

# TRANSACTIONS OF THE LEICESTER LITERARY & PHILOSOPHICAL SOCIETY.

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VOLUME 98

AUGUST 2004



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Business and Education  
Of Lice and Men  
Poetry of R.S. Thomas  
Treasure Houses of Knowledge  
You are what You Eat  
Women in Industrial Chemistry

Building Stone in Northamptonshire  
Super-eruptions and the Environment  
Ruins of Palmyra  
Fathers and Sons  
Farming and Wildlife  
Annual Reports

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Cover picture: South Adyton Ceiling, Temple of Bel, 1st century AD, Palmyra, Syria

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# WHY LINKS BETWEEN BUSINESS AND EDUCATION ARE IMPORTANT

**Presidential Address by Mr Michael Kirk, O.B.E., F.C.A.**

*Delivered On October 6 2003*

**I believe that Schools have a responsibility to contribute to the preparation of young people for the world of work. Let me give you some background information.**

**Since 1981 the number of jobs in the UK has increased by 11%. Two million less in the Public Sector but an increase of four million in the Private Sector. Small businesses (fewer than 50) now account for 40% of all business jobs. In Leicestershire out of a population of 900,000 some 435,000 are in employment with 34,000 different employers. 88% of those employ fewer than 10 people.**

**The days of large Companies employing thousands of people are past and future growth will come from the start up and growth of small businesses. Young people will need enterprising skills, positive attitudes and improved capabilities.**

I worked in the Aerospace Industry for many years and had little contact with Universities, Schools or Colleges from a business point of view. In 1982 I was appointed Managing Director and began to recognise the problems of dealing with people who had maybe under-achieved in their education and had very little training.

1986 was designated Industry Year and a group of Head Teachers and Chief Executives agreed to meet to exchange views. I was persuaded to join in. Discussions did not get off to a good start. Most Head Teachers insisted that they were there simply to educate the students without involving employers. The employers job was to train their employees.

However it was agreed that we should exchange visits. I spent a day with the Head of a school and he spent a day shadowing me in the Company. The year was rounded off with an 'away day' chaired by the distinguished historian Corelli Barnett with much more open discussion and good relationships formed. Contact between Schools and Employers began to develop.

In 1992 Education Business Partnerships were formed and I was fortunate enough to be asked to become Chairman in Leicestershire. Funding became available from the Training and Enterprise Council and a Limited Company was formed with 12 Directors - 5 from Business, 5 from Education and 2 Independent.

The Company has grown and brought together a number of Government Education and Business initiatives. It is now known as the Leicestershire Education Business Company and funded by the Learning and Skills Council.

The Company has 25 full time staff and a budget of some £1.8million.

The Objectives of Education Business Links are as follows:

- to enable young people to experience the world of work and thus improve their employability.
- to improve behaviour, attendance and motivation of students.
- to raise levels of achievement in schools.
- to enhance delivery of the National Curriculum
- to acquire knowledge, skills and attitude to enterprise, financial literacy and an understanding of business.
- to support the development of Teachers

The Company, working with other partners, runs a number of programmes and I intend to limit my presentation to the following:

Work Experience  
Young Enterprise  
Right to Read  
Mentoring  
Setpoint

## WORK EXPERIENCE:

Every year 11 students in the City and County are encouraged to spend two weeks with an Employer. Every Company has to be vetted under Health & Safety requirements.

Number of Employers on data base	11,600
Number of placement opportunities	12,500
Number of year 11 students each year	11,500
% of Students placed	95%

## YOUNG ENTERPRISE:

Students aged 15 -19 set up and run their own Company for one year. Also special programme for Primary Schools

Learning by Doing:

- raise awareness about and encourage more positive attitude about employment
  - raise aspiration levels to become more enterprising
  - develop enterprising behaviours, skills and capabilities
  - enhance and improve key skills and citizenship
  - encourage life long learning and the value of education and training
  - promote self esteem and confidence to young people
- |                           |       |
|---------------------------|-------|
| No of programmes          | 145   |
| No of Pupils              | 2,835 |
| No of Schools             | 68    |
| No of Business Volunteers | 240   |
| No of Companies           | 80    |

## RIGHT to READ:

National campaign to promote Literacy

Company employees to spend one hour per week for minimum of 12 weeks listening to 5 - 11 children read

Unique partnership between Business and Education. Gives Volunteers the opportunity of making a real difference to the life of a child

76 Schools in City and County
65 Companies involved
1,145 Volunteers
2,250 Pupils

## MENTORING:

Volunteers give a commitment of one hour twice a month to visit a School or College for a one to one mentoring session with a student:

- Motivating under -achieving students
- Raising self esteem and confidence
- Providing an opportunity for students to reach their full potential
- Supporting, enthusing, motivating, organising and facilitating students
- 28 Schools
- 260 Mentors

## SETPOINT:

To engage Employers in supporting Science, Technology, Engineering and Maths in Schools.

In Schools to inspire and motivate Students to pursue learning and career opportunities in these disciplines.

To contribute to raising standards by setting up project opportunities which will help students to see the relevance of industrial applications to classroom theory.

- Maths & Science Workshops
- Science Suitcases
- Young Engineer Clubs
- Industry Days
- Crest Awards
- 130 Businesses
- 450 Teachers

I started off by saying that Education had a responsibility to prepare young people for the world of work. I hope I have demonstrated that Business has shown it is prepared to help with Education.

Whilst accepting there is no substitute for the inspirational teacher in the classroom I believe in today's environment Schools need all the help we can give.

There are areas of this City where over 10% of the population are unemployed. There has been the growth of single parent families. The distractions of TV, Mobile Phones, Drugs etc. Discipline is a serious problem. The Teaching profession needs help and support.

I believe we have developed an effective Partnership between Education and Business but there is still much to be done. More Companies need to be involved and more students should participate.

The Howard Davies Report on Enterprise and the

Economy in Education has recommended a new question for OFSTED Inspectors in Schools:

How well does the School prepare young people for employability and work?

I fully endorse that question.

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## OF LICE AND MEN

### Dr D. A. Burns, Emeritus Consultant Dermatologist, Leicester Royal Infirmary

*Lecture delivered on Nov 3 2003*

*Ye ugle, creepin, blastit wonner,  
Detested, shunn'd by saunt an' sinner,  
How daur ye set yer fit upon her,  
Sae fine a lady.  
Gae somewhere else and seek your dinner,  
On some poor body.  
R. Burns*

**The content of this verse from 'To a louse, on seeing one on a lady's bonnet at church', indicates that Robert Burns thought it totally inappropriate for a louse to be wandering around on the head of someone in the upper social echelons – its proper place was on the hoi polloi. This is a reflection of a still commonly held belief that head lice only inhabit 'dirty' scalps, and certainly surveys in Britain in the 1940s showed that infection occurred more commonly in lower social classes in urban areas. There is no doubt that the spread of lice is encouraged by circumstances of poverty and overcrowding, but in more recent years it has become obvious that the head louse is by no means exclusively an urban dweller, nor are its social aspirations limited to the lower classes – it is now thoroughly cosmopolitan and may affect any socio-economic group.**

Head louse infection is a common problem in children, and when seen in adults those affected are usually the parents of the aforementioned children. The lice are usually spread by head-to-head contact. Females of all ages are affected more than males, although I doubt that Henry Fox was aware of this when he made his impromptu retort following an encounter with Lady Montague:

*Lady Montague told me, and in her own house,  
'I do not care for you three skips of a louse.'  
I forgive her, for women, however well-bred,  
Will still talk of that which runs most in their head.*

Adult lice are about 2–3mm in length, feed on blood, and live for about 40 days. Female lice stick their eggs to hair shafts with an extremely efficient cement material. Eggs hatch after about 10 days, and it is the empty egg-cases or 'nits' which frequently

lead to discovery of the problem, in association with complaints of itching – although only about half of those affected itch. Intact eggs are closer to the scalp and more difficult to see.

Methods directed at head louse control include chemical and physical treatments. For many years there have been a number of insecticides (e.g. lindane [now withdrawn from UK use], malathion, carbaryl and synthetic pyrethroids) available over-the-counter in retail pharmacies. These are convenient and easy to use, and have been quite effective, although lice in many parts of the UK are now resistant to some, if not all, of these agents. In addition, media reporting about potential adverse effects of some insecticides and increasing concern about environmental contamination have contributed to changing attitudes, and the increasing use of physical methods of control, principally the

'Bug Busting' technique of shampoo/conditioner and combing with a fine-tooth comb. However, there is little new in the latter – as a 5-year-old my head lice were dealt with by combing and manual (maternal) removal of eggs over a copy of the Yorkshire Post every evening until clearance was achieved. There is also anecdotal evidence of the effectiveness of lavender and tea tree oils, although I am not aware of any formal trials of their use.

Moving south, towards the nether regions, we enter the territory of the infamous crab louse. 'Crabs' are different in appearance from head lice, and their name derives from a resemblance to a crab, with a body like the carapace and large claws similar to pincers. Anyone with a naval background will know that all members of the RAF are referred to as 'crabs' by the Royal Navy. This is because the blue of the RAF uniform is the same colour as a mercury ointment (crabfat) used in the past to treat these lice in navy personnel. Also known as pubic lice and love bugs, and 'pants rabbits' and 'bloomer crickets' in the USA, infection with these little creatures is sometimes called 'cupid's measles'. My favourite of the various names is the French 'papillons d'amour', which I think suitably conveys Gallic aestheticism. As many of the names suggest, crab lice are usually transmitted during sexual encounters. They are lice which are virtually helpless off the host.

Although colourful, some of the names are misleading, in that crab lice frequently colonise hair on parts of the body other than the pubic region. They are adapted to living in hair of a particular density, and the only area that they eschew is the main mass of scalp hair – they will colonise scalp margins, eyelashes, beard hair, axillary hair and general body hair. In the hirsute, Neanderthal-type male, one occasionally encounters a veritable adventure playground teeming with crabs.

Contrary to popular opinion, they are not acquired from contact with toilet seats, although they do frequently feature in toilet graffiti, a well-known example of which is:

*It's no good standing on the seat,  
The crabs in here can jump ten feet.  
If you think that's rather high,  
Go next door, the buggers fly!*

They are treated with the same insecticides used to control head lice, although it is said that the armed forces have their own patent, exotic treatment techniques (with the exception of the RAF apparently). In the navy, the afflicted must rub the affected parts vigorously with rum, and then sprinkle sand over them – so the lice get aggressively drunk and stone each other to death. In the army, one shaves half of the pubic region with a razor, sets the other half alight with a match, and beats the little swine to death with a hammer when they run from the flames!

The third variety of human louse is the clothing (body) louse, which resembles the head louse, but is larger. This louse lives in clothing, and visits the body to feed. Infection with the clothing louse is still common in poorer countries of the world, but in affluent societies its usual hosts are tramps and down-and-outs who have only one set of clothes which are never removed or cleaned – conditions which are ideal for the clothing louse. Individuals who change their clothing regularly and have a reasonable standard of hygiene will never carry this louse. When low temperature biological washing powders were introduced there was some concern that clothing lice might become more prevalent because the wash temperature was not sufficient to kill lice and eggs. I could never understand the reason for the concern, as washing machines and biological washing powder did not figure prominently in the lives of the only group of people likely to be affected by the louse.

The usual features of this infection are itching and numerous scratch marks on the body. The itching occurs because the affected individual develops an allergy to the contents of louse saliva. In the usual scenario of doctor encountering clothing louse infection, a tramp is lying on a couch in a hospital A and E department, having been bathed and given a clean white gown. There is no point in searching for lice on the patient, as their natural habitat is the clothing – so attention must be concentrated on the black polythene bag containing the clothing, which is rustling ominously in the corner of the cubicle; in my experience volunteers to rummage through this are usually hard to find.

To deal with the problem, an affected individual's clothing can either be replaced, or subjected to high

temperature wash and tumble drying. In underdeveloped countries, where clothing lice are common, many affected people have few clothes, and attempts to control the lice are centred on dusting clothing with insecticide.

Clothing louse control in poorer countries is important because this louse is the vector of epidemic typhus, a rickettsial disease which has been responsible for millions of deaths in the past and has had a profound influence on the course of human history. It is particularly likely to emerge in conditions of famine and warfare. Typhus is spread by contact with infected louse faeces, not by lice inoculating the organisms when feeding. Infected lice, or dried louse faeces from an individual with typhus, are transferred to others who, it is thought, become infected via abrasions or because they have their own populations of lice and therefore scratch and inoculate themselves with the organisms.

Typhus has had a number of names in the past, including famine fever, ship fever and gaol fever. The last mentioned relates to its frequent occurrence in the crowded and filthy conditions of the prisons of the past. A print of Newgate prison shows an apparatus on the roof that resembles a small windmill. It was connected to a system of ducts in the building, akin to an air-conditioning unit – and this was its intended function, as it was thought that prisoners were dying because of the foul air. Apparently, in the early eighteenth century, for every person taken from Newgate gaol to Tyburn to be hanged, about four died in Newgate from gaol fever or a related disease.

Typhus in prisons not infrequently affected others who came in contact with the prisoners, and was responsible for numerous so-called 'Black Assizes' when those in court were stricken by the disease. One well-documented episode occurred in 1577, during the reign of Elizabeth I, at the assizes in Oxford. A man named Rowland Jencks, described as 'a saucy Roman Catholic bookbinder', was put on trial on a variety of charges including 'vilifying the government, profaning God's Word and absenting himself from church'. Shortly before the assizes several of the prisoners in Oxford gaol had died in their chains. Jencks was found guilty as charged, and sentenced to have his ears lopped off, which sentence was duly carried out. Not long thereafter,

most of the court officials and their relatives sickened and died, as did many of those attending the assizes as spectators. The final account was 1 Roman Catholic bookbinder slightly damaged and about 500 other denominations deceased.

Another episode, which demonstrated very clearly how typhus spreads, occurred at the old Old Bailey in 1750, at the trial of a Mr Clarke, for murder. The weather was warm, and windows behind the dock were opened. At that time, there were two juries, a Middlesex jury and a London jury, which were situated on either side of the Bench. After the assizes, the jury and those members of the Bench directly opposite the dock died of gaol fever. The breeze from the open windows had presumably wafted dried louse faeces from the area of the dock onto them.

During the First World War, the troops in the trenches were plagued with lice. In the west, efforts were made to de-lice uniforms when soldiers were away from the front-line, but as soon as they returned to the trenches they were louse-ridden again. Trench fever, a louse-borne rickettsial disease, occurred on the western front. This is mild in comparison with typhus, which was a major problem on the eastern front, and continued to be so in eastern European countries after the war.

Louse infection was less problematic during the Second War War, but was notable in certain situations, for example during the siege of Stalingrad. Typhus was a major killer in Belsen concentration camp, and following its liberation there was a sign placed on the main gate imposing a 5mph speed limit and stating 'Dust spreads typhus'. The Japanese had a biological warfare facility in Manchuria that was developing techniques to disseminate a number of diseases, including typhus – by dropping bombs containing large numbers of infected lice.

These are just a few historical snippets relating to lice, insects which have plagued human beings for millennia, and will most likely continue to do so despite all efforts to eradicate them.

# EXPERIMENT WITH AN AMEN - THE POETRY OF R S THOMAS

**The Venerable Dr T. Hughie Jones, Archdeacon of Loughborough**

*Lecture Delivered on 17 November 2003*

I am grateful to our Programme Secretaries for persisting with their request for me to present this paper, which has been re-written for the occasion. You have heard the history of its availability over a long period of time, with me acting understudy to a number of more distinguished speakers. Now I step out of the wings, and take off-centre stage in my own right. Truth to tell, this is something of a self-indulgence, not without a nationalist tinge. The Welshness of R S Thomas will form a large part of what I have to say, including a very little, from time to time, of what we Welsh modestly describe as 'the language of heaven'. One small digression on that phrase, derived from my undergraduate days in Cardiff. When the late Gilbert Norwood vacated the chair of Greek there, to take up a post in Canada, a farewell dinner was held in his honour. Tribute was paid to the courtesy and thoughtfulness with which he, an Englishman, had learned Welsh, - the language of heaven' - during his time in the Principality. In his reply, Norwood denied that Welsh would be the language of heaven, which, he contended, would undoubtedly be classical Greek. 'However', he added, 'I concede that the singing in heaven may very well be in Welsh'.

Well, it is to a Welsh poet that we turn our attention tonight, and begin by rehearsing briefly his life and career. Ronald Stuart Thomas was born in Cardiff in 1913. During his infancy the family moved from place to place while his father served in the Merchant Navy. At the end of the Great War they settled in Holyhead, his father then working on what are known locally as 'the Irish boats'. I find it interesting that at that time those boats would have been the *St Siriol* and the *St Tudno*, on both of which uncles of mine also served, one as purser and the other as a stoker. RS (please allow the abbreviated form of address) was then six years old. In 1925 he went to the Holyhead County Grammar School, where he distinguished himself both academically and in sport, unlike four of my cousins (much older than I) who must have been there at the same time. None of them survives to tell whether he made any impression on them. After school, he attended University College, Bangor - 'Coleg ar y bryn', where he graduated with honours in classics. He then descended the length of Wales to enrol at St Michael's College, Llandaff, in preparation for ordination into Anglican ministry. In 1936 he returned to North Wales, serving his title as curate of St Mary's, Chirk, near Wrexham, where he met and fell in love with the art teacher at Oswestry High School for Girls, Mildred Eldridge. To her we owe the striking 1978 portrait of the poet. They married in 1940 and moved to Hanmer, in the eastern corner of what was then Flintshire. Both Chirk and Hanmer

were too Anglicized for RS, who was by now longing to be, in his own words, 'part of a more Welsh environment'.

I realised what I had done. My place was not here on this plain among these Welsh with English accents and attitudes. I set about learning Welsh, so as to get back to the real Wales of my imagination. I came on slowly, too slowly to be ready for a Welsh parish. I applied for two parishes, but the vicars refused to help me. I carried on with my Welsh, going to Llangollen every week for an hour's lesson with lowerth Roberts. But there was no one I could practise on during the week, and my progress remained slow. But within two years, Manafon, a country parish in Montgomeryshire, became vacant, and there we went, to the rectory on the banks of the river Rhiw. There was no Welsh in Manafon either, but the parish was up in the hills, and when the floods came down from the moors and the clouds flew past, I really felt that I had come back to Wales.

As we shall see, the Manafon experience was to be formative for a particular phase of RS's poetry, and it was here that the most significant character in his verse - Iago Prytherch - was born.

After only two years in Manafon, the Thomases moved in 1954 to Eglwysfach, twelve miles north of Aberystwyth (my father's hometown), where RS

ministered for a further thirteen years. In 1967 he began his final incumbency on the tip of the Llyn peninsula, St Hwyn, Aberdaron with St Mary Bodferin, adding, in 1972, Rhiw with Llanfaelrhys (amalgamation of parishes within a single benefice is nothing new!). In 1978 he retired to Porth Neigwl, four miles from Aberdaron, known in English as 'Hell's Mouth'. His devoted wife died in 1991 and he, having remarried, died in Anglesey September 2000, aged 87. His poetic output, all of it in English (of which fact more later), earned him the Heinemann Award of the Royal Society of Literature in 1956, the Queen's Gold Medal for Poetry in 1964, and the Cholmondely Award in 1978, together with three of the Welsh Arts Council's literary awards.

Let us turn now to the three major areas of his work which, though inter-twined in ways I shall demonstrate, are nonetheless distinct emphases. They are briefly, nature, Wales and God. Less briefly, nature means an awareness of and concern for the impact of technological advances on the integrity of the countryside, together with a realisation of the harshness of life in the Welsh hills. A sensitivity to the beauties of flora and fauna, though secondary, informs this part of RS's work.

It was in Manafon that he became conscious of the harshness just mentioned, which found its expression in the character named earlier, Iago Prytherch (in English, James Pritchard). For twenty years of the poet's writing, from his first appearance in *The Stones of the Field* (1946) to his farewell in a 1969 poem, *The Grave*, which appeared in *The Anglo-Welsh Review*, Prytherch became a vehicle for the poet's recognition of the Welsh peasant condition. RS's own reflections on his character found expression in his letter to Raymond Garlick, another Welsh poet and critic:

As you will see from the poem *And Prytherch, then, was he a real man?* - I have never been quite sure about his existence - he's certainly dead now! The first poem I wrote about him, *A Peasant*, certainly was written in the evening after visiting a 1,000 feet up farm in Manafon, where I saw a labourer docking swedes in the cold, grey air of a November afternoon. I came later to refer to this particular farmer jestingly as Iago Prytherch. Iago Prytherch his name, though, be it allowed

Just an ordinary man of the bald Welsh hills,  
Who pens a few sheep in a gap of cloud.  
Docking mangels, chipping the green skin  
From the yellow bones with a half-witted grin  
Of satisfaction, or churning the crude earth  
To a stiff sea of clods that glint in the wind -  
So are his days spent...  
There is something frightening in the vacancy of  
his mind.  
His clothes, sour with years of sweat  
And animal contact, shock the refined,  
But affected sense with their stark naturalness.  
Yet this is your prototype...  
Remember him, then, for he, too, is a winner of  
wars...

Prytherch is not the Welsh *gwladwr*, the Welsh-speaking countryman with a literary and poetic tradition stretching far back in time and nourishing his daily life, however drab. Hence the 'something frightening in the vacancy of his mind'. This is a man robbed of intellectual and emotional development by the rigour of his daily round and the starkness of his environment. It would be interesting in discussion to learn whether this is exclusively a Welsh phenomenon, which I doubt, or whether someone like Crabbe or Goldsmith sings the same song. Certainly, something of the kind could be found in Wordsworth. In *The Depopulation of the Welsh Countryside*, an article in the journal *Wales* (V.7, 1945, 106-7), RS introduced what would be a constant theme for many years - the deleterious and devastating effect of modern technology on life in general, and on farming in particular, on the simple but rich culture of the upland peasant community.

It may appear to the reader that I am merely indulging a personal nostalgia, merely sighing a lament over something which has gone beyond recall. But...despite the many ruined homesteads in these upland districts, there are others still managing to hold out, and it is for their sake that I write. These are the true Welsh peasantry, and to know them is to feel a real affection for them.

From the powerful tone-poem *The Minister*, with its Welsh sub-title, *Swm y gallon fach yn torri*, 'Sound of the small heart breaking' come the lines

This is the land where men labour  
In silence, and the rusted harrow

Breaks its teeth on the grey stones.  
Below, the valleys are an open book,  
Bound in sunlight; but the green tale  
Told in its pages is not true.

There is an ambivalence in RS about the transformation of farming. He is aware of the alleviation of hard, back-breaking labour by machinery, but the cost, for him, is too great, too destructive of that remoteness, even exclusivity, which retained for the farmer the values and culture now disappearing. The ambivalence extends to his attitude to the peasants themselves. One of his most sensitive critics, the French Academician, Marie-Thérèse Castay, identified it (the translation is mine) – ‘Often, however, his despair turns to harsh reproach of these simple hill-dwellers who, instead of distrusting the allurements of the modern world, hanker after the restoration of a past golden age’.

For him, the poet, there is also a creative dilemma. For how long should he beat this particular drum? From the early sonnet, *No Through Road*:-

All in vain. I will cease now  
My long absorption with the plough,  
With the tame and the wild creatures  
And man united with the earth  
I have failed after many seasons  
To bring truth to birth,  
And nature's simple equations  
In the mind's precincts do not apply.  
But where to turn? Earth endures  
After the passing, necessary shame  
Of winter, and the old lie  
Of green places beckons me still  
From the new world, ugly and evil,  
That men pry for in truth's name.

He was to continue his crusade against the spoliation of the countryside for much longer, but with it, and eventually almost supplanting it, was the second area or emphasis I mentioned at the outset - his crusade for the preservation of Welshness.

There is a factor in this to which allusion was made in the brief sketch of RS's life, and to which I can personally relate, though my own experience was almost the exact opposite of his. He was, you remember, though born in Wales, an Anglophone, learning the Welsh language only, and of set

endeavour, as an adult. I was born of Welsh parents in Manchester, into a Welsh-speaking chapel culture, and speaking only Welsh in the home until I went to school. I then almost lost my Welsh, regaining it only, and less than perfectly, in adult life. It is not now my first language; indeed, in terms of fluency, it is probably my third. RS and I, therefore, technically belong, as do most of our nation, to what he hated to call, though recognising the validity of the term, the ‘Anglo-Welsh’. Though he wrote fluent prose in Welsh, he never felt able to write in the traditional, or even newer forms of Welsh verse, with its strict metres and rhyming conventions. In a 1952 prose article in the Welsh-language journal *Y Fflam* (‘The Flame’) he wrote (my translation again):-

‘Anglo-Welsh literature’ - what is it? Literature by Welsh people about Welsh things? Literature by English people about Wales? Or literature by Welsh people about any subject at all?

After contrasting the approaches of Matthew Arnold and Sir Idris Bell in an attempt to answer his own questions, RS continued

My view is this: since there is in Wales a mother-tongue that continues to flourish, a proper Welshman can only look on English as a means of rekindling interest in the Welsh-language culture, and of leading people back to the mother-tongue (*y farniaith*).

And again:-

An Anglo-Welsh writer is neither one thing nor the other. He keeps going in a no-man's-land between two cultures. For various reasons he is obliged to write in English. Whatever may be said to the contrary, therefore, he is contributing to English culture, and deserves the strictures of his fellow-Welshmen on that account...Woe that I was born! For who has not suffered, if I have not suffered? For I bear in my body the marks of this conflict. Who, in fact is this vaunted Anglo-Welshman - one who knows that he is Welsh, or likes to think of himself as such, but is constantly conscious of the fact that he speaks a foreign language?

No one has better amplified this concern than Glyn Jones, himself a Welsh novelist writing in English. His 1968 book *The Dragon Has Two Tongues* gives a

more sympathetic treatment to the Anglo-Welsh than does RS, and interestingly includes an essay on that very different version of 'Thomas the Poet' - Dylan. But the concern is real, and widely shared, often amounting to what it is now fashionable to call an identity crisis. In some it is felt almost as guilt. I myself feel apologetic that my Christian name has an English spelling, and whenever I confess Manchester as my birthplace add, in extenuation, 'Where Lloyd George was born, you know!' together with the feeble quip, 'Being born in a stable doesn't make you a horse'.

For RS there was a sense of grudge and resentment that a prevailing English culture had deadened the sense of many Welsh-speaking Welshmen, and deprived their Anglophone compatriots of the riches of their rightful linguistic inheritance. Once he had learned Welsh, he relished the *englynion*, the four-line stanzas of classical Welsh verse, as all of us do who have the language. Translation never plays fair by poetry, but hear his favourite *englyn*, first in English, and then in the original:-

Silence brought by the dark night: Eryri's  
Mountains veiled by mist:  
The sun in the bed of brine,  
The moon silvering the water.  
Y nos dywell yn distewi -  
Caddug yn cuddio Eryri,  
Yr haul yn gweli'r heli,  
A'r lloer yn ariannu'r lli.

The tone-poem, *The Minister*, already quoted, has many touches of Welsh culture. Hear, for example, the minister himself, The Reverend Elias Morgan BA, describing his evening service:-

I was good that night, I had the *hwyl*.  
We sang the verses of the last hymn  
Twice. We might have had a revival  
If only the organ had kept in time.

And from the poem, *Welsh Landscape*:-

You cannot live in the present,  
At least, not in Wales...  
There is no present in Wales,  
And no future;  
There is only the past,  
Brittle with relics,

Wind-bitten towers and castles  
With sham ghosts;  
Mouldering quarries and mines;  
And an impotent people,  
Sick with inbreeding,  
Worrying the carcass of an old song.

Now we begin to hear the note of despondency over his nation which becomes, for what he himself eventually admitted to be too long, a feature of his verse. Listen to the poem, *Some Others*:-

Hate takes a long time  
To grow in, and mine  
Has increased from birth;  
Not for the brute earth.  
That is strong here and clean  
And plain in its meaning  
As none of the books are  
That tell but of the war  
Of heart with head, leaving  
The wild birds to sing  
The best songs-I find  
This hate's for my own kind,  
For men of the Welsh race  
Who brood with dark face  
Over their thin navel  
To learn what to sell;  
Yet not for them all either,  
There are those other  
Castaways on a sea  
Of grass, who call to me,  
Clinging to their doomed farms;  
Their hearts though rough are warm  
And firm, and their slow wake  
Through time bleeds for our sake.

It is time - to your relief- to turn away from Wales to that third and final area of RS's work which I promised to survey, namely, God, and it is at this point that I need to explain my chosen title for this paper - *Experiment With An Amen*. It is, as some will know, almost exactly the title of the poet's 1986 published collection and, to my mind, expresses more precisely than anything else, his revealed theological position. For remember, we are meeting a priest in the Church of God, who day by day and week in, week out, proclaims by word and action the sacred mysteries of the Christian faith. How can he? How can one whose whole being cries out against 'the rape of the fair country' (to borrow a Welsh

novelist's title), who finds little but cause for despair in what he sees and in the indifference of others to what he sees, how can such a one maintain the faith? His answer is, with difficulty, and with diffidence. Experimenting with an amen was, to the end, as far as he was prepared to go.

'Amen' is, of course, the Biblical expression of assent – 'Let it be'; a reception and acceptance of the given, whether in word or deed. It is an affirmation of commitment, of belief that the given is good and right, of a willingness to throw in one's lot with it.

Experimenting, as all the scientists here know, is the testing of a hypothesis to destruction. The scientist sets out not to prove, but to disprove. A suggested theory is subjected to every possible attack, to see whether it will stand up. If pragmatic challenge proves it inadequate, it is rejected. If, after every test that can be devised, it does stand up, time after time after time, it is accepted, and becomes the basis for prediction. But still, the true scientist will admit, only provisionally.

For the hypothesis that the God of Christian belief exists, all-powerful, all-good, RS could find sufficient support to continue practising as its advocate, ministering its encouragement, its solace, to those committed to his pastoral charge. But the path was not an easy one:-

To one kneeling down no word came,  
Only the wind's song, saddening the lips  
Of the grave saints, rigid in glass;  
Or the dry whisper of unseen wings,  
Bats, not angels, in the high roof.  
Was he balked by silence? He kneeled long,  
And saw love in a dark crown  
Of thorns blazing, and a winter tree  
Golden with fruit of a man's body.  
*(In A Country Church)*

Silence, not communication, is more often than not his experience and his theme. Or is silence communication

Often I try  
To analyse the quality  
Of its silences. Is this where God hides  
From my searching? I have stopped to listen  
After the few people have gone,

To the air recomposing itself  
For vigil. It has waited like this  
Since the stones grouped themselves about it.  
These are the hard ribs  
Of a body that our prayers have failed  
To animate. Shadows advance  
From their comers to take possession  
Of places the light held  
For an hour. The bats resume  
Their business. The uneasiness of the pews  
Ceases. There is no other sound  
In the darkness but the sound of a man  
Breathing, testing his faith  
On emptiness, nailing his questions  
One by one to an untenanted cross. *(In Church)*.

There is a faith here, but it is most surely grounded in the spirit of man, wrestling, like Jacob, with the angel of the unknown, and refusing to let go, despite the awe and the mystery, until the blessing comes:-

And courage shall give way  
To despair and despair  
To suffering and suffering  
Shall end in death. But you  
Who are not free to choose  
What you suffer can choose  
Your response. Farmers I  
Knew...proudly  
They lived, watching the spirit,  
Diamond-faceted, crumble  
To the small, hard, round, dry  
Stone that humanity  
Chokes on. When they died, it  
Was bravely, close up under the rain-hammered  
Rafters, never complaining. *(The Unvanquished)*

This is little more than stoicism, humanist acceptance of what cannot be avoided, an 'Amen' to life, rather than to the God and Father of Jesus Christ. But life is shot through, for RS, with intimations of divine involvement in the human condition:-

Is the night dark? His interests  
Are darker, more perilous  
To enter. Are there whispers  
Abroad? They are the communing  
With himself our destiny  
Is to be outside of, listeners  
At our breath's window. Is there  
An ingredient in him of unlove?

It is the moment in the mind's  
To his own will to conceive the tree  
Of manhood we have reared against him. (*The  
Moment*)

And then, unexpectedly:-

Suddenly after long silence  
He has become voluble.  
He addresses me from a myriad  
Directions... I have no need  
To despair; as at  
Some second Pentecost  
Of a Gentile, I listen to the things  
Round me: weeds, stones instruments,  
The machine itself, all  
Speaking to me in the vernacular  
Of the purpose of One who is. (*Suddenly*)

So there is communication, and yet the over-riding  
theme of RS's spiritual odyssey is that of an  
acceptance that God is to be found, if at all, in the  
waiting for - for what?

For what waiting alone can bring:-

Prepare yourself for the message.  
You are prepared?

Silence.

Silence is the message.  
The message is.. .Wait.  
Are you sure? An echo?  
An echo of an echo?

Sound.

Was it always there with us failing to hear it?  
What was the shell doing on the shore?  
An ear endlessly drinking?  
What? Sound? Silence? Which came first?  
Listen. I'll tell you a story  
As it was told me by the teller of stories.  
Where did he hear it? By listening? To silence? To  
sound?  
To an echo? To an echo of an echo?  
Wait. (*Questions*)

This gnomic poet, with his compressed and  
compacted language, asks much of us, his readers  
and hearers. Not least, that we share his searching,  
share his willingness to accept, or is it mere  
inescapable acceptance, of the enigma which is  
faith? The blending of ignorance with knowledge?

But his is a faith more than that of Tennyson:-

I stretch lame hands of faith, and grope  
And touch the dust and chaff, and call  
To what I feel is lord of all,  
And faintly trust the larger hope. (*In Memoriam*)

Rather, he shares Browning's experience of that 'life  
of faith diversified by doubt' –

Just when we're safest, there's a sunset-touch,  
A fancy from a flower-bell, someone's death,  
A chorus-ending from Euripides, -  
And that's enough for fifty hopes and fears  
As old and new at once as nature's self  
To rap and knock and enter in our soul. (*Bishop  
Blougram's Apology*)

But let RS himself have the last word, in a remarkable  
poem from the collection *Laboratories of the Spirit* -  
a title which could equally well have served for this  
paper. *Sea-Watching* was born of his Aberdaron  
years, when many hours were spent on that

'Land's End' peninsula, engaging in a physical  
contemplation which became - something else:-  
Grey waters, vast  
As an area of prayer  
That one enters. Daily  
Over a period of years  
I have let the eye rest on them.  
Was I waiting for something? Nothing  
But that continuous waving  
That is without meaning occurred.  
Ah, but a rare bird is  
Rare. It is when one is not looking.  
At times one is not there that it comes.  
You must wear your eyes out, as others their knees.  
I became the hermit  
Of the rocks. habited with the wind  
And the mist. There were days,  
So beautiful the emptiness  
It might have filled, its absence  
Was as its presence; not to be told  
Any more, so single my mind  
After its long fast,  
My watching from my praying. (*Sea-Watching*)

# TREASURE HOUSES OF KNOWLEDGE: THE MUSEUMS, LIBRARIES AND ARCHIVES OF THE EAST MIDLANDS

**Dr Tim Hobbs, Chief Executive, East Midlands Museums, Libraries and Archives Council**

*Lecture delivered on December 1 2003*

**If a man empties his purse into his head, no man can take it away from him. An investment in knowledge always pays the best interest.'**

Some (surprising?) facts

- Some 450 million visits a year to museums, libraries and archives
- More people visit museums than attend sporting events or rock concerts
- In the last 10 years, the number of people visiting archives has doubled
- 6 out of 10 people in the UK are members of a library. 95% of users believe that libraries are amongst the most valuable services to local communities. A vote winner!

The East Midlands: a region of diversity

- 6 counties
  - Derbyshire, Leicestershire, Lincolnshire, Northamptonshire, Nottinghamshire, Rutland
- 4th largest region in England
  - 12% of land area
  - Population 4.2 million (8.5% of total)
  - Expected to grow by 7% to 2020
  - 93.2% rural
  - 63% of population live in 6.8% non-rural areas
  - Rich seams of cultural diversity

The region's museums, libraries and archives

- Six major archives repositories
- 140 museums, most of them Registered. 48% local authority, 52% independent: many of them reliant on voluntary support
- 340+ public library service points, inc 51 mobiles  
40+ university library service points plus extensive provision in non-HE education, commerce & industry
- Local Authority and University MLA expenditure: £100m

EMMLAC: the East Midlands Museums, Libraries & Archives Council

- Regional development agency for museums, libraries and archives in the East Midlands
- Created April 2002: all nine Regional Agencies to be in place by Easter 2004
- Core funded by DCMS through the Museums, Libraries and Archives Council
- Additional funding from other sources

EMMLAC's strategic objective

EMMLAC's aim, working in partnership with the region's domain-specific bodies, is to ensure that the region's museums, libraries and archives play a full role in the social, educational, cultural and economic life of the East Midlands

To be achieved through

- advocacy and profile raising
- delivery of national, regional and local agendas in social, cultural, economic and learning areas
- encouraging MLAs to work together

EMMLAC's four key aspirations

- Learning and skills  
People to develop the skills, knowledge and qualities needed for life and work, through formal education and lifelong learning, by using museum, library & archive collections and services
- Creativity  
People at all stages of life to use the inspirational collections and expertise of museums, libraries and archives as a vital source of creative energy, innovation and ideas
- Economy  
Museums, libraries and archives to be recognised by national, regional and local stakeholders as key drivers of cultural tourism, as being at the forefront of the digital revolution, as central to the knowledge economy, and as a significant link in

the wealth creation chain.

- Community cohesion: a sense of place  
Museums, archives and libraries to be at the heart of their communities

Knowing what knowledge is

- Knowledge of the past and the present leads to a better understanding of our world
- Knowledge fuels the imagination, inspiration and innovation
- Knowledge, skills and creativity are key catalysts for change
- Knowledge is different from information

- It comes not just from formal learning, but also from informal lifelong learning
- What's more, it can be fun

Making the UK a Knowledge Society

- Entails enabling everyone to have access to the knowledge and information they require, to make the choices they need to develop their skills, to support their interests, and to shape their lives
- Knowledge is not simply another commodity. On the contrary, knowledge is never used up. It increases by diffusion and grows by dispersion.

*(D.J. Boorstein)*

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## YOU ARE WHAT YOU EAT: ISOTOPES AND MIGRATION STUDIES

Jane Evans NERC Isotope Geosciences Laboratory

*Lecture delivered January 12 January 12 2004*

Different masses of an element are called isotopes and there are two basic types of isotope 1) those that are referred to as 'stable isotopes', these are elements such as oxygen and hydrogen in which the difference in the mass between isotope species is sufficiently large that they can be separated by physical processes such as evaporation, and 2) those which are referred to as 'radiogenic' isotopes because the isotope differences are caused by the decay of a radioactive element eg  $^{238}\text{U}$  to  $^{206}\text{Pb}$ .

The isotope signature of elements incorporated into the body can tell us about the geography, climate and culture in which a person lived. The presentation is based on the use of three elements: strontium, oxygen and lead.

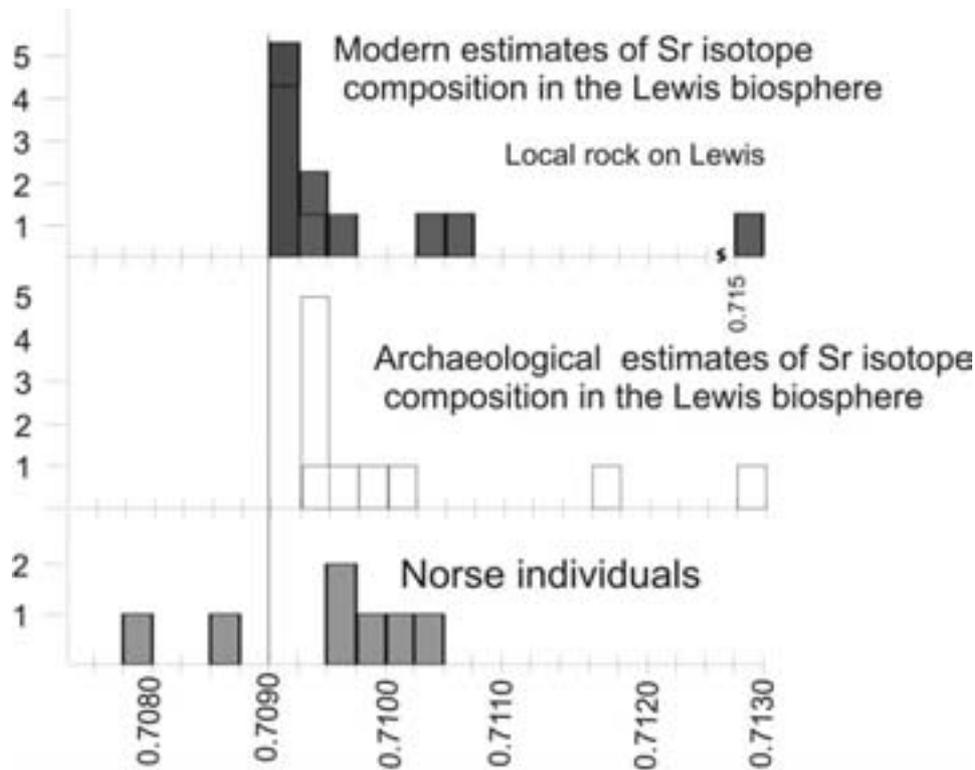
Lead is essentially a poison- the body does not need lead and it is naturally present at concentrations of less than 1ppm. However, exposure to pollution and metal ware will raise the Pb concentrations in the body and, in doing so, tell us something about the culture of the individual. Lead concentrations in the Stone Age were essentially zero as no one had access to metal ware. In contrast, the Victorians of the industrial revolution were exposed to high levels of Pb, which was incorporated in their teeth. In modern times petrol lead has caused a rise in body lead content: however modern children have returned to the values of the Stone Age now that petrol is lead free.

Oxygen isotopes tell you about the climate in which someone was raised. The oxygen isotope composition of rainwater varies fairly systematically

from equator to pole and across the UK these variations are very well documented. This makes it possible to match someone with a climatic zone on the basis of the oxygen isotope composition of his or her tooth enamel.

Strontium is an element that enters the food cycle via plants. It is chemically very similar to calcium and so follows calcium into teeth and bones. The isotope composition of Sr varies depending on the underlying geology of an area.

The talk looked at case studies of migration in bird communities and in archaeological Norse communities from Lewis, Outer Hebrides, and shows how isotopes have been used to document and unravel the behaviour and migration in populations. Shorebird habitat loss on estuaries in the UK is a major conservation issue as these areas are of vital importance to tens of thousands of staging and overwintering migrants using the East Atlantic Flyway. Redshanks (*Tringa totanus*) breed in both Iceland and Scotland and then fly south in winter to overwinter on Scottish estuaries and it is important to the



*The  $^{87}\text{Sr}/^{86}\text{Sr}$  isotope composition of plants animals and humans from the island of Lewis (top two histograms) and the results from the Norse community showing the two results below 0.7090 which cannot come from Lewis.*

understanding of population dynamics to know where birds in the mixed flocks originated. The geology of Scotland and Iceland is very different, Iceland is a young basaltic, geologically homogenous area which should generate  $^{87}\text{Sr}/^{86}\text{Sr}$  values in its biosphere of around 0.706 whereas Scotland is an old, heterogeneous, granitic landscape which is likely to produce much higher  $^{87}\text{Sr}/^{86}\text{Sr}$  in its overlying biosphere. We found that we could identify the indigenous Redshank from each area and thereby provide a method for sourcing the birds without the laborious and time-consuming method of ringing and retrieving birds. The original study was based on bone samples from road and raptor kills, however by extending this method to the analysis of feathers we hope to provide a reliable method of provenancing bird populations from contrasting geological terrains.

Vikings are conventionally believed to have arrived in NW Scotland from Norway and are often portrayed as a warring, male dominated groups. The excavation of the largest and only known family cemetery from the Norse period in the Hebrides provided scope to test this theory using strontium isotopes analysis of tooth enamel. This provides a

means of assessing individuals rather than relying upon their artefacts to source their origins.

We show that this community group was of mixed origins. The majority were from Lewis. Two individuals, a middle-aged man and woman had strontium isotope compositions that could not have been incorporated into their teeth through a childhood on Lewis: they had to come from an area where the geology was significantly younger. Two sites were thought possible- the basaltic area of Antrim and/or the chalk of southern England. As these areas were both Christian at the time of the 9<sup>th</sup> - 10<sup>th</sup> century the possibility arises that the two 'immigrants' were slaves that had been captured during Viking raids on Christian communities.

For further information see

MONTGOMERY, J., EVANS, J.A. & NEIGHBOUR, T., 2003. Sr isotope evidence for population movement within the Hebridean Norse community of NW Scotland. *Journal of the Geological Society*, **160**: 649-653.

<http://www.stir.ac.uk/Departments/NaturalSciences/DBMS/staff/rbullman>

# WOMEN IN INDUSTRIAL CHEMISTRY: THE EARLY YEARS

**Dr Sally Horrocks, School of Historical Studies,  
University of Leicester**

*Lecture Delivered on January 26 2004*

**It may seem unusual to introduce a talk on women in industrial chemistry with a picture of a prominent politician, but Baroness Thatcher also enjoyed a brief career as an industrial chemist, during which she worked for British Xylonite Plastics and J. Lyons. Her example also highlights the extent to which industrial chemists and especially women industrial chemists have, as a group, remained largely hidden from the historical record. They only appear when they, like Margaret Thatcher, became famous for other achievements. Their absence belies their important roles in the development of modern industry and of its products. The double invisibility of female industrial chemists makes it difficult to establish a comprehensive picture of women's participation in science more generally and the factors that prevented and promoted that participation. This talk examines the employment of women in industrial science between World War One and the 1950s and argues that women were able to build careers in this field not because they had successfully encroached into a male domain, but because some aspects of industrial chemistry came to be seen as work suitable for women and female labour was cheaper than that of men with equivalent qualifications and expertise.<sup>1</sup>**

Prior to World War I, few, if any of the chemists working in industry were women. Employment in industrial laboratories was regarded as a task done by men as well as one particularly suited to masculine attributes. Since this position was regarded as 'natural' it was rarely articulated or discussed at length. It was argued that women lacked the intellectual capacity and staying power for scientific work and that expensive training would be wasted when they left to marry. In addition they could not work directly alongside men because of the possibility that men might be distracted from their work by the presence of female colleagues, nor could they be placed in positions of authority over men. Additional restrictions applied to female scientific work in an industrial context which was regarded as incompatible with both femininity and gentility.

During World War I women with a scientific training were first employed in industrial laboratories. Here, as elsewhere, wartime expediencies broke down existing constraints and industrial enterprises and government laboratories employed women to undertake scientific work for the first time. Among the tasks undertaken by women were metallurgical analysis, gunnery computing, aerodynamics research, materials testing and chemical work connected with munitions production. Their employment during wartime did not mean, however,

that women had come to be regarded as an integral or permanent part of the workforce in industrial science and those employed as industrial chemists frequently lost their jobs after the conflict as returning male employee took their places, or the positions they had occupied evaporated.

Despite the widespread disappearance of these posts the conflict nonetheless had an important indirect impact on the possibilities for women's employment in industrial laboratories. It did so through the impetus which it gave to the development of industrial science more generally which meant that many firms which already employed scientists expanded and reorganised their laboratories and others chose to employ their own scientists for the first time. This expansion of industrial science significantly increased the demand for industrial chemists as a whole and provided openings for women because many of the jobs emerged in the so called 'new' industries which already employed large numbers of women in manufacturing. In addition many of the posts also called for new types of expertise in fields such as bacteriology or biochemistry where there was no existing tradition of exclusively male employment.

Despite the emergence of employment opportunities for graduate women chemists within these firms they

constituted a relatively small minority of industrial chemists throughout the interwar period, holding posts in only a small percentage of the 566 British firms who by 1938 carried out research and development. In the absence of reliable data on the total number of chemists employed in industry it is not surprising that providing an estimate of the number of women is problematic. Figures are available for female membership of the Royal Institute of Chemistry but it is difficult to ascertain the proportion of female RIC members who worked in industry.

Table 1. Women Fellows and Associates of the Royal Institute of Chemistry, 1914-38<sup>2</sup>

	Fellows	Associates	Total
1914	4	1	5
1918	13	36	49
1935	27	174	201
1938	29	182	211

Although women were firmly established in industrial chemistry by the 1930s the differences between their career opportunities and those of their male contemporaries became apparent as soon as women began their search for employment. Initially, and for much of the 1920s, the search for employment demanded of women a tenacity and a willingness to accept any job, no matter how poorly paid, that was not required of men and the pioneers resorted to a range of strategies in their efforts to secure employment. Some women signed letters of application with initials only in the hope of being considered. Another option was to improve their qualifications or gain additional practical experience, often on a voluntary basis. Women took advantage of the assistance offered directly through professional organisations such as the National Union (later Association) of Scientific Workers and the Institute of Chemistry, who operated an employment bureau. These strategies did not guarantee success, but they did help some women to secure posts, even if these sometimes offered salaries so low that men would not consider them.

Nor did finding a job mean the end of their struggles. Frequently women found that the posts they had worked so hard to secure involved little more than routine and repetitive work and gave them no access to the promotion and positions of authority available

to men with the same qualifications. Moreover, women almost invariably started on salaries lower than those paid to their male contemporaries, and fell further behind as their careers continued. Women persisted in their efforts to gain employment as chemists because these disparities mirrored those in other occupations so that the salaries they were able to secure compared favourably to those available to women in other posts demanding a similar level of education.

This distinction between the career paths of male and female chemists appears to have been further intensified as employers began to offer posts specifically aimed at women graduates during the 1930s. These increased the number of opportunities available to women but also circumscribed clearly the roles which they were expected to play. Women were more likely to be required for analytical or secretarial work than they were for research posts and to find themselves employed to work alongside other women doing tasks which were considered particularly suitable to their feminine as well as their scientific skills. Despite frequently holding the same qualifications as men they found themselves pursuing careers as women chemists rather than simply as chemists and the image of the profession as a whole remained resolutely masculine. This ensured that when wartime mobilisation began the skills of female chemists were often ignored and commentators writing after World War II tended to discuss the problem of 'scientific manpower' without reference to the potential contribution of women.

The employment of women chemistry graduates was only one aspect of women's employment in industrial laboratories. From the mid-1920s onwards a number of firms began to recruit women with few or no qualifications to carry out routine work, and by the mid-1930s the availability of posts as laboratory assistants was actively promoted in the careers literature aimed at those girls who had studied science at school to matriculation level. Such posts were also available to boys with similar qualifications, but the expectations concerning the long-term career aspirations of men and women entering this type of employment were distinctly different. For men it was regarded as a stepping stone to more responsible posts either in the laboratory or the works itself. The 'secondary school boy' starting work as a laboratory assistant was expected to

continue his education through part-time study directed towards recognised professional qualifications, usually either the Associateship of the Institute of Chemistry or an external London B. Sc. For the 'secondary school girl' the prospects were generally very different, with only limited opportunities or expectation of advancement. Few women were encouraged to undertake study part-time, while their lack of advanced qualifications prevented them from securing promotion. Firms appear to have been reluctant to invest resources in employees who were expected to leave after only a few years service when they married and women were discouraged from embarking on further study because they themselves anticipated that their tenure would be limited.

A range of evidence suggests that the employment of girls in this context served to ensure that a vastly increased volume of routine work could be carried out while preserving career positions which offered the possibility for advancement for men. Further support for this interpretation of events comes from R. Brightman, writing in *Industrial Chemist* in 1931, who suggested that girls were being recruited as laboratory assistants for precisely this reason. He claimed that :

the embarrassment caused by the fact that most boys entering laboratories as assistants wish finally to become chemists, has induced some firms to recruit certain sections of their laboratory staff, particularly for analytical duties, from girls.<sup>13</sup>

## Conclusion

This study confirms that a gender division of labour similar to that documented in other contexts also emerged in British industrial chemistry during the interwar period. The assimilation of women into this part of the scientific labour force was based on the emergence of jobs which were regarded as particularly suitable for them as women, whether they were graduates or not. Women did not compete directly with men, instead their position in the labour market facilitated an increased division of labour within industrial laboratories. They were employed because they could be offered conditions of service very different from those regarded as the norm for men, and because the nature of the work which they

undertook could be readily associated with established notions of female skill and expertise. This combination of circumstances enabled firms to solve at least some of the difficulties of recruiting labour to do routine work when few prospects of promotion could be offered. The emergence of women's work served to preserve for men those tasks and career opportunities which accorded with expected notions of men's work. These conclusions echo those which have been reached by scholars who have examined the development of women's careers in other skilled and professional occupations, especially clerical work and medical professions, as well as other recent research on women's careers in science and engineering.

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<sup>1</sup> This talk is a condensed version of my paper, 'A promising profession? Women in industrial chemistry in inter-war Britain' published in the *British Journal for the History of Science*, 33 (2000), pp. 351-367 where full references can be found

<sup>2</sup> R. Pilcher, *The Profession of Chemistry*, London, 3<sup>rd</sup> edition, 1935, p. 96.

<sup>3</sup> R. Brightman, 'Registration and the laboratory assistant', *Industrial Chemist* 6 (1931), pp. 122-4.

# BUILDING STONE IN NORTHAMPTONSHIRE

Dr Diana Sutherland

*Lecture delivered to the Geology Section on Jan 28 2004*

**Geologically Northamptonshire is a north-easterly extension of the Cotswolds, lying in the swathe of Jurassic rocks that stretches across England from Dorset to Lincolnshire and North Yorkshire. The Cotswold Hills are shaped by the thick cream limestones of the Middle Jurassic; but further north the Jurassic geology is more variable. Within the Lower Jurassic, an iron-rich limestone (the Marlstone Rock Formation) becomes prominent, capping the escarpment of Edge Hill and providing the warm brown building-stone of the Banbury area, which continues into western Northamptonshire. The Middle Jurassic in Northamptonshire also has distinctive geology; in place of the thick limestones of the Cotswolds are more varied rocks, with yet more iron-bearing, rusty-coloured sandstones and ironstones, which are conspicuous in local building over a wide area of the county. There are limestones too, but mostly they are not the massive scarp-formers of the Cotswolds - rather they occur intermittently among softer sediments, each limestone unit having its own distinctive character, and providing recognisably different building-stones.**

Across the county, there is a broad pattern in the Jurassic outcrops. The earth movements that uplifted the rocks tilted them very slightly to the south-east, bringing to the surface the oldest Lias in the west and successively younger rocks towards the east. Across the width of the county the slight tilt is largely responsible for the regional distribution of different rocks - reflected most noticeably in the differences in building stones from one side of the county to the other.

Some years ago John Hudson from Leicester University's Geology Department and I began a study with classes at the University Centre in Northampton, examining the stone in Northamptonshire's village buildings in relation to the geological maps. We found that the roughly dressed rubblestone of the churches, farmhouses and cottages is mostly very local, matching either the underlying geology, or coming from within about a kilometre. But certain rocks too were sources of good-quality freestone, which could be cut and used freely in any direction, for church mouldings, domestic window and door cases, quoins or smooth ashlar blocks using little mortar. The better-dressed stone is seen in villages near the recognised sources such as Harlestone or Weldon, but was also transported over a wide area for special projects.

The scenic uplands in the west of the county are carved in sediments of the Lias Group, capped in places by outliers of Northampton Sand - including Eydon Hill south of Byfield, Arbury Hill near Badby, and Borough Hill by Daventry. Within the Lias the

Marlstone Rock, about 3 metres thick, is prominent in the steep escarpment and the tributary valleys of the Cherwell lying to the west, from Kings Sutton to Byfield. The tributaries of the easterly-flowing Nene from Badby to Watford cut through the Marlstone Rock, which is the warm brown local building stone of more than 30 attractive villages close to the outcrop. The various shades of brown are due to the natural weathering of originally more blue-grey rock, patches of which sometimes remain. It is a composite rock of iron minerals and limestone - locally being sufficiently iron-rich to have been quarried as ironstone, for example around Byfield. Marlstone Rock has also been worked as freestone, as seen in the fine 14th century churches and the 17th and 18th century houses in Kings Sutton, Middleton Cheney and Byfield. At Badby, Bridges had noted in the eighteenth century, 'there are several quarries of a fine blue rag stone, very hard and durable, from whence large quantities are carried into Warwickshire, for building and pavement'. Though no longer quarried in Northamptonshire, Marlstone Rock is still worked between Banbury and Edge Hill, and is known as Hornton Stone. The stone itself is well worth a closer look - in barn walls, in church masonry, or buildings by the roadside. Often it contains conspicuous fossils, such as belemnites (the bullet-like remains of cephalopod molluscs), bivalves and brachiopods.

Rich brown building stones are the hallmark of central Northamptonshire, but these come from the Northampton Sand Formation, separated geologically from the older Marlstone Rock by 60

metres of the Whitby Mudstone Formation, and by several million years. The Northampton Sand Formation includes many varieties of sedimentary rock - from ironstone to sandstone and sandy limestone; they are not distinguished on a geological map, but local building stones reflect the underlying changes in Jurassic geology. The best examples of building in oolitic ironstone are seen in Wellingborough and Finedon; the tiny spherical ooliths (visible with a hand-lens) formed as iron silicate on the sea-floor, later becoming oxidised to brown limonite. The stone here is durable, and handsome buildings remain from the medieval period and later centuries.

Westwards the Northampton Sand Formation is increasingly sandy, the quartz grains held in a matrix of brown limonite in the sandstones which are typical of Northampton, Duston, Harlestone and Eydon (Fig.1). But, for a few kilometres north of Northampton, pale sandy limestones occur within the Northampton Sand, providing the local building material of Boughton, Pitsford and Moulton, and quarried at Kingsthorpe for Northampton's Victorian churches. At Mears Ashby the limestone was quarried for freestone, a golden stone containing remains of small crinoids. John Morton recorded the quarries in 1712 and Mears Ashby Hall had been built of it in 1637; but the fine 14th-century church steeple at Wilby and the Victorian church at Orlingbury give a measure of the life-span of those



Fig.1. The stables at Althorp, built in 1733 of the local Harlestone sandstone (Northampton Sand).

quarries.

The Northampton Sand in all its guises disappears from the geological succession close to the Nene

valley in the east, and from south-east of Towcester. The explanation goes back to the palaeogeography in the Middle Jurassic, when only part of Britain was covered by the sea, and a persistent landmass existed between eastern England and Belgium, its western



Fig. 2. The palaeogeography of eastern and central England during formation of the Northampton Sand (c.180 Ma). Land (white), sea (dashed), dots indicating ironstone area. N=Northampton. (Adapted by Sutherland, 2003, from Bradshaw et al.with permission from The Geological Society.)

shore lying at times near our present Nene valley, with sedimentation confined to the west of it (Fig.2).

At times in the Middle Jurassic earth movements caused the sea to retreat altogether from the East Midlands, exposing the region variously to coastal swamps and erosion. When the sea returned, forming the Lincolnshire Limestone, it mainly covered Lincolnshire (where the limestone is 30 metres thick) and Rutland, apparently only reaching northern Northamptonshire, where the limestone becomes thinner, disappearing altogether south of Kettering. It is geologically confined to the north of the county. The Lincolnshire Limestone Formation has for many

centuries furnished some of the country's finest building stones (three great cathedrals of eastern England are built of it - Lincoln, Ely, and Peterborough, as are most of the historic stone colleges of Cambridge) and in the past a great deal of it has been quarried in northern Northamptonshire and the adjacent Soke of Peterborough.

Collyweston 'slates', unlike Leicestershire's Swithland Slate, are not metamorphic, but come from the lowest beds of the Lower Lincolnshire Limestone in the few places where they form a sandy limestone with the necessary properties to split into thin layers. The bed varies from a few centimetres to about a metre in thickness, the lower surface rounded and undulating, and resting on soft sands. When the damp rock is exposed to frost it splits naturally, and material suitable for roofing would have been first found where it lay at the surface. In due course the slatestone was obtained by digging into the limestone plateau around Collyweston and Easton-on-the-Hill, and from the shafts galleries were dug horizontally in the sand just high enough for the miner to lie on his side, using a foxing pick to undermine the slate bed. The lumps of stone (slate 'log') were then raised to the surface, laid out and constantly kept damp, waiting for a succession of frosts to split the stone. Slate mining was therefore mostly carried out in winter.

The industry was able to supply, for instance, 14,000 slates for Rockingham Castle in the fourteenth century and many subsequent consignments for major buildings in the county as well as for several of the Cambridge colleges, conveyed via the fenland waterways. Underground mining has now ceased altogether, but slate 'log' is still extracted from the bottom of one opencast quarry, and reclaimed slates are much in demand. Steep, stone-slatted roofs are a feature of cottages in northern Northamptonshire. Here villages are built mostly of coursed blocks of cream, fine-grained Lower Lincolnshire Limestone.

It is from the Upper Lincolnshire Limestone that the best building stones have been obtained; but its occurrence is much more localised, for it is mainly confined geologically to areas where channels were cut down into the underlying beds, most of the rest having been removed by erosion in an interval of relative uplift soon after its deposition. The channelling of the sea-floor by scouring currents can explain some

of the special features of these rocks: they are composed of calcium carbonate oolites and calcareous fossil debris in varying proportions, largely winnowed free of fine mud, giving rise to pure oolite or shelly oolite, some rocks remaining porous (indurated by the minimum of cement), but others having the intergranular space later cemented by sparry calcite.

Well-known freestones were quarried at Barnack (formerly in the Soke of Peterborough which until 1888 was part of Northamptonshire), Stanion, Weldon and King's Cliffe. The Abbey of Peterborough controlled the Barnack quarries, and allowed stone to be transported by waterways to the fenland abbeys (Ramsey, for example having to supply in return, 4000 eels during Lent). Successive early monastery buildings at Peterborough were eventually replaced after the great fire of 1116 by the present magnificent Norman nave, the west front was added in the 13th century, and the porch in the fourteenth, in robust Barnack Rag. This distinctive stone was widely used in ecclesiastical contexts in the medieval period. It is packed with assorted shelly fossil debris including small gastropods and echinoderm spines, and oolites which tend to weather out of the very strong spar cement, leaving holes. It is cross-bedded, and the stone often has a



*Fig. 3. The 10th-century tower of All Saints' Church, Earls Barton. The large blocks are of Barnack Rag, transported a distance of over 50 km.*

ribbed appearance. The well-known Saxon tower at Earls Barton has Barnack-type stone as quoins and pilaster blocks, some 1.5 m long; the diagonals are structural components, packed with local Wellingborough Limestone masonry behind the rendering (Fig.3). The large quantity of stone was perhaps dragged on sledges by oxen from Barnack down the old Roman route of Ermine Street 8 kilometres to the River Nene at Wansford, to begin a slow journey of more than 50 kilometres by barge.

At Stanion, Morton in 1712 saw the 'Marks of great Age in its spacious Hollows: and in the Stone digg'd out of it, whereof the Churches thereabouts are built'. The stone can be seen in Stanion parish church, the Perpendicular tower built of large ashlar blocks, mostly a spar-cemented oolite with fossil debris, similar to Barnack Rag but not quite as coarse-textured; most noticeable is the rich colour, the ooliths being somewhat yellowish, the colour contrasting with the pale Weldon-type limestone used against the windows. Stanion Stone can be recognised similarly in the fine churches of Fotheringhay and Lowick.

The pale limestone from Weldon near Corby is Northamptonshire's best-known building stone, a freestone suitable for both ashlar and carving, composed of ooliths with shell fragments, a porous rock with almost no visible cement. It was first recorded for the massive Norman gatehouse at Rockingham Castle, but this stone embellishes most of the fine country houses in the north of the county - Kirby Hall (Fig.4), Deene Park, Boughton House, and Lamport Hall, as well as Rushton Hall and the unusual constructions by Sir Thomas Tresham. A great deal of

Weldon Stone was transported via the waterways to Cambridge colleges, the soaring fan-vaulting of King's College Chapel being completed in 1515.

A stone very similar to Weldon, a porous oolite with a little shell, came from quarries in the interesting stone village of King's Cliffe, its generally golden colour or textural banding distinguishing it from the pale grey Weldon limestone. Stone was quarried in Cliffe Park for Burghley House in 1556. From the Lincolnshire Limestone in Rutland, Ketton Stone is recognised as the purest oolite without shell or any visible cement. It was especially favoured for columns and pilasters, and can be seen in central Northampton and with other limestones in Oundle.

The pale limestone villages encountered through southern and eastern Northamptonshire are made of geologically younger limestones deposited after a period of erosion across the Midlands. The first, thin Wellingborough Limestone was used locally for rubblestone but becoming thicker in the south, and continuing as the Taynton Limestone, it was quarried at Helmdon for medieval carved features, including Northampton's Eleanor Cross, and later for 18th-century Easton Neston House. However, the common local building stone, from Brackley to Oundle, is the more widespread Blisworth Limestone, mostly seen as cream to grey rubblestone, but in certain places occurring as workable freestone. Hills and hollows of old quarries remain at Cosgrove where it was also worked underground; mouldings decorate the medieval churches at Higham Ferrers, Stanwick and Raunds, and around Oundle are houses of excellent ashlar. Where Blisworth Limestone could be quarried just a few metres above the Northampton Sand



*Fig. 4. Kirby Hall, built 1570-75, of Lincolnshire Limestone: local rubblestone walling, with fine ashlar and dressings from Weldon. (English Heritage property.)*



*Fig. 5. A cottage in Blisworth, built of Blisworth Limestone, with dark brown stripes and quoins of ironstone, and sandstone mullions, from the Northampton Sand.*

ironstone, the two contrasting colours in buildings make an attractive feature (Fig.5).

It is clear from this brief account that the county is well endowed with building stone. The Romans transported Barnack Rag as far afield as London, but also used more local stone for villas and small towns in Northamptonshire. After an apparent hiatus in stone building, local quarrying had probably resumed by the 10th century for projects such as Earls Barton, also using the prized but distant Barnack Rag. In the 8th- or early 9th-century church at Brixworth, however, the stone tells a different story. The Church of All Saints, on the site of a monastery founded in 680, was built of such an assortment of stone that the geologist W.J. Arkell called it 'a museum of rock types'. It is a large church by any standard (Fig. 6) and when first built it was still larger, for the north and south aisles (each of which began as a row of separate chapels, or porticus) were demolished sometime in the Middle Ages. The tower originally had side-chambers forming a narthex, and a great west door, but this was altered when the later Saxon stair turret was built against it. There are more than 30 different types of stone, some of them being varieties of the local Northampton Sand, but including others not seen anywhere else in Northamptonshire. There are also quantities of Roman-style brick - in the walling



Fig. 6. The Saxon Church of All Saints, Brixworth, Northamptonshire.

and, conspicuously, fan-wise around the many arches, big and small.

The exotic stones can be studied easily from ground level; they occur in the masonry of the tower, nave and choir up to a height of about 4 metres. Many of them are igneous rocks, visibly crystalline: various diorites, some greenish with pink feldspars, others reddish with white feldspars, and granite, with

striped grey volcanic ash and dark grey, slate. There are also large blocks of sandstone, and several kinds of limestone. The origin of this extraordinary assortment was discussed by visiting members of the Geologists' Association in 1921, who concluded that the rocks came from the local glacial deposits. However, the church rock-types cannot be matched in these deposits, where igneous rocks are rare.

Many of the unusual rocks in the church are in fact types peculiar to Leicestershire, but from different places: some resemble the varied rocks of Charnwood Forest, including markfieldite, but others are like the diorites of Croft and Stoney Stanton or the granite of Mountsorrel. Much of the assemblage is actually to be found in the standing remains of Roman Leicester known as the Jewry Wall (Fig. 7), including Roman bricks. The rest of the church is built of more local Northamptonshire Jurassic rocks, but surprisingly they include random burnt blocks, easily visible for example in the (non-local) Blisworth Limestone of the later Saxon stair turret. The inevitable conclusion is that reclaiming old masonry,



Fig. 7. The Jewry Wall in Leicester, part of a Roman bath complex, built of various Leicestershire rocks, and brick. Roman Leicester is believed to be the source of stone, and probably brick, for the 8th/9th century church at Brixworth in Northamptonshire.

even from a distance, was a practice at that time largely preferred to quarrying.

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# SUPER-ERUPTIONS AND THEIR ENVIRONMENTAL EFFECTS

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*Bennett Lecture delivered on February 11 2004*

The geologic record contains abundant evidence of past volcanic activity on a scale not witnessed within the past few 1,000 years. These huge eruptions, which are not yet formally defined, are currently termed super-eruptions. The purpose of this lecture is to examine the types and size ranges of super-eruptions, and review our current understanding of their frequency. Eruptions in this size range must inevitably have a widespread environmental impact, and the causes of such effects are mainly due to the sulphur gases released. Ash injected into the atmosphere will have a brief residence time aloft, and thus cause only short-term changes, but ash fallout that might cover a whole continent would be disastrous. The longer-term effects such as climate change would be due to sulphuric acid aerosols, and these may perhaps last up to 5 years or so.

While super-eruptions are not common, they may be considerably more frequent than the impact upon Earth of asteroids or comets of a size that would have an equivalent effect. At our current level of knowledge, there is about a 0.5-1% probability, not great but significant, of a smaller scale super-eruption occurring this century.

## Defining super-eruptions

Volcanic eruptions come in two types: explosive and effusive, or lava-flow forming. Even the latter usually has some explosive activity associated with it. Both types have a natural range of sizes, from very small to exceedingly large. As with most natural phenomena, the larger examples are much rarer than the smaller, and thus super-eruptions are very infrequent. The last full-blown one, a really big eruption, was about 74,000 years ago (Rampino and Self, 1992). When

viewed from the perspective of the range of eruption sizes (Table 1), eruptions that are much bigger than those experienced and recorded by humankind also come in a range of sizes, such that "small" super-eruptions have been more frequent throughout geologic history than the very largest. The largest are estimated to be about 5,000 cubic kilometres in magnitude, which is a measure of the volume or mass of magma emitted (Mason et al, in press). Even a small super-eruption could have environmental implications far beyond anything within the

SIZES OF VOLCANIC ERUPTIONS

The Volcanic Explosivity Index * (VEI)							>Super-eruptions		
VEI	0	1	2	3	4	5	6	7	8
General description	Nonexplosive	Small	Moderate	Moderate-large	Large	Very large			
Qualitative description	Gentle	Effusive	? Explosive ?		? Cataclysmic, paroxysmal ?				
Maximum erupted volume of tephra (m <sup>3</sup> )	10 <sup>4</sup>	10 <sup>6</sup>	10 <sup>7</sup>	10 <sup>8</sup>	10 <sup>9</sup>	10 <sup>10</sup>	10 <sup>11</sup>	10 <sup>12</sup>	10 <sup>13</sup>
Ditto (km <sup>3</sup> )					1km <sup>3</sup>	10km <sup>3</sup>	100km <sup>3</sup>	1000km <sup>3</sup>	
Eruption cloud column height (km)	<0.1	0.1-1	1-5	3-15	10-25	>25			

*Pyle (2000), adapted from Newhall and Self, 1982.*

Table 1

experience of our civilization, and thus we should learn more about them.

The next time Earth suffers an eruption of the scale of magnitude considered here, from Volcanic Explosivity Index 6.5 and above (Table 1), it will be of the explosive type. Lava-forming super-eruptions are restricted in occurrence throughout Earth history to those times when a flood-basalt episode is occurring, during the formation of a large igneous province (LIP; Eldholm and Coffin 2000). As the record of LIPs indicates that they appear on average every 20-30 million years or so, and the most recent one (the Columbia River Basalt province) occurred about 15 million years ago, we might expect that there will not be another for several millennia.

Therefore, apart from a brief mention later, this talk will concentrate on the explosive type.

There is not set definition of a super-eruption, but an eruption that produces more than 300 km<sup>3</sup> of magma is significantly bigger than any in recent pre-history (Figure 1), and we have to go back about 20,000 years before an eruption of this size is found. The very rare, largest super-eruptions occur at a rate of one every few million years – and the chances of one occurring in the next few 100 years are very slim indeed. Even an eruption of >300 km<sup>3</sup> would have profound effects in the hemisphere in which it occurred, with global effects if the volcano was situated in the tropical to equatorial zones.

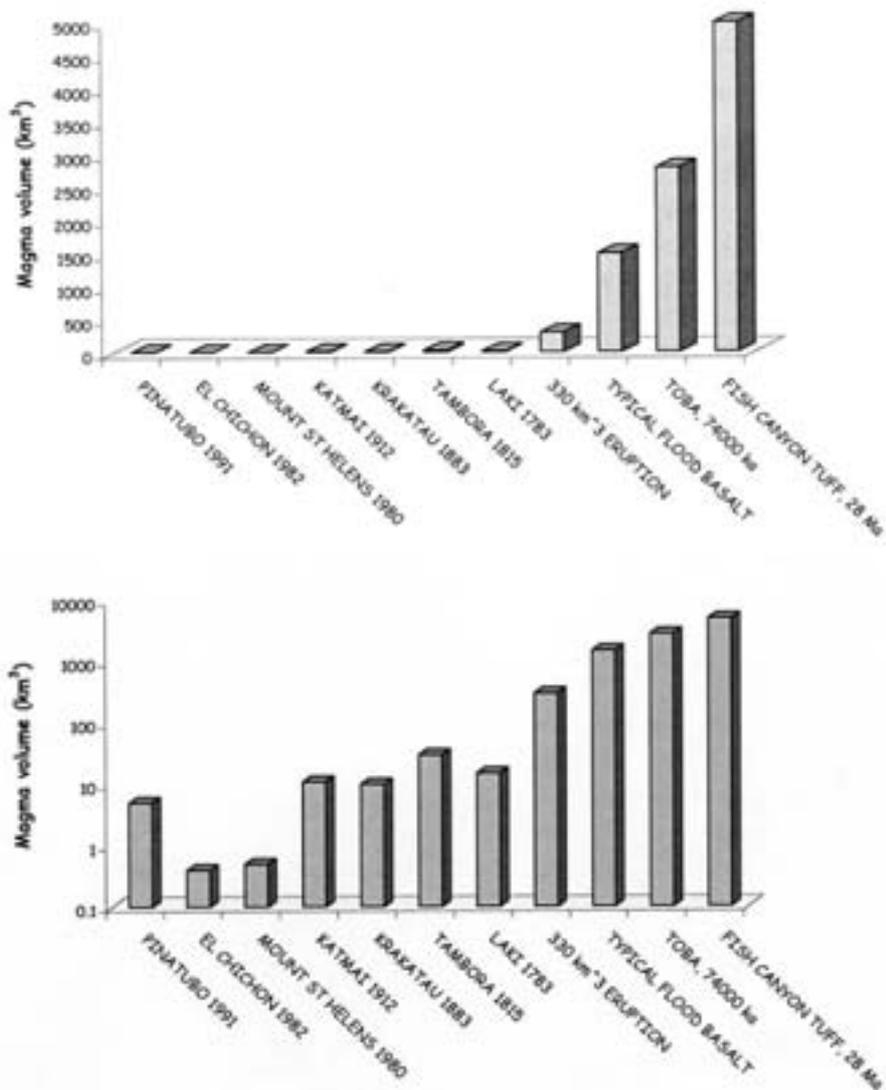


Figure 1. Examples of sizes of volcanic eruptions. Top: plot of magnitude of eruption expressed as the volume of magma erupted (in km<sup>3</sup>); famous and/or large historic eruptions and their dates (on the left) hardly register when compared with various examples of super-eruptions, beginning with a hypothetical example of a “smaller” one (330 km<sup>3</sup>). Bottom: same eruptions and data plotted on a logarithmic scale so that the volumes of the historic eruptions can be discerned. Ma = millions of years; ka = thousands of years.

Quite recently there has been a flurry of media attention, programs, and book chapters about *super-volcanoes*. This is a slightly misleading term and will not be further mentioned here. Of course, the largest eruptions must come from large volcanic systems but these often do not resemble the commonly held idea of a volcano. For instance, the world's largest volcanoes, such as the giant pair of Mauna Loa and Mauna Kea on Hawaii, have never had, nor will have, a super-eruption.

### **Where might future super-eruptions occur?**

Super-eruptions will occur wherever there are volcanic systems with a suitable, huge magma storage capacity. They have previously come from two types of volcanic zone during the present tectonic plate configuration on Earth, and, within the time scale of interest to humankind, this is where we might expect them to happen again. One zone is along destructive plate margins, or the subduction zone belts of volcanoes, and this includes sites such as Indonesia, Japan, and New Zealand, all of which have experienced super-eruptions within the past 1 million years. The other is in scattered continental volcanic sites that might be variously be due to hot-spots or rifting; examples include Yellowstone (Wyoming, USA), which has had 3 super-eruptions between 2 million and 600,000 years ago, and the San Juan Mountains of Colorado (USA), which had a series of super-eruptions between 31 and 27 million years ago.

The known record shows that North America has had more super-eruptions than any other area (Mason et al., in press) but this probably reflects the relatively thorough knowledge base for this continent. Other volcanic regions such as Mexico and the Andes may contain the record of many more, as-yet-unknown super-eruptions but are their volcanic regions relatively unexplored.

### **Explosive super-eruptions and their potential effects**

Most explosive super-eruptions involve viscous silicic magma (dacite and rhyolite) that erupts to form towering, vertical eruption columns and accompanying pyroclastic flows. Even from the flows, clouds of ash and gas will rise into the upper atmosphere (to the stratosphere, which is above 12-17 km altitude depending on latitude), as they do from the main eruption column. Much of the silicate ash falls

out very quickly, in a matter of hours to days, and the very fine ash that may stay aloft longer is an unknown threat. We do not yet know what real effects it would have on solar radiation but we can conjecture that it should cause a severe reduction of the amount reaching the surface, and thus darkness and cooling. However, the ash that falls out onto the ground could cause havoc; imagine an ash blanket up to several cm thick that arrives overnight and could cover the whole of the USA (and some of Canada)! Several of the ash falls from Yellowstone and other North American volcanoes have had this widespread a distribution. Little research has been done on the health effects of the ash.

Longer-term effects will come from the volcanic sulphur gas released into the stratosphere, where it forms sulphuric acid aerosols that have residence times of up to 3 years. During this time, there will be reduction of temperatures, strange weather patterns, and increased cloudiness. Rampino (2002) has discussed the possible effects on civilizations of super-eruptions in the 1000 km<sup>3</sup> size range, naming climatic disturbances as the main threat. Problems for world agricultural production and possible political disturbances might ensue. With our present society, one can think of many more possible disturbances to our way of life. These include a shut-down of satellite communications due to the ash and dense aerosol clouds and an inability of jet-aircraft to fly for several reasons (limited visibility, clogging of engines by ash, effects of airborne acid on electrical and navigation systems). The depressing list of potential impacts from super-eruptions goes on and on, so what are the chances of one occurring?

### **Frequency**

The record of super-eruptions that have taken place in distant past is still incomplete but, to the best of our knowledge, the very biggest super-eruptions probably occur at the rate of about one every 1 million years. However, the actual numbers of smaller super-eruptions, which could still cause very severe effects, is very poorly known – several more are discovered during each decade of volcanological research. All we can suggest at present is that numbers probably lie between a few tens and 100 per 1 million years. This gives a maximum average frequency of 1 event every 10,000 years, but super-eruptions span a considerable range of magnitude

(Table 1) and the lower size may be more frequent than this. Generally, there is a probability of much less than 1% of such an eruption occurring in the next century. This frequency is still considerably higher than that proposed for meteorite impacts of a size that would have the same effects as a super-eruption (Rampino 2002; Chapman 2004).

### The Toba super-eruption

The formation of Toba caldera on Sumatra was caused by an exceptional eruption, one in the big league of super-eruptions (about 2,500 km<sup>3</sup> of rhyolite magma). This event took place “only” 74,000 years ago, but we should not think that, “Ah, then we’ve had our great super-eruption for this million year period”, because it is recognized that they can occur in clusters. Toba formed a very widespread ash fall deposit found mainly in deep sea cores and thick ignimbrite (ash flow tuff) deposits across middle Sumatra. The effects of this eruption have been surmised in several papers but the evidence of the severity of the effects is presently inconclusive (Oppenheimer 2003). Some workers have linked the eruption to the onset of a glacial period, while others have suggested, from ice core evidence, that the eruption did produce a huge aerosol cloud but at a time before the major cooling at about 70, 000 years ago began. Atmospheric scientists running global climate models on super-computers have shown that a hypothetical event on the scale of Toba could have a catastrophic impact, with 10°C global cooling for a few years. However, resolving such a short but potentially dramatic event from palaeoclimate records has not yet been achieved. Considerable future work must be done before a realistic picture emerges about the environmental effects of Toba-sized eruptions.

### Conclusions

Much still remains to be discovered about explosive super-eruptions and their effects. This includes their actual frequency, and thus probability of occurrence, and the nature and extent of their global climatic impact. What can be stated with some confidence is that the longer-term effects would be hemispheric to global in extent, and would include some deleterious impact on weather and climate from the longer-lasting (2 to possibly 5 years) sulphate aerosol cloud. Shorter-term, but perhaps no-less-serious, effects would be from widespread (continent-scale) ash fallout and its effect on transport, communications, and health. Super-

eruptions are rare but the smallest that fall into this class may have a frequency approaching a 1% chance of an occurrence in the next 100 years. Such an eruption would still have severe global consequences, and future societies will eventually have to cope with the aftermath of one. In terms of an event that would cause equivalent effects, Earth is more likely to next suffer from a super-eruption rather than a meteorite impact. From the perspective of deep time, flood basalt volcanism has featured a series of lava-forming super-eruptions and the magma emitted may have released copious quantities of sulfur gas. It is perhaps, therefore, not surprising that the formation of flood basalt provinces are linked in time with mass extinction events (e.g., Courtillot 1999 ) but, again, much research needs to be done to investigate this possible link.

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# THE RUINS OF PALMYRA

## New Research and Links with some 18th Century Ceilings in England

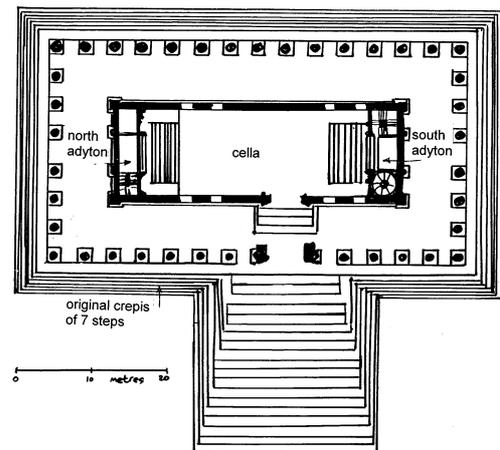
**Professor Susan Tebby, Honorary Visiting Research Professor,  
Faculty of Arts and Design, De Montfort University, Leicester**

*Lecture Delivered on February 23 2004*

Palmyra is one of the great sites of the ancient world, with its evocative golden limestone ruins set in the Syrian Desert, halfway between the Mediterranean Sea to the west and the River Euphrates to the east. Palmyra sits on one of the ancient trading routes of the Middle East, conveniently sheltered by high mountain ridges on two sides, and watered by underground aquifers which feed the huge oasis of date palms, olive trees and pomegranate orchards to the south, and to which Palmyra owes its existence and name. Two thousand years ago, Palmyra was a flourishing trading centre, grown fabulously rich over the centuries, partly from the shrewd enterprise of exacting taxes from both vendor and purchaser alike, but also profiting from that essential, and thus expensive, commodity in a desert region: water. Historically, Palmyra protected Rome against invasion from Persia, but it will always popularly be associated with Queen Zenobia, who defied Roman rule during the third century, continuing to manage the affairs of Palmyra, maintaining its strategic position and wealth, until the Romans under the Emperor Aurelian, went to subjugate her. The city of Palmyra's decline began from this period.

The accumulating wealth of Palmyra had manifested itself in the gradual building of a magnificent city, comparable with others in the Middle East - such as Jerash in Jordan and Baalbek in Lebanon. One of the most extraordinary sights at Palmyra is that of the main colonnaded street, well over one and a half kilometres long, with its Corinthian capitals and projecting brackets two thirds of the way up each column. There are several hundred of these brackets, intended to carry statues of local dignitaries and 'worthies', although some were never installed. Most of the architecture visible today is essentially of the first two centuries AD, although there is considerable evidence of earlier, and especially Semitic, settlement. The rising mound on which the Temple of Bel sits is indicative of a tell many centuries old. Excavations have continued over the last two centuries but there is still much to be uncovered and assessed. One of the most exciting aspects of excavation is the way in which new discoveries either endorse earlier interpretations of a place and its history, or, more often than not, a radical re-think is necessary in the light of the new finds.

The most well known area, at Palmyra, is that of the Sanctuary of Bel and its Temple, south of the city and



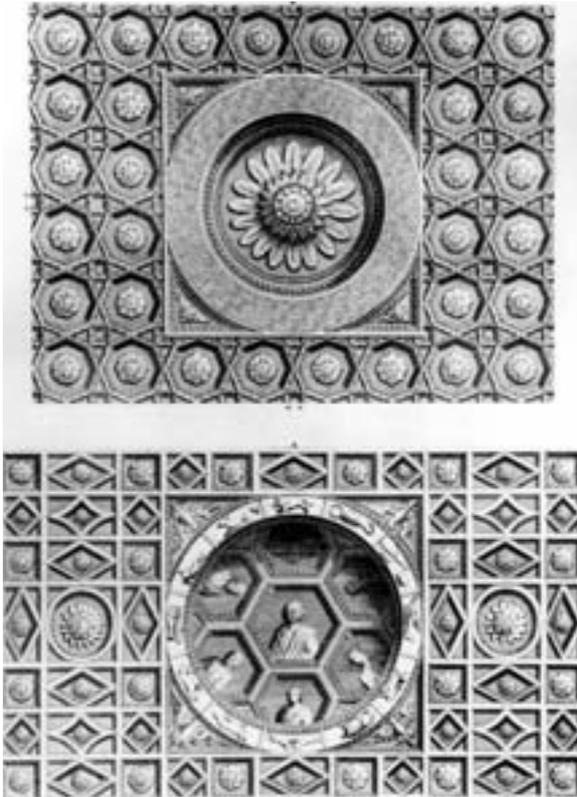
*Plan of the Temple of Bel, with the two adytions at either end of the inner cella*

the centre of trade. The great walled and colonnaded temenos, or temple precinct, contains the temple of Bel dedicated by the following inscription, now in the adjacent museum:

"In the month of October 357 [=AD45] this is the statue of Lishamsh, son of Taibbol, son of Shokaibel of the Mene Komara: he has dedicated the Temple of the Gods Bel, Jarhibol and Aglibol in its sanctuaries on the 6th day of April 343 [=AD32]; this statue has been erected by his sons to honour him".

In this vast space approximately 200 metres square stood the large stone slab – 6 feet x 15 1/2 feet - known as the Palmyrean tariff, dated AD 137 and written in the Palmyrean dialect of Aramaean with the same text in Greek. Here twelve panels give the exchanges rates for every conceivable commodity from camel loads of bronze statues to the price charged by a prostitute, and the price of water - with discounts for quantity. There is no doubt that this trading centre was a very important place indeed and the Temple of Bel in its midst provided a munificent focus.

My interest in this temple focussed in 1979 with the publication of *Palmyra* by Iain Browning. A photograph by Garstang from the 1920s shows a part of a carved ceiling from within the temple complex, while several pages earlier appears the engraving of the drawing of the whole ceiling by Giovanni Battista Borra, the Italian draughtsman who accompanied Robert Wood and James Dawkins on their Grand Tour of 1751 to the Middle East. This engraving was



*Engravings of the two ceilings by Borra, published 1753*

published, with many others, in *The Ruins of Palmyra or Tedmor in the Desert*, in 1753. Browning notes that the central fleuron in the photograph is composed of alternating lotus and acanthus leaves (effectively a combination of eastern and western

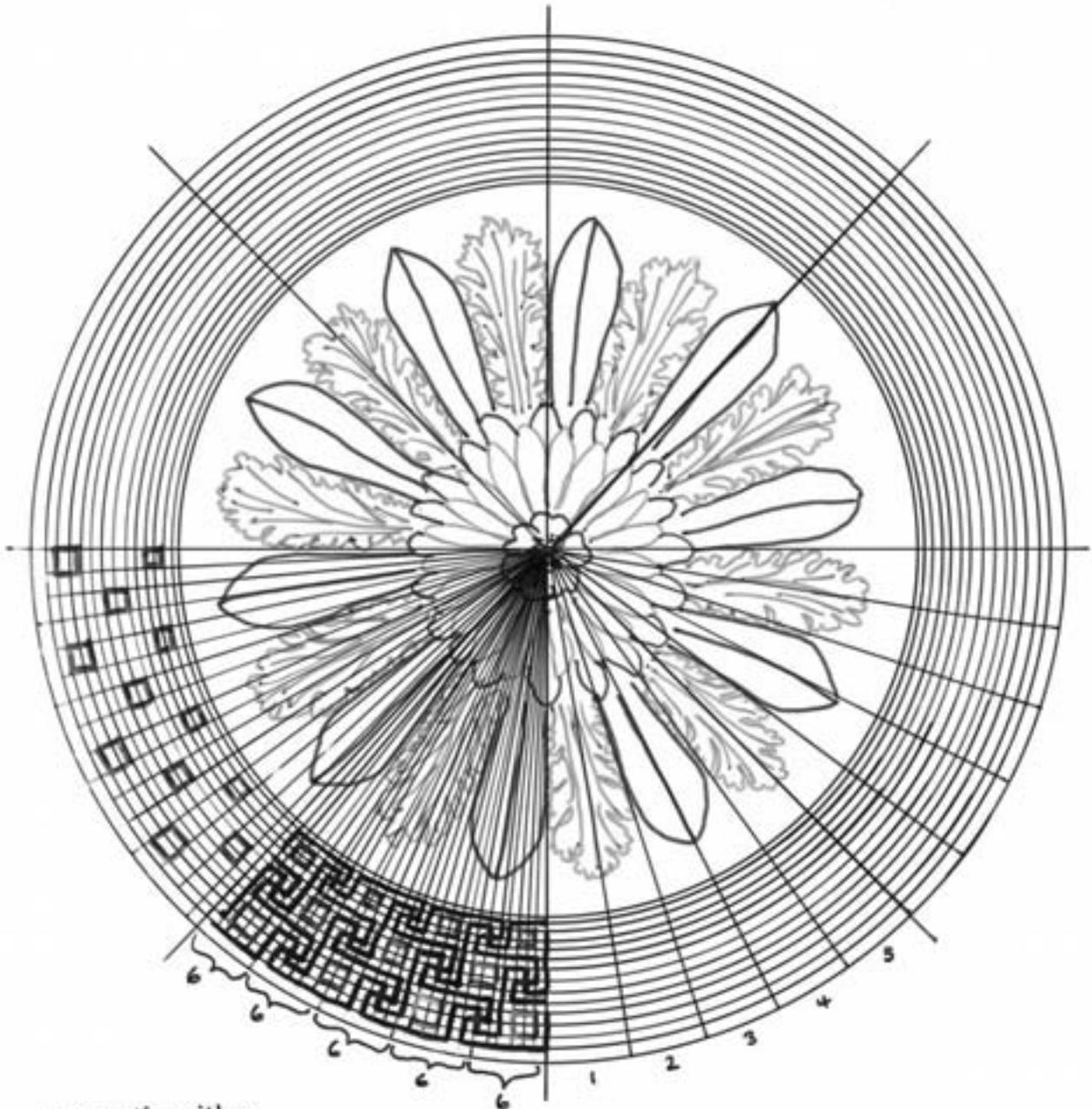
motifs) while the Borra engraving shows feathers surrounding a kind of sunflower. I could see, though, that the photograph did not match up in *many* respects with what I could see in the engraving. The more I looked, the more differences I could see. For example, the geometric layout was quite different, the architectural ornament was not the same and the number of octagons along one side differed in the two images. However, the photograph only showed a part of the ceiling and there was no way of knowing if either image portrayed a reconstruction. I could not make a judgement on such partial evidence.

Exactly twenty years later, I travelled to Palmyra to see for myself. In the cella, the two adytions, or holy of holies, lie to the north and south. The north adyton ceiling has a central dome, in the centre of which presides Bel - or Jupiter in Roman mythology - ringed by the twelve signs of the zodiac and inset with busts of Selene, goddess of the Moon; Helios, god of the Sun; Mars, Venus, Mercury and Saturn. Known as the wandering stars, they give their names to the seven days of the week.

The south adyton ceiling, which probably held a portable statue of Bel, is made from a single slab of limestone. It contains the central fleuron seen in the 1920s photograph, surrounded by a triple swastika meander border, set in a square. Surrounding the square are five octagons on each side and one at each corner, with an additional outer row of octagons on each of the short sides. I was now able to compare the ceiling, blackened from fire but in its original condition, directly with a copy of the Borra engraving.

There are 7 octagons along each end, or short side, of the ceiling, leaving 7 octagons along each side of the central square, including the corners. The octagons along each side of the square are composed within a 14 x 14 grid, while the long side is drawn within a total of 28 grid squares. The short side is constructed within 22 grid squares; there are 38 octagons in total. The distribution of rosettes in the octagons is even more remarkable: in Borra's engraving there are three different motifs, whereas there are actually five different rosettes and because of the smaller number of octagons in Borra's engraving, the distribution of rosettes is very different. The central fleuron has 20 alternating lotus and acanthus leaves compared with Borra's 17 feathers and 19 sunflower calyxes.

SANCTUARY OF BEL, PALMYRA : SOUTH ADYTON CEILING CENTRAL ZONE



Construction either

1. A circle divided into 8 - diagonals and medians of enclosing square.
2. Divide each segment into 5. Then into 6. Total 240 radii (1°30' each)
3. 14 concentric bands from outer circumference on a diminishing scale in such a way that the cell is always 'square'. Squares sit on 60 radii
4. 10 lotus leaves ; 10 acanthus leaves on alternating major radii.

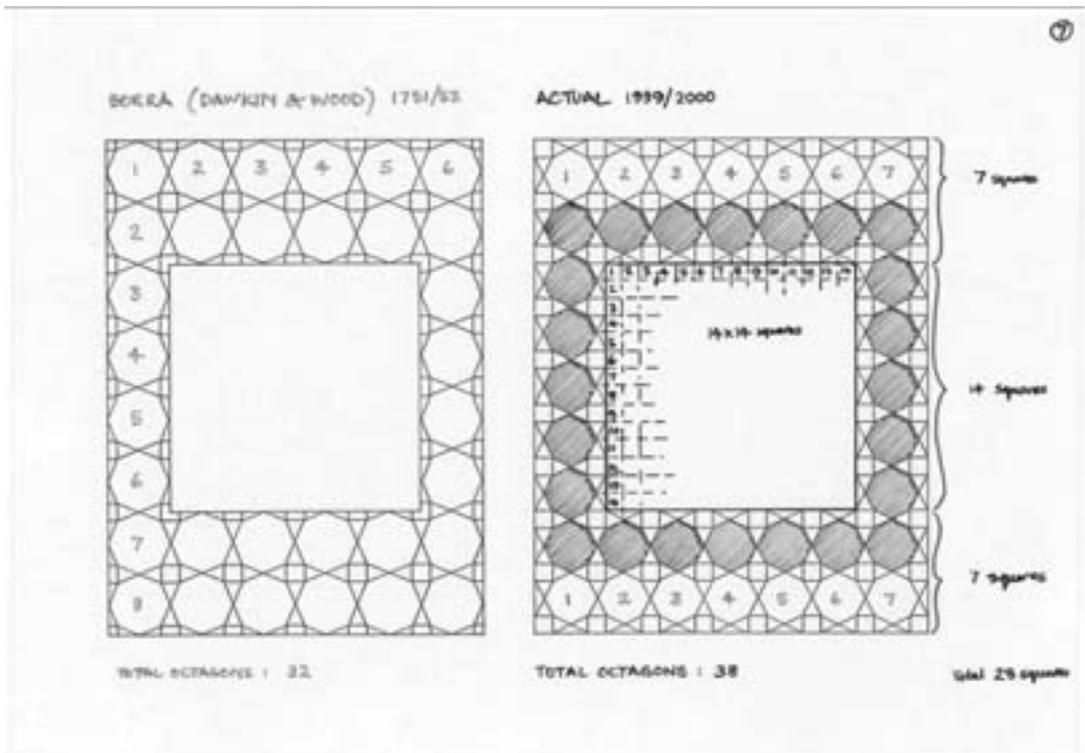
or  
 Ignore the square altogether. Mark off 6 equidistant points on circumference with fixed radius of circle. Join alternate points to create intersections for new intermediate radii.  
 or mark off 12 equidistant points from diagonals of square on circumference etc.

*Construction method for central square and swastika meander border*

*Colour versions of this page and other illustrations can be seen at [www.susantebby.co.uk/Palmyra](http://www.susantebby.co.uk/Palmyra)*

Borra's engraving can be shown to have been constructed within a entirely different geometric layout from the original ceiling. Set in an overall grid of 6 x 8 squares, Borra's octagons are located within inscribed circles, whose circumferences coincide with the diagonals of each square. There are a total of 32 octagons. The small squares are formed in the spaces between the octagons, automatically creating the isosceles triangles. This is a surprisingly difficult geometric scheme to keep square and parallel. The resultant octagons are 'perfect'; that is to say, all sides and internal angles are equal. However, after much comparison with other similar geometric designs, particularly of first century BC to second century AD mosaic pavements from Italy and elsewhere in the Roman Empire, the actual ceiling is shown to be composed within a regular grid of 28 x 22 squares. All that is required is to join opposite corners of double squares to generate the octagons and isosceles triangles. The small squares follow the lines of the layout grid in the spaces left. This is remarkably quick, easy and neat to construct. But the main difference between the two methods of construction lies in the shape of the octagons. The Borra octagons are 'perfect' or regular - to give them their correct description - whereas the ceiling octagons are 'skewed': all the sides are equal in length, but the internal angles are alternately different. The visual effect of this is that the moment one moves from the exact front centre position of viewing, the ceiling octagons appear to distort. As one moves back and forth, the octagons almost appear energized. The Borra octagons retain their symmetry; they might thus be said to be more static. A further contribution to this visual effect is made by the difference in ornamentation. The Borra engraving shows the octagons to be *discrete* and composed of an inner band of egg and dart, a flat

fillet and thin, out-line border of bead and reel. The Palmyra ceiling has its octagons formed *continuously* by raised crossed ribs of wide bead and reel: the



*Comparative construction of ceiling design and relative distribution of octagons*

design is thus quite different. As a confirmation that the wholly square gridding is the more likely one, the measurements on site bear this out with respect to the isosceles triangles. The Borra isosceles triangles are proportionately longer, notwithstanding the different numbers. Finally, the square gridding method I have proposed generates numerous patterns of 7 which link the south adyton ceiling with that of the north, with its 7 planetary busts, in a closed tessellation of 7 hexagons. Both ceilings express acknowledgement to the numerical order of the heavens as well as their counterparts in the number of days of the week.

If this is the 'heavenly' order of elements in patterns of seven, then the 'earthly' order is also seven: the cella was originally mounted by seven steps, verified by excavation, although regrettably no longer visible.

In one sense, of course, the differences in geometric construction and differences in ornamentation do not matter. The 'feel' between the Borra engraving and the actual ceiling is similar. One can recognise this 'Palmyrean ceiling' because it is composed of octagons, isosceles triangles and small squares,

which is distinctly and uniquely different from the usual simple octagon and square tessellation seen everywhere else, and the detailing of bead and reel and egg and dart are both Hellenistic with Roman stylisation. But the reason for questioning the two very different outcomes is that in *The Ruins of Palmyra*, Wood had stressed the mathematical accuracy with which the drawings had been completed, both by Borra and especially by the efforts of Dawkins who had meticulously checked all the measurements himself. My question was, if this were so, what was the extent of difference, and of course, similarity? How could the differences we see in almost every respect be accounted for? What did this mean for those 18<sup>th</sup> century ceilings in England that purported to be 'Palmyrean'? If the designs from which they had emanated were not, in fact, accurate, how far did they deviate from the original and in which ways? Could any 18<sup>th</sup> century ceiling be called strictly 'Palmyrene'?

On my return to England the next step was to examine a copy of *The Ruins of Palmyra*. Many aristocratic families had purchased copies after 1753 – sales, after all, had been the purpose of publication in order to fund Wood and Dawkins Grand Tour. I decided to visit the library of the Royal Institute of British Architects and on being given the large portfolio volumes of engravings was asked, casually, if I would like to see the original Borra drawings? Did I? I had considered whether or not there had been differences between the transition from Borra's original drawings to the engravings, small enough in the individual instance, but accumulatively had resulted in a significant overall change in appearance.

Borra's drawings in black ink, painted in monochrome in several shades of grey, with highlights in white, are exquisitely executed, even beautiful. On comparison with the engravings by Foudrinier, there is no doubt that the subtlety is lost. Engravers tools produce even weights of line, and tone can only be represented by multiple lines, or hatching: there is either black ink on the paper or no ink (white). Nevertheless, the accuracy of the geometric layout and the translation from Borra's grey tones to the various densities of hatched lines of engraved surfaces is exemplary. I could see that there was no discrepancy between Borra's drawing, geometry, ornamental detail and measurements and the Foudrinier engraving. There was still no evidence

to account for the difference between the ceiling in Palmyra and Borra's drawing. My enquiry in the RIBA Library as to the possible whereabouts of Borra's site sketches, or preliminary drawings for publication, drew a blank. I was resigned to them being lost forever. There were references to other drawings by Borra from the Baalbek tour, but these were not what I sought.

A few days after my second visit to Palmyra (partly to check drawings and photographs) and sitting in a traffic jam stationary behind a number 37 bus going to Leamington Spa, my eyes wandered over an advertisement up on the corner of the back of the bus. To my amazement, a green band of what looked like octagons, isosceles triangles and small squares came into soft focus. Surely this was the exclusive Palmyrean ceiling design? It was actually a millennium poster encouraging a visit to Warwick Castle. I didn't need much enticement, but looked up the reference first in Pevsner's *Buildings of England*: Warwickshire, everyone's initial source for a coherent and masterly exposition on architectural information. To my acute disappointment, Pevsner merely says "The ceiling in the Green Drawing Room of small hexagons looks Early Victorian". Not only was I seeing tessellations before the eyes, then, but my sense of period was wrong. (I was later to establish that Palmyrean ceilings in England appear only to have been executed between the mid 1750s and about 1780). Pevsner went on to say that "the white chimney piece in the room is late C18". Subsequently looking at the room as a whole, it appeared to me that the room is all of the same period: the dovetailing of panelling, cornice, ceiling, fittings and chimney piece, including the patina of ageing. A search through the records at Warwick Castle revealed a report of 1846 by Henry T Cooke, who says of the Gentleman's Room (as it was then called): [it has] "just been repainted green with the mouldings, both of the ceiling and walls richly gilt". The existing painted surface has lasted over one hundred and fifty years, so no doubt the earlier (first?) paint and gilt had lasted eighty years or so. It would hardly have been repainted and gilded in less than ten years if it had, indeed, been early Victorian: this was a costly process. Additionally, this particular geometric tessellation is not known to occur anywhere in England after the late 1770s. If the ceiling had been even early Victorian, its geometry would have been the traditional, simpler, octagon

and square. The first Earl of Warwick had certainly been on a Grand Tour (he had died in 1773) and owned a copy of *The Ruins of Palmyra*; records in the Warwickshire Records Office attest to this. Other Castle records refer to rebuilding during the 1770s and to work by “Robert Moore, a jobbing plasterer from Warwick” and previous work in 1764 by Robert Heath. Further searching may reveal more information. It is surprising what may be extrapolated from the back of a ‘bus...

In his *Palmyra*, Browning cites numerous Palmyrean ceilings in England. A photograph of the Drawing Room at Osterley Park House in 1898 shows a Palmyrean ceiling, designed by Robert Adams probably about 1770, with the central circle re-interpreted as an ellipse in order to fill the central rectangular space more effectively. Standing in the room, its colouring of pink, pale blue and cream with



*Drawing room, Osterley Park, circa 1770; photo: 1898, courtesy © National Trust*

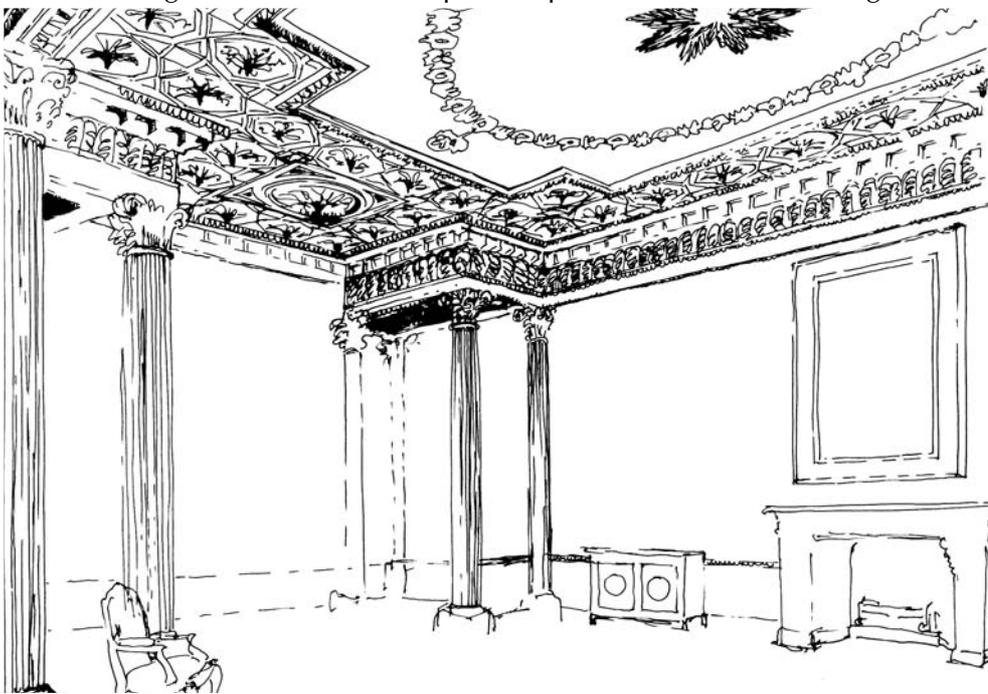
the gilded ribs of the geometric tracery is a typically more graceful 18<sup>th</sup> century version, more in keeping with the smaller size room, lower ceilings than at Palmyra, and not dependent on strong sunlight and

shadow for showing the design to its best advantage. Stratfield Saye, in Berkshire (home of the Duke of Wellington) which was designed by Lord Rivers in 1775, with fine gilded ribs of thin bead and reel delineating the geometry, albeit constructed by the grid and circle method faithful to Borra, but not Palmyrean. Looking directly upwards at the ceiling, one is immediately aware of the discrete, perfect octagons; there is no indication of continuous, skew octagons at all. The ornamental ribs consist of a doubled bead (two spherical and one elongated) but no reel, a slender egg and dart band, with a narrow flat fillet between. The central circle is barely Palmyrean, consisting of a single row of swastika meander and the fleuron replaced by a roundel of sixteen feathers and a sixteen petalled sunflower. This latest colouring here of pink, pale blue and cream imitates that of the ceiling at Osterley Park House. And yet the ceiling suits its environment.

There are many such ceilings, each adapting to its particular architectural interior, almost certainly the preferences of the owner, and above all the ability of the plasterer to cope with the structural limitations of the ceiling itself. The original ceiling at Palmyra, as already stated, is formed from a monolith. Most importantly, though, it is carved. Carving is a sculptural, reductive process, designed with each part removed not only to produce, as here, an extraordinary geometry, but *predominantly to reduce the weight of the block*. The sculptural carving is thus not only aesthetic, but it is also functional. It appears by rough measuring that the Palmyra block has about fifty per cent of its volume removed, thus, of course, reducing the weight by the same amount - less at the sides where support is required and more at the centre where unsupported. The centre aesthetically also appears to open up heavenwards, dome-like, as if to echo the north adyton dome with the planets. 18<sup>th</sup> century ceilings in England, however, are made by an additive process. The various elements are firstly modelled, then cast and then fixed on to the ceiling surface, using plaster as a ‘glue’ and then where necessary pinned to laths above the ceiling plaster finish. The load must be considerable in some cases and repairs are necessary to most ceilings every so many years. Osterley Park has recently completed such a renovation programme. We can perhaps now understand why the ceiling at Stratfield Saye was made with rather finer tracery than elsewhere.

Stowe House in Buckinghamshire (now a Boys' Public School; gardens only open to the public) was added to and rebuilt on many occasions, reflecting the changing fashions and desires of its owners. In 1752-54, Borra is known by a letter from him to the owner, Earl Temple, to have been employed there as the resident architect. Pevsner says in *The Buildings of England: Buckinghamshire* that it is surprising that Borra did not refer more to his designs from Palmyra when working at Stowe as he would presumably have had considerable opportunity. However, I found Palmyrean designs in some unlikely places. The Palladian Bridge over the lake has a double row of octagons, isosceles triangles and small squares on the ceilings of both end 'rooms' over the bridge. The ceilings were undergoing restoration at the time of visiting and the complex construction of the ceiling was clearly visible. However, the most exciting discovery was in the Boys' School Dining Room (!) Pevsner shows the original plan of the house, complete with the principal bedroom at the far western end.

A drawing made after a photograph taken after a 1935 re-construction, when many of the interior fittings had already been removed, shows the room presumably as Borra designed it - with the exception of part of the



ceiling. Together with the plan, this bedroom, both structurally and in general ornamental detail, is remarkably close to representing a miniature Temple of Bel. This would have also been a tribute to Earl

Temple with the pun on his own name. There are dressing rooms in the two western corners, with Corinthian columns supporting the ceiling. Their location, layout, proportion and decoration are consistent with the square corner stair-turrets either side of the south adyton at Palmyra. Interestingly enough, the square stair 'turret' at Stowe lies just outside this bedroom. Two small ante-chambers at the eastern end correspond with the two chambers either side of the south adyton. The ceiling stucco design - as we would expect from a design by Borra - is of the discrete, perfect octagon type. Nevertheless, in the space between the two corner dressing rooms, flanked by a border of four by four octagons, sits a central square with an ornate fleuron, unfortunately too indistinct to see its design (and currently coated in many layers of white paint). The Stowe ceiling was seemingly originally with a simple rectangular central space with a probable equivalent swastika meander and central fleuron. But there is no record of this. What we do know is that when the first Duke of Buckingham was knighted, he had the central ceiling area altered to accommodate a huge ellipse formed by a chain of office, enclosing a Star of the Garter. The ellipse in perspective when lying in bed would have visually corrected to a near circle, thus combining simultaneously the original design from the Temple of Bel (acknowledging his ancestor Earl Temple) and imitating the very fine design at Osterley House by the then most imitated architect, Robert Adam (one might almost say a case of 'keeping up with the Adamses'). I believe that the intention of Borra was indeed to create a miniature Temple of Bel and that this was almost certainly known and approved by Earl Temple and adapted accordingly by the first Duke.

The last ceiling to be discussed here is Woburn Abbey in Bedfordshire. The State Bedroom has a magnificent pale turquoise blue, white and gold ceiling, possibly one of the most faithful copies of Borra's drawing. The ornamentation is far more substantial than in other 18th century ceilings, and the octagons are numerically

consistent with the drawing and the proportions are more in keeping with the original. However, there was one aspect that struck me immediately. When lying in bed on the central axis of the room (or standing at the foot, in the middle) the octagons possess bi-lateral symmetry. Yet, as I looked upwards and moved round the bed, the octagons skewed...



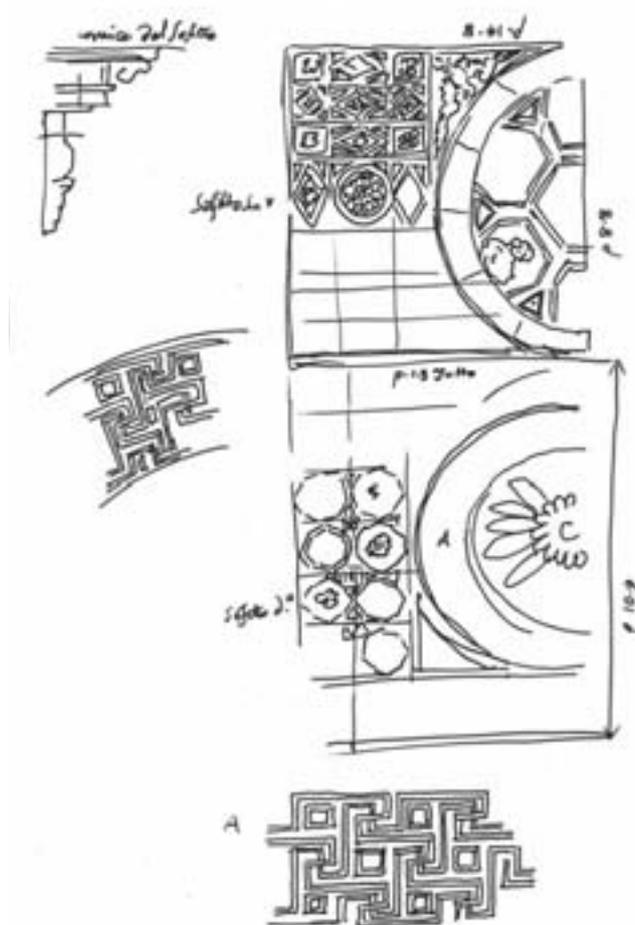
*Central part of ceiling, State Bedroom, Woburn Abbey, with skew octagons*

They were not the perfect, circle-constructed octagons of Borra at all. These octagons were constructed by the original square grid method employed on the Temple of Bel and later verified by measuring and drawing. It would seem that by chance the ceiling at Woburn Abbey accurately reproduces the skew octagons and is the only one I have found so far which does this.

The final part of the quest was unexpected. I visited the Library of the Joint Society for Hellenic and Roman Studies and asked if they had a copy of **The Ruins of Palmyra**. They did; and ..."We also have the Wood Bequest, are you interested in it?"

And when I looked, there was one of Borra's site sketch books from Palmyra.

The index was quickly skimmed; each page was headed according to the first sketch on the page; nothing resembled the adyton ceilings of the Temple of Bel. However, when I looked at page 34, indexed '*Cornice di soffitto*' [sic] I saw the *untitled* outline sketch of half of each adyton ceiling. I could see that Borra had sketched part of the south adyton ceiling within a grid, correctly divided into the five spaces for octagons along the side of the central square, but he had filled in only four spaces with an octagon, leaving



*After Borra's sketches, courtesy Wood Bequest, Hellenic Society*

the fifth square empty. Borra would almost certainly have sat at the centre of the entrance to draw, that is, symmetrically disposed to the ceiling design. The octagons, possessing bi-lateral symmetry, would look perfectly regular. As indeed most octagonal tessellations would be. Borra would not have needed or wanted to get up and walk around to draw, so he would not have noticed that the octagons were skewed and thus irregular in composition. Finally, from his position, even if standing, the size of the ornamentation is not that large. To the naked eye, the chunky bead and reel on the ceiling does look very like the standard egg and dart design. It should also be remembered that the entrance faces due north and that the ceiling is always darker than its surroundings. The shadows created would not help identification of the moulding.

One suspects that the entire operation of recording so many panoramic views, architectural wonders with all the details, checking measurements and so on, from such a large site over a period of barely two weeks, was bound to rely a great deal on

memory. The fifth empty square of the site-sketch was no doubt interpreted by Borra on his return to England as actually being redundant: he had simply drawn too many on site, after all, he had filled in only four with octagons. Furthermore, he had drawn the octagons as separate polygons because they were the predominant, recognisable shapes. His site sketch of the geometric construction was primitive to say the least, but he had already interpreted the design as being composed of perfectly regular polygons. He did not need to draw what he already knew. He probably saw exclusively egg and dart moulding because that was the most typical Hellenistic-Roman border motif and its chunkiness on the ceiling in the poorer light, at a distance, would have led him to accept that rather than consider bead and reel. There is an interesting post-script from Wood's diary of 1751, which has an entry after the party had left Palmyra: 'Borra's sketch-book is lost'. Luckily for everyone, an entry several days later records: 'Borra's sketchbook has been found'...

None of this in any way takes away from the beauty of the south adyton ceiling from the Temple of Bel, nor the 18<sup>th</sup> century ceilings designed and made in England over a period of about twenty years. Nor does it judge Borra's drawings which are remarkable in their draughtsmanship and an extraordinary feat of recording at a great site of antiquity. Without

these drawings much of what is possible in reconstruction terms today could not be achieved without them. Rather, I have sought for an explanation and understanding to account for similarities and differences between all three expressions of a unique geometric design within the context of their period.

### Acknowledgements

With acknowledgement to the Joint Library of the Hellenic and Roman Societies to reproduce images from *The Ruins of Palmyra*, and permission of the Hellenic Society for access to the *Wood Bequest* and to copy Borra's Sketches. Thanks to assistance and courtesy from Osterley Park, photograph © National Trust; Woburn Abbey for permission to reproduce photograph and to all owners and curators of their respective properties in allowing access, drawing and photography.

### Further reference and reading

1. For images of Palmyra:  
[www.atlastours.net/syria/palmyra.html](http://www.atlastours.net/syria/palmyra.html)  
[www.galenfrysinger.com/palmyra\\_syria.html](http://www.galenfrysinger.com/palmyra_syria.html)
2. Palmyra and its Empire, R.Stoneman (historical account and life of Queen Zenobia), 1992
3. Monuments of Syria, R.Burns, 1999
4. Roman Imperial Architecture, J.B.Perkins, 1992

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## FATHERS AND SONS: Y CHROMOSOMES, HUMAN EVOLUTION AND GENEALOGY

**Dr Mark A. Jobling, Department of Genetics, University  
of Leicester, University Road, Leicester LE1 7RH**

*Lecture delivered on March 8 2004*

**This story is about DNA, an extraordinary molecule that possesses two remarkable properties: first, the ability to encode information for the building of cells in all living things, and to fit those cells together to produce complex living systems; and second, the means to transfer that information to daughter cells when a cell divides. Thus, DNA acts both as a blueprint to build an organism, and as a way to make the blueprint heritable. DNA accumulates changes through time (mutations), and these mutations have a story to tell about our past. Modern technology allows this message from our ancestors to be decoded and interpreted, and the message contained in one part of our DNA, the male-specific Y chromosome, has been particularly interesting.**

DNA is a linear polymer – a long, unbranching chain of subunits, small molecules known – rather

uninterestingly - as bases. The four bases of DNA are known in shorthand as A, G, T and C, and it is the

order of these bases along the DNA chain that encodes the information. The amount of DNA-encoded information needed to build one of us, *Homo sapiens*, is about three thousand million bases. This is the human genome, and almost all cells in our bodies contain two copies of this genome. The genome is not one long DNA molecule, but instead is subdivided into 'packages' called chromosomes. A genome's worth of chromosomes numbers 23, so most normal human cells contain 46 of these.

### The lonely Y chromosome

If we look at the chromosomes of men and women, we see an obvious difference. Both sexes share a set of 22 pairs of chromosomes, known as autosomes. The difference resides in the remaining two chromosomes, which as a consequence are called the sex chromosomes. Women carry a chromosome pair known as X chromosomes. However, men carry only one of these X chromosomes, and in addition a small, male-specific chromosome called the Y chromosome. This is no coincidence – a gene on the Y chromosome actively determines male sex in the growing embryo, by causing the embryo to develop testes, rather than ovaries. The testes then secrete male hormones that govern the other aspects of male sexual characteristics.

While sex-determination is certainly fascinating, it is not the primary focus here. I am more interested in another consequence of its sex-determining role for the lonely Y chromosome. The fertilised egg from which each of us developed contained one set of 23 chromosomes from our mother (from the egg), and one from our father (the sperm). Most chromosomes exist in pairs, and each time a new sperm or egg is made, each of the 23 parental chromosome pairs exchanges segments of DNA so that any one chromosome of the egg or sperm is in fact a patchwork of DNA from each of the two corresponding chromosomes borne by our mother or father. Now, imagine a boy, choose one of his autosomal chromosomes, and try to trace it back through the generations. Because of the reshuffling effect of recombination, in any previous generation *all* of the boy's ancestors (a number that doubles with each generation) contributed DNA segments to this autosome of his. Now consider, in contrast, his Y chromosome. It came to him from his father, who in turn inherited it from his father, and so on back

through the generations. There is thus only a single ancestor in any given generation for the Y, and this simple mode of inheritance makes it an attractively simple system to study. All of the changes we observe upon Y chromosomes are the cumulative effect of mutation alone, and not recombination.

### The bacterial fossil within us – mitochondrial DNA

Before we move on to ask how we might study Y chromosomes in human populations, we need to consider another curious segment of our DNA. As well as the 46 chromosomes, contained within the nuclei of cells, we possess DNA in structures outside the nucleus called mitochondria. These structures are the home of energy-generating processes within cells, and long ago (about 1.5 billion years ago) were bacterium-like organisms given shelter in a symbiotic relationship with our single-celled ancient ancestors. Since that time the DNA that these precursors possessed has undergone many changes, but still persists as a small (16,500-base) circular molecule that retains many of the properties that we see in modern bacterial genomes. When a sperm fertilises an egg, sperm mitochondria (from the father) do not contribute to the child, and so all of a child's mitochondrial DNA comes from his or her mother – it has strict maternal inheritance. Mitochondrial DNA thus forms a counterpart to the Y chromosome: both are inherited from one parent only, both escape from recombination, and both therefore contain a relatively simple record of their past. In combination, these two systems can tell us a lot about the histories of our ancestors.

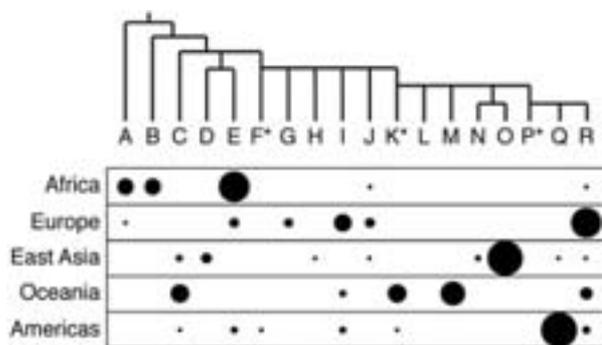
### Variation among human Y chromosomes

If we are to use the Y chromosome to decipher the DNA-encoded message from our ancestors, and so to understand the histories of human populations, we need to be able to distinguish between different kinds of Y chromosomes. We need what geneticists call 'DNA polymorphisms' – variations of some kind in DNA sequence. Importantly, the polymorphisms we use are generally assumed to be 'neutral' in their effects – in other words, they do not affect the health or fertility of the bearer.

The simplest kind of polymorphism is where one base in DNA (say, a C), is exchanged for another (say, a T). This is known as a 'single nucleotide

polymorphism', or SNP for short. While there are many of these polymorphisms to be found, the changes (mutations) that underlie them occur very infrequently – we say that the 'mutation rate' is low, in fact, any particular base has a chance of about 1 in one thousand million of changing in any one generation. As a consequence of this low rate, most of the changes we observe can in effect be regarded as unique events in human evolution.

Gathering together enough of these polymorphisms and assaying them in lots of different Y chromosomes allows us to build a family tree of all Y chromosomes, known as the Y phylogeny (see *Figure 1*). Different classes of Y chromosomes are called 'haplogroups',



**Figure 1: The Y chromosome tree, and frequencies of the major Y haplogroups.**

*Relative haplogroup frequencies (represented by area of filled circles) are illustrated below the tree for five indigenous continental population groups.*

and the major haplogroups are named with capital letters from A through R. The total number of haplogroups, including the most finely divided tips of the tree, not shown in the Figure, is now about 170.

### Geographical distribution of different Y chromosome types

Having defined different classes of Y chromosomes, we can ask how they are distributed among human populations. The tree, like all good trees, has a root, and the most ancestral branches (the ones descending most directly from that root), haplogroups A and B, are almost exclusively found in sub-Saharan Africa (though see below!). As with much genetic data, this information is consistent with a recent African origin for modern humans. However, the other haplogroups in the tree also show very striking geographical differentiation in their distributions among indigenous populations (*Figure*

1). In fact, the Y chromosome shows much greater differentiation than any other part of our genome; for autosomal chromosomes, it has been observed that 85% of the variation lies *within*, rather than *between*, populations, reflecting the recent origin of our species and insufficient time for differences to have accumulated. This is good evidence that races, in the sense that they are applied to other species, do not really exist in humans at all. However, the corresponding figure for the Y is only 35%, with 65% of the variation existing between populations. Why the difference? Since the Y is male-specific, it must be something to do with sex: anthropologists have shown that, for about three-quarters of traditional human societies, a wife will move to her husband's birthplace upon marriage, while he is content to stay put. This phenomenon of 'patrilocality' will have the effect of spreading out autosomal and mitochondrial genetic variation among populations, while accentuating variation for the Y chromosome.

One consequence of this geographical differentiation is that genetic evidence for admixture, the mixing of populations from different ancestral sources, should be particularly easy to spot using Y chromosomes. In a study carried out for a television programme, *'Motherland – a Genetic Journey'*, we analysed the Y chromosomes of a sample of British Afro-Caribbean men. We found that while 74% of them carried Y chromosomes typical of African populations, 26% carried typically European Y chromosomes, suggesting a contribution from Europeans to their ancestors after they were taken from Africa to the Caribbean during the Atlantic slave trade. In stark contrast to the Y-chromosomal picture, typically European mitochondrial DNA was present in only 2% of the subjects, suggesting that European women contributed very little to the Afro-Caribbeans' ancestors, while European men contributed considerably. This 'sex-biased admixture' is a genetic illustration of the social and sexual politics of slavery.

While I have painted a very simple picture in which particular kinds of Y chromosomes are very specific to particular indigenous populations, this is not completely true. A cautionary tale comes from our work on a rare Yorkshire surname, in which 9 of 27 randomly ascertained men having this surname possess a Y chromosome belonging to haplogroup A (one of the most characteristically 'African' lineages there is!). The men carrying the chromosome have no

knowledge of any African ancestry, and genealogical research shows that this chromosome has been associated with the surname since at least the mid eighteenth century. We can only speculate about the origin of this remarkable African import, but it does show that we need to be careful about assigning people to places on the basis of the DNA they carry.

### **Y chromosomes and surname studies**

The example just given shows that there is some association between Y chromosome type and surname. For patrilineally inherited surnames like those of England, this may seem unsurprising, and has led to an explosion in the number of commercial companies offering Y chromosome testing as a genealogical service. However, there are many questions about the nature and extent of this association which our current work is trying to address. Most hereditary English surnames were established about 700 years ago. Imagine the first man to adopt a surname, Bloggs; his sons, and their sons, and so on through the generations, should inherit both his surname and his Y chromosome. Then, if we randomly select modern men called Bloggs who do not know themselves to be related, we expect them to share a Y chromosome type tracing back 700 years. This scenario has proved appealing to policemen who would like to be able to deduce a surname from a DNA sample left at a crime-scene.

The simplicity of this idealised relationship is, of course, complicated by a number of factors. First, some names clearly had more than one founder: the occupational name Smith, carried by 1.3% of all Britons today, must have had many independent founders. In support of this, we see that the pattern of Y chromosome haplogroups in a random sample of Smith men is not significantly different from a control set of 450 men who all have different, randomly-chosen, English surnames. A second influence disturbing the surname-Y link is non-paternity (and adoption). The rate of non-paternity per generation has not been reliably estimated, and varies from place to place and from time to time; however, it is very probably greater than 1%, introducing many different Y chromosomes into a surname in the time since its foundation. A third influence is what geneticists refer to as 'genetic drift' – random changes in the frequency of a particular type of Y chromosome from generation to generation because of variation in offspring number among different men.

Some men have no sons, and this can lead to a lineage (or even a surname itself) going rapidly extinct. Genealogists sometimes say that a line has 'daughters out'. In contrast, some men can have very many sons, and so their Y chromosome (and surname) proliferates. This could mean that a surname could show evidence of being associated with a single kind of Y chromosome, but that the association reflects a recent common ancestor through drift rather than anything to do with the foundation of the name many generations earlier. In our work we have sampled over 2800 men and studied over 40 surnames in detail. Most names show patterns that differ markedly from the random-surname control group, and our current efforts are in using computer simulations to disentangle the different factors that could account for these intriguing relationships.

### **The DNA/genealogy/ancestry industry**

As any internet search will testify, the industry based upon DNA-testing for genealogical and ancestry purposes is burgeoning, and now probably carries out the greatest number of privately commissioned genetic tests on members of the public of any industry. These activities may seem innocent enough, but they are completely unregulated and do raise some concerning issues. There is usually a considerable degree of uncertainty about what can be deduced from these genetic tests, which is not always passed on to clients who want a simple answer. As our case of the 'African' Yorkshiremen illustrates, ancestry information can be unreliable, and in any case only looks at one (paternal, or, for mitochondrial DNA, maternal) ancestor out of very many; the remaining majority passed down to us 98% of our DNA, but are currently inaccessible because of the bugbear of recombination that affects autosomal chromosomes. Undue emphasis is often placed on the paternal and maternal lineage results. Finally, Y chromosome tests can occasionally reveal unwanted and unwelcome information. Some men have deletions of parts of their Y chromosomes that are necessary for fertility. Genes required for spermatogenesis lie in these deleted intervals, and some of the polymorphic DNA markers tested by commercial and academic research labs lie in them too. Absence of these markers signals probable infertility of the bearer of the Y chromosome – private genetic information. These concerns have recently led the government's Human Genetics Commission to look into the industry; it is currently considering whether regulation is necessary.

## Perspectives

DNA does indeed contain a message from our ancestors, and one that has the fascinating potential to unravel much of the past at different time-depths, from our family to our local population, to the peoples of the continent in which we live, and, ultimately, to our species as a whole. Scientific developments in the sequencing and analysis of the human and chimpanzee genomes promise to provide an increasing flood of data about our evolutionary origins, and technological developments promise to make available extraordinary amounts of information on a commercial basis to private individuals. Within the next 10 years, it is plausible that a customer with a few hundred pounds to spare could have their entire genome sequenced, an enterprise that only recently cost hundreds of billions of dollars. Potentially there is a mass of information about both history and health to be mined in such sequences. Research scientists, and those who analyse DNA commercially, have a responsibility to interpret the information in the most honest way they can, and society as a whole has much to debate on the ethics of these enterprises.

## Acknowledgements

I thank Brian Wilkins, a past member of this society and much missed colleague in the Department of Genetics, for suggesting me as a speaker; Sue Adams,

Turi King, Andy Lee, Emma Parkin, Zoë Rosser and Morag Shanks in the lab for their practical efforts in generating the data on which we rely; and the Wellcome Trust for support under a Senior Fellowship in Basic Biomedical Science (grant no. ).

## Further reading and information

- <http://www.le.ac.uk/genetics/maj4/maj4.html> - my webpages, including links to full-text articles, including:
- Jobling MA, Tyler-Smith C (2003) The human Y chromosome: an evolutionary marker comes of age. *Nature Reviews Genetics* 4:598-612
- Jobling MA (2001) In the name of the father: surnames and genetics. *Trends in Genetics* 17:353-357
- Jobling MA, Hurles ME, Tyler-Smith C (2003) *Human Evolutionary Genetics: origins, peoples and disease*. Garland Science, New York/Abingdon – a general text-book aimed at undergraduates and postgraduate students
- <http://www.takeawaymedia.com/> - homepage for the Motherland Afro-Caribbean study
- <http://www.archersoftware.co.uk/> - homepage for the wonderful and excellent-value Surname Atlas software, that allows you to map the distribution of any surname in England, Scotland and Wales in the 1881 census.

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# FARMING AND WILDLIFE

## Nicholas Watts, Farmer And Conservationist

*Lecture Delivered on March 22 2004*

I have farmed in Deeping Fen for nearly 40 years and in that time I have seen farming evolve from horses and carts to the use of computer technology and along with that change has come a decline in wildlife. Two hundred years ago the farming was mainly grazing, there was little habitation as Deeping Fen was still freshwater marsh in many places. Windmills were the only way that water could be pumped out to sea and the more the water table was lowered the more the land shrunk. Many people still earned a living from the land as there were huge flocks of wild fowl, plenty of fish and eels. Reed and sedge were cut and sold for many purposes. Since then with a succession of pumps we have drained Deeping Fen and all of Lincolnshire until there are fewer than ten pairs of snipe that now nest in Lincolnshire. Agriculture has altered until there is no grassland in the Fen. Intensive arable farming is now practised. Birds that live in arable crops have replaced the wildfowl.

It was in 1982 when I wanted to record the breeding birds on my farm. I would set off down my farm with pen and paper and record all the birds and cropping on a map. I did this for ten years but didn't do much

with these records until one day in 1992. The results were devastating; corn buntings had declined by 90% and skylarks by 60%. It was at about the same time that the British Trust for Ornithology also

realised that the population of our farmland birds had crashed. Nobody knew whether it was lack of winter or summer food or indeed whether it was machinery that was destroying nests.

I started to study corn buntings as they had declined so much. In doing so I also learnt a lot about wildlife in general and the effect that intensive agriculture was having on our ecosystem. I looked at old maps and talked to older members of the community. In the mid-fifties there were 21 farmers in the area that I was studying and each farm had at least two yards where cattle were kept in the winter. The average field size was about fifteen acres. Today there are only 8 farmers, there are no cattle or pigs and the average field size is about fifty acres. Not only have the cattle gone but the swallows have disappeared too. Quite simply swallows live on flies that live around our farm animals. Wheat covers the largest acreage of any crop and in the sixties we sprayed it once with a herbicide which was not able to kill all the weeds. Today we spray it with three herbicides, three fungicides and an insecticide and we are able to kill all the weeds in the crop. Obviously both summer and winter food sources have disappeared.

Where farm animals are fed there are always a few pickings for seed eating birds, there were also grain stores, many of which were open in the sixties which now have to be closed by law to all birds. Harvesting has become more efficient and so there is less grain left in our fields. In fact one could ask 'where do the birds find their food in the winter?'

During spring and summer our farmland birds feed on insects and unripe seeds. Because weeds compete for light and nutrients in our crops, sprays have been developed to kill them. The insects that the birds feed on live on the weeds in our crops and so if there are no weeds there are no insects. These insects have their own specific plant as a host and so if there is no knotgrass for example, the knotgrass beetle, in desperation, may well lay her eggs on a different plant species. When the eggs hatch out they will die as they are not able to digest the different plant tissue. If food is in short supply birds may start nesting later. This could well mean that our farmland birds are only able to rear one brood in a summer instead of two which they need to do to maintain the numbers of their species and so their numbers start to decrease.

The average household garden has also lost its diversity. There are no vegetables now in most gardens and because the soil is not tilled annually, weeds associated with cultivation no longer grow; the insects that live on our vegetables will also not be present. Herbaceous borders with lupins, foxgloves and other native plants have been replaced by evergreen shrubs from around the world. The insects that live on these plants probably cannot live in our climate then we wonder why the spotted flycatcher is decreasing.

Motorcars kill a lot of insects and even if each vehicle only kills one bird or animal a year, more birds will be killed by vehicles than by sparrow hawks. The sparrow hawks of course eat what they kill. The motorcar tosses its kill on to the side of the road which means that we are serving the crow family breakfast every morning on the road. We have seen that when a species runs out of food its numbers start to decline. When a species has a surplus of food its numbers will increase. So now our passerine birds that are declining because of lack of insects have two additional hazards, the motorcar and the crow family, which delight in raiding birds nests.

What can we do about this decline in birds? Does it really matter? To some people it doesn't matter but to others it does matter. We are just one species that lives on this planet and we have no right to rape it and to destroy its biodiversity. If we continue at our present pace of life with little or no regard to our environment what will the world be like in another hundred years?

In general those birds whose populations are declining are running out of food at sometime during the year. We can address this problem during the winter easier than in the summer. Birds can be fed seeds and of course this is happening all over the country as feeding birds is a growing hobby, farmers are also doing this on their farms, even though we are not sure that birds are running out of food in the winter. What we do know is that birds are running out of food during the summer. The food they require is unripe seeds and insects. During the winter birds can flock up and come to feeding stations but during the summer birds spread out over the whole country, many of them have their own territories and do not wander from those territories so to increase the breeding success of our breeding passerines we have

to create a more diverse landscape. Ideally farmers should not specialize, they should return to mixed farming and let some weeds grow in all their crops. Householders should create more diverse gardens with native plants.

In reality this will not happen and so you can see there is a real problem on how to stop our bird populations declining. The government has recognised this problem and gives grants for farmers to create diversity on their farms. For a farmer to make a good job of providing diversity on his farm he needs to be interested in wildlife and so does the householder and so we have to encourage more people to become interested in wildlife. Certainly the RSPB and the Wildlife Trusts are doing a good job and certainly if everyone became a member of one or both of these organisations it would be a great boost for wildlife.

On my farm I have been implementing various measures to increase the wildlife. The first action I took was not to fill dykes in to make fields larger. I knew that reed and sedge warblers nested in these dykes and so to fill them in was a direct action to reduce their population. I also knew that reed buntings nested in winter oilseed rape and thought that they were still nesting when rape was swathed so I found several reed buntings near to swathing time and found that 50% of them were still nesting when rape was swathed. Swathing is one way of preparing rape for harvesting. It entails cutting it and laying it in rows and no nests survive swathing. The other way of preparing rape for harvest is to desiccate it, i.e. to kill it with spray. All nests survive the spraying and fledge their young under the spraying technique. I have been desiccating my rape now for about 15 years and the RSPB now advise farmers to prepare their rape for harvest in this way to help reed buntings.

I have persuaded our local drainage board to be friendlier towards wildlife in our main drains. Instead of cutting both sides and the bottom twice a year they now only cut one side and the bottom once each year. We now have a pair of reed warblers nesting every 40 yards in ten miles of drain, whereas before there were no reed warblers nesting.

Barn Owls have increased in Deeping Fen from four pairs in 1985 to twelve pairs in 2002 simply by putting nest boxes in disused barns.

The whitethroat population has trebled in fifteen years on my farms simply by not using the flail mower and leaving wider margins. The flail mower is that yellow machine on the back of a tractor that trims our road sides and hedges. There seems to be this urge by farmers to flail everything flat to make it look tidy but in so doing nesting places for whitethroats, yellowhammers, reed buntings, sedge warblers and grey partridge are destroyed.

Skylark and meadow pipit numbers have been maintained by creating wild flower meadows in various parts of my farms.

Corn bunting and turtle doves have been more difficult, and their numbers continue to decline. This year I have created six miles of six meter wide annual weed margins on the countryside stewardship scheme. It is the weeds that are missing from our farms and we cannot afford to let weeds grow in our crops but there is now a prescription in that scheme that allows a farmer to be paid to cultivate a six meter wide margin each year on the sides of fields. This will allow those spring germinating weeds to grow that provide the insect life that our birds need to feed their young on. I will be monitoring these margins to see if the birds are using them to collect food.

Government has pledged to reverse the decline of our farmland birds by 2010. I feel they have an uphill struggle but at least there is now more awareness in the decline of our wildlife and I for one will be looking forward to the day they start increasing. The cost, of course, will have to come from government funding.

# THE PRESIDENT'S ANNUAL REPORT 2003/04

## 169th Season

*Presented at the Annual General Meeting on 26 April 2004*

**The main object of the Society remains unchanged - The advancement of education in Literature Science and Art by the provision of lectures and discussions. Lifelong Learning is not new and the Society offers the opportunity to members to listen to many talented speakers on a variety of subjects. It is not always possible to determine from the title of the lecture exactly what the context is going to be. We are often surprised and enlightened to listen to someone who is enthusiastic about their chosen subject of which we knew so little.**

The 2003/2004 Lecture programme included a variety of topics including Business and Education, North American Expeditions, Lice and Men, Archives of the East Midlands, Isotope Studies, Women in Industrial Chemistry, Journalism, The Ruins of Palmyra, Genetics and Farming and Wild Life. The Lecture for Schools entitled Living with earthquakes given by Professor James Jackson was much appreciated and well attended. This annual lecture run in co-operation with Leicester University and sponsored by the Leicester Mercury is one of the highlights of our programme. Two Awards of £75 each were made from The Henry Swain Bennett Research Fund to post graduate students from the University of Leicester to help with their expenses: Dr George Ferzoco MA an art historian researching 'The Messages of the Massa Marittima Mural' and Mr Andrew Swift, MPhil who is researching in microfossils especially conodonts among other related palaeobiology projects. Our thanks go to Professor P J Boylan, Dr David Bethell, and Dr Trevor Ford for acting as Assessors. The organisation and planning of the Society's activities is in the hands of the Officers and Members of Council. Their support and time they give on our behalf is very much appreciated. We have been particularly fortunate in the appointment of our new Honorary Secretary Dr Mary Hamill. She has brought us up to date with the Council Minutes circulated by E-mail, established contact with many organisations and carried out her task in a highly efficient manner. The Hon. Membership Secretary Mrs P L Silver continues to maintain our membership records and is always on hand to deal with queries and new members. The Hon. Programme Secretaries Dr. Geoffrey and Mrs Hilary Lewis continue to provide an array of varied speakers through their hard work and enthusiasm. We are extremely grateful for their efforts over many years.

The Hon. Treasurer Mr David Beeson maintains our Books and Accounts in good order and ensures that

the Society's finances remain sound. Our thanks also go to our Independent Examiners Mr K Smithson and Mr D Barker for certifying that the Accounts have been properly recorded. The Hon. Editor of Transactions Professor Aftab Khan carries out the considerable task of ensuring that we have an abstract of most of the talks made during the season and preparing the Annual Publication. We are very fortunate to have someone so dedicated to this task. We are very grateful to Mrs Joan Beeson for providing refreshments at all our meetings. Tea Coffee and Biscuits are served to order - always with a smile! One of the reasons we are able to maintain our Subscriptions at a very reasonable level is that many of our lectures are sponsored. Our thanks and appreciation should be recorded to the following:

The Leicester Mercury  
The De Montfort University  
The University of Leicester Bookshop  
The Royal Society of Chemistry  
The British Association for the Advancement of Science.

Finally I would like to thank the New Walk Museum and Art Gallery Staff and the City Council for allowing us to use the Victorian Art Gallery for our meetings. I have found the Staff extremely pleasant and helpful during the past season. I trust that the Sound System will continue to operate satisfactorily to enable all our members to hear the speakers clearly. Attendance this season has been slightly higher than the previous year but with over 200 members the average attendance is about 75. Perhaps by completing the Questionnaire which has been circulated at the Annual General Meeting members will tell us how we can increase our membership and encourage a higher attendance.

Michael Kirk O.B.E., F.C.A.

## Programme for the 2003-2004 Season

*Except where indicated all lectures were held in the Art Gallery of the City Museum, Leicester, on Mondays at 7:30 pm*

October 6, 2003

### **WHY LINKS BETWEEN BUSINESS AND EDUCATION ARE IMPORTANT**

President's Address

Open meeting to be followed by a social gathering.  
The Lord Mayor was present.

October 20, 2003

### **THE SEARCH FOR SIR JOHN FRANKLIN'S MISSING EXPEDITION 1847-1859**

William Mills (*deceased May 2004*)

Librarian & Keeper of Collections, Scott Polar Research Institute, University of Cambridge

November 3, 2003

### **OF LICE AND MEN**

Dr Tony Burns

Emeritus Consultant Dermatologist

November 17, 2003

### **2003 EXPERIMENT WITH AN AMEN - THE POETRY OF R.S. THOMAS**

The Venerable Dr T. Hughie Jones

Archdeacon Emeritus of Loughborough

December 1, 2003

### **TREASURE HOUSES OF KNOWLEDGE: THE MUSEUMS, LIBRARIES & ARCHIVES OF THE EAST MIDLANDS**

Dr Tim Hobbs

Chairman & Chief Executive Officer East Midlands Archives Council

*(Sponsored by the University of Leicester Bookshop).*

December 17, 2003

Lecture For Schools. Held in the Rattray Lecture Theatre

### **LIVING WITH EARTHQUAKES**

Professor James Jackson, F.R.S.

Department of Earth Sciences, Bullard Laboratories, University of Cambridge

*(Sponsored by the Leicester Mercury)*

January 12, 2004

### **YOU ARE WHAT YOU EAT: ISOTOPE STUDIES AND MIGRATION**

Dr Jane A. Evans

NERC Isotope Geosciences Laboratory, British Geological Survey, Keyworth

*(Joint Lecture with the Geology Section)*

January 26, 2004

### **WOMEN IN INDUSTRIAL CHEMISTRY (1914-1950)**

Dr Sally Horrocks

Department of Economic and Social History, University of Leicester

*(Sponsored by the Royal Society of Chemistry).*

February 9, 2004

### **JOURNALISM AFTER HUTTON**

Alan Russbridger

Editor of the Guardian

*(Sponsored by the Leicester Mercury)*

February 23, 2004

### **THE RUINS OF PALMYRA: NEW RESEARCH AND LINKS WITH SOME 18<sup>TH</sup> CENTURY CEILINGS IN ENGLAND**

Professor Susan Tebby

Artist, Designer and Archaeologist

*(Sponsored by De Montfort University)*

March 8, 2004

### **FATHERS AND SONS: Y CHROMOSOMES, HUMAN EVOLUTION AND GENEALOGY**

Dr Mark Jobling

Department of Genetics, University of Leicester

*(Sponsored by the British Association for the Advancement of Science)*

March 22, 2004

### **FARMING AND WILD LIFE**

Nicholas Watts

Farmer

*(Joint Lecture with the Natural History Section)*

April 26, 2004 (7.00 p.m. start)

### **ANNUAL GENERAL MEETING**

Followed by a piano duo recital of music by Bach, Mozart, Schubert and Dvorak by the pianists John Humphreys and Allan Schiller

*(Wine was served in the interval)*

# ANNUAL REPORT OF THE GEOLOGY SECTION

## Officers 2003/2004

Honorary Life President:	Dr Bob King
Honorary Life Vice-President: O.B.E	Dr Trevor Ford
Chairman:	Andrew Swift
Vice-Chairman:	Mark Evans
Secretary:	Joanne Norris
Acting Treasurer:	Joanne Norris
Field Secretary:	Dennis Gamble
Publicity Officer:	Paul Monk
'Charnia' Editor:	Graham Stocks
Student Representative:	Kay Hawkins

## Committee

Dr Roy Clements	Dr Mark Purnell
Professor Andy Saunders	Doug Lazenbury

## Co-opted:

Margaret East	Dennis McVey
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Once again the Section flourished in 2003-4. Both summer and winter programmes proved very successful, and we were blessed with some lovely weather while in the great outdoors. The highlight of the summer programme was undoubtedly the weekend excursion to Suffolk, based in the pleasant town of Woodbridge. We were there over midsummer's day, and enjoyed quintessentially English weather and landscape, and excellent Tertiary geology. The attendance broke our existing record for a field trip in recent years, at over 30. The newly instigated society meal on the Saturday evening proved very popular, and looks like it may become a regular event on the weekend trip. Our day trips to the Sedgwick Museum, the Triassic rocks of Nottingham, Bradley Fen Quarry and its Oxford Clay, and the Jurassic of Tilton and Holwell also passed off extremely well, and were well supported in the main, but we could always stand a few extra participants. Many thanks to all the leaders associated with those trips, and to Dennis Gamble for his organisation.

The winter programme was equally successful, but everything was not without incident, as we were obliged to find a replacement speaker at the last

moment on November 19<sup>th</sup> (many thanks to John Dickinson for stepping into the breach), and the meeting of January 28<sup>th</sup> very nearly succumbed to the freezing snowy weather on that day. Full marks to Diana Sutherland for battling through to speak to us, and also to the 12 hardy souls who equally bravely managed to get there to form the audience. The greatest shame was that Diana's excellent talk on the building stones of Northamptonshire was heard by such a small gathering, but hopefully she may repeat it for us in the future. Probably the coup of the season was persuading Professor Simon Conway-Morris to travel up from Cambridge to address us. Simon is without doubt one of the highest profile geologists in the country, and is always splendid value for money with his innovative, stimulating and progressive ideas. Fittingly, his talk attracted our highest attendance of the season, 61. On other nights Jane Francis gave us a first class virtual excursion to Antarctica, we went mammoth hunting with Neville Hollingworth, grappled with the complexities of orbital forcing with Graham Weedon, revisited East Anglian geology with Jan Zalasiewicz, travelled with Murchison to Russia led by Michael Collie, experienced the difficulties of hominids trying to cope with a world changing around them with Mark Maslin and finally came to rest much nearer home with the Chairman's Address - a 'virtual' field trip to one of our local geological highlights.

Jane Evans from the British Geological Survey was a fine speaker for the Parent Body lecture in January and demonstrated convincingly just why isotopes can tell us so much about the life of the past. Vice-chairman Mark Evans took on the onerous task of organising the Saturday School at Vaughan College, and was rewarded by a first class day of very well delivered talks on the subject of Mesozoic swimming and flying reptiles. The Christmas meeting in the Museum was as enjoyable as ever, but sadly, was not quite as well supported as we'd hoped. Perhaps a change of date to move the meeting a little further away from Christmas is the answer, and then the meeting will get the attendance it deserves. In contrast, the Member's Evening in February was well attended and engendered its usual relaxed and friendly atmosphere.

As for your committee, they all worked hard for the Section's benefit, but I must single out Joanne Norris

for special mention, for as well as continuing her excellent job as Secretary, she also took on the exacting role of Treasurer when it was clear we could not find a replacement for Doug Lazenbury. I think that the fact that hardly anyone commented on the change or noticed what had happened, is a true testament to how well she coped. Dennis McVey has diligently kept our excellent website ([www.charnia.org.uk](http://www.charnia.org.uk)) updated, and all the other officers and committee members are thanked for their efforts in their respective areas of responsibility.

This report ends on a sadder note, for it seems likely that the Geology Section will have to quit the Geology Department for the start of the new winter season in October 2004. We enjoyed 8 happy years there, but the University is enforcing its policy of centralising the meetings of groups around the campus in the Ken Edwards Building, and will no longer provide free portering for other venues. Thus, the Section would have to pay for porters in the Bennett Building, an expense that is beyond our means. The university is not in favour of 'self-portering' and it is unreasonable and unwise for us collectively or as individuals to take on responsibility for the security of the building and personal safety. The good news is that the KEB is an excellent venue, is located very close to the Geology Dept, and is free.

Andrew Swift

### Summer Programme 2003

**Saturday May 17th.**

**THE SEDGWICK MUSEUM, CAMBRIDGE.**

Host: Mike Dorling

**Friday June 20th - Sunday June 22nd.**

**WEEKEND FIELD TRIP TO SUFFOLK TO SEE PLIO-PLEISTOCENE SEQUENCES. BASED AT BULL HOTEL, WOODBRIDGE.**

Leaders: Peter Long and Roger Dixon.

**Sunday July 13th.**

**GEOLOGY IN NOTTINGHAM. TRIASSIC EXPOSURES IN AND AROUND THE CITY, INCLUDING THE HEMLOCK STONE.**

Leader: Keith Ambrose

**Sunday August 17th.**

**BRADLEY FEN QUARRY, WHITTLESEY. OXFORD**

**CLAY.**

Leader: Cliff Nicklin

**Sunday September 14th.**

**TILTON CUTTING AND HOLWELL QUARRIES. LOWER JURASSIC.**

Leader: Roy Clements.

### Winter Programme 2003 – 2004

**2003**

**Wednesday October 8th**

**HUNTING MAMMOTHS IN A CO-OP CREAMERY**

Dr Neville Hollingworth (NERC, Swindon) –

**Wednesday October 22nd**

**TECTONICS, ICE AGES AND HUMAN EVOLUTION**

Dr Mark Maslin (Department of Geography, University College, London)

**Wednesday November 5th**

**GEOLOGY BY CANOE: RODERICK MURCHISON'S MAPPING OF THE URAL MOUNTAINS**

Professor Michael Collie (Barkestone, Nottingham)

**Wednesday November 19th**

**VOLCANOES OF THE WORLD**

John Dickinson (Coalville, Leicestershire)

**Wednesday December 3rd**

**SLIDING INTO THE DEEP FREEZE: THE PLIO-PLEISTOCENE GEOLOGY OF EAST ANGLIA**

Dr Jan Zalasiewicz (Department of Geology, University of Leicester) -

Wednesday December 17th

**CHRISTMAS MEETING,**

(At the New Walk Museum, Leicester)

**2004**

**Monday January 12th**

**YOU ARE WHAT YOU EAT: ISOTOPE STUDIES AND MIGRATION**

Dr Jane A Evans, NERC Isotope Geosciences Lab., British Geological Survey, Keyworth.

Parent Body Lecture, held at New Walk Museum, Leicester.

**Wednesday January 14th**

**FROM CLIMATE CHANGE TO TIME SCALES:  
EXAMPLES FROM THE JURASSIC IN ENGLAND**

Dr Graham Weedon (Department of Environment,  
Geography and Geology, University of Luton)

**Wednesday January 28th**

**GEOLOGY ABOVE GROUND IN  
NORTHAMPTONSHIRE**

Dr Diana Sutherland (Mears Ashby, Northampton)

**Wednesday February 11th**

**MEMBERS EVENING**

At the New Walk Museum, Leicester

**Saturday February 21st (whole day)**

**NOT WALKING WITH DINOSAURS: MARINE  
AND FLYING REPTILES OF THE MESOZOIC**

Saturday School, Vaughan College, Leicester

**Wednesday February 25th**

**FROM GREENHOUSE TO ICEHOUSE, FROM  
FORESTS TO FROST. USING FOSSIL PLANTS TO  
TRACK CLIMATE CHANGE IN ANTARCTICA**

Dr Jane Francis, Department of Earth Sciences,  
University of Leeds

**Wednesday March 10th**

**MEETING THE EXTRA-TERRESTRIALS: CLUES  
FROM EVOLUTION ON PLANET EARTH**

Professor Simon Conway-Morris, Department of  
Earth Sciences, University of Cambridge

**Wednesday March 24th**

**GEOLOGICAL HIGHLIGHTS OF THE  
MIDLANDS, II - SOUTHAM (LONG  
ITCHINGTON) QUARRY, WARWICKSHIRE**

AGM and Chairman's address

Andrew Swift, Department of Geology, Leicester  
University

## Annual Report of the Natural History Section

### Officers

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Hon. Secretary	Mrs. G. Ball, B.A.
Hon. Minutes Sec.	Mrs. D. Thompson, B. Sc.
Hon. Winter Programme Sec	Miss J.E. Dawson
Hon. Editor	Mrs. D. Thompson

### Committee

Dr. A. Bevington  
Brooks, B.A.  
Mrs. M. Gillham  
Mrs. E.J. Harris  
Mrs. E. Penn-Smith  
Miss D. Phillips, B. Sc., C. Phys  
Miss A. Pinnock  
P. Tyler  
Mrs. S. Walton

There have been two well-attended committee meetings this year. The Summer Programme was devised by a sub-committee of Doreen Thompson, Maggie Frankum, Jenny Harris, Sue Walton, Richard Iliffe and Gill Ball. It was felt that last year's Summer Programme was a success. "The Millenium Atlas of Butterflies in Britain and Ireland" was bought with

the money raised from the sale of books and presented to Nick Gordon, Managing Curator of the New Walk Museum. We applied successfully to "Grants for All" for money to buy a sound system which will be in use soon. Alan Bevington has set up a web-site which has recently been updated. It looks good and we thank him for his hard work. Letters were sent from the Chair to various influential persons expressing our concern about the possible closure of the National Botanic Garden of Wales. Our letters were acknowledged but the situation remains unsatisfactory. A presentation was made of garden tokens to Biddy Ewen to thank her for her many years of invaluable work as Treasurer. We are keen to encourage new members and particularly younger ones to serve on the committee. Thanks are due to Jan Dawson for her Winter Programme of very interesting speakers. Doreen Thompson does much valuable work both as Minutes Secretary and Editor of the Newsletter for which we thank her.

Pat Heighway and Alison Gregory always supply us with coffee and biscuits and Jean Cooper makes the A.G.M. extra enjoyable by providing wine and cheese. Many thanks to all of them. Winter meetings were held at fortnightly intervals.

## Winter Lecture Programme 2003

**January 8**

**A FASCINATION FOR GALLS**

Maggie Frankum

**January 22**

**THE DEMISE OF THE DORMOUSE? AND WATER  
VOLE UPDATE**

Helen O'Brien

**February 5**

**THE CAPE FLORAL KINGDOM**

Dorothy Phillips

**February 19**

**THE RUTLAND WATER TREE SPARROW  
PROJECT**

Dr. Rob Field

**March 5**

**THE STATUS OF THE LEICS. AND RUTLAND  
FLORA AT THE TURN OF THE CENTURY**

Michael Jeeves

**March 19**

**JOURNEY TO THE BOTTOM OF THE WORLD**

Alan & Beth Elston

**March 31 Joint Meeting with the Parent Body**

**THE MILLENIUM ATLAS: COMINGS AND  
GOINGS AMONG BRITISH BUTTERFLIES**

Richard Fox

**April 2**

**A.G.M., QUIZ AND SOCIAL EVENING**

**October 15**

**MEMBERS' SLIDE AND EXHIBITION EVENING**

**October 29**

**RAT AND SUPER RAT**

Prof. Rob Smith

**November 12**

**BEHIND THE SCENES - THE BIOLOGY  
COLLECTIONS AT NEW WALK MUSEUM**

Nick Gordon, Jan Dawson

**November 26**

**31ST SOWTER MEMORIAL LECTURE  
ITS A BUG'S LIFE - THE CONSERVATION OF  
INVERTEBRATES**

Matt Shardlow

**December 10'**

**BIRDS OF OUR OFF-SHORE ISLANDS**

Steve McGuinness

## Summer Outdoor Programme

**May 2**

**DIMMINDALE AND SPRING WOOD, DERBYS.**

Maggie Frankum, Bas Forgham, John Bland

**May 17**

**MAGGIE'S BUMBLES REVISITED**

Maggie Frankum

**May 31**

**SUTTON PARK, SUTTON COLDFIELD, WARKS**

Dr Peter Coxhead

**June 14**

**WILLESLEY WOOD**

Ian Retson

**June 28**

**SWITHLAND WOOD AND BRADGATE PARK**

Peter Gamble

**July 9**

**CROFT PASTURE**

Steve Woodward

**July 19**

**KETTON QUARRY**

Jenny Harris

**July 30**

**WISTOW WALKABOUT**

Gill Ball

**August 9**

**OLD SULEHAY FOREST & RING HAW,  
NORTHANTS.**

Maggie Frankum

**August 30**

**SUMMER LEYS, NORTHANTS**

Pat Heighway

**September 13**

**BROWN'S HILL QUARRY - BAT WALK**

Jenny Harris

**September 27**

**BRANDON MARSH, WARKS**

Doreen Thompson

**October 12**

**MARTINSHAW WOOD - FUNGUS FORAY**

Richard Iliffe

The average attendance for these meetings was 31

Mrs D. Thompson

Minutes Secretary

Mrs. G. Ball

Secretary



# THE LEICESTER LITERARY & PHILOSOPHICAL SOCIETY

Founded in 1835

## OFFICERS AND COUNCIL

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144 Evington Lane, Leicester, LE5 6DG

**Independent Examiners:** Keith Smithson, F.C.I.B., M.I.Mgt., F.R.S.A.  
D. Barker

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D. Thurston, B.Sc., Ph.D.

N. Wood, B.A., M.A., Ph.D.,

The Vice Chancellor of the University of Leicester

The Vice Chancellor of De Montfort University

One representative of the Geology Section

One representative of the Natural History Section

### Geology Section Hon. Secretary:

Ms Joanne Norris, 208 Milligan Rd, Aylestone, Leicester, LE2 8FD

### Natural History Section Hon. Secretary:

Mrs G.M. Ball, 603 Welford Road, Leicester, LE2 6FP