Spring 2019

TOUCHPAPER

The Newsletter of the Royal Gunpowder Mills Friends Association

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David Hartley



Spring 2019

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Deadline for the next issue is 24th May 2019

Chairman's Chat

Welcome to the new season at the Mills. As it has been winter, or so the calendar says, it is the closed time at the Mills so not a lot has happened Since the last issue we have had yet another review by consultants as to how to make the RGPM more profitable or should I say less loss making. Some of their recommendations were valid and I hope to be in a position to reveal more next issue. To help us understand how other similar organisations cope the trustees have visited other sites including Chatham, Whitchurch silk mill, and will visit Duxford in March.

The reroofing of the mill buildings on the mead has been postponed as the Foundation has changed their minds about what to do. The latest plan is not to adopt a temporary roof but to reroof buildings as they were originally but of course to latest insulation standards. This should now go ahead in the autumn.

Your committee have now purchased new table and chop saws for the workshop to the latest standards. If anybody is interested in purchasing one or both old saws which are quite suitable for home use and in very good condition please speak to one of the committee urgently.

We opened to the public this last week which was half term and I am pleased to say that due to the exceptional weather the attendance was excellent.

This year's events and opening times will be on the website, the next general opening will be for the Easter period. May I stress that we are heavily dependent on volunteers to run some of the activities and we need more urgently.

Lastly on a very sad note I lost my wife of 59 years in January rather suddenly after a short illness. Many of you will have known her well particularly from the old ERDE club days. It has been a difficult time but we have to remember the good times.

Let's hope we have some good memorable times at the Mills this season.

Editorial

Thank you to all those who have already renewed their membership, those who have not yet renewed should find a renewal form enclosed or attached. Please note that we do not now send out membership cards or letters acknowledging receipt of renewals. Any queries regarding membership status should be addressed to the treasurer who maintains the membership database; I do not normally have access to this.

Also enclosed or attached should be a booking form for the Social event which follows the AGM on May 10th.

The article on Allen Clarke and his daughter Ann has produced letters and an article on whiskers; I hope 2019 will be the year when letters in Touchpaper are the norm rather than a rare treat.

Again we have a full issue and I have some material held over until future issues but please do consider submitting your own efforts, the more varied the better.

Our sympathies to our Chairman for the loss of his wife and thank him for continuing to support the Friends activities. On a happier note Bryan Howard has now had a long delayed knee replacement; we wish him a speedy recovery and look forward to seeing him back at the Mills.

Brian Clements

Three Arctic Voyages

Today the west coast of Norway is well-visited by cruise liners on their way to the land of the midnight sun. In the 1950s when the fisheries research vessel 'Ernest Holt' sailed to Bear Island north of Norway it was rare to sight any large vessels so to see the upturned hull of the German battleship 'Tirpitz' lying in Tromso Fjord was amazing. This would be 1953 or '54 when she was about to be broken up and sold as scrap.



Above Tirpitz afloat and below fit only for scrap



I did three Arctic trips, one in each of the years 1953,'54, and '55. There was a bonus in going on a month-long Arctic trip as the scientific staff were expected to do so many days at sea each year. Like many others I suffered from 'Mal de Mer' but recovered after a day or so. Note that a sure cure for sea sickness is to sit under an oak tree!

The 'Ernest Holt' was the only purpose-designed research vessel that we had in the 1950s and she was based in Grimsby as Lowestoft was not suitable. Visiting Tromso in the North of Norway was necessary to top up fuel before steaming to Bear Island to sample seawater and assess fish stocks.

The amount of fish that a trawl could catch in one hours tow was astonishing. I can recall seeing a so-called 5-bag catch, each 'bag' was about 50 baskets of fish i.e. approximately 250 baskets – the whole fore deck was waist deep in fish! This was compared with a typical North sea haul of about 10 baskets for a one-hour tow.

Cod and haddock were the main species in the Arctic that would be marketable in the UK. Most other species were discarded including Norwegian Haddock, a spiny red fish said to be palatable but difficult to handle, because of the spines. However, when passing close to Russian trawlers we saw that they used pitchforks to handle Norwegian haddock.

I can recall a number of incidents but cannot say on which trip they occurred.

The most impressive catch in the trawl was a Greenland shark which was gently hoisted by its tail and released over the side. Several large cod fell out of its mouth during this operation which gives an idea of the size of this shark.

Collection and storing of seawater samples was done in a small unheated aft deckhouse. Corona style bottles were used and it was not unknown for these samples to become frozen!

Once we were North of the Muckle Flugga light, following naval

tradition we were issued with a tot of rum; much appreciated in your coffee if you were chipping ice off the rigging!



78 degrees North and close to the west coast of Spitzbergen was as near as I got to the North Pole; what we were doing there I haven't the faintest idea!

My three trips were all in the summer months and I can't recall any sightings of the 'Northern

Lights' which the crew held were bad news as they preceded stormy weather.

Returning to the UK from 'down north' was via Tromso for refuelling and the purchase of 5kg bags of sugar which was still rationed at home. A detour into Aberdeen was made to sell the catch of fish (I assume that the Aberdonians were less 'Bolshie' than the Grimsby Dockers).

Finally when we berthed at Grimsby we transferred our samples and gear to an estate van and drove home to Lowestoft.

Bryan Howard

NB The Muckle Flugga light is the most Northern part of the Shetlands which makes for a suitable reply to the Scottish question "Have you been this far North before?" "I've been North of the Muckle Flugga light!"

Conundrum

West was the wind and west steered we The wind was from aft How could that be?

History of Explosives Legislation

Over the centuries explosive legislation has attempted to balance public and media reaction to the not infrequent explosions of stores and powder magazines, mills and factories that were then prevalent with the need to defend the realm from both external and internal threats and to maintain a stable supply chain of explosives. As such the nature of this legislation has changed over the years. However, as was reported in "The Rise and Progress of the British Explosives Industry" of 1909, every change and every improvement in legislation usually brings some difficulties and inconveniences in its train.

In that book there is a chapter on legislation written by Edward Arthur Brayley Hodgetts (incidentally also of "Swiss Family Robinson" fame) in which he says "There is a Russian proverb to the effect that those who fear wolves should refrain from frequenting forests; but such fatalistic philosophy has never found acceptance with the practical spirit of British public opinion; our legislature, with indomitable optimism, again and again attempts the impossible, and even endeavours to reconcile opposing and incompatible interests in a spirit of wise and charitable compromise. Thus we constantly find the interests of the state at variance with the comfort and convenience of the individual and in its practical efforts to remedy abuses, Parliament has not infrequently to contradict itself in quite a perplexing, though to us not an entirely unentertaining manner". Sounds familiar?

Thus it has been since the mid-1600s, when legislation was used alternately first to encourage and then to restrict the free movement of gunpowder, mainly from overseas. On the one hand in 1641 legislation was introduced to remove restrictions on both domestic manufacture and import from overseas because they had "...weakened and endangered the Merchants thereof and much damnified many Mariners and others taken prisoner into miserable captivity and slavery, many ships taken by Turks and other pirates and many other inconveniences...if they had not been timely prevented". On the other hand the Long Parliament enacted legislation in 1642 which stated that "... no Carrier, Waggoner, Watchman, Wharfinger or other person whatsoever shall carry or covey out any gunpowder to any place without Warrant from both Houses of Parliament". In 1672 this was repealed under a general Free Trade Act specifically legalising again the unhindered movement of gunpowder. And so the legislation went back and forth.

But it is not until 1719 that we come across any serious attempt at a measure at all resembling in its scope the current explosives legislation. The 1719 Act stated that "Whereas great quantities of gunpowder are frequently lodged and kept in warehouses and other places in and about the Cities of London and Westminster, and the suburbs thereof, to the apparent danger, if not utter ruin and destruction of several public offices, and of the lives and fortunes of many thousands of his Majesty's subjects: For preventing these mischiefs it was enacted that from and after the first day of August, 1719 it shall not be lawful for any person or persons to have or keep more than 600 pounds of gunpowder within the Cities of London and Westminster, or within the Suburbs thereof, or within three miles of the Tower of London, or within three miles of His Majesty's Palace at St. James's".

Six years later it was found necessary to make amendments to the law, and so in 1725 an Act was passed to prevent dealers in gunpowder from dividing their houses and warehouses into several small partitions or apartments, and therein keep greater quantities of gunpowder. It was moreover felt to be necessary to lessen the quantity of Gunpowder allowed to be kept to no more than 200 Ib.

Two further Acts were passed in 1742 and 1749 *"for preventing mischiefs which may happen"* by keeping gunpowder; the first, referring only to the Cities of London and Westminster; the second a general Act including carriage as well.

This latter Act prohibited the carriage within Great Britain of "more than 2,000 Ib. of Gunpowder in any waggon, cart, or other carriage, by land or more than 5,000 Ib. of Gunpowder in any barge, boat, or other vessel, by water".

The first Act of Parliament affecting the manufacture of gunpowder was passed on the 22nd January, 1772, and came into force on the 1st July of the same year. To judge by the preamble, this Act would seem to be a sort of legislative afterthought, for it stated that "Whereas the manufacture of gunpowder within Great Britain, though necessary to be encouraged in respect of the value of gunpowder as an article of defence and commerce, yet ought to be regulated by law in order to prevent the great mischiefs which may arise from explosions occasioned by the improper construction and use of the mills, engines, and buildings, employed in the making of gunpowder, and for keeping and carrying gunpowder in too great quantities, or in an improper manner".

The Act then went on to prohibit the use of stamp mills and provided that no more than 40 Ib. of gunpowder should be manufactured at one time or under any single pair of Mill Stones, and nobody was allowed to dry any quantity of gunpowder exceeding 40 cwt. Furthermore this Act specifically exempted from its coverage any mills or buildings on land belonging to the King, therefore the Royal Gunpowder Factory at Waltham Abbey was exempt from this Act.

It was not until 1860 that the first Gunpowder Act of that century was passed. This contained a number of regulations for the manufacture and keeping of gunpowder, among which there is the first provision for protection against lightning, every maker of gunpowder being enjoined to "cause to be erected or provided good and sufficient thunder rods in connection with every store magazine where gunpowder is kept by him." But the Gunpowder Act of 1860 had many defects, the most serious of which was apparently the difficulty of enforcing its provisions. Public attention was first directed to this by an infamous explosion on 1st October 1864, at Erith, which resulted in much loss of life and destruction of property within a radius of ten miles, and led to the inhabitants of the neighbourhood calling for the appointment of a special commission of inquiry.

At about 7 o'clock in the morning, two barges were being loaded with powder from one of the magazines on the marshes, when one barge exploded, instantly followed by the other, and then by the magazine. The explosion was heard all over London, and was felt 50 miles away. A tall column of black smoke rose above the area and hung for some minutes until dispersed by the wind. No trace of the barges was found, but bricks and timber from the magazine and nearby houses which were destroyed were scattered over a wide area.



This picture from the London Illustrated News depicts the aftermath of the Erith gunpowder explosion in 1864.

Colonel Moody, Commanding Royal Engineers at Chatham, reported that "My inspection revealed to me a condition of affairs in respect to the existing magazines in the neighbourhood that, I submit, necessitates the immediate consideration and action of Government. I found the magazines uniformly built as close as possible to the river bank: in fact partly on the inner slope of the embankment. The doors of the magazines fronting straight to the river, doors, stage with tramways, and the jetty all in a direct line. None of these were roofed. closed or guarded. While the stage and door of each magazine were on the same level as the top of the embankment, along which a public thoroughfare, free and open, passed at a distance of two yards from the door of the magazine. I found one of these doors open without anybody in charge. A man actually passed by smoking his pipe, and boys were in the habit of selling matches from open door to door of the magazine. Steamers passed within moderate distance of the river bank, sparks streaming from the funnels. There were beds of reeds close to the doors; when the reeds were cut down the stubble was frequently set fire to, in order to improve the next crop". Not a happy state of affairs!

In the following month, Lieutenant Colonel Boxer RA, Superintendent of the Royal Laboratory, made his report on the explosion, which corroborated all Colonel Moody had said, and concluded with these words: *"I respectfully submit that further restrictions in relation to gunpowder magazines, are required for the due protection of the public."*

This report of Colonel Boxer's marked the beginning of the present system of inspection, and Colonel Boxer may be described as the first Government Inspector of Explosives, for on the 31st October, 1864, Sir George Grey, the Home Secretary, authorized Colonel Boxer "to inspect and examine any mill, magazine or place in which any kind of explosive was manufactured or kept". Thereupon Colonel Boxer inspected a number of gunpowder mills and magazines and issued a report, dated 31st January, 1865, making recommendations, the spirit of which appeared in the concluding sentence: "In the absence of legislative restrictions of universal and compulsory applicability it would be unreasonable to expect the adoption by individual firms or manufacturers, or the voluntary imposition by the trade at large, of more than ordinary precautions, when extra precautions entail extra cost". In other words, enforced legislation would result in a level playing field.



Colonel Sir Vivian Daring Majendie KCB carried the evolution of legislation a step further by recommending, in 1871, the appointment of permanent Inspectors. In a report to the Home Secretary dated 16th May 1872, he again urges this recommendation, and says: "If I succeed in showing that the law is habitually disregarded, and that many necessary precautions are neglected, I shall, I think, have established the necessity for the appointment of one or

more permanent inspectors of Gunpowder Factories."

Colonel Majendie investigated the explosion on 2nd October 1874 in the Regent's Canal when the barge 'Tilbury', carrying six barrels of petroleum and five tons of gunpowder blew up, killing the crew and destroying Macclesfield Bridge and cages at nearby London Zoo. This resulted in The Explosives Act of 1875, which dealt with the manufacture, keeping, conveyance, and importation of explosives. For his work on framing this legislation he was awarded the Companion of the Order of the Bath (CB). The 1875 Act was eventually superseded by the Explosives Act 1923, the Manufacture and Storage of Explosives Regulations 2005 and most recently by the Explosives Regulations 2014. There has been much other detailed legislation over the years, albeit the basic principles of the 1875 act remain unchanged to this day. Moody, Boxer and Majendie did much for which we should be very grateful.

Geoff Hooper

The Rapier Gas Generator Story

Power for the guidance of a missile may be by one of the following sources: Tapping gas from the main sustain propellant (provided it does not burn out before reaching the target). Alternatively an electric battery may be used but long-term storage may be a problem. Finally a separate end-burning propellant to provide hot gas to actuate a steering unit has proved popular in a number of missiles including Swingfire, Sea Wolf and Rapier.

Traditional gas generators for these missiles used Mechanite 14 propellant inhibited with ethyl cellulose overwound with electricians tape! The tape was necessary to prevent inhibitor failure.

For the field standard 'C' version of Rapier ICI decided to inhibit their Mechanite 14 with silicone rubber. This offered many advantages in production costs and was accepted by BAe for development.

All went well until it was found that the pipes to take the hot gas to the actuator were being distorted by higher than normal gas temperatures compared with ethyl cellulose inhibited charges.

P1 branch were asked to suggest a solution and an MoD contract was placed on us to provide a cartridge for testing in a BAe rig. Eric Baker formulated a double-base propellant with a low NG level for use with an oxamide filled cellulose acetate inhibitor. After some problems with ignition, solved by increasing the surface area of the end of the charge, the problem was solved.

In 2017 a group of retired BAe staff had a group visit to Waltham Abbey Mills and Tony Machell who had tested the P1 cartridges confirmed that it was now in service use.

From this story it is easy to understand why the missile business is ultra-conservative and is cautious about using new technology.

B C Howard

A Quiz to be Sniffed at

(Some questions are easy, others are real stinkers.)

- 1. Which oriental fruit has a fine taste but nasty smell
- 2. Why is Chanel No. 5 chemically special
- 3. Explain the meaning of 'Lang may your lums reek'
- 4. Who corrected an objector to his presence by the retort 'Madam you smell, but I stink'
- 5. What is the source of ambergris used in perfume
- 6. Who made London less smelly by removing sewage
- 7. Which plants smell of dead meat to attract flies for pollination
- 8. Why is the Floris perfume house famous
- 9. Who is the author of 'and drugs cause cramp, guns aren't lawful, nooses give, gas smells awful, you might as well live'
- 10. What is the link between isoprene and many of the essential oils used in perfumes
- 11. Which relative of the weasel defends itself by ejecting a noxious fluid
- 12. What was a pomander used for
- 13. What is the purpose of a flinch in whisky manufacture
- 14. What is the odour of a 'smelt' fish
- 15. Which non-metallic element is named from its stench
- 16. Which drama has the line 'All the perfumes of Arabia will not sweeten this little hand'
- 17. 'Eat no onions nor garlic for we are to utter sweet breath' which play does this come from
- 18. Whose birthday was on August 19th, celebrated by No. 9 perfume
- 19. What smell is derived from iris roots and is known as Orris

Bryan Howard



Bryan Howard's Christmas lunch

Regarding his most alcoholic pre Christmas celebration I can add the following:

I joined Waltham Abbey in October 1967 and hence can vouch for the date of the Christmas in question as 1967. From memory the van had windows in the back. The Superintendant at that time was a Dr Williams. His office had a large window facing on to the approach to the main exit; he backed this window, but craftily he had a large mirror on the opposite wall in order to observe any movements. Dr Williams approach to Christmas was similar to that of Oliver Cromwell. Hence the departure for the Duke of Wellington would have done credit to the SAS. One particularly paranoid member (I can supply a name) walked around the Fire Station and got into the van by the gate in order not to be seen in the van. The rest of us were instructed to lie on the floor as we passed the office. It was something of a culture shock to me. I wondered what on earth I was getting into.

As Brian recalled we had a very convivial lunch and then all returned to P742 somewhat the worse for wear!

Peter Stone

A reaction to Christmas 2018 Touchpaper

Allen Clarke was a great friend who did a lot of design for me in the Ballistics Section. We also met socially as he was the Badminton Club Treasurer until he left for Australia; even then we kept in touch with Christmas cards. I was sorry to have missed meeting Ann Clarke as I knew her sister, Brenda, who also played badminton at one time.

The picture of the barge is almost certain to be of 'Elmira' which was obtained from the Civil Service Sailing Association as a basic 'shell'. I recall Eric Speller, Vic Clifford, Ron Treadgold and Pete Topley (to mention a few) casting cement blocks for ballast in the lunch hour.

'Elmira' provided some happy times on the Lea but eventually the 'call of the sea' meant that she was traded in for a small sailing cruiser, whose name I forget, kept on the Blackwater.

Bryan Howard

At this point I hand over this article to Tony Barratt who sailed with Ron Long (skipper) and Bill Smith.

The Civil Service Sailing Association's yacht 'Demijohn' was taken to Waltham Abbey for minor works to be carried out during a winter in the early 60s. The boat was moored outside the old North Site Surgery, which was the ERDE Sailing Club base, just inside the Refinery Gate. The work was supervised by Bob Simkins. I was a crew member with Bob and Eric Speller when it was returned to its base at Maldon in the Blackwater. This involved passing under the cast iron humped backed road bridge outside Refinery Gate. We then followed the route of the gunpowder barges by motoring down the Lea and sailing down the Thames past Woolwich Arsenal then round to the Blackwater. Bob Simkins was a keen rally driver . One evening we had an exciting ride in his Mini to the 'Demijohn' which was moored next to Bradwell nuclear power station. A rope was wrapped round the propeller so Bob stripped off, went over the side and removed the rope. We did a few other minor jobs and returned to Waltham Abbey in the dark.

The following summer I sailed in the 'Demijohn' round the Blackwater and up the Colne to Wivenhoe. The other crew were Bill Smith, Gudge Taylor and skipper Ron Long. We had a good week but some rain as shown in the photo taken by Gudge. He was a very good photographer and put on slide shows in Waltham Abbey Town Hall.

Tony Barratt

Open Day 1968 and the Whiskers Demonstration

I was very interested to read Geoff Hooper's articles in the Winter 2018 edition of Touchpaper. Unfortunately I have no recollection of the Open Day because I did not join ERDE until 1969, but I do have a copy of the Mintech ERDE leaflet 'Composites – The Right Material for Your Job?' that was one of a number produced for the occasion on a variety of topics. As its title suggests, the leaflet was part of an initiative to make industry more aware of the expertise and facilities available within the Establishment, as indeed were the Open Day itself and the ERDE brochure 'Research and Development Activities and Facilities' produced at about the same time. The leaflets and the brochure included advice on how to consult ERDE.

The leaflet on composites covers the displays at the Open Day as well as outlining ERDE's research and development work on materials reinforced with fibres and on the growth of ceramic whiskers. The composite materials of interest included thermoplastics such as polypropylene and Nylon 6 reinforced with asbestos fibres graded to remove rock and dust, thermosetting resins based on epoxy or phenol formaldehyde reinforced with asbestos and other fibres, and aluminium alloys reinforced with ceramic whiskers such as silicon carbide.

Asbestos, the cheapest fibre, was of interest because of its good balance of mechanical properties, particularly stiffness and tensile strength, and was the subject of a research project aimed at improving these properties by treating the surface of the fibres. Other fibres such as carbon, and whiskers made from silicon carbide or silicon nitride were also being studied, and were candidates for use in more demanding applications. In some applications, properties such as the performance at high temperature could also be important. Silicon carbide whiskers, the best experimental fibres, were the subject of an intensive research project to produce them cheaply on a large scale as demonstrated at the Open Day by Exhibit 24.

The leaflet on composites does not give details of Exhibit 24, but it must be the one remembered by Allen Clarke's daughter Ann. Very probably, the exhibit included equipment similar to the 'Bran Tubs' used for the synthesis of silicon nitride that are illustrated on page 13 of the ERDE brochure. The 'Bran Tubs' were furnaces of various types with removable lids, and were capable of operating at temperatures up to about 1600 0C. A 'Bran Tub' would have looked like a vat when displayed with the lid removed.

Another exhibit (13) showed two methods for aligning fibres for use in applications where composites were required with high strength in a particular direction. Two other exhibits (16 and 25) displayed equipment for separating fibres according to their length. In practice, the longest fibres were used in thermosetting resins and the shorter fibres were used in light alloys and thermoplastics. The stand at the Open Day also displayed some items made from composite materials. These included airframe structures and components of rocket motors made with fibre-reinforced thermosetting resins, and components made from metals reinforced with silicon carbide whiskers. RR58, an aluminium alloy used in the Concorde airliner, was one of the metals that ERDE had selected for development, and items made from reinforced RR58 formed part of the display.

Mike Bagley

How Mistakes are made

The back page of the last Touchpaper called for images of Allen Clarke.

Allen provided engineering support for various projects, including the suspension rig over Newton's Pool and subsequently Allen visited the Pool from time to time, standing at the water's edge to watch an explosion.

I was aware of an image in the Image Archive showing an onlooker without identification in this position watching an impressive explosion and immediately assumed it was Allen and would blithely have sent it in, with this identification – except it would have been wrong. At the time it was pointed out that the standing figure was in fact Gordon Bromberger.



Anyway it gives a good impression of the eternal fascination for all which explosions exert and particularly those under water, creating the white water plume. In his book Jim Burgess writes 'The most stern, elevated and distinguished visitors have all rubbed their hands with glee at the sight of an underwater explosion!' (Touchpaper Summer 2018).

Les Tucker

The last Touchpaper did not in fact ask for images of Allen Clarke, but did ask for identification of people in the group photograph.

We have had a good response on whiskers and boats but NO identifications of people.

Please have another look at the photo and try to identify at least one. Ed.

Whiskers at Waltham Abbey

Ann Clarke's mention of whiskers in the winter 2018 issue of Touchpaper stirred some very distant memories for me. In 1956 I joined a Tube Investments materials research group, headed by James Gordon, on the lookout for novel structural materials when reports of very fine metallic filaments (promptly called "whiskers") growing spontaneously on plated metal surfaces began appearing in scientific journals. (I discovered that there were some on the drawer runners of my filing cabinet.) Numerous reports followed and it was suspected that the fibres were unusually strong for their size. A colleague duly designed and made a miniature tensile testing instrument which confirmed that many had strengths close to theoretical estimates.

Jim Gordon, who had previously worked at RAE Farnborough with glass and asbestos fibres, wondered if non metallic materials generally could also be made in strong whisker form to make a new generation of fibre reinforced plastics to replace existing glass-resin composites. Our research group set about studying a range of everyday materials and we concluded that if you could find exactly the right crystallising conditions most could be made in filamentary form. Top material on Gordon's wish list was the refractory silicon carbide known to have a very high Young's Modulus (stiffness), ideal as a reinforcing fibre. This was quite a challenge to make needing near white heat which stretched our lab furnace beyond its limits and to an early grave, but in the end we had a tiny sample of silicon carbide whiskers. We had to think bigger.

The result was a gas tight cylindrical drum, about the size of a dustbin, lined with insulation and heated by a central carbon electrode. It was promptly named the "Bran Tub" as any outcome was a lucky dip. Early experiments were encouraging. We managed to grow a few grams or so of tiny straight filaments of silicon carbide on a carbon substrate. Beginners luck. It was just at this point that we, as a research group, were given our marching orders by our employer Tube Investments which was suffering financially as a result of abruptly changed company tax laws. Our work was not considered to be relevant to the manufacture of steel tubes. Thanks to Jim Gordon with contacts in the Ministry of Aviation we were offered premises at ERDE Waltham Abbey when Dr. Johnson was the director. (He was a gentleman of the 'Old School' who used to walk his dog in Powder Mill lane in order to wish late corners a curt 'Good Morning'!) He made us very welcome.

Our move in 1962 to comfortable premises on L157 North Site took six months where Jim Gordon was installed as Superintendent of a new Materials 2 Branch bringing with him Noel Parratt, Ron Gooding, Mike Dyne and myself. Long term resident Tom Lewis was co-opted to assist us Materials freaks with basic chemistry. Once settled in, we broached the possibility of making a scaled up version of our Bran Tub at a meeting with the ERDE Engineering Branch. As we feared this got a pretty startled reception from a team used to doing nearly everything in an explosives environment with steam and compressed air whereas we were talking about very high temperatures and a massive electricity load. Eventually it was agreed that we should liaise with the Design Office to sketch out our requirements. This was the beginning of a long exchange with Allen Clarke who relished the novel challenge. Overall, about 100 KW of heating power might be needed, necessitating water cooling for the reactor case. Building L168 looked the ideal site, currently holding the remains of a beam engine. It already had high level water tanks suitable for cooling and was close to the substation.

Fast forward five years of plans, building modifications, specifications for tender, assorted contractors, etc. and we had two giant Bran Tubs ready to be commissioned (two tubs so that they could be run in tandem, one heating whilst the other cooled). Mike Dyne had drawn the short straw to stay the night on the first trial. All went well and the solid state temperature control +/- 3° at 1450°C was probably a first in 1967, thanks to a very enlightened electrical contractor. We then tried a series of silicon carbide runs only to find small patches of whiskers scattered around the walls much as in our earlier small scale trials. With the prospect of the 1968 Open Day looming we hastily resorted to a successful silicon nitride whisker run which looked like freshly fallen snow. That, probably, is what Ann remembers.

Subsequently, with Tom Lewis's direction we tried other unsuccessful routes to silicon carbide, one involving corrosive silicon tetrachloride with a hydrogen atmosphere. By now we were fairly sure that, in spite of the carbon box lining the heated reaction zone, much of the problem was coming from some volatile component emerging from the brick insulation which persisted from run to run. At the time there were no alternative high temperature bricks available. (Our experiments in the original small Bran Tub had used expensive carbon fibre insulation). About this time the Americans published a paper showing that silicon whiskers could be 'seeded' to order in sterile conditions using radio frequency heating. Perfect for the scale of semiconductor manufacture but not a feasible approach for us. Meanwhile RAE Farnborough had succeeded in converting commercially available polyacrylonitrile fibres into moderately strong pure carbon fibres.

The carbon fibre composite era had arrived.

Chris Evans

James Edward Gordon (1913 - 1998) had the gift of writing about technical matters in an entertaining arid readable style resulting in two best selling Pelican Books on Strong Materials and on Structures which were translated into at least twenty languages for use as course textbooks. He moved on to accept the newly created Chair of Materials Science at Reading University where he made many more contacts whilst enjoying the academic life. Cambridge University named a laboratory in his memory. In his younger days he was a keen yachtsman and crewed in Atlantic Ocean races.



Tin Whiskers



Silicon Carbide Whiskers



Bran Tubs

Obituaries

Brenda Sims 1939-2019



Brenda was born in Manchester in January 1939 the eldest of two children. Her father was an engineer working on Gardner diesel engines for the war effort. She was educated at Monton Junior and Senior schools.

However the family originated from Lincoln where all her relatives including her grandmother lived. Thus she spent a lot of time in Lincoln. When she was 15 she joined the Co-op head office in Balloon Street and

worked as a Hollerith machine operator which was an early form of punched card computer. Whilst in Lincoln one day she met her future husband via her cousin who sat behind him at school.

As happens with these things when university time came David followed her to Manchester University. They were married in 1959 when she was 20 and in the middle of 1960 had the first of their three children. After university as you know they moved to Thaxted Way with many other graduates and added to the family. That was a good time especially since many of them had families. Later they moved around the corner to Norman Close which was home for almost 50 years. For many years she worked for the Cheshunt Building Society until they were taken over and everybody made redundant. After that she worked in Marks and Spencer at Lakeside. You might guess this judging by the M&S labels in all our cupboards. Her great love was the children, grandchildren and lately greatgrandchildren.

She also loved travelling especially in the caravan where she quite often got heated as I tried to park the thing. Also she loved to go to Tenerife where we were fortunate to own a flat with another couple right on the seafront.

This last year she was not too well but really enjoyed her 80th birthday on January 13. The following Monday she was admitted to Princess Alexandra's Hospital with a chest infection but sadly deteriorated overnight and died suddenly on Tuesday morning. She will be greatly missed by all of us especially the 9 grandchildren, 3 great-grandchildren and myself.

Dave Sims

David Hartley

Dave died peacefully in Harlow Hospital on February 13th.

He was educated at Manchester Grammar school, went on to Manchester University where he graduated and left with a PhD in Chemistry (in Carbanion Kinetics and Spectrometry in solution). He then worked at Princeton University in New Jersey, then at the University of Southern California where he also worked as a special consultant at the Jet Propulsion Laboratory, returning to England in 1963. After 2 years working in Cambridge, he joined ERDE in Waltham Abbey in 1965 in E Branch.

Jim Hawkins was the section head of the Explosives Performance Section in 1972 and Dave Hartley was his (nominal) deputy. At that time, as a Senior Scientific Officer, he was very well regarded as one of the rising stars.

Things went wrong shortly thereafter. Jim Hawkins went on long term sick leave and Dave rapidly followed suit. Both were out for a long time.

In the late seventies/early eighties Dave's intellect and potential was recognised by Rick Richards and the two of them formed a good, but sadly short-lived working relationship. Thereafter Dave took medical retirement.

Dave had long been a member of the Friends and had lived in Lea View flats for longer than anyone else apart from Jock McDougal and would occasionally join the 'Last of the Summer Wine' group in the Crown in Romeland.

Quiz answers

- 1. Durian
- 2. Chanel No. 5 first synthetic perfume
- 3. 'Lum is a Scottish chimney, expression wishes one a long life
- 4. Dr Johnson who didn't wash, sat near a lady in church who said 'Dr Johnson you smell' (hence the grammar correction
- 5. Ambergris comes from whales excreta after eating cuttlefish
- 6. Joseph Bazalgette
- 7. Cacti
- 8. Floris oldest perfume house founded 1780
- 9. Dorothy Parker
- 10. Terpenes units of C_5H_8 , $C_{10}H_{16}$ etc plus other elements (isoprene is C_5H_8)
- 11. Skunk
- 12. Countering the smells of towns, horse dung etc
- 13. A flinch is used to test and blend whisky
- 14. Cucumber
- 15. Osmium
- 16. Bromine
- 17. MacBeth Lady MacBeth
- 18. Midsummer night's dream
- 19. Coco Chanel
- 20. Violets

Please do not forget to renew your subscription if you have not already done so.

Also please try to attend the AGM and social event on May 10th. The cost of lunch remains at £10, a booking form is enclosed (attached for email copies).

Julie's Nature Column

Towards the end of last year the Mills had an otter survey done which is part of the Lee Valley otter survey. One area under a bridge showed that otter activity was present so I decided to put a trail camera out next to the water. I checked it for a few weeks with no otter results. Plenty of ducks and swans and the constant dropping of autumn leaves triggered the camera until finally an otter showed up. This was very exciting news. We have about 4 photos at night time and are amazed that the otter has chosen to come and visit the site and hopefully keep the area as part of its territory. The hope now is to get a daylight photo, perhaps on a summer evening when it's quiet. The night photo is black/white as the infrared takes over in the dark. I've added an arrow to the photo as the otter isn't obvious to everyone.



Our resident swans seem to have parted company from each other. The male was spotted at the north end of the site on the track. We went up there to rescue him as the high fence was preventing him from returning to the water. We brought him back to the southern end and released him. His mate was nowhere to be seen and when she did finally show up a day or so later she had a new male with her. This explains why our resident male left, possibly chased away by the younger, stronger male. Our male has been around ever since I can remember so it will be a shame not to see him anymore, kind of felt sorry for him, but I guess that's life in the animal world.

We've had a pretty mild winter and it looks like spring is well and truly on its way. We have snowdrops out and some daffs too. I've seen a Brimstone butterfly which is one of the earliest ones to emerge after winter. I have yet to get a photo of one as I've never seen them sit still. I also saw my first bumble bee of the year. Blue tits are checking out the nest boxes on the trees and the Great Spotted Woodpeckers have been drumming on the trees and the metal lampposts.

Heron activity is going on all over the site, they are never far away and on occasion I've seen a single Red Kite checking out the area. The main difference between the Common Buzzard and the Red Kite is the forked tail which you can see in the photo whereas a buzzard has a fantail shape.



The deer seem to have spent most of the winter keeping tucked out of the way. They are normally creatures of habit, but this winter has seen different patterns in their grazing habits by mostly staying in the woodland when we're on site. There is one female deer that is nicknamed Dolly, she is bolder than most and certainly knows when the food is being put out. Here she is enjoying an apple.



Most of the site has been filled with the usual flocks of siskins, goldfinches and chaffinches feeding on the Alder seeds. Many of the birds flock on the ground to pick

up the already fallen seeds. I was trying to get some photos of them when they suddenly took off. Then there in front of me flew a Sparrowhawk very low to the ground.

It was an unsuccessful hunt and it sat in a tree for a moment and looked back at me as if it was my fault that it missed out on breakfast! Not my best photo of a Sparrowhawk, but it is my only one. Just goes to show that if you're in the right place at the right time wildlife will surprise you in the nicest of ways.

Julie Matthews

Mills Nature Conservationist