

Welcome
to issue 52



Happy New Year! And an even happier International Year of Chemistry! 2011 has been officially declared International Year of Chemistry by the United Nations and in this issue we celebrate the contribution chemists have made to our lives and explore why they are our modern-day superheroes!

We also take a closer look at the life of one of the most important and remarkable chemists, Marie Curie, the only female chemist to receive two Nobel prizes.

Check out another interesting career that a chemistry degree could lead to, as we look at how we use neutrons to 'see' the structure of proteins.

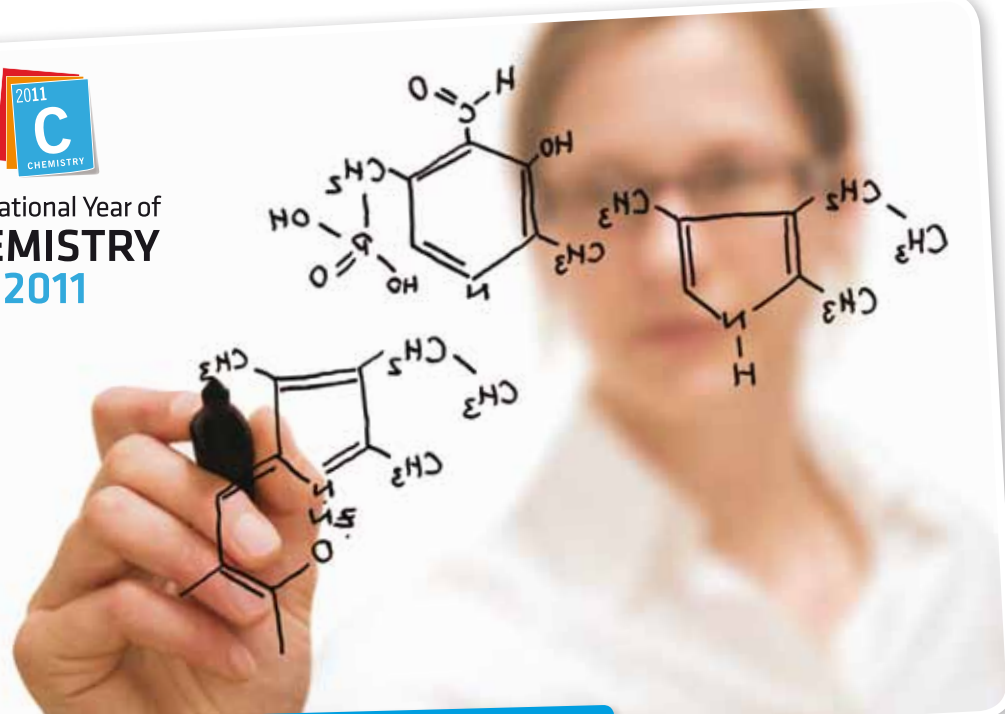
IYC will bring about some very exciting events, one of which is a massive global experiment that you can get stuck into! Brace yourselves for the unfolding of IYC!



Sotonye Dagogo – Editor



International Year of
CHEMISTRY
2011



International Year of Chemistry Our life, Our future

2011 is officially the International Year of Chemistry (IYC)!
So what makes this year so special for chemistry?

Well, this year marks a number of very important milestones for the chemical sciences including: the 100th year anniversary of Marie Curie receiving her Nobel Prize for her groundbreaking work on radioactivity, the publication of Rutherford's theory of atomic structure and the 100th anniversary of the founding of the International Association of the Chemical Societies. This year also marks 350 years since the publication of the 'The Sceptical Chymist' by Robert Boyle. So it's a very significant and exciting year!

This month sees the onset of many events taking place all around the world in celebration of the achievements of chemistry and its contribution to the well-being of mankind. The official launch of IYC will take place in Paris at the UNESCO (United Nations Educational,

Scientific and Cultural Organization) headquarters on 27th and 28th of January. IYC also brings about a great opportunity to take part in the '**Global Experiment – Water: A Chemical Solution**', a truly global and unique experiment that can't be missed! And if you are a more creative chemist with an appreciation for art make sure you don't miss out on the '**Our Children on Water**' exhibition themed around '**Water: Refreshment or Responsibility**.' This international exhibition will tour European cities this summer and will feature paintings from school children in Europe and Africa. So what are you waiting for? Join in the celebrations! Find out more on www.rsc.org/iyc

Dates for your diary

ChemNet Events:

► **Sex and the City – The Emerging Role of Human Skin**

The Chemistry Centre
Royal Society of Chemistry
Burlington House, London
06 January 2011

► **Exploring the Dark Universe**

University of Bath
09 February 2011

► **Turn on, Tune in**

The Chemistry Centre
Royal Society of Chemistry
Burlington House, London
10 February 2011

► **Science in Drug Politics**

Prof David Nut
University of Bath
16 February 2011

► **Mysterious Cases of Misbehaving Molecules**

University of Bath
24 February 2011

► **Marie Curie and Aspects of the History of Radiochemistry**

The Chemistry Centre
Royal Society of Chemistry
Burlington House, London
18 March 2011

► **Look what chemistry has done for me!!**

Royal Society of Chemistry
Thomas Graham House
Cambridge
24 March 2011



To book a place on a ChemNet event:
E: events@rsc.org
T: 01223 432340
or book online and find more info about all the events at:
www.rsc.org/chemnet
<http://my.rsc.org/chemnet>

The Chemist – the modern day superhero

When you think of a superhero, an image of a muscular man dressed up in uncomfortable but surprisingly flattering tights, a cape and perhaps a mask come to mind. They often fly and invariably have some sort of superpower that never fails to stop the bad guy. But in today's world, Gotham city isn't threatened by some gruesome evil creature or super villain; instead, we face challenges like: feeding the world, finding ways to meet the world's energy needs, dealing with issues relating to human health, saving the environment and meeting the emerging demands of growing future cities. It is today's, yesterday's and tomorrow's chemists that tackle these challenges head on, acting as our modern-day superheroes!

Let's go back in time and see a few things that 'superhero chemists' have contributed to our world so far;

► **The modern atomic theory (1808)**

John Dalton was pivotal in the development of modern chemistry. Dalton identified that elements consist of atoms and linked these atoms to measurable quantities of mass and volume. He also discovered that a pure element consists of identical atoms, with the same mass, and that compounds consist of atoms of different elements combined together. This may seem like basic knowledge today, but this good work really set the foundation for modern chemistry.

► **Dynamite (1867)**

Alfred Nobel, famous for establishing the Nobel Prizes, also discovered dynamite. Now you may think that dynamite hasn't brought about anything 'good'; however dynamite accelerated the building of roads, tunnels, canals, and other construction projects worldwide.

► **Refrigeration (1871)**

The household fridge has become commonplace, and most of us don't think twice when we grab our cold milk or reach for yesterday's leftovers. Yet before our superhero chemist Carl von Linde came along there was no such thing as modern refrigeration. Von Linde was also the first person to extract oxygen gas from air launching the gas industry and paving the way for the production of gases used for refrigeration.

► **Fertilizers (1918)**

The controversial German chemist Fritz Haber, perhaps more super villain than superhero, nonetheless also contributed tremendously to chemistry. Haber discovered how to make ammonia from its simple elements. And although he used ammonia to create explosives, it also led to the production of agricultural fertilizers.

► **Plastics (1869)**

Plastics have become an integral part of modern day living, providing us with clothes, table tops, electronic insulation and much more. This amazing material was brought to us in the form of celluloid plastic by chemist John Wesley Hyatt. His discovery led to the development of other plastics such as Bakelite and eventually nylon.

► **Minimising pollution (1975)**

Chemical engineer Kathleen C. Taylor and other scientists developed catalytic converters, which use chemical reactions to turn harmful emissions from cars into less harmful gases helping to reduce exhaust pollution by 95%!

► **Green fluorescent protein (1995)**

Even better than kryptonite! The green fluorescent protein (GFP) allows scientists to see cells and protein position in live cells or organisms. GFP was discovered and developed by Osamu Shimomura, Martin Chalfie and Roger Y. Tsien.

Who will be the next superhero chemist? You?



Careers: Crystallography

Making chemistry crystal clear

Interview with Dr Matthew Blakeley



Name: Dr Matthew Blakeley

Profile: Crystallography

Age: 33

Job: Neutron Macromolecular Crystallographer

"I love the diversity of experiments that I am involved in, from the study of key enzymes involved in the life cycle of HIV (the retrovirus which causes AIDS), to working out how antifreeze proteins, found in the blood of arctic fish, permit them to survive in sub-zero environments."

► What is your official job title?

Neutron macromolecular crystallographer/LADI-III Instrument scientist

► That's a long title! What does it actually mean?

I try to understand how important large molecules like proteins, viruses and DNA (macromolecules) function by determining their overall 3D atomic structures and studying the interactions they make with their target molecules. To do this I use a technique known as neutron crystallography. This involves firing a beam of neutrons at a crystalline biological sample to produce various patterns of diffracted neutrons – these patterns are unique to the sample being studied and allow us to determine the sample's structure. For example, when studying an enzyme-substrate complex it is possible to produce a detailed 'picture' of the enzyme's active site, in which we can see the key interactions between the enzyme and its substrate, allowing us to decipher the enzyme's catalytic mechanism.

► Don't crystallographers normally use X-rays rather than neutrons?

The use of neutrons is quite rare because of the more demanding experimental requirements, however, using neutrons allows us to see the positions of hydrogens within the structure (which is very difficult with X-rays), and this can be of great importance when trying to understand how the enzyme functions.

► What are your day-to-day activities?

As well as doing my own research, I help visiting scientists do their experiments. This involves setting up all the equipment, making sure everything is working correctly, guiding them through the experimental process, testing their samples and devising the best strategy for data collection. I monitor the experiment while data is being collected and process it when the experiment is complete, ultimately deriving the structure of the macromolecule.

► What's the best part of your job?

I love the diversity of experiments that I am involved in, from the study of key enzymes involved in the life cycle of HIV (the retrovirus which causes AIDS), to working out how antifreeze proteins, found in the blood of arctic fish, permit them to survive in sub-zero environments. As I work at an international neutron research centre which attracts scientist from all over the world, I get the chance to meet lots of different people and to collaborate with them on exciting projects. I am also lucky enough to be invited to give talks on my research at places all round the world, and so this gives me the opportunity to visit many interesting places such as Japan.

► What made you interested in this field?

I have always been fascinated with nature and how things work. At college I studied A-level biology, chemistry and maths, and then went on to study chemistry at the University of Manchester. During my degree I was introduced to crystallography by Prof. J.R. Helliwell and have been interested in the technique ever since.

► And finally, if you weren't a scientist what would you be?

I really love electronic music and in my spare time make my own tunes and DJ, so I guess in a parallel world I could be a techno DJ!

Chemistry
on the web

► Wondering what you can do with a chemistry degree?

Find out here

<http://tiny.cc/eqh2o>

► Think chemistry is dull?

Think again! Take a look at some flame throwing, colour changing, 'don't try this at home' chemistry in the wired blog's amazing chemistry video list. <http://tiny.cc/n1u9q>

► It's IYC, a time to reflect and build on our chemistry legacy.

The chemsoc timeline is a visual exploration of key events in the history of science with particular emphasis on chemistry. Check it out!

www.rsc.org/chemsoc/timeline/pages/timeline_ch_01.html



► A great series about the volatile story of chemistry, a real must see!

<http://tiny.cc/7l4dm>

► Want to be a part of something big? Take part in an international competition organised by Google! Find out more!

www.google.com/sciencefair



It's IYC and time to celebrate the achievements of our fellow chemists!

Chemists are doing great things to help improve the world every day, and it's no surprise that their work has been recognised with 102 Nobel prizes. On the Nobel medal for chemists the following inscription is engraved;

'Inventas vitam juvat excoluisse per artes'

What does this mean?

To submit your answer log onto the ChemNet area of MyRSC at <http://my.rsc.org/chemnet> and check out our competition corner! The closing date is 13 January 2011. Two winners will receive Molymod kits.



Congratulations to last month's winners who were Philip Kent from Nottingham and Rachel Andvig from Ipswich. They both correctly answered that the atomic number of gold is 79.

Chemistry facts

We all know that water boils at 100°C, but this is only under normal conditions of sea level. On the top of Mount Everest, due to the change in barometric pressure, water boils at 68°C! And water deep in the ocean in close proximity to geothermal vents remains liquid at 100°C.

Cutting-edge Chemistry

Marie Curie



There's no doubt that you have heard of Marie Curie, and you may even have some idea about her having something to do with radioactive materials, but what did she actually do? ChemNet is here to get you up to speed.

Marie Curie is arguably the most renowned female chemist of all time! And with not just one but two Nobel prizes under her belt, awarded at a time when the female scientist was still a rare concept, you can tell she that really knew her stuff!

Marie Curie was born in Poland in 1867 and undertook her early education there. She went on to study physics and maths at the Sorbonne in Paris and it is there that she met her future husband another well-known scientist, Pierre Curie. Pierre was professor of the school of physics and the pair fell in love and married in 1895 the following year after meeting.

All very sweet and romantic, but let's get back to the chemistry! What did the Curies actually do?

Inspired by the discovery of radioactivity by Henri Becquerel in 1896, the Curies set about investigating radioactivity and although times were hard financially, they managed to maintain a steady income through teaching whilst still making time to carry on with their research. In 1898 the Curies announced the discovery of not just one but two new elements. One, they named polonium after the country of Marie's birth and the second was named radium. In 1903 Marie Curie, along with her husband and Becquerel, received her first Nobel Prize. She was the first woman to receive a Nobel Prize in physics.

1906 saw the tragic death of Pierre, and a devastated Marie decided to devote herself to continuing the work that her and her late husband had begun together. She started off by taking his teaching post and simultaneously making history, yet again, as the first ever woman to teach at the Sorbonne! She received a second Nobel Prize, for chemistry, in 1911 "in recognition of her services to the advancement of chemistry by the discovery of the elements radium and polonium, by the isolation of radium and the study of the nature and compounds of this remarkable element". Marie's research played a vital role in the application of X-rays to surgery—a technique that we still use today.

Science in Drug Politics: From current oxymoron to future principle



As part of the exciting millennium lecture series sponsored by the RSC, the lecture *'Science in drug politics'* will be given by Professor Nutt at

the University of Bath. Professor Nutt, the government's former chief drug advisor, was forced to resign in 2009 after making controversial but evidence based comments on illegal drugs and their classification. This lecture will delve into the role of science in politics. How are drugs classified? Should drug politics be based on scientific evidence? Or should morality, cultural norms and politics overrule? Don't miss out on what promises to be a thought provoking and frank discussion. *Science in Drug Politics*, Prof David Nutt, University of Bath, 16 February 2011.

The Global Experiment: Water – A Chemical Solution



This year you have the opportunity to participate in the biggest global experiment ever conducted to explore one of the Earth's most critical resources, water.

The IUPAC Global Experiment will be conducted by thousands of students around the globe and will contribute to an online global map of water quality. Why is this important? Well, globally more than 1.2 billion people do not have safe drinking water and 2.4 billion people lack basic sanitation facilities.

Chemistry can provide solutions to deliver safe water to people all over the world with improved filtering devices and analytical equipment. The Global Experiment will allow you to explore methods of purification by filtration, evaporation and cover the use of disinfection techniques. You will also get the chance to build your own water filtration unit from household materials and build an efficient solar still. To find out more information visit

www.facebook.com/globalexperiment