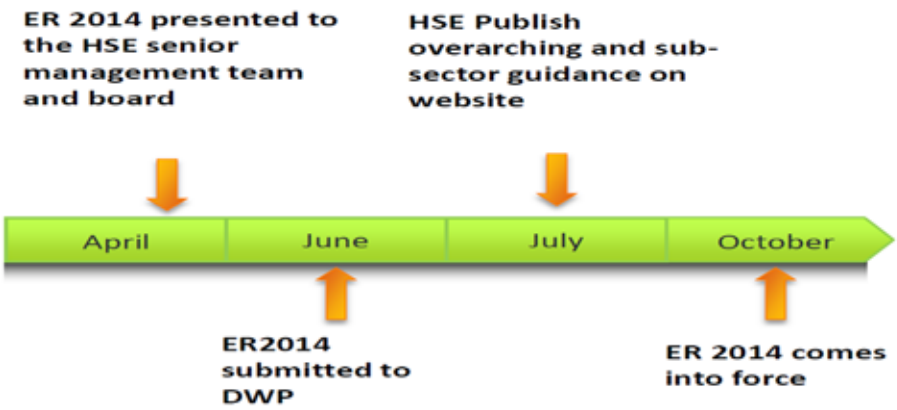
SPARK

The Official Newsletter
of the
UK Pyrotechnics Society



Issue 13
Spring 2014
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The **UK Pyrotechnics Society** is the only independent UK organisation that exists to represent the heritage, science, history and art of pyrotechnics in the United Kingdom.

The society was officially formed in 2006, and consists of industry professionals, academics, and enthusiasts of the general public.

We are not a trade association, but represent the interests of a very wide ranging, vibrant membership. If you are not already a member, we invite you to read the newsletter, visit our webpage:

http://www.pyrosociety.org.uk

and perhaps even consider joining our organisation?

Steve Moore. UKPS Chairman

SPARK - Issue 13

In this issue

From The Editor		4
Hello from the new Chair	By Steve Moore	5-6
UKPS 2014 AGM	By Phil Dunford	7-11
ELR Update	By Wayne Robshaw	12-14
The Chemical Formulary	By Ian Williams	15-19
Firework Quote		18
Useful addresses & information		Back Page

From The Editor:

2014 is proving to be a significant year for the UKPS.

We had a superb AGM at which Wayne announced the ground breaking news that his 6 years of hard work have resulted in a legal framework for our hobby.

Yes, you read that right – Hobby Pyro is confirmed as LEGAL in the UK.

I have stepped down as Vice Chair. I'm just too busy to give it the time it needs, but rest assured I will still be involved with the hobby.

Steve Miller has also stepped down and we thank him for his time as Chair and for the memorable events he organised for us.

Steve Moore and Roger Renshaw have taken over as Chair and Vice Chair respectively and I'm sure they will both fulfil their roles admirably.

Steve already has a programme of events in mind, so keep your eye on the forum for announcements.

I'm sorry that we seem to have missed a copy of Spark.

Regrettably this was down to not receiving enough copy to put together an issue. If you want Spark to carry on being published, we really do need you to send in your articles. Now you can tell us about all those 100g devices you have made and all your latest formula and discoveries!

Phil Dunford Editor Editor@pyrosociety.org

Hello from the new Chair

by Steve Moore

I live in a small village just west of London with my girlfriend Meshell our 2 Cats, 8 Ferrets and Steve snake.

I'm a keen motorcyclist, although mostly 'fair weather' and follow most forms of motorcycle racing. I also like to watch snooker, playing just frustrates me !!

I have been a member of the UKPS since 2009 but my interest in fireworks was aroused at a very young age. My brothers birthday is 5th November so my Nan would always take us on a tour of our local shops that sold fireworks. My Dad indecently, hated them and only set them off because my Nan made him (I offered every year but was never allowed).

When I was eventually allowed to buy and set off fireworks myself I certainly made the most of it, and would generally use any occasion as an excuse for a firework display. As I had no formal training at this point they were a bit hit and miss (mostly miss thankfully).

Steve emerges from the darkness at the AGM

My favourite fireworks now are girrandollas and cat faced shaped shells. As a kid, airplanes/helicopters, jack in the box, airbombs & rockets, although I can't think of one that I dislike.

One fine day I met, by pure coincidence, Malcolm Smith. He was the first professional pyrotechnician I had ever come across and I didn't waste any time in pestering him for a job as a firer. Eventually, a few years later, he gave in and allowed me to help on a display. I have worked for him ever since, firing displays the old fashioned (best) way.

I then discovered the society and joined because I wanted to get a

better idea of how fireworks worked and learn about how all the various firework effects are created, partly because I was always being asked about this at displays and always had to point to Malcolm and say 'ask him'.

I have also always had a fascination with chemistry, again from a very young age, probably I guess after seeing my first science teacher (Mr Hibbert) perform the 'old water to wine' demonstration and the' screaming jelly-baby' demonstration. He then took us to the playing field over the road and he set off what I now know was a fairly large bag of flash powder. That was it, I was hooked. I built a small chemistry lab in the corner of my bedroom, this got moved to garage after I filled the house with the stench of Chlorine! My current 'lab' is still nicely separated from the house for this self same reason (plus a few others obviously). My Element collection on the other hand, takes pride of place in the living room, I spend a lot of time and money improving and changing this, it's a great talking point, even with people that don't really have a clue what it is.

Since becoming chairman I have had a few ideas on how I would like to carry the society forward and I think, some pretty good ideas for promoting the cause. The main one being the 'outreach program', details of which are of course on the forum. I also hope, with the help of a lot of other members and staff to organize some pyro and non-pyro related day trips and hopefully, work towards a fascinating and fun AGM with record breaking attendance

I'm really open to new ideas and I don't bite (that much) so please feel free to contact me via the forum if you have any suggestions.

Here's to a great year!! - Steve

New item in the UKPS shop (www.pyrosociety.org.uk/shop).

UKPS mugs with the gunpowder formula (in case you forget it!)

£6 + P&P - get one today!

UKPS 2014 AGM

by Phil Dunford

This year's AGM was held at the Royal Gunpowder Mills at Waltham Abbey. The combination of splendid speakers, good news, good attendance, the facilities of The Mills and the knowledge and enthusiasm of the volunteers made this (in my opinion) our best ever AGM.

Those attending the AGM enjoy refreshments in the Gunpowder Cafe

The AGM business was swiftly concluded with Steve Moore being appointed as Chair and Roger Renshaw as Vice Chair.

Nathan Munson from the Home Office outlined the current state of the proposed 'explosives and poisons precursors regulations'. He fielded a variety of probing questions from the floor and left (I believe) with a lot to think about. It's a measure of the respect in which the UKPS is now held that we could attract such a high caliber of speaker.

Wayne delivers the good news!

Wayne Robshaw then announced the momentous news that ELR 2014 will effectively give the green light to building devices under the 100g rule. Wayne has written about this elsewhere, so no more detail here, but this is the most important

news the UKPS has ever had.

After refreshments, provided by the Mills, we had an excellent presentation by member Malcolm Smith about his work on the Thunderbirds remake and the new film Monument Men. He showed us how the special effects were created and later gave us a practical demonstration in the open air.

Malcolm chats to the audience

After the talks were over, we had a chance to look around the exhibits on show at the mills.

"Rambo" Vince in the armoury – be afraid, be very afraid!

The armory (showing a fascinating selection of small arms) was opened specially for us and proved very popular.

After this, we were given the opportunity of a guided tour around the vast site, to see some of the many historic sites and buildings associated with the manufacture of gunpowder, explosives and secret devices on the site.

The volunteers that showed us around were amazing. As some of them had worked at the site, their knowledge was encyclopedic. There was the occasional pause in the narrative, when they were clearly thinking "can I tell them this, or am I breaking the Official Secrets Act"! Fascinating stuff.

We were shown some items that they had in storage, in particular some

of the firework production machines from Brocks. These are probably the only machines of their type still in existence – most of us had never seen anything like it.

While the tour was taking place a team of riggers, lead by Gareth, was setting up our finale display on the main green.

A highlight of this display was a traditional set piece, constructed for us by Malcolm. I'm sure that the younger members (and many of the older ones too) had never seen anything like this. It very much fulfilled one of the societies aims, which is to celebrate and keep alive the history of fireworks.

While this was all going on, our new Chair was giving a demonstration in the 'Mad Lab'. This consisted of various spectacular scientific experiments – hopefully a forrunner of many public demonstrations we hope to stage.

As darkness fell, Malcolm gave us a live demonstration of some of the gunpowder and spark effects used in Thunderbirds.

Roman Candle filling machine

Historic gunpowder press complex with vast blast-wall

The evening concluded with an excellent display, which was appreciated by the volunteers as well as by the members.

In conclusion, thanks to all those involved, an excellent day was had by all.

Spark special effect demonstration

Steve demonstrates

Erecting the set piece

Part of the display finale

Explosive Legislation Review: Update

by Wayne Robshaw

Explosive Legislation Review Update

You may have noticed that it's been quite some time since the last ELR update way back in 2010. So what has happened since then you may ask? Well it has to be said, A LOT! The whole ELR process is an extensive and very complex process for the HSE to undertake to which we are only a very small part. Understandably therefore it takes a significant amount of time for things to progress. Well wait no more….we are nearly there!

2014 will be remembered as one of the most significant years in the history of the UKPS. It's the year when experimental pyrotechnic manufacture will be recognised, clarified and most importantly, Legal! It could be argued that the activity was legal before all this (Under MSER 2005), but now we have clarification that the regulation suits the activity and most significantly, we will soon have guidance to help comply with the regulations and to operate under them safely.

This is the culmination of work which started out in 2008. Since 2008 I've been involved with the Police, the HSE and the Home Office attending numerous meeting with the HSE in Bootle and the Home Office in London, drafting several documents, responding to consultations and generally working towards the goal of getting the UKPS and experimental pyrotechnics recognised and clarified. It is unquestionable that if we had not pursued this cause, experimental pyrotechnic manufacture would have been eliminated or have severely reduced maximum gram quantities from Explosive Regulations 2014 (ER 2014). It has been a very worthwhile endeavour and a great example

of positivity and support I've experienced working with the Police, the HSE and the Home Office.

So where are we now? Each explosive sector (our experimental pyrotechnic manufacture being one specific sector) was tasked with creating a good practise guidance document pertinent to their area of interest. This is with the intention that each sector will interpret ER2014 in a manner that is relevant to their sector. These documents will be created in conjunction with the HSE's own overarching document which is essentially a baseline guidance document. I'm currently working on our guidance document (see previous page) which will be key document for an individual to gain an understanding of what is required to be compliant and to work safely while conducting experimental pyrotechnics. It will cover the basic safety principles and potential legal requirements such as a COER certificate, explosive storage and explosive pre-cursor licenses. The document will be continually revised, updated and published for download on both the UKPS website and the HSE's own website. Given the electronic nature of the document, the ease of update is one of the main benefits of sector led guidance over MSER ACOP. All guidance documents must be ready by July when all explosive sectors guidance documents and the HSE overarching guidance are published

The schedule for 2014 is shown below:

As you can see, 2014 really is the year!

Things will become clearer as the year progresses and the guidance document is published. There is certainly more work ahead and to some extent, this will always be the case as we update and improve the guidance documents and adapt to any legislation changes. At last it can be now said that we have a clear vision and a feeling of security that

experimental pyrotechnics manufacture is legal and will continue to be so in the future.

We are planning to hold a number of events to provide support with the guidance document and its requirements so lookout for announcements in the coming months.

Finally, I would like to take this opportunity to thank the following people who have been instrumental in supporting and nurturing our cause:

The UKPS Legislation Committee

Danny Kay, North Yorkshire Explosive liaison officer.

Fiona Smith, West Yorkshire Explosive liaison officer.

Martin Simes, HSE, HM Principal Inspector of Health and Safety.

Ann Faulkner, HSE, Hazardous Installations Directorate.

Isobel Townsley, Home Office

Nathan Munson, Home Office

Wayne Robshaw

UKPS Legislation Committee Lead.

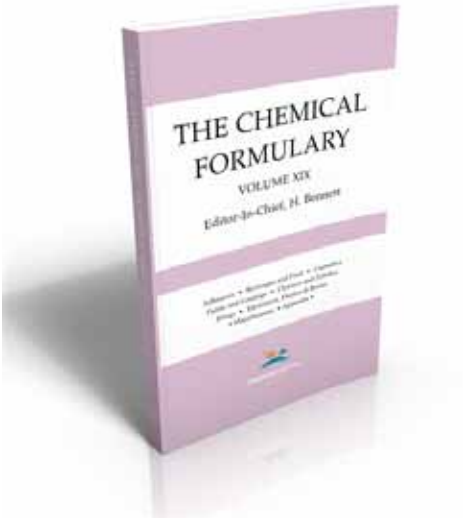
The Chemical Formulary

A useful source of information

By Ian Williams

As a young teenage school boy, chemistry was the subject that interested me and a few of my classmates the most. A memorable school trip to see Colonel Brian Shaw present his famous lecture on explosives ignited our interest with lots of exciting demonstrations, some including liquid oxygen – the first time I'd seen it used. Incidentally, Colonel Shaw celebrated his 100th birthday in 1998.

Fortunately, our chemistry teacher was also keen on similar "flash and bang" type demonstrations and far from adopting the "don't try this at home" approach, he positively encouraged interested pupils to experiment. If one of his class made a primitive firework, he would take us outside during break time and with his supervision we would let it off. I can't imagine that happening today but attitudes were quite different in the early 70s.



Apart from firing my enthusiasm for science, especially chemistry, he also encouraged me to read the scientific literature. He suggested that I try to obtain copies of a series of publications called The Chemical Formulary. To this end a school friend and I made a trip to our local library and ordered the available copies. These consisted of several volumes and an index. From memory, the library obtained two volumes at a time and we were permitted to borrow them for a couple of weeks as you would any normal library book. On their return, the next two volumes would be supplied. To be honest, the sheer quantity of information contained in these books was somewhat overwhelming!

Apart from firework and explosive formulations, just about everything else seemed to be incorporated too. As it states on the title page of each volume of The Chemical Formulary: "A condensed collection of valuable, timely, practical formulae for making thousands of products in all fields of industry."

Some years later (early 80s) and a bit more mature we requested these volumes again. The library was kind enough to order then but this time we were not permitted to remove the publications from the premises. However, we made the most of it and copied some of the more interesting material from each volume.

Recently, I've been pleasantly surprised to find that volumes one to eleven including the index (the volumes we had borrowed) are available to view online. The later volumes, twelve onward, seem to be subject to copyright restrictions. Probably most of the interesting information on pyrotechnics and explosives is contained in the earlier publications (1933 to 1961), although I can't be certain because I haven't seen the later volumes. Some formulae clearly contain chemicals or combinations of chemicals that would no longer be permitted or considered safe to use in fireworks such as sulphur and potassium chlorate mixtures, but the majority of information contained would seem to be tried and tested.

For anyone who is interested and has not already seen this publication, I have listed below the sections of The Chemical Formulary that contain pyrotechnic and explosive information, formulae and recipes. I have only referenced some of the pyrotechnic headings but information on explosive compositions can also be found. The Chemical Formulary, edited by Harry Bennett, volumes one to eleven including the index can be viewed using the HATHITRUST Digital Library.

http://www.hathitrust.org/

Pyrotechnic references:

TCF (1933), Vol 1, 169 – 172
Pyrotechnic Snakes, White Red Green and Blue Fire Compositions, Smokes, Sparklers.

TCF (1935), Vol 2, 477 – 480
Eggs of Pharaoh's Serpents, Sparklers.

TCF (1936), Vol 3, 296 – 301
Pin Wheels, Pyrotechnic Fountains, Flower Pots, Gerbs, Serpents, Snakes Nests, Table Rocket, Miracle Candles, Roman Candles, Cascades, Gold and Silver Rain (Cut Stars), Cannon Flash and Chinese Crackers, Japanese or Cap Torpedoes, Rocket and Roman Candle Match, White Red Green Blue and Yellow Fire, White Red and Green Lances, Magnesium and Parade Torches, Orange and Brown Smoke, Smoke Pot.

TCF (1939), Vol 4, 442 – 447
Chemical Snakes, White Pyrotechnic Light, Signal Rocket Powder, Red and Green Stars, Red Green and Yellow Fuses, Military Signals, Orange and Brown Smoke, Smoke Cloud, Safety Matches, Sparklers.

TCF (1941), Vol 5, 537 – 538
Outdoor Red Green and Blue Fire, Pink Smoke Composition, Signal Flare, Match Igniting Composition.

TCF (1943), Vol 6, 418 – 430
Pin Wheels, Fountains, Flower Pots, Gerbs, Serpents, Magic Serpents, Sky Rockets, Tourbillions, Roman Candle Compositions, Cascades, Drivers, Saxons, Ruby and Emerald Shower Sticks, Gold and Silver Rain (Cut Stars), White Red Green Blue and Yellow Stars, Red Green and Blue Exhibition Pumped Stars, Red and Green Box Stars, Japanese Stars, Electric Spreader Stars, Granite Stars, Aluminium Stars, Magnesium Stars, Comet Stars, Yellow Twinklers, Cannon Flash and Chinese Crackers, White Red Pink Green Blue and Yellow Fire, Red and Green Smokeless Tableau Fire, Port Fires, Starting Fires, White Red Green Blue and Yellow Lance Compositions, Purple Green Blue Amber and Aluminium Parade Torches, Extra Bright Torch, Spark Pot, White Black Brown/Yellow Smokes, Quick Match, Safety Match Composition.

TCF (1945), Vol 7, 349 – 350
Pyrotechnic Flare, Green Pyrotechnic Torch, Red Green Orange and Yellow Rocket Smoke Flares, Red Blue Purple and Yellow Coloured Smokes.

TCF (1948), Vol 8, 336 – 339
White Red Green Blue Violet Orange and Yellow Coloured Smokes, Dyes for Coloured Smokes, Waterproof Matches.

TCF (1951), Vol 9, 455 – 464
Pyrotechnic Whistle, Flitter Fountain, Delay Fuse, Roman Candle

Composition, White Red Green Blue Amber and Yellow Roman Candle Stars, White Red Green Blue and yellow Fire and Flare, Green and Orange Smoke Puff, White Red Green Blue Yellow Dark Brown and Black Coloured Smokes, Phosphorus-free Safety Match, Silver Red and Green Sparklers.

TCF (1957), Vol 10, 280 - 284
Yellow Signal Flare, Devil's Step on the Walk (nitrogen triiodide), Military Smoke, Match Heads.

TCF (1961), Vol 11, 284 - 285
Signal Flare, Yellow Smoke, Smoke Mixture.

Firework Quote:

"... and what with being blowed out of winder, case-filling at the firework business, I'm ugly enough to be made a show on!"

— Charles Dickens, Bleak house, Chapter XXVI (1853)

* Primer, Explosive

Mercury Fulminate	37
Barium Nitrate	32
Antimony Sulfide	28
Ground Glass	3
Trinitro Toluol	4–8

* "Tracer" Bullet Composition

An improved light emitting composition is a mixture of two parts of magnesium powder and three parts of bismuth oxide, which when pressed under a load of ten cwts. into tracer pellets for shot gun cartridges, gives excellent results, having the desired properties of certainty of ignition, brightness of trace, and freedom from danger of possible toxic effects. Similar results are obtained with a mixture of one part magnesium powder and one to two parts of sodium bismuthate.

A composition containing three parts of bismuth oxide, two parts of magnesium powder or other suitable metallic powder, and half a part of strontium peroxide. The addition of the strontium peroxide changes the white colour of the flame emitted by the tracing composition to a reddish colour and in brilliant sunlight the trace is much more discernible than a completely white light.

* Explosive Primer

Zirconium (Powd.)	10
Mercury Fulminate	35
Barium Nitrate	40
Antimony Trisulfide	15

Pyrotechnics

"Red Fire"

Strontium Nitrate	66 parts
Potassium Chlorate	25 parts
Powdered Orange Shellac	9 parts

Strontium Carbonate	16 parts
Potassium Chlorate	72 parts
Orange Shellac Powdered	12 parts

Potassium Chlorate	37 parts
Strontium Nitrate	50 parts
Shellac Powd.	13 parts

Strontium Nitrate	8 oz.
Sugar	4 oz.
Potassium Chlorate	1 oz.
Potassium Perchlorate	15 oz.
Strontium Nitrate	80 oz.
Flowers of Sulphur	20 oz.
Wood Charcoal (powdered)	1 oz.
Gum Kauri (red gum)	2 oz.
Vaseline-sawdust Mixture	10 oz.

The sawdust and vaseline mixture is made by rubbing 8 oz. of sawdust with 6 oz. of melted vaseline.

Potassium Perchlorate	4½ oz.
Strontium Nitrate	20 oz.
Sulphur	5½ oz.
Rosin	½ oz.
Sugar	½ oz.
Antimony, Powdered	¾ oz.
Vaseline-sawdust Mixture	10 oz.

Perchlorate Potash	12½ parts
Nitrate Strontia Powdered	50 parts
Powdered Charcoal	1 part
Powdered Sugar	4 parts
Red Gum	15 parts

Potassium Chlorate	6 parts
Strontium Nitrate	2 parts
Strontium Carbonate	1½ parts
Gum Kauri (red gum)	2½ parts

Green Fire Composition

Barium Chlorate	90 gm.
Powdered Orange Shellac	10 gm.

This mixture is made by mixing the above two ingredients together.

Barium Chlorate	23 parts
Barium Nitrate	59 parts
Potassium Chlorate	6 parts
Orange Shellac	11 parts
Stearic Acid Powd.	1 part

Barium Chlorate	55 parts
Barium Nitrate	33 parts
Shellac	12 parts

Barium Nitrate	6 parts
Potassium Nitrate	3 parts
Sulphur	2 parts

Barium Nitrate	18 parts
Shellac	4 parts
Mercurous Chloride	4 parts
Potassium Chlorate	2 parts

Barium Nitrate	3 parts
Potassium Chlorate	4 parts
Gum Kauri (red gum)	1¼ parts

Blue Fire Composition

Potassium Chlorate	6 parts
Ammonio-sulphate of Copper	8 parts
Shellac	1 part
Willow Charcoal	2 parts

Example page from 'The Chemical Formulary'

UKPS Address

:

UKPS Registered Office (and UKPS Membership Secretary):

Angel Lane Cottage
Angel Lane
Stour Provost
Dorset
SP8 5LU

Email for membership secretary:

membership@pyrosociety.org.uk

(Please DO NOT use any previously published addresses)

We welcome any firework related articles for publication.
Please send to:
editor@pyrosociety.org.uk

Remember to visit the Website and Forum for up to date information
www.pyrosociety.org.uk
www.pyrosociety.org.uk/forum

We now also have a Youtube Channel at:

http://www.youtube.com/ukpyrosociety

This edition is also being offered online - please go to:
http://www.pyrosociety.org.uk/spark-online/

Next issue should be published Autumn 2014