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The Reading Naturalist

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THE READING NATURALIST

No 44 for the year 1991

The Journal of the
Reading and District Natural History Society

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EDITORIAL

This is the first year that I have edited the 'Reading Naturalist' and my first duty must be to thank Hilda Lambden for all her years of dedicated work as editor of the magazine. I hope that I can live up to the high standards that she has set and thank her for the guidance she has kindly given towards the production of this issue. Many thanks are also due to the recorders who have painstakingly collated the records, and of course to the authors of the articles.

As this is the first issue that I have been associated with, I thought I would remind readers and myself of the aims of the Reading Naturalist. As Brian Baker points out in the Entomology Report, the motivation behind establishment of the Reading Naturalist, back in 1949, was to ensure that records of natural history note from the Reading area were recorded permanently. This is of as much relevance today as it was then. Pressure on land is increasing and local knowledge of areas of natural history importance could be invaluable to decision makers who need to make informed choices between development of local sites or their conservation. Local natural history records may also fuel debates on subjects of international significance, as changes in the distribution of animals and plants can indicate changes in the environment and be of interest to the global warming issue. Lastly, but by no means least, collecting of records can be an enjoyable pastime in itself. There are many groups of plants and animals for which we only have a superficial knowledge and a study of these could be extremely rewarding. As Betty Newman points out in her report, there is no need to organise major expeditions, an area of wasteland, your garden or even your house could provide an interesting list. Happy hunting! I look forward to your records next year and articles on particularly noteworthy sites and species are very welcome.

OBITUARIES

William Albert Smallcombe 1892 - 1992

Until very recent years this society enjoyed a close association with Reading Museum and Art Gallery. To a great extent this link was due to the untiring work of William Smallcombe who, in his one hundredth year, died peacefully on 15th January, 1992. He was museum curator (later director) from 1926 until retirement in 1957 and, during that time, he encouraged many of us to develop a lasting interest in natural history. He also changed the general public's conception of 'the man who worked in a museum' and brought a breath of fresh air into a largely misunderstood profession. He believed in displaying living natural history such as an observation beehive and an ant's nest that could be viewed between two small pieces of glass and even carried in the pocket. He was before his time in realising the value of visual aids and, long before the last war, would run film evenings in the art gallery especially for Reading school children. In later years he chaired the Young Naturalists' Evenings held in the Reading Town Hall, a joint concept between the Museum and this Society and one which was repeated annually for twelve years. He was our president from 1941-44 and kept the Society alive during that difficult period. A kindly man, much respected in his profession, and one whose wish it would be that, when refurbishment is completed, our long association with Reading Museum and Art Gallery should again flourish.

Brian R. Baker

Kathleen Frances Rhodes 1911 - 1991

Kathleen Rhodes had been a long-standing and loyal member of the Reading and District Natural History Society and its Honorary Secretary for two years.

Born in Hackney, she qualified in Horticulture at Plumpton Farm Institute in 1932 and was awarded a scholarship to study at Reading University from 1935-38 where she obtained her B.Sc. in Horticulture and was awarded a National Diploma in Horticulture. From then until 1944 she worked as Horticulture Inspector for the Ministry of Agriculture. For many years she was a Council Member for the Women's Farm and Garden Association and became editor of the magazine for the Horticultural Education Association (now the Institute of Horticulture). With her husband she was a founder member of BBONT and also took part in helping to map the Flora of the Upper Teasdale before Cow Green Reservoir Dam was completed.

My association with Kathleen started in 1955 when we both became lecturers in the Biology Section of the Reading Technical College, from which as lecturer she retired in 1974. Also, I remember well a delightful afternoon when she led a party of BBONT members around the reserve at Bix. We have lost a very valued member.

Hilda D. Lambden

EXCURSIONS

Winter Walks 1990-1991

The first walk of the new season, on November 10th 1990, to Grims Ditch, the Nuffield Ridgeway and Mongwell Woods, turned into a very long one, in terms of time, and finished in total darkness. Despite this, it was much enjoyed by twelve members. December 8th was a bitterly cold, snowy day for Michael Fletcher's 'Urban Cryptogams'. After thawing the snow from the tops of several local walls in order to identify the hidden specimens, the party of four adjourned to Michael's house for most welcome tea and biscuits, and to examine moss specimens under the microscope. Eight members enjoyed a good bird outing to Farlington Marshes and Hayling Island, led as usual by Martin Sell, on January 12th. The second bird walk which should have been led round Twyford gravel pits by Norman Hall, was cancelled due to snow. Dr Watson's mosses and liverworts outing, starting in his garden, was as popular as usual. Afterwards eighteen members adjourned to the excellent tea and cakes and hospitality provided by Mrs Watson. The final winter walk was the Aldermaston and Padworth circular walk, led by George Lacy. Twenty-six people enjoyed a fine spring day and finished in virtual darkness, with three ladies hitching a lift along the canal in a longboat.

Summer Walks 1991

The summer walks commenced on April 16th, round the Mapledurham area, on a cold, windy day, that turned into a very wet one. The party of twelve sought sanctuary in the porch of Mapledurham church for tea. On April 12th, Steve Evans led a party of 15 round the SSSI at Old Copse, Beenham, on a cold, bright day. He gave us a lot of interesting information about the woodland and its management by BTCV. Ten people braved a cold, wet dawn at 4.30 am on May 4th at Burghfield gravel pits. Lots of nightingales and a good variety of other birds were heard. Hot kedgeree was popular for breakfast afterwards provided kindly by the Brickstock's. Four stalwarts spent the rest of the day at the south coast. Martin Sell was again our expert leader. On May 12th, a marvellous hot sunny day, Frances Cook led twenty-five members round Kew Gardens. The bluebells and rhododendrons were at their superb best. There were lots of geese and ducks and two swarms of bees were seen at close range. June 1st started cold and overcast, but the afternoon became sunny and warm. George Lucy led nine people through the woods above the Thames at Whitchurch Hill, and then round the Hartslock reserve. One hundred and thirty-four species of plants were recorded. On June 8th, 13 people enjoyed a most excellent outing to Ron Ward's superb meadow at Tadley in the morning, led by Ron Ward, and to the Ashford Hill reserve in the afternoon led by Ken Grinstead. A moth trap had been run overnight and Dr Peter Brough identified specimens during the lunch break. Graham Vick's dragonfly outing to Thursley Common on June 16th at least got under way this year, on a very dull, cool morning, but very few dragonflies were to be seen. The party of nine were drenched by a torrential thunderstorm at 12.45 and the afternoon outing to Stopham Bridge was abandoned after lunch. The coach outing on June 29th was to the superb reserve at Kenfig, a marvellous sunny, warm day and an interesting range of flowers were much enjoyed by fifty people.

The 25th annual mothing night took place at Old Copse, Maiden Erlegh, by kind permission of Earley Town Council and appreciated support from Wokingham District Council (in the form of a car park key). A splendid log fire had been prepared by Trish Marcouse and Christine Brewster in readiness for the barbecue which was again organised by Jocelin Whitfield and was enjoyed by all twenty-five who were present. Brian Baker and Norman Hall as usual led the mothing. The night was an extremely windy one, but down in the shelter of the valley, close to the barbecue site, it still proved possible to run the moth lamp until the early hours. Among the 52 species seen, were *Blastobasis decolorella* (Woll.), the meal moth *Pyralis farinalis* L., and the bee moth *Aphomia sociella* (L.), - those members who stayed to the very end were rewarded by an impressive flight of poplar hawkmoths.

Jack Hulbert led an outing round Bernwood Forest, the NCC reserve famous for its butterflies, on July 20th. A very attractive walk, on a hot sunny day, along the Holy Brook and the dismantled Southcote railway, on August 4th, was much enjoyed but by only 4 people. Norman Hall led a good mothing night at The Slade, Bucklebury on August 9th, and Neville Diserens led an excellent walk round Swyncombe and Sliding Hill on September 14th, much enjoyed by 9 members. Renee Grayer changed the venue to Watlington Hill for her walk on September 28th.

The two fungus forays were well attended with 25 people at Kingwood Common on October 6th and over 30 people at Ufton Nervet and Padworth Common on October 13th. Both of these forays were led by Neville Diserens, Paul Cook and Alan Brickstock. A total of 92 species of fungi were reported on the first foray and during the second, 74 species were recorded in the morning and 76 in the afternoon, giving a total of 122 species for the day, quite an excellent foray record. Interestingly only 28 species were common to both sites.

Wednesday Afternoon Walks

One of the six planned mid-week walks had to be cancelled due to lack of a leader, but the others were very much enjoyed by small groups, ranging from 2 to 8. Remarkably, on the first four of these walks we recorded 101, 98, 111 and 99 species of plants, respectively, only the September walk, at 65, being much lower. These are not arduous walks, and are taken at a very relaxed pace - it would be nice to have more members trying them.

Many thanks to all the leaders helping us to enjoy these walks.

Alan Brickstock & Brian Baker

MEETINGS

Meetings were held from October 1990 to March 1991 in the Abbey Room, Reading Central Library. The A.G.M. on the 11th October was attended by 45 people, and was followed by the Presidential Address, given by Neville Diserens. 'Spring Orchids of the Mediterranean' was his subject, which was illustrated with some of his superb colour slides. On October 25th, Hugh Ennion spoke on 'Natural History and Photography' showing the camera to be a valuable tool in the hands of the professional and amateur naturalist (29 members present). 'A taste of Himalaya' was the subject chosen by Annette Morris on November 8th when 37 people were present. On November 22nd the society was privileged to have David Boag speak on 'Kingfishers' to an audience of 47. Lewis Jones spoke to 33 on 'Cockles and Poppies and things that come up in the field' which included an insight into agricultural history. On February 7th John Langley talked about 'Pond invertebrates as indicators of pond ecology' to 25 people, some of whom contributed to information on undamaged ponds in the Berkshire area. 44 people attended the excellent talk given by Paula Cox on 'Bats' on February 21st. The speaker on March 7th was Dudley Iles who talked and showed slides on 'The Natural History of the Mediterranean' to 49 people.

There were two members' evenings. The first part of each was a 'mini lecture' which was used to introduce a branch of natural history. On December 13th larger gill fungi were explained by Alan Brickstock and on March 31st and illustrated talk entitled 'Why every garden should have stinging nettles' was given by Michael Keith-Lucas. On each occasion there was the usual supply of refreshments provided by Ivy and Alan Brickstock, after which members' slides were shown, which had been co-ordinated by Jim Newman.

Meryl Beek

JUST BACK FROM CHINA

Presidential Address, October 10 1991

Jocelin Whitfield

Before we went, people said 'You may love it, you may hate it, but you are sure to be surprised!' George and I were staying in a university campus in the middle of Zhengzhou city. I was surprised how very few flies there were, maybe because of liberal use of DDT, also very few birds. But at night bats and geckos hunted the mosquitoes, and by day hawking dragonflies and cicadas abounded. Noise levels were very high, motor horns, loud speakers, steam escapes, the first year students square bashing, but the cicadas whirred and shrilled over everything in waves of activity.

There was dust everywhere, constantly swept away. The sun was reddened and sky paled with it. The whole area was made from drifting loess soil blown down over millennia from Inner Mongolia to form the rich soil of central China. Sometimes the loess is over 200 feet thick. It has good water holding properties for irrigated agriculture, is used everywhere to make stiff yellow mud walls, and is so vulnerable to river erosion that the nickname 'China's sorrow' has been given to the Yellow River.

I thought the Yellow River was wonderful, very impressive. Where we saw it, north of Zhengzhou, and still 650 km from the sea, the railway bridge was 5 km long. The year 1991 was unusual in China, dry in the north and wet in the south. There were calamitous floods on the Yangtze Kiang in south China, but here the river was low.

Rivers make fine landmarks. I very much enjoyed navigating the aeroplanes with the aid of maps, watch and eyes glued to the window. So we saw the flooded Yangtze; rice fields being reclaimed on the Xi Jiang delta at Canton; vulnerable Bangladesh awash in the mouth of the Ganges; the desert around the Persian Gulf; strange circular formations and volcanic peaks in Turkey, Mount Ararat? We couldn't be sure.

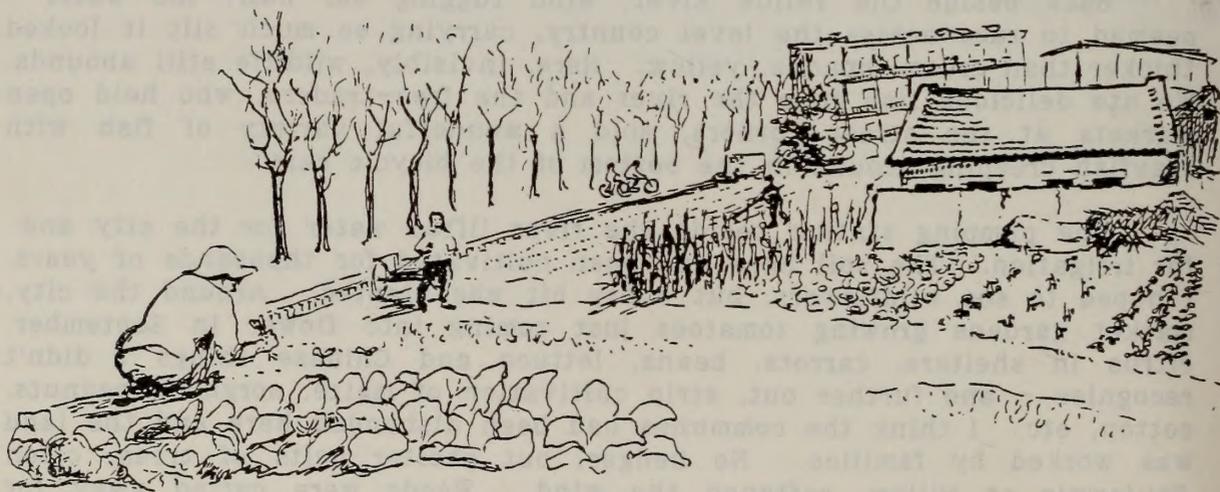
Back beside the Yellow River, wind tugging our hair, the water seemed to race across the level country, carrying so much silt it looked thicker than cream, opaque, yellow. Here, invisibly, wildlife still abounds. We ate delicious fish from the river and the free-traders, who held open markets at the street corners, sold a wonderful variety of fish with crayfish creeping around in the bottom of the bicycle cart.

The pumping station beside the river lifted water for the city and for irrigation. The soil here had been cultivated for thousands of years. I hoped to see wildflowers, but every bit was planted. Around the city, market gardens growing tomatoes just coming into flower in September, citrus in shelters, carrots, beans, lettuce and Chinese things I didn't recognise - and further out, strip cultivation of maize, sorghum, peanuts, cotton, etc. I think the communes had been disbanded here and the land was worked by families. No hedges, but shelter belts of trees, often *Paulownia* or willow, softened the wind. Weeds were carted away for feeding livestock, and crop wastes put straight back on the plot together with night-soil which was collected and taken to the fields; but the earth felt to me like arid dust with very little humus. I believe oxidation and decay are much faster here than in England, giving a very rapid turnover

of nutrients. Hygiene must be a problem. No vegetables were eaten raw, no fresh salads, and water was boiled for 40 minutes before it was thought fit to drink. We were not out in the countryside very much, but when we were there, we never saw a landscape without people working away - no pastures with cattle, in fact no pastures at all. Often weeds were recognisable as stray crop seedlings, castor oil plants and luffa being especially striking, and various ipomoeas were allowed to scramble over walls. Places were very often walled, usually 6 feet high with the house windows opening inwards onto a guarded court.

In other parts of China I know there is a very rich native Flora, but there seemed no place for it here. You couldn't imagine a rabbit surviving long in those guarded fields. I don't think many birds survived either, there was no food to spare for them. I loved seeing the people and found them very attractive. Their culture is full of admiration for plants and animals. Many of the city flats had pot plants on the windowsill, and caged birds are a very popular hobby. But there seemed little room for any other species but man. Population estimates vary a bit depending on whether they are being counted for a handout which everyone wants to get in on, or for a levy, when suddenly there's nobody around. The census of April 1989 suggests 1,110 million people in China with another 20 million in Taiwan. This is about one-fifth of the world's population on, say, one-fifteenth of the world's land, much of that mountain and desert. I thought they were managing very well, so many fed, housed and working.

I must end by saying this is the merest fleeting impression, one part of a vast country, one season, we were there less than three weeks. My strong wish on returning is that humanity may learn to keep space for other species. One family, one child looks to me like a good idea for all of us.



HEELSTRIKE!

Michael Fletcher

People are among the most extraordinary animals ever to evolve on planet Earth. The most striking body adaptation is probably our upright posture.

Being vertical, the human body is less affected by the heat of the midday sun than that of most large animals. It is also relatively slender and almost hairless, making it uniquely efficient at shedding surplus heat. People can therefore remain active in conditions hot enough to give any large furry animal heatstroke -unless it takes a siesta, as most tropical savannah animals do. Though our fastest running speed is quite low, 20 m.p.h., as against 40 m.p.h for a fast horse, a human runner has remarkable endurance. Few other animals could run a 26-mile marathon course non-stop, and none in hot conditions. Pete Wheeler (1988) has even suggested that our upright posture evolved as a means of keeping cool. The complex and poorly understood energy metabolism of a human runner, especially a long-distance runner (Newsholme & Leech 1988) and the ability of many aboriginal peoples to pursue animals over long distances, both suggest that people are well adapted to travel long distances at an average speed which few other animals, even the fastest, can match.

Our upright posture, in conjunction with our large size, poses an unique set of mechanical and engineering problems. In all vertebrates the backbone must protect the spinal cord, whose injury spells near-certain death, while also providing a flexible connection between the two parts of the skeleton. In the human skeleton it has a third function - to support the weight of the upper body. A healthy human backbone, when held erect, can support a steady load of some hundreds of kilograms. Nevertheless under some circumstances individual vertebrae can be subject to very large stresses. Such extreme stresses can be caused by careless lifting or unbalanced heavy loads, by poor posture, or by the impact of the body with the ground in running, jumping or falling. Though strong, the backbone is also vulnerable, as millions of sufferers from back trouble can testify. One of the most fundamental constraints on the design of the human body, and on the way we move, is the need to protect the backbone from such damaging forces. I will look especially at the running movement, and in particular at what happens at the moment the heel strikes the ground.

In normal running virtually no energy is lost through friction, and little through air resistance. Most of the energy used in running is devoted to repeatedly throwing the body into the air. The energy consumption involved can be roughly calculated by multiplying the amount of the vertical body movement at each stride by the body weight, and by the frequency of the stride. It is also possible to measure energy production directly by measuring carbon dioxide output. Though difficult, this has been done, and the results show that a good runner uses only about half of the energy which calculations suggest should be used. The human body, in other words, has a coefficient of elasticity, when running, of around 50%, making it more elastic and bouncy than a tennis ball. How this is done has been, until recently, a mystery, and my own analysis is only tentative and partial.

It has long been known that animal tendons are elastic and can store large amounts of energy. In the horse and the kangaroo, powerful leg tendons with only small muscles attached do just that. By analogy, it has been assumed that the powerful tendons in the human leg, in particular the Achilles tendon at the back of the heel, likewise contribute to energy-efficient running by storing elastic energy. However a moment's thought shows that this assumption is wrong, or at best over-simplified.

At the moment of heelstrike the Achilles tendon is slack. As the foot pivots the tendon becomes shorter. Therefore it cannot absorb or store any of the body's kinetic energy at the moment of heelstrike. Conversely, the strong tendons at the front of the ankle, though usually tense at the moment of heelstrike, are slack at the end of the movement, as the foot thrusts the body up again into the air. Therefore they cannot return any kinetic energy to the body as it bounces up again. Elastic energy must be stored in some other way.

Anyone who has ever walked down a step, not knowing it was there, will have landed like this, with the leg and the backbone forming a straight solid bony column. Even a small step, a few inches high, will give an unpleasant or even dangerous jolt. For this reason we normally avoid landing in this way. I will consider eight movements by which a runner adjusts his or her body to manage the impact and cushion the backbone at the moment of heelstrike. I will then suggest how some of these movements also store kinetic or elastic energy.



IMPACT MANAGEMENT

Eight ways, working upwards, (there may be others) are:

- 1) The compression of elastic tissue between the skin and the bone on the bottom of the heel;
- 2) Elastic deformation of the ankle joint;
- 3) The pivoting of the foot around the ankle joint;
- 4) The bending of the knee;
- 5) The bending of the leg at the hip;
- 6) Bending the back, leaning forwards;
- 7) Arm movement;
- 8) Movement of the soft and elastic tissues of the body.

Methods of impact management

Bending and arm movement



These involve the use of muscles. They can be brought under conscious control, and can be varied. A walker will have the knee and hipjoint slightly bent, and the backbone straight.

A runner will have these joints more strongly bent at the moment of heelstrike, to absorb the greater impact more effectively. A person moving over treacherous ground should also stoop, keeping the backbone slightly bent, to reducing the risk of back injury if he or she falls. A person expecting to land heavily, as when jumping off a wall, will exaggerate these movements, and may thrust down both arms at the moment of impact.

The arms are usually moved while walking, running or jumping. They play a part in balancing, and also, as they acquire or lose angular momentum about the axis of the body, in reducing sideways swaying and sideways rotary movement of the body. The more violent arm movements which accompany strenuous running and heavy landing are a way of transferring linear momentum. The faster the arms are moving down at the moment of impact, the slower the rest of the body will be moving at that same moment.



While the tendons and muscles controlling knees, hips, back curvature and arm movement are all under tension at the moment of heelstrike, they do not remain so throughout the cycle of movement, and there is therefore no obvious way in which they can store elastic energy for the next stride. It seems therefore that most energy storage must be associated with other movements.

Compression of Heel Tissue

Advertisements for running shoes and walking boots often emphasise their cushioning effect at the moment of heelstrike. A few brisk barefoot steps over hard tarmac after wearing such footwear should convince anyone that shoes can indeed cushion the foot. On the other hand it is not hard to put a foot on a set of scales and to measure how the flesh under the heel is compressed as the force on the foot is increased. When the pressure is removed the heel regains its shape.

Dr McNeill Alexander, at the University of Leeds, is one of the few zoologists actively researching human movement and body design. He has measured the response of human heel tissue under a press, and has shown that the process of compression and release stores and releases elastic energy. However the amounts are small. In my own foot the deformation seems complete at a pressure of 25 kg., less than half my body weight of 60 kg. Like an underinflated bicycle tyre which is on the wheel rim before the rider has put his full weight on the machine, such a heel cannot be a very effective cushion. Nevertheless there are reasons for suggesting that the human heel may be a more effective cushion than shoe manufacturers might wish us to believe. One is that since our feet are so rarely challenged, the elastic tissue may be poorly developed. I have noted comments that in poorer parts of Africa, where many people live without shoes, feet are better padded than our own. Another is that heel tissue expands when challenged by athletic activity or "serious" walking. One shoe manufacturer claims to produce shoes which adjust to this response. It is probably a rapid response, since I find that the jolt associated with barefoot walking on hard surfaces becomes less noticeable within at most a few minutes. Over such short time scales, this expansion of the heel must represent fluid accumulation rather than new tissue.

There is also intriguing anatomical evidence that the blood supply to the heel is part of a hydraulic shock-absorbing system. In the sole of the foot are veins which become inflated with surplus blood when standing. When compressed this blood is forced upwards into the veins in the calf of the leg (Medicine Now, 1988). As a viscous fluid, this blood would effectively absorb sudden transient forces, such as occur at the moment of heelstrike. On the other hand, energy absorbed by a viscous fluid cannot reappear as kinetic energy, but is dissipated as heat. However effective this mechanism as a shock-absorber, it cannot account for more than a very small part of the apparent energy savings achieved by a human runner.

This leaves three movements to consider, which appear to interact in a complex and unexpected way. They are;

- Elastic deformation of the ankle joint;
- Pivoting of the foot around the ankle joint;
- Movement of the soft and elastic tissues of the body.

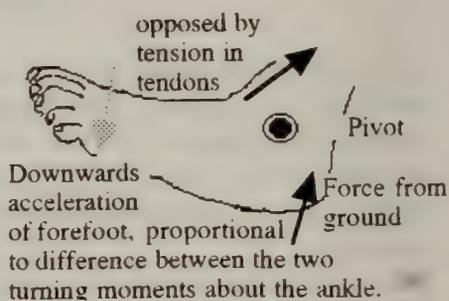
Elastic deformation of the ankle joint

The ankle joint and the tarsal and metatarsal bones, all the small bones of the foot, are bound together with tendons and ligaments which are so strong that their movement under pressure is hardly apparent. Nevertheless they form a far from rigid system. Movement of the ankle joint, though slight, can be observed on a pair of scales, by marking a spot on the ankle and measuring its position as pressure is increased. Unlike the compression of the heel tissue, this deformation goes on as the force is increased, and at the highest force I can comfortably apply to one of my own ankles on a weighing scale - about twice my own bodyweight - it is still increasing. It is a straightforward elastic deformation, involving no significant muscles. At the moment of heelstrike it affects only the ankle, but as the body moves forwards weight is moved onto the forefoot, and the rest of the foot, in particular the arch, is also deformed. The deformation of the arch of the foot can also be seen by pressing the foot as hard as possible between the hands, though the force which can be applied in this way is quite small.

I have not been able to convincingly time the transfer of weight from the heel to the forefoot while running, but it seems to start happening about 0.1 seconds after heelstrike, and to be complete very soon after. The timing of this transfer may be highly significant, as will be suggested later.

Pivoting of the foot around the ankle joint

This movement can be brought under conscious control. If the tendons at the front of the ankle are relaxed the foot pivots freely, accelerating fast under the force of heelstrike, and the forefoot slams down violently onto the ground, dissipating a lot of kinetic energy. A runner can brake very effectively with this movement, or if one foot only is slammed down, turn sharply. It can be seen and - even more clearly - heard, when children play games on a wooden floor which involve sudden starts, stops and turns.



In normal walking these tendons at the front of the ankle are tensed at heelstrike. They are more tense when hurrying, and more tense still when running. This tension, and therefore the speed with which the foot pivots, are under precise step-by-step control, though the process is usually unconscious. The obvious effect of the tension is to reduce the speed of the pivoting movement, and hence the amount of energy dissipated as the forefoot strikes the ground. However the most important consequence is that increasing tension in these tendons increases the resistance of the heel to pivoting, and hence the peak force acting on it at heelstrike. This peak force is transmitted through the skeleton. Despite the cushioning effect of bent knees, bent hips, and possibly a curved back, this peak force can be very large. In running it normally reaches twice the total body weight, and it sets up a complex movement in the body.

Movement of the soft and elastic tissues of the body

Anyone can become aware of this movement, as I first did, by standing (barefoot or in hard shoes), heels together, on a hard floor, as of cement. Raise the heels, then release them suddenly, letting them fall sharply on the floor. The body will vibrate strongly two or three times, as if a powerful spring has been released. It took me some time to work out that this spring cannot reside in the Achilles tendon, nor in the cartilage of the backbone. It involves the torso, both the stomach and the upper torso, whose weight is normally supported by the ribcage. It presently became obvious that the ribs in turn are supported by the backbone, being bound to

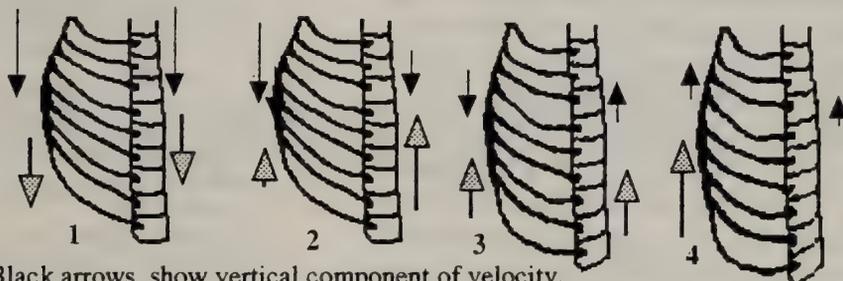
it, and to each other at the front of the ribcage, by cartilage which is itself elastic. This cartilage can therefore store energy, and when deformed exerts a force upon the ribs and the contents of the torso. It is part of an elastic system involving almost half the total body weight.

As an elastic system the torso must have a resonant frequency. By bouncing gently on my heels I can set up a continuous oscillation whose frequency I have timed at about 0.22 seconds. I was further puzzled by another oscillation which involves the next largest volume of soft tissue, the muscles of the upper leg, when relaxed. This can be found by sitting with the leg muscles relaxed and striking the upper leg gently with a clenched hand. It is a more heavily damped oscillation and dies away in at most two cycles. I cannot time it so accurately, but the period of oscillation seems close to that of the ribcage. Since it involves relaxed muscle, and since the composition of human muscle does not vary greatly, it is likely that every relaxed muscle in the body, if attached to a rigid part of the skeleton, will oscillate at a similar frequency. When running, the muscles of the upper arm, for instance, can be felt doing just that.

It is an intriguing situation, and one which no anatomist, to my knowledge, has yet studied. Nevertheless oscillating systems are simple enough mathematically to make possible some novel suggestions about what happens in running. Using the timing I have identified on my own body, here is a semi-mathematical description of what happens to the torso in four consecutive running positions.

In the first position, just before heelstrike, the runner's body is falling freely. The runner is experiencing weightlessness, just as does an astronaut in orbit. Released from the pull of gravity, the contents of the ribcage are pulled upwards by the elastic cartilage until it is free of the usual tension and deformation caused by their weight. They thus move to a position which is higher than usual, relative to the backbone.

In the second position, the shock of heelstrike has been transmitted up the backbone, arresting the downward movement of the rigid skeleton. The soft tissues are above their normal position relative to the backbone, but are still moving downwards. Their movement relative to the backbone begins to deform the rib cartilage, which bends down and begins to exert an upwards force against them.



Black arrows show vertical component of velocity.

Grey arrows show vertical acceleration, and are proportional to the sum of the external forces, including the force of gravity.

Arrows on the left of each figure relate to the front of the ribcage.

Arrows on the right relate to the backbone.

In the third position, after about 0.055 seconds (a quarter of an oscillation), the soft tissues pass through their normal equilibrium position relative to the backbone, but are still moving downwards, still increasing the deformation of the rib cartilage, and hence the elastic force it exerts against them. This is slowing their downward movement.

In the fourth position, about 0.11 seconds (half an oscillation) after heelstrike, the soft tissues are at their lowest point relative to the backbone. The rib cartilage is now at its most deformed, and is exerting its greatest upwards force on the contents of the ribcage. By this time also, the runner's weight has been transferred from the heel to the forefoot. The tendons at the front of the ankle now have no further work to do and relax, while the Achilles tendon is tightening, ready to lift the heel off the ground

The relation between force, velocity and acceleration is more clearly expressed in the notation of elementary calculus than in plain English, but one thing should be clear. In exerting a force on the ribcage and its contents, the cartilage of the ribs is exerting an equal and opposite force on the backbone. Therefore, in the fourth position above, the backbone is being pushed down with considerable force. This force is transmitted through the bones of the leg to the foot,

helping to press it harder against the ground. This deduction agrees with measurements showing that the pressure of a runner's foot against the ground peaks at about twice body weight immediately after heelstrike, falls (while the torso is still moving downwards) and then rises to a still higher maximum value after the weight has been transferred to the forefoot, as the foot begins to thrust the body up into the air for the next stride (i.e., as the ribcage is again accelerating upwards).

What seems to happen is that the elastic system involving the ribcage has absorbed some of the kinetic energy of heelstrike and returned it to the foot a tenth of a second later. It is a passive system, involving no expenditure of muscular energy. This in itself might not help a runner to save energy. However, as mentioned, firstly, the ankle will be deformed under this pressure. Second, at this stage, the arch of the foot will also be compressed. Thirdly, the forefoot will also be pushed out sideways, stretching the ligaments which connect the metatarsal bones. This sideways spread will be restrained by most shoes, and like the deformation of heel tissue, reaches its maximum under a pressure less than the total body weight. It is therefore the least important of the three elastic deformations of the foot which help store the energy needed to launch the body into the air. Deformation of the ankle joint is probably more important, but the most important elastic energy store is almost certainly the arch of the foot.

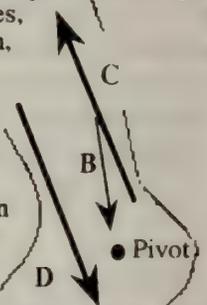
At this stage there is a force of nearly three times the body weight acting on the foot. If the foot is considered as a lever pivoting about the ankle joint, the Achilles tendon, attached to the shorter part, must exert a proportionately greater force. It has been estimated at seven times body weight, stretching the tendon and the attached calf muscle, and storing a lot of energy, some of it presumably from the impulse returned from the ribcage. This energy is stored not in one spring (the Achilles tendon or the arch of the foot) but in the two springs, the arch of the foot and the tendon itself, coupled together like a pair of consecutive resistors in an electrical circuit. To it is added energy produced by the calf muscle as it straightens the leg. This energy is discharged from both springs and from this muscle by pushing the forefoot down, thus helping to thrust the body up into the air

Fores on ankle at liftoff

Force A, pressure of ground on foot. (3x body weight).
 Force B, resistance of body to upwards acceleration, plus bodyweight
 These external forces, being in equilibrium, are equal and opposite

Force C, up to 7x body weight, in Achilles tendon is an internal force on the ankle

The turning moment of forces A and B about the pivot is equal and opposite to that of forces C and D



The missing internal equilibrium force D on the ankle must be exerted by the deformed arch.

McNeill Alexander (1987) has estimated that a runner uses 100 joules of energy at each stride, and that 35 are stored in the Achilles tendon, and 17 in the arch of the foot. These two energy stores seem to me interchangeable. My estimate is that other parts of the foot also store smaller but useful amounts of energy, and that some of that energy has been stored in the ribcage, then transferred back to the foot in the way described. My judgement is also that some of this stored elastic energy is dissipated by wearing shoes, especially rigid or heavy ones.

Considering the enormous public interest in competitive athletics, the huge public participation in running, and the size of the market for sophisticated running shoes and athletic equipment, the extent of our ignorance about how it is done seems astonishing. However one cannot look to shoe manufacturers for disinterested research into the design of the human body.

I hope these suggestions will stimulate an interest in what happens when a person runs. Further research and more accurate measurements seem well worth undertaking.

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THE RECORDER'S REPORT FOR
BOTANY 1991

B.M. Newman

Unlike the previous two seasons, the first part of 1991 was cold and there were no reports of plants flowering unusually early. The first flowers to open on camellias in our garden were exactly one month later than in 1990. By late spring the countryside had caught up with the season and several members sent in long lists of plants seen in various localities during the year. Records from more members would be welcome. There is no need to make a major expedition, the piece of wasteland where you walk the dog would probably have one or two plants worth noting.

A selection from member's records is printed below. The nomenclature and order follow those of Clapham, Tutin and Moore (1987). The English names are mainly from Dony, Jury and Perring (1986).

PINACEAE

*Pinus nigra Arnold Austrian pine
Swyncombe Down 14.9.91 (NH, HHC).

RANUNCULACEAE

Ranunculus arvensis L. Corn buttercup
In a meadow, Tadley 8.6.91 (AB).

Ranunculus scleratus L. Celery-leaved buttercup
Prospect Park, Reading; Holy Brook and dismantled railway line, Reading 4.8.91 (AB); near new Plant Sciences lecture theatre, Whiteknights Park (SLJ).

Ranunculus fluitans Lam. River water-crowfoot
Hartley Wespall 24.4.91 (AB).

NYMPHAEACEAE

Nuphar lutea (L.) Sm. Yellow water-lily
Loddon Drive area 13.7.91 (HHC).

FUMARIACEAE

Fumaria parviflora Lam. Fine-leaved fumitory
In a meadow, Tadley 8.6.91 (AB).

CRUCIFERAE

*Coronopus didymus (L.) Sm. Lesser swine-cress
Holy Brook and dismantled railway line, Reading 4.8.91 (AB).

Iberis amara L. Wild candytuft
Swyncombe Down 14.9.91 (NH, HHC).

*Capsella rubella Reuter
In a meadow, Tadley 8.6.91 (AB). A Mediterranean species, sometimes found as a casual.

Rorippa sylvestris (L.) Besser Creeping yellow-cress
Prospect Park, Reading; Farley Hill 21.8.91 (AB).

*Hesperis matronalis L. Dame's-violet
Prospect Park, Reading (AB).

VIOLACEAE

Viola odorata L. Sweet violet
Mainly white flowered plants, Aldermaston 23.3.91 (NH, J&SW).

Viola tricolor L. Wild pansy
Aldermaston 23.3.91 (NH, J&SW).

CARYOPHYLLACEAE

*Agrostemma githago L. Corncockle
In a meadow, Tadley 8.6.91 (AB).

PORTULACACEAE

Montia fontana L. Blinks
Aldermaston 23.3.91 (NH, AB).

CHENOPODIACEAE

Chenopodium rubrum L. Red goosefoot
Swyncombe Down 14.9.91 (NH, HHC).

Atriplex prostrata Boucher ex DC. Spear-leaved orache
Near new Plant Sciences lecture theatre, Whiteknights Park (SLJ).

MALVACEAE

Malva neglecta Wallr. Dwarf mallow
Near new Plant Sciences lecture theatre, Whiteknights Park (SLJ).

LINACEAE

Linum bienne Miller Pale flax
Prospect Park, Reading (AB).

Radiola linoides Roth Allseed
A dozen or two plants along a ride, Ufton Nervet 8.8.91 (AB).

GERANIACEAE

Geranium pratense L. Meadow crane's-bill
Sulham 19.6.91 (AB); Loddon Drive area 13.7.91 (HHC).

*Geranium versicolor L. Pencilled crane's-bill
Sulham 19.6.91 (AB).

Geranium pusillum L. Small-flowered crane's bill
In a meadow, Tadley 8.6.91, Prospect Park, Reading (AB).

- Geranium lucidum L. Shining crane's-bill
In a meadow, Tadley 8.6.91 (AB).
- Erodium cicutarium (L.)L'Herit Common stork's-bill
Mapledurham 6.4.91 (AB).
- OXALIDACEAE
- *Oxalis corniculata L. Procumbent yellow-sorrel
Near new Plant Sciences lecture theatre, Whiteknights Park (SLJ).
- BALSAMINACEAE
- *Impatiens capensis Meerburgh Orange balsam
By the Holy Brook, Reading 4.8.91 (AB).
- LEGUMINOSAE
- Ononis spinosa L. Spiny restharrow
Swyncombe Down 14.9.91 (NH, HHC).
- Melilotus altissima Thuill. Tall melilot
Swyncombe Down 14.9.91 (NH, HHC).
- Medicago sativa L. Sickle medick
ssp. falcata (L.)Arcangeli
A large stand on a hillside off Pack and Prime Lane, Badgemore, Henley
4.8.91 (KMH).
- ROSACEAE
- *Prunus domestica L. Wild plum
Loddon Drive area 13.7.91 (HHC).
- *Prunus lusitanica L. Portugal laurel
Aldermaston 23.3.91 (NH, J&SW).
- SAXIFRAGACEAE
- Saxifraga granulata L. Meadow saxifrage
Ashford Hill Reserve 8.6.91 (AB).
- ONAGRACEAE
- Epilobium roseum Schreber Pale willowherb
Farley Hill 21.8.91 (AB).
- HIPPURIDACEAE
- Hippuris vulgaris L. Mare's-tail
Kennet and Avon Canal between Thatcham and Newbury 1.5.91 (J&SW).
- UMBELLIFERAE
- Scandix pecten-veneris L. Shepherd's-needle
In a meadow at Tadley 8.6.91 (AB).

- *Smyrniololus L. Alexanders
Prospect Park, Reading (AB).
- Oenanthe fistulosa L. Tubular water-dropwort
Ashford Hill Reserve 8.6.91 (AB).
- Silaum silaus (L.)Schinz & Thell. Pepper-saxifrage
Ashford Hill Reserve 8.6.91 (AB).
- Apium inundatum (L.)Reichenb.f. Lesser marshwort
Moor Copse 18.5.91 (AB).

EUPHORBIACEAE

- Mercurialis annua L. Annual mercury
Near new Plant Sciences lecture theatre, Whiteknights Park (SLJ).

POLYGONACEAE

- *Reynoutria japonica Houtt. Japanese knotweed
Near new Plant Sciences lecture theatre, Whiteknights Park (SLJ); Prospect
Park Reading (AB).
- Rumex hydrolapathum Hudson Water dock
Holy Brook, Reading 4.9.91 (AB).

BETULACEAE

- Betula pubescens Ehrh. Downy birch
By the Holy Brook and dismantled railway line, Reading 4.8.91 (AB).

SALICACEAE

- *Populus x canadensis Moench. Black Italian poplar
var. serotina (Hartig)Rehder
Growing beside the Kennet and Avon canal near Aldermaston (NH, J&SW).
This hybrid is generally supposed to have arisen in France about the
middle of the 18th century and var. serotina is always male.

APOCYNACEAE

- Vinca minor L. Lesser periwinkle
Aldermaston 23.3.91 (NH); in flower by the Kennet and Avon canal
between Thatcham and Newbury 24.4.91 (J&SW).

GENTIANACEAE

- Centaurium erythraea Rafn Common centaury
Hartslock Reserve 6.8.91, Ufton Nervet 8.8.91 (AB).
- Blackstonia perfoliata (L.)Hudson Yellow-wort
Swyncombe Down 14.9.91 (NH, HHC).
- Gentianella germanica (Willd.)
E.F. Warburg Chiltern gentian
Swyncombe Down 14.9.91 (NH, HHC).

Gentianella amarella (L.) Börner
Hartslock Reserve 6.8.91 (AB).

Autumn gentian

MENYANTHACEAE

Nymphoides peltata (Gmel.) O. Kuntze
Prospect Park, Reading (AB).

Fringed water-lily

BORAGINACEAE

Symphytum x uplandicum Nyman
Checkendon 15.5.91 (AB).

Russian comfrey

*Pentaglottis sempervirens (L.) Tausch
Sulham 19.6.91 (AB).

Alkanet

Myosotis sylvatica Hoffm.
ssp. sylvatica
Swyncombe Down 14.9.91 (NH, HHC).

Wood forget-me-not

Echium vulgare L.
Swyncombe Down 14.9.91 (NH, HHC).

Viper's bugloss

SOLANACEAE

Atropa bella-donna L.
Swyncombe Down 14.9.91 (NH, HHC).

Deadly nightshade

SCROPHULARIACEAE

Verbascum nigrum L.
Mapledurham 6.4.91 (AB); Swyncombe Down 14.9.91 (NH, HHC).

Dark mullein

*Linaria repens (L.) Miller
By the Holy Brook and dismantled railway line, Reading 4.8.91 (AB);
Swyncombe Down 14.9.91 (NH, HHC).

Pale toadflax

Chaenorhinum minus (L.) Lange
Swyncombe Down 14.9.91 (NH, HHC).

Small toadflax

*Lathraea clandestina L.
Still flourishing in Prospect Park, Reading (AB). This was first recorded
by the Society in 1956.

Purple toothwort

VERBENACEAE

Verbena officinalis L.
Hartslock Reserve 6.8.91 (AB).

Vervain

LABIATAE

Stachys arvensis (L.) L.
Near new Plant Sciences lecture theatre, Whiteknights Park (SLJ).

Field woundwort

Scutellaria minor Hudson
Ufton Nervet 8.8.91 (AB).

Lesser skullcap

CAMPANULACEAE

Campanula trachelium L. Nettle-leaved bellflower
Prospect Park, Reading (AB).

*Campanula rapunculoides L. Creeping bellflower
Hurley 5.9.91 (KMH).

Campanula glomerata L. Clustered bellflower
Swyncombe Down 14.9.91 (NH, HHC).

RUBIACEAE

Asperula cynanchica L. Squinancywort
Hartslock Reserve 6.8.91, Swyncombe Down 14.9.91 (NH, AB).

VALERIANACEAE

Valeriana dioica L. Marsh valerian
Ashford Hill Reserve 8.6.91 (AB).

DIPSACACEAE

Dipsacus fullonum L. Teasel
Beside the Kennet and Avon canal between Aldermaston and Woolhampton
24.4.91 (J&SW).

Scabiosa columbaria L. Small scabious
Swyncombe Down 14.9.91 (NH, HHC).

COMPOSITAE

Bidens cernua L. Nodding bur-marigold
Farley Hill 21.8.91 (AB).

Bidens tripartita L. Trifid bur-marigold
Farley Hill 21.8.91 (AB).

Senecio viscosus L. Sticky groundsel
Prospect Park, Reading; by the Holy Brook and dismantled railway line,
Reading 4.8.91 (AB).

Petasites hybridus (L.) Gaertner, Butterbur
B. Meyer & Scherb.
In flower by the Kennet and Avon canal between Aldermaston Wharf and
Woolhampton 24.4.91 (J&SW).

Chrysanthemum segetum L. Corn marigold
Farley Hill 21.8.91 (AB).

Cirsium eriophorum (L.) Scop. Woolly thistle
In a meadow at Tadley 8.6.91 (AB).

Onopordum acanthium L. Cotton thistle
In a meadow at Tadley 8.6.91 (AB).

Cichorium intybus L. Chicory
Sulham 19.6.91 (AB).

Picris echioides L. Bristly oxtongue
Prospect Park, Reading (AB).

ALISMATACEAE

Sagittaria sagittifolia L. Arrowhead
Holy Brook, Reading 4.8.91, Farley Hill 21.8.91 (AB).

LILIACEAE

Allium ursinum L. Ramsons
Whitchurch Hill and Hartslock Reserve 1.6.91 (AB).

IRIDACEAE

Iris foetidissima L. Stinking iris
Prospect Park, Reading (AB).

SPARGANIACEAE

Sparganium emersum Rehmman Unbranched bur-reed
Holy Brook, Reading 4.8.91, Farley Hill 21.8.91 (AB).

TYPHACEAE

Typha angustifolia L. Lesser bulrush, reedmace
Mapledurham 6.10.91 (AB).

Contributors

Thanks are due to the following contributors:

A. Brickstock (AB), H.H. Carter (HHC), K.M. Horswell (KMH), S.L. Jury (SLJ), J. & S. Ward (J&SW). Natural History Society walk (NH).

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THE RECORDER'S REPORT FOR
FUNGI 1991

Alan Brickstock

For the third successive year we had a very dry autumn, and although there had been a brief 'flush' of fungi in July, the season proper was very slow to get underway. Many normally abundant species were again present in only ones and twos. There were some notable exceptions: Clitocybe nebularis (Batsch. ex Fr.)Kummer, was exceptionally numerous in many woods and so were normally uncommon earthstars. Geastrum triplex Jung. has been recorded from one location in Sulham woods for many years, but this year it was found in three well separated areas there. Geastrum sessile (Sow.)Pouz. was also found in one location at Sulham in 1986, but found in three widely separated sites there this year, with a total of about 20 specimens. The shaggy parasol mushroom was present at the Holies at Streatley in numerous large rings, totalling many hundreds of specimens. The beautiful magpie fungus, Coprinus picaceus (Bull. ex Fr.)S.F.Gray, was also present in unusually large numbers at Sulham, throughout the latter part of October and much of November.

The total number of species of fungi recorded for 1991 was 359. The following are some of the more interesting records for the year.

AGARICALES

Agaricus augustus Fr.

Reading Golf Course 27.7.91, Emmer Green 10.8.91 (GC).

Agaricus bernardii (Quel.)Sacc.

Ufton Nervet 6.10.91 (NH); Emmer Green 4.10.91 (GC). Grows in saline environments, often on roadside verges where roads have been salted in winter.

Agaricus bitorquis (Quel.)Sacc.

Emmer Green 2.7.91 (GC). A stout agaric which often grows up through asphalt.

Agaricus langei (Moell.)Moell.

Sulham Woods 25.6.91 (B).

Agaricus semotus Fr.

Sulham 16.11.91 (B). Flesh and stipe white but staining yellow at the base.

Agrocybe praecox (Pers. ex Fr.)Fay.

Burghfield Gravel Pits 7.6.91, Reading Golf Course 18.6.91 (GC).

Clitocybe phyllophila (Fr.)Kummer

Lackmore Wood 20.10.91 (B). Has dull white bloom on cap and white down at base of stipe.

Coprinus domesticus (Bolt ex Fr.)S.F.Gray

Cucumber Wood 26.6.91 (GC).

Cortinarius calochrous (Pers.)Fr.
Sulham 15.10.91 (B).

Cortinarius crocolitus (Pers.)Fr.
Ufton Nervet 2.10.91 (B).

Cortinarius violaceus (L. ex Fr.)Fr.
Kingwood Common 6.10.91 (NH).

Entoloma clypeatum (L. ex Fr.)Kummer
Reading Golf Club 5.5.91 (GC); Donkin Hill, Caversham 5.91 (C). Both records under Rosaceae.

Gomphidius roseus (L.)Fr.
Ufton Nervet 13.10.91 (NH). A beautiful species with a very viscid, bright coral cap.

Hohenbuehelia geogenia (DC. ex Fr.)Sing.
Ufton Nervet 8.6.91 (B). Pale brown, funnel shaped, split down one side.

Inocybe griseolilacina Lange
Virginia Water 19.10.91 (MS). Flesh lilac coloured when young, strong mealy smell.

Inocybe hirtella Bres.
Burnham Beeches 3.11.91 (MS). Straw-yellow to gold with small adpressed scales on cap.

Inocybe lacera (Fr.)Kummer
Ufton Nervet 7.8.91 (B). Snuff brown, fibrillose, slightly umbonate.

Laccaria purpureo-badia Reid
Virginia Water 19.10.91 (MS). Dark purple-brown when moist.

Lentinellus cochleatus (Pers. ex Fr.)Karst.
Kingwood Common 6.10.91 (NH). A species we don't often find.

Lepiota acutesquamosa (Weinm.)Kummer
Great Wood, Hambledon 2.11.91 (D). Close to L. aspera or L. friesii, but gills not forked.

Mycena capillaris (Schum.)Kummer
Burnham Beeches 3.11.91 (MS).

Nolanea hirtipes (Schum. ex Fr.)Kummer
Emmer Green 30.6.91 (GC).

Pholiota destruens (Brond.)Gillet
On poplar, Reading Golf Course car park, Emmer Green 25.10.91 (GC); Bramshill 9.11.91 (D).

Pluteus plautus (Weinm.)Gillet
On elder, Lower Hartslock Wood, Goring 10.11.91 (C).
Uncommon, medium sized Pluteus with a grey cap. Usually occurs on coniferous wood. Material identified and retained at Kew.

Pluteus umbrosus (Pers. ex Fr.)Kummer
Lousehill Copse, Tilehurst 23.10.91 (SD).

Tricholoma fulvum (DC.ex Fr.)Sacc.
Virginia Water 19.10.91 (MS).

BOLETALES

Leccinum duriusculum (Schulz.)Sing.
Virginia Water 19.10.91 (MS).

Leccinum holopus (Rostk.)Watling
Ufton Nervet 13.10.91 (NH).

Suillus granulatus (Fr.)O.Kuntze
Reading Golf Course 20.4.91 and 28.6.91 (GC).

Suillus grevillei (Klotsch.)Sing.
Virginia Water 19.10.91 (MS).

Xerocomus armeniacus (Quel.)Quel.
Burnham Beeches 3.11.91 (MS).

APHYLLOPHORALES

Abortiporus biennis (Bull. ex Fr.)Sing.
Burnham Beeches 3.11.91 (MS).

Auriscalpium vulgare S.F.Gray
Ufton Nervet 13.10.91 (NH). Has kidney-shaped cap, covered with yellow or brown hairs.

Coltricia perennis (L. ex Fr.)Murr.
Ufton Nervet 7.8.91 and 23.8.91 (B).

Coniophora olivacea (Fr.)Karst.
Ufton Nervet 13.10.91 (NH). A cottony, brownish resupinate usually on rotten conifer.

Hydnum repandum L. ex Fr.
Kingwood Common 6.10.91 (NH). Found forming a large ring.

Laetiporus sulphureus (Bull. ex Fr.)Murr. Chicken of the woods
Cucumber wood 16.6.91. Edible when young. In large tiers up to 40 cm across, so enough for a good meal! (GC).

Phlebiopsis gigantea (Fr.)Jul.
Padworth Common 13.10.91 (NH). A whitish resupinate on dead conifer wood. Margin rolls back when dry.

Pistillaria quisquiliaris Fr.
Ufton Nervet 13.10.91 (NH). Tiny white fruiting bodies on dead bracken stems.

Schizopora paradoxa (Schrad. ex Fr.)Donk

Kingwood Common 6.10.91 (NH). A whitish resupinate with fine tubes and pores which are often maze-like.

Skeletocutis amorphia (Fr.)Kutl. & Pouz.

Kingwood Common 6.10.91 (NH); Ufton Nervet 13.10.91 (NH). A small polypore on dead coniferous wood. Often has a pale orange tint to the pore surface.

GASTEROMYCETES

Geastrum sessile (Sow.)Pouz.

Sulham Woods 14.10.91 (B). Previously only found at one place in Sulham Woods, but this year in three separate locations.

Geastrum triplex Jung.

Sulham Woods 15.10.91 (B). Has been in one area for many years, but found in two fresh places this year.

Langermannia gigantea (Batsch ex Pers.)Rostk.

Virginia Water 19.10.91 (MS). Henley Road Gravel Pits 12.91 (C)

Sphaerobolus stellatus Tode

Virginia Water 19.10.91 (MS). Minute fruiting bodies, a bit like earth-stars. Spore packet is projected up to several metres when ripe.

ASCOMYCETES

Aleuria aurantia (Fr.)Fuckel

Virginia Water 19.10.91 (MS). Unusually abundant here, forming most attractive displays

Geopora sumneriana (Cooke) de la Torre

On lawn under Cedar tree, Whiteknights Park 3.91 (C).

Gyromitra esculenta (Pers.)Fr.

Heath Warren 21.4.91 (D). Despite its name, deadly poisonous when raw - best avoided.

Helvella leucomelaena (Pers.)Nannf.

Heath Warren 21.4.91 (D). Formally known as Paxina leucomelas (Pers.) Kuntze.

Mitrophora semilibera (DC. ex Fr.)Leveille

Morgaster Wood 21.4.91 (D); Warren Row 20.4.91 (D); 35 Essex Street 4.5.91 (D). A morrell which is edible but not worthwhile.

Morchella vulgaris (Pers.)Boud.

164 Kidmore End 4.91 (JM).

Peziza petersii Berk. & Curtis

Virginia Water 19.10.91 (MS). Numerous specimens on old bonfire sites.

Verpa conica Swartz ex Pers.

Morgaster Wood 21.4.91 (D). Under hawthorn on chalk.

DEUTEROMYCETES

Graphium smaragdinum (Alb. & Schw.)Sacc.

The Wilderness, Whiteknights Park 14.3.91 (C). Turquoise green 'pin head' sized fungus forming extensive patches on the underside of rotten wood.

MYXOMYCETES

Ceratomyxa fruticulosa (Mull.)Macbr.

Kingwood Common 6.10.91 (NH); Padworth Common 13.10.91 (NH). White powdery patches on rotting wood.

Leocarpus fragilis (Dicks.)Rost.

Padworth Common 13.10.91 (NH). On bracken, bright yellow.

Contributors:

Ivy & Alan Brickstock (B), Paul Cook (C), Gordon Crutchfield (GC), Neville and Mary Diserens (D), John Marshall (JM), British Mycological Society foray (MS), Reading Natural History Society meeting (NH).

Special thanks to Paul Cook and Neville Diserens for leading forays and identifying species, and also to Gordon Crutchfield for his numerous records.

THE RECORDER'S REPORT FOR ENTOMOLOGY 1991

B.R. Baker

'There has long been a feeling among members of this society that the recorders' reports should be given a greater permanence. It was with this in mind that your Committee decided to proceed with this present publication'

Reading Naturalist Vol. 1 , No 1 1949

That laudable aim has now been pursued for more than 40 years but with limitation upon space we are not able to include every record submitted. These are, however, included in Reading Museum's data bank which can be seen by arrangement with Mr H.H. Carter, Keeper of Natural History.

The order and nomenclature in this report are those given in Kloet and Hincks (1964, 1972, 1977, 1976, 1978,) for small orders and Hemiptera, Lepidoptera, Coleoptera, Diptera and Hymenoptera, respectively. Those for Lepidoptera are supplemented by Bradley and Fletcher (1979, 1986).

EPHEMEROPTERA

Mayflies

Ephemera lincata Eaton

Matlock Road, Caversham 23.7.91 (HGB); near Caversham Bridge 4.8.91, many sub-imagines (fifty plus) attracted to a lit shop window and noted just before midnight. This large and usually scarce species hatches later in the season than the other two species of Ephemera (BRB).

ODONATA

Dragonflies

Lestes sponsa (Hans.)

Runnymede Meadows 20.7.91; near Aldermaston 21.7.91 (N&MD).

Green lestes

Agrion virgo (L.)

Pamber Forest N.R. 7.7.91, many (N&MD).

Demoiselle agrion

Cordulegaster boltonii (Don.)

Pamber Forest N.R. 7.7.91 (N&MD).

Golden-ringed dragonfly

Aeshna cyanea (Mull.)

Burghclere 4.9.91 inside a Robinson moth-trap (GGE-F).

Southern aeshna

Anax imperator Leach

Heath Warren 4.7.91, flying at 8.45 p.m., Virginia Water 20.7.91; Runnymede Meadows 20.7.91 (N&MD).

Emperor dragonfly

Libellula quadrimaculata L.

Pamber Forest N.R. 7.7.91, chased off an egg-laying L. depressa L. (N&MD).

Four-spotted libellula

ORTHOPTERA

*Crickets, bush crickets,
grasshoppers etc.*

Metrioptera brachyptera (L.)
Wokefield Common 14.9.91 (N&MD).

Bog bush cricket

Metrioptera roeselii (Hagenbach)
Runnymede Meadows 20.7.91 (N&MD).

Roesel's bush cricket

Gomphocerippus rufus (L.)
Hartslock N.R. 1.9.91 (N&MD).

Rufous grasshopper

HEMIPTERA

*Plant bugs, water bugs,
leaf hoppers, aphids etc.*

Zicrona caerulea (L.)
Ruskin Reserve, Cothill, one male 6.7.91. Last recorded at Wytham Park,
c. 1920 (HHC).

Scolopostethus affinis (Schilling)
Hartslock N.R. end 7.91, coll. Niki Barrett, det. HHC.

Phytocoris longipennis Flor
Hartslock N.R. end 7.91, coll. Niki Barrett, det. HHC.

Ledra aurita (L.)
Sulham Wood 1.3.91, an overwintering nymph on a beech trunk (BRB).

NEUROPTERA

*Alderflies, snakeflies,
lacewings*

Chrysopa albolineata Killington
Hargrave Road, Maidenhead 25.6.91 (MA).

Chrysopa carnea Stephens
Hargrave Road, Maidenhead 13.10.91 (MA).

Chrysopa flavifrons Braür
Braywick Park, Maidenhead 20.7.91 (MA, PH).

Nathanica capitata (Fabr.)
Braywick Park, Maidenhead 20.7.91 (MA, PH)

LEPIDOPTERA

Butterflies, moths

Phlyctaenia perlucidalis (Hüb.)
Burghclere 11.7.91. A notable addition to the Burghclere list of
microlepidoptera (GGE-F).

Thymelicus lineola (Ochs.)
Silchester Common 26.7.91, in some numbers with fewer seen nearby in
Pamber Forest N.R. (BRB).

- Aricia agestis (D. & S.) Brown argus
Burghclere 25.8.91. New to the Burghclere list, probably a wanderer from the chalk (GGE-F).
- Celastrina argiolus (L.) Holly blue
Ewelme 1.6.91, three females seen egg laying on Cornus sanguinea (N&MD).
- Pieris brassicae (L.) Large white
Crawshay Drive, Emmer Green 15.8.91, one inside a moth light trap (JN).
- Pieris rapae (L.) Small white
Crawshay Drive, Emmer Green 5.8.91, three specimens inside a moth light trap (JN).
- Cynthia cardui (L.) Painted lady
Burghclere 7.7.91 (GGE-F); Pamber Forest N.R. 23.7.91 (BTP); Emmer Green 25.8.91 (JN); Aldermaston 27,29.8.91, 19.9.91 (PS); Surley Row 31.8.91, 16.9.91 (PS); Whiteknights Park 7.9.91, Swyncombe Hill 14.9.91 (N&MD).
- Aglais urticae (L.) Small tortoiseshell
Crawshay Drive, Emmer Green 14.10.91, one inside moth trap (JN).
- Polygonia c-album (L.) Comma
Aldermaston 25.9.91, nine on one blackberry bush (PS); Nuney Green 2.10.91, seven on one blackberry bush (HGB).
- Eurodryas aurinea (Rott.) Marsh fritillary
Berkshire Downs, a very late female 29.6.91, a small larval winter nest 3.9.91 (BRB).
- Melanargia galathea L. Marbled white
Kidmore End Road, Emmer Green 15,22.7.91 (JM).
- Pyronia tithonus (L.) Gatekeeper
Crawshay Drive, Emmer Green 28.4.91, larvae in the garden (JN).
- Scopula immutata (L.) Lesser cream wave
Lower Denford 7.91 and 8.91 (NC).
- Lampropteryx otregiata (Metc.) Devon carpet
Burghclere, first brood not recorded, second brood, four between 13 and 25.8.91 (GGE-F).
- Chloroclysta siterata (Hufn.) Red-green carpet
Burghclere, spring, one 6.6.91, autumn, ten 5.9 to 18.11.91, a very good year (GGE-F).
- Eupithecia irriguata (Hübner.) Marbled pug
Burghclere, six between 28.4.91 and 20.5.91 (GGE-F); Wash Common 23,26.5.91, Lower Denford 24.5.91 (NC).
- Eupithecia simpliciata (Haw.) Plain pug
Burghclere, one 21.7.91 (GGE-F).
- Eupithecia indigata (Hübner.) Ochreous pug
Burghclere, one 25.5.91 (GGE-F).

- Eupithecia chloerata (Mab.) Sloe pug
Burghclere, one 20.7.91 (GGE-F).
- Aspitates ochrearia (Rossi) Yellow belle
Burghclere, one 31.5.91, one 4.6.91 (GGE-F); Brimpton Gravel Pit 8.91 (NC).
- Acherontia atropos (L.) Death's-head hawkmoth
Woodley allotments 25.8.91, a larva taken to Dinton Pastures C.P. for identification (info. Kit Brownlee); a second larvae found near Maidenhead (info. W. Parker).
- Macroglossum stellatarum (L.) Hummingbird hawkmoth
Bray 21.7.91, seen and reported by Mrs P.M. Harris of 2 Court Close.
- Euproctis chrysorrhoea (L.) Brown-tail
Burghclere, one 15.7.91 (GGE-F); Wash Common 22.7.91 (NC)
- Rhyacia simulans (Hufn.) Dotted rustic
Crawshay Drive, Emmer Green, two, 5, 14.8.91 (JN); Wash Common, one female, 21.9.91 (NC).
- Hadena confusa (Hufn.) Marbled coronet
Burghclere, one 15.7.91. New to Burghclere list (GGE-F).
- Lithophane semibrunnea (Haw.) Tawny pinion
Burghclere, one 10.10.91 (GGE-F); Crawshay Drive, Emmer Green, one 20.3.91 (JN).
- Lithophane hepatica (Cl.) Pale pinion
Burghclere 6.4.91, 12.5.91, 13.9.91, 2.10.91 (GGE-F).
- Lithophane ornitopus (Hufn.) Grey shoulder-knot
Burghclere, spring, seven 13.3.91 to 3.4.91, autumn, ten, 14.10.91 to 23.11.91, a very good year (GGE-F); Emmer Green 17.9.91, Clayfield Copse, two on fencing 13.10.91 (JN); Ufton Park, two on oak trunks 1.10.91 (BRB). A normally uncommon moth which has made something of a comeback in 1991.
- Mesapamea secalella Remm Remm's rustic
Braywick Park, Maidenhead 20.7.91, genitalia checked (MA, PH).
- Arenostola phragmitidis (Hübner) Fen wainscot
Wash Common, one 9.8.91, Lower Denford, one 10.8.91 (NC).
- Pyrrhia umbra (Hufn.) Bordered Sallow
Braywick Park, Maidenhead 20.7.91 (MA, PH); Harcourt Drive, Earley 28.7.91 (NMH).

COLEOPTERA

Beetles

Mr T.D. Harrison, in submitting this year's detailed list, has asked that all previous records of Helochares and Ischnomera should be deleted. My thanks go to HHC for the usual preselection of records from Mr Harrison's comprehensive list.

Trechus discus (Fabr.)
Leighton Park, Reading 22.7.91, attracted to m.v. lamp at 23.00 hrs (TDH).
First local record (HHC).

Bembidion bruxellense Wesmael

Near Hall Farm, Shinfield 28.3.91, obtained by shaking old flood refuse on bank of river (TDH). This, and many subsequent records of this date refer to River Lodden. Second local record (HHC).

Bembidion gilvipes Sturm.

Near Sonning Eye 2.5.91, under plant debris on bank of Thames (TDH). Two old local records (HHC).

Amara anthobia Villa.

Leighton Park, Reading 17.4.91, inside a house at 23.45 hrs, presumably flew in attracted to light (TDH). First local record (HHC).

Amara convexiuscula (Marsham)

Leighton Park, Reading 20.7.91, attracted to m.v. lamp at 22.10 hrs. A second specimen obtained two days later in the same way (TDH). First local record (HHC).

Trichocellus placidus (Gyllenhal)

Near Hall Farm, Shinfield 29.3.91, in old flood refuse on bank of river (TDH). First local record (HHC).

Agabus sturmi (Gyllenhal)

Near The Lynch, Shiplake 2.5.91. A male and a female were obtained by dipping a net into a water-filled ditch at edge of a meadow (TDH). One (vague) previous local record (HHC).

Gyrinus substriatus Stephens

Gravelpit Copse, Pamber Forest N.R. 12.6.91, netted from the surface of a pond (TDH). One previous local record (HHC).

Sphaeridium lunatum Fabr.

Aston Upthorpe Downs 6.9.90, in cow dung on chalk grassland (TDH). One previous record (HHC).

Helochares punctatus Sharp

The Ridges, Finchampstead 8.5.91, obtained by trampling rushes into water of pond, in mixed deciduous wood (TDH). One doubtful local record (HHC).

Enochrus melanocephalus (Oliv.)

Whiteknights, Reading 24.5.91, netted from an ornamental lake within parkland (TDH). First local record (HHC).

Plegaderus vulneratus (Panzer)

The Ridges, Finchampstead 8.5.91, under bark of dead but standing conifer (TDH). First local record (HHC).

Abraeus globosus (Hoffman. J.)

Leighton Park, Reading 4.11.90, obtained by shaking handfulls of compost over sheet (TDH). One old local record (HHC).

Nargus wilkini (Spence)

Burghfield Common 23.12.91, obtained by shaking handfulls of dead leaves over sheet, on marshy ground in oak wood (TDH). Two old local records (HHC).

Catops grandicollis Erichson

Near Sincombe Farm, Letcombe Bassett 6.10.90 on rabbit carcass on grass verge of road (TDH). One old local record (HHC).

Siagonium quadricorne Kirby W.

Whiteknights, Reading 1.1.91, under bark of fallen, decaying horse chestnut, in mixed copse (TDH). Two old local records (HHC).

Planeustomus palpalis (Erichson)

Leighton Park, Reading 22.7.91, attracted to m.v. lamp at c. 23.00 hrs. A Red Data Book (3) sp. (TDH). First local record (HHC).

Carpelimus bilineatus Stephens

Near Hall Farm, Shinfield 28.3.91, amongst reed litter in old flood refuse on the bank of a river (TDH). First local record (HHC).

Stenus exiguus Erichson

Near Hall Farm, Shinfield 28.3.91, in old flood refuse on the bank of a river (TDH). First local record (HHC).

Stenus fornicatus Stephens

The Ridges, Finchampstead 8.5.91, obtained by trampling plants of Juncus sp. into the water of pond, in a mixed deciduous wood (TDH). First local record (HHC).

Stenus latifrons Erichson

The Ridges, Finchampstead 8.5.91, obtained by trampling plants of Juncus sp. into the water of pond, in a mixed deciduous wood (TDH). One old local record (HHC).

Stenus pallipes Gravenhorst

Near Hall Farm, Shinfield 28.3.91, in old flood refuse on the bank of a river (TDH). First local record (HHC).

Stenus picipennis Erichson

Near Hall Farm, Shinfield 28.3.91, amongst reed litter in old flood refuse on the bank of a river (TDH). First local record (HHC).

Stenus subaenus Erichson

Near Pingewood 15.11.90, one male found running over gravel at base of plant of Sinapis sp. on bank of water-filled gravel pit (TDH). One old Berks. record (HHC).

Staphylinus globulifer Fourcroy

Near Pingewood 15.11.90, a mating pair found under piece of old carpet (rubbish) on grassy place on gravelly soil beside water-filled gravel pit (TDH). First Berks. record (HHC).

Quedius aetolicus Kraatz

Leighton Park, Reading 21.12.90, under bark of standing but diseased horse chestnut in deciduous wood (TDH). First local record (HHC).

Bolitobius inclinans (Gravenhorst)

Heckfield Heath 10.11.90, under a log amongst bracken in woodland (oak, birch and planted conifer) (TDH). One local record (HHC).

Homalota plana (Gyllenhal)

Whiteknights, Reading 1.1.91, under bark of trunk of fallen, diseased horse chestnut, in copse of trees within parkland (TDH). First local record (HHC).

Anomognathus cuspidatus (Erichson)

Leighton Park School, Reading 22.12.90, under bark of fallen oak in deciduous wood (TDH). First local record (HHC).

Tachyusa coarctata Erichson

Sonning 24.4.91, on more or less bare mud and sand on shore of Thames (TDH). First local record (HHC).

Tachyusa leucopus (Marsham)

Sonning 24.4.91, on more or less bare mud and sand on shore of Thames (TDH). First local record (HHC).

Ocalea picata (Stephens)

Burghfield Common 23.12.90, obtained by shaking handfuls of leaves over sheet, in marshy area in oak wood (TDH). One old local record (HHC).

Oxyomus sylvestris Scop.

Leighton Park, Reading 4.11.90, obtained by shaking handfuls of garden compost over a sheet (TDH). Two old local records (HHC).

Selatosomus bipustulatus (L.)

Pamber Forest N.R. 12.6.91, resting on tip of grass blade in clearing in oak wood (TDH). One old record (Bagley) (HHC).

Rhagonycha testacea (L.)

Pamber Forest N.R. 12.6.91, by general sweeping of grass, rushes, buttercups on marshy ground which supported willow trees, in open oak woodland (TDH). One local record (HHC).

Biphyllus lunatus (Fabr.)

Leighton Park, Reading 30.12.90, under bark of standing but diseased horse chestnut, in deciduous wood (TDH). Two old local records (HHC).

Diplocoelus fagi Guerin-Meneville

Leighton Park, Reading 30.12.90, under bark of standing but diseased horse chestnut, in deciduous wood (TDH). One Berks. record (HHC).

Stethorus punctillum Weisse

Near Letcombe Regis 21.2.91, in an old bird's nest in hawthorn bush (TDH). First local record (HHC).

Cartodere constricta (Gyllenhal)

Near Swyncombe House, near Cookley Green 6.1.91, under bark of a standing but diseased beech tree, in open beech wood on chalk downs (TDH). First local record (HHC).

Enicmus brevicornis (Mannerheim)

Leighton Park, Reading 27.12.90, under bark of standing but diseased horse chestnut, in deciduous wood (TDH). First local record (HHC).

Corticaria impressa (Olivier)

Near Hall Farm, Shinfield 28.3.91, in old flood refuse on the bank of a river (TDH). One old local record (HHC).

Ischnomera cyanea (Fabr.)

Leighton Park, Reading 22.6.91, on flowers of ornamental cherry (Prunus pensylvanica) in garden (TDH). First authentic record (HHC).

Grammoptera ustulata (Schaller)

Pamber Forest N.R. 12.6.91, obtained by sweeping lower branches of willow tree beside log pile in clearing in oak woodland. A Red Data Book (3) sp. (TDH). Two recent records (HHC).

Altica oleracea (L.)

Aston Upthorpe Downs 6.9.90, caught on a white sheet which was layed upon short turf in area of chalk downland (TDH). First local record (HHC).

Rhynchites aeneovirens Marsham

Pamber Forest N.R. 12.6.91, by general sweeping of grass and rushes on marshy ground which supported hazel and willow in open oak woodland (TDH). One old local record (HHC).

Sitona humeralis Stephens

Near The Firs, Binfield Heath, 24.4.91, amongst small chalk stones on small patch of grass on floor of a disused chalk pit (TDH). First local record (HHC).

Clonus alauda (Herbst) and several C. hortulanus (Fourcroy)

Bowdown Woods N.R. 26.6.91, bred from larvae taken on Scrophularia nodosa L. Neither is new to the district but the food plant is of interest as textbooks state Verbascum spp. Similar larvae on the same food plant were seen in Stony Bottom, Peppard earlier in the year (HHC).

Coeliodes dryados (Gmelin in L.)

Pamber Forest N.R. 12.6.91, obtained by beating oak tree in clearing in oak woodland (TDH). Two old local records (HHC).

Curculio villosus Fabr.

Pamber Forest N.R. 12.6.91, found resting on leaf of foxglove under oak trees in oak woodland (TDH). Two old local records (HHC).

Scolytus intricatus (Ratzeburg)

Leighton Park, Reading 22.7.91, attracted to a m.v. lamp, in parkland at 21.45 hrs (TDH). One recent local record.

Xyleborus saxeseni (Ratzeburg)

Leighton Park, Reading 22.12.90, under bark of a fallen oak in deciduous woodland (TDH). Two old local records (HHC).

Ips sexdentatus Boerner

Leighton Park, Reading 30.12.90, under bark of conifer logs in woodland (TDH). First local record (HHC).

HYMENOPTERA

*Sawflies, ichneumonflies,
ants, bees, wasps*

Empria tridens (Konow)

Nuney Green 20.5.71, coll. E. Burtt, det HHC originally as E. lituratus (Gmelin) (HHC).

Epyris niger Westw.

Clayfield Copse 30.9.91, one female swept from field hedge (JN).

Trichrysis cyanea (L.)

Frieze Farm 8.91, coll. sticky trap, one female (DGN).

Formicoxenus nitidulus (Nyl.)

Bramshill Plantation 18.10.91, queen and worker from nest material of Formica rufa L. (DGN).

Nomada baccata Smith

Hartslock N.R. one female late 6.91, coll. Niki Barrett det HHC.

DIPTERA

True flies

Anopheles plumbeus Steph.

Bowdown Wood N.R. one male 10.9.91 (HHC).

Paracladius obtexens Walker

Bowdown Wood N.R. one female 20.5.91 (HHC).

Endochironomus albipennis (Mg.)

Bowdown Wood N.R. one female 20.5.91 (HHC).

Microtendipes chloris (Mg.)

Bowdown Wood N.R. 22.7.91 (HHC).

Phaenopsectra flavipes (Mg.)

County Lock, Reading, one female 14.5.91, last record Goring, 1962 (HHC).

Polypedilum convictum (Walker)

County Lock, Reading, two females 14.5.91 (HHC).

Hercostomus nanus (Mcq.)

Caversham Mill Stream, female 11.6.91 (HHC).

Delia quadripila (Stein)

2 College Road, Reading, coll. E. Burtt, redet. HHC.

Pegomya albimargo group

2 College Road, Reading, females 12.12.70 and 18.5.73, coll. E. Burtt were originally det. by HHC as P. caesia Stein (HHC).

Pegomya consanguinea (Tiensuu) or P. socculata (Zett.)

Greyhone Shaw, Stoke Row, female 16.6.91 (HHC).

Pegomya nigrisquama (Stein)

2 College Road, Reading, female 31.10.73, coll. E. Burtt, det. HHC (HHC).

Pegomya steini Hendel

Tilehurst 23.5.75, coll. R.G. Leeke, originally det. HHC as P. versicolor (Mg.) (HHC).

Phaonia falleni (Mich.)

Parsonage Moor, Cothill female 6.7.91 (HHC).

Helina pertusa Mg.

Bowdown Wood N.R. male, 20.5.91 (HHC).

Coenosia vibrissata Collin

Caversham Mill Stream, female 1.10.91 (HHC).

ARANEAE

Spiders

Drassodes lapidosus (Walk.)

Birdhill Avenue, Earley, Reading 18.7.91, immature female, coll. R. Bradbury, det. S. Hopkin (HHC).

Theridion pallens Blackwell

Bowdown Wood N.R. 26.6.91, female with egg cocoon (HHC).

Contributors

The recorder expresses his thanks to:

M. Albertini (MA); H.G. Baker (HGB); N. Cleere (NC); H.H. Carter (HHC); N. & M. Diserens (N&MD); Lt. Col. G.G. Eastwick-Field (GGE-F); T.D. Harrison (TDH); N.M. Hall (NMH); P. Hall (PH); J. Marshall (JM); J. Notton (JN); D.G. Notton (DGN); B.T. Parsons (BTP) and P. Silver (PS).

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THE RECORDER'S REPORT FOR
VERTEBRATES 1991

H.H. Carter

FISH

Esox lucius L.

Pike

One about 350 mm in length taken by anglers at Henley 2.3.91.

Leuciscus cephalus (L.)

Chub

One about 350 mm in length in Holy Brook at Reading Central Library 20.21.6.91, again with a smaller one 15.7.91; 2 of about 350 mm and several smaller ones 17.7.91, 2 large ones downstream of the library the same day may have been the same individuals; one of 350 mm seen swimming rapidly upstream at the same locality closely pursued by a smaller one 8.8.91; smaller ones seen to end August, two of about 330 and 300 mm there 3.10.91.

AMPHIBIA

Triturus vulgaris (L.)

Smooth Newt

Abundant this year at the Coach House, Manor Road, Silchester (H-H). Bred in garden pond 164 Kidmore End Road, Emmer Green (JMA).

Bufo bufo (L.)

Toad

Three dead on Old Peppard Road, Emmer Green 25.2.91, one dead there 6.3.91, two dead 19.3.91, one dead there 31.10.91, one dead in Lowfield Road, Caversham Park 2.10.91, and alive 4.10.91 mark the spring and autumn migrations (EMC and Recorder). None seen in Coach and Horses Pond.

Rana temporaria L.

Frog

Many in garden pond, Caversham Park 27.2.91 (BA). Several in garden pond at 27 Fernbrook Road, Caversham 10.3.91 (MRWS). Seen occasionally in garden at Tudor Close, Wokingham. One at 6 Tudor Close 20.10.91 (JM). Bred in garden pond 164 Kidmore End Road, Emmer Green. One at Page's Orchard, Sonning Common 27.7.91. One on Milestone Way, Caversham Park 15.5.91 (MJC). One only 15 mm in length at 10 Northbrook Road, Caversham Park 5.10.91.

REPTILIA

Lacerta vivipara Jacquin

Lizard

One on heath at High Wood, Bulmershe 25.4.91 (SD).

MAMMALIA

Erinaceus europaeus L.

Hedgehog

Eight dead on roads in Caversham Park and Emmer Green from 9.5.91 to 5.11.91; one dead in Reade's Lane, Gallowstree Common 31.8.91; one dead on the A4 by the Old Devil, Hare Hatch. Juvenile in garden of 113 Redhatch Drive, Early 19,20.9.91, one in Maiden Erlegh Woods 12.7.91 (NMD).

Nyctalus noctula (Schreber)

Noctule Bat

Up to 42 in summer roost in hollow tree in Blackhouse Wood (AL, MC and Recorder).

Myotis nattereri (Kuhl)

Natterer's Bat

Up to 37 in summer roost in hollow tree in Blackhouse Wood (AL and Recorder).

Pipistrellus pipistrellus (Schreber)

Pipistrelle Bat

One found drowning in Tilehurst in mid-January (AB).

Vulpes vulpes (L.)

Fox

Bowsey Hill 13.1.91, Lambourn 26.1.91, Blundell's Copse, Tilehurst 11.5.91, near Munday Dean Bottom, Marlow 18.5.91, AWE Harwell 7.7.91 (NMD). Tracks in snow at Tilehurst 6.2.91 (AB). Spencer's Wood 18-21.91 (JW). Shinfield Road at M4 crossing 15.5.91 (MJC). Henley road gravel pits 13.1.91 (FC). Tracks in snow at Mill Green, Caversham 8.2.91, Blackhouse Wood, Caversham 9.2.91; one dead on A4 near Theale 25.8.91; two dead on M40 near High Wycombe.

Mustela erminea L.

Stoat

Near Nuffield 1.6.91 (NMD). Howe Hill near Watlington 4.5.91.

Lepus europaeus L.

Hare

Lambourn 26.1.91; at least 13 on downs near Compton (NMD). Tracks in snow on school playing field north of Caversham Park Village 9.2.91.

Oryctolagus cuniculus (L.)

Rabbit

Several at rear of Harley Road, Lower Caversham 2.2.91 (MJC). Tracks in snow at Multifreight Depot, King's Meadow 8.2.91, Clayfield Copse and Blackhouse Wood, Caversham 9.2.91, one dead in St. George's Road, Caversham 25.2.91, one in field by Emmer Green water tower 16.5.91 and at Blackhouse Wood nearby 14.7.91, one dead on A4 near Shottesbrook 20.7.91, one in Shaylor's Pightle and one in Dogkennel Lane, Sonning Common 26.8.91, dead ones on roads at Peppard Road, Blackmore Lane and Crowsley (all near Sonning Common) 26.8.91, one at Kiln Lane, Mortimer 13.11.91, one dead on Kenavon Drive, Reading 14.11.91. One at Chapman's Farm, Dunsden 22.12.91 (EMC, MJC and Recorder); 23 at Hardwick in December (EMC and Recorder). The last record is the only one of any number and none have been received from observers other than the recorder and family; evidently rabbits were scarce this year and as usual this is correlated with larger numbers of hares.

Apodemus sylvaticus (L.)

Wood Mouse

One dead on road at Coppid Hall, Binfield Heath 26.8.91.

Rattus norvegicus Berkenhout

Rat

One dead on Reading Bridge 4.11.91.

Sciurus carolinensis Gmelin

Grey Squirrel

Many records of small numbers (maximum 5) wherever there are observers. Five young squirrels were reared in birds' nest box at 164 Kidmore End Road, Emmer Green (JMA).

Capreolus capreolus (L.)

Roe Deer

Curridge 3.2.91, five including a buck in velvet Pamber Forest 2.3.91, four at Sherbourne St. John 10.3.91, two at Lambourn 2.6.91, buck browsing from trees at Moore Copse 13.2.91 (NMD). Prospect Park five 31.5.91, nine 1.6.91, three 2.6.91, one 27.6.91 (AL). No records from north of the Thames.

Dama dama (L.)

Fallow Deer

Hambleden Great Wood seven (not seen together) 2.11.91 (NMD). Slots in Old Copse, Sonning Common 2.2.91 (MJC).

Muntiacus reevesi Ogilby

Muntjac

Seen frequently in garden of 164 Kidmore End, Emmer Green all year, occasionally both doe and buck but more often singly, last 2 weeks of December, fawn in garden with parents (JMA). Prospect Park odd ones all year (AL). Bowsey Hill 13.1.91, Hambleden Great Wood 2.11.91 (NMD). One crossing Caversham Park Road at night 28.12.91. One seen close in the grounds of Wordsworth Court (GB).

Contributors

My thanks are due to the following observers:

Bob Abel (BA), Alan Brickstock (AB), Elizabeth Carter (EMC), Mary Carter (MJC), Frances Cook (FC), Neville and Mary Diserens (NMD), Stephen Diserens (SD), Mr Hamilton-Hewett (H-H), Adrian Lawson (AL), John Marshall (JMA), John Murray (JM), Jocelin Whitfield (JW).

The Weather at Reading during 1991

by

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1991 proved to be quite an unexceptional year weatherwise, particularly when compared with 1990 and 1989. Temperatures were very close to normal (which was disappointing for the proponents of global warming), mainly due to below-average February and June values. The year was also relatively dull with sunshine hours some 12% below average, making it the dullest year since 1939. Indeed, only one month (August) recorded over 200 hours of sunshine, compared with four months in 1990. Despite the increased cloud cover, rainfall was below average for the fifth year running since the very wet months of January, June and July were more than offset by the very dry spells in May, August and December. 1991 was a calm year with the run of wind at 2 metres the lowest since 1969 and the highest gust recorded was 62 mph (on the 9th January), compared with the stormy 88 mph in January 1990. The more settled anticyclonic weather in the early and late months of 1991 produced the highest number of fogs since 1978.

The following monthly weather summaries are based on the table of weather records provided (Table 1), along with the monthly and annual average for the station between 1971 and 1990 (Table 2). All these data have been kindly provided by the Department of Meteorology at Reading University.

January was a very mixed month with a very mild and wet first half, changing to cold, dry weather after the 21st. Indeed, temperatures exceeded 11°C on four days up to the 10th and the maximum of 13.2°C on the 1st was the highest January temperature for almost a decade. Unfortunately, temperatures decreased significantly during the last week (with maxima well below 4°C) to herald the start of a prolonged spell of severe wintry weather. Rainfall was 28% above average due to the very wet first half of January when 11 consecutive raindays were observed (compared with only 2 days of precipitation in the last 10 days). Despite a sunless last week (the longest January spell without sun since 1970), sunshine totals were 13% above average.

February continued the 'big freeze' weather, with sub zero temperatures and moderate falls of snow up to the 15th. Indeed, temperatures on the 7th (i.e. -3.8°C maximum and -7.9°C minimum) were the lowest in two decades. This 'big freeze' came as quite a shock to us all following three years running of mild, winter-less conditions. The number of air frosts recorded and number of hours in the month below 0°C were the highest since 1986. Temperatures recovered after the 14th and indeed

maximum values exceeded 10°C on five successive days from the 22nd, accompanied by rainfall. However, despite this wet spell and the nine days of snowfall up to the 15th, precipitation totals were 28% below average. Sunshine totals were 24% below normal making it the dullest February in almost a decade.

March started off cold and wet but the weather improved considerably at the end of the first week, to give generally very mild and dry conditions. Temperatures were some 2°C above average and the maximum value on the 13th of 18.1°C (coupled with nearly 8 hours of sunshine) provided an early taste of spring. The month was dull though, with sunshine about 15% below average. The dry spell continued as the month's aggregate rainfall was 36% below normal, to aggravate the conspicuous water deficit in the Reading area.

April provided reasonable early spring weather with average temperatures, although a maximum of 19.6°C was recorded on the 12th. Rainfall totalled over 42% above the monthly average mainly due to the prolonged rain of the 29th, which turned out to be the main weather event of the month. A very slow-moving depression deposited 30.6 mm on Reading on that day (the highest total for any April day since before 1921). The rainfall duration of 19.5 hours was only 0.6 hours less than the record 70-year old April duration received in 1971. For the third month running, sunshine hours were below normal (by 12%), although the 11.2 hours recorded on the 28th gave us the sunniest day recorded at Reading since the 30th August 1990.

May was a cool, very dry and dull month and was most disappointing after the glorious May weather experienced in 1989 and 1990. The first half of the month was abnormally cool and we had to wait until the 20th for the temperatures to exceed 20°C, with the highest maximum of 23.1°C recorded on the following day. The rest of the month experienced just-above average temperatures so that for the month overall, they still remained below normal. Aggregate rainfall was very low (some 86% below normal) making it the third driest May since 1921, to provide problems for gardeners in an active growing season. Yet again, sunshine was below normal (by 39%) making it the dullest May since 1956 when sunshine records began. The pathetic mean duration of sunshine (4 hours per day) was about half of that recorded in the gloriously sunny May of 1990.

June provided dreadful early summer weather for the second year running with very cool, dull and wet conditions throughout the month. Temperatures were well below average and the 12.9°C mean was indeed the third lowest since 1921, after 1972 (12.0°C) and 1977 (12.3°C). Also, the minimum temperatures recorded on the 2nd, of 1.5°C in the air and -5.7°C on the grass, were the lowest June values for almost 70 years. June turned out to be the wettest month at Reading since February 1990 and the rainfall aggregate (47% above normal) was not exceeded during the rest of 1991. Perhaps the most disappointing feature of a forgettable month was the lack of sunshine

and depressingly dull weather, yet again. Hours of sunshine recorded were only 58% of those expected, and the miserable mean daily sunshine duration of 3.7 hours was only 22% of the maximum duration possible (for the second June running). Indeed after 1990, it was the second sun-less June recorded in Reading since before 1939.

July saw a reasonable improvement in the summer weather with above-average temperatures and close-to-average sunshine totals. Indeed, 20°C was exceeded on 24 days and the 27.6°C recorded on the 29th proved to be the warmest day of the year. It was a very wet month since the rainfall aggregate was 86% above normal, although 90% of this total was deposited on only 5 days. As a result of this summer rainfall (nearly 1.5 times the average), the lawns and weeds flourished in Reading's gardens.

August proved to be a superb month with hot, sunny and very dry weather (at last!). Temperatures remained above normal throughout the month with daytime maxima consistently reaching the lower to middle twenties (°C). Indeed, only on one occasion (the 23rd) did the maximum temperature fail to reach 20°C and 24.8°C was exceeded on 8 days. Sunshine hours were 14% above average and exceeded 200 for the first (only!) time this year, to represent about 50% of the total possible. August turned out to be a remarkably dry month (following the deluges of June and July) with the recorded aggregate rainfall 84% less than normal (compared with July's 86% more than!). It was the driest August since 1947 and the third driest month ever since measurements began in 1921.

September continued the superb hot, sunny and dry weather, at least until the last week of the month, when conditions became more cyclonic with a dominance of Atlantic depressions. The month started very warm with the maximum temperature of 27.5°C (recorded on the 1st) representing the highest for any September's day since 1973. Indeed, 21°C was exceeded on 14 days during the first three weeks and despite below-average temperatures being recorded in the last week, the overall monthly means were well in excess of normal (which along with 1989 and 1964, were the warmest Septembers for 30 years). Sunshine hours totalled 16% above average, which was a welcomed 44% of the maximum possible. In terms of rainfall, September was a very mixed month. A 21-day drought ended on the 14th and it remained quite dry until the 28th when a deluge of 27.5 mm was recorded. Despite this late wet spell, rainfall for the month was 9% below normal.

October as a whole was cool, dry and dull although September's 'Indian Summer' weather continued for the first half of the month. Until the 16th, temperatures were well above average (20°C recorded on the 11th) but then temperatures fell to below average so that, for the month as a whole, they ended up below average. Hours of sunshine were 17% below average due especially to a very dull period after the 21st. The month was very dry (i.e. rainfall totalled 31% below average) and indeed almost half of the total recorded was deposited on the last two

days of October. The number of fogs observed was the highest for two decades.

November proved to be an average month in terms of temperature and rainfall and only sunshine deviated significantly from normal. It was generally dull, especially in the last 10 days of the month, and sunshine totals were 25% below the monthly average. Even though temperatures overall were close to normal, November was noted for very mild weather in the first and last weeks with a cool period observed in the middle fortnight. The first week was also stormy and gusts in excess of 60 mph were experienced on the 3rd.

December was a month of extremes with alternating mild and cold periods. Overall, temperatures remained well below average, mainly due to the eleven-day cold snap after the 5th. Indeed on the 12th, the minimum temperature reached -8.9°C in the screen and -12.4°C on the grass whilst the maximum value of -2.0°C on the 14th was the lowest December maximum for 13 years. The last 10 days were very mild with maxima of 13°C on the 21st and 11°C on Boxing Day. It was a very dry month with an aggregate rainfall recorded which was 81% below normal (making it the third driest December since 1921). The anticyclonic dominance was responsible for sunshine totals some 10% above average and the calm, clear nights caused the highest number of fogs since 1986.

Postscript

It is useful to summarise the 1991 weather in the Reading area with a brief look at seasonal patterns as revealed from data in Table 3. The Winter produced the first 'big freeze' since 1987 although the 267 hours below 0°C (between December and February) in 1990/91 only provided a ranking of 15th in the 1960-1991 'league, far behind 1962/63 (1216 hours) and 1984/85 and 1985/86 (c.680 hours). However, the season mean of 3.5°C in 1990/91 was only 'beaten' 7 times in the past 40 years (with 1962/63 again top of the 'league' with a 3-month mean of 0°C).

Spring was overall quite warm since above-average temperatures in March compensated for the cooler May. It was also very dull, with sunshine hours totalling 26% less than normal, making this season the second-dullest since 1939 (after 1981). Spring was also dry, especially May, and overall rainfall totalled 31% less than normal, making it the 12th driest Spring in the last 70 years.

Summer was close to average in terms of temperature, but was wetter and duller than normal due to such miserable June weather. August provided some compensations for the holidaymakers (too late for Wimbledon and Lords though) but, overall, it could not counterbalance the wretched start to the season. Finally, Autumn was overall a pleasant season, thanks to the superb hot, dry and sunny 'Indian Summer' weather observed in September. Despite the marked deterioration of all elements later in the season, Autumn 1991 remained pretty average.

Table 1. WEATHER RECORDS: 1991

STATION: READING UNIVERSITY (WIITEKNIGHTS)

		Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Mean Daily Temperatures °C	Max.	6.8	4.9	11.9	12.3	15.2	16.6	22.1	23.1	20.6	13.6	10.0	7.6	13.7
	Min.	1.6	- 1.4	4.9	4.5	7.4	9.1	13.5	13.1	10.1	7.3	4.1	1.5	6.3
	Mean	4.2	1.8	8.4	8.4	11.3	12.9	17.8	18.1	15.3	10.5	7.1	4.5	10.0
	Range	5.2	6.3	7.0	7.8	7.8	7.5	8.6	10.0	10.5	6.3	5.9	5.1	7.3
Extreme Temperatures °C	Extreme Max. Date	13.2 1st	12.2 23rd	10.1 13th	19.6 12th	23.1 21st	20.3 29th	27.6 29th	26.7 21st	27.5 1st	20.0 11th	15.3 1st	13.0 21st	27.6 29/7
	Extreme Min. Date	- 3.1 14th	- 7.9 7th	- 1.8 30th	- 1.1 21st	0.4 9th	1.5 2nd	9.8 10th	8.1 19th	3.7 20th	1.1 22nd	-1.9 21st	-8.9 12th	-8.9 12/12
	Extreme Grass Min. Date	- 7.0 14th	-11.3 9th	- 9.1 30th	- 7.2 21st	- 5.6 9th	- 5.7 2nd	3.0 17th	0.9 19th	- 3.1 20th	- 5.8 21st	- 7.7 21st	-12.4 12th	-12.4 12/12
Days with air frost		6	19	2	1	0	0	0	0	0	0	3	12	43
Days with ground frost		22	23	14	14	7	3	0	0	5	9	16	18	131
Hours at or below 0.0°C		24	200	5	3	0	0	0	0	0	0	7	139	378
Sunshine Hours	Sum	63.0	52.9	90.0	135.7	118.7	110.3	199.1	224.5	166.1	80.7	53.7	53.5	1351
	% of possible	23.9	18.8	24.6	32.7	21.7	22.4	40.0	49.8	44.3	24.2	20.0	21.5	30.1
	Daily Mean	2.0	1.9	2.9	4.5	3.8	3.7	6.4	7.2	5.6	2.6	1.8	1.7	3.7
Precipitation	Amount in mm	75.0	29.9	35.0	58.9	7.0	76.3	75.7	8.6	47.3	42.2	57.1	12.3	525
	Rain Days	14	12	12	14	5	20	11	4	9	11	13	7	132
Maximum rain in one day "		18.3	10.2	10.6	30.6	3.2	15.6	20.0	3.6	27.5	12.8	19.9	3.8	30.6
Date		3th	27th	6th	20th	16th	23rd	30th	22nd	20th	13th	10th	17th	29/4
Longest run of consecutive rain days		0	5	4	7	3	0	3	2	3	2	3	4	7 April
Longest run of consecutive dry days		7	5	9	5	14	2	4	14	13	11	5	14	14 May Aug. 3 Dec
Snow or sleet days		2	7	0	0	0	0	0	0	0	0	0	0	9
Days with snow lying		1	9	0	0	0	0	0	0	0	0	0	0	10
Visibility	Days with fog at 0900 GMT	1	4	1	0	0	0	0	0	0	7	3	5	21
Thunderstorm Activity	Days of thunder	1	0	0	1	0	1	1	0	1	0	0	0	5
	Days of hail	0	0	1	2	0	0	0	0	0	0	0	0	3
Barometric Pressure mb	Mean	1020	1017	1012	1017	1025	1012	1016	1020	1016	1015	1011	1029	1017
	Highest Date	1041 3rd	1036 5th	1035 29th	1032 15th	1035 22nd	1024 1st	1023 15th	1030 20th	1031 6th	1034 23rd	1029 21st	1045 25th	1045 25/12
	Lowest Date	995 10th	997 8th	985 8th	988 4th	1010 7th	999 7th	1006 24th	1005 22nd	990 28th	1001 11th	989 4th	1003 19th	985 8/3

TABLE 2. MONTHLY AND ANNUAL WEATHER AVERAGES
UNIVERSITY OF READING (WHITENIGHTS)

1971 - 1990

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
MEAN BAROMETRIC PRESSURE	1014.2	1015.2	1014.0	1015.8	1014.9	1016.5	1017.2	1016.6	1017.0	1015.2	1015.9	1015.0	1015.7
MEAN TEMPERATURE °C	4.2	4.2	6.3	8.2	11.6	14.5	17.0	16.7	14.0	10.8	6.9	5.5	10.0
MEAN MAXIMUM TEMP. °C	7.0	7.3	9.8	12.4	16.2	19.1	21.9	21.4	18.4	14.5	10.1	8.2	13.9
MEAN MINIMUM TEMP. °C	1.3	1.2	2.6	4.0	7.0	9.9	12.2	11.9	9.7	7.1	3.7	2.7	6.1
DAILY RANGE TEMP. °C	5.7	6.1	7.2	8.5	9.3	9.2	9.7	9.6	8.8	7.4	6.1	5.5	7.8
SOIL TEMP. 5cm °C	3.1	2.9	5.1	8.8	13.6	17.2	19.3	18.1	14.5	10.1	5.9	4.2	10.2
" " 10cm "	3.3	3.1	4.9	8.0	12.4	15.9	18.1	17.1	13.9	10.0	6.1	4.5	9.8
" " 20cm "	4.0	3.9	5.3	7.9	11.8	15.1	17.5	17.0	14.3	10.8	7.1	5.2	10.0
" " 30cm "	5.0	4.7	6.1	8.4	11.7	14.8	17.0	16.9	14.8	11.9	8.4	6.2	10.5
" " 50cm "	5.5	5.2	6.3	8.4	11.4	14.4	16.5	16.8	15.1	12.4	9.2	6.8	10.7
" " 100cm "	6.6	5.9	6.4	8.0	10.5	13.1	15.1	15.9	15.0	13.0	10.5	7.9	10.7
AGGREGATE RAINFALL (mm)	58.6	41.3	54.5	41.1	50.9	51.9	40.6	52.6	52.1	60.8	53.6	64.4	622.3
RAIN DAYS (0.2mm or MORE)	16	13	16	13	14	11	11	11	10	14	13	15	157
WET DAYS (1.0mm or MORE)	11	8	12	9	10	9	7	8	8	10	9	9	112
SUNSHINE (No. of HOURS)	55.9	69.3	106.3	155.6	193.4	189.0	206.5	193.0	144.5	97.1	71.9	48.7	1531.2
MEAN DURATION	1.80	2.48	3.43	5.19	6.24	6.30	6.66	6.23	4.82	3.13	2.40	1.57	4.19
DAILY MEAN DURATION POSSIBLE AT LATITUDE 51°	8.51	10.05	11.86	13.83	15.51	16.45	16.03	14.53	12.65	10.73	8.97	8.04	12.27

Table 3 Seasonal Weather data, Reading

Winter Weather (Dec - Feb)

<u>Years</u>	<u>Hours</u>	<u>Years</u>	<u>Temperature</u>
1962-1963	1216.0	1962-1963	0.0
1984-1985	684.0	1978-1979	2.0
1985-1986	680.5	1984-1985	2.2
1981-1982	559.3	1981-1982	2.9
1986-1987	447.7	1968-1969	3.3
1961-1962	359.6	1955-1956	3.3
1967-1968	357.3	1985-1986	3.4
1977-1978	345.0	1967-1968	3.5
1968-1969	322.0	1991-1991	3.6
1969-1970	316.5		
1970-1971	307.3		
1982-1983	295.5		
1983-1984	295.3		
1976-1977	281.1		
1990-1991	267.0		

Years with greatest number of hours below 0°C (1960-91)

Years with the lowest winter mean temperatures (1950-91)

Spring Weather (March-May)

<u>MEAN TEMP</u> (1959-1991)		<u>SUNSHINE</u> (1939-1991)		<u>RAINFALL</u> (1920-1991)	
<u>YEAR</u>	<u>°C</u>	<u>YEAR</u>	<u>HOURS</u>	<u>YEAR</u>	<u>TOTAL (mm)</u>
1959	10.5	1981	321.5	1990	39.2
1961	10.5	1991	335.0	1944	43.4
1990	10.3	1983	335.2	1976	51.4
1960	10.2	1941	368.8	1938	52.1
1989	9.9	1975	371.1	1974	54.8
1991	9.4	1947	378.4	1929	60.5
1988	9.4	1964	380.7	1956	61.5
1981	9.4	1951	394.7	1957	78.7
1967	9.4	1986	398.5	1960	87.4
1964	9.3	1963	402.9	1945	87.4
				1943	87.6
				1991	100.9

Warmest Springs

Dullest Springs

Driest Springs

Summer Weather (June - Aug)

Average (1971-1990) 1991

MEAN BAROMETRIC PRESSURE:	1010.8 mbs	1015.9mbs
MEAN TEMPERATURE:	16.1°C	16.3°C
MEAN MAX TEMPERATURE:	20.8°C	20.6°C
MEAN MIN TEMPERATURE:	11.3°C	11.9°C
AGGREGATE RAINFALL:	145.1 mm	160.6 mm
RAIN DAYS:	33	35
WET DAYS:	24	24
HOURS OF SUNSHINE:	588.5	533.9

AUTUMN WEATHER (Sept - Nov)

Average (1971-1990) 1991

MEAN TEMPERATURE:	10.6°C	11.0°C
MEAN MAXIMUM TEMPERATURE:	14.3°C	14.7°C
MEAN MINIMUM TEMPERATURE:	6.8°C	7.2°C
HOURS OF BRIGHT SUNSHINE:	313.5	302.6
AGGREGATE RAINFALL:	166.5	146.6
NUMBER OF RAIN DAYS:	37	33
NUMBER OF WET DAYS:	27	20
NUMBER OF AIR FROSTS:	6	3
NUMBER OF GROUND FROSTS:	29	30
NUMBER OF DAYS WITH THUNDER:	2	1
NUMBER OF DAYS WITH FOG:	5	10
MEAN BAROMETRIC PRESSURE:	1016.0	1014.1

