Spring 2024

TOUCHPAPER

The Newsletter of the Royal Gunpowder Mills Friends Association
Registered Charity No. 1115237

Restoration of Building L157

Lady of the Lea

Smokeless Powders

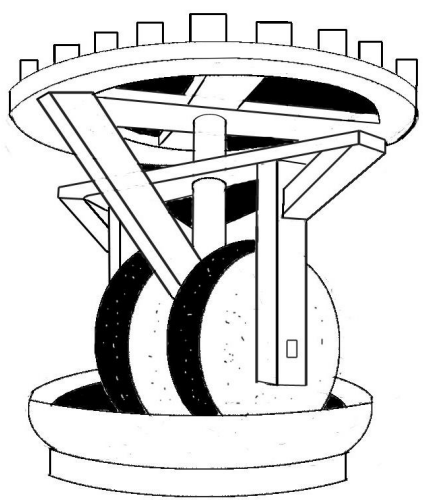
Explosives Acts

Notice of the Annual General Meeting

Are We Ready for War?

A Foot in Two Continents

Obituary
Dr Frank Baker



Spring 2024

Officers of the Friends Association

Chairman

John Cook
63 Lakenheath
Southgate
London
N14 4RR

rgm.fa@virginmedia.com

Treasurer

John Cook
63 Lakenheath
Southgate
London
N14 4RR

rgm.fa@virginmedia.com

Secretary

Geoff Hooper
17 Stoneyshotts
Waltam Abbey EN9 3DF

geoffrey.hooper1@btinternet.com

Membership

Daphne Clements
56 Park Road
Enfield
EN3 6SR

wargmfa@btinternet.com

All enquiries relating to this newsletter and articles, not membership, should be addressed to:

Brian Clements
56 Park Road
Enfield
EN3 6SR

wargmfa@btinternet.com

Deadline for the next issue is May 24 2024

Chairman's Chat

Back in November I spent a very enjoyable and enlightening morning at the Museum of the Home in trendy Hoxton. What used to be known as the Geffrye Museum has been extended and completely revamped. Now, behind the familiar 18th century almshouses façade on Kingsland Road is a much larger permanent exhibition space appealing to visitors of all ages.

The museum was best known for its displays of period furniture and domestic artefacts. These 'Rooms Through Time', have been reimagined by the curators to reflect home life, mundane or otherwise, as experienced in an area of London which has witnessed so much change in the last 400 years. Accompanying and enriching the displays of pots and pans, and tables and chairs, are the fascinating stories of their former owners; the people who lived, and still live, in the richly diverse and ceaselessly evolving local community.

The transformation of this museum would not have been possible without the vision and commitment of the trustees, management team, staff and volunteers, the support of stakeholders and large grants from external funding bodies. Our recently appointed Chief Executive, Andrew McDonald was a director in that Museum of the Home management team. A few weeks ago, I talked to Andrew about how the Mills can benefit from his recent success transforming a rather tired visitor attraction.

There are many common issues, not least the need for a robust and credible plan for the Royal Gunpowder Mills visitor attraction that protects the site and its historic buildings. This not be possible without grants from the Heritage Lottery Fund and, potentially, other external bodies. Competition for funding is intense. There is much hard work ahead. The 'new' Museum of the Home is testimony to the possibilities. With Andrew McDonald at the helm, there's a realistic prospect of a 'new' Royal Gunpowder Mills attracting the visitors it deserves.

John Cook

Editorial

In this issue we have news from Geoff Hooper that work is finally starting on the extensive works needed for the restoration of L157, our grade 1 listed building. There will be a volunteer meeting on Wednesday the 13 March when there will be news on the future of the site after which we will be able to reveal all in the next issue. Two articles from Peter Stone cover the Blow-Up Bridge and explosives legislation and our ammunitions stocks. The former topic has appeared before in longer form by Geoff Hooper, this version has a few photos to try to show marks made by towing ropes, I apologise for the graffiti which was not present last time I visited the site in 2015.

Thanks to all those members who have already renewed; there is another copy of the renewal form in the centre of this issue for those who wish to renew. Because the distribution as well as printing is now done by the printers it is not practical to send forms to only those needing them, if you are not certain whether you have yet renewed, please contact the membership secretary. Also, there is the announcement of the AGM and reunion together with the booking form for the reunion lunch. The back of the form is deliberately left blank so that nothing will be lost when it is cut out to return. There is no need to book if only attending the AGM but we do need as many as possible to come. Currently we need 30 members present for a quorum, failing this we will have to adjourn and reconvene at a later date as happened last year. If we get a quorum we will be able to reduce its size to be more suitable to our reduced membership.
The final item is from David Debenham and includes a group photo of the Compatibility and Stability Group, those included are all named so no guessing required.

Brian Clements

Restoration of Building L157



At long last work is proceeding on the restoration of Building L157. For those of you who building numbers do not flow off the tongue, this is the southern-most incorporating mills on the Queens Mead and is perhaps better known to old-timers as “Dr Uri’s lab”. Of our twenty listed buildings on the site, this is the only Grade One listed. Getting the necessary permissions for the repair work has been a considerable task, requiring much negotiation with Epping Forest District Council and with Historic England. That has now come to a satisfactory conclusion. . Planning permission and listed building consent was achieved on 1st March 2024 and work started on the site on 4th March 2024. The firm that is doing the work is Bakers of Danbury, a well-established local Essex firm expert in restoring historic buildings. The main features of the work are the repair and replacement of rotting timbers on the veranda and elsewhere, the replacement of sky-lights and some windows, the re-provision of toilet facilities in the building with associated foul water drainage and a further disabled access ramp. Work “on the ground” runs to early June 2024. The programme was scheduled in this way to avoid the seasonally bad weather in January and February; as it turned out a wise precaution. Now that we have got work underway on L157 we just have to find the money needed to repair the other nineteen listed buildings.

Part of the requirement by the National Heritage Memorial Fund (NHMF) who are funding the repair work was that the history of L157 be interpreted throughout its lifetime. This was originally as a gunpowder incorporating mill, then for cordite processing and, from 1945 onwards as a research laboratory. In 2000 it was reconfigured to as it was back in 1860 as a gunpowder mill. The selected company for this work is DNCO who have done commendable work at the Museum of the Home in Kingsland Road, Hoxton; formerly known as the Geffrye Museum.

When completed, the restoration work will enable our education programme to be expanded from the present Key Stages 1 and 2 (primary schools) to Key Stages 3 and 4 (secondary). None of the building works will affect our offerings to visitors this year; the site will be open every other Sunday from Easter (31st March) until early in December; see the Royal Gunpowder Mills website for details.

Geoff Hooper

Lady of the Lea

For over three centuries, explosives barges carried their dangerous cargo from the Mills at Waltham Abbey to the Woolwich Arsenal and the Grand Magazines at Purfleet, via the river Lea and the Thames.

Road traffic across the bridges of the Lea was usually suspended as the barge passed beneath, for fear of embers (from steam driven vehicles) and other discarded means of ignition dropping onto the deck of the passing barge.



“Lady of the Lea” – Explosives Barge
From an original painting by Richard Penfold MSIAD

Smaller craft in the illustration, were used to transport explosives materials between the various process buildings on the Royal Gunpowder Mills site, along a network of narrow canals.

A brief view of the image can be seen on the BBC’s iPlayer “Countryfile/River Lea”, where Dr Jim Lewis, author of books about the historic river Lea, discusses the subject (within the first 5 minutes of the hour long programme).

Richard Penfold

Smokeless Powders

Every year since the site closure programme thirty years ago, a number of former Royal Ordnance Factory employees meet up for a Christmas lunch; always a very enjoyable affair which I try not to miss. This year it was at the Royal Automobile Club (RAC) on Pall Mall, London. One of those present was David Izod. Back in the seventies he and I had adjacent offices in the British Embassy, Washington DC. David went on to be Superintendent of Explosives at Fort Halstead, subsequently taking on senior positions in what was by then Royal Ordnance plc and later British Aerospace. One of these was at RSAF Enfield. His final appointment was as a Visiting Professor at the Defence Academy, Shrivenham. Anyway, over the RAC lunchwe got to discussing our various adventures with "energetic materials" and he mentioned smokeless powders, including "Rifleite". Now this was a new name to me so I asked him what he knew about it. His notes on the subject are below; I can do no better than to reproduce them verbatim.

"War is the realm of uncertainty; three quarters of the factors on which war is based are wrapped in a fog of greater or lesser uncertainty."

Carl von Clausewitz 1832

One of the factors of uncertainty was the "fog of war" caused by use of black powder in cannon and small arms, preventing the ability to see what was happening on the battlefield.

The .303 British rimmed rifle cartridge was developed as a black powder-based round and put into service in 1888 for the Lee-Metford rifle which had rifling designed to lessen fouling from this propellant.The British Committee on Explosives caused experiments to be conducted on many smokeless powders then coming to the market. Amongst these were Ballistite, Cordite and Rifleite.

The Committee on Explosives, chaired by Sir Frederick Abel, monitored foreign developments in explosives and obtained samples of the French Poudre B developed by Paul Vielle in 1894,and Ballistite. Neither of these smokeless powders were recommended for adoption.

In 1887, Alfred Nobel invented and patented a smokeless propellant he called Ballistite. It was composed of 10% camphor, 45% nitro-glycerine and 45% collodion (nitrocellulose). Over time the camphor tended to evaporate, leaving an unstable explosive.

Abel, Sir James Dewar and W Kellner, who was also on the committee, developed and jointly patented (Nos 5,614 and 11,664 in the names of Abel and Dewar) in 1889 a new ballistite-like propellant consisting of (by weight) 58% nitro-glycerine, 37% guncotton (nitrocellulose) and 5% petroleum jelly. Using acetone as a solvent, it was extruded as spaghetti-like rods initially called "cord powder" or "the Committee's modification of Ballistite", but this was swiftly abbreviated to Cordite. Sadly. Nobel sued Abel and Dewer over patent infringement, eventually reaching the House of Lords and Court of Appeal where Nobel lost his case. Nobel felt that his trust had been betrayed.

Cordite began as a double-base propellant. In the 1930s triple-base was developed by including a substantial proportion of nitroguanidine. Triple-base propellant reduced the disadvantages of double-base propellant – its relatively high temperature and significant flash.

In 1891 cordite was selected because of its high Force Constant, lowest barrel wear and barrel erosion. The Royal Small Arms Factory changed the land profiles, and the gun became known as the Lee-Enfield. Later, the form of the propellant was changed to cut tubular and produced before WW2 and onwards at many commercial, Royal Ordnance Factory sites and Waltham Abbey. Because of the peace dividend, by the 1980's ICI Ardeer was the sole supplier based on a Ministry of Supply contract dating back to those earlier days. Unfortunately, because of privatization, Royal Ordnance were unable to compete on the world stage with its 5.56 mm ammunition without switching to the cheaper ball powder.

ICI stuck to their original contract or “guns” if you pardon the pun so the change to ball powder occurred and Ardeer sadly closed down.

Turning to the other main contender, Rifleite.The Smokeless Powder Company (SPC) of Barwick Hertfordshie manufactured their



A 303 round showing cordite propellant

propellant consisting of nitrocellulose and dinitrotoluene to which barium and potassium nitrates and wood meal were added to improve the oxygen balance and probably slow the burning rate. Kynoch’s also made a similar smokeless propellant. The snag with dinitrotoluene is that it is decidedly poisonous.There are four isomers of dinitrotoluene with melting points in the range of 48 deg.C to 70.5 deg. C. so it is easily melted safely with hot water. It was produced in the form of flakes.

SPC was founded in 1888 by James Daziel Dougall Jr., son of the famous Glaswegian gunsmith. He took a 99-year lease for 126 acres of land from the Youngsbury Estate and built a factory estate called Barwick. This was designed and superintended by Ernest Spon who was a well-respected engineer.



The venture was successful as the first modern producer of smokeless powders for use in torpedoes, artillery shells, small arms, and mine blasting, selling to overseas governments as well extensively in the UK. It must have been a bitter blow to lose the Committee on Explosives competition. The company experienced two fatalities in 1893 caused by a fire and explosion in a drying house. Later in 1898, SPC was sued by the Dynamite Nobel Trust for patent infringement. They won their case but the financial drain in doing so caused the company to enter liquidation.

Explosive materials continued to be manufactured by different companies on the site including Sabulite, a blasting explosive and later producing snaps for Christmas crackers. However, it is now a derelict works. Some of the remains of the original SPC facilities can be seen such as concrete magazines with their blast mounds, rifle butts and the remains of the drying houses.

Geoff Hooper

Explosives Acts

When I first was involved with explosives licensing, I was given an elderly copy of the 1875 Explosives Act. The Act was produced by a Col Majendie, a larger than life character, who became the Chief Inspector of Explosives in 1871. He was a member of several Boards of Enquiry into accidents at Waltham Abbey. The Act was produced in something of a hurry because of public concern about a large explosion in a barge on Regent's canal. This occurred in 1874 when a barge, the "Tilbury" carrying amongst other things six barrels of petroleum and five tons of gunpowder, blew up. Damage occurred to houses up to a mile away. It happened just as the barge was passing under the Macclesfield bridge near to the London Zoo. The bridge was later rebuilt using the original iron support columns.



Now, as anyone who has been on a canal boat holiday knows, the ropes that hauled the barges, when horses were used, left deep scores in bridge supports. The columns on the Macclesfield bridge were turned the other way when it was rebuilt and the rope grooves are now on the "wrong" side of the columns. They can still be seen today. Presumably the columns were reversed because the grooves caused extra wear to the tow ropes.

One of the pillars showing grooves, enlargements on next page



Canal side



Land side

I suspect that the reason that no new grooves have been formed on the freshly exposed side, is that the change over from tow horses to motorised barges would have occurred around this time. I was surprised that such a comprehensive Act, as the 1875 Act, had come out of nowhere. Also, I was intrigued by the following requirement in the Act "No Gunpowder must be stored within two Miles of any Palace or House or Residence of Her Majesty, her Heirs and Successors". The same clause did not appear anywhere in our own MoD Regulations. The 1875 Act lasted, with amendments, until 2014. I could not find this requirement in the 2014 Act.

I subsequently discovered that there were explosives acts in 1724, 1772 and 1860 (and possibly there were more). So, the 1875 Act had developed and grown over time rather than being pulled like a rabbit out of a hat. The 1772 Act had a slightly modified requirement about the Sovereign's residences, as George III was on the throne. The Act in 1724 states "No gunpowder to be stored within three Miles of his Majesty's[1] Palace at St James or within two Miles of any magazine belonging to his Majesty his Heirs and Successors". My thought is that the obsession with the Sovereign and explosives was due to the Gun Powder Plot which had occurred in 1605. Presumably the clause about His Majesties magazines was a mistrust of commercial Gunpowder users to store their powder safely.

Also of interest, and possibly it is relevant to the two mile limit for commercial magazines, is a clause in the 1724 Act is designed to prevent quantities of Gunpowder in excess of the legally permitted maximum from being stored. It would appear that unscrupulous persons were simply partitioning rooms and treating them as separate buildings to get around the limits. Under the 1724 Act they now had to consider each separate roof as a storage area for the purpose of the quantities permitted to be held.

The above rather rewrites my preconceptions of explosives legislation in the past. The flowery language in which it is written is quite amusing but they thought carefully about safety problems and did their best to mitigate any risk.

N.B. I am the first to admit to the overuse of capital letters. But I have copied those in my quotes from the originals. So “Not Guilty” this time.

Peter Stone

1 the quote from the 1724 Act “His Majesty’s” was copied accurately. I presume that at some time we changed to "Majesties".

WALTHAM ABBEY ROYAL GUNPOWDER MILLS
FRIENDS ASSOCIATION

Notice of the Annual General Meeting

The Association's AGM will be held in the Mixing House/Women at War room opposite Walton House on Friday 14th June 2024 commencing at 11.00. Tea and coffee from 10.30.

- Nominations for election to the Association's General Committee,
- any proposals for amendment of the Association's constitution, and
- any other resolutions for the AGM, to be sent to the Secretary,

Geoff Hooper
17 Stoneyshotts
Waltham Abbey, EN9 3DF

or by email to geoffrey.hooper1@btinternet.com

to be received no later than 7th June 2024

AGM/Reunion Friday June 14th 2024

This year we are splitting the AGM and Reunion events over two venues. The AGM will be held in the Mixing House/Women at War Room, next to the Control Room and opposite Walton House. The Reunion social event will take place in the café which has better facilities for the lunch which will be served at 12.30.

There is a charge of £14 per head to cover the cost of the lunch. If you would like to attend the Reunion please detach / print the form on page 15 and send it to:

Daphne Clements,
56 Park Road,
Enfield, EN3 6SR

Please attend the AGM before the Social/Reunion if possible. We need a quorum to proceed with the AGM agenda.

PLEASE NOTE Cars should be driven on site and parked on the concrete pad.
Please be careful when driving on site.

GDPR declaration

We will comply with the General Data Protection Regulations by ensuring information about you:

- will be held only with your agreement (see below);
- will be held safely and securely;
- will never be given or sold to a third party;
- will be deleted from our files on request.

I give my permission for the personal information shown above to be held in the files of the WARGM Friends Association

Signature……

Payment

Either by Bank Transfer to:

Account Name:	Waltham Abbey Royal Gunpowder Mills Friends Association
Account Number:	50358711
Sort Code:	20-20-37
Reference:	Your name and initials

WALTHAM ABBEY ROYAL GUNPOWDER MILLS
FRIENDS ASSOCIATION
Registered Charity 1115237
MEMBERSHIP RENEWAL 2024

I/We wish to renew my/our membership for 2024

Membership with Touchpaper by post (£10) ☐ Please Select one option

Membership with Touchpaper by post & email (£10) ☐

Membership with Touchpaper by email (£5) ☐

My Name .....

My Family Members' Names .....
(Optional) .....
.....

My Home Address .....
.....
.....

.....

Postcode .....

My Telephone Number .....

My email Address .....

ADDITIONAL INFORMATION

NEWSLETTER
Our newsletter — 'Touchpaper' will be sent to you either by post or email

GIFT AID
If you pay Income Tax, have you signed a GIFT AID CERTIFICATE? If not please contact the Treasurer. As a charity the Association can claim 20p from HMRC for every £1 received from subscriptions and donations at no additional cost to you.

YOUR INTERESTS
Do you have any specialist skills or knowledge that would be useful to site or artefact conservation at the Royal Gunpowder Mills?

.....
.....
.....

Please complete both pages of this form and return with cheque to the address overpage.

OR by a cheque
made payable to
WARGM Friends Association

to:

Daphne Clements
56 Park Road
Enfield EN3 6SR

Please return the completed form by post to the Daphne Clements
or scan and email to WARGMFA@btinternet.com

email enquiries to WARGMFA@btinternet.com

PUBLICATIONS

The Association's current publications are available to members. Please indicate your requirements below and ensure your cheque reflects the cover price(s) as well as your membership subscription.

"Listed Buildings" booklet (copies)	☐	@ £1 / copy (inc. P&P)	£
"Beam Engines" booklet (copies)	☐	@ £1 / copy (inc. P&P)	£
"Trials, Trib. & Pranks" booklet (copies)	☐	@ £1 / copy (inc. P&P)	£
Membership Subscription for 2024		*as indicated overleaf*	£
Donation			£
TOTAL (cheque payable to WARGM Friends Association)			£

Reunion Booking Form

Friends Association Social Day / Reunion - Friday 14th June 2024

I / We would like to attend this event. I / We enclose a cheque for: £____
Payable to: WARGM Friends Association
Number of attendees _____ @ £14 each = _____

Name(s) of attendees: _____

_____

_____

Are We Ready for War?

The Royal Ordnance Factories (ROFs), who used to make our ammunition and military equipment, have now mostly been closed and the land sold off[1]. If we are serious about fighting a protracted war, I suggest we cannot do it without new ordnance factories. You simply cannot hold enough stock for such a war. In the last war new ordnance factories were built and manned in great haste, but we have no one left who could do that now.

Waltham Abbey (where I used to work; it was a research establishment by then) was the main supplier of cordite[2] for the UK land forces from 1894 until around the start of WWI and then again until WWII. At the start of both World Wars new factories were hastily opened. In WWII the Bishopton factory, together with ROFs Wrexham and Ranskill were constructed as an emergency measure for WWII production. Staff from Waltham Abbey were certainly involved in setting up Bishopton and, most likely, also the other two sites. Being further from the continent, these new sites were considered to be more difficult for the Luftwaffe to reach. My old boss used to say that we at Waltham were an insurance policy. If there was another European war, he thought that we would form a core of staff who could open new ordnance factories. There is another European war but where are the ordnance factories let alone the people to open new ones?

The facilities on Waltham Abbey south site were an insurance policy in themselves. We had enough manufacturing buildings and plant, that given sufficient manpower, we could have made a significant contribution to a war effort if necessary. When I worked there, we only ever had enough staff to man them on a part time basis. One group of process workers moved from one building to another.

Also, we had almost every conceivable type of building and facility for propellant manufacture. Ranging from large solventless cordite presses, Ball Powder manufacturing plant and almost any cordite processing plant that can be imagined. The facilities must have been worth a small fortune and were all simply scrapped after privatisation to make way for a park! To give an idea of the size of our Defence Munitions industry in the past, the numbers of personnel employed MoD (PE) in the Research Establishments, the P&EE Ranges and the Royal Ordnance Factories (ROFs), say at the time of the privatisation of the ROFs were huge. The ROFs alone employed over 19,000 people at this point in time. And at times of international tension the numbers have been monumental[3].

A lot of rubbish has been talked about the fact that the doctrine of the British Army does not rely on large quantities of artillery ammunition. That is probably true until you have a war. We used vast quantities in WWI and WWII and (so I believe) nearly ran out in the Falklands War. The 155mm artillery guns and their ammunition are the mainstay of many Armies and are vital to our own. It appears to me that the development of man portable antitank weapons and highly effective air defences have resulted in a return to trench warfare. Hence in the current conflict in Ukraine both sides are relying on very large quantities of artillery ammunition. We in the UK are now reliant on imports from overseas. In two World Wars we were blockaded and could be blockaded again. Our main supplier of 155mm ammunition is now South Africa and they are now forging close ties with Russia. We also no longer have the capability to manufacture weapons or ammunition in large quantities. It is worth noting that the ROF organisation also designed and built many armoured vehicles, up to and including Main Battle Tanks. We in the research establishments were often (unfairly perhaps?) critical of the ROFs. But they never had a debacle to match the Ajax project.

I was told that the quantity of ammunition in the UK War Stock is classified information. So, we need to do a bit of spying. Below I have estimated the UK War Stock of 155mm artillery ammunition using information available on the internet. This will be available to our enemies. My point is that we no longer have the capability to manufacture 155mm ammunition in particular. As regards the quality of 155mm ammunition; that produced by the ROFs was specially processed to minimise premature detonation. The premature detonation of a shell in the barrel of a gun will result in the loss of that gun and probably the gun crew. It would be interesting to compare the premature rate of ROF produced shell with that from South Africa. A low rate is insignificant if shell usage is very low, but becomes much more significant once such very large usage of shell becomes the norm.

UK War Stock

According to Wikipedia the depot at Kineton contains 60% of UK ammunition stocks.

From looking at the satellite view on the OS Map app there are 80 Igloos located there; Igloos are the standard NATO earth covered explosives storage buildings

The UN publication ITAG 05.20 states that Igloos can hold up to 75,000Kg of HD1.1 (mass detonating) explosives.

Hence 80 Igloos will give 80X75,000=6,000,000Kg of HD1.1 storage capacity. And dividing this by 6.86 (the quantity of HD 1.1 explosives in a 155mm shell) we can calculate the number of 155mm Shell that could be held at Kineton as 874,636.

Estimates for Russian artillery Shell usage vary from 20,000 to 50,000 per day.

So, if 874,636 of 155mm shell are held at Kineton, we can divide this by 20,000, the minimum estimate of a day's usage, to give a usage of 43 days!

Perhaps adjust for only 60% of stock held at Kineton gives 72 days and this is the absolute best case that can possibly be envisaged.

The above assumes that the propellant charges for the ammunition are held elsewhere and the that all the Igloos at Kineton are used solely for 155mm Shell. No account is taken of the storage of other stocks of ammunition required by the UK. Hence this is certainly a gross over estimate. It is highly likely that up to half the Igloos are used for storage of the propellant charges, which obviously reduces the above estimates by half! And the 40% of UK stocks held elsewhere may not be 155mm shell.

Conclusion

During the Cold War it used to be said that a conventional war in Europe would last about a week. We would then resort to tactical nuclear weapons. Hence, I suspect that currently only one week's supply of munitions is held as a reserve. The trouble with this approach is that it is a self-fulfilling prophesy. Although I have looked here at ammunition shortages, it is clear that we are in the same situation with regard to equipment and personnel. New ROFs might solve the equipment and explosives issues but not the personnel problem!

1 They were sold off by the Thatcher Government in the 1980s. Unfortunately, ROF Bishopton was closed in the 1990s when the contract for 155mm ammunition was given to South Africa. This does not look such a good idea now that they have been cosying up to the Russians!

2 Cordite is the propellant that delivers a projectile from a gun to the target. It takes approximately 10lb of propellant to deliver 1lb of high explosives. Hence it is very important. It is also used in a small rocket motors. It is probably true to say that it is more difficult to manufacture than High Explosives.

3 In between 1936 and 1939, thirty new ordnance factories were built with a combined workforce of about a million people. At its peak Woolwich Arsenal had a workforce of 100,000.

Peter Stone

Obituary

Dr Frank Baker



I have had real trouble writing this. Initially, I thought I would recount what I knew of his life and of his numerous accomplishments, but you can all use "Google Scholar" so, instead, I will say what he was to us, his team members.

Frank was a nice man and a good man.

He was kind and generous, both with his time and his knowledge. We knew him as Uncle Frank and with good reason. He would help you when he could and was always happy to put paperwork to one side and go into the lab and help grapple the equipment and software until it gave in and did what it was damn well told. I have to say I think he was happiest in the lab or talking shop: generating patents and papers was just what Frank did – he certainly taught me how to be an experimental scientist. I may also have picked up some of my cynicism regarding upper management from him: with privatisation and relocation looming, the Abbey was not always a happy place to be.

He was a natural scientist and rejoiced in finding out new things, reading papers and always learning. Many was the day, coming out of the lab and in search of some desperately needed tea, I would see him ensconced in Tom Lewis's office, the two of them arguing about how nitrocellulose (NC) interacted with nitroglycerine (NG) – a long running debate - with Tom's pipe filling the air and Frank filling the white board.

Some aspects of NC based propellant manufacture were still a black art and Frank threw science at it, and threw it hard. He formed extended research teams by placing contracts and PhD funding with universities like Strathclyde, Durham and Sheffield, while we pursued DMTA and dielectric spectroscopy studies in N567 and rheology in R616 - work better suited to an energetics site. The lab in R616, designed by Frank and envied by the US DoD, quick became an essential on the tours taken by visiting dignitaries, despite the scepticism of some. I well remember 3 days at Ross Priory on the banks of Loch Lomond, when it hosted a seminar that was the MOD funded/Frank led assault on the structure of the NC and NG matrix. 20 scientists pored over every result of the team members. It was exhausting, but we made progress and generated some unique papers, often highlighting the need for updated manufacturing techniques and improved process control at Bishopton - as ever more highly loaded triple based propellants became the norm.

Like many good scientists he was able to change field effortlessly: scanning electron microscopy, improved adhesion performance, dielectric spectroscopy, thermal mechanical analysis, rheology and instrument design were just some of the areas he had mastered by the time I worked for him. I often wonder how he would have fared if, after the privatisation, had he rejoined MOD instead of forming CBE with Roy Carter. He would have settled in fine at somewhere like RSRE Malvern and risen high, but he took a different path.

To conclude, I asked another of Frank's minions, Kate Turner, what she most remembered of working for him and, for her, it was his kindness, good humour and concern for his staff, but she also mentioned his love for the Directors bitter they served at the Plough in Sewardstone. It's easy now to remember him, a pint in hand, a contented smile on his face and realise what a joy he was to work for and what a good friend he was to have.

Grant Privett

Remembering Dr Frank Baker

I fondly remember Frank Baker from my time working on Royal Ordnance's (RO) P1 gun propellants branch. He was friendly, and caring, and brought a cheery humour, with no small amount of noise, to the workplace. Frank was a thoroughly decent human being, and a great colleague, who brought a ray of sunshine into the RO organisation.

I knew Frank best for being the head of the P1 Branch rheology team: rheology being the branch of physics that studies the deformation and flow of matter. He was a member of the British Society of Rheology and had a deep interest in the subject together with very many other scientific disciplines. He was a natural scientist.

Frank was originally employed by Ministry of Defence (MOD) and his employment was transferred across to Royal Ordnance, an organisation he didn't particularly like. This transfer occurred during a ministry reorganisation in preparation for the privatisation of the ordnance factories.

Frank was very intelligent and had a work hard, play hard attitude that won over many of his colleagues. Frank was described, by Dr David Stalker of Royal Ordnance, Bishopton factory, as being Royal Ordnance's best scientist; undeniably, MOD's loss was RO's gain. Indeed, Frank, in his earlier years, was reputed to have personally manufactured an electron microscope. Frank researched microwave ignition of propellants. I recall Frank telling me that he conducted an initial feasibility experiment, to ignite gun propellant with microwaves, in his home's domestic microwave oven. And it worked!

Those who knew Frank would have recognised that he was a great networker. For example, he forged strong links with the United States' Department of Defense (DoD) research community at Picatinny Arsenal amongst other places. His work, and that of his team, greatly influenced US DoD to use rheology to characterise the deformation and flow of propellants and thus to improve the quality of propellants and optimise processing parameters. He and Roy Carter were held in such high regard by US DoD that the DoD made plans to employ a whole team from Waltham Abbey. The US DoD were far more accepting of his ideas than some of his less enlightened British colleagues.

Frank was highly sociable too and enjoyed unofficial lunchtime team building exercises in various local hostelries, visiting with Roy Carter and their respective teams. It worked because we all became friends. The pubs we visited were numerous. Amongst the favourites were: the very rustic the Forest Gate, Bell Common, near Epping – a proper old-fashioned boozer, where we would be frequently encounter Dr David Tisley, who headed P2 rocket branch; and, the Royal Oak, Sewardstone, known locally as "Venners'". The Royal Oak was run by former Royal Navy petty officer Fred Venables, who was the father of the famous footballer, Terry Venables, Sadly, the Royal Oak was demolished to make way for a care home.

Being such a genial people person, Frank enjoying entertaining visitors in the Royal Ordnance South Site visitors' restaurant. The South Site visitors' restaurant was in the same building as the staff canteen. Alcoholic refreshments were available in the visitors' restaurant but alcohol was secured under lock and key, with the key being very closely guarded by head of RO South Site, Dr David G Davies. When entertaining visitors, Dr Davies would invariably deny their hosts' access to the alcohol cabinet. However, there was a sure way to circumvent Dr Davies's parsimony and that was to call upon the generosity of Dr Tisley, who was always willing to oblige by loaning out his key.

After his time with Royal Ordnance, Frank, with Roy Carter, formed a company, Carter Baker Enterprises (CBE) making rheological testing equipment and, following the takeover of CBE, he worked at the prestigious Cavendish Laboratories, part of Cambridge University, where he published several papers on challenging applications of scanning electron microscopes. He was perfectly suited to life in academe.

Before I finish, I shall recall an anecdote. Frank commuted to work via M25 motorway, a road notorious for its traffic jams and hold-ups. On one occasion, the M25 was at a standstill and Frank was close to the exit slip road and was in a hurry to get to work. The hard shoulder was empty and so Frank used it to bypass the traffic queue. This caught the attention of the crew of a nearby Essex Police patrol car who promptly stopped Frank. Frank was required to show an officer his driving licence which contained the title, Doctor. The officer believed that Frank was a medical doctor and waived him on his way. Frank did not disabuse him.

I have worked with some pretty talented scientists, in MOD, ICI, and QinetiQ. Frank was very much the equal to the very best of them. Yes, Frank will be sorely missed.

Martin Gough

A Foot in Two Continents

The interview for a post at ERDE had covered the routine stuff when Alan Owen suddenly asked me the bonding structure of the boron hydride molecule, diborane. Unflustered by this, only because I happened to know it, I reeled it off. Smiles all round suggested this interview was going well but in the back of my mind I knew it might all come to nothing.

I had an ongoing appeal against a charge of possessing an offensive weapon. This had to result in the case being dismissed in order to join the MOD. What you may ask was it about? Let's just say it was just brought about by a large homemade thunder flash that I had made in my garden shed and set off at an Enfield November 5th gathering some months earlier. Spectacular it was but neither dangerous or threatening but Police had taken a different view. The appeal was upheld and I was offered the post.

Joining Waltham Abbey in 1962, I had come to know of it from day release students already working there and who I had met at college when my employer, Thorn Electrical, had similarly sent me on the same HNC Chemistry course. Coming from grimy industry, with few Health and Safety rules, I was taken aback by the site and its natural setting. I cannot emphasize how easy it was to settle into WA. Promotion followed 7 years later but then an opportunity came to drop out for a couple of years to take up a voluntary position as Assistant Chemist in the Tea Research Institute of East Africa. Ivan Dunstan studied my request and granted me the unpaid leave of absence, for which I was personally very grateful for his enlightened approach to an unlikely request.

Little did I know this would lay the ground 7 years later to again leave WA to take up a Secondment to the UK Overseas Development Administration as an SSO working on a Kenya soil fertility project. Studying principally soil sulphur deficiencies that were limiting crop yields, it involved analysis of soil, plant and even sampling the atmosphere, so less polluted in terms of sulphur dioxide than industrial countries where such pollution is a measurable soil sulphur input entering through rain.



Sampling tea for analysis at Tea Research Institute of East Africa 1970

I might have stayed in Agricultural research on returning to UK 6 years later, but such establishments engaged in that sector were being closed or privatized by the then Thatcher Government. So it was that I returned to MOD, WA to work under Ozzy Blay and then Jim Burgess. It's worth a reminder of the several pleasures of being at ERDE. There were the weekend courses at RCMS, Shrivenham where a round of golf was easily slipped in together with Kitchener Hall gastronomic delights. One could enjoy a brief attachment to the Armed Forces, in my case RAF Waddington to fly in a Vulcan and even visiting a British Army war game in Northern Kenya,and the final perk for me was using Nairobi bound RAF indulgence flights from Brizenorton with my family.



Compatibility and Stability Section ERDE 1982
L to R Paul Bunyan, Dave Debenham, Mike Farey, Dick Dedman, Pete Mayer, Ray Vaughan, Ozzy Blay

The eighties saw upheaval at ERDE. The Site was briefly shared with Royal Ordnance before full closure and dispersal of staff to other locations. Everyone had a story to tell and, along with others, my fate was to go to RARDE, Fort Halstead. Not long after, it too would be the focus of privatization and change. And so I moved house from St Albans to Kent.

Back at WA, saving the precious North Site occupied the minds of many and much credit to those since who have fought for the location to be on one hand preserved for nature, and on the other, kept as a place of great historic interest.

The year 2000 saw me retire from FH and I returned to Africa to develop land I had bought in Kenya five years earlier. The location at 7000ft overlooking Africa's great Rift Valley is spectacular, just south of the Equator and farming, albeit on a small scale, keeps me occupied to this day. In addition, I started the Sevenoak Kenya Education Trust SKET, a UK charity that helps needy young Kenyans with school fees.

So it was, on looking back, that the three Cs of life.... chances, choices and changes, were central in my own experience. Joining WA was the starting point from which things happened and began this unlikely tale sixty one years ago

They say variety is the spice of life. I had worked as a Chemist for more than forty four years, eight of which were abroad, built a second home in Kenya and now manage a Charity. That job interview back in '62 laid the way for my particular life journey, as for all of us who at some time can say "but for"...

David Debenham

Contents