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BIRTHS

Our orchard at Morley Retreat has around 30 mature trees, with another dozen or so within the walled garden. Our decision to allow a local beekeeper to put some beehives in the orchard came out of a love of nature and a desire to get a good set of fruit in the Spring. Our ten hives hold around 25,000 bees each. The lifespan of a bee is around 30 days, and in their lifetime they make a teaspoon of honey. We've calculated there are on average 5 bees a minute produced in them thar hives.

MARRIAGES

Putting technology together often works well, sometimes better than the performance of the individual parts themselves. We've paired colour chemistry with precise micro-arraying to come up with a range of self-indicating urine dip strips. It allows us to print anything you like onto membrane for a dip test. How about a pregnancy test that shows as a smiley face? Assuming it's good news, of course.

DEATHS

Our Vauxhall Meriva has finally expired. Ex company car, ex family runabout, ex-towcar, it twice lost its power steering in an unexplainable manner, so we daredn't sell it to some unsuspecting family. Stripped of its number plates it became an estate runabout. Perfect as a mobile wheelbarrow, log lugger and mobile platform, it has ended up as a portable log store, but now it's clutch has started to slip, and will only go backwards. So it's now Meriva, RIP (rust in peace) destined to be a wildlife haven. (Hmm, how many bees would it take to fill a Meriva?)

EXPECTING

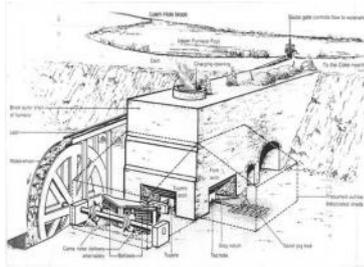
A Magnolia 'Apollo' for the garden and a lasting tribute to commemorate Mick Craven, SureScreen employee of many years and thoroughly nice guy, sadly passed away in 2014. We're still missing you Mick.

THE IRON AGE. A CASE FOR HOLMES AND WATSON?

Steel can provide many clues about its manufacturing route, its heat treatment and its fabrication history. But when a client recently asked us to date the steel reinforcement bar in sea defences, we had to get our deerstalker and spyglass out.

Abraham Darby of Ironbridge fame developed steelmaking by a series of 'eureka' coincidences really. Apprenticed to a brassmaker, he made machinery for the brewing industry. He was aware that malting houses 'charked' their coal by heating it in sealed tubs to drive off sulphur, which otherwise tainted the malted barley. Indeed a patent as early as 1589 was granted for cooking or 'coking' coal for the brewing industry. Darby's great uncle Dud Dudley had already melted iron using this charred coal as a fuel, encouraging Darby to experiment. Sulphur embrittles iron, making charred coal an ideal fuel, but it was the porous nature of charred coal that enabled air to be drawn through it so the heat could be intensely concentrated, as barbecue chefs will be well aware.

Darby was helped by Shropshire coal, which was already low in sulphur, so his 'pig' iron was fairly pure and could be forged when hot. His foundry in 1709 signalled the start of volume production of steel, thus fuelling the industrial revolution, but Darby died some 8 years later, aged just 37.



Darby's furnace had water powered air blast bellows

From the middle 1850's, steel started to be made by the Bessemer route, which allowed a steel convertor vessel to remove carbon and improve the speed of production. Wrought iron gave way to steelmaking around 1900 and quality has improved tremendously over the years. Undesirable elements like sulphur and phosphorus have reduced, while metallic trace or 'tramp' elements such as copper have increased as scrap is recycled. Also, as energy prices have risen and awareness of pollution has increased, steelmaking improvements have affected the microstructure in subtle ways. We recognise these changes when dating the metal.

During World War I the use of melted scrap increased as production could not keep pace with demand, this trend increased further during World War II. Elements that could not readily be removed, such as copper, began to increase in concentration in the metal. Then from about 1945 the cost of oxygen reduced, allowing the development of the LD converter in which an oxygen lance allowed the oxidation of phosphorus and sulphur in steel; hence their concentrations declined significantly in steel. However, copper is more noble

than iron itself and so an LD convertor cannot reduce the concentration of copper in steel, and it continues to rise to a typical value at the moment of around 0.3%, because currently around 60% of steel production is from recycled scrap that inevitably includes copper wiring from car body recycling etc.

Steel was made by the ingot route until continuous casting was developed in 1985, which allows continuous pouring of molten metal into a 'strand' that travels directly through the mill to a finished product. Continuous casting produces centreline segregation that is apparent when a cross section is etched.

And the samples from the sea defences? The microstructure revealed the bars to be steel, not wrought iron or cast metal. Hence probably post 1900. Deformations in the grains identified they were 'wrought' and had residual cold work in them. The slag level was quite good, but with a few turbulent areas and some small surface rokes. That slag level and method of manufacture put them at just pre-First War to Second World War eras.

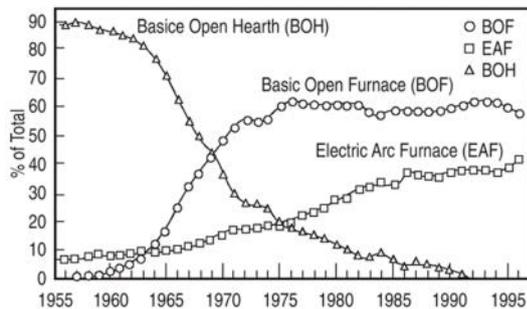
Tensile values that were estimated from hardness gave values that were significantly greater than actual tensile values recorded on the samples. This difference between estimated values from hardness, and real values are largely dependent on slag content, and further demonstrates that the steel used for these bars deviates from modern steel. Nevertheless the steel is quite ductile, dating it more recent than basic Bessemer steel which is more brittle. The chemical analyses showed a steel of moderate carbon content, (0.3% with a high sulphur content of 0.05% and phosphorus of 0.06% and manganese of 0.5% and low silicon, with no special alloying elements. The copper is low, 0.09%). Modern steel has a sulphur limit of 0.04% maximum and the copper is rising due to its inclusion in scrap, and currently averages around 0.24%.

The variation in analysis indicates it is not from one batch of steel and this suggests a smaller batching process for the steelmaking route, plus probably some variation due to being made from rolled ingot.

These factors suggest this is steel that was produced around 1925 -1935. During World War I and World War II much steel was produced by remelting scrap. This refined the steel that it was produced from, and it is also possible these re-bars are from either of those periods.



A microstructure of ferrite and pearlite. Fingers of slag date the steel to probably between the wars.





SureScreen Life Sciences at the 18th Century Morley Retreat, just north of Derby, houses our clinical chemistry labs, conference facilities, & consulting and treatment rooms.

There are three luxuriously appointed hotels close by, all with excellent golf courses, making this a wonderful location in beautiful countryside close to the Derwent Valley World Heritage Sites, which our clients can enjoy while the underlying cause of their illness is diagnosed.

Church Lane is part of The Portway, a 4,000 year old portage route across England from the Port of Nottingham to Liverpool.



SureScreen Diagnostics Ltd is based in a modern manufacturing unit close to Derby city centre and near the River Derwent and The Silk Mill - the world's first factory. John Lombe constructed the mill and a large weir to generate power for spinning silk.

The building is now the gateway to the UNESCO World Heritage Site that includes Joseph Arkwright's Masson Mill, the world's first metal framed building. Famous for its innovation, Derby is also the home of Lara Croft and is a centre for computer game design.

In 1772 John Lombe died in mysterious circumstances and it is thought he was targeted by traditional Italian silk manufacturers who were being undercut by The Silk Mill's factory methods.

In May 2013 the weir was opened as a 1.3MkW/yr hydro-electric scheme for Derby.

The city is world renowned for Crown Derby China, Rolls Royce Aero & pre war Rolls Royce cars, and is the home of many of the UK rail industry's Headquarters.

## BULLETINS, NO BULL

Heard the one about the young bull that sees a herd of cows in the next field and says to the old bull next to him, 'let's run over and make love to one of those cows!' The old bull replies, 'Lets walk over there and make love to all of them'!

It's a fact of life that enthusiasm ultimately gives way to experience. Here in the Scientifics Laboratory we regularly hold training sessions in which the older staff pass their vast knowledge onto the younger members of our team. Hence our more senior metallurgists who no longer relish crawling round a power station can still train those who are fitter and more nimble.

We're well known of course for our broad experience of most things in engineering. But equally important is our name for reports that are easy to understand and simple to apply. That's the product of a forensic mind, we're used to explaining complex issues to laymen in a courtroom. Many experts just don't have that ability.

Now, we've decided to release our training sessions to a wider audience, as downloads on our website as well as through handouts and emails to special clients.

We have three titles so far that involve mechanical testing, crystal structures and phase diagrams.

Each issue will be a no-frills summary for further study, along the lines of our other bulletins. Maybe you'll even nominate us for a no-bull prize?. We write for our sister company, SureScreen Diagnostics too—here is a list of the current bulletins you can download from [www.surescreen.com](http://www.surescreen.com) (go to Diagnostics and Technical & Training then Technical Bulletins). Current titles include:

- **How drugs are handled in the body**
- **Drug retention times and cut off levels**
- **Definitive guide to alcohol**
- **Oral fluid, urine and hair - which medium is best**
- **Definitive guide to Urine**
- **Curfew Monitoring**
- **Mood food and addiction**
- **Clinical diagnosis of chronic illness**

### *What's this, a recipe in a newsletter for a scientific journal? Let us explain.*

The above recipe is taken from a book that SureScreen Life Sciences is publishing shortly. Some of you may remember Hannah Sunderani who spent six months with us a couple of years ago, at the time we were moving into Morley Retreat. As well as helping us with forensic work, she planned a lot of the early development of the building into a forensic and biochemistry lab. It was Hannah who organised our brown tourist signs for example.

Hannah was inspired during her stay to promote a healthy lifestyle, and has since been writing a book called happy Tummy Healthy Body. Her meticulous detail, superb photographs, and thorough research into the dishes is sure to make this a hit. All meals are simple to make, and provide a balance of vitamins and minerals so essential to good health.

We know that elements like zinc, manganese and molybdenum are in chronically short supply in our modern diet, yet they are essential for our well being. Hannah's dishes are designed to prevent those mineral deficiencies that can lead to chronic diseases. We recommend her recipes, and we'll be recommending her book too.

And Hannah? She's back in Toronto now, working in healthcare. She has proven to be a strong project manager with great initiative and has a good understanding of the healthcare landscape. You could say that's an ideal recipe for a very successful career.

## Inside-Out Sushi Roll

This quinoa salad has all the goodies of a vegetarian Japanese susi roll, but tossed instead of rolled. It tastes just like a sushi roll, but without the worry of immaculate presentation. We can leave expertise to the Japanese chefs!

### **Recipe contains:**

- 85 g (3 oz) rinsed uncooked quinoa
- 250 ml (8.5 fl oz) water
- ½ cucumber (12 cm or 5 inches long)
- 1 medium raw carrot
- 1 avocado
- 3 large nori sheets
- 30 ml (2 tbsp) organic soy sauce (or gluten-free sauce)
- 22.5 ml (1½ tbsp) sesame seeds
- wasabi to taste

### **Preparation:**

Begin by cooking your quinoa. In a pot add 85 g uncooked quinoa to 250 ml of water. Bring to a boil, then cover with a lid, reduce heat and let simmer for 15 minutes. Then place in a mixing bowl and let it cool.

Finely chop up your cucumber, and use a cheese grater to grate your carrots. Next cut your avocado into cubes. To do this, slice the avocado lengthwise all the way around and twist to separate. Remove the stone. Then, carefully slice into the avocado lengthwise and then widthwise to make a grid pattern. Flip the avocado over so you're looking at the skin. Then, squeeze the ends towards each other starting from the middle outward, similar to squeezing a lemon, to pop out the avocado cubes.

Add your cucumber, carrot and avocado to your quinoa. Rip up your nori sheets into pieces and add them to the bowl. Add your soy sauce, tahini paste and wasabi. Give it a good stir. Place in bowls and serve to your loved ones.



*\*Note: This recipe is dairy-free and gluten-free (if using gluten-free soy sauce). It is also vegan and vegetarian.*



## THIS DOG FEEDS THE HAND THAT BITES IT

Did Harry M. Stevens, eldest son of James Stevens, a foreman of Midland Railway Locomotive in Derby, have the greatest influence on American culture?.

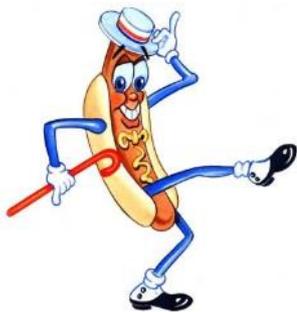
Quite possibly. After all, he designed the baseball scorecard still used today, and he pioneered the drinking of soda through a straw. Born in 1856, Harry's influence on popular American culture is immense; but mainly because he invented the hot dog - the world's most popular fast food.

Born in Derby, Harry became a caterer in his home-town before emigrating with his family to Ohio in the 1880's, believing that he could make money from catering at large sporting events in the United States. His early visits to baseball grounds, however, ended in personal frustration at being unable to identify visiting players, or to keep up with the action. As a result, he devised a scorecard which could be used by the fans, and he also left space on them for advertisements. An instant success, Stevens' scorecards have altered little to this day.

But when Stevens won the catering concession for major league baseball games, he lost money trying to sell ice cream and cold soda. One chilly April day in 1901 at New York City's Polo Ground, he hit upon the idea of hot food served within seconds. He bought up all of the 'dachshund' sausages he could find, with bread rolls to put them in, and started shouting "They're red hot. Get your dachshund sausages here".



Local newspaper cartoonist Tad Dorgan, short on ideas and working to a tight deadline, drew inspiration from what he saw and drew a barking dachshund sausage nestling in a roll. Not sure how to spell "dachshund", he scrawled the words "hot dog" on his cartoon instead. That drawing became famous, and so did the hot dog's connection with baseball. And another American icon was born.



In 2013 Americans spent \$2.5 Billion on hot-dogs in supermarkets. Major league ballparks in USA are expected to sell over 21 million hot dogs in a season. The baseball fans love the hot dog, so much so that July is designated National Hot Dog Month.

Chicago's O'Hare International Airport consumes SIX times more hot dogs, 725,000 more than Los Angeles International Airport and LaGuardia Airport combined.

On Independence Day, Americans will enjoy 150 million hot dogs, enough to stretch from Washington to Los Angeles more than five times. During peak hot dog season, from Memorial Day to Labor Day, Americans typically consume 7 billion hot dogs. That's 818 hot dogs consumed every second during that period.

And all because of a Derby Inhabitants' innovative spirit. Little wonder then, that Derby has been designated the best City for innovation.

<http://www.visitderby.co.uk/discover/history-heritage/how-derby-invented-the-hot-dog>

## PANCHROMATIC PRIVATE PARTS?

When I started out as a forensic scientist, we used to supply visiting policemen with packets of an insidious dye called Gentian violet. They used it to dose coat pockets where there were pickpockets operating. Thrusting a hand into a pocket dosed with Gentian violet, the pickpocket's hand is marked with this violet dye that cannot wash off. You're nicked my son.



The iridescent Gentian flower's name derives from Gentius, king of ancient Illyria and alleged discoverer of the plant's medicinal value. Possibly it is the reason why purple is associated with royalty, just as the rare and hugely expensive yellow saffron crocus is associated with higher religious orders.

One day a burly constable appeared at the desk, and said "I've been sent to pick up some Genital Violet". We wonder to this day if someone set him up, or if it was a genuine Freudian slip.

*Jim Campbell*

## PATENTLY OBVIOUS?

Is a forensic scientist's mind wired differently, do you think? We love cryptic crosswords, and linking events together. Does everyone else think of headache tablets every time the sat-nav says 'Your destination is a-head'? Possibly not.

The same ability to link events makes inventing new ways of doing things a doddle. We recently analysed a series of e-cigarettes for their nicotine content, incidentally finding a wild variation in concentrations. That set us thinking. (again).

We have a big chart on the lab wall of all the biomarkers in the body. Hormones work at pico-concentrations, neuro-chemicals work at nano-concentrations, while regulatory markers work at the micro-level. Many precursors for health work at the nano-level. In fact a bee sting injects around 5 microliters of venom, and once diluted in the body of most mammals the dilution factor becomes nano-scale—just at the level where it hurts most!

That being the case, e-cigarettes deliver the nerve-toxin called nicotine at the nano-scale. When we make up a nicotine standard we have to take great care. It's able to be absorbed through the skin (hence the nicotine patch) so if we spill it on our hands, we've 20 minutes to live. Yes, it really is that toxic.

But to us it's patently obvious that e-cigarettes would be the ideal vehicle to deliver a whole range of neuro-supportive substances too, and many medicines like Naltrexone at low doses. Except that with our daft patent laws, now we've told you, the idea is disclosed and so we can't patent it.

## STAFF SPOTLIGHT SPOT

Here's where you usually get to know a member of staff better, but this time it's impossible to single out any one member of the team that won the Derby Telegraph Award for Excellence in Enterprise.



Top row from left are Alex, Jim, Alastair and David Campbell, and Tom Wood our biochemist. Lower row from left are Shirley Moody, Heather Baillie, Julie Maskrey, Lisa Duxbury and Luci Campbell.

The rest of the dedicated staff all make things happen at SureScreen but could not be there at the awards ceremony.

SureScreen is delighted to win this award, particularly against stiff competition including one company with a £4Bn turnover and 200 patents to their name. The award recognised the diversity of the business and its dedication to excellence in research.



Not only that, but SureScreen came joint runner-up in the Export awards. Our medical and diagnostic skills are exported round the world, with about 50% of our revenue coming from exporting products and skills to other countries.



The awards were presented at the Derby Roundhouse, a former engine repair shed and the oldest surviving used roundhouse in the world. It's now part of the Derby University campus and is a fitting tribute to Derby's heritage with the largest collection of transport companies in Europe. It certainly has a wow

SureScreen is a family owned and run organisation, applying many years of experience in forensics, material science, rapid diagnostics and chronic disease through innovative products and services, to deliver the best diagnostic tools and approaches.



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## NEWS IN BRIEF UPDATE

Here at Scientifics we have a contract to test hydraulic fluid for mining applications to make sure it is compatible with the hydraulic system that holds the roof up and cuts the coal. These hydraulic fluids are also lubricating the system, but the fluid must not attack elastomer seals, be safe to use, prevent corrosion, will not break down at low and high temperatures, and provide low friction.

Until recently the tests were compared with a 'standard' calibration fluid, but changes to the formulations of some synthetic mining fluids has caused some reaction between the control and the test fluids, requiring a rethink.

As a consequence we have been carrying out a series of tests on our own formulation of 'control' standard which is designed to be compatible with all of the products out there in the market. Once we had optimised our choice, we then had to revalidate the previous samples to make certain that no other spurious effects crept in from our choice of ingredients.



These roof supports are pretty impressive structures. A row of these form a 'long-wall' along the coal face, and as the cutter flies along its track, alternate roof supports retract and walk forwards, pushing the cutter track to its new position.

A conveyor below the track removes the coal that has been cut.

This system allows four men to run a complete coal face, with plans to have the coal face completely unmanned. With some coal faces up to 40 feet thick, these roof supports can be monsters. Imagine the task of getting these into position in a mine.



And imagine how much hydraulic fluid is needed!!

Just another example of the diversity of work and influence that SureScreen has around the world.

## DID I HEAR RIGHT?

Think you've heard of SureScreen before? Chances are you probably use our medical products somewhere in your life. We supply drugs and alcohol tests to Power Stations for their safety screening, and your gatehouse probably has one of our Alcometers for site incidents. We supply medical products such as pregnancy tests through the supermarkets too. And SureScreen Life Sciences looks after people's health and analyse samples for occupational health, keeping Britain safe and healthy.

## Have your say...

Diagnostics form an important part of the puzzle, whether it be caring for patients with chronic illness, helping an individual with drug dependencies, or designing the latest and greatest component. We strive to provide you with all the tools you need to do the best job, so please drop us a line if you are looking for something specific - we'll do our utmost to assist you. Alastair Campbell, Marketing Director, SureScreen.

### e-CONSULT.

Good pictures of fractures provide so much detail these days. Did you know we can provide examinations and reports from good quality pictures in 24 hours from receipt by email. In most cases this points you in the right direction quickly, efficiently and without posting or delivering samples.

It's a great example of the Pareto principle, better known as the 80/20 rule. You get 80% of the information in 20% of the time. And 80% is often enough to get the job moving. Bet you'd like all labs to work this fast.

Why not give us a try? We guarantee you'll be impressed.