slime moulds) are well represented in the park, with around 30 species, mostly from decaying wood and leaf litter. These interesting small organisms, now not considered to be fungi, are often found in brightly coloured colonies; they form a very attractive group for study and collection (they are easily preserved).

The heathland and grassland contribute a number of species, including several of the brightly coloured, waxy-textured *Hygrophorus* species. Among smaller things, *Pezicula myrtillina* may be mentioned, a rare species occurring on dead stems of Bilberry. Animal droppings of various kinds produce, in damp weather, a surprising variety of ascos as well as many small species of the genus *Coprinus* and the larger *Panaeolus semiovatus* and *Stropharia semiglobata*.

The boggy areas provide a few interesting fungi. Among the larger toadstools, *Leccinum holopus* and *Russula aquosa* are restricted to this habitat,