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Photographic Heritage
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THE EARLY WOMEN MOUNTAINEERS AND SOME
OF THEIR SUCCESSORS

(Presidential Address delivered on October 3rd 1983)
by Cicely Williams

Nowadays I think everyone knows at least a little about
mountains - but it hasn't always been so. Time was when they
were regarded with fear and dread by those who lived among
them. They were thought to be the abode of evil spirits.
Nothing would induce the alpine peasants to set foot upon them.
In the summer they led their cows to the pastures but in winter
they huddled in their weather-beaten chalets and imagined that
they heard the voices of the damned in the storms that swept
down upon the villages.

Suddenly all this was changed by the arrival of British
mountaineers - the pioneers in the Alps. Between 1845 and 1850
scientists and botanists explored the alpine regions; hard on
their heels came the climbers, eager for untrodden peaks. By
1855 the mid-Victorian poets, with their passion for description,
had sown the seeds of alpine enthusiasm all over Europe. The
Alps became fashionable; several centres became particularly
popular - Grindelwald, Chamonix, Pontresina and, most of all,
Zermatt. There was no other place to which mountaineers flocked
in such ever-increasing numbers.

One of the most remarkable features of this period was the
fact that most of the alpine pioneers arrived in Zermatt en famille.
In an age when women took practically no part in sport and
children were supposed to be seen and not heard, wives and sisters,
sons and daughters not only stayed in the village but sometimes
actually accompanied their menfolk on their mountain adventures.
Some of the ladies took to mountaineering like ducks to water and,
having started, women have never looked back - they have gone on
from strength to strength. It's about some of these women that
I want to tell you tonight.

The first woman climber to make herself famous - and I say
that advisedly because I'm afraid she really did want to become
famous, was a French woman, Mlle. Henriette d'Angeville, who
climbed Mont Blanc in 1838 and was the first woman to do so.
She was born in France in the Reign of Terror but the family
escaped to Switzerland and it was here that she developed a taste
for climbing. But it was not until she was forty-four years of
age that she visited Chamonix and was suddenly seized with an
insatiable desire to be the first woman to climb Mont Blanc.
Some mountain historians advance the theory that she was obsessed with a morbid passion for self-advertisement. We shall never know if this is a true assessment of Henriette; what we do know is that for sheer tenacity she was second to none. Her plan was violently opposed by all who knew her; her women friends burst into tears and swooned, but she remained quite unmoved. Her planning, forethought and attention to detail were quite remarkable. She consulted her doctor and made her Will. She engaged six Chamonix guides and six porters — incidentally most people today seem to manage with just one guide. She was extremely careful to see that provisions for the party were adequate. The list of what she considered necessary was so remarkable that it has been handed down to posterity. Here are just a few of the items mentioned — 2 legs of mutton, 2 ox tongues, 24 fowls, 3 lbs of sugar, 3 lbs of chocolate, a bottle of brandy and a cask of vin ordinaire. It's hardly surprising that she needed six porters. But Henriette's own needs seem to have been comparatively slight; they included a private blancmange in a flask and a few prunes; these items she insisted on carrying herself. Just how to carry a blancmange, even in a flask, to the summit of a major mountain is a mystery which later generations of mountaineers have still to solve.

Her list of required clothing almost rivalled her list of provisions. She was arrayed in red flannel undies and woollen stockings; scotch tweed knickerbockers lined with flannel and a blouse of the same material. One has always to reckon with sun and wind, intense cold and scorching heat when climbing so to combat these extremes she had a bonnet and a straw hat. A fur-lined pelisse and an alpenstock completed the picture. Her appearance must have been impressive — not to say unusual.

At 6:00 a.m. on the great day she was ready to be off. She had not failed to give public notice of her departure; crowds of visitors were up early to see her off and some soldiers stationed nearby turned out to salute.

During the course of the first day she climbed well and by nightfall the party had reached the Grands-Mulets and pitched their tents. Early next morning they were off again; but the difficulties proved to be much greater. At the foot of the great ice wall poor Henriette suffered palpitations and mountain sickness. For another four weary hours she staggered on, pausing for breath, every few minutes. Only her strength of will kept her going; at one moment she even asked the guides to drag her body to the top of the mountain if she died before she got there. Mercifully she survived and, as she explained later, the instant she stood on the summit she recovered miraculously. She forgot all her troubles, she was utterly lost in the incredible wonder of the mountain world around her; her sense of peace was complete. You may think this sounds phoney and fanciful but I can assure you that every
dedicated mountaineer from that day to this has had similar experiences on even the smallest peak. Perhaps that's the reason why we climb.

The guides, of course, were delighted with Henriette's success and the whole party waved furiously to the crowds whom they fervently hoped were watching down below in Chamonix. A night was spent under canvas on the Grands-Mulets on the descent and on the following day Henriette made a triumphal entry into Chamonix. Never before or since in the annals of mountaineering has there been such a saga; parts of it are reminiscent of comic opera. It has to be admitted that the first ascent of Mont Blanc by a woman bears little resemblance to the great traditions which have since been established by later women climbers. Nevertheless it's a story worth telling. Henriette d'Angeville continued to climb for another twenty-five years; she became much more normal, much less publicity-minded and she climbed her last peak at the age of sixty-nine - clad in a crinoline!

The years went by and during the 1850s and 60s most of the great alpine peaks were climbed for the first time - mainly by men I'm afraid. Then in 1865 came the tragic Matterhorn disaster - about which most of you will probably know. The Matterhorn had defied all mountaineers until at last, on July 14th 1865, Edward Whymper, with three British friends and two Swiss and one French guide, succeeded in reaching the summit. On the way down the rope broke - only Whymper and the two Swiss guides survived. This event shattered the climbing world in Europe and far beyond. Queen Victoria, who could always be guaranteed to be tiresome on such occasions, actually enquired if climbing could not be stopped by law. This suggestion was turned down of course, and gradually the clouds hanging over mountaineering dispersed.

Meanwhile a small, but brilliant, crowd of women climbers had been finding their feet in the Alps; the stage was set for a new era; the Golden Age of women mountaineers was about to begin. Of course it came as something of a shock to mid-Victorian minds to discover that lady mountaineers actually existed; such a thing was quite out of keeping with the current idea of a well-bred young lady. But these adventurous young women were very diplomatic and very unobtrusive and slowly but surely they were not only accepted but publicly applauded.

The very first woman to climb regularly in the Alps, and to this day she is still one of the most famous, was Miss Lucy Walker. Apart from a little quiet croquet she never indulged in any other form of sport - but the mountains captivated her. She climbed essentially as a woman, always in a voluminous white print frock - how she managed it I just don't know. The tragic Matterhorn accident didn't deter Lucy at all; having achieved most of the great peaks in the Zermatt area she decided to try her luck on that mountain. On July 20th, 1871, only six years
after Edward Whymper's disaster, Lucy Walker, with her guide
Melchior Anderegg, climbed the Matterhorn. Of course she became
news at once; a poem in her honour was published in *Punch*, no
alpine gathering was complete without her and she became the
heroine of her generation, accepted by men as well as by women.
Lucy Walker, on her doctor's advice, gave up serious climbing
rather early but for another thirty years she continued to come
to the Alps and in 1912 she became the second President of the
Ladies' Alpine Club at the age of seventy-six. My generation,
of course, never met her but all these years later we are still
aware of her legendary spirit hovering over the world of women's
climbing.

In the 1870s an American lady, Miss Meta Brevoort, arrived
in the Alps accompanied by her fifteen-year-old nephew - a short,
fat boy noted for picking up every disease to which flesh is heir.
Meta Brevoort decided that alpine air was exactly what this
unhealthy child needed. She loved the mountains herself and had
every intention of inspiring her nephew with the same passion.
She succeeded far better than she could possibly have hoped -
that nephew was W. A. B. Coolidge who became one of the most
famous and controversial figures in the alpine world and one of
its most famous historians. Meta Brevoort didn't look much like
a climber; she was heavily-built and slow-moving and always much
encumbered with her clothes. She apparently felt she had to
endure the flannelette drawers and heavily-boned corsets in vogue
at the time; she was always experimenting, but without much
success. However, she and her nephew and their guide Christian
Almer succeeded in climbing almost all the major peaks - many
of them in winter - and on most of their ascents they were
accompanied by their dog Tschingel. Tschingel really deserves
a little mention all to herself among lady climbers. Between 1868
and 1876 this dog achieved sixty-six major peaks and on state
occasions of the Alpine Club she was always present, wearing a
very smart collar festooned with little medallions showing the
names of her peaks. Meta Brevoort and Tschingel finished their
climbing days together. Meta Brevoort died suddenly in 1876;
Tschingel retired and passed peacefully away in her sleep in
front of the kitchen fire three years later. It is always said
that without Meta Brevoort and Tschingel W. A. B. Coolidge would
never have become so internationally famous. He lived for many
more years and was always thought to be rather hard and
unsympathetic by those who knew him. Nevertheless, he kept
Tschingel's famous collar hanging behind his front door for more
than forty years.

About this time Frances Ridley Havergal, the famous
Victorian hymn-writer, came out to Switzerland. She was a frail,
delicate creature even more prone than most of her contemporaries
to attacks of the vapours and similar conditions. But the Alps
opened up a new world to her and she fell in love with everything
she found - the streams, the flowers, the quiet, quaint villages,
the mountain people and, above all, the great snow peaks. She
never achieved spectacular heights but she had the greatest
admiration for the guides and was willing to undertake any
ascent on which they would take her. But only, of course, if
there was another woman included in the party. She wrote to her
mother that she would 'never be so demented as to go on a climb
alone with a guide'. In spite of this attitude she did make a
remarkable first ascent of the year to the Grands-Mulets on Mont
Blanc. She did this in early June, an expedition rated in the
guides' tariff book as a course extraordinaire. I do recommend
her book *Swiss Letters* - it's a Victorian treasure and can still
be picked up in second hand bookshops.

One of the best-known women mountaineers of her own, or any
other generation, was Mrs Aubrey Le Blond. She climbed in summer
and in winter and was an excellent organiser. She was who
founded the Ladies' Alpine Club in 1907 which became, and
remained, the premier ladies' climbing club in the world until
eventually, in 1975, we merged with the even more famous Alpine
Club. Few climbers can have had a less propitious start mountain-
wise than Mrs Le Blond. She was extremely delicate and had to
be sent out to Switzerland to recuperate. This brought mountains
into her life in a big way. Previously, as she said herself, she
'knew nothing about mountains and cared less' - but the views of
the peaks thrilled her so much that she decided there and then
that mountaineering was for her and her subsequent climbing career
lasted for more than twenty years. She began in the Chamonix area
in the 1880s by climbing Mont Blanc and the Grandes Jorasses. Her
Victorian great-aunt was scandalized but Mrs Le Blond turned a deaf
ear and wrote home that she 'owed a supreme debt of gratitude to
the mountains for knocking from her the shackles of conventiality'.

She was an adventurous spirit and with regard to mountains she
was insatiable. Having made no less than five first winter ascents
in the Chamonix area she set off to repeat the process in the
Monte Rosa district of Zermatt. For many years she had the
distinction of being the only lady who had led a guideless party
in winter and in spring. The Zermatt district became for her, as
it has become for many of us since, the Mecca of the mountaineer.
She climbed with the guide Joseph Imboden and his son Roman but, as
one used to mixing in the best society, she at first thought it
entirely suitable that she should also be accompanied in the
mountains by a lady's maid. She was the personification of elegance
and no doubt found a maid a necessity: it has never been made
clear if she insisted on climbing qualifications when she engaged
the girl. However, she was a flexible type and after one of these
treasures had eloped with the courier and another had collapsed
with hysteria when she was a little late in returning from a climb
she decided to dispense with their services altogether. In spite
of her bold approach in many matters Mrs Le Blond loyally obeyed
Victorian standards of respectability. For many years she wore
climbing breeches under her skirt. When the village had been left
behind and the last cow had been passed she quietly removed the
skirt and the guide carried it in his rucksack. Just why she was
so concerned for the morals of the last cow I have never quite
understood. But this ingenious method resulted in an unfortunate situation on at least one occasion. With her guide and a porter she climbed the Zinal Rothorn from Zermatt, intending to make the traverse and descend to the Zinal valley. The Zinal Rothorn is a long and difficult climb as I know only too well. As they approached the first village after the descent the alarm was raised - the skirt had somehow been left on the summit! No compromise was possible; the party re-ascended, rescued the skirt and made a late return to Zermatt. One can imagine the guide's feelings - not to mention his language!

In 1895 one of her guides, Roman Imboden, was killed on the Lyskamm when climbing with another client. Somehow neither she nor Joseph, his father, ever seemed able to enjoy the Alps again. This happens to so many people for one reason or another. When our guide, with whom I had climbed almost since school days, died in 1965 - not in an accident I'm glad to say - neither my husband nor I ever felt quite the same again. We climbed for many more years but somehow a bit of the magic seemed to have vanished. Mrs Le Blond continued to climb in Norway for some years and then her climbing career came quietly to an end. She was the first President of the Ladies' Alpine Club and was re-elected President for 1932/34. She died as she would have wished, while still in office. Neither I nor any of my friends became members of the Club early enough to know her but we have always been very much aware of her - her fame is undimmed, even today.

The Himalayas have been the focal point of mountaineering expeditions during the middle years of the present century, but it isn't easy to realise that they were already being opened up by leading alpinists like Martin Conway and A. F. Mummery before the end of the last century. Even more surprising is the fact that a woman was in the forefront of these pioneer explorations. Fanny Bullock Workman was an intrepid traveller who graduated to mountaineering early in middle life. As a personality she stood alone; she was just - Fanny Bullock Workman. Even her name stands out like a sore thumb; it seems to suggest a rather tough, aggressive, ruthless character. This exactly describes the most important side of Fanny - she was nothing if not a go-getter.

Fanny was American and immensely rich; she was married to Dr. Willis Hunter Workman; it would, in fact, be more correct to say that he was married to her, for she was certainly the dominant partner. They never described themselves as Dr. and Mrs Workman; it was always Fanny Bullock Workman and Dr. William Hunter Workman. Fanny liked it better that way and her 'mild' husband, as he was once described, knew better than to argue the point.

In their early married years they travelled extensively in all directions, almost always by bicycle. This gave Fanny the emotional and intellectual outlet she needed. She was, par excellence, the New Woman of the late-Victorian era; she didn't propose to emulate the male-dominated, housebound female of earlier decades; it was impossible to throw off the shackles at

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home but away in foreign parts, with her husband coasting along behind her, she had unbounded freedom of action and the world was her oyster.

Fanny's outfit was cumbersome beyond belief and her appearance was not improved by the ostentatious topee she was never without. The bicycles of both were festooned with luggage and on Fanny's handlebars was always securely perched, no one knows how, the tea kettle without which she refused to travel.

In 1890 the Workmans pedalled their way to the Karakoram: she was forty and he was fifty-two at the time. The Himalayas made a vast impression on Fanny; they gripped her immediately! Thereafter they dominated her life and she had little time for anything else. Dr. Workman, it goes without saying, acquiesced. Between 1898 and 1912 they visited the Karakoram eight times. In 1899, after a cycling tour of Java, they arrived in Srinagar, the capital of Kashmir, to climb with the famous Swiss guide Matthias Zurbriggen who had already made many ascents in the area with Sir Martin Conway. It was sometimes suggested that the Workmans tended to exaggerate the heights they achieved but no one disputed the fact that in their first season all the peaks they climbed were in the 18,000 to 21,000 ft. range. And it's important to remember that all their ascents were carried out without the assistance of oxygen cylinders.

In 1903 Fanny, with her husband and three guides, climbed Pyramid Peak in the Karakoram. There were doubts expressed by a few as to whether the summit was actually reached but at this stage in history it seems kinder to give Fanny the benefit of the doubt. In 1906 she covered herself with glory by making the first ascent of Pinnacle Peak, 22,000 ft, in Kashmir and no one has ever attempted to disprove this fact. In 1911 she visited the Masherbrum Glacier from Hushe; this was a notable and quite unchallenged achievement - so much so that twenty-seven years later the 1938 British party to Masherbrum named one of the peaks 'Fanny' in her honour.

Among her other interests Fanny was a staunch contender for Women's Rights - the current Women's Lib. would have loved her. Even among the mountains the matter was often uppermost in her mind. Before she left the Himalayas she stood proudly on a pass, which for some reason she had christened 'The Silver Throne', brandishing a banner bearing the device 'Votes for Women'. Just what she thought this solo demo in aid of women's suffrage would achieve in the Himalayas it is difficult to imagine. She did, however, manage to get herself photographed and perhaps this brought hope and renewed zeal to those leading the crusade at home.

Fanny had her weaknesses and her eccentricities but fundamentally her intentions were good. She became a member of
the Ladies' Alpine Club in 1908 and was elected Vice-President for America in 1912. Later generations owe much to Fanny who, decked out in her topee and veil and vigorously flourishing her ice axe was, even in those far away days, blazing the trail which the great Himalayan women climbers of today have followed so successfully.

The outbreak of the First World War put paid to mountaineering as it did to everything else, but when climbing was resumed in the early 1920s women got off to a flying start. They had been emancipated in every way; they had a new status in society, not least in the climbing world. In the past women climbers had been mainly ladies of leisure - artists, writers and linguists. In the 1920s career girls, students, housewives, mothers and school-girls were added to the ranks. One who quickly became, and has remained, really famous was Dorothea Pack who very soon married L. A. Richards, the famous Cambridge don, also a celebrated climber. Together they virtually made alpine history, climbing the most difficult peaks in all parts of the world, including the great North Ridge of the Dent Blanche as the crowning event of their honeymoon. This is still regarded as one of the epic ascents in the Zermatt mountains even today. On a more personal note we had a special interest in Ivor and Dorothea Richards. My husband attended Ivor Richard's lectures in Cambridge when he was reading for his English Tripos and I, at that time, was worshipping at the feet of Dorothea. We never actually met them again for thirty years - until 1961 - by which time naturally their climbing careers were almost at an end and they were just enjoying the simplest ascents. With our guide we were spending the night in a mountain hut in preparation for a climb the next day when we saw an elderly couple slowly descending the last slopes of the Breithorn. Our guide said at once 'Why, that's the famous Richards'! Of course we rushed out to meet them; to our astonishment they recognised us and we spent a marvellous evening together in the hut. I'm sorry to say that Ivor Richards and my husband talked Cambridge until the small hours, but Dorothea and I redeemed the situation by talking mountains in a big way.

Other famous names belong to this period. I expect many of you will have read the books of Freya Stark, the traveller and explorer. She also did great things in the Alps, including the awe-inspiring Marinelli Couloir on the Italian face of Monte Rosa - the first time it had been done by a woman.

To descend for a moment from the sublime to the ridiculous, I and most of my friends began our climbing careers in the late 1920s - frequently reminded by our parents how lucky we were to start so young. Most of us remained very mediocre - but very enthusiastic - but there are a few who became famous and created records and climbed unscaleable heights as others had done before them. There is the Dutch climber, Anna Roelfsema, one of my closest friends; Christine de Colombelle, the first woman to do the north wall of the Eiger; Nea Morin who married a famous
French climber; Loulou Boulaz the great Swiss climber; Wren Robinson who was head girl of my school but unfortunately left before I arrived there - nevertheless we have become close friends. Then there was Miriam Underhill, the greatest of all American women climbers, the first woman to lead an all-women rope to the summit of the Matterhorn in 1932 with no men, not even a guide, in the party. These 'ladies-only' ropes were the great new feature of the 1930s - today, of course, they are regarded as entirely normal. And to mention just one more woman of those days - Ethel Whymper, the daughter of Edward Whymper of the Matterhorn disaster in 1865. She must have been a bit of a late extra because she was not born until 1907, just before her father died, but in the 1930s she was following in his footsteps and her daughter Nigella has now succeeded her.

When the Second World War broke out in 1939 we all knew that that was the end of our alpine climbing for years to come - perhaps for ever. But even in those terrible times the hills were a source of inspiration to mountaineers. We were in London all through the war and during the endless nights of the Blitz I was never without a mountain book to keep me steady - the knowledge that if the war did ever end, and if we survived, the mountains would be waiting for us seemed to give us strength to face up to life as it was then.

The war did end and in 1946 the climbers came crowding back. The ranks were sadly depleted. The husbands and brothers of many of our friends had gone and this led to what has been described as the 'mother and daughter', 'mother and son' era. The women climbers were determined that their teenage sons and daughters should follow in their fathers' footsteps and the Alps were alive with women leading their youngsters - usually without guides. The day I climbed the Matterhorn, in atrocious weather, the only two other parties to reach the summit were Nea Morin leading her son and the fifteen-year old son of the American Miriam Underhill with a guide. I need hardly say they were already on the summit when my guide and I got there.

The next development came when women climbers, and men too, of course, began to widen their horizons. I know you once had Joyce Dunsheath here to talk about her adventures in the Caucasus - she continued to lead all-women parties in that area for some years. But when Lord Hunt's party reached the summit of Everest in 1953 women climbers heard the call of the Himalayas and they responded with the greatest enthusiasm. This delighted Lord Hunt. I was present at his lecture in the Royal Festival Hall after the party returned and he read us a letter which he said was the nicest of all the thousands he had received. It was from two schoolgirls and it said - 'Dear Colonel Hunt - we send our congratulations to the Everest Team. We want to tell you that we have decided we will try to be the first women to reach the summit of Everest, but we think we must wait for a while because we are not yet eighteen'.
Incidentally three members of that famous Everest team married climbing friends of mine; Michael Wesmacott carried Sally Seddon, who has become one of our greatest women climbers; Charles Evans married Denise Morin, the daughter of Nea; and George Lowe married Lord Hunt's second daughter Susan. One hopes this will ensure a succession of keen climbers in the years to come! But that is by the way.

Parties of women climbers soon set out for the Himalayas, driving across Europe and Asia in jeeps and land-rovers to save expense. There were parties to the Jugal-Himal, to Kulu-Lahal and the Hindu Kush, and to Anna-Purna, one of the biggest Himalayan peaks. The biggest women's expedition set out for Cho Oyu in Nepal in 1959 under the leadership of the famous French climber Claude Kogan; it included three British members of our Ladies' Alpine Club. Belgium and Switzerland were also represented and at Katmandu they were joined by the daughter of Sherpa Tenzing who reached the summit of Everest with Sir Edmund Hillary. Pem-Pem, as she is known, is a delightful girl and a fine climber. Sadly this great expedition met with disaster - at 23,000 ft an enormous avalanche crashed down the slope and swept away Claude Kogan and Claudine van der Straten, the youngest member of the party. This was a great grief and a bitter disappointment to all of us and just because this was an all-women party there was unkind criticism of all kinds. But in spite of this women continued to climb in the Himalayas and the next three decades brought many successes.

By the middle of this century many women's climbing clubs had been formed. First and foremost the Ladies' Alpine Club; then the Swiss Ladies' Alpine Club; the Ladies' Scottish Climbing Club and the Pinnacle Club to mention only a few. But in 1968 an international women's mountaineering club emerged. Women mountaineers from ten different countries met at Engelberg in Switzerland to form an association that would promote closer contact between women mountaineers of all nations. Fifty women attended, including several from this country, and all the most famous women climbers of the day were there. This international group was christened the Rendez-vous Haute Montagnes. It has only one purpose - to bring together from all parts of the world those who climb because they really love the mountains. There are two types of membership - 'moderates' and 'tigresses'. I'm a member but you won't be surprised to hear that I am a 'moderate'. Neither can I often attend the meetings. The R.H.M. meets every year in a different country - this year they met in Bulgaria. One of our most popular and talented members is Pem-Pem Tenzing from Katmandu. There is no sense of competition; we meet solely as mountaineers and, above all, as mountaineers who revere and respect the hills - the trendy notion of 'conquering' a mountain has no place in the R.H.M.

And now, having listened so patiently to the long story of women mountaineers, you will want to know if Everest has yet been
climbed by a woman. Well, I'm glad to tell you that it has. In 1975 the enterprising ladies of Japan - and the Japanese are marvellous climbers - were given permission for an all-women expedition to make an attempt on Everest. They succeeded and on May 16th 1975, Mrs Junko Tabei, with a Sherpa porter, became the first woman to stand on the summit of Everest. Since then two more have also succeeded.

Just at the moment, although there are scores of brilliant women climbers scattered all over the world, we don't seem to hear much about big expeditions or first ascents. I think the reason for this is mainly financial - it costs an incredible amount to fund even the smallest expedition. But certainly women climbers will go on and go forward - their future lies in their own hands. They don't lack courage or the questing spirit. The challenge of the hills is always there and women will follow wherever it may lead them - perhaps to undreamed of triumphs. But whatever the future may hold women will always enjoy the mountains - that is the common inheritance that all mountaineers, men and women, have shared down the ages; it's the bond that, in spite of all differences, makes them one. It's the feel of the rope round one's waist, the firm rock beneath your fingers, the crunch of snow underfoot, the response of body and mind to the problem posed and, above all, the sheer exhilaration of being among the mountains that brings climbers back year by year. Climbing calls for all that one has got in perseverance and endurance; but always the mountains give more than they demand; there is beauty and exaltation of spirit in abundance and peace that passes understanding. In the uncertainties of the times in which we live I think modern mountaineers are lucky; the mountains are changeless, eternal. One has only to climb even a small mountain to stand above the chaos, to sense the steadfastness of the hills, to see the world, if only for a fleeting moment, as God sees it.

As so we leave our women mountaineers with their faces set to the future on a path that will always lead them onward and upward.
THE LURE OF THE MICROSCOPE
Brian Bracegirdle

(lecture delivered on 31st October 1983)

The microscope is a universal symbol of science and
medicine on the screen and in advertising for example, and
it is certainly true that it is the closest instrument we
have to one of universal application. Man relies very heavily
on sight for information about his world, and the telescope
(to magnify tiny objects far away) was invented about 1600 at
the same time as the microscope (to magnify tiny objects
close by). By the middle of the 17th century the compound
microscope (which uses two separated lenses to produce its
image) was well known. In 1665 Robert Hooke published his
book *Micrographia* which included superb large plates showing
magnified views not only of common objects such as the edge
of a razor, but also the first ever picture of what we still
call cells. No doubt inspired by this volume, Antoni van
Leeuwenhoek, who was a linen draper of Delft in Holland, used
very powerful, simple microscopes (magnifying glasses) to
make astonishing discoveries for half a century. He was the
first to describe bacteria and many other things, and it is
interesting to see human blood and materials such as cork
magnified with one of his own instruments. His original
letters still survive in the archives of the Royal Society,
and some of the drawings sent with them are remarkable not
only for their scientific content but also for their beauty.

In the 18th century the compound microscope was developed
into a series of models of greater or lesser utility, but all
providing poor quality images by modern standards. "Sliders"
were provided for the amusement of the wealthy for whom the
instrument was a drawing-room recreation. These sliders
contained several specimens mounted dry between pieces of
mica. Many of the specimens were thin slices (sections) of
timber, and their popularity may have been largely the result
of work by John Hill. His book on timber was published in 1770
and featured a "section machine", which we would now call a
microtome. Examples survive and still cut quite adequate
sections of timber. Hill also invented the world's first
automatic microtome and this also was an interesting device,
but about a hundred years ahead of its time.

By the beginning of the 19th century opticians had improved
the quality of the image produced by the microscope and by 1840
both the mechanical and optical parts had been developed to a
sufficiently high standard to allow proper scientific research
to be conducted. From the 1840's onwards many examples of
preparations ("slides"), largely intended for the amateur, have survived. These enable us to use them with microscopes of their time to judge exactly what our forefathers could see in the microscope. The amateur market, especially in England, was a large one and many thousands of preparations are still available on the open market for those with an interest in the very small. Many examples could be quoted, but among the most famous preparers were C. M. Topping (from about 1840), Alexander Hett (from about 1848), A. C. Cole (from about 1860) and J. T. Norman (from about 1850). The range of specimens included in the slides produced by these and many others is staggering. They can still be informative even today and many would have to be described as beautiful. Examples would include human and animal tissues prepared in every conceivable way, scales from butterfly wings arrange as pictures, many diatoms (which attracted attention because of the fine markings on their surfaces, acting as a test of the resolving power of an instrument), and many different kinds of minerals, ground thin enough to see through.

The machines used to produce thin sections of tissues, microtomes, developed in parallel with the microscope itself, as did the technique for preserving the tissues and colouring them. Probably the most important microtome ever invented was the Cambridge Rocking Microtome, first sold in 1885 and still on sale in modified form today. By about 1890 both the microscope and the means of preparing specimens for it and theoretical knowledge to understand the images produced were all well enough developed to allow the brand new science of bacteriology to develop. This would have been impossible had any of the strands of knowledge and technique been absent, and medical science and the health of everyone in the world would have been immeasurably the poorer.

The microscope can be used with various kinds of illumination. It is rare nowadays for the illumination to be reflected back from the surface of an opaque object. Almost always we see the microscope image in much the same way as we see a stained-glass window from inside a church. The latest advances in illumination for the microscope enable us to combine a rendering of fine detail virtually at the theoretical limits, together with colour contrast of a vivid and very informative kind - but he would be a foolish man who said that the instrument has now reached its peak of perfection.

Thus developed, the microscope is, as we have said above, the universal tool of science and medicine. Many modern discoveries about the nature of all kinds of things have been made by its aid, and will clearly continue to be made. To attain higher magnifications the electron microscope has been developed, but the light microscope remains supreme for the study of living cells and their contents. Apart from this universal scientific use, however, there is still a strong
amateur following of the instrument.

To some extent the amateur can still make original discoveries with the aid of his microscope, for example in identifying new species or at least new features of various kinds of animal and plant life. As a recreation the use of the microscope is booming in popularity once again, just as it did with our Victorian forefathers. It is both pleasurable and instructive to prepare one’s own specimens for the microscope, and certain clubs and societies exist to foster such interest, the Quekett Microscopical Club being pre-eminent among them.

In one way especially the microscopist can create scenes which simply are not visible in ordinary nature. This is when he takes some crystals, of all kinds of varied substances, and uses his microscope with polarised light to inspect their structure. The most vivid results are obtainable, far surpassing any interplays of colour and form in nature and such a display of results may be thought to be a fitting conclusion to a discussion on the lure of the microscope.

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The National Photographic Record is a Department of The Royal Photographic Society. It is concerned with the preservation and recording of photographic collections as archives. Britain possesses relatively more photographic collections than any other nation largely because photography as practiced today owes its origin to the discovery of the negative-positive process by an Englishman, William Henry Fox Talbot in 1834. The oldest surviving negative, of a window at Lacock Abbey, Fox Talbot's home, is dated August 1835. Many of these early 'Talbotypes' are preserved at Lacock. The recording of such collections materially assists in their preservation. Unfortunately, many irreplaceable collections have been lost or destroyed because their significance was not apparent at the time. An example is the Francis Frith collection, one of the largest and best records of urban and rural life in 19th Cent England. Although part of this collection remains, a few years ago the firm's own employees smashed with hammers thousands of the earliest, and now extremely valuable, glass plates, and mixed the pieces with concrete to make the floor of an outhouse. Had this collection been properly recorded in print it is much less likely that a substantial proportion of it would have been destroyed.

It was considerations such as these which led to the convening of a Conference at the London home of the R.P.S. in March 1972. The delegates came to the conclusion that whilst there were a number of photographic collections of topographical interest in danger of destruction, deterioration or dispersal for want of a suitable home, nevertheless the time was not ripe to try to establish a 'central photographic archive'. Nevertheless there was a prior need to record existing photographic collections, in order to identify those under threat, and areas where photographic records were lacking. The Conference accordingly resolved that a Register and Index of Photographic Records should be compiled, and the R.P.S. agreed to take this on board. Providentially the proposed Register, renamed The Directory of British Photographic Collections, came to the notice of the Sunday Times which adopted it as a worthy cause, ran a series of articles illustrated by twelve reproductions of historic photographs from the R.P.S. permanent collection, and sponsored a fund which raised £16,000 to put the N.P.R., reborn in 1973, effectively in business.

At the time there was no single, up to date, comprehensive reference work devoted solely to photographs as such. The N.P.R.
therefore broke new ground, and was required to devise some novel techniques in order to achieve publication of the Directory. Standard questionnaires were devised and despatched to 17,000 known owners of every conceivable category of photographic collections. The completed Directory features 1600 of the most significant, each entry recording details under 13 headings, of which the most sought-after is subject-matter. Because the Directory is subject-ordered the N.P.R. had to devise an entirely new subject classification system, analogous to the Dewey Classification system for the book-form, but specific to photographs, and computer compatible. The N.P.R. system has since been adopted by other photographic institutions both at home and abroad. The Directory also includes detailed Indexes for Subjects, Locations, Owners, Titles and Photographers.

The task took four years with an office staff of four and the Directory was published jointly by Heinemann and the R.P.S. in November 1977. Since that date the information acquired (of which the Directory represents only the tip of the iceberg) has been utilised as the basis for an enquiry service to deal with queries about photographic collections of every kind. The files also enable the N.P.R. to identify those areas which are photographically well documented and represented by the many excellent specialist archives in Britain. By the same token the N.P.R. is able to identify areas which are not catered for by specialist interests, and which fall between them, in particular 'Social Studies' - objects and events of everyday life which go unrecorded because of their everyday familiarity. The N.P.R. has taken a leading part in advocating the establishment of a National Photographic Archive to undertake this function, among others of pressing importance.

Regrettably the present financial cutbacks in both local and national government spending bode ill for expansion. This is especially true of that large part of our photographic heritage which is in the care of the local authorities, where the situation was already critical when the Directory was published in 1977. A more recent threat to the integrity of some important collections is posed by the government's plan to disband the metropolitan counties and the G.L.C. There is a real possibility that these collections, or at least their administration, may be divided and dispersed among their constituent Boroughs or Districts, with all the impediment to access and to scholarship which could result.

The injection of commercial capital into the photographic collections field is not necessarily the best solution. There has recently been a disturbing tendency for government or quasi-governmental agencies (such as the British Railways Board) to try to sell off important archives to commercial companies because of the cost of their maintenance and upkeep. There are
severe drawbacks to privatisation of this kind, not least restrictions on public access. A possibly more alarming prospect is that the sale by auction of private collections in Britain may so appreciate the value of historic photographs as to put them beyond the purchasing power of British Institutions. The enormous potential purchasing power of the J. Paul Getty Museum Trust in America qualified it as both the cause and the principal beneficiary of this unwelcome development. The export licencing system for works of art is no guarantee in the long term against this ebbing away of Britain's photographic heritage, sometimes even before it can be properly recorded.

Nevertheless there are some encouraging signs. Interest in photography and photographic collections is growing apace. Facilities for public participation and enjoyment are expanding. For example, The Art of Photography Gallery has recently opened in the Henry Cole wing of the Victoria and Albert Museum; the National Museum of Photography, Film and Television has opened in the Wardley Theatre in Bradford; and The National Photographic Centre at the Royal Photographic Society's new home in Bath.

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In the past the father of a family was clearly considered as giving to a child unquestioned, assumed parentage. Things are changing due to social moves and advances in medical science. In the future an increasing number of children may ask "Who is my father, Dad?".

As an Obstetrician and Gynaecologist I have been made aware of marked changes in the social and marital background of patients since I qualified thirty years ago. Socio-economic poverty used to be the problem whereas nowadays insecurity and social instability seem to be prevalent. Social changes and medical intervention by artificial insemination and in vitro fertilisation has meant that children may not be able to identify their father with certainty.

SOCIAL CHANGES

These are mainly reflected in an increase in the divorce rate, a continuing high illegitimacy rate and the replacement of marriage by the "stable relationship".

There has been a six-fold increase in divorce in the past 20 years (25,000 in 1961 to 146,000 in 1981). One marriage in three now ends in divorce. The earlier the age of the couple at marriage the more likely it is to break-up. With the greater tendency of teenage marriages there is a greater chance of divorce and it is now reckoned that only one marriage in every two involving teenagers will remain stable. With the increase in the divorce rate there is a greater chance that one or both partners will re-marry. This may lead to a second family with another partner and so couples will have living with them children who may not be the offspring of both of them. This will undoubtedly lead to confusion in the minds of the children and some will not know whom to call father. Seven out of ten divorces involve children and it is considered that one in every five children born will experience the problems of parental divorce before they are sixteen. Of all legitimate live births 6.7% were to women who had remarried and this is double what it was ten years ago.

As well as an increasing number of marriages breaking-up there is an increasing number of babies born to single girls or to couples having a relationship other than marriage. It is difficult to define what a stable relationship is and why girls who get pregnant during such a relationship find themselves frequently without support by the time baby is born. In 1982
more babies (52%) were born illegitimate to mothers under 20 than legitimate.

In Leicestershire where there are over 11,000 deliveries every year, the number of children involved in divorce annually will be about 2,000. Add to that the number of possible single parent families and those whose relationships break up and we are probably talking about 3,000 children a year who will have problems finding the true answer to "Who is my father?" and they are certainly unlikely to be living with him.

It is difficult to see what can be done to change this and people will argue that it is of little relevance in modern life, but the security of identifying with parents can be of the utmost importance and if this is undermined, social and psychological problems for the child are bound to occur. Medical problems in obstetrics are not nearly so common now as they used to be but they have been replaced by social problems which may be impossible to solve. Young women in their early twenties may have three or more children, all by different fathers, and living either on their own or setting up yet another temporary "stable relationship". The problems of their children, who may well be identifying themselves with a "new father" almost annually are obvious. Such children, brought up in insecure surroundings, must strive themselves for a "stable relationship". This then leads to their seeking such a relationship as soon as possible which is probably just after the age of 16 and the problems in the next generation become compounded.

MEDICAL ADVANCES

Medical intervention occasionally obscures the true father of the child but the numbers involved are small.

Artificial insemination by a sperm donor is used when the husband of a marriage is found to be sterile or carries a defective gene.

About 1000-2000 babies are born each year in this country by this means. It is not a technique which is universally accepted and has been termed "adultery at a distance" or "conception without connection".

Anonymity of donors must be guaranteed which prevents a register being kept but such a donor must have no rights to the child consequent to the donation. Before artificial insemination a couple should have adequate medical, social and psychological counselling. Those involved must be satisfied that the couple are suitable even though the right of the medical profession to select or reject couples, single women or sexual deviants has been challenged.
Once a child has been conceived by artificial insemination it should be up to the parents how much information is given either to medical practitioners, relatives or to the child itself.

In law the child conceived by artificial insemination remains illegitimate. In fact, the mother's husband often registers the baby in his name but by law he is giving false information and could be liable to prosecution. It has been suggested that it would be better to do away with the terms legitimate and illegitimate and to have a term "accepted child" which means that by registering the child a father confirms his responsibility for that child even if he is not the true father. Should the child conceived by A.I.D. be made aware of the circumstances of his birth? Where the marital father has been a carrier of genetic abnormality the explanation may come easier. Otherwise, it can be left alone. To compare the situation with adoption could be misleading since in these circumstances adoption does not take place until after the birth and neither parent has a genetic relationship with the child, which one, at least, has in A.I.D.

The secrecy surrounding artificial insemination is disturbing to many people but it is such a small percentage of total births that surely it is up to parents to decide on the lengths they go to meet legal requirements and the extent they wish to maintain secrecy.

In vitro fertilisation has fewer ethical problems, at least at present, than A.I.D. However, in the future it is possible that fertilised eggs may be implanted into a woman who has not donated the ovum. This gives rise to children having a genetic mother, i.e. the one from which the egg was taken, and an environmental mother, the one who supplied nourishment for nine months.

The possible consequences of further development in this field are difficult to comprehend and will complicate society even more. Not only may children doubt who their father is - they may have to accept two different kinds of mother.

**CONCLUSIONS**

Problems of identification of parents by children have become more common in the past 20 years and their consequences have not been fully appreciated. The social changes are much more worrying because of the numbers involved.

Research into the outcome of the so called "stable relationship" is necessary. If it is more stable than marriage then we may have to reconsider the benefits of marriage as a social institution. There is no doubt that the less stability a child has the greater will their desire be to achieve some security in the future. How can we prepare teenagers for marriage, or
relationships that last? Children tend to follow the lead of their elders and if their elders change partners so also will the children. People both young and old must be responsible for their actions. In modern life this is never emphasised. Procreation of children involves two people, however it is achieved, and, therefore, responsibility for the offspring must be theirs and changing of partners must be seen as a rejection of that responsibility. Divorce should not be made unduly difficult or relationships considered always permanent but we must break away from the rapidly growing assumption that changes only effect the couple involved and that children can adapt to any environment. Should we revert to the herd and do away with family life altogether? Attempts at establishing such communes have not met with success.

It is doubtful if we shall ever get back to unquestioned assumed parentage but for the future we must try.

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GEMSTONES

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(Lecture to joint meeting of the Society and the Geology Section
delivered on 20th February, 1984)

The only feature which characterises minerals which have
gem varieties is their suitability, which depends mainly on
beauty and durability. For beauty it is fortunately not
possible to offer scientific criteria, but durability when
expressed in mineralogical or gemmological terms means that
the mineral or stone must not be too soft (in practice greater
than 5 on Mohs' scale of hardness) and must not have too good
a cleavage or tendency to split along certain planes. It should
be noted, however, that diamond cleaves rather readily parallel
to the octahedral faces and indeed could not be easily fashioned
into a cut stone were it not for this weakness parallel to its
direction of greatest hardness.

From the commercial point of view the most precious stones,
and those which best hold their value, are diamond, ruby,
sapphire, emerald and opal; most of the other gemstones suffer
under the rather unfortunate name of "semi-precious stones" and
their value fluctuates according to fashion. Thus in Victorian
times agates were in great demand and fetched a good price
whereas in the mid-twentieth century their silver mounts were
prized more than the stones themselves.

Two other matters which affect the value of a gemstone are
its rarity and - for coloured varieties - the exact hue and
depth of colour. Thus a sapphire to be prized should be corn-
flower blue and not so dark as to appear virtually opaque.
Another factor which is now important is the modern manufacture
of synthetic stones - not fakes or the more cunning simulants,
but man-made copies of the real thing differing principally in being
too perfect. It is a truism to say that the vast majority of
natural gemstones have minute or microscopic flaws or impurities
of one sort or another (and the modern trickster has had to devise
ways of making his synthetic stones equally impure). So here we
come to a slight ethical dilemma: a one carat deep-red Burma ruby
might cost £1,000-£5,000 whereas a cut synthetic ruby of the same
weight could be obtained for less than £1.

The derivation of the international unit of weight for
gemstones, the carat, gives an interesting insight into the long
history of gem trading. Dealers could not afford to trust the
weights produced by other dealers with which to weigh and price
the stones, and likewise their own weights were similarly
distrusted. A solution was found in the seeds of a tree grown in those Mediterranean lands which saw the development of gem trading some 2000 years B.C. The seeds of the locust bean or carob tree (*Ceratonia siliqua*) were shown to be remarkably uniform and the term "carat" is derived from their name. It is now defined more precisely as 0.200g. (The use of the term with reference to the purity of gold is of more recent origin and comes from the original weight of the Roman gold coin named *solidus*; the content of fine gold in this coin was later reduced from 24 units to 20½ and later to 20 and 16). Thus we are dealing with items selling for up to £1000 for 1/40th of an ounce and with such high monetary values all forms of trickery and simulation have been rife for centuries.

One of the earliest methods of faking was to use coloured glass (known in the gem trade as "paste"). This led to the use of refractometers in gemmology, instruments for measuring the refractive index of cut stones. The refractive indices of normal glasses are much lower than those of most gemstones; they can be raised by the addition of lead or thallium to the glass but the latter then becomes noticeably soft. A swifter distinction of paste can be made by an experienced gemmologist by its being warmer to the touch than a real gemstone - scientifically this is the result of the greater thermal conductivity of the crystalline gemstones compared to glass.

Another universal and simple test is that of hardness. Mohs' scale grades all minerals from 1 (talc) to 9 (corundum) and 10 (diamond): glass, being a metastable state - a liquid, typically has a hardness of around 5½ (so the market trader's statement that "it must be diamond - it scratches glass", is a particular non sequitur). When testing the hardness of a gemstone though, it is important to start with a standard which is definitely softer and work up to harder materials, and also to scratch the gemstone in an inconspicuous place. It is bad enough to have to shatter someone's illusion that their stone is a valuable ruby, without returning it to them with a large scratch-mark across the table facet!

There are two facts that everyone knows about diamonds: it is the hardest natural crystalline substance known and when cut as a gemstone it displays an intense "fire", i.e. strong dispersion. This property of splitting white light into its spectral colours is shown by most transparent materials. In the extreme case of diamond which has a refractive index of 2.451 for violet light and 2.407 for red light, the dispersion has the value (the difference for these two wavelengths) of 0.044. Geometrical consideration of the path of a ray of light through a gemstone will show that the greater the distance of the light-path within the stone, the greater the apparent dispersion observed on the exit of the light. Thus to obtain strong "fire" firstly the gemmologist must use a stone with a high dispersive power (e.g. diamond), and secondly the stone must be so cut and faceted to
give the longest possible light-path, and thirdly the cut must be such that light entering through the main facet is refracted and reflected and eventually returns, showing maximum dispersion, cut in a suitable direction to catch the eye (Fig. 1). The proportions of the various facets and the angles between them to obtain maximum brilliance are unique for the diamond; they are different for other materials with different refractive indices.

Fig. 1. A typical light-path through a brilliant-cut diamond, showing dispersion and total internal reflection.
Although diamond is the gemstone with the greatest dispersive power, other brilliant stones are to be found in synthetic materials. Thus synthetic rutile (TiO₂) has a dispersion of 0.280, i.e. six times greater than diamond. It is, however, never obtained in a completely colourless state, being slightly milky, and it slowly becomes oxidised to light yellow. Some 25-30 years ago the synthetic compound strontium titanate was produced: this is water clear, has a refractive index of 2.41 and a dispersion of 0.19, i.e. four times greater than diamond. It presents such a fabulous appearance of fire and brilliance that it is marketed under the tradename of "fabulite". This material is a real danger to the public but a potential purchaser has to remember that it looks too good; it presents too much fire for a diamond. As always if one thinks a bargain is to be had in gemstones, that is the time to stop and think; one almost never will be offered such a bargain. One pointer here is that the hardness of strontium titanate is only 6. But alas one cannot test a cut stone for hardness in a jeweller's shop; even if it is examined with the aid of a hand lens suspicions will be raised that some sleight-of-hand and substitution may occur. The only solution here is to put one's faith in a High Street jeweller (preferably an F.G.A.) whose trade depends on his knowledge and reputation. More effective diamond simulants now include cubic zirconia with a hardness of 8½ and a dispersion of 0.04. To distinguish these materials, the gemmologist must have recourse to electronic instruments which rapidly measure the thermal conductivity or other distinctive physical property.

The synthesis of gem materials can really be said to have started in 1877, when Verneuil found that corundum (Al₂O₃) synthesized by him in an oxy-hydrogen flame at around 2000°C could be produced as ruby by the addition of some 1% Cr₂O₃. Sapphire was first synthesized in a similar fashion (1902) by the addition of Fe₂O₃ and TiO₂; green stones have been produced by adding vanadium and yellow stones by adding about 3% NiO. Synthetic emeralds have been produced since the 1930s; in general they are simply too good compared with most natural emeralds which typically contain abundant bubbles and inclusions of all sorts, though the synthetic stones have characteristic veil-like inclusions. Synthetic gem diamonds have now been produced by the General Electric Co., of New York, but have proved too expensive for commercial jewellery (synthetic industrial-grade diamond grit is now readily produced and 30-400 mesh material has been sold for as little as £2 per carat). Synthetic opals, the last of the "big five" to be produced, have recently come on the market but are somewhat unconvincing on close inspection.

An early form of simulation lay in the production of doublets or triplets. Initially, a doublet purporting to be of ruby for example, consisted of a thin layer of precious ruby
cemented to a base of relatively worthless, colourless corundum. Unmounted, the join was easily visible, but when mounted in a ring, the metal shielded the join and the brilliant colour of the ruby flooded the whole stone with red light. Any tests as to hardness or crystal structure, etc. were useless as ruby is merely the red gem variety of the mineral corundum. However, careful examination could reveal the presence of the intermediate cement layer, by the presence in it of microscopic bubbles. Other doublets use synthetic corundum or more commonly synthetic spinel (MgAl₂O₄) as the base. A triplet may consist of two such layers of spinel with a sandwich filling of green glass, simulating an emerald. For most such stones, the natural materials (ruby, sapphire, emerald) contain microscopically observed straight growth lines or inclusions arranged in a hexagonal pattern (reflecting the symmetry of these minerals) whereas any synthetic phases have curved growth lines and contain tiny air bubbles.

The cause of the play of colours shown by precious opal is now known to be layers of closely-packed minute silica-spheres which produce a diffraction grating effect. Thus the colour of opal is a surface phenomenon; if one looks through an opal it has a dirty yellow appearance. In view of the cost of precious opal it has thus become the accepted practice to cut thin slivers of the material which to be easily mounted are then stuck to a layer of black plastic thus giving an opal doublet. In addition, to safeguard their polished surface, opals may be topped by a layer of quartz, forming an opal triplet. (Note: this is a correct way of conserving a scarce and expensive material and not to be confused with the doublets and triplets in the simulants mentioned above).

Diamonds were known to the Romans, but they used them only as hard stones or abrasives. They are first recorded in use as gemstones in the XIV century, but were not considered of exceptional value or interest. Their fortunes changed following the discovery of diamonds at Jagersfontein, near Kimberley in South Africa, in 1870. Here diamond occurs in the "blueground" overlying fresh kimberlite and amounts to only 1 part diamond for 2 million parts of blue ground. As was the custom, each prospector was allowed to work a 20 square feet claim (at a charge of £20/month). By 1874 a series of cables was rigged to allow direct access to each claim but after two years the whole complex was bought out by Cecil Rhodes and De Beers and eventually became the Kimberley "Big Hole", until recently the deepest open hole on Earth. Ever since the Kimberley diamond find, the price of gem diamonds has tended to rise steadily due to the development of a powerful and effective cartel. During the Second World War, one item the Soviet Union was forced to import were industrial diamonds. Since the war, some 5000 geologists have been trained in the U.S.S.R., a good proportion of whom were sent to Siberia - to prospect for diamonds. Some 25 kimberlite pipes have now been
discovered and the Soviet Union is now not only self-sufficient in diamonds but exports to the West. Indeed more than one quarter of all gem diamonds on sale in London and Amsterdam are of Soviet origin. They could effectively challenge the pricing of international markets but it is the Soviet interest to maximize their hard currency earnings by maintaining the price levels.

In conclusion, in the harsh commercial world of gemstones it is evident that bargains are rare. On the other hand it must be remembered that the "value" of a gemstone, rough or cut, is simply what somewhat is prepared to pay for it. The true value lies in the beauty, symmetry, colour, and other properties and their proper appreciation and enjoyment.

Selected Bibliography:

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THE BLACKBROOK STORY

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Those who read "The Hallgates Story" in last year's Transactions will be aware of the connection between this article and the accompanying one by Dr. Helen Boynton. The "Blackbrook Story" is the story behind the dam and how it came to be built. It ends with reference to the Diseworth earthquake of 1957.

The reports prepared by the advocates of the dam, on which this article has drawn, give a fascinating insight into seldom-published aspects of the social history of the second half of the 19th century and a lifestyle experienced by the grandparents, and parents even, of many of us. These were not always "the good old days" we were led to believe.

The Blackbrook Story begins in 1797 when the first dam was built by a Mr. Jessop; its purpose was to supply water to operate the Charnwood Forest Canal. The canal in turn had been constructed as a means of transporting coal from the mines at Coleorton to a tramway at Nangantam, from there to be taken to the Coal Wharf on the Derby Road at Loughborough. The tramway itself seems to have been noteworthy as being "the first smooth line railway in England adapted for flanged wheels" (G. & F.W. Hodson, 1898). Mr. Jessop's attempt at dam-building seems to have been no more than a large scale version of a child's on some holiday beach, for it was carried away by the first flush of storm water in 1799. A contemporary account of the dam burst is given in Appendix 1. Repaired in 1801 it failed again and the canal was later filled and converted into a railway. (G. & F.W. Hodson, 1898 and c.1902; Smith, 1971). Plate 1 was taken of the site many years later. Plate 2 shows the breach in the old dam.

The next development occurred some 50 years later with the passing of the Public Health Act of 1848. This set up Local Boards of Health throughout the country, including of course, one at Loughborough. In many instances, as in Leicester, the new Local Boards were able to give priority to sewerage and sewage disposal, rather than to piped water supplies. There was an undoubted need, as the extracts of a report published in Appendix 2 show. Elsewhere, but not in Loughborough, private water companies were already providing piped water, or were shortly to do so, in many of the major towns and cities. So it was that the Loughborough Local Board included both water supply and sewerage in their earliest deliberations. In 1868, G. Hodson, Surveyor to the Board, mentioned that a Mr. Lee, Engineering Inspector to the General Board of Health, had reported favourably on a scheme as early as 1850. This scheme was resubmitted in 1851 to the Board
by their then Surveyor, Mr. G. W. Stevenson, and figures yet again in another report prepared by Thomas Hawksley (1852). The latter was an eminent Consulting Engineer of his day, engaged at the time in the building of the Thornton Dam for the Leicester Waterworks Co., and later to build Cropston Reservoir for them. He specialised in both water supply and sewerage schemes.

Hawksley's report is still available in full, and is essentially a feasibility study covering both drainage and water supply. In his view, the two were inseparable for Loughborough. He recorded that "nearly the whole of the liquid refuse of the Town is carried away to the R. Soar by three brooks or open drains which are frequently stagnant" and that "much of the subsoil (of the town) and the cellars are waterlogged".

As regards water supply, Hawksley said "the Town waters" (generally from wells) "are excessively hard and loaded with Carbonates and Sulphates, particularly the latter" (a drink therefore akin to taking Epsom or Glauber salts!) and adds "although clear and apparently agreeable, contains a very notable quantity of matters obviously derived from impurities incident to a town population, and not from mere natural or less disagreeable sources." Hawksley was clearly a diplomat, with an elegant turn of phrase. He suggested that water could be drawn from the Wood Brook, but that this would necessitate an impounding reservoir to tide the town over through periods of dry weather. He concluded by saying that no sewage system in Loughborough could be made to perform properly without artificial flushing with abnormal quantities of water. He recommended immediate action to allow an enabling Bill to be put before Parliament in the next Session, giving estimates of £7,000 - £8,000 for the Blackbrook scheme, £11,000 - £13,000 for the Wood Brook scheme, with overall expenditure not exceeding £20,000. This would have been slightly less than £2 per capita, roughly 4 weeks wages for a manual worker. To put this in perspective, in today's terms, that would be of the order of £150 - £200 million for Leicester, or £30 - £40 million for Loughborough, which possibly helps to explain the Board's reluctance to proceed.

No doubt the matter was raised frequently over the years, but nothing actually happened in regard to water supplies until 1866 when a limited liability company was formed with a view to developing a scheme based on the Black Brook (Hodson, 1882). This seems to have stung the Board into action, partly because they considered that the scheme, which ultimately would have to be paid for by the townsfolk out of water charges, was unduly extravagant, but partly and worse, the company's charges would be set to ensure that the shareholders would reap substantial profits.

The consequence was that the Board commissioned yet another report, this time from James Simpson C.B., ("one of the most eminent authorities in the Kingdom"). Simpson (Hodson, 1882) recognised the value of the Black Brook scheme proposed by the
company, but chose to recommend the Wood Brook scheme on the basis that the former was unnecessarily large, and the cost more than the town could afford. He considered that there was no likelihood of growth of either population or industrial activity to justify the larger scheme, but hedged his bet by recommending that the Wood Brook scheme be developed at an elevation to permit augmentation from Black Brook if circumstances necessitated.

How wrong Simpson was in his forecasts, and how right in providing for a fall-back, for in 1882 "... what seemed so improbable in 1866 has now become an established fact, the population has increased by nearly 40%, and the water has been found so beneficial on sanitary grounds and so essential for certain processes of dyeing and other trade purposes, that of total supply sent to the town during the prolonged drought of last year one-sixth of the whole quantity was taken by three trade customers ...") (Hodson, 1882). Remember, this would be only eleven years after the commissioning of the Wood Brook (Nanpantan reservoir) scheme, and despite Simpson's calculations as to its capabilities having proved, if anything, conservative.

As it happens, Hodson had reported to the Board in 1878 that the demand on Nanpantan was such that the yield would not be adequate in the event of a drought, and that a further scheme was needed. Nothing had been done by 1880 when he seems to have resigned his appointment as Surveyor to the Local Board, to set up as Consulting Engineer with his son(?), Frederic Hodson.

At the beginning of 1882, the Local Board commissioned Mr. F. M. Eaton, C.E., an official of the Sheffield Waterworks Co., to advise them on the best way of augmenting Loughborough's supplies of water. His report favoured further development of Wood Brook using additional reservoir capacity, in preference to a Black Brook scheme, on the grounds that the latter would be costly for the additional benefits to be gained therefrom. He chose to plan for a population of 18,000 "40 years hence". At that time, Loughborough's population had increased slowly from 1841 (10,025) through 1851 (11,192), 1861 (10,830), 1871 (11,456) before exploding to 14,611 after 10 years of decent water and improved sewerage, and his forecast seemed unacceptably low to at least one person, namely George Hodson.

George Hodson seems to have been a quite remarkable man, fiercely loyal to his home town. Having quit the service of the Local Board, he had soon been elected to serve upon it as a member. It was in that capacity that he chose to address a substantial personal report to the rate-payers of Loughborough, printed in Leicester, presumably at his own cost. His motivation appears to have been a mixture of personal and professional concern for his township, for at the end of his 1882 report, he offered to supervise (and subsequently did) the construction of the Blackbrook dam, foregoing the substantial fee, then around £365, rather than resign his seat on the Local Board, as the terms of office would have required him to do.
His report convincingly destroyed that submitted by Eaton, and incidentally called into question figures supplied to the Board by a Mr. Baker, who appears to have succeeded him as Surveyor. Hodson made the case for developing Blackbrook in two stages, first by piping water to be used conjunctively with the existing Nampantan/Wood Brook scheme, then later if needed by constructing additional reservoir storage. He envisaged a town population of around 30,000 in 1923 (i.e. 40 years on), and a scheme which if added to the existing one, would suffice for 70,000 at the then level of consumption. One hundred years later, that population has about been attained, although per capita consumption including trade use has more than doubled.

The Board's response was to commission in 1883, Professor H. Robinson to report upon the Wood Brook scheme alone. He estimated that with additional reservoir storage, a population of 25,000 could be supplied with 25 gallons per head per day. Some exploratory work was started, but soon abandoned when it was realised that the forecast yield could never be met.

Time passed with no decision, then 1884 gave rise to a drought that emptied Nampantan reservoir and led to the town becoming totally dependent on what water remained in the Wood Brook augmented by water which could be abstracted and filtered from Burleigh Brook.

This experience forced a decision finally to go ahead with the Blackbrook scheme. By now, however, Leicester Corporation was also needing to augment resources, and in consequence, both Loughborough and Leicester were negotiating with Mr. De Lisle to purchase the water rights from the lands which he owned and which form the catchment to the present reservoir. Leicester's plans suffered a setback when their scheme was passed in Council by a majority of only one vote. (G. & F.W. Hodson, 1898; Storey, 1895). This was not sufficient to satisfy the requirements of the Borough Funds Act.

Problems like these do not go away, and eventually both Loughborough and Leicester deposited Bills in the same Parliamentary Session, and the matter finally was argued out in a Parliamentary Committee. Parliament found in favour of Loughborough.

In view of the reluctance with which the Loughborough Local Board had eventually opted to proceed with Blackbrook, it is ironic to read (Storey, 1895) that the Town Clerk of Leicester had questioned whether Loughborough could in fact make a good case for so much water, and that Leicester's consulting engineer had concluded that Wood Brook could be developed to supply twice the contemporary population. It was only on this basis that Leicester saw fit to go ahead with their own proposals since they had recognised that if Loughborough could establish a case to the water, their petition was the more likely to succeed.
Having lost, Leicester were clearly upset by Loughborough's proposals which they considered failed to make proper use of the resource (Storey, 1895). Indeed, at that stage, Loughborough had plans for but limited development, involving the laying of a 15 inches diameter pipeline along the bed of the brook to transfer clean water from the gathering grounds to Nanpantan reservoir.

Loughborough's 1885 plans were, however, revised and enlarged so that the 1897 Act, which empowered them to build the reservoir, also authorised them to acquire additional land, and the scheme as completed probably does not differ all that much in size from that proposed by Leicester.

The records covering this episode imply that there was no formal contact between the two townships and that neither knew anything of the other's activities. This may seem surprising, but 100 years on, one is apt to forget the developments in travel and communications which have occurred. Or, possibly, it is nothing more than local rivalry taken to an extreme.

Loughborough, having obtained its powers to build Blackbrook reservoir in 1897, the Hodsons, George and Frederic, were next year stating the case for an immediate start. This was apparently a routine report to enable the Water Committee to pass the necessary procedural resolution for the Town Council in turn to confirm, and thereby authorise work to commence, for by now, the Local board had given way to the new Corporation. The immediate interest which the report has (G. & F.W. Hodson, 1898) lies in the short historical review going back to 1866, and the detailed explanation it gives for the form of construction to be adopted.

From here on, it seems to have been fairly plain sailing, at least in political terms, and no doubt George Hodson was able to devote his energies to the more satisfying physical and managerial problems of getting the job done.

The nature and scale of these problems can well be appreciated from the large collection of photographs which were taken throughout the period of construction. Possibly the most interesting remain in the possession of the Severn-Trent Water Authority, but many more can be seen in the Public Library in Loughborough (Plates 1 - 8).

It is worth remembering that this impressive structure was ultimately built by direct labour, that is to say, by men in the direct employ of the Town Council, who were, of course, under the supervision of the Hodsons, and their Resident Engineer, Mr. C. E. Robinson.

The following brief description of the dam is taken from an undated paper presented by the Hodsons about 1902-4. Obviously written when construction work was well advanced, and from its
style and phrasing, probably for an inspection visit by a group of Civil Engineers.

"The reservoir holds 506 million gallons, has a top-water area of 84½ acres, and yields 2 million gallons per day (on the conventional basis of a maintainable yield over three dry years). The overall length of the dam is 525 feet; its height to overflow crest is 65 feet from brook level, 93 feet 6 in. from bottom of main trench and 108 feet to the top of the main parapet. Below the bottom of the main trench, a narrow safety trench was excavated to a further depth of 20 feet, to cut off any transverse fissures in the rock, and to get below some small springs which were proving troublesome (Plate 7). The nature of the rock ruled out blasting, so that excavation was arduous and slow". Presumably this means that all the rock, and certainly in the narrow trench, would have been excavated manually by driving hardened steel bits to form holes, and by subsequently driving steel wedges and bolsters into these holes, and into natural cracks, fissures and planes of weakness in the undisturbed rock, in order to split away chunks of rock. Some idea of the working conditions can be gained from Plates 7 & 8.

The thickness of the dam at brook level was 65 feet narrowing to 15 feet at overflow level. The (cart) road across the dam was to be 9 feet wide, and flood water was to pass through six arches of 25 feet span, thence falling into a tail-water pond 5 feet deep (Plate 6).

The dam was to be constructed of mass concrete using 5 to 1 hand-mixed cement into which rock "plums" (boulders) weighing as much as 4 or 5 tons apiece would be placed.* (Plate 5).

The upstream (or wet) face of the dam is faced with Staffordshire blue-bricks to a thickness of 2-3 feet, so bonded as to avoid any continuous horizontal joints (Pl.5). The mortar was made from local sand which had been found to be superior to that from Leighton Buzzard, the normal quality choice.

*Concrete has negligible tensile strength and must be reinforced (with steel) if it is to be subject to tensile forces. Mass concrete is the term used for a structure designed to operate without tensile forces being applied to it, and which therefore can be made from a mass of concrete, totally without reinforcement of any kind. A 5 to 1 concrete would consist of 5 parts by volume of (in this case) roughly graded rock aggregate, subject to a maximum size of material, to one part by volume of cement, the object being to achieve a fairly homogenous material lacking, so far as possible, any voids. Modern concretes consist of carefully determined ratios of "coarse" aggregate (e.g. gravel, crushed rock), "fine" aggregate, (e.g. sand, or finely crushed, graded, rock) and cement. Water is added in strictly controlled (today) amounts to initiate the chemical reactions by which the cement can convert a loose mix into the final hard strong concrete, and to give the wet mix a suitable degree of "workability" to enable it to be placed in position, and by appropriate working and vibrating, to enable all voids and entrapped air to be removed so as to leave a solid, homogenous material. "Plums" are solid lumps of rock or other suitable strong, non-organic material, placed individually and randomly in mass concrete in order to provide bulk at least cost.

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The downstream face and the parapets were to be faced (clearly this work had not then been started) with Pre-Cambrian rock from local quarries. These were to be built as "random rubble", (i.e. individual stones being randomly interlocked) the stones being not dressed (Pl.6). Derbyshire Millstone Grit was to be imported for the lip of the overflow, and copings and parapet were to be of "fine concrete made with local stone" (as would be termed "artificial stone" today).

Twelve tenders were received for the work, ranging from that accepted, £58,707, to £84,812. The Engineer's estimate had been £61,476. It was the failure of the Contractor to maintain satisfactory progress which had led, at the time of the article, to the Corporation taking over the construction of the works.

In his 1898 report to the Corporation, George Hodson had been at pains to explain the suitability of the site for construction of a dam of this type, the great advantages it possessed over other sites in the Midlands, and had alluded to world-wide developments of a comparable nature. He had obviously been well-informed. How good was his advice? How good was his design? Very good indeed would seem to be the answer.

Unlike most engineers, and most designers responsible for structures whose failure would have disastrous consequences, Hodson's work has undergone, and successfully withstood the ultimate test. Quite simply, it has survived a sizeable earthquake!

The earthquake occurred on the 11th February 1957 and was to provide Blackbrook with a degree of notoriety in the specialised field of dam safety, since it was thought to be, and therefore still is, the only large dam in England to have suffered damage by an earthquake.* **

The epicentre of the earthquake was subsequently determined to have been at Diseworth, only 4 miles north of the Blackbrook Dam. Dollar's study (1957) showed that the shock was felt over a large part of the East Midlands, and in fact many of the relays in Trent Valley power stations were tripped by the shock wave (Lees, 1957, 1958). At point VII on the Modified Mercalli Scale of Intensity the Diseworth earthquake was among the stronger shocks recorded in Britain. Descriptions of the damage were given by Walters (1962 & 1964) and briefly by Smith (1971).

*Minor displacement of protective, non-structural, stone beaching on the upstream face of the Swithland dam was identified and attributed to the same earthquake. Swithland is about 9 miles from the epicentre of the earthquake.

** Not just one but possibly two earthquakes! A shock in the early hours of 30th May, 1984 affected much of north Leicestershire. With a magnitude of 2.7 on the Richter scale it was less severe than the 1957 earthquake. Subsequent inspection of the Blackbrook Dam revealed hairline cracks, some of which had broken calcite deposits in the inspection tunnel. Unfortunately no detailed inspection had taken place for some time previously so it is not certain whether the recent earthquake was responsible, and other normal ageing processes such as climatic or thermal movements may have been the cause.
It was coincidental that at the time of the earthquake Mr. John S. Bates, then Borough Surveyor and Water Engineer to the Loughborough Corporation, happened to be in the filterhouse at the foot of the dam. "He reported severe shock accompanied by noise and considerable vibration ...." (Lapworth & Partners, 1957). Mr. Bates noted that there was visible evidence that the dam had suffered damage and arranged for a special inspection in accordance with the Reservoir Safety Act, 1930.* This was done by Mr. R. C. S. Walters, B.Sc., M.I.C.E., F.G.S. of Messrs Herbert Lapworth & Partners, Consulting Engineers, London. Mr. Walters was already familiar with the dam, for, being on the Panel of Engineers appointed by the Home Secretary for such purposes under the 1930 Act, he had previously undertaken routine statutory inspections of Blackbrook.

It is not necessary to detail all the damage which the dam had suffered. If was evident that it had received a "severe shock", but the damage, whilst widespread, was ultimately not serious. It was considered that the dam had been bodily lifted and dropped back, not necessarily in the same position. The evidence for this is that all the individual coping stones on top of the dam had been lifted from their beds, the mortar bedding had disintegrated, and it was possible to see daylight under many of the stones which weigh about ¼ ton apiece. There is an inspection tunnel running through the heart of the dam and within this tunnel, numerous new hair cracks were seen. These subsequently closed up. At either end of the tunnel, access is via brick-lined man-holes. The brickwork in both was seen to have shifted laterally about ½ inch, some 3 or 4 courses below the entrance. Numerous other cracks were visible on both upstream and downstream faces of the dam. Checks showed that the overflow sill remained level. Other checks were made to assess leakage.

At the foot of the dam there had for many years been a flow of water, dependent on rainfall. It was considered to be a spring, largely independent of leakage. The flow of this spring is constantly metered, together with any overflow spillage which joins with it. Normally, this flow had been about 500 gallons per day, which would increase in wet weather, so this amount would represent a top-side figure for any leakage. On the day of the earthquake, the 11th February 1957, the flow increased to 200,000 gallons a day, reducing to 30,000 gpd by 6th March, and finally returning to normal. Walters (1964) pointed out that the sudden increase in flow might well have originated from the fracturing of the rock on either side of the valley, thereby temporarily increasing the natural flow from the hillsides. He decided that the leakage from the

*The Reservoirs Act of 1975 was intended to supplant the Reservoirs Safety Act of 1930, providing a greater degree of public control over the inspection and maintenance of such structures whether under public, or more particularly, private ownership. Implementation of the 1975 Act has been delayed by successive Governments, because of the cost to public funds. As a result of continuing pressure from the Engineering Profession, the Government have now agreed that implementation should begin.
reservoir had not been affected by the earthquake. Subsequent recordings and statutory inspections have revealed nothing to disprove this finding.

George Hodson had been proud to serve his town. Loughborough might well be glad he did, and proud equally, of him. The formal report to Loughborough Corporation by Herbert Lapworth & Partners, dated March 1957 concludes: "36. It is indeed fortunate that the Corporation had entrusted the design of the dam to Messrs. George and H. F. (sic) Hodson, ...".

ACKNOWLEDGMENTS

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Thanks are due to the Leicestershire Museums, Art Galleries and Record Service for permission to reproduce certain photographs and the transcript of the letter in Appendix 1. Mrs Curzon-Herrick is also thanked for her kindness in allowing reproduction of the 1799 letter.

The opinions expressed herein are those of the authors.

REFERENCES

Hawksley, Thos. 1852. Report to Loughborough Local Board of Health, 14th July, 1852.*
Hodson, G. 1868. Report to Loughborough Board of Health.*

* These papers are in Loughborough Public Library.

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APPENDIX 1

LETTER TO MRS GILDART, MORTON HALL, LICHPIELD, FROM HER BROTHER, I. HERRICK
(transcribed from Leics. Record Office DG/9/2546)

Beaumanor Feb'y 21st 1799

Dear Sister,

I fully intended myself the pleasure of waiting upon you before this time but the weather prevented me, but I hope soon to have that pleasure, must now relate a dreadful calamity that happened yesterday morning at 11 o'clock, and at which Miss Lucy will be shocked to hear. I am very sure, for a more awful sight I never beheld providence was kind it happened in the day time, or the loss of lives would have been incalculable; the history is a melancholy one as follows. We was all going to Garendon about one o'clock to take leave of the family who are going to town - when we got to Loughbr'o the town was in a consternation coaches horses & all stopped by a deluge of water. The Telegraph Coach saw it a coming was obliged to gallop with the Coach to save their lives when we got within a mile of Garendon it was like the sea, roared so as to be heard a mile and swept all before it cattle sheep houses hedges Corn fields and Large Oak Trees tore up by the roots and thrown down, Stacks of Corn Hay & when we arrived at Garendon all consternation expecting accounts every moment of the destruction of Dishly Mill & Sheepshead Mill it carried away the bridge at Garendon and came close to the park wall a large Stack of Hay was carried over several fields and hedges and set down in a lane and left there, quite perfect - it extended to Thorpe Town and covered the Derby road for a mile and a half in length - we saw cheeses loaves of bread furniture of all sorts beds tables, rig trees of houses doors window frames & all brought down in the torrent people up to the neckin water saving sheep of which vast numbers are drowned and getting out furniture Boxes & whole fields of Turnips washed away Wheat fields the same, a more dreadful sight I never beheld. Ellens horse was up to the top of his saddle on the Turnpike road, we rode a mile up to the horses belly in water to behold it. - All this dreadful calamity was occasioned by the breaking down of the whole bank of the reservoir in the Forest - a large farm house & Mr. Chesters situated by the side of Blackbrook near the Ashby Turnpike road which Lucy will know, the man and all his children had only two minutes to make their escape, the water rose instantly above the rig tree at the top of the house turned the house round and dashed it down and not a vestige remains they could not save either cloaths or furniture all their money writings etc lost. Another new built house on the opposite side of the road was swept away in a moment a woman and a young child only 2 months old run out of the house could not save even her hat or cloak - all Mr. Chesters Hay stacks corn Stacks and buildings all carried away - another farm house high up the Hill nearer the reservoir - the water came up to the heaves of the buildings carried some large Stacks of weat and hay out of his yard and his Carts and Waggons all carried away - the Stacks was floating on the water like ships on the sea, one large Stack was carried almost to Mr Tomsons house and there left on dry land it run over the top of the Aquaduct that goes betwixt the two hills from Mr Tomsons to Mr Chesters which you must observe from the road is an immense height, it then burst all the aquaduct down with the whole navigation and carried all away many large oak trees tore up by the roots. My brother and I set off for Black Brook about five o'clock that evening to see it. The whole reservoir empty in eleven minutes, all the fields there like the sands on the Sea Shore not a blade of grass to be seen or a vestage of the building not one stone left upon another, we do not know the particulars of damage done at other places it is supposed it will cost the navigation Company a many thousand pounds, there was above 500 people from all parts there today and the roads full going to view it 40 men at work to make the Turnpike road passable today the men that stood upon the bank of the Reservoir had not been off more than a mimit when it fell it burst like a clap of thuder and flew near fifty foot in the air believe I have told you all particulars as far as I know please to inform Mr Thomas Herrick of it poor Joe Simpson died last week lay ill but a short time - Mr & Mrs Patchet are both pretty well - our new minister is come to Woodhouse - young in his office - I have not time to add more than my best respects to Mr Gildart and Miss Lucy and am your affectionate loving Brother I Herrick excuse a bad scrawl in great haste - I fear Mr Thomas will have no dividend from the Navigation for some years now all this damage is done, it will cost many thousand pounds to repair so send him word of it -
APPENDIX 2

The following is an extract from a report entitled "The Water Works Question" submitted to the Loughborough Local Board of Health by George Hodson, in his role as Surveyor to the Board, in June 1868. This part of the report gives a vivid picture of the conditions of life in Victorian England, the conditions in which the grandparents of many readers will have been brought up.

"In carrying out my duties as your Surveyor, I am sorry to say I have met with but few really water-tight cesspools; many, I may say nearly all the older ones, have their bottoms laid dry, and consequently pass their contents freely into the surrounding soil; in fact to such an extent has this taken place, that there are cesspools in the Town which have never required emptying. On removing old privies, I have found the site blackened and completely saturated with putrid foecal matter, at a distance of five yards measured horizontally from the cesspool, and have no doubt that the saturation extended to a much greater depth vertically. Under these circumstances, how can we expect pure water supplies from the shallow wells in the older parts of the town, especially when we taken into consideration that this absorption has been going on, not for a few years, but for generations, and that in many cases the wells are situated in dangerous proximity to these filters of putrid foecal matter, and must necessarily communicate directly with them? For instance, if we suppose the space drained by each well to be represented by an inverted cone, having an angle of about 45 deg. the bottom of the well being the apex of that cone; then the circumference would represent the area of surface drained, and the diameter would vary according to the depth of the well; consequently it would follow that the contents of any cesspool placed within the circumference of the base of the cone would by the natural force of gravity, descend into the well, and that after saturation of the adjacent soil and gravel had taken place, the persons using the well would actually be drinking portions of their own voidings, diluted with the waters of the strata, and the absorbed drainage water, and only clarified by filtration through a more or less thickness of sand and gravel.

There is also another aspect of the case from which the establishment of Water Works must be viewed as a necessity, and taken in conjunction with the preceding remarks, as to the contamination of the well water, together with the known prevalence of diarrhoea in Loughborough during the summer months, must be weighed by the Board before giving their decision on the important question submitted to them, and that is the supposition of a visitation of that most terrible of all scourges, Cholera.

In the report of Dr. Simon, the Medical Officer of the Privy Council, during the last outbreak of Cholera, he says -
1. The Blackbrook valley before the start of building the reservoir. August 1899. The breach in the 1797 dam is visible in the distance.

2. The 18th century dam embankment showing the 1799 breach as seen in August 1899.
3. The outlet tunnel under construction, August 1904. (looking east, upstream side of the dam to the right).

4. One Barrow or South Quarry at the southeast end of the reservoir, 25th Jan. 1906, showing the Blackbrook Reservoir Formation rocks before partial submergence (courtesy of Loughborough Libraries).
5. The half-built dam showing the blue-brick upstream face and the large boulder "plums" in the core, with the temporary gap for the railway, June 1905.

6. The downstream face of the dam almost complete in July 1906 showing the random masonry facing.
7. The foundation trench looking east in October 1902, showing the igneous dyke in the lower left.

8. The first concrete and shuttering at brook level in December 1903, showing a small fold in the Charnian rocks left of centre (looking west, upstream side of dam to the right).
"In relation to Asiatic Cholera now threatening us, there are two principal dangers against which extreme and exceptional vigilance ought to be used: first, there is the danger of drinking water which is in any (even the slightest) degree tainted by house refuse or other kinds of filth: as when there is overflow, leakage, or filtration from sewers, house drains, privies, cess-pools, foul ditches, or the like, into streams, springs, or wells, from which the supply of water is drawn, or into the subsoil in which the wells are situate: And secondly, there is danger of breathing air which is made foul by effluvia from the same sort of impurity..."

This extract represents about one-seventh of the full report. It is hardly surprising that the Board were finally convinced of the desirability of proceeding with the construction of Nampantan reservoir, for which they had by then, received the necessary Parliamentary powers.

The Table which follows has been copied from the annual report of the Medical Officer to the Leicester Local Board of Health, covering the year 1858, being a year in which the figures were broken down in this detail. The total of 1939 deaths relates to a population of 60,642. The corresponding figures in the same year for Loughborough, and which are not broken down in the same manner, were 591 deaths from a population of 25,368. Both populations derive from the 1851 census, and, relating as they do to the "District or Parochial Union, presumably include persons from outlying areas who were not included in the proposed water supply schemes.

The figures show that the mortality rate in Loughborough was about 3/4 of that in Leicester, itself one of the worst in the country. Possibly this might be ascribed to Loughborough's population being somewhat more scattered. They also show that babies had only a 75% chance of surviving for one year, and only a 44% chance of attaining the ripe old age of 15 years.

Ages at the time of death for the year 1858 from all causes in the Borough of Leicester

| Age Range             | Under one day | 1 day to 1 week | 1 week to 1 month | 1 month to 6 months | 6 months to 1 year | 1 year to 5 years | 5 years to 15 years | 15 years to 20 years | 20 years to 30 years | 30 years to 40 years | 40 years to 50 years | 50 years to 60 years | 60 years to 70 years | 70 years to 80 years | 80 years to 90 years | 90 years and upwards | Age not known | 1939 |
|-----------------------|--------------|----------------|------------------|---------------------|-------------------|------------------|-------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
NOTES ON THE GEOLOGY OF THE BLACKBROOK AREA, CHARNWOOD FOREST
by Helen E. Boynton

Geologically the Blackbrook valley was well chosen as the site for the Blackbrook dam in view of a large part of it being cut into the hard Charnian rocks. Only in the middle section of the valley did the Triassic marls (Mercia Mudstones) come down to water level and, being impervious, they could not affect the holding capacity.

The gorge-like section of the valley where the dam was built had exposures of Charnian slates which, though cleaved and somewhat shattered, could provide a firm foundation. A quarry was opened at the south-eastern end of the valley to provide stone for the blocks in the aggregate and for the facings (Plate 4).

The site of the Blackbrook reservoir is in Northwest Charnwood about 1½ miles southwest of Shepshed and is entirely in the oldest group of Charnian rocks, the Blackbrook Group. The basic disposition of these beds in the Charnian anticline was recognised by Hill & Bonney (1880) but a stratigraphic subdivision instituting the Blackbrook "Series" dates from the work of W. W. Watts (1900 and 1910) and the most complete published description is in his book on the Geology of Charnwood Forest in 1947. He noted fine-grained greenish-buff or creamy-coloured volcanic ashes, which were usually stained purplish-red along bedding planes, joint and cleavage surfaces. They were deposited in water and showed few sedimentary structures, as well as banding caused by variation in grain size.

Although much of what Watts mapped is now under water and inaccessible, Moseley (1979) was able to distinguish a number of distinct stratigraphic units. Within the Blackbrook Series he noted that at the south-eastern end of the reservoir the outcrops were in the lower part of the Blackbrook Group which he called the Ives Head Formation and, as there was less volcanic material, he described the beds as greywackes. These are separated from the overlying Blackbrook Reservoir Formation of tuffaceous pelites by the South Quarry Slump Breccia which is visible in South Quarry (SK 466171) about 30 feet above the water level of the reservoir. On the lower exposure of this Quarry (the old name for which was One Barrow Quarry) can be seen gently undulating bedding planes dipping down below the water level just adjacent to the bridge. These are faintly discernible in Plate 4 taken from an old photograph dated 1906 now in Loughborough Library. Moseley found that most of the outcrops around the dam itself belonged to the higher Blackbrook Reservoir Formation and he inferred a NE-SW fault across the
central part of the dam, though it is nowhere visible.

Watts noted a dyke having been seen in the dam foundation trench. He said that it compared closely with the porphyroid igneous rocks of Peldar Tor, some 2 miles to the southwest near Whitwick, but he gave no description and it is now no longer visible. However, one of the photographs taken during the dam construction shows the dyke clearly (Plate 7). It appears to be about 2 feet wide with an approximate NE-SW trend. Other photographs taken during the construction works show the Blackbrook rocks clearly (Plates 5 & 8). Bedding dips at steep angles, from 65° to 78° to the southwest, while cleavage is nearly vertical striking 105°. Several small minor folds can be seen (Plate 8) and the cleavage-bedding intersections gave rise to much "shattered" rock so that the foundation trench had to be taken some 20 feet deeper than planned (Plate 7).

REFERENCES

Helen E. Boynton,
7 The Fairway,
Oadby, Leicester.
STRATIGRAPHY AND AMMONITE ZONATION OF THE MIDDLE AND UPPER LIAS (LOWER JURASSIC) AT AVONHILL QUARRY, WARWICKSHIRE.

by David Martill and Don Blake.

Abstract
A measured section through the Middle and Upper Lias at Avonhill Quarry, Warwickshire, is recorded and the ammonite zonation established. The significance of the ammonite Frechihella subcarinata (Young & Bird) is discussed. The section is highly condensed with numerous non-sequences. A rich and varied bivalve fauna was obtained from the lower beds of the Middle Lias.

INTRODUCTION

The stratigraphy of the Middle and Upper Lias of the English East Midlands is complicated by lateral facies variations, and an abundance of non-sequences and condensed horizons. Since the closure of the large open-cast ironworkings during the 1960's, exposures of the Middle and Upper Lias have become rare. Detailed measured sections for a number of the old ironstone quarries have been recorded in Leicestershire and surrounding areas (Jones unpublished, see footnote).

Howarth (1978) has recorded a number of temporary exposures in West Northamptonshire. The recent occurrence of a temporary exposure at Earls Barton, Northamptonshire (SP864617) has indicated the presence of a highly condensed sequence within the basal beds of the Upper Lias (Martill and Blake, in prep).

It is the purpose of this paper to place on record the stratigraphy and fauna of the Middle and Upper Lias at Avonhill Quarry (SP415508), near Fenny Compton, Warwickshire; and to establish the Upper Pliensbachian and Lower Toarcian ammonite zonation present in the area. This section will add to our knowledge of the stratigraphy of the Middle and Upper Lias, and will form a basis for comparison with detailed work being carried out in Leicestershire and Northamptonshire (see footnote). Comparable beds are exposed in the Leicestershire Nature Reserves at Tilton and Holwell and will form the subject of later contributions.

A collection of fossils and samples representative of each bed has been deposited in Leicester Museum, accession numbers LEICS G20-60, 1984.

LOCALITY

Avonhill Quarry (SP415508), is situated 1.6km south of Fenny Compton, and 1.2km NNE of Avon Dassett. The quarry lies towards the northern end of an outlier of Middle and Upper Lias strata, which forms a narrow ridge continuing for approximately 10km from Northend (SP392525), South Eastwards to Little Bourton (SP458442), some 3.3km North of Banbury.

Copies of unpublished sections for Leicestershire and Rutland can be obtained through Leicestershire Museums and Art Galleries, Earth Sciences Section, at 96 New Walk, leicester, which is a record centre for the National Scheme for Geological Site documentation.
The quarry is still active, and is worked for the Marlstone Rock Bed, a chamositic ironstone, now used locally as an aggregate. The Marlstone Rock Bed is underlain by silts and silty clays of the Margaritatus Zone, which are infrequently exposed in drainage ditches to a depth of two to three metres, and is overlain by clays and impure limestones of the Upper Lias. The latter is removed as overburden and used to seal refuse dumped in old parts of the pit. The amount of exposure is variable due to the nature of the workings, and local faulting can sometimes confuse the stratigraphy.

STRATIGRAPHY

The classification of the Middle and Upper Lias in the East Midlands is outlined in Table 1. We have divided the succession into thirteen units, many of which are highly fossiliferous. The section (see Fig. 2) displays up to 14.5 metres of ironstones, impure limestones, siltstones and clays. Beds 1-3 are assigned to the Middle Lias Clays, beds 4-6 represent the Sandrock and bed 7 is the Marlstone Rock bed. Collectively, beds 1-7 constitute the Middle Lias. The Cephalopod-rich limestones and poorly fossiliferous clays of beds 8-13 belong to the Upper Lias.
Fig. 2 Section at Avonhill Quarry
<table>
<thead>
<tr>
<th>STAGE</th>
<th>LITHOLOGY</th>
<th>TERMINOLOGY</th>
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<tbody>
<tr>
<td>Lower Toarcian</td>
<td>Cephalopod-rich clays and shales with thin limestones</td>
<td>Upper Lias Clays</td>
</tr>
<tr>
<td></td>
<td>Chamoxite oolite</td>
<td>Marlstone Rock Bed</td>
</tr>
<tr>
<td>Upper Pliensbachian</td>
<td>Sandy limestones</td>
<td>Sandrock</td>
</tr>
<tr>
<td></td>
<td>Silty and micaceous clays and shales with concretions</td>
<td>Middle Lias Clays or Margaritatus Shales</td>
</tr>
</tbody>
</table>

Table 1. Classification of the Middle and Upper Lias for the East Midlands (Based on Hallam 1968 and Howarth 1978)

MEASURED SECTION

**Upper Lias**

**Bed 13**
Clay, blue-grey and highly weathered. No fauna observed. 2.0 metres seen

**Bed 12**
Limestone, argillaceous and ferruginous, buff/orange with broken shell debris and rare ooliths. Ammonites, some partly crushed are abundant:- *Froehiella subcarinata* (Young and Bird); *Hildoceras sublevisoni* Fucini; *Hildoceras aff. sublevisoni*; *Harpoceras falciferum* (J. Sowerby); *Dactylioceras commune* (J. Sowerby). 0.20 metres

**Bed 11**
Limestone, hard, ferruginous with much broken shell material, belemnites and many ammonites:- *Hildoceras sublevisoni* Fucini; *Harpoceras of solonicense/falciferum*; *Harpoceras falciferum* (J. Sowerby); *Dactylioceras* sp. with broad-and narrow-vented forms of the *commune* type. Belemnites frequent and *Conoceras* sp. 0.18 metres
Bed 10  Clay, variegated, pale grey in the upper half and buff in the lower part with abundant ooliths. Ammonites abundant in top 10cms including Harpoceras sp. indet.; Dactylioceratidae; and plentiful belemnites. 0.55 metres

Bed 9  Limestone, fine grained, pale grey weathering cream. Pisolithic in patches. Serpulids and worn belemnites. Dactylioceras sp.; Harpoceras exeratum (Young and Bird) in top 10cms and at base. 0.20 metres

Bed 8  Clay, buff to yellow, calcareous with sharply defined boundaries. Poorly fossiliferous. Poorly preserved fragments of dactylioceratid ammonites. 0.48 metres

Marlstone Rock Bed

Bed 7  Ironstone, oolitic, chamositic when fresh, limonitic on weathered faces, cross bedded, bioturbated with bands of shell debris, contains abundant bivalves and the brachiopods Tetra- hypnata tetrahedra (J. Sowerby) and Lobothis punctata (J. Sowerby) 5.00 metres

Sandrock

Bed 6  Conglomerate, coarse pebbly cross bedded ironstone matrix with rounded intraclasts, worn belemnites and broken shell debris. Rich bivalve fauna and a small Liparoceratid amonote of Beanioceras sp. 0.20 metres

Bed 5  Silt, buff, highly fossiliferous, bioturbated, coarsening upwards into fine micaceous sand. Burrows picked out in grey clay. Disarticulated bivalves, mainly as internal moulds, rare ammonites. Pleuroceras sp. in top; Amaltheus submodus (Young and Bird); Amaltheus striatus Howarth; Protocardia truncata (J. de C. Sowerby); Pseudolimnea sp.; large worn Gryphaea sp. with encrusting oysters; pectinids and rolled belemnites. 1.20 metres

Bed 4  Siltstone, buff, micaceous showing box- stone weathering; highly fossiliferous, bivalves dominate; unidentified amaltheid ammonites, crinoid ossicles; Plicatula spinosa (J. Sowerby); Oxytoma cf inequivalvis (J. Sowerby); Pholadomya sp.; Pleuromya sp. 1.20 metres

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**Middle Liassic Clays and Shales**

Bed 3  Shaley clay, light blue/grey, highly fossiliferous. Aragonitic and calcitic bivalves preserved whole crinoid debris only as external moulds. Fauna includes ammonites. *Amaitheus* sp. indet.; crinoid ossicles; gastropods indet.; and bivalves, many still articulated - *Goniomya hybrida* (Munster); *Pleuronycha costata* (Young and Bird); *Mactromya cardioides* (Phillips); *Pholadomya simpsoni* Tate; *Protocardiina truncata* (J. de C. Sowerby); ? *Parainoceras* sp. indet.; *Cressyia* sp.; *Pseudolimnea* sp.; and other indeterminate bivalves.

Bed 2  Clay, green mottled with abundant shell debris and occasional ironstone nodules. Belemnites and bivalves including *Pleuronycha costata* (Young and Bird); *Grampitodon inscon* Melville; *Pholadomya simpsoni* Tate and cf *Camptonectes* sp.

Bed 1  Shaley clay, light blue/grey, ferruginous in lowest 1 metre, becoming less shaley downwards. Some pockets of phosphatic nodules. No fauna collected but bivalves present.

**AMMONITE ZONATION**

Bed by bed collecting throughout the sequence has enabled us to establish the boundaries between some of the ammonite zones and subzones of the Pliensbachian and Toarcian. The zonal scheme adopted follows that of Dean, Donovan and Howarth (1961) and Howarth (1980). See Table 2.

All the basal silts and clays of bed 1 to the lower part of bed 5 are taken to belong to the Margaritatus Zone of the Upper Pliensbachian, although diagnostic ammonites have only been found in beds 3, 4, and 5. The base of bed 5 is attributed to the Subnodosus Subzone of the Margaritatus Zone. A small pleuroceratid from the top of bed 5 indicates the Spinatum Zone, but as *Amaitheus* is still found at this level; a mixed fauna is present here. No ammonites of any zonal value were obtained from bed 6, but a small, spinose liparoceratid precludes a Toarcian date. The Marlstone Rock Bed (bed 7) has failed to yield any diagnostic ammonites and we have presumed it to be of Spinatum Zone age, although we have not ruled out the possibility of the upper part being Toarcian, as at Tilton (top 0.9m) and Harston (top 0.23m), (Howarth 1980).

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<table>
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<tr>
<th>Zones</th>
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<tr>
<td><em>Hildoceras bifrons</em></td>
<td><em>Zugodactylites braunienus</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Pereonoceras fibulatum</em></td>
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</tr>
<tr>
<td></td>
<td><em>Dactylioceras commune</em></td>
<td></td>
</tr>
<tr>
<td><em>Harpoceras falciferum</em></td>
<td><em>H. falciferum</em></td>
<td>Lower Toarcian</td>
</tr>
<tr>
<td></td>
<td><em>H. exeratum</em></td>
<td></td>
</tr>
<tr>
<td><em>Dactylioceras tenuicostatum</em></td>
<td><em>D. tenuicostatum</em></td>
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<td><em>D. clevelandicum</em></td>
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<td><em>Proteogrammoceras paltum</em></td>
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<tr>
<td><em>Pleuroceras spinatum</em></td>
<td><em>Pleuroceras bawkerense</em></td>
<td>Upper Pilenschachian</td>
</tr>
<tr>
<td></td>
<td><em>P. spyrenum</em></td>
<td></td>
</tr>
<tr>
<td><em>Amaltheus margaritatus</em></td>
<td><em>Amaltheus gibbosus</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>A. subnodosus</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>A. stokesi</em></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Ammonite zones and subzones of the Middle and Upper Lias (after Dean, Donovan and Howarth 1961 and Howarth 1980)

Above the Marlstone Rock Bed, the first appearance of *Dactylioceras* occurs in bed 8. Preservation in this bed is too poor to allow for the accurate identification to species level, and it is therefore not possible to prove the presence of the Tenuicostatum Zone, but nevertheless it serves to indicate a Lower Toarcian age for these beds. Bed 9 yields *Harpoceras exeratum* indicating the Exeratum Subzone of the Falciferum Zone and above this it is possible to show the continued existence of the Falciferum Zone up to the top of bed 10 with *Harpoceras falciferum* abundant. Beds 11 to 13 belong to the Commune Subzone of the Bifrons Zone as indicated by plentiful *Dactylioceras commune* and *Hildoceras sublevisoni*. Of particular interest here is the occurrence in bed 12 of *Preociella subcarinata*, a broad
vented hildoceratid, normally restricted to the Tethyan realm. The sudden influx of *Frechiella* at certain horizons has been noticed by the authors at Earls Barton, Northamptonshire, (Martill and Blake in prep) and it is possible that the influx of this ammonite may have some correlatory value. Beds younger than the Commune Subzone have not been proved at Avonhill.

The succession begins in the Margaritatus Zone but we cannot determine to which subzone these beds belong. A hiatus between the Subnodosus Subzone and the Spinatum Zone occurs with the total absence of the Gibbosus Subzone.

The Spinatum Zone is present but its upper limit could not be defined nor could any of its subzones be established.

The presence of the Tenuicostatum Zone has not been proven and, if present, it must be extremely thin.

All of the subzones are present from the Exeratum Subzone of the Falciferum Zone to the Commune Subzone of the Bifrons Zone, but the two lower subzones (Exeratum and Falciferum) are extremely thin. The upper boundary of the Commune Subzone cannot be determined.

DISCUSSION

The section at Avonhill Quarry shows an extremely thin sequence of the upper part of the Middle Lias and the lower part of the Upper Lias. The Spinatum, Tenuicostatum, if present, and Falciferum Zones are represented by only 6.63 metres of the sequence. It is not clear how much condensation has occurred, but certainly non-sequences at the boundary between bed 6 and bed 5 account for a considerable time span. Worn fossils in bed 5 and bed 6 indicate a period of increased current activity and reduced sedimentation. A non-sequence may be present at the top of the Marlstone Rock bed (Bed 7) and the cephalopod rich limestones in the Upper Lias may also represent condensed deposits. Reworking of thicker sequences may have occurred. These problems of deposition will only be resolved after a detailed sedimentological investigation.

ACKNOWLEDGMENTS

We wish to thank the owners of Avonhill Quarry for permission to visit the locality and to Dr. R.G. Clements and Dr. J.D. Hudson for helpful criticism of the manuscript. We would also like to thank Mrs E.M. Barradell and Miss J. Briers for patiently transforming the manuscript into typed copy.
REFERENCES


Don Blake,
Dept. of Chemical Engineering,
Loughborough University of Technology.

David Martill,
Dept. of Geology,
University of Leicester.
REPORT OF THE COUNCIL FOR 1983-84

The Society has had a successful year, its membership rising above 200 for the first time since the 1979-80 Season. It is now 230.

The lecture programme proved a great success and our thanks are due to Mr. Boatz who prepared the programme and our gratitude is owed to the sponsors who supported the lectures. Large audiences attended Lord Montagu's lecture last November; the lecture held jointly with Natural History Section which was given by Philip and Marjorie Blamey; and Professor David Bellamy's lecture at the University's Rattray Lecture Theatre. It is recorded that in future the Society intends to hold its lectures on the first and third Mondays of each month during the Season, instead of fortnightly as formerly. This change was approved at the Council Meeting of 20th February 1984.

The Society sadly recalls the death of Mrs. Margaret Fisher who had been a Council Member for 7 years and a past Secretary of the Society.

The President is thanked for the publicity she obtained in reporting the Society's meetings in the "Leicester Mercury".

Mr. S.J.Mann is thanked for his untiring work in providing refreshments after each meeting. The Museum staff are also thanked for their continuing co-operation in courtesy in helping to arrange the Society's meetings.

D.G.Lewis
Hon. Secretary

The programme for the session 1983-84 was as follows:

1983
3rd October  "Early Women Mountaineers and their Successes"
             President's Address by Mrs. C. Williams.

17th October  "Musical Journey: London to Vienna" - Dr. William
             L. Reed.

31st October  "The Lure of the Microscope" - Dr. Brian Bracegirdle,
             Keeper of Wellcome Medical Collection, Science Museum. Joint
             Meeting with Royal Society of Arts (East Midlands Region).

14th November  "Byzantine Art and Society" - Very Rev. Anthony
             Bridge, Dean of Guildford Cathedral.

28th November  "The Stately Home Business" - Lord Montagu of
             Beaulieu. University Bookshop Lecture.

12th December  "We Shall See What We Shall See" - Mr. Jack Reedy,
             Regional Officer, Independent Broadcasting Authority. Leicester
             Mercury Lecture.

1984
16 January  "Recording Britain's Photographic Heritage" - Dr. John
            Wall, F.R.P.S., Editor, National Photographic Record of the
            Royal Photographic Society (sponsored by Leicester City Council
            Recreation Committee).
1984

30 January    "Travelling for Flowers" - Philip and Marjorie Blamey.

13 February   "Who Is My Father, Dad?" - Professor John McVicar, Professor of Obstetrics & Gynaecology, University of Leicester.

20 February   "Gemstones" - Professor R.A. Howie, Professor of Mineralogy, Kings College, London.

12 March      "Down to Earth - The Importance of Soils as a Natural Resource" - Professor David Bellamy (sponsored by Leicestershire Museums and Art Galleries).

8 May         A.G.M. followed by a musical entertainment by the Halcyon Singers.
ANNUAL REPORT OF THE GEOLOGY SECTION FOR 1983-1984

President: Dr R.J. King
Chairman: Mr A. Dawn
Vice-Chairman: Mr M. Bird
Secretary: Dr D.J. Siveter (resigned 12.1983)
Treasurer: Mr J.G. Martin
Assistant Secretary: Dr Diane Thurston
Field Secretary: Mr D. Martill
Committee Members:
  Dr R. Clements
  Dr F.R. Crowther (Acting Sec. from 1.1984)
  Dr M.P.A. Howe
  Mrs P. Marsden

A full programme of summer excursions was held. We thank the leaders involved, and particularly David Martill for organising the programme.

Summer Excursions 1983:

April 23   Cromer, Norfolk. Mr I.St.J. Fisher (Leicester University)
May 7     Tilton Railway Cutting. Mr J. Martin (Leicestershire Museums)
May 21    Dudley, West Midlands. Mr D. Martill (Leicester University)
June 11   Leicester Coalfield. Mr M. Bird (NCB)
June 25   Calvert, Buckinghamshire. Dr R.J. King (Leicester University)
August 13 Newark, Nottinghamshire. Mr D. Martill (Leicester University)
August 28 Hunstanton, Norfolk. Mr D. Martill (Leicester University)
Sept 17   Long Itchington, Warwickshire. Dr R.G. Clements (Leicester University)

Winter Programme 1983-1984:

We thank our Secretary David Siveter for organising the varied programme summarised below. Efforts by Section Committee members to publicise the Iris King Memorial Prize more widely this year paid off, with an excellent response from schools and individuals. Three prizes were presented by our President at the Conversazione, where entries were displayed.

October 5   Members evening
October 19  "Coal forests and monsoons" - Dr F. Broadhurst (Manchester University)
November 2  Film evening - Open University courses - Professor G. Brown and Dr Brown (Open University)
November 16 "Museum geologists - what do they do anyway?"
            Dr F.R. Crowther (Leicestershire Museums)

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November 26  Saturday School, Vaughan College - "The earliest fossils"
    "Pre-Biology" - Dr A.A. Mills (Leicester University)
    "Precambrian microbiotas" - Dr C. Peat (Oxford University)
    "Late Precambrian macrofossils" - Dr T.D. Ford
        (Leicester University)
    "The first shelled invertebrates" - Dr M.D. Brasier
        (Hull University)
    "The Burgess Shale fauna" - Dr S. Conway Morris
        (Cambridge University)
    "The earliest land plants" - Dr Diane Edwards
        (Cardiff University)

November 30  "Geology of the lower crust : evidence from Scotland to
    Italy" - Dr Jane Sills (Leicester University)

December 14  Conversazione at the Geology Dept., Leicester University

January 11  "Silurian to Scandinavia and beyond; geology in Murchison's
    footsteps" - Dr M.G. Bassett (National Museum of Wales)

January 25  "Deep structure beneath Charnwood Forest and the Soar
    Valley" - Dr P. Maguire (Leicester University)

February 8  "Caledonian granites of Northern Britain" - Ms Cathy
    O'Brien (Leicester University)

February 20  JOINT MEETING WITH PARENT SOCIETY
    "Gemstones" - Professor R.A. Howie (Kings College, London)

February 22  "The exotic world of the micropalaeontologist"
    - Dr J.E. Whittaker (British Museum, Natural History)

March 7    "The earliest evidence for man in Britain?" -
    Dr M.J. Bishop (Burton Museum, Derbyshire)

March 21  AGM and Chairman's Address by Mr A. Dawn

The Section thanks the Department of Geology, Leicester University
for hosting our Conversaziones once again, and Leicestershire Museums
Service for the facilities provided for all other meetings in the
Winter Programme.

Peter Crowther, Secretary.
ANNUAL REPORT OF THE NATURAL HISTORY SECTION FOR 1983

President: I.M. Evans, M.A., F.M.A.
Chairman: H.C. Gabbits
Vice-Chairman: H.J. Smith
Hon. Treasurer: Miss E.I. Clay
Hon. Secretary: Mrs. L. Loosmore
Hon. Asst. Secretary: Miss B. Davies, B.A.
Hon. Programme Secretary: Miss J.L. Dawson, M.A., A.M.A.
Hon. Editor: Mrs. D. Thompson, B.Sc.
Committee: Mrs. G.H. Ball, B.A.
P. Clark
Mrs. D. Koffman, M.D.
P. Lucas
J.H. Mathias, B.Sc., Ph.D.
Mrs. J. Owen, B.A., Ph.D.
K. Shilcock
A.E. Squires
D.A.C. McNeil, B.Sc., Ph.D. (co-opted)
M.T. Billings

The Newsletter was published twice during 1983 - both issues under the editorship of Doreen Thompson.

As a Section, we have become used to lectures of a very high standard and fascinating variety and, in 1983, we were not disappointed. Again, as in 1982, some lectures were held in the Art Gallery.

The Symposium, organised by the Section and Leicester University, at Vaughan College on March 19th had, as its theme, 'The Natural History of the Seashore'. Speakers were Ian Tittley (British Museum), Dave Bodger (University of Nottingham), and Tim Stove (R.S.P.B.) and the Chairman was Harry Gabbits, Chairman of the Section.

The Summer Programme included full-day excursions to the Bedfordshire Chalk (led by Mr. and Mrs. Hands of the Bedfordshire Natural History Society) and to Cannock Chase (led by members of the Staffordshire County Council) and some members of the Section had a weekend excursion to North Wales.

We are all most grateful to Jan Dawson, who, once again, produced both winter and summer programmes.

Paid up membership for the year was 197 (compared with 188 for 1982). Ordinary meetings were held at fortnightly intervals, and the average attendance for the second half of the 1982/83 winter session was 66, to hear the following speakers.

5th January Mrs. F. Copson - "Woodlice"
19th " Dr. D.H. Holdich - "Tropical Queensland and the Great Barrier Reef"

cont'd...
31st January  Dr. J.J. Pegg - "Birds and Man" (Joint Meeting with Parent Body)
2nd February  Dr. M. Wade - "Changes in the Aquatic Flora of the Loughborough District"
16th    "  Mr. E. Skidmore - "Cow-pat Communities"
2nd March  Mr. D.H. Mitchell - "Wild Orchids of England"
16th    "  Dr. R.W. Vaughan - "The History of the British Seals"

The Annual General Meeting was held on 30th March 1983 after which a number of members showed slides.

The Section's Summer Programme of outdoor meetings was as follows:

23rd April  Mr. H. Godsmark            Shearsby Walkabout
7th May     Mrs. D. Thompson & Mr. A.E. Squires   Sauvey Castle & Lovers' Walk
21st May    Mrs. P.A. Evans
1st June    Dr. R. Gormall
4th       "    Mr. H.G. Cherry
18th       "    Lt.Col. D.H. Hall-Smith
3rd July    Mr. & Mrs. D. Rands
15-17 July  Mr. P. Lucas
20th July   Mrs. E. Hesselgreaves
30th       "    Rev. A.L. Primavesi
13th August Dr. J. Owen
27th       "    Mr. I.M. Evans
11th Sept   Staffs. County Council & F.C. Rangers
24th       "    Mr. B. Meloy
8th October Dr. T.F. Hering

The average attendance at field meetings was 28. The Section would like to thank all leaders, landowners and other helpers who made the programme so successful.

The indoor Winter Programme for 1983/84 began on 12th October with a Member's Exhibition Evening and other speakers were:

26th October Mr. C.A. Howes  What the cat brought in
9th November Mr. F. Clark     The Lake Naivasha Project
23rd       "    Dr. O.L. Gilbert   A lichenologist in the Hebrides
7th December Mr. I.M. Evans, Mr. Phillips
            D.A. Lott and Dr. W.M.
            Beetlemania

The average attendance for these meetings was 65.

The Section would like to thank the Museum for the facilities which it provides for all indoor meetings.

E. Loosmore
Hon. Secretary
D. Thompson
Minutes Secretary
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<th>Year of joining</th>
<th>Name</th>
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<tr>
<td>1969</td>
<td>Adams, Miss D.M.</td>
<td>24 Midway Road, LE5 7TP</td>
</tr>
<tr>
<td>1969</td>
<td>Alexander, Dr. C.P., MB, MRCP</td>
<td>22 Ratcliffe Road, LE2 3TB</td>
</tr>
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<td>1983</td>
<td>Allen, Mrs. N.</td>
<td>79 Knighton Church Road,</td>
</tr>
<tr>
<td>1981</td>
<td>Anderson, Mrs. S.</td>
<td>12 Shelley Road, Enderby, LE9 5QX</td>
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<td>1982</td>
<td>Armitage, Mrs. R.</td>
<td>3, Wilmington Court, Glebe Road, Oadby</td>
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<td>1983</td>
<td>Aulakh, Mr. J.</td>
<td>30 Marlow Road,</td>
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<td>1975</td>
<td>Baatz, Mr. M. A.</td>
<td>16 Southernhay Road, LE2 3TJ</td>
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1981 Hetherington, Dr. R.R. 25 The Bridle, Glen Parva, LE2 9HR
1967 Hickinbotham, Mr. P.F.J., ChM, FRCS 69 Main Street, Bushby, LE7 9PL
1950 Higson, Miss C.W.J. 26 New Way Road, LE5 5UA
1978 Holloway, Dr. J.H. 43 Morland Avenue, LE2 2PE
1935 Holme, Mr. W.N. 92 Shanklin Drive, LE2 3QE
1982 Holt, Mrs. M.H. 13 Ripon Street
1951 Humphreys, Prof. A.R. 144 Victoria Park Road, LE2 1XD
1976 James, Mr. J.N. 6 Elsalene Court, London Road, LE2 2PN

1981 Janes, Alexey 52 Kirkland Road, LE3 2JP
1981 " Daniel " 
1981 " Mark " 
1975 " Mr. P.J. " 
1982 Johnson, Mr. C.A.G. " 
1962 Johnson, Miss E.M. 6 Upperton Rise, LE3
1953 Judge, Miss E.M. 98 London Road, Oadby, LE2 5DJ
1971 Keay, Mrs D.M. 13 North Avenue, LE2 1TL
1983 Keay, Mr. G. The Pines, Links Road, Kirby Muxloe, LE9 9DJ
1982 Kemp, Mrs. E.M.L. 38 Romway Road, LE5 5SE
1974 Khan, Dr. M.A., Ph.D, FGS, FRAS 28 The Oval, Oadby, LE2 5JB
1983 King, J.N. 144 Evington Lane, LE5 6DG
1974 King, Dr. N.W. White House Farm, 22 Main Street, Barkby
B.Sc, MB, BS, FFAECS " 
1958 Kirkby, Rev. A.H. 
MA, BD, Ph.D. 27 Westminster Road, LE2 2EH
1962 Kneen, Mr. H.C., FBTI 52 Homeway Road, LE5 5RG
1983 Knibb, Mr. E.C. 76 Kingsmead Road, LE2 3YD
1982 Laine, Mr. J.R. 46 Kimberley Road, LE2 1LF
1976 Lamb, Miss F.M. 5 Farley Road, LE2 3LD
1971 Lane, Miss D. 112, Queens Road, LE2 3FL
1924 Laws, Miss G. 40 Nevanthorn Road, LE3 6DR
1976 Lawson, Dr. B. 27 Brookside, Rearsby, Leics.
1983 Leader, Mrs. B.J. Fines Cottage, Barsby, Leics.
1963 Le Bas, Dr. M.J. 1 Carisbrooke Avenue, LE2 3PA
B.Sc, PhD, FGS " 
1980 Leslie, Dr. D.R.S. 9 Mosse Way, Oadby, LE2 4HL
1975 Lewis, Dr. D.G. 3 Shirley Road, LE2 3LL
1976 Lloyd-Smith, Mr. L. 12 Ashfield Road, LE2 1LA
1964 Long, Mrs. G. BSc, FLA 46 Wintersdale Road, LE5 2GT
1963 Long, Mr. R.H. 38 Heddington Way, LE2 6HT
1982 Loosmore, Mr. R.G. 1 Roundhill Road, LE5 5JR
1983 Loveland, Miss E. College Hall, Knighton Drive, LE2
1967 Lowe, Mr. L.A.B. 45, Knighton Drive, LE2 3HD
1981 Ludlam, Mr. B.A. Lower Greenhill Farm, Whitwick
1969 McLaughlan, Mr. J.K. 166, Evington Lane, LE5 6DG
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1957 McLaughian, Mrs. P.M. 38 Knighton Church Road, LE2 3JH
1975 LcLearie, Mrs. M.E. 39 Ashfield Road, LE2 1LB
1972 McNeil, Dr. D.A.C. 175 Byron Street, Loughborough
1975 Majat, Dr. H.G.K. 24, Stanley Road, LE2 1RE
1977 Mann, Mr. S.T. 12, Palmerston Boulevard, LE2 3YR
1959 Marson, Miss K.E. 75 Pine Tree Avenue, LE5 1AL
1983 Martin, Miss K.R. 158 Harborough Road, Oadby, LE2 4LD
1983 Martindale, Miss E. 91 Shanklin Drive, LE2 3QF
1979 Marvin, Mrs. G.M. 14 Dalby Avenue, Bushby
1973 Matthews, Mrs N.H.L. 3 Bude Drive, Glenfield, LE3 8BA
1983 Mettrick, Mrs. C. 13, Springfield Crescent, Kibworth Beauchamp

1933 Millard, Dr. M.L. 50 The Broadway, Oadby, LE2 2HE
1977 Mills, Dr. A.A. 34, Holmfield Avenue, LE2 2BF
1982 Modi, Dr. J.J. 11, Rushford Drive, Willow Park
1983 Moore, Mrs R. 2, St. Andrews Drive, Oadby
1974 Morley, Mr. J.A. FCMA 45 The Broadway, Oadby, LE2 2HF
1974 Morris, Mr. D.L. BSc, FRICS 63 Regent Road, LE1 7AX
1948 Morton, Miss I.N. Belvoir Lodge, Medbourne, Market Harborough, LE16 5FL
1948 Morton, Mr. J.H.M. 90 Howard Road, LE2 1XH

1982 Nichols, Mrs. E.F. 46 Desford Road, Kirby Muxloe, LE9 9BD
1983 Nye, Miss V. House QQ, Freeman's Common Houses, 165 Welford Road, LE2

1971 Orpen, Miss M.J. 4, Briar Walk, Oadby, LE2 5UE
1980 Orton, Mr. A.F. 38 Sybil Road, LE3 2EY
1983 Orton, Mr. E.S. 68 Park Road, Birsell
1966 Orton, Mr. H.A. 26 The Circle, Gwendolen Road, LE5 5GB
1960 Page, Mr. J.L. 42, Bankcart Avenue, LE2 2DB
1978 Page, Mr. J.M. 153 Spencefield Lane, LE5 6GG
1974 Palmer, Mrs H. Barn Hayes, Forest Drive, Kirby Muxloe
1981 Parkins, Mrs B.M. 42 Fairefield Crescent, Glenfield, LE3 8EA

1983 Parkins, Miss S. 68 Howard Road, Clarendon Park
1983 Payne, Mrs B. 36 Fairway, Kibworth Beauchamp, LE8 OLB

1983 Pegg, Mrs. H.C. 8 Somerby Drive, Oadby, LE2 4PH
1983 Penton, Dr. G. Flat 4, 19 Tower Street
1979 Pickard, Mrs J.L. 21 Grenfell Road, LE2 2PA
1933 Pickard, Mr J.N. 12 Stoughton Drive South, Oadby
1983 Plaskett, Miss R.J. JP, BA
1981 Pole, Miss E. 30 The Lawns, 21 Stoneygate Road

1945 Potter, Lt.Col. J.B. Flat 147, Goscote House, The Elms, 18 Main Street,
TD Sparkenhoe Street, LE2 0TN Smeeton Westery, LE8 0QJ
1972 Powdrill, Mr. E.J. 54, Coverside Road, Great Glen, LE8 OEA MA
1974 Price, Mrs. D.E. Ranmore, Gullet Lane, Kirby Muxloe
1983 Pybus, Mrs. K. 21 Rookery Lane, Groby, LE6 OGL
1972 Rablen, Mrs. M.C.B. 53 Knighton Drive, LE2 3HD BA
1983 Rajput, Mrs. M.I. 51 Bulwer Road, LE2 3BW
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<td>Swales, Prof. J.D.</td>
<td>21 Morland Avenue, LE2 2PE</td>
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<td>Sylvester Bradley, Mrs</td>
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<td>J.E.M.</td>
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<td>Tarrett, Mrs. B.M.</td>
<td>11 Towers Drive, Kirby Muxloe, LE9 9EW</td>
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<td>Taylor, Dr. R.W.</td>
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<td>12 Pilgrim Gardens, LE5 6AL</td>
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<td>3 Ridgeway Road, LE2</td>
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<td>3 Barrington Road, LE2 2RA</td>
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<td>Vearncombe, Mrs. M.M.</td>
<td>30 High Leys Drive, Oadby</td>
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<td>Waddington, Miss N., MA</td>
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<td>Webster, Mr. G.F.</td>
<td>45, Glen Parva Avenue, Glenfield</td>
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<td>15 Kingscliffe Crescent, LE5 6QF</td>
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<td>Wilcock, Mr. S.H.</td>
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<td>Flat C, 11 Knighton Rise, Oadby, LE2 2RF</td>
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<td>Wood, Miss D.J.</td>
<td>26 Greengate Drive, Birstall, LE4 3DJ</td>
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<td>Capler, Peppers Lane, Burton Lazars, Melton Mowbray, LE14 ZKA</td>
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<td>Worn, Mr. T.</td>
<td>17 Danvers Road, Mountsorrel, LE12 7JG</td>
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<td>1980</td>
<td>Wright, Mrs. J.C.</td>
<td>24 Evington Lane, LE5</td>
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<td>1951</td>
<td>Wykes, Mr. C.L.</td>
<td>61 Stoneygate Court, London Road, LE2 2AJ</td>
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