

# The Journal

Autumn 2014



---

# Contents

---

■ Editor's welcome	<i>Ian Moulson</i>	02
■ Chairman's view	<i>Terry Croft</i>	03
■ New members and registrations	<i>IST Office</i>	04
■ Chartered Scientist	<i>Natalie Kennerley</i>	06
■ IST members' news	<i>IST Office</i>	08
■ Apprentice training	<i>Greg Nicholson</i>	09
■ The brothers Gurr	<i>Alan Gall and Derek Sayers</i>	12
■ Real time	<i>Samia Akhtar</i>	22
■ NDOC Databank	<i>Raffaele Conte</i>	26
■ Cage-farmed rainbow trout	<i>Gina Conroy</i>	31
■ The other IST	<i>Adrian May</i>	34
■ Value of nature		36
■ UK honeybee threat		37
■ Bird flu		38
■ Crystallography XFEL		39
■ S-Lab	<i>Michelle Jackson</i>	40
■ IST special interest groups CHEM & TMU	<i>Harry Adams &amp; Aliane Martin, Ian Lyne &amp; Geoff Howell</i>	42
■ Effective learning	<i>Kevin Fletcher</i>	44
■ HEaTED	<i>Rachel Crossley and Katherine Forsey</i>	46
■ Oldest working compressor		49
■ Hydrogen fuel breakthrough		50
■ New dementia treatments		52
■ Easel reveals secrets		53
■ Robotics goldmine		54
■ Leading Your Technical Team programme	<i>Kevin Oxley</i>	56
■ CSci, RSci, RSciTech, IST(Reg), and CPD	<i>IST Office</i>	60
■ IST and IST organisation	<i>IST Office</i>	64
■ Association Conference – 2014		66

# The Journal

The Official Journal of The Institute of  
Science & Technology

The Professional Body for Specialist,  
Technical and Managerial Staff

Autumn 2014

ISSN 2040-1868

# Editor's welcome



## Welcome to the autumn 2014 edition of the IST's Journal.

I am really pleased that in this particular edition we have an excellent

variety of major articles, short articles from several disciplines, and also news and updated information about the IST. My thanks go to all our contributors.

It's also pleasing that, as a unique organisation for the technical community, the IST continues to thrive and grow, and Terry Croft highlights some of the exciting developments now coming to fruition for us in his "Chairman's View" in this edition.

However, there is for me one new development in particular that I am very excited about, and that's the IST's new technical management skills programme "Leading Your Technical Team". Leading Your Technical Team (LYTT) has a long and well-respected history. It was the brain child of Bob Hardwick who developed and ran it for HESDA<sup>1</sup>, and then continued under LFHE<sup>2</sup>, for a total of more than 30 years, and it is now continuing through IST. Over this time the programme, which runs two to three courses per year, has been attended by more than 1,200 technicians and technical managers. The underlying secret of its success, I believe, is twofold. Firstly, its content has continued to adapt and develop to keep up to date in line with the many changes in Higher Education. Secondly, through delivering a very high standard of technical management training via experienced HE managers, in a practical context that is focused on the reality of managing in a university technical environment. Not surprisingly it continues to be held in very high regard by many HE senior managers and staff developers.

Perhaps at this point I should own up to a conflict of interest, or rather a conflict of enthusiasm.

Before my retirement from the University of Sheffield in December 2013 I was, for many of the 40 years that I was there, the departmental manager of the Department of Electronic and Electrical Engineering. Throughout my university career I built up a wealth of experience in managing a diverse range of support staff teams.

I managed technical teams ranging in size from 2 to 40 people as well as small to medium sized administrative and managerial teams, and was actively involved in both promoting and delivering technical management training at Sheffield. But also more widely, since 2002, I have helped to deliver the Leading Your Technical Team programmes.

So I'm very pleased to announce here that Kevin Oxley, who coincidentally is recently appointed to the IST executive, is the new LYTT Programme Director for this, one of our first "IST Master Class" programmes, which will be one of a series of continuous professional development programmes and courses the IST is planning to run going forward.

Getting back to this edition, thanks again go to Adam Booth – our resident cartoonist (and non-scientist) – who has kindly donated some more of his delightful light hearted sketches. [Adam's Facebook page link: www.facebook.com/adampboothcartoons](http://www.facebook.com/adampboothcartoons)



**Ian Moulson**  
Editor

<sup>1</sup>Higher Education Staff Development Agency  
<sup>2</sup>Leadership Foundation for Higher Education

# Chairman's view



Where do I start? We are halfway through 2014 and what a year it has been so far. I think the main message for our members from universities and colleges is that more and more institutions have now realised the importance of the national Professional Registers scheme for

technicians to the higher education (HE) sector, and its importance to their own institution, but more importantly to **YOU** as a professional technician.

In July, Melanie Hannah and I gave a presentation at Nottingham University to an audience of technicians of all grades and disciplines. The Professional Registration Agenda is fully supported by their VC and senior management. The event was arranged by Kelly Vere and supported by their HR department who have put aside funding to support technical staff registering for the scheme. Again, a win-win for the technical staff and the University, who can now (quite rightly) demonstrate the technical competence of their Professional Technicians – vital in the new HE environment.

However we still need more champions to represent the IST in other institutions. Now is the time to push forward as more higher education institutions (HEs) are getting on board with the professional registration agenda. Full training and support will be provided. The IST and the technical community need **YOUR** help. Please contact the office at [office@istonline.org.uk](mailto:office@istonline.org.uk).

The good news doesn't stop there! Firstly a big thank you to the Executive Team and the office staff for many months of hard work, dedication **AND** their free time resulting in a further licence from the Science Council to assess and award the status of Chartered Scientist (CSci). This now enables the IST to assess and award all levels of Professional Status: Registered Science Technician (RSciTech); Registered Scientist (RSci); and Chartered Scientist (CSci).



In June we had further celebrations at the University of Sheffield when Natalie Kennerley, Assistant Technical Manager for

Neuroscience in the Department of Psychology, became the University's first technician to receive the award of CSci by the IST. The Vice Chancellor, Professor Sir Keith Burnett, said: "As a scientist, much of my own career has drawn on the professional expectation of my outstanding technical colleagues and I am personally keenly aware of how much scientific programmes depend on the kind of work now endorsed in this way by the Institute of Science and Technology". So isn't it time we celebrated **YOUR** achievements! Apply now for registration. Further information is available at [ISTONLINE.ORG.UK](http://ISTONLINE.ORG.UK).



As you can see, Universities have been recognising the need to celebrate the key work technical staff undertake in all areas of teaching and research, and the

contribution they make. We also celebrated with the University of Sheffield in March, when their trainees completed their two-year training programme in the Faculty of Engineering, and in successfully completing the IST endorsed training programme they also achieved the award of Registered Science Technician (RSciTech). What a start to their professional technical careers – well done!

With more and more universities engaging with Professional Registration and supporting away days, workshops, and the practicalities of registration, the rest of 2014 looks very busy and positive indeed.

So if you want to help or support the technical community in any way then please contact me directly at [t.croft@istonline.org.uk](mailto:t.croft@istonline.org.uk) or call **01142763197 today**.

With sincere thanks  
**Terry Croft**  
Chairman

# New members and registrations

## New members February 2014 – July 2014

Mem No.	Name	Grade			
T15160	Mr D R Drew	MIScT	T15208	Miss M M Edmondson	MIScT
T15161	Ms L Inuabasi	MIScT	T15209	Dr Odo ize	MIScT
T15162	Mr G Strudwick	MIScT	T15210	Mr C P Hatton	MIScT
T15163	Mr A Mead	MIScT	T15211	Mr D S O ubiyi	MIScT
T15164	Mr S O adipo	MIScT	T15212	Mr J Ba rber	MIScT
T15165	Miss S Ashe	MIScT	T15213	Mr M Alz ahrani	MIScT
T15166	Miss C Bradshaw	MIScT	T15214	Miss E diku	MIScT
T15167	Mrs R A Daodu	MIScT	T15215	Mrs I Campbell	MIScT
T15168	Ms S Marcus	MIScT	T15216	Mrs S L Bello	AssocIScT
T15169	Mr S P Parkin	AssocIScT	T15217	Mr E O eh	MIScT
T15170	Mr S D orward	AssocIScT	T15218	Dr F N Kautzman III	FIScT
T15171	Miss O York	AssocIScT	T15219	Mr A Lee	MIScT
T15172	Mr R Kelly	AssocIScT	T15220	Mr L Shunburne	MIScT
T15173	Mrs D C Sutton	MIScT	T15221	Mr O Abiola	MIScT
T15174	Mr A I Edet	MIScT	T15222	Mr P F Baker	MIScT
T15175	Mr S Richards	MIScT	T15223	Mr S O h	MIScT
T15176	Mr B S Foakes	AssocIScT	T15224	Mrs L Labaran	AssocIScT
T15177	Mr M F Kaize	MIScT	T15225	Miss A D O day	MIScT
T15178	Mr M Smith	AssocIScT	T15226	Miss B R Kwota	AssocIScT
T15179	Mrs F O bironke	MIScT	T15227	Mr K O depa	AssocIScT
T15180	Miss A Smith MSc	MIScT	T15228	Mr S Hunguru	MIScT
T15181	Mr N zareth	MIScT	T15229	Mr H B O adri	MIScT
T15182	Mr R A Ashurst	MIScT	T15230	Mrs T D O kin-Ibitayo	MIScT
T15183	Mrs W Birtwistle	MIScT	T15231	Mrs A A semota	MIScT
T15184	Mr T Blake	MIScT	T15232	Miss H O em oh	AssocIScT
T15185	Mrs F O aoluwa	MIScT	T15233	Mrs O Wombo	MIScT
T15186	Mr T O Y igue	MIScT	T15234	Mrs P Sc holes	MIScT
T15187	Mr T Hill	AssocIScT	T15235	Miss A C Akuta	AssocIScT
T15188	Dr O McAllister	MIScT	T15236	Mr K A Adleke	MIScT
T15189	Mr P O ukoro	MIScT	T15237	Mr L O ubiangha	MIScT
T15190	Mrs A Balasundaram	MIScT	T15238	Mrs H Igbigbi	AssocIScT
T15191	Miss AP Aighobahi	AssocIScT	T15239	Miss C Brannigan	MIScT
T15192	Miss S Bradshaw	MIScT	T15240	Mrs O undey	MIScT
T15193	Mrs Z O ry	MIScT	T15241	Mrs I P Fasipe	MIScT
T15194	Mr A Patrick	MIScT	T15242	Miss J M Tingle	MIScT
T15195	Mr D B Polatajko	O nior	T15243	Miss A Storey	MIScT
T15196	Miss B O oh	MIScT	T15244	Mr. O achukwu	MIScT
T15197	Mrs J F Moulton	MIScT	T15245	Mr O age	AssocIScT
T15198	Dr S Myers	FIScT	T15246	Mr G P assmore	MIScT
T15199	Mr Blackburn	MIScT	T15247	Mr A Marston	MIScT
T15200	Miss T Choudhury	MIScT	T15248	Dr K W itley	MIScT
T15201	Miss S Lyst	MIScT	T15249	Mrs O ba batope	MIScT
T15202	Mr I Khan	MIScT	T15250	Mr L Stanke	MIScT
T15203	Mr A C H Brook	MIScT	T15251	Mr M Balmont	MIScT
T15204	Mr A Ford	MIScT	T15252	Mr C C W abueze	MIScT
T15205	Mrs I M Ogbemor	MIScT	T15253	Mr L O es	MIScT
T15206	Mr D Stirling MPhil	MIScT	T15254	Mr M W d	MIScT
T15207	Mr O O orogieva	MIScT	T15255	Mr D W son	MIScT

Total: 96

## Science Council Registrations

Mem No.	Name	Grade
T1488	Mr M Z Khan	RSciTech
T1486	Mr J H Powell	RSciTech
T14966	Mr A P Ham	RSciTech
T1487	Mr P N Trend	RSciTech
T1484	Mr F A Mohammad	RSciTech
T1485	Mr M On es	RSciTech
T15157	Mrs L M G ady	RSci
T12361	Dr D S Ga nchez	RSci
T148	Dr L Kay	RSci
T15138	Ms D Yates	RSciTech
T14933	Mr J P Richards	RSci
T15168	Ms S Marcus	RSci
T14926	Mr P Farran	RSciTech
T14934	Mr M Lister	RSciTech
T14942	Mrs R R oberts	RSci
T15165	Miss S Ashe	RSci
T15125	Mr A K Millin	RSci
T14953	Mr N J Pr ice	RSciTech
T1483	Mr U Younis	RSciTech
T15163	Mr A Mead	RSci
T14753	Mr G owell	RSci
T15201	Miss S Lyst	RSci
T1518	Miss W ir twistle	RSci
T15210	Mr C Hatton	RSci
T15160	Mr D R Drew	RSci
T15121	Dr L Woodbine	RSci
T1486	Mr P Page	RSci
T14957	Ms N K ennerley	CSci
T14574	Dr M E d ckson	CSci

Total: 29

## Reinstated Members

Mem No.	Name	Grade
T13339	Mr D Beard	MIScT
T1468	Mrs I Abina	MIScT
T14728	Mr B Shuaibu	MIScT
T14731	Miss O arisiagbon	MIScT
T14760	Mr A P Adenuga	MIScT
T1482	Mrs S I Ga ma	AssocIScT
T1485	Mr P K Akpeh	AssocIScT

Total: 7

## Correction from Previous Journal Entry

Mem No.	Name	Grade
T1485	Mr T Madzira	MIScT and Higher Diploma

# Chartered Scientist

## Gain Chartered Scientist (CSci) through the IST

### Natalie Kennerley

The Institute of Science and Technology is pleased to announce that it has been granted a licence from the Science Council to award the status of Chartered Scientist to members who fulfill the necessary criteria. This follows on from two years of successfully awarding Registered Scientist and Registered Science Technician to over 81 IST members. Chartered Scientist status is primarily aimed at those people in science or related roles that are working at level 7, which is the equivalent of Masters level for example. However, it is not absolutely essential that applicants have to have a qualification at this level but it is essential that they are able to clearly demonstrate and evidence that they are working consistently at this level.

The Higher Education Funding Council for England (HEFCE) has defined the criteria of what it believes constitutes work at this level and, based on these criteria, the Quality Assurance Agency for Higher Education (QAAHE) have published a framework about level 7. This describes what they consider that those people working at this level should have:

1. A systematic understanding of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of their academic discipline, field of study or area of professional practice
2. A comprehensive understanding of techniques applicable to their own research or advanced scholarship
3. Originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline
4. Conceptual understanding that enables them:
  - To evaluate critically current research and advanced scholarship in the discipline
  - To evaluate methodologies and develop critiques of them and, where appropriate, to propose new hypotheses.

People working at level 7 should also be able to:

- Deal with complex issues both systematically and creatively, make sound judgments in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences
- Demonstrate self-direction and originality in tackling and solving problems, and act autonomously in planning and implementing tasks at a professional or equivalent level
- Continue to advance their knowledge and understanding, and to develop new skills to a high level

And they will have the qualities and transferable skills necessary for employment requiring:

- The exercise of initiative and personal responsibility
- Decision-making in complex and unpredictable situations
- The independent learning ability required for continuing professional development.

We are very proud that Natalie Kennerley is one of our first members to achieve Chartered Scientist status – she kindly tells us her story is here.



My name is Natalie Jane Kennerley and I have been an immunohistochemistry technician at the University of Sheffield for over 20 years. I started my career as a trainee technician and progressed to senior technician before becoming Technical Manager for the Neuroscience section of the Psychology Department.

Sadly over the years I have become aware that technicians can be overlooked and under-valued; often looked down upon by academic peers – even when, after 20+ years' experience, we might have acquired more knowledge than them in our respective field. Hopefully professional accreditation will stop this happening and give technicians the recognition they deserve.

It is for this reason that technicians have needed a professional body that recognises this key role in research and understands their significant contribution to the smooth running and efficiency of research institutions. Over the recent years I have become involved with the Institute of Science & Technology (IST) and the way in which it seeks to promote making a difference for technicians by changing the way technicians view themselves and how academics view them, indeed by giving them a voice to be heard. The IST provides a means of measuring a skill level and rewarding for such, in its awards as Registered Science Technician, Registered Scientist and more recently Chartered Scientist. Having a technician in possession of a document that proves these competencies is becoming more crucial in the capture of grant income. Indeed for many roles within science and technology this is also becoming an essential requirement of the job.

I have my own personal journey with the IST, which began when I became a Fellow of the IST in 2013 and soon after gained my Registered Scientist (RSci) status. In my leadership role I was looking for an award that could demonstrate my high level of skill and competency. Everybody knows what "Chartered" means and most people have heard of, Chartered Surveyor, Chartered Accountant, Chartered Physicist, Chartered Mathematician and the high esteem in which these are held. The Chartered Scientist award obtainable through the IST intrigued me.

I discovered that Chartered Scientist status gives a high standard of professional accreditation. CSci is equivalent to a Master's degree plus at least 4 years postdoctoral work. Those individuals working at this level don't always possess such academic qualifications and this is a fantastic way to demonstrate this high level of knowledge and understanding.

The award also promotes personal/professional development by ensuring that the individual reflects on their role and their work. Through continuing professional development (CPD) candidates are required to constantly address their personal and professional development, which is essential in a leadership and senior scientific role. CSci also increases employability with leading players in the field of research and teaching, it's a statement and a benchmark about the high skill level attained.

This ultimately helps to generate grant income capture within the institution, which is becoming increasingly more difficult to achieve. Having achieved CSci status sets me apart from my competitors and gives me the advantage.

Having spent my whole working life within the University setting I feel passionate that the skills we all learn and develop should be taught and passed down to the next generation of aspiring scientists. As such I am developing a taught IHC course – and being a Chartered Scientist demonstrates to potential applicants that I am good at what I do. This can only have a positive impact on recruitment and increase income for the University. Being a Chartered Scientist gives me a feeling of being part of a wider scientific community and one that I can influence.

Applying for CSci status actively ensures that I reflect on my work and teaches me to be self-critical and consider my work-based learning, professional activity, and self-directed learning. It also gives me a sense of achievement and something to be proud of, it allows me to put things into perspective and highlights areas of my work where I need to focus. This in turn ensures that I keep up to date with my professional development, which demonstrates that I have the motivation and determination to continue to develop myself, and sometimes face quite difficult challenges. Reflection is also beneficial for my employer as it prompts me to consider my role within my organisation and how I can affect change in a positive way.

I found the whole process of applying for CSci a valuable learning experience, it made me think about why I do the job I do and how I can influence those around me, my organisation, and future scientists. To say that I'm absolutely delighted and thrilled to have achieved CSci as well as be the first person awarded CSci by the IST would be an understatement. Indeed I have been shouting this from the rooftops to anybody who would listen! I'm immensely proud of myself and extremely grateful to my institution for giving me the freedom and support to develop.

### Natalie Kennerley FIScT, CSci

**"I was delighted to hear that Natalie was the first person to be awarded Chartered Scientist (CSci) status by the Institute of Science & Technology. We have taken great strides in Sheffield in empowering our technical staff and supporting them through knowledge networks and opportunities for training. This is a great result for her as an individual but also for The University of Sheffield as an institution - and an acknowledgement of Natalie's leadership in this field. We are truly proud of her!"**  
(Professor Tony Ryan, the University of Sheffield's Pro Vice Chancellor for the Faculty of Science)

# IST members' news

## The 2014 Times Higher Education Leadership and Management Awards

### Outstanding departmental administration team



Kevin Oxley accepts the award from Rob Brydon on behalf of the award-winning MDH Faculty Managers Group

The University of Sheffield's Medicine, Dentistry and Health (MDH) Faculty Managers Group was praised for transforming the impact and working experience of its 470 professional staff through outstanding innovation in leadership, culture, communications and development.

Now, the Faculty's professional mentoring scheme, has been taken up by one third of staff in the Faculty and has now been extended across the University. The award also recognises a number of further initiatives including a greater focus on individual training needs, uniting strategic objectives and individual staff development.

**"I am immensely proud of the Medicine, Dentistry and Health Faculty Managers Group for their recognition as Outstanding Departmental Administration Team. They have demonstrated great innovation in leadership, culture, communications and development which in turn is supporting the vital work of teaching and research."**  
(Vice-Chancellor, Professor Sir Keith Burnett)

**"Working at the interface between academic and centrally located administrative and professional staff provides for a challenging working environment."** Matthew Andrews, academic registrar at Oxford Brookes University and lead judge for this category

All the shortlisted entrants demonstrated how they met this challenge and found "innovative ways to deliver services across structural boundaries of relevance to students and different groups of staff alike".

However, the transformation led by administrators at the University of Sheffield's Faculty of Medicine, Dentistry and Health was "especially impressive", with "clear evidence provided of increased flexibility and team commitment among other developments".

A prime example is the faculty's professional mentoring system, the appropriately titled *Grow*, which has now been rolled out across Sheffield. It has generated a 35 per cent increase in the number of staff deemed to have made an "exceptional contribution" in appraisals.

The improvements are also evidenced by independent Hay Group Organisational Climate Surveys in 2010 and 2013, which show significant departmental improvement in key areas such as flexibility (a score of 75 out of 100, up from 42), team commitment (72, up from 48), responsibility (81, up from 60) and clarity (78, up from 65).

Senior management noted that faculty income had increased by 6 per cent on 2011-12 despite overall fiscal challenges, and attributes this in part to professional services innovations.

**Mr Andrews said the faculty had shown "a proactive approach to staff development that produced clear results".**

**Note:** Kevin Oxley FISCT, RSci is the Departmental manager of the Department of Infection and Immunity in University of Sheffield's Faculty of Medicine, Dentistry and Health. He is also a member of the IST's Executive and is the Programme Director for the IST's new "Leading your Technical Team" programme set.

# Apprenticeship training - what's in it for me?

Greg Nicholson

Apprentices helped build Britain's first Universities and so it could be argued that they have a greater history than that of the graduate. The historian AH Thomas in 1929 considered that a craftsman teaching a younger man "appears so natural that one would be disposed to consider it almost as ancient as the crafts and trades themselves."<sup>1</sup> A fundamental principle of apprenticeship, condensed in a modern interpretation of an ancient saying attributed to Confucius, states, "Tell me and I will forget, show me and I will remember, but let me do it and I will understand."<sup>2</sup> However, despite the notion of apprenticeship being well established within most societies, both ancient and modern, the subject has a meagre recorded history and little has been openly published on the methodology of apprenticeship training. For example, nearly 60 years after the completion of Duke University, USA, the institution's archivist commented, "Official university construction photos concentrate on architectural detail instead of the human element"<sup>3</sup> and that "The very least information is available on the stone carvers who fashioned the decorative sculpture and statuary on the campus"<sup>4</sup>. Even in the field of academic teaching, accessible material on one-to-one teaching is sparse and tends to focus on classroom settings.

Most stakeholders, from government bodies to employers, emphasise the benefits of modern apprenticeship schemes using broad strokes. In a response specifically concerned with apprenticeships, the government stated to the House of Lords Select Committee on Economic Affairs that, "UK productivity could improve if the pool of skilled labour could be increased, and the cost to the economy and to society of failure to achieve this would be high"<sup>5</sup>. Indeed, the spring edition of this journal makes the point that "technical skills are vital to the UK economy"<sup>6</sup> and technicians contribute to this partly through "knowledge transfer activities"<sup>7</sup>. However, rarely mentioned are the benefits to those technicians transferring their knowledge. Training apprentices is not just an opportunity to develop other people – it is also an opportunity to develop oneself.

Perhaps some technicians may decline the opportunity of supervising an apprentice because of the misapprehension that it will entail additional work with very little personal return.

However, my experience of supervising young apprentices was worth the effort. The benefits to me included an increase in my teaching, communication and leadership skills, an expansion of my network of contacts and a boost to my knowledge of available technology.

A technician apprenticeship scheme currently running at the University of Sheffield, UK, was developed by the university's science departments and has been operational since February 2013.

The scheme offered eight young people the opportunity to acquire practical skills, vocational qualifications and to become useful members of a technical team. Over a two-year period, apprentices spend time in at least four of the faculty's seven science departments and thus they obtain an impressive breadth of knowledge and practical skills. For example, apprentices can learn how to prepare first-year teaching experiments and also work with researchers on global food security projects within the multi-million pound research facilities of the Animal and Plant Sciences department.

Further activities can include stripping down microscopes, being trained in the practical skills of glass blowing, extracting **RNA\*** from zebra fish and using a cryostat to slice animal brains. Day-release classes that focus on vocational qualifications augment the practical work experience. Successful completion of this process produces a young science technician with a solid foundation in the profession.

When I became a supervisor of apprentices, the scheme was already underway. I was therefore fortunate that the management mechanisms of the scheme were established and scheduled meetings of supervisors had become routine. Thus, the supervisors could regularly refine detailed plans. Because of the pooled talent, ranging across several departments and specialities, problems reported by one supervisor would often lead to helpful discussions and solutions. For example, procedures and techniques used by one supervisor could be adapted and used by other supervisors. The meetings, mainly used as an information exchange, increased my network of contacts.

Information distributed to and by the supervisors' group was often in electronic format.

\*Ribonucleic acid

I was therefore introduced to a set of electronic collaborative tools. For example, the apprentices are required to maintain an electronic logbook of their work. The application chosen for this was “Pebblepad”, a web-based system incorporating recording and editing tools. This “Personal Learning Environment” is used extensively within higher education and has been used for research projects funded by Jisc, a specialised organisation concerned with the implementation of technology in teaching and research. Apprentices could use the application to produce a record of their work in the form of an electronic diary. The electronic diary is capable of accepting digital pictures, including videos imported from social networking sites. In electronically documenting an apprentice's body of work, the application can be beneficial in the accreditation process to a professional body and in the continuing professional development (CPD) process. Importantly, it also allows supervisors access to inspect and comment upon apprentices' input. I was unaware of Pebblepad before I supervised apprentices, but now I have it at my disposal for purposes of my own choosing.



An example of an apprentice's electronic diary

Despite the network of support and technology available, much of a supervisor's role involves providing 'on the job' training. Initially, time must be allocated to allow the adequate demonstration and understanding of tasks. Time must also be allowed to observe, assess and, if necessary, help the apprentice performing the task. These activities, which may be perceived as time-consuming and unrewarding for a supervisor, may disincline some technicians from supervising apprentices. However, when one considers that an apprentice spends six months assigned to one department, the relatively small amount of time spent ensuring that a routine job is understood and can be well executed by the apprentice pays the supervisor well. Indeed, it was my observation that as knowledge and skill builds, a point is reached where many tasks can be divided, shared or worked on together. Thus, the apprentice not only becomes an asset to the department, but also becomes an asset to the supervisor in the daily work routine.

My experience of the one-to-one teaching of an apprentice was that of great flexibility for both student and teacher. The work environment was conducive to the identification of specific needs of the apprentice and so activities could become focussed on practicing particular skills or imparting required knowledge. A more conversational tone could be adopted than that of a classroom teacher, collaborative working could quickly become established (so introducing the benefits of team working) and the apprentice's performance could be easily assessed.

Being able to do a job is not the same as being able to explain how to do the job. A supervisor must be able to do both. The matter of how a job is executed and why must be clearly addressed to the initiate. Just like classroom teaching, one must be prepared to suspend a demonstration to answer questions or make it clear that questions will be answered later. However, one must also be prepared to suspend a demonstration because of the interruptions that a normal work environment readily provides. Unlike classroom teaching, one must often accept these breaks in the intended lesson as a normal part of work. Critically, so must the apprentice, for such things are part of the work experience. The daily interactions of the work place are part of an apprentice's education. Similarly, because the learning experience takes place in a work environment, it does not stop at a specified time the way a classroom lesson does. Much of the activity is dictated by genuine work requirements and so teaching methods must adapt and fit the situation. What course a supervisor takes at any particular time is a matter of judgement. "If education is to develop human nature so that it may attain the object of it's being it must involve the exercise of judgement." (Kant)<sup>8</sup>

Training an apprentice requires a combination of classical pedagogy and modern didactics and the approach required can be quite distinct from "classroom learning". Thus, a supervisor does not simply teach how to do a task, but also introduces the apprentice to people who can do the task and so the neophyte's list of contacts grows. A supervisor does not simply explain how to use a machine, but also explains how to refill the machine and what to do when the machine breaks. A supervisor does not simply say when to start working, but also explains what to do when an apprentice cannot make it into work. In this way, the apprentice is introduced to the administration and operations of an organisation. Consequently, the apprentice experiences the "workings" of a work place. To quote Kant once more, "the difference between a private teacher who merely instructs, and governor who guides and directs his pupil, is that one trains for school only, the other for life."<sup>9</sup>

Compared to an apprentice, a university graduate has a deeper, though narrower, depth of knowledge. The successfully qualified apprentice brings a wide breadth of knowledge and, significantly, an arsenal of instantly useable work-based skills. Because they have been imbedded in an organisation for two years, apprentices will have built a network of contacts and be familiar with the organisation of their employer. Unlike a graduate starting a new job, the apprentice will probably not have to be told how to sign for and collect a parcel, or many of the other activities that fall into the category of “orientation”. With a two-year practical education within the organisation, a newly qualified apprentice should hit the ground running.

Over ten years ago employers, educators and the government were aware that the UK’s competitiveness was adversely affected by an imbalance of skills in the workforce. A 2003 government report stated that the UK’s economic productivity and competitiveness were below those of competitor nations, partly due to employers not getting the recruits with the skills they wanted.<sup>10</sup> The report said that there were “serious gaps in our national skills base”<sup>11</sup> and specified “skills at apprenticeship, technician, higher craft and associate professional level”<sup>12</sup> as areas for concern. Four years after the report’s publication, The Queen’s speech in 2007<sup>13</sup> confirmed that the Government would accelerate apprenticeship legislation with the introduction of the Apprenticeships Bill.<sup>14</sup>

The government has stated that it plans to give all suitably qualified young people the right to an apprenticeship place.<sup>15</sup> Aware of the government’s legislation, financial constraints affecting the hiring of experienced technicians and the decline of technical talent due to their aging workforce, many employers have developed apprenticeship schemes.<sup>16</sup> Furthermore, many people look upon apprenticeship favourably. Of the 2110 people surveyed by a YouGov poll<sup>17</sup> in 2010, 84% of them thought that an apprenticeship was a good way to simultaneously “earn and learn”. A subsequent YouGov poll<sup>18</sup> showed that many parents, from all social backgrounds, actively seek an alternative to university for their children’s education, with almost half being positive about apprenticeships.

There are many motivations for educators. There are noble reasons concerning expanding and contributing to knowledge. Other, more prosaic reasons involve league tables and government targets. The government provides incentives for organisations to adopt apprenticeship schemes and the numbers of apprentices in the UK are likely to rise, regardless of troublesome red tape.<sup>19</sup> My experience was that worthwhile work could be produced from apprentices under my instruction that appeared to produce a sense of achievement from those involved.

However, through the whole process, and never far from conscious thought, was the message often displayed on the back of driving instructors’ cars, “Have patience, you were once a learner”.

To make any scheme successful requires more than government legislation. It also requires the co-operation and commitment of those involved. Because any structured learning experience is a two-way process, commitment is required from the apprentices and the technicians assigned the task of imparting their knowledge. Having supervised apprentices, it is gratifying to know that the benefits can flow both ways.

## Author

### Greg Nicholson MSc

Greg is a Controlled Environment Technician in the Department of Animal and Plant Sciences at The University of Sheffield. He works in the Sir David Read Controlled Environment Facility which is the culmination of a £0.4 million investment by the Joint Infrastructure fund and represents a world-leading climate controlled plant growth facility. Thirty-two individual units are independently able to simulate the majority of terrestrial environments from tropical to the Polar Regions as well as past and future global atmospheric environments including elevated and sub-ambient CO<sub>2</sub>. These revolutionary facilities provide the basis for Sheffield’s ground-breaking contributions to World food security research.

## References

- <sup>10</sup>Introduction: Apprenticeship, Calendar of the plea and memoranda rolls of the city of London: volume 2: 1364-138 (1929), pp. X -XLV I. [online] <http://www.britishtory.ac.uk/report.aspx&compid=36671> [Accessed: April 2014]
- <sup>11</sup>Legge, J. (189) , The Chinese Classics: Translated into English with Preliminary Essays and Explanatory Notes. Vol. 1. The Life and Teachings of Confucius. Second Edition. London: N Trübner & Co. author: Confucius. Translator: James Legge)
- <sup>12</sup>The Stonemasons The Men Who Built the University (1992) William E. King, Edited and updated June 2003 by Thomas Harkins [online] <http://library.duke.edu/rubenstein/uarchives/history/articles/stonemasons> [Accessed: April 2014]
- <sup>13</sup>ibid
- <sup>14</sup>HM Treasury The Government Response to the House of Lords Select Committee on Economic Affairs’ Fifth Report of Session 2006-07 on Apprenticeships p4 Crown copyright)
- <sup>15</sup>HM Treasury (2014), In defence of the university technician, The IST Journal, p9
- <sup>16</sup>ibid
- <sup>17</sup>Kant, I. (1900) Immanuel Kant über Pädagogik Translated as ‘Kant on Education’ D. C. Heath & Co
- <sup>18</sup>ibid
- <sup>19</sup>HM Treasury 21st Century Skills Realising Our Potential Individuals, Employers, Nation p11 Crown copyright)
- <sup>20</sup>ibid
- <sup>21</sup>ibid, p12
- <sup>22</sup>The Queen’s Speech to Parliament 2007 [online] <https://www.gov.uk/government/publications/the-queens-speech-to-parliament-november-2007> [Accessed March 2014]
- <sup>23</sup>HM Treasury Draft Apprenticeships Bill July 2008 Crown copyright)
- <sup>24</sup>HM Treasury The Government Response to the House of Lords Select Committee on Economic Affairs’ Fifth Report of Session 2006-07 on Apprenticeships p3 Crown copyright)
- <sup>25</sup>Employer information [online] <http://www.apprenticeships.org.uk/employers/stepsto-make-it-appen.aspx> [Accessed April 2014]
- <sup>26</sup>YouGov / Electrical Contractors’ Association Survey Results [online] <http://cdn.yougov.com/todayukim/Port/YES/Archives/100120.pdf> [accessed April 2014]
- <sup>27</sup>Ward, L., Shaw, C. and Wootton, P. (26 February 2014) Parents question value of university education, The Guardian p5
- <sup>28</sup>Segal, S. Apprenticeship reforms fail to solve problems with the system. [online] <http://www.theguardian.com/education/2014/mar/19/apprenticeship-funding-reformssmallbusinesses> [Accessed: April 2014]

# The brothers Gurr: purveyors of biological stains

Alan Gall and Derek Sayers

... you must be a fine sort of fellow: in fact something of a saint, which is a change for a member of the Gurr family; for your information, in case you may be interested, I am a bit of a heel: I beat my wife, I'm cruel to animals and children, and I swear and smoke and drink, and needless to say, I'm a very serious sort of bloke. (Edward Gurr to his cousin Albert George Gurr in a letter, undated but probably sometime between 1957 and 1963)



## Introduction

The demands of war extend far beyond the production of armaments and the means to deploy them. Britain soon found this out when the flow of scientific supplies from Germany ceased at the beginning of hostilities in 1914. One of the many areas affected by the shortages concerned the use of stains for histological work. Into the breach, so to speak, stepped George Gurr by developing replacements in a cellar on New King's Road, London. He later boasted that his Leishman and Giemsa stains were the first produced by any British manufacturer to give satisfactory results.

George brought his brother Edward into the business.<sup>1</sup> Sixteen years younger, Edward had ideas of his own and eventually a split resulted in the brothers trading separately, but courting the same customers. Those loyal to George maintained that Edward's versions of "Gurr" products were inferior, even if their higher prices suggested otherwise. In response to this turn of events George added the wording "No connexion with any other firm of similar name" to his advertisements. It must have been a source of great annoyance when he saw Edward's adverts appearing side by side with his own in the technical press.

Both brothers achieved a high standing in the profession. Both were admitted as Fellows of the Royal Institute of Chemistry. George became president of the British Association of Chemists, and Edward a well-known author in his field. Indeed, one of Edward's books received the endorsement of Sir Howard Florey, a significant figure in the story of penicillin.

The name of Gurr went on to reach a level of such world-wide renown that the brand has been continued to the present day, long after the demise of the original companies. Likewise with George's onetime employee, Raymond A Lamb, whose name is still linked to anatomical pathology products available from Fisher Scientific.

## A history of staining microscope slides

For many of us the use of a microscope and the stained slide are inseparable; from which one might have assumed, incorrectly, that the two developed at the same time. The indigo dye, from the *Indigofera* plant, was used by the ancient Egyptians for colouring cloth and possibly in paints. Interestingly, the Arabic word for indigo is annil hence the naming of the synthetic aniline dyes in the 19th century. Dyes used in Britain included woad from the plant *Isatis tinctoria* that the Ancient Britons used on their skin to appear more fearsome. It is said that Robin Hood and his men used the *Genista tinctoria* plant to produce Lincoln green colour for their clothing. Other early dyes include:

**Alizarin from the madder plant**

**Tyrian purple from shell fish**

**Saffron from the stamens of the crocus plant**

**Carmine or cochineal from beetles**

**Iodine from seaweed**

**Haematoxylin from logwood.**

The microscope has been around since the 17th century. In the early years it was used to view solid objects such as insects and minerals. Histological staining was rare prior to the 1850s. Robert Hooke may have been the first to describe the microscopic appearance of a stained object when he examined dyed hair and wool. However, Antonie van Leeuwenhoek, who developed the first commercial microscope, is credited with using saffron, to show contrasting muscle fibres circa 1714-1719. Sir John Hill in 1770 stained wood fibres using carmine (cochineal). The use of glass slides did not become common until the middle of the 19th century some 200 years after the invention of the microscope.

The universal “3 x 1 inch” slide did not become standard until after about 1880. Before this time other media, such as thin slivers of ivory, were used. The real advancement in tissue staining did not take place until fixation had been understood in the early 19th century. Before the 1850s only naturally occurring dyes were used, such as haematoxylin and carmine. Joseph von Gerlach used carmine on brain tissue and reported that it stained the nucleus and not the cytoplasm or intercellular substance.

Haematoxylin was first discovered by the Spanish in Yucatán, Central America, in 1502 and was used for dying fabric. Haematoxylin is extracted from *Haematoxylon campechianum* and is now exported from the West Indies. The amount used in histology is very small in quantity and it is said that in the 1970s a ship carrying the total supply for Europe sank<sup>2</sup> and this very common dye was going to become impossible to buy. During this time Derek Sayers experimented with the use of blackberries and Berberis berries which become a similar colour to haematoxylin preparations when ripened (unpublished work). Making up berry preparations using Ehrlich's or Cole's haematoxylin formulae produces very similar nuclear results. As the demise of haematoxylin never materialised this interesting result was never used routinely.

### Synthetic dyes

Perhaps the most significant event in the history of staining was in 1856 when Henry Perkin discovered how to prepare synthetic dyes.<sup>3</sup> The manufacture of these dyestuffs for the clothing, print and paint industries made the use of natural dyes, which in many cases were less permanent, virtually obsolete. It was not until the 1860s that people like F.W.B. Benke and Joseph Janaviev Woodward in the USA began using these synthetic aniline dyes for staining tissue. The Swiss chemist Friedrich Miescher in 1869 used aniline dyes to examine the cell nuclei and in 1875 Carl Weigert, cousin to Paul Ehrlich of haematoxylin fame, demonstrated the use of methyl violet, a fuchsine derivative, for staining bacteria as opposed to tissue. The first use of haematoxylin with eosin, i.e. the use of an acidic dye and a basic dye as a standard morphological staining method for tissues, has been credited to Renaut in 1876 and Busch in 1876-8. Renaut certainly first used the haematoxylin/glycerine technique but it was probably Busch in 1877 who used the method for demonstrating ossification.<sup>4</sup>

### Commercial suppliers of histological dyes

Before William Henry Perkin, at the age of 18 discovered the aniline dye he had been studying chemistry in London under Professor August Wilhelm Hofmann.<sup>5</sup> When he discovered this purple dye, which he called “Mauveine” or “Mauve”, he took a sample to his tutor and asked whether he should go ahead and market it. He was advised by Hofmann to proceed with his academic studies and not get involved in the commercial world.

He did not follow this advice; in fact not long after Perkin opened his successful factory in Greenford, Middlesex, Hofmann left England to take up a chair in chemistry at Berlin and help promote the German dyestuff industry. Apart from his academic work on organic reactions, Hofmann discovered and patented a number of dyes.

By the 1870s Perkin realised that his site in Greenford and his production of the new alizarin dyes could not compete with the Germans. There were a number of factors involved such as pollution issues caused by a lack of drainage, and the shortage of space for necessary expansion. Rather than undertake a wholesale removal to a new location, Perkin negotiated a sale of the business to Brooke, Simpson & Spiller in 1873. After two years of operation, during which time there were unhappy exchanges between Perkin and the new owners (but that's another story), the Greenford works was sold on again to Burt, Boulton & Heywood. Other British firms started production but Germany surged ahead to become the main supplier of dyes. The remnants of Perkin's original venture eventually ended up under Imperial Chemical Industries (ICI) via the British Alizarin Company. What little remained of ICI after various divestments was finally taken over by Akzo Nobel on 2 January 2008.

In 1880 Dr G. Grüber started a Company in Leipzig, Germany to supply the needs of biologists. He soon developed a reputation for excellence. It must be remembered that whereas the clothing, print and paint industries use dyes by the “sack full” daily, histologists only use a thimbleful perhaps monthly of any particular stain. Hence to make dyes for biologists is not cost effective. Usually what happened was that histology stain suppliers would buy, histologically speaking, a large amount (perhaps a sack full) that would last for maybe 10 years or more. Therefore the supplier, for example Grüber, G. T. Gurr, E. Gurr or Raymond A. Lamb, could guarantee that the dye supplied was the same as the previous order as it probably came from the same batch (sack). Histologists often would stipulate the name of the supplier as they were sure that particular source of the dye would work. Generally the suppliers did not purify the dyes they provided. Alcian blue for example contained a 50% acid impurity. Purifying the dye did not improve its performance. In fact a buffer had to be added to stop it precipitating! Suppliers would generally rely on the histologist to report in the first place about the suitability of the dye.

Grüber was the main supplier until in 1906 another German Company was formed by Dr Hollborn. The two Companies successfully marketed most of the world's histological dyes. Chroma Gesellschaft-Schmid GmbH became the successor of the Grüber Company. During the First World War in 1914 buying from Germany was stopped, so British and American Companies stepped in to fill the gap.

The experience of Dr Donald Montemurro as a young research worker illustrates the problems that could arise in achieving consistent results from a given stain.

From 1958 to 1960 I was a postdoctoral fellow of the British Empire Cancer Campaign studying at the Chester Beatty Institute, Royal Cancer Hospital, London, England. I was at that time interested in the functions of the pituitary gland and the hypothalamus directly above.

I was staining pituitary glands with a variety of stains to identify the many pituitary cell types and the hormones they produced. One such stain was (if memory serves me) aniline blue which stained selectively those cells responsible for the production of Growth hormone. Not all batches of the stain worked, and I had to go to the Gurr factory [George T. Gurr Ltd], which I believe was in Fulham or Putney, to obtain several batches each with different batch numbers to finally find a batch that worked.



Images courtesy of Rebecca Porter



Advertisement displaying the trade name "Gurr's" registered in 1950 (Journal of Science Technology, April-June 1965)

The Gurr catalogues (Edward Gurr Ltd 1961, George T. Gurr Ltd 1962) are interesting to compare. Whereas the section on dry stains in the GTG catalogue gives the internationally

recognisable Colour Index numbers, introduced by the Society of Dyers and Colourists in a publication of 1922, Edward Gurr lists only his own "Michrome numbers". Thus, for example, Congo red is Michrome number 400, and under the Colour Index it is 370 (1st edition).

Some histologists were convinced that Edward Gurr renamed or mixed dyes and sold them at inflated prices (for typical prices in the early 1960s see the comparison chart in the appendix). Rhodanile blue was an Edward Gurr product that according to his patent of 1967 was a compound dye formed by the reaction of rhodamine B with Nile blue.<sup>6</sup> However, in action it appeared to be just a mixture of the two components.<sup>7</sup>

There were also grounds for suspecting that Edward diluted his immersion oil with xylol, judging by reports of damage to objective lenses on microscopes. Particularly affected were the objectives on Watson microscopes, which could not be repaired.<sup>8</sup>

Another problem facing histologists, although they are often not aware of it, is that commercial suppliers will cease manufacturing dyes if the colour has become unpopular or if a better process to produce a similar colour can be found. The modified or replacement dye will probably produce completely different results histologically. Suppliers like Grubler etc, would keep a "close eye" on this and if a dye was going to be or had been discontinued they would then buy up unused stocks from firms in the clothing, paint and print trades. Derek Sayers contacted Raymond Lamb when he heard that alcian blue was to be discontinued, only to be assured that enough dye had been bought up to maintain supplies to histologists for the next 20 years!

### A tragedy in the Gurr family

The brothers' grandfather was one of many Gurrs to be called George. A newlywed of little more than three weeks, he departed from Plymouth on a voyage to Australia, accompanied by his wife Mary Ann. They arrived in Melbourne on 6th March 1860 after nearly three months at sea. Perhaps the hope of a better life in Australia didn't live up to expectations. Whatever the reason, it was eventually homeward bound for the Gurrs; but before returning to England, Mary Ann gave birth to Annie Collins Gurr (25 March 1861), William Stanton Collins Gurr (27 January 1863) and Thomas Blown Collins Gurr (20 August 1864). William would become the father of our George and Edward.

Grandfather George, whose profession was listed as a cashier while in Australia, took on the running of The Elephants Head public house at Hook Green, not far from Lamberhurst, afterwards finding work as an office clerk. At the beginning of 1876 the family moved to Leicester and sometime around 1892 George secured a position with accountants Steeds & Wright, becoming head clerk. By this time, many of the children had either died or left home. Mary Ann and daughter Annie both became invalids, a financial burden that George found increasingly onerous. Profound depression set in and he ended his life by hanging himself in the toilets at the local Conservative club. There must have been some indecision about the exact means of suicide since his pocket contained a bottle labelled poison. Also found was a sad note that ended:

"I thank all in the office for their general courtesy and kindness, and ask them to forgive and forget my shortcomings towards them".

## Edward and George

William Stanton Collins Gurr earned a living from his occupation as a shoe clicker. This was a skilled job cutting out shapes from a leather sheet for the manufacture of boots and shoes. The sound made during this operation gave rise to the term “clicking”. His wife Violetta ran a business selling boots (perhaps the fruits of William’s labours) and hosiery. All their children were born in Leicester: George early in 1910 and Edward on 3 October 1905.

The 1911 census lists the dependents of William and Violetta: daughters Annie, Connie (Katie Constance), Nellie (actually Rosie Mary), and Violet; sons George, William and Edward. Also recorded is Annie’s illegitimate daughter, Edna. The profession of 22-year-old George is given as warehouseman for a wholesale chemist, presumably at a location not far from the house in Upper Kent Road, Leicester. Edward was then aged five.

Edward began his professional life probably as a laboratory assistant at Hopkin & Williams Ltd, a chemical manufacturer founded in 1870. This was in the early 1920s, before Hopkin & Williams became a subsidiary of the major laboratory supply house Baird & Tatlock (London) Ltd.<sup>9</sup> At the time, H & W had offices on Cross Street, London EC1 and the Lavender Mount Works at Ilford. Both of the Gurr businesses would later come under the direction of this firm as part of the Baird & Tatlock group.

In 1930, Edward married Florence Phoebe Gruner and she would later join her husband’s new enterprise as a director. Although Edward wrote in the introduction to one of his books “I wish to express my thanks to Mrs. F. P. Gurr, BSc”, around the house he called her “Babs”.

George married later than his brother, in 1934 to Winifred Muriel Nash and they went to live in New Malden, only a short train journey away from London. If George was a golf fanatic, he would have been in seventh heaven. Within walking distance were three golf clubs: the Malden, Coombe Wood and Coombe Hill courses.<sup>10</sup>

## George T. Gurr

**To obtain a really good microscopic picture is an art and joy and only accomplished by the utmost care in the preparation of stains, and attention to the purity or suitability of reagents.**

George T. Gurr, in *Biological Staining Methods*, 6th Edition, 1957)

George’s sales literature always claimed that his business had been founded in 1915 and that its first specialised laboratory opened in 1919. How he made the leap from a warehouseman in Leicester to a biological stain specialist in London still needs to be established. Indications are that his first formulations were prepared in very small premises at 121A New

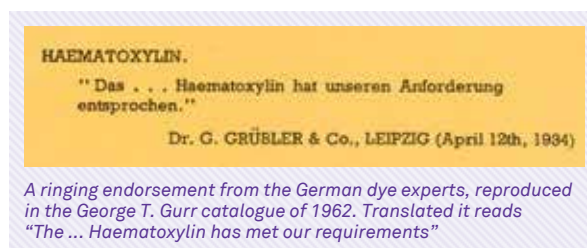
Kings Road, where he advertised himself as a technical chemist. In the early 1920s he moved about half a mile further down New Kings Road to number 136. Over the years adjacent buildings were added until he occupied 138, 140, 142, 144 and the rear of 136.



An ideal project for scientifically-minded hobbyists in the 1920s was the construction of crystal radio sets. Good results could be obtained with little more

than headphones, a tuning coil, an aerial and a crystal, without the need of any extra power source. Radios were known as “wireless listening-in sets” when George Gurr started to acquire an interest. The crystal detector worked in conjunction with a fine pointed wire (the so-called “cat’s whisker”), acting as a semiconductor diode. The crystal was often a piece of galena (a mineral form of lead sulphide) or pyrite (mineral form of FeS<sub>2</sub>). George found that if he crushed a suitable crystalline material and formed it in a press, the resulting tablet performed well in a radio. The *Nottingham Evening Post* of 6 October 1923 reported George as saying: “The virtues of the tablet are that it is simple to mount, cheaper to produce, gives complete contact, and can be replaced in exactly the same size.” The report also refers to the idea as “just patented”. However, no record of this has been found.

One thing that George Gurr definitely did seek a patent for is a trouser press. In 1925 he made an application for “Improvements in and relating to presses and stretchers for trousers, ties and other wearing apparel”. The device consisted of a wooden tube split in two, the two halves being moveable in the radial direction using a screw mechanism. The item of clothing was wrapped around the tube and the tube halves forced apart to give the pressing/stretching action. George must have had second thoughts as the patent was not granted because he didn’t pay the sealing fee required by the Patent Office.



In 1940 George supported Edward’s application to become a fellow of the Chemical Society.

The following year George became a Fellow of the Royal Institute of Great Britain and Ireland and in 1945 received the Hinchley Medal, awarded by the British Association of Chemists (BAC).

On 24 Feb 1955 nearly 500 people attended an exhibition of laboratory apparatus organised by the BAC and held at the College of Technology, Liverpool. The weather conditions were reported as appalling, with the unwelcome disruption of a local railway strike. Recently elected as President of the BAC, George T. Gurr gave an address praising the efforts made to organise "provincial exhibitions" and the value to local industry. The Liverpool section of the BAC was active in running trade exhibitions, generally hosted at universities or colleges.



At the end of 1955 George presided over a BAC meeting at New Brighton where it was suggested that special publicity might be given to the national shortage of chemists. The proposal did not receive enough support because: "... as a trade union its [the BAC] duty lies in the interests of its members, which might be threatened if supply should one day exceed demand."<sup>11</sup>

George T. Gurr Ltd acted as the UK agent for an American manufacturer called The Sigma Chemical Company, St. Louis, suppliers of organic compounds for research and testing in biological laboratories. The range included and still does amino acids, enzymes, nucleotides and histochemicals.

Managing the day-to-day running of Gurrs was Norman Arthur Virgo who left when Sigma decided to set up an operation in about 1963 to look after UK sales. Norman became a director of Sigma London Chemical Company and a driving force behind its success.

The Sigma London biochemical and organic compounds catalogue of 1967 makes the startling claim:

**Although many of us work over 80 hours per week, it is against our rules to go home while a shippable order is unshipped. Your orders must be shipped within hours ... Wherever you are in the world, you are invited to telephone us (at our expense, of course) when you want information or reagents.**

Norman Virgo even initiated phone calls to his home during holidays and at night. Service indeed!



**SIGMA**  
Biochemicals  
Organic Compounds  
for Research  
Clinical Reagents



**Nucleotides & Bases  
Enzymes  
Steroids  
Carbohydrates**

The Sigma Chemical Co.  
St. Louis, Missouri, U.S.A.  
Please request lists from  
U.K. Agents  
**George T. Gurr Ltd.**

*Norman Arthur Virgo  
(Sigma London Chemical  
Company Ltd catalogue 1967)*

*The agency was lost  
when Sigma set up a UK  
branch headed by Gurr's  
ex-manager Norman  
Virgo (George T. Gurr  
catalogue 1962)*

After Norman left to spend the rest of his working life (and some of his holidays) with Sigma, the management of Gurrs fell to Raymond A. Lamb. Raymond had worked as a laboratory technician at Edgware General Hospital joining George as a medical representative in the 1950s. His role as manager lasted only a few years. In 1964 Raymond left to set up a venture dealing in histological products, in partnership with his wife Pauline. It was initially operated on a small scale and for some time they were able to work from home. There, they developed an innovative embedding wax supplied in pellet form. Raymond's daughter Sarah says:

**Dad was highly respected, enormously liked and very much trusted in the industry and knew everyone in his field. Therefore, as soon as Raymond A. Lamb launched 'Fibrowax' in the Spring of 1964 and sent out samples for evaluation, the take up was incredible and indeed pretty instant. Dad only needed to poke his head around a hospital laboratory and a new customer would be on board immediately!**




*Early days. The address given is the home of the Lamb family  
(Journal of Science Technology, October-December 1964)*

A few years later they were in a position to take on premises, moving to 12 The Viaduct, off Ealing Road, Alperton. The building was actually under the viaduct arches, near to Alperton Station and a ten minute stroll along Ealing Road from Giffin & George's HQ and main distribution centre for laboratory supplies.

As time went by, and the product range expanded by the addition of factored and manufactured items, successively larger premises were needed.

The Raymond A. Lamb catalogue of July 1968 caused ructions. Someone at George T. Gurr Ltd, by then part of the Derbyshire Stone group,



Pauline and Raymond Lamb  
(courtesy of the Lamb family)

soon spotted that some of the artwork was very similar to that used by Gurrs. An injunction for infringement of copyright followed, forcing Ray to recall the catalogues already sent out. A new version was duly prepared and distributed to customers.

Raymond Lamb died in 1988, leaving his wife and daughter to run the business. After several changes of address the firm made its final move to Eastbourne in 1999 where Sarah Lamb Hughes and Tom Hughes continued until 2008. The company was then sold to Thermo Shandon Ltd, part of the Thermo Fisher Scientific group. With members of the Raymond A. Lamb staff, Tom went on to form Pyramid Innovations Ltd, offering a range of stains and equipment.

Electrothermal Engineering Ltd supplied George T. Gurr Ltd with histology baths and accessories. Stan Miller, who worked as a sales representative for Electrothermal in the 1960s, made visits that spanned the time over which Raymond Lamb replaced Norman Virgo and a Mr A. W. Barrell succeeded Virgo. Stan also called on Raymond A. Lamb Ltd after they moved to Sunbeam Road, Park Royal, in London.

A. Gallenkamp & Co Ltd was another provider of apparatus to Gurrs. Doug Cutts worked in sales at Gallenkamp and says:

**I used to supply George T. Gurr with lab equipment. Also I pulled them up sharp about their adherence to out of date practices by using Canada balsam as a mounting medium, telling them that I had a boxful of their slides which had gone bright yellow! And in this age of synthetic mounting media which remained crystal clear. Great consternation and a quick change to better products!**

### Derbyshire Stone

Baird & Tatlock (London) Ltd started as a partnership between Hugh Harper Baird and John Tatlock in 18 at Sauchiehall Street, Glasgow. Like the Gurr brothers, the two parted company. Hugh Baird moved south to form what would become Baird & Tatlock (London) Ltd (commonly referred to as BTL) and John Tatlock stayed in Scotland.

Since both firms traded as Baird & Tatlock initially, some customers were inevitably confused. This led BTL to state "No connection with any other firm" in advertisements, again a similar situation to



Sahli haemoglobinometer  
(George T. Gurr Ltd catalogue 1962)

George & Edward's. The problem resolved itself when the "Scottish" Baird & Tatlock changed name to Giffin & Tatlock Ltd.<sup>12</sup>

BTL had been expanding steadily by acquiring Hopkin & Williams (in 1929), Revector Dye Company (1930) and W. B. Nicholson (Scientific Instruments) (1943). Derbyshire Stone, a group with interests in quarrying, decided to move into laboratory supply by adding BTL to its portfolio. This was further bolstered in the UK by purchasing C. F. Palmer (London) Ltd, a well-known name in physiological apparatus, in 1964.

1966 saw both the death of George Thomas Gurr and the sale of his business. Derbyshire Stone reported that the group had paid £33,625, a part of which covered the purchase of Swansea based laboratory furnishers T. Dryden Ltd.

### The move to Colindale

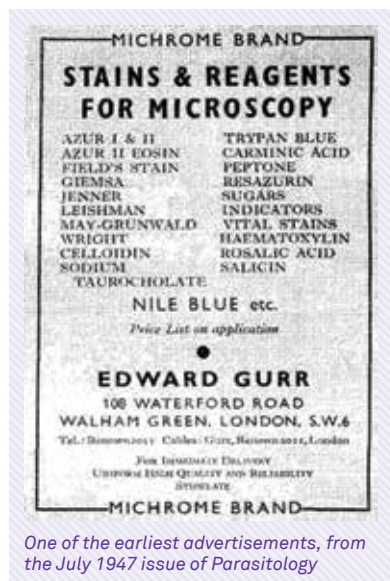
Shortly after George T. Gurr Ltd joined the Baird & Tatlock division, stain manufacturing facilities and a new home were set up at Carlisle Road, Colindale, in the NW9 district of London. The *Chemist & Druggist* of 3 February 1968 reported on the move, although a new manager, Reginald Edward Silverton, had been appointed and was already in place at Colindale by early 1967. R. E. Silverton had left his previous employment at the Pneumoconiosis Research Unit, Llandough Hospital, Penarth, South Wales at the beginning of that year. A Fellow of the Institute of Medical Laboratory Technology,<sup>13</sup> he had a number of publications to his credit. Co-authored with Francis Joseph Baker and Eveline D. Luckcock, *An Introduction to Medical Laboratory Technology* came out in 1955 and had reached the 4th edition by 1966. It went on to reach the 7th edition in 1998 under the title *Baker and Silverton's Introduction to Medical Laboratory Technology*. Second-hand copies are currently being offered for around £150 - £250 on the Internet!

George T. Gurr Ltd had little time to settle in before another shuffle occurred. In 1968 Derbyshire Stone joined forces with Tarmac and William Briggs to form Tarmac Derby and the following year sold the Baird & Tatlock division to American pharmaceutical giant G.D. Searle & Co. Gurrs now moved to the HQ of the

division at Chadwell Heath, in Essex, where it came under Hopkin & Williams. C. F. Palmer (London) Ltd, still an independent subsidiary of the BTL group, moved into the Carlisle Road premises at Colindale.

### Edward Gurr

Following Edward's decision to be his own boss he established a base of operations at 108 Waterford Road, Walham Green, less than a mile further up Kings Road from George's place. This must have happened by 1947 since



One of the earliest advertisements, from the July 1947 issue of *Parasitology*

advertisements started to appear in such journals as *Parasitology* (July 1947). Edward used the brand name Michrome, which he registered as a trade name with the B.P. Patent Office. He also named his premises the "Michrome Laboratories". Later in 1947 Edward Gurr Ltd was incorporated.

Edward's Michrome biological stains gained sales rapidly enough to warrant a move to bigger premises and towards the end of 1950 Edward Gurr Ltd advised customers that additional and larger premises had been acquired at 42 Upper Richmond Road West, Ealing, London W.4. The new address was effective from 1 January 1951.



Edward Gurr in his laboratory (Edward Gurr, *A Practical Manual of Medical & Biological Staining Techniques*, 1953)

L.G. E. Bell reviewed Edward's *Methods of Analytical Histology and Histochemistry* for the *Journal of the Royal Institute of Chemistry* in 1959, taking exception to the use of the word "histochemical" in the book.

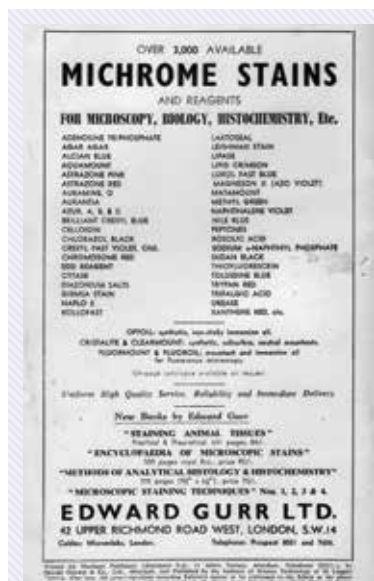
Histochemistry is a rigorous discipline of analytical biochemistry ... Histological staining methods are very useful to the experienced worker but it does not advance knowledge to label such methods as histochemical.

And went on to carp:

The price of a leaf of this book is approximately 5d., and it seems an unnecessary expense to use such large structural formulae that two sides are taken to illustrate one procedure ... The structural formulae in the book do not in my opinion enhance its usefulness.<sup>14</sup>

However, Edward did receive praise from no less a figure than Sir Howard Florey<sup>15</sup> in a foreword to his *Staining, Practical & Theoretical* (1962):

Mr. EDWARD GURR is known to many histologists and cytologists for the excellent reagents he produces and for his unfailing courtesy and helpfulness in dealing with the questions put to him about stains and staining methods. He has for many years made a study of the chemistry of dyes, and at the same time he has extensively studied their histological applications on which he has written a number of successful books.



Advertisement from the *Journal of Science Technology* 1963

At some point in the 1950s, Edward began a close association with Irish professor of anatomy Michael Aloysius MacConaill, collaborating on subjects of mutual interest. In a joint paper for the Royal Microscopical Society, Edward is described as "Honorary Research Assistant in Anatomy,

University College Cork". The paper introduces what the authors call falgic acids.<sup>16</sup> Histologists already used compound dyes for certain applications, formed by the combination of a basic dye with an acid dye, whereas the falgic acids were prepared from two acid dyes.

Edward went on to complete a PhD at University College Cork, awarded on 16 January 1962 after presentation of a thesis entitled “The structure and interactions of certain histological dyes and their use with formalin fixed preparations”.

He subsequently gave the College an endowment to make an annual award for medical and dental students showing high merit in the histology section of the examinations. The first Edward Gurr Prize was awarded in 1986 and has continued to the present day.



Edward Gurr  
(from the website  
of University  
College Cork,  
describing the  
Edward Gurr  
Prize, courtesy  
of Bereniece  
Riedewald)

While George concentrated on revising his modest *Biological Staining Methods*, seeing it reach the 7th edition before his death, Edward wrote a number of hefty tomes. His 1960 compendium *Encyclopaedia of Microscopic Stains* had 498 pages, *Staining Animal Tissues, Practical and Theoretical* (1962) covered 631 pages, and *Synthetic Dyes in Biology, Medicine and Chemistry* of 1971 weighed in with 807 pages.

Edward evidently enjoyed travel. Apart from his trips over to Ireland, he found time for missions further abroad. According to *The Chemist and Druggist* of September 1951: “Edward Gurr...is setting out during the week ending Sept 15 on a business tour of France, Switzerland, Italy, Spain and Portugal.

In 1959: “Mr Edward Gurr, *Fellow*, has recently returned from a tour of South-East Europe during which he spent some time in Turkey studying the chemical industry there.”<sup>17</sup> Three years later: “Mr Edward Gurr... has recently returned from Rumania where he visited hospital and university laboratories and other state organisations concerned with medical and biological research and teaching.”<sup>18</sup>

### Gurrs reunited

As the 1970s began, Edward Gurr Ltd was approaching the end of its existence as an independent entity.

In 1972 the business moved, transferring the name “Mochrome Laboratories”, to a building on an industrial estate at High Wycombe, Buckinghamshire. This new location, on Coronation Road, was also the recent home of J. G. Franklin & Sons Ltd, manufacturers of rubber hospital supplies and a subsidiary of G. D. Searle & Co Ltd since 1968. Soon after, Edward found himself working for Searle Diagnostic as part of the “Gurr Stains and Dyes Division”.

Meanwhile, there had been a devastating fire at BTL’s Chadwell Heath site. Searle employee Michael Affries saw the destruction a few months afterwards.

The fire was in Freshwater Road and happened on a Saturday afternoon in August 1973 [11th]. It was massive but did not destroy the whole site. The offices and some warehousing survived. I was sent there in November 1973 to help sort out the accounts. By December 1974 the warehouse had been rebuilt and I was due to return to High Wycombe but on New Years Eve 1974 I was summoned back to Chadwell Heath as another fire had destroyed the Inflammables Warehouse right next to the railway tracks. This was immediately suspected as arson as someone had been seen from across the railway tracks setting the fire ablaze. A while later an employee of BTL attempted suicide and on questioning by the police admitted to starting both fires.

This was not the first substantial fire at Chadwell Heath since the opening of the site in 1951. The entire stock of Difco culture media went up in smoke during June 1962. A rush order by telephone to Difco Laboratories in Detroit resulted in about 1½ tons of replacements arriving at London airport the following day.<sup>19</sup>

Gurr products were despatched from Chadwell Heath but the fire in 1973 mainly destroyed instruments and did not spread to the part used by Hopkin & Williams. It is not clear exactly when the remains of George T. Gurr merged with Edward’s in High Wycombe, although before the end of 1973 both “G. T. Gurr” and “E. Gurr” were listed in the local telephone directory at Coronation Road with J. G. Franklin & Sons Ltd. The combined operation became the Gurr stains & dyes division of Searle Diagnostic.<sup>20</sup>

The activities of G. D. Searle & Co Ltd at High Wycombe were split into several divisions. In the mid-1970s these included:

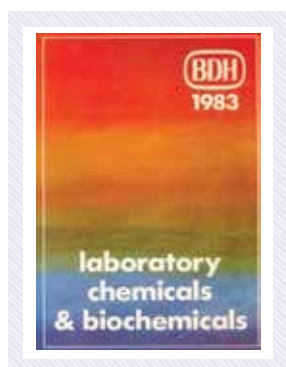
Searle Analytical on Lincoln Road, specialising in nuclear laboratory instrumentation.  
Searle Diagnostic. Head office at Lane End Road and production at Coronation Road.  
Searle Instruments, Lincoln Road, manufacturing chemical and clinical analysis instrumentation.  
Searle Laboratories, Lane End Road.  
Searle Medical and Surgical Products Division, Coronation Road.  
Searle Radiographics, Lincoln Road, manufacturing nuclear imaging instrumentation.

Searle’s main buildings were on either side of Hillbottom Road, one of them with an entrance on Lane End Road that was used as the address for both.

Andrew Coleman, who started in the chemical development department on Hillbottom Road in 1972, recalls that George T. Gurrs occupied part of the working area.

We had a number of laboratories as well as the plant area with 300, 200 and 50 gallon vessels for chemical preparation. Gurrs had one corner of the plant and a small store room/office and the man in charge when I was there was a guy called Ken Copplestone. Gurrs were only there for the first couple of years of my time there and then they moved out.

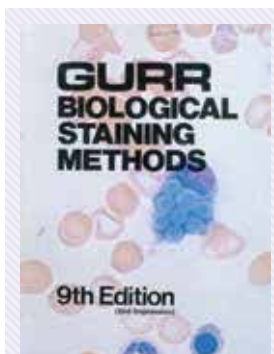
Under Searle Diagnostic, Edward Gurr revised George's *Biological Staining Methods*. This appeared as the 8th edition in 1973. Edward also made a major contribution to *The Chemistry of Synthetic Dyes* volume 7 (1974), edited by K. Venkatataraman. This period saw George T. Gurr Ltd officially dissolved in 1974, and Edward Gurr Ltd in 1975. Hopkin & Williams retained the rights to the trade names "Gurr's" (from George T. Gurr Ltd) and Michrome (from Edward Gurr Ltd).



British Drug Houses and Hopkin & Williams, although separate commercial organisations, co-operated to establish AnalaR (Analytical Reagent) as a brand name for chemicals of a higher purity than the standard laboratory range.<sup>21</sup> The scene was now set for them to combine as part of the E. Merck group of companies. When Merck bought the Baird & Tatlock division from Searle in 1978, it had owned British Drug Houses for five years. The responsibility for the Gurr range of stains and microscopy materials moved to the newly created BDH Chemicals Ltd, with Hopkin & Williams looking after bulk chemical supplies to industry. One of the last acts of Hopkin & Williams as the parent was to issue the 2nd impression of the 9th edition (1980) of *Gurr Biological Staining Methods*, containing the following prediction:

Today biological staining is having to face one of its greatest challenges, a shortage of dyes, even more serious than the '1973 Haematoxyline famine'. Some of the best known dyes are now no longer available from traditional sources. The most important reason for this, apart from obsolescence as textile dyestuffs, is that a growing number of dyes and their precursors are now listed as suspected carcinogens. Modern legislation makes even the small scale laboratory production of these unlikely. It can only be a matter of time before many traditional stains disappear from suppliers' catalogues forever.

After consolidation of the constituent parts of BDH under Merck Ltd in 1991, production at BDH's Poole factory, first started in 1947, was gradually transferred a few years later to Germany. Still on the takeover trail, Merck acquired American company **VW** and formed **VW** International Ltd in 2002, relinquishing control



The last edition, after nearly 50 years of publication

Muriel died in 1993 she left over a million pounds. Some of this went to the New Victoria Hospital at Kingston upon Thames and some to the YMCA in Leicester.

Edward outlived his brother by nearly 30 years, passing away in 1995.

### Acknowledgements

Thanks to: **David Gurr** for genealogical information and a copy of the letter from Edward Gurr to his cousin. **Stan Miller** for his always accurate recollections of visits to laboratory suppliers in the 1960s and 1970s. **Bereniece Riedewald**, Senior Technical Officer, Department of Anatomy and Neuroscience, University College Cork, for the picture of Edward Gurr in connection with the Edward Gurr Prize.

The following helped with reminiscences

and/or information: **David Allen**, Library Collections Coordinator, The Royal Society of Chemistry.

**Andrew Coleman**, ex-Searle Diagnostics.

**Doug Cutts**, ex-A. Gallenkamp & Co Ltd.

**Miriam Dorgan**, Senior Executive Assistant, Department of Anatomy and Neuroscience, University College Cork.

**Sarah Lamb Hughes**, ex-director of Raymond A. Lamb Ltd.

**Tom Hughes**, Pyramid Innovation Ltd.

**Michael Jeffries**, ex-G. D. Searle & Co Ltd, High Wycombe.

**Alan Johnson**, Chadwell Heath Historical Society.

**John Kiernan**, Professor Emeritus, Department of Anatomy and Cell Biology, University of Western Ontario, Canada.

**Ann Lamb**, relative of Raymond Lamb.

**Pauline Lamb**, ex-director of Raymond A. Lamb Ltd.

**Victoria Masters**, Royal Microscopical Society, Oxford.

**Donald G. Montemurro**, retired professor of the Department of Anatomy and Cell Biology, University of Western Ontario, Canada.

**Rebecca Porter**, Laboratory Manager, Institute of Orthopaedics and Musculoskeletal Science, Stanmore, Middlesex.

**Michael Ruth**, ex-Sigma London Chemical Company Ltd.

Thanks to Dr John Kiernan for checking the manuscript. SDA Electronics Ltd, Salford funded the research costs.

just two years later to an investment firm, Clayton Dubillier & Rice. **VW** International Ltd is now owned by Madison Dearborn Partners LLC. Based at Magna Park, in Lutterworth, **VW** still offers stains under the brand name **Gurr**.

As a possible measure of the success of George's business, when his wife

## Appendix

A comparison of prices for randomly selected dry stains from the major British suppliers. Prices are pre-decimalisation, in the format "shillings/old pence".

Using the Historic Inflation Calculator on [www.thisismoney.co.uk](http://www.thisismoney.co.uk), one shilling (1/0) in 1962 equates to 93p in 2012. Roughly, the buying power of each shilling at the beginning of the 1960s is equivalent to £1 today.

Stain		British Drug Houses 1963	Flatters & Garnett 1963	T. Gerrard 1961	Edward Gurr 1961	G. T. Gurr 1962
Aniline blue (water soluble)	10g 25g	4/0 6/6	2/6 5/0	3/0 6/0	5/0 10/0	3/0 6/0
Haematoxylin	10g 25g	7/3 14/6	6/6 13/6	5/6 11/0	7/6 15/0	6/6 13/6
Leishman's	10g 25g	7/3 15/0	6/6 13/6	5/6 12/6	10/0 20/0	6/6 13/6
Methyl violet (6 B)	10g 25g	4/0 6/6	2/6 5/0	2/6 5/0	5/0 10/0	3/0 6/0
Orange G	10g 25g	4/9 8 9	2/6 5/0	2/6 5/0	5/0 10/0	3/6 7/0
Sudan III	10g 25g	4/6 7/9	3/0 7/0	3/0 6/0	7/6 15/0	3/6 7/0
Trypan blue	10g 25g	5/9 11/0	3/6 7/0	3/6 7/0	7/6 15/0	5/6 11/0

### Sources for the above

Laboratory Chemicals Catalogue, March 1963, The British Drug Houses Ltd, Poole, Dorset.  
Stains, Chemicals and Reagents, Catalogue S8 March 1963, Flatters & Garnett Ltd, 309 Oxford Road, Manchester 13.  
Biological Stains, Chemicals and Reagents Catalogue, October 1961, T. Gerrard & Co Ltd, 464 Pentonville Road, London N1.  
Mochrome Stains for Microscopy, Universal Catalogue 1961, Edward Gurr Ltd, 42 Upper Richmond Road West, London SW14.  
Gurr's Biological Stains and Reagents, Price List H, 1962, George T. Gurr Ltd, 136/140 New Kings Road, London SW6.

### Bibliography

Cole, H. C., "Tinctorial Methods in Histology", Journal of Clinical Pathology, 50 (1996), 716-720.  
A. R. FIELD, Simon, Mauve: How the Man Invented a Colour that Changed the World London: Faber & Faber, 2000).  
R. Edward, A Practical Manual of Medical and Biological Staining Techniques, 2nd edition; New York: Interscience Publishers, 1956).  
R. Edward, Staining, Practical and Theoretical Baltimore: Williams & Wilkins, 1962).  
R. George T., Biological Staining Methods 6th edition; London: George T. Gurr Ltd, 1957).  
R. George T., Biological Staining Methods 9th edition; Chadwell Heath: Hopkin Williams, 1979).  
KIRMAN, N. D., "Classification and Naming of Dyes, Stains and Fluorochromes", Biotechnic & Histochemistry, 76/56 (2001), 261-277.  
KELMAN, Wolf D., "Natural and Synthetic Dyes in Histology", [web document] 2008, <[http://www.immunologylaboratory.com/cellmarkerfiles/IEL\\_reagents07.pdf](http://www.immunologylaboratory.com/cellmarkerfiles/IEL_reagents07.pdf)>, accessed 26 March 2014.

References to other sources are contained in the notes and the text. Catalogues consulted are as listed in the appendix.

### Notes

<sup>1</sup>An obituary of Edward Gurr in Chemistry in Britain (1996) states that he joined George Gurr's business in 1942. This is incorrect since in Edward's application for fellowship of the Chemical Society two years earlier he gave his profession as "Manager, George T. Gurr Laboratories". Gordon Fenn, in answer to a query on histosearch.com in 1999 gave a date of 1924, which seems rather early. See [www.histosearch.com/histonet/Dec99/Gurr.htm](http://www.histosearch.com/histonet/Dec99/Gurr.htm).

<sup>2</sup>The story that the supply of haematoxylin ended up at the bottom of the ocean may be apocryphal. For a discussion of this see Dapson et al, "Haematoxylin Shortages: Their Causes and Duration, and Other Dyes That Can Replace Hemalum in Routine Hematoxylin and Eosin Staining", Biotechnic & Histochemistry, 85/1 (2010), 55-63.

<sup>3</sup> See Derek Sayers, "The Birth of Synthetic Dyes: William Henry Perkin (1838-1907)", Science Technology, April 2005), 9-11.

<sup>4</sup>H. Busch, "Die Doppelfärbung des Eosin- und Hämatoxylin", Verhandlungen der Deutschen Physikalischen Gesellschaft, 14 (1871).

<sup>5</sup> He was made a baron in 1880 to become von Hofmann.

<sup>6</sup> The suggested reaction is shown in "Improvements in or relating to Dyes and Stains", Patent 1,057,594. Application date 21 May 1964. Complete specification published 1 February 1967.

<sup>7</sup> For evidence of this see Derek Sayers, "A Method for Demonstrating Fibrin Binding to Ultraviolet Light", Journal of Science Technology, 12/4 (1966), 170-172.

<sup>8</sup> Derek Sayers, from personal experience.

<sup>9</sup> Hopkins Williams Ltd and Baird & Tatlock (London) Ltd appear to have been connected before the date usually given (1929) for the acquisition of the former by the latter.

<sup>10</sup> These three golf clubs claim some interesting connections. Prime Minister Arthur Balfour and Field Marshall Earl Haig were captains at Coombe Wood, Weston Church was an early member of Coombe Hill and William Commander Frank Brock (of Brock fireworks fame) played at Malden Golf Club as did, briefly, Gary Player (winning Crosby).

<sup>11</sup> "Too Few Chemists", The Manchester Guardian, 12 December 1955.

<sup>12</sup> By a merger with John J. Giffin & Sons Ltd in 1928 Giffin & Tatlock Ltd became Giffin & Gurr Ltd in 1959 when it merged with W. & J. George and Becker Ltd.

<sup>13</sup> The Institution has seen a number of name changes: Pathological and Bacteriological Laboratory Assistants' Association (1912-1942), Institute of Medical Laboratory Technology (1942-1975) and now the Institute of Biomedical Sciences.

<sup>14</sup> Journal of the Royal Institute of Chemistry, (1 January 1959), 24-25.

<sup>15</sup> Sir Howard Walter Florey was at that time President of The Royal Society and Professor of Pathology at the University of Oxford. He was jointly awarded the Nobel prize (1945) with Sir Alexander Fleming and Ernst Boris Chain for work on penicillin.

<sup>16</sup> E. Gurr and M. A. MacConaill, "The Falcic Acid Dyes and Their Applications in Histological Staining", Journal of the Royal Microscopical Society, 79/4 (1961), 353-357.

<sup>17</sup> Journal of the Royal Institute of Chemistry, 8 (1959), 36.

<sup>18</sup> Journal of the Royal Institute of Chemistry, 8 (1962), 438

<sup>19</sup> The Chemist and Druggist, (7 July 1962), 8

<sup>20</sup> There was also a period when Gurr stains came under Searle Scientific Services.

<sup>21</sup> The first edition of Analabs Standards for Laboratory Chemicals was published jointly in 193

# Real time quantitative PCR assays

Samia Akhtar

Quantitative polymerase chain reaction (qPCR) assays use fluorescence to detect and quantitate nucleic acids as they are amplified in real time, transforming an otherwise qualitative method into a quantitative one. The technique is primarily used to quantitate RNA that must be first reverse transcribed into complementary DNA (cDNA) which is called reverse transcription qPCR (RT-qPCR). RT-qPCR is typically used in gene profiling studies to investigate changes in gene expression in control versus disease conditions. The assays are also used to quantitate DNA, for example to determine gene copy number. The technique has been developed to quantitate proteins by combining ELISA and PCR technology this is termed immunoPCR and has been used to identify diagnostic markers for disease.<sup>1-2</sup>

The main advantage of qPCR is only small quantities of nucleic acids are required to amplify sequences with a high degree of sensitivity and specificity, this is important when dealing with limited sample availability. qPCR has a wide range of applications in life science research, agricultural and food science, forensic science, molecular diagnostics and gene expression studies (figure 1)<sup>3-4</sup>.

## Principles

The principles of qPCR are similar to traditional PCR; target sequences are amplified exponentially from DNA or cDNA template using specific primers through thermocycling. Using PCR alone means that the amplified products can only be semi quantified by visualisation on an agarose gel at the end of a reaction. This can be time consuming and often produces inconsistent results because of the variability produced during the linear and plateau phases of PCR (figure 2). The exponential phase of the PCR is the most efficient where the amplified products double per cycle because the reagents are in abundance.

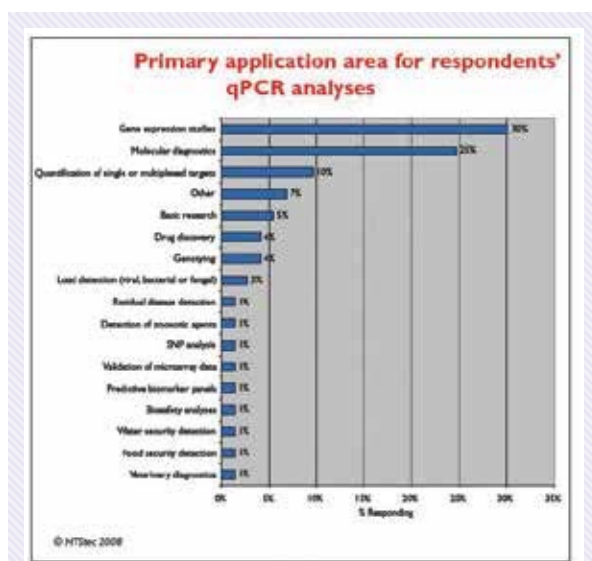
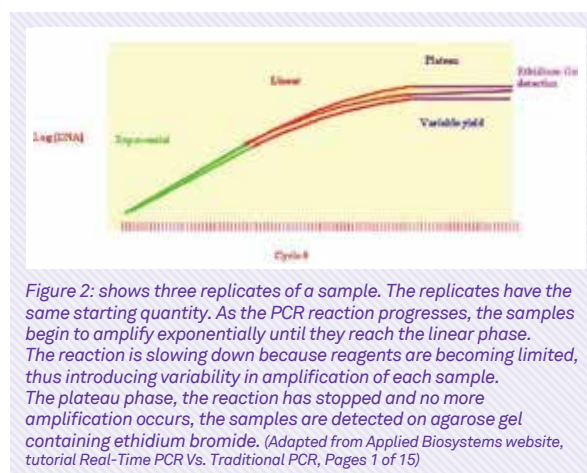


Figure 1: Primary applications for qPCR analyses include gene expression studies (30%), molecular diagnostics (25%), quantification of single or multiplexed targets (10%), other areas (7%) and basic research (5%). (Adapted from qPCR Assays end user practices and latest vendor offerings, Drug Discovery World Winter 2008/9)

The popularity of real time assays has grown in recent years as they provide researchers with a valuable alternative to traditional detection methods, that are time consuming and laborious, in favour of simplistic high throughput assays that deliver results quickly and cost effectively.



In qPCR fluorescent reporter dyes are used to detect amplified products during the exponential phase. In the initial stages of cycling no real change in fluorescence signal is observed, this is called background or baseline fluorescence, when the signal crosses the threshold i.e. above the baseline, the quantification cycle (Cq) is calculated (figure 3).

The Cq value is inversely proportional to the amount of target in the sample (figure 4) and can be quantified using two methods absolute or relative.

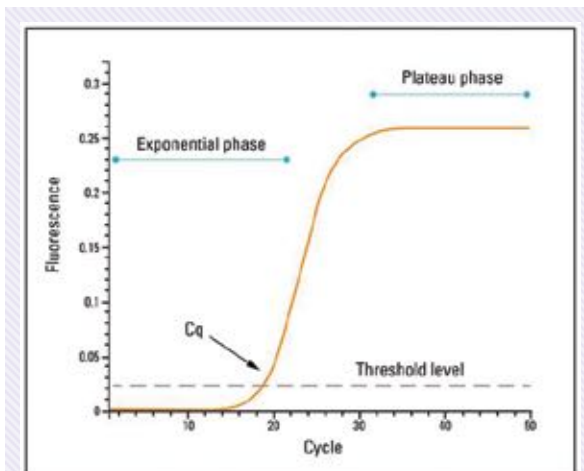


Figure 3: Illustrates amplification and plateau phases of qPCR. The Cq value is metric term for qPCR data and represents the cycle number at which fluorescence crosses the threshold. (Adapted from ThermoScientific website)

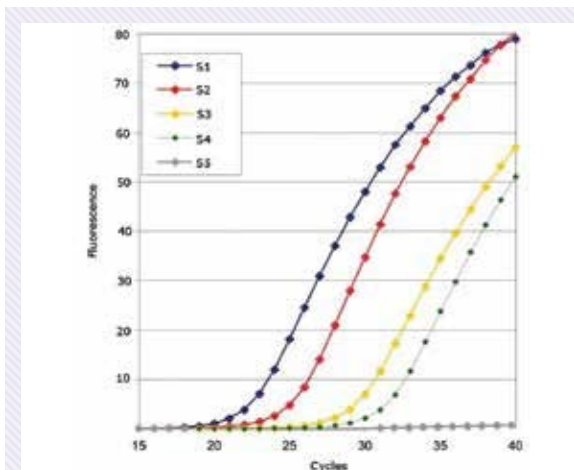


Figure 4: shows amplification plot showing of five samples (S1 to S5). As the target DNA in each sample is being amplified through cycles the fluorescence increases. Sample S1 contained the highest initial number of target DNA molecules, resulting in the fastest increase of fluorescence. Sample S4 contained the lowest initial number of target DNA molecules while S5 did not contain any target DNA. qPCR basics. (Image: Biosistemika website)

In absolute quantification; a standard curve is generated from known amount of template and used to extrapolate unknown values. In relative quantification fold change in Cq values of genes of interest (GOI) are compared with Cq values of reference genes and is expressed as a ratio GOI to reference genes.

The quantification method chosen depends on the objective of the investigators do they need a comparative or absolute value? For example in molecular diagnostic it is essential to know the exact viral load in a given blood sample to determine disease severity, progression and treatment plans,

rather than compare viral loads between different samples, therefore absolute quantification is required. In research investigating changes in gene expression in response to a drug the levels of GOI in treated cells would be compared in untreated cells, therefore relative quantification required.

### How valid is qPCR data?

It is possible for two people to perform the same experiment and get widely different results making it difficult to determine whose data is correct. So what causes these differences? qPCR consists of a series of experiments that must be performed in sequence and validated before proceeding to the next stage, each stage can be a possible source of error (figure 5). There is also a diverse range of reagents available (fluorescent probes, primers, mastermixes, kits), assay formats (manual loading, custom made plates, automated assays), multiple protocols and data analysis programs. In addition to absence of technical information in published qPCR data, for example how assays were validated or optimised. These factors contribute with problems in reproducing qPCR experiments, raising questions about the reliability and accuracy of reported results, without proper standardisation of qPCR assays, it will remain difficult to determine the usefulness of qPCR data in research and development.

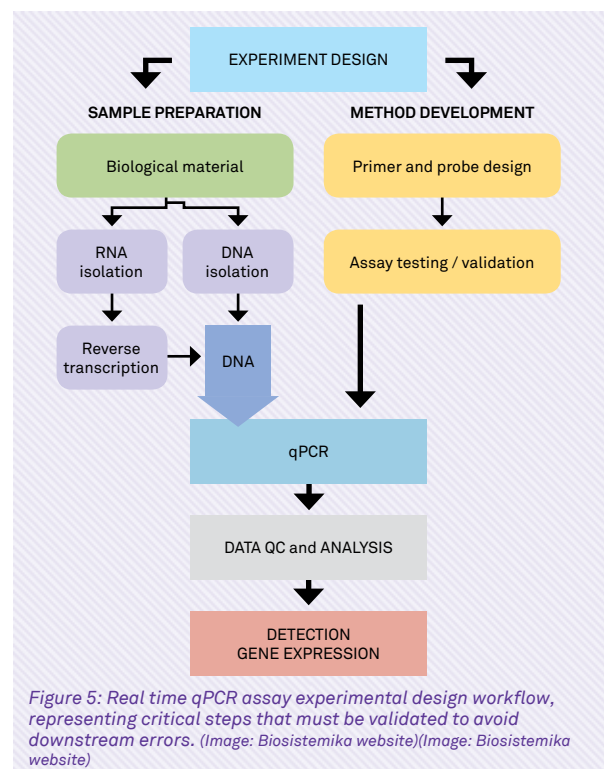


Figure 5: Real time qPCR assay experimental design workflow, representing critical steps that must be validated to avoid downstream errors. (Image: Biosistemika website)(Image: Biosistemika website)

Bustin et al had previously addressed these issues<sup>5-6</sup> and in 2009 and published the Minimum Information for Publication of Quantitative Real Time PCR Experiments (MIQE) guidelines<sup>7</sup>.

These guidelines are intended to standardise assays by introducing a checklist of relevant information that should be made available as a supplement when submitting a manuscript. These include providing relevant experimental conditions, a full disclosure of all reagents, sequences and analysis methods to encourage consistency and reproducibility amongst researchers.

Although MIQE guidelines are applicable to both DN and RN, the remainder of this article will focus on RTq PCR. RN is not as robust as DN and is susceptible to degradation, RN also needs to be reverse transcribed, and both of these factors can cause potential variation and inconsistency in the quality of cDNA used for RTq PCR.

## RNA quality

The success of qPCR assays is dependent on the quality of RNA, therefore it is crucial the integrity and quantity of RNA is confirmed before proceeding to cDNA synthesis. Ribosomal RNA (rRNA) represents 80% of total RNA, therefore the ratio of the rRNA subunits; 28S and 18S are used to determine RNA integrity. The ratio of the subunits should be roughly 2:1, because 28S is roughly twice the size of 18S both subunits should be intact and not degraded (figures 6 and 6a). Purified

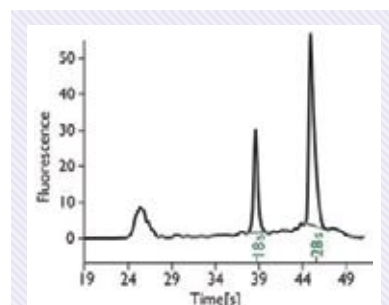


Figure 6: Agilent 2100 Bioanalyzer image of intact total RNA. The 18S and 28S peaks are clearly visible at 39 and 46 seconds, respectively. (Image: Life Technologies website)

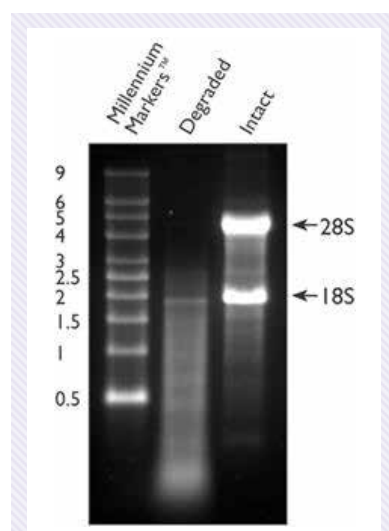


Figure 6a: Gel image of degraded total RNA and intact total RNA. (Image: Agilent website)

RNA must be also be free of contaminants, such as protein, DNA, salts and phenol that can be co-purified during extraction process. Overlooking these factors will compromise template quality for cDNA synthesis efficiency and yields that will have an impact qPCR efficiencies and subsequent gene expression analysis<sup>8-9</sup>.

## Reverse Transcription

It is important to choose the correct priming method for reverse transcription to

generate high quality full length cDNA, representing full gene expression profile available. There are several approaches to consider depending on downstream application; oligo (dT) primers, random primers (hexamers) or gene specific primers (figure 7).

Oligo (dT) primers are specific and only prime the poly A tail at the 3' end of mRNA transcripts and will not prime sequences that do not contain poly A tail such as rRNA and should in theory yield a good representation of mRNA transcripts. However there are some disadvantages with this method first; it is difficult to transcribe long mRNA transcripts or transcripts containing secondary structures such as hair pin loops, prematurely terminating reverse transcription resulting in truncated cDNAs strands. There is also a bias towards sequences at the 3' end of a transcript, as the 5' end does not have poly a tail.

Random primers hybridize at multiple points along a transcript, avoiding problems with long transcripts and secondary structures of mRNA, there is also no bias towards 3'end because hexamers can bind at 5'end of transcripts. The main disadvantages with this method is multiple priming sites creates more than one cDNA copy per original transcript, which can distort final qPCR analysis, by misrepresenting actual mRNA levels. The method is also nonspecific and will prime rRNA so a large proportion of cDNA will be ribosomal derived.

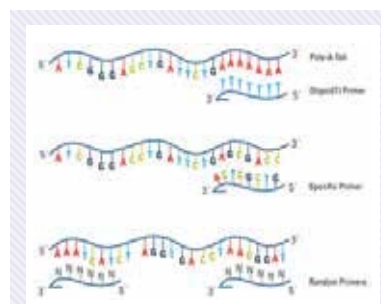


Figure 7: Three different priming methods for the cDNA synthesis. (Image: Thermo scientific website)

Gene specific primers are highly specific and are not as flexible as oligo dT and random priming, however they are useful for priming low copy transcripts although a separate

reaction has to be performed for each specific target. Resuehr et al demonstrated a combination of oligo dT and random hexamers is the ideal approach for full representation of mRNA transcripts<sup>10</sup>.

For reverse transcription it is essential to eliminate any contaminating gDNA that is often co-purified during RNA extraction. Contaminating gDNA can lead to non-specific amplification of the GOI resulting in misleading RT-qPCR data. The majority of RT kits include DNase treatment step to eliminate contaminating DNA the sample.

A reverse transcription (RT) negative control should be included in cDNA synthesis step, this is a reaction containing all reagents required for cDNA synthesis except RT enzyme and a positive signal in a PCR will indicate gDNA contamination.

## Assay Efficiency

Amplification efficiency can be affected by the primer and template concentration making it necessary to validate the assay using controls before analysing test samples. Primers should be specific and amplify a single product or amplicon of approximately 50 to 200bp length and with amplification efficiency 90 to 100%. Primer concentration should be optimised by running a dilution series of the forward and reverse primers. A no template control (NTC) should be included; this is a reaction that contains all reagents required for amplification except template a positive signal indicates reagents or primers are contaminated.

Template concentration should also be optimised by generating a standard curve from a series dilution of the template normally covering the complete range of expression of target gene. If PCR efficiency is 100% a linear fit will be generated with a slope of -3.32, a slope between -3.1 and -3.58 is accepted indication efficiencies of 90 to 100%. It is critical the reference gene are optimised at the same time as target gene the efficiencies are similar.

For qPCR assay validity it is essential to normalise the data using reference genes, by definition their expression must remain constant in all experimental conditions. Researchers often select reference genes based on evidence of being stable in published articles and do not assess suitability themselves, this leaves question of validity of data open. The most commonly used housekeeping genes such as GAPDH has been shown not to be stable by several groups<sup>11-13</sup>.

## Future of qPCR

The original MIQE paper is the fifth most cited publication in Clinical Chemistry and has been cited over 3000 times indicating the message for proper standardisation and validation of real time qPCR assays is getting through. However there is still a large number of publications since 2009 that do not adhere to these recommendations<sup>14-15</sup>, it may be simply a case of researchers not being aware of these guidelines or do not think they have time or resources to validate each step. This can lead to the publication of contradictory or controversial reports<sup>16-18</sup> that can make it difficult to interpret the biological or clinical significance of qPCR results.

To guarantee confidence in published qPCR data, it is essential to encourage investigators to adopt proposals outlined in MIQE and to submit all technical information on pre and post qPCR experiments, as a prerequisite for publication, as is already the case for the publication of microarray<sup>19</sup> or proteomics<sup>20</sup> experiments. This will not only ensure standardisation and transparency amongst researchers in qPCR methodology, but will also promote integrity of scientific literature in peer reviewed journals.

Real time RT qPCR assays are the first step in understanding how a cell responds to stimuli through changes in gene expression and how these changes affect biological processes. If the MIQE guidelines are adhered to and each stage is properly optimised and validated real time assays can yield reliable and accurate results that can be useful to understanding biological systems.



## Author

**Samia** joined the Department of Human Metabolism as a research technician in the Medical School at the University of Sheffield in 2002. Over the following 12 years, Samia developed a wide range of technical knowledge and expertise

in molecular and cell biology methods, including gene expression analysis using real time qPCR.

## References

1. Lind K (2005) Development and evaluation of three real-time immuno-PCR assemblages for quantification of PSA. *Journal of Immunological Methods* Volume 304, Issues 1–2, Pages 107–116.
2. Singer D (2009) ImmunoPCR Based quantification of multiple phosphorylated tau epitopes linked to Alzheimer's disease. *Analytical and Bioanalytical Chemistry*, Volume 395, Issue 7, Pages 2263–2267.
3. Comley L (2009) qPCR Assays end user practices and latest vendor offerings, *Drug Discovery World* Winter 2008–9.
4. Vence T (2010) qPCR's Big Bag of Tricks, *Genome Technology* Pages 3337.
5. Bustin SA (2005) Pitfalls of Quantitative Real Time Reverse-Transcription Polymerase Chain Reaction. *Journal of Biomolecular Techniques* Volume 15, Pages 155–166.
6. Bustin SA (2004) Real-time reverse transcription PCR (qRT-PCR) and its potential use in clinical diagnosis. *Clinical Science*, Volume 109, Pages 365–379.
7. Bustin SA (2009) The MIQE guidelines: the minimum information for publication of quantitative real time PCR experiments. *Clinical Chemistry* Volume 55, Number 4, Pages 611–622.
8. Fleige S (2006) RNA integrity and the effect on the real-time qRT-PCR performance. *Molecular Aspects of Medicine* 27, Pages 126–139.
9. Vermeulen J (2011) Measurable impact of RNA quality on gene expression results from quantitative PCR. *Nucleic Acids Research*, 2011, Vol. 39, No. 9 e63.
10. Resuehr D (2003) A real-time polymerase chain reaction based evaluation of cDNA synthesis priming methods. *Analytical Biochemistry*, Volume 322, Issue 2, Pages 28–291.
11. Thomas KC (2014) Evidence based selection of commonly used RT-qPCR reference genes for the analysis of mouse skeletal muscle. *PLoS One* 9(2): e853.
12. Lin Q (2012) Histological evidence: housekeeping genes beta-actin and GAPDH are of limited value for normalization of gene expression. *Development Genes and Evolution*, Volume 222, Issue 6, Pages 369–376.
13. Sikand K (2012) Housekeeping Gene Selection Advisory: Glyceraldehyde 3-phosphate Dehydrogenase (GAPDH) and  $\beta$ -Actin Are Targets of miR644a. *PLoS One*; 10(7): e47510.
14. Bustin SA (2013) The need for transparency and good practices in qPCR literature. *Nature Methods*, Volume 10, Pages 1063–1067.
15. Bustin SA (2010) Why the need for qPCR publication guidelines? The case for MIQE. *Methods* Volume 50, Issue 4, S1–5.
16. Scholl C (2009) Synthetic Lethal Interaction between Oncogenic KRAS Dependency and STK33 Suppression in Human Cancer Cells. *Cell*, Volume 137, Issue 5, Pages 81–84.
17. Babji C (2011) STK33 Kinase Activity Is Essential in KRAS-Dependent Cancer Cells. *Cancer Research*, Volume 71, Pages 5818–586.
18. Wakefield AJ (1998) RERACTB: ileal lymphoid nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. *The Lancet*, Volume 351, Pages 637–641.
19. Brazma A (2001) Minimum information about a microarray experiment (MIAME) toward standards for microarray data. *Nature Genetics*, Volume 29, Pages 365–371.
20. Taylor CF (2007) The minimum information about a proteomics experiment (MIAPE). *Nature Biotechnology* Volume 25, Pages 8–93.
21. Is Your RNA Intact? Methods to check RNA Integrity, Life Technologies website.
22. Applied Biosystems website, tutorial Real-Time PCR Vs. Traditional PCR, Pages 1 of 15.

---

# Helping scientific communication: The NDOC databank

---

Raffaele Conte

## Abstract

Scientific communication is essential for the development of science as it permits the spreading of knowledge. The understanding of the importance of data sharing has resulted in a huge amount of information being currently available that needs to be appropriately organised. For this purpose databases are the best way to arrange inputs as they allow the analysis of the entire spectrum of research. In this paper a special focus will be given to the “negative databases”, namely those databanks that inspect failed interactions such as the Negative Database for Organic Chemistry reactions (NDOC databank), and to consider their important contribution due to the awareness given on outcomes that are not regularly published.

## Introduction

Scientific communication is a term that refers to the importance of the sharing of experimental data among scientists. These pieces of knowledge are often indispensable in the organisation of a project and because of this they need to be carefully checked and promptly delivered. Researchers regularly receive requests for information related to their activities, where information means research-related findings, methods, data, or materials. This is common even if the results are already published in journals or technical reports due to the fact that these formats frequently omit critical information or detailed descriptions of techniques. In addition some journals state formal policies about an author's responsibilities on the sharing of publication-related data and materials and articles are not always available in “open source”. Therefore scientists who want to replicate or extend the results of a published study frequently approach the author of the article directly to request additional information. The ethical principle of the importance of data sharing for the progress of science is supported by the professional norm of communalism.

In fact, in Merton's early formulation of this norm, it is stated that “*Secrecy is the antithesis of this norm; full and open communication its enactment*”<sup>1</sup>. The accepted understanding being that information withholding is considered a violation of a uniformly revered norm of sharing, a socially unacceptable and morally unjustifiable act.<sup>2</sup>

Fortunately the norm of communalism is for the most respected, and consequently this is making available an increasing amount of information that must be organised.

A **database** is a set of data with a regular structure that is organized in order to easily find the desired information. Data is a collection of distinct pieces of information. In a databank, data are formatted in a specific way for the use in analysis or in the process of making decisions. A database is organized as a collection of records, each of which contains one or more fields about some entities. Examples of entities in scientific databases are chemicals, sequences of DNA, structures of proteins, etc...

The use of databases in science is related with the necessity to organise the enormous amount of information due to the development of scientific researches and the advent of novel scientific disciplines that have led to an exponential increase of the number of journals, books, congress proceedings, dissertations, patents, technical reports, and other papers bringing research results. These publications are referred to as “primary publications” or “primary sources of information”. To conveniently analyse this huge number of scientific works it is the “secondary publications” or “secondary information sources”, which process and summarise primary publications, that are used<sup>3</sup>. In some cases the process of comparison with biography implemented by the “secondary publications” is also used in scientific validation.

**Beilstein or Reaxys:** The Crossfire Beilstein, a product of MDL, a subsidiary of Elsevier Science, is the largest database in the field of organic chemistry with an index of the chemical literature from the year 1771 containing structures, physical properties, reactions and literature citations for more than eight million compounds. Moreover, included are details on ecological chemistry issues, the synthesis of each compound, its pharmacology, and its toxicology. Beilstein holds more than five million chemical reactions and 35m associated chemical property and bioactivity records <sup>4</sup>.

**Chemfinder:** It is a portal to free and under subscription scientific databases that allow searches for chemical structures, physical properties, reactions, and purchasing information of chemicals through the typing of the CAS registry number of the required compound. This site was created by CambridgeSoft alongside its largest database available, ChemReact. This latter database carries data on more than 300,000 reactions abstracted from the chemical literature spanning 1974-1991. ChemReact provides the reactant and product structures, necessary solvents, required reagents, catalysts and information of the yield, and of the side products of the reactions 4.

“this software speeds and improves the processes of molecular discovery efforts and the identification and optimization of new compounds spanning dozens of industries from the largest pharma companies to emerging biotech firms, from agrochemical and chemical makers to the creators of flavours and fragrances”.<sup>5</sup>

An important element of this software is the collection of databases. Tripos' databanks can be used to extensively trace commercially available compounds and molecules with similar structural features. Furthermore, it is advantageous in the identification of physically or biologically related compounds, a characteristic that is valuable in the searching of the matching of molecules with pharmaceutical models<sup>4</sup>.

**NIST Chemistry webbook:** This is a database managed by the National Institute of Standards and Technology that carries information on about 30,000 compounds. Its main feature is in the possibility to do searches using the physical properties of the compounds, such as Ion energetics properties, Vibrational and electronic energies and Molecular weight as well as using general information, like Formula, Name, IUPAC identifier, CAS registry number, Reaction, Author and Structure. In addition, it presents appropriate links for models and tools useful in chemistry research<sup>4,6</sup>.

### Importance of “negative” databases

There is a spread of knowledge of chemical phenomena and the possibility to use a wide range of databases to predict interactions and behaviour of substances, however, more than 60% of experiments fail to produce results or expected discoveries<sup>7</sup>. This implies a consequence of quantifiable economic cost through wasted time both in research and in the industrial technological transfer. It is therefore necessary to create a debate among scientists on the importance of a database approach aimed to classify failed reactions of organic chemistry and interactions that in literature are considered to be thermodynamically and/or kinetically favoured but that fail because of factors not always known. Currently, information on what didn't work is more difficult to find and abstract compared to the usual reactions. This is because the regular publication of details on failures is not seen as a career enhancing strategy. Despite of this, there are journals that report failed chemistry interactions.

An example is The All Results Journals: Chem (ISSN: 2172-4563) which focuses on recovering and publishing experiments that were aborted or that led to unexpected results within all areas of Chemistry. Failed reaction protocols with a focus on the obtained experimental discoveries and the interpretation of their significance are specifically described<sup>7</sup>. The information on wrong interactions, in spite of all the difficulties encountered in the bibliographic research, must be further enhanced due to the fact that it is essential in the generation of knowledge.

Currently, electronic searches to identify relevant articles on this are rarely useful, and the only effective search method is to read through all the articles in a journal looking for comments about experiments that didn't work. This makes the use of a database approach for reactions with stated yields of zero necessary. Indeed, the idea of including interactions that failed in some way in the current commercial databases is not new, as shown by the Failed Reactions database from Accelrys. The content of Accelrys' Failed Reactions consists of reactions abstracted from the primary literature. Each record contains information on the synthesis such as reaction conditions, catalysts and solvents involved in the reaction as well as structure diagrams for the expected reaction and, if given in the original article, the actual products obtained with its structure. A typical entry in the Failed Reactions database from Accelrys has coloured borders aimed to clearly distinguish data on the expected reaction (red) and the actual reaction (green)<sup>8</sup>. The project of the Negatome Database for Organic Chemistry reactions or NDOCdatabank is intended to strengthen the progresses made in the scientific communications about failed reactions<sup>9,10</sup>. The name Negatome database derives from a databank diffused in biological studies, that is a collection of proteins and domain pairs that are unlikely to be engaged in direct physical interactions (The Negatome database is available online at <http://mips.helmholtz-muenchen.de/proj/ppi/negotome>).

### NDOC Databank

NDOCdatabank is found at the address <https://sites.google.com/site/ndocdatabank/database> The internet site of this database is structured in different sections.



Figure 2: Main page of NDOCdatabank

**Updates!** This page shows an overview on the periodical upgrades of the internet page.

**Database.** This is the core of the databank where it is possible to find information on the registered failed reactions. It is divided in 25 subpages in which are classified all the reactions of organic chemistry.

This arrangement is based on the subdivision into chapters of the book “Organic Chemistry” of Paula Yurkanis Bruice published by Pearson Education, Inc. Clicking on each of these fields is possible to reach entries with information on the type of reaction, the date of submission and the date of publication in the database, the title and the authors of the research paper from which data on the failed reaction are taken with a specific view on the reagents used and a direct link to the article. Where possible, the publication is enclosed as PDF, DOC or TXT file.



Figure 3: Database's field of NDOCdatabank

**Information.** This section describes the scope of the NDOCdatabank. In fact, it is stated:

**“The -Negatome Database for Organic Chemistry reactions (NDOCdatabank)- is an information bank in which are collected information of non-performing reactions in organic chemistry. Aim of this project is to promote a share of information in the scientific community useful to avoid the effects related with the debacle of the chemical reactions”.**<sup>11</sup>

**Links and collaborations.** In this page there are links on research journals and research communities particularly involved in the sharing of scientific information. The International Research Journal of Chemistry and Life Sciences Leaflets by Pearson Education Trust, Danta, district Banaskantha (Gujarat + India), provide immediate open access to their content on the principle that making research freely available to the public supports a greater global exchange of knowledge.

In addition, the International Journal of Chemtech applications published by Rescite Publication, is an association of scientists, academics, and industrialists who are committed to provide a common universal platform to utilise research knowledge globally. A special mention also includes The Research Cooperative, a network aimed to promote contact and effective working relationships among researcher and all the people involved in research communication and in the preparation of educational materials.

**Reaction attempts.** This is a section in which are provided the results of not yet published chemical interactions, regardless of whether they have been unsuccessful. This field is aimed to improve the usefulness of NDOCdatabank, considered the fact that those reactions can give useful information. Data are taken by the Open Notebook Science Challenge which is a project aimed to allow immediate communication of scientific results through the sharing of the outcomes of experiments (especially regarding the solubility of chemicals) through an online laboratory notebook available at <http://usefulchem.wikispaces.com/>.

**Sixtyfour Chemistry Databases.** The page “Sixtyfour Chemistry Databases” gives all the tools to study chemistry in its broad aspects, in fact it presents a link to open-access databases useful in research activities. Through this section it is possible to reach the Depth-First internet site, a project aimed to promote scientific communication created by Rich Apodaca, a PhD chemist and software developer. Examples of some interesting databanks featured are PubChem, which provides information on chemical compounds; NMRShiftDB, a database for organic structures and their nuclear magnetic resonance spectra; DrugBank, which is a unique bioinformatics and cheminformatics resource that combines detailed drug data with comprehensive drug target information; The Organic Syntheses gives experimental procedures of organic reactions; The PDBbind database is designed to maintain a collection of experimentally measured binding affinity data; The CrystalEye project is intended to aggregate crystallography information from web resources; The MatWeb's searchable database of material properties includes data sheets of thermoplastic and thermoset polymers.

**Submit a reaction.** This sections gives instructions on how to add a reaction on the database. It is clearly stated that the submitted interactions must be already published in a research journal due to the fact that NDOCdatabank does not offer a peer-review service.

A search bar is accessible on the upper right hand side of the main page of NDOCdatabank. This toolbar permits a particularly powerful searching strategy, exploiting the fact that the keyword fields are indexed. The information on the databank is organised in keywords indicating the type of reaction, title, reagents, author, the expected and the actual reactions. Then, writing an appropriate evocable in the search bar it is possible to get a faster outcome on the entries related with the inserted word. NDOCdatabank is designed to permit different modalities of usage.

It can be used mainly in global searches, in conjunction with standard synthetic methodology databases, to highlight potential problems prior to attempt any reactions in the laboratory. Another possible use is in the design of combinatorial libraries, where a selected library is modified with the information deriving from the negatome database, excluding problems on the substrates. Conversely, the NDO databank can be used in a stand-alone manner to investigate the reasons for which a synthetic step failed and what possible products have been formed. The Negatome Database for Organic Chemistry reactions is designed for both the search as in-house databases or the access to online databanks. Its structuring as in-house databank provides a full database management systems, with the ability to build fields, add data to them, and import or export information from other systems. A great advantage is given by the direct link from the "NDO entry" to the research journal in which the reaction is published. This online accessing system exponentially improves the ability to retrieve information on the registered interactions.

## Conclusion

In conclusion it is possible to affirm that information sharing is critical to the advancement of the scientific knowledge on which so many organizations and industries depend for innovation, growth, and competitive advantage in the global economy. To organise this huge volume of information, databases are necessary. Different types exist, each with pieces of knowledge that must not be lost to guarantee a valuable sharing. In this context "negative databases" and NDO databank give an important contribution as they focus on arguments that are not regularly published.

## Author

**Raffaele Conte**, MIScT, RSci, is a Research and Development Scientist for ALFA INTES pharmaceutical company in Casoria, Italy and an Associate Researcher for the Institute of Biosciences and BioResources of the National Research Council in Naples, Italy. His scientific activity is focused on the development of drug delivery systems, also he follows additional projects as an independent researcher. Raffaele is the author of several publications in various areas of biological, chemical and pharmaceutical sciences and a reviewer for different peer-reviewed journals. His last qualification is a post-graduate master as "Expert in innovative processes of biomolecular synthesis techniques applied to epigenetic".

Raffaele's e-mail address is: [raffaele.conte86@tiscali.it](mailto:raffaele.conte86@tiscali.it)

## References

1. Merton, R. K. 1973. The normative structure of science. R. K. Merton, ed. *The Sociology of Science: Theoretical and Empirical Investigations*. University of Chicago Press, Chicago, 267–278
2. Haas and Park: Professional Norms, Reference Groups, and Information Holding Among Life Scientists. *Organization Science* 21(4), pp. 838–851
3. Petracchini, S. The role and relevance of bibliographic citation databases. *Biochemia Medica* 2006;16(2): 93–102.
4. A database approach to chemical reactions. *Research Information*. Spring 2002. <http://www.researchinformation.info/feature4a.html>
5. "Order product" section of Tripos' internet page. [http://www.tripos.com/index.php?family=Modules,SimplePage,OrderProducts&family=312e47a6&id=68f76\\_b9de77e55207&id=312e47a6&id=68f76\\_b9de77e55207](http://www.tripos.com/index.php?family=Modules,SimplePage,OrderProducts&family=312e47a6&id=68f76_b9de77e55207&id=312e47a6&id=68f76_b9de77e55207)
6. NIST Chemistry Webbook. <http://webbook.nist.gov/chemistry/>
7. The All Results Journals: About us. (<http://blog.arjournals.com/p/about.html>)
8. Jeremy Potter (2001), Hindsight is an exact science. *Chemical Innovation*, September 2001 Vol. 31, No. 9, pp 18–22.
9. Conte R., The importance of a Negatome database for organic chemistry reactions, a case study: reaction of bromination of palmitoylethanolamide. *International Research Journal of Chemistry*, volume 4 (2013), page: 5463.
10. Conte R., The Negatome Database: Reaction of bromination of the sulfonic ester of palmitoylethanolamide. *International Journal of Chemtech Applications*, Vol 3, No 1 (2014): 1–8
11. NDO databank: Information. <https://sites.google.com/site/ndocdatabank/information>

# Cage-farmed rainbow trout from Lake Titicaca, Peru

Gina Conroy

First report of *Yersinia ruckeri* Type I in cage-farmed rainbow trout, *Oncorhynchus mykiss* (Walbaum), from Lake Titicaca, Peru

## Introduction

Lake Titicaca, divided into the Lago Mayor and the Lago Menor, is the highest freshwater navigable lake in the world. At a height of 3,812 metres above sea level, it is situated at 15°13'19" - 16°35'37" S and 68°23'36" - 70°02'13" W, with a surface area of 8,290 km<sup>2</sup>, and a shoreline of 1,152 km. It is fed by 29 affluent rivers of local origin, which provide 53% of its water content, the remainder being furnished by the rains. The lake is shared between Bolivia and Peru, and the international border between those two South American countries bisects the waters and the watershed of the lake.



Chura-Cruz & Mollocondo-Hualpa (2009) have recorded the physico-chemical characteristics of the lake as being: pH 8.6 at the surface, a temperature of 11.2 – 14.35°C, and an average dissolved oxygen concentration of 7 mg/litre. Other workers (Ittis et al. IN Dejoux & Ittis, 1991) have reported surface temperatures in the Lago Mayor of 11.25 – 14.35°C, with decreases to 10.9°C in June (winter) and increases of up to 17°C in February (summer). The annual average temperature is 13°C.

A detailed account of the development and prospects of trout farming in Puno Department, Peru, has been published by Chura-Cruz & Mollocondo-Hualpa (op.cit.). According to those authors, the rainbow trout (*Oncorhynchus mykiss* Walbaum) was introduced to a hatchery in Junín Department, Peru in 1927, and for trout farming purposes into Puno Department in the 1930's. The species started to be farmed in Lake Titicaca in 1977, using the Japanese "fish nets capture" technology. That practice failed to reach initial expectations, and was replaced in 1996 by the use of octagonal (5 X 5 metres) and square (10 X 10 metres) metal cages. The production of rainbow trout using such cages reached 7,204 metric ton in 2008 and 8 543 metric ton in 2009. Artificial feeds are used, and these are now purchased in pelleted form from commercial sources, rather than being prepared on site by the trout farmers themselves using ingredients which are available locally, as was formerly the case.

The Peruvian authorities have designated a total of 13,434 hectare as available for aquaculture in that part of the lake in Puno Department, with an additional 8 000 hectare being processed administratively for that same purpose. 15% of the requirements for eyed trout eggs are supplied by trout hatcheries in Puno Department, and the remainder are imported from Denmark and the USA. It is a legal requirement that the eyed eggs be treated, prior to their dispatch from source, with an aqueous 10% solution of organic iodine, for a period of 10 minutes. The cage-farming of rainbow trout activity is estimated to have an annual production of 40,000 metric ton per annum, with an estimated value to the Peruvian economy of US\$ 100 million/year. In addition, the nearby Lake Lagunillas, which has similar physico-chemical characteristics, and a surface area of 50 km<sup>2</sup>, is also being incorporated into the cage-farming of trout activity.

In South America, enteric red mouth (ERM) disease, the aetiological agent of which is *Yersinia ruckeri*, has been reported for the first time from Atlantic salmon (*Salmo salar* L.) caught in Chile (Bravo & Jorgensen, 1993), and from rainbow trout farmed in traditional raceways in the Venezuelan Andes (Alvarez, Austin & Conroy, 1992). The first report of the occurrence of this disease in the Peruvian Andes, caused by *Y. ruckeri*, was made by Bravo & Jorgensen (2004) from the Department.

Other hatcheries and trout farms which were sampled during the period October 1998 – March 2000, which were fed by water from lakes and rivers from that locality, and among which was one involved in cage farming, *Y. ruckeri* was tentatively identified from 34 sites (including 3 hatcheries which provide rainbow trout fry to smaller sites for growing purposes). The isolates were subsequently identified by a Chilean laboratory as being *Y. ruckeri* Type I.

During the period June – July 2013, the author was able to visit the trout farming facilities in the Lake Titicaca Region of Peru, to investigate the causes of trout mortalities occurring there. Eight different production sites were visited, most of which had juvenile rainbow trout with a mean average weight of 20g. Two of those sites had trout showing obvious clinical signs of enteric red mouth disease, the investigation of which forms the basis of this communication.

## Material and methods

The affected trout exhibited exophthalmos with periocular haemorrhages, necrosis reaching to the anus in the hind part of the gut, petechiae on the palate, pyloric caeca, heart, tongue, and internal surface of the opercula. The gills were pale, and thrombi were detected in the gill lamellae. The liver was also pale, and several of the trout showed splenomegaly. Apparently healthy fish from the same population showed signs of soft opercula. When in the cerebral cavity, signs of dilation of the blood vessels surrounding the brain lobules and optic peduncle were observed, in addition to petechiae on the surface of the cerebral lobules themselves.

Rainbow trout displaying the aforementioned clinical signs were euthanised, and duplicate smears were taken from the peripheral blood, kidney and spleen, which smears were stained by the Gram technique and by the Wright technique. Material from the kidney and spleen was streaked onto the surface of blood agar plates, and submitted to bacteriological investigation.

## Results

The microscopical examination of Wright-stained peripheral blood smears showed neutropaenia, thrombocytopaenia, and the presence of monocytes/macrophages. Non-reactive lymphocytes were observed in moderate numbers (in spite of a septicaemic process being present). There was a high incidence of mature (normochromic and normocytic) erythrocytes with segmented nuclei, some of which displayed nuclear clefts, together with large numbers of polychromatocytes. The changes in the nuclear morphology of the erythrocytes are suspected to have been caused by vitamin B complex and folate deficiencies in the diet.

Gram-stained smears of the kidney and spleen revealed numerous straight Gram negative rods in 9/9 (100%) of the trout sampled. Subsequent laboratory studies on the material led to the isolation and identification of pure isolates of *Yersinia ruckeri* Type I, on a basis of the phenotypical characteristics displayed in Table 1, as per the profile published by Witman & MacNair (2004).

TEST	REACTION
gelatine liquefaction	-
urease production	-
H <sub>2</sub> S production	-
catalase	+
nitrate reduction	+
indole production	-
lipase	-
oxidase	-
O/129 sensitivity	-
arginine dehydrolase	-
lysine decarboxylase	-
ornithine decarboxylase	+
fermentation of glucose	A B
fermentation of arabinose	-
fermentation of adonitol	-
fermentation of cellobiose	-
fermentation of mannitol	+
fermentation of saccharose	-
fermentation of sorbitol	-
fermentation of trehalose	+

Table 1: Phenotypical characteristics of *Yersinia ruckeri* isolates from rainbow trout farmed in Lake Titicaca

Antibiotic sensitivity tests were undertaken, and the isolates were found to be sensitive to amikacin, ampicillin, cephalothin, cephtazidine, cephalotoxin, cephtriazone, cephuroxin, ciprofloxacin, florfenicol, gentamycin, levofloxacin, tetracycline, tobramycin and trimethoprim/sulpha. The isolates were resistant to aztreonam, cephtazidime, nalidixic acid, and piperacillin/tazobactan.

## Discussion

The isolation and identification of *Yersinia ruckeri* Type I from rainbow trout farmed in cages in Lake Titicaca constitutes a new geographical record for that bacterial fish pathogen, in addition to the second report of its occurrence in the Andean Region of Peru.

Certain aspects of the management practices employed by the trout farmers need to be considered. For routine disinfection procedures of the nets are undertaken during the on-growing phases, and the nets are dipped in the water of the lake to allow small shrimps to clean the surface fouling, after which they are left to dry in the air for 2–3 days, prior to their reuse. The nets are not cleansed with high-pressure hoses, as that is thought to damage them.

On capture from the cages, the trout are transferred in boats to the shore, where they are gutted by hand and placed in plastic boxes for transportation to the markets. The trip by road to Cuzco, for example, may last 8 hours, and during that time no ice is used. When the trout are gutted, the blood spills into the water of the lake, in which the cages are located at approximately 300 metres distant from the shore. It is obvious that some necessary improvements to the handling, husbandry, management, and marketing practices should be implemented as soon as possible.

The sensitivity of the isolates to most of the antimicrobials tested suggests that such compounds could be utilised as a short-term procedure to control cases of enteric red mouth disease in Lake Titicaca trout.

It would be convenient to consider the implementation of field trials with commercial vaccines designed to prevent cases of *Yersinia ruckeri* Type I infections in rainbow trout being farmed in cages in that South American lacustrine environment.

## Acknowledgments

The author thanks Dr. José Riera and the technical staff of SEDICOMVET, Maracay, Venezuela, for their assistance in the typification of these isolates in the laboratory. This work formed part of a consultancy in Peru by the author under the auspices of the U.S. Soybean Export Council (USSEC), to which organisation she expresses her gratitude for financial support.



## Author

**Gina Conroy** is a qualified fisheries biologist of dual British and Peruvian nationality, with an M.Sc. in fish pathology, and is a Chartered Biologist (C.Biol.), and a Member of the Society of Biology (MSB).

She works as a professional consultant in aquaculture and aquatic pathobiology, in which capacity she has travelled widely in the Americas, Asia, and Western Europe. In addition, she is the founder and Managing Director of Pharma Fish SRL, a private company registered in Venezuela.

## Bibliography

- J. D. Álvarez, B. Austin & A. Conroy. 1992. First outbreak of enteric redmouth in rainbow trout, *Oncorhynchus mykiss* (Walbaum), cultured in Venezuela. *Bull. Eur. Ass. Fish Pathol.* 12 (6): 189–190.
- S. Bravo. 1993. Diseases reported from pen-reared salmonids from Chile. *American Fisheries Society Fish Health Section (A-FS/FHS) Newsletter* 21 (8): 3.
- S. Bravo & V. Kojagura. 2004. First isolation of *Yersinia ruckeri* from rainbow trout (*Oncorhynchus mykiss*) in Peru. *Bull. Eur. Ass. Fish Pathol.* 24 (2): 104–108.
- R. Churruarín & J. Mollocondo. 2009. Desarrollo de la acuicultura en el Lago Titicaca (Perú). *Rev. Aquática Revista Científica de la Sociedad Española de Acuicultura* 8(1): 6–19.
- A. Iltis, P. Carmouze & J. Lemoalle. 1991. Características físico-químicas del agua. IN 'El Lago Titicaca. Síntesis del conocimiento limnológico'. Editores: C. Dejoux & A. Iltis, B. STOL / HISBIO, La Paz, Bolivia: 107–113.
- K. A. Whitman & G. MacNair. 2004. *Finfish and Shellfish Bacteriology Manual: Techniques and Procedures*. Iowa State Press, Ames, Iowa, USA: 256 p.

---

# The other IST

---

## History of the Institute of Spring Technology (IST)



**Adrian May**, Director of the Institute of Spring Technology

The Coil Spring Federation (C.S.F) (which comprised the Heavy Coil Spring Association and the Light Spring Association) was established in 1942 as a wartime measure to unify the industry for the purpose of meeting the large demands for numerous types of springs vital to the production of reliable equipment. In conjunction with various technical branches of Government departments, individual firms in the spring industry conducted investigations covering the design, materials and methods of manufacture for springs, and specifications were produced laying down requirements to ensure the supply of material and components of the necessary quality.

When the end of the war, it became necessary to consider how the advantages that had already been accrued could be extended to benefit the whole of the industry and how technical liaison could be placed on a more permanent footing.

As a result, the Coil Spring Federation Research Organisation (C.S.F.R.O.) came into operation in October 1945.

In 1961, the C.S.F.R.O. applied for recognition as a Research Association and this was granted. As a consequence, the Research Organisation was converted into a limited liability company and the name was changed to the Spring Manufacturers' Research Association (SMRA). A further change occurred in 1966, when the Association was renamed the Spring Research Association (SRA) to reflect the fact that its objective was to offer services to the whole of the spring industry, not just the spring makers who were members of the original Federation. At the that time, the Spring Manufacturers' Association (SMA) was responsible for commercial interests of the industry, and their Members included companies dealing with flat springs and other types of spring components, not just coil springs.

In 1974, it became apparent that the functions of the SRA and the SMA were becoming increasingly interdependent, particularly as the SRA had taken over the secretarial work for the SMA and it was decided to rationalise the organisation into one unified company with a new name of the Spring Research and Manufacturers' Association (SRAMA).

A further change occurred in 1997 when, following a reduction in the level of Government funded research, a decision was made to market the technical services to a much wider customer base worldwide, so the technical division was relaunched as the Institute of Spring Technology (IST), with the Trade Association function for the British Spring Industry falling under the auspices of the UK Spring Manufacturers' Association (UKSMA).

IST operates on a "not for profit" basis and receives no Government subsidy or grant to enable business to continue, relying on membership subscriptions and commercial sales of technical services and products. IST has built up an excellent reputation for technical competence, independence and impartiality over the entire World in the past seventy plus years. Our range of services and products offered has expanded over the years to ensure that we continue to be a unique service provider to the World's spring industry supply chain.

Today, the Institute of Spring Technology is recognised as the industry's most authoritative and influential voice – renowned as a unique centre of excellence for spring technology - enjoying an unrivalled pedigree and reputation stretching back many decades.

The company's sole objective is to help its members grow their businesses – combining expert knowledge and advice with a wealth of services, unsurpassed and unequalled on a global scale.

IST's spring design software is recognised as being the very best in the world.

Their spring test machines are highly accurate and boast exceptional quality whilst their training courses educate, inform and inspire. They have a valuable research databases amassed over decades of work.

The IST offers all companies involved in the spring industry supply chain a wide range of specialist technical services – and access to a unique 'knowledge bank' of in-depth information.



#### INSTITUTE OF SPRING TECHNOLOGY

Henry Street, Sheffield S3 7EQ. United Kingdom.

Tel: +44 (0) 114 276 0771 Fax: +44 (0) 114 252 7997

ist@ist.org.uk www.ist.org.uk

Registered in England No. 3305326 VAT No. 690 0145 57



# New tools to capture the full value of nature

UK researchers provide new information and tools to help decision-makers in Government, local authorities, land managers and businesses to understand the wider values of our ecosystems and what they offer us. In 2011 UK National Ecosystem Assessment (UK NEA) concluded that the natural world and its ecosystems are important to our well-being and economic prosperity. Yet they have been consistently under-valued in conventional economic analyses and decision making. The UK National Ecosystem Assessment Follow-up (UK NEA FO) project was commissioned to address this problem. The project has developed a range of tools for decision makers to make use of the research from the UK NEA and has carried out new research to understand and capture the shared cultural values of the natural environment.

Our interactions with natural spaces can be experienced in a number of ways; we might take a stroll in a woodland or picnic with friends in a park. Previously it has been difficult for land managers to capture what value people place on these experiences outside of the monetary value.

This new research found that by using a range of approaches we could understand the strength and depth of feelings that people hold about a natural space.

By understanding an individual's spiritual connection, identity and the aesthetic values that they place on nature, land managers will be able to have much fuller picture of the total value of the decisions that they make in financial terms and the value that people place on these decisions.

The findings and tools developed from the UK NEA FO project provides a useful resource for policy-makers and practitioners with advice on which methods and tools are best for a given situation, how they should be used, and in which combination.

**"This has been a truly productive partnership with the Research Councils. A healthy and resilient natural environment underpins our economy and wellbeing. This research is an important step forward in our efforts to reflect the value of nature more widely in decision-making."**

(Lord de Mauley, Natural Environment Minister)

The UK NEA FO has been a collaborative effort between the Department of Environment Food and Rural Affairs (Defra), the Arts and Humanities Research Council (AHRC), the Economic and Social Research Council (ESRC), the Natural Environment Research Council (NERC) and the Welsh Government.

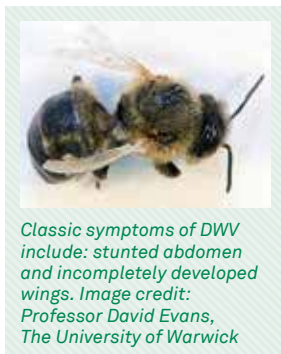
# Bloodsucking mite threatens UK honeybees

Scientists have discovered how a bloodsucking parasite has transformed Deformed Wing Virus (DWV) into one of the biggest threats facing UK honeybees.

Honeybees are a key pollinating insect, adding around \$40Bn globally to crop value. Over recent years the spread of parasites and the viruses they transmit has resulted in high overwintering colony losses.

New and emerging threats to insect pollinators are putting increasing pressure on the agricultural sector to meet the demands of a growing population. DWV is one of the most common viruses infecting European honeybees. Although present in almost all colonies, high levels of deformed wing disease – characterised by developmental deformities, reduced foraging ability and longevity – are only common when Varroa is also present.

Researchers at the University of Warwick have discovered how the disease is amplified in the presence of Varroa destructor, a tiny parasitic mite infesting hives across the globe.



*Classic symptoms of DWV include: stunted abdomen and incompletely developed wings. Image credit: Professor David Evans, The University of Warwick*

In colonies free from Varroa, DWV is present at very low levels and generally causes symptomless infections. However, the team found that when Varroa feeds on honeybee haemolymph (‘blood’), specific virulent strains of the virus are transmitted and

amplified, explaining why colonies infested with the mite suffer most severely.

The researchers also demonstrated that direct injection of a mixed DWV population in the absence of the mite, resulted in the same virulent strain being amplified, suggesting that this route of virus transmission bypasses the insect’s anti-virus defence systems.

Professor David Evans, from the University of Warwick, who led the study, explains:

**“We found that a harmful variant of the virus only multiplies rapidly if it is directly injected into honeybee haemolymph by Varroa. Once injected, the variant takes over. In mite-exposed bees, levels of this single virulent form can be 10,000 times higher than in the absence of Varroa.”**

**“Although exposure to Varroa caused disruption to a number of genes involved in the bee’s immune response, it is the route of transmission which has caused this severe strain of DWV to become widespread.”**

The introduction and global distribution of the mite has had a significant impact on the health and survival of honeybee colonies. The research, published in the journal PLOS Pathogens could lead to informed breeding programmes for Varroa and virus resistance.

Professor Evans added:

**“Our results strongly suggest that DWV is widespread in UK honeybees – even where Varroa is absent. However, the identification of a single virulent form of the virus is an important step in developing strategies to boost honeybee health, to prevent colony losses and to safeguard this important pollinator.”**

The research shows how Deformed Wing Virus (DWV) has been transformed into a major disease thanks to the parasitic mite Varroa destructor. DWV is widespread in UK honeybees and is usually harmless. However Varroa transmission amplifies a virulent form of the virus associated with disease, reducing foraging ability and increasing mortality. The findings could lead to informed breeding programmes for Varroa and virus resistance to help safeguard insect pollinators.

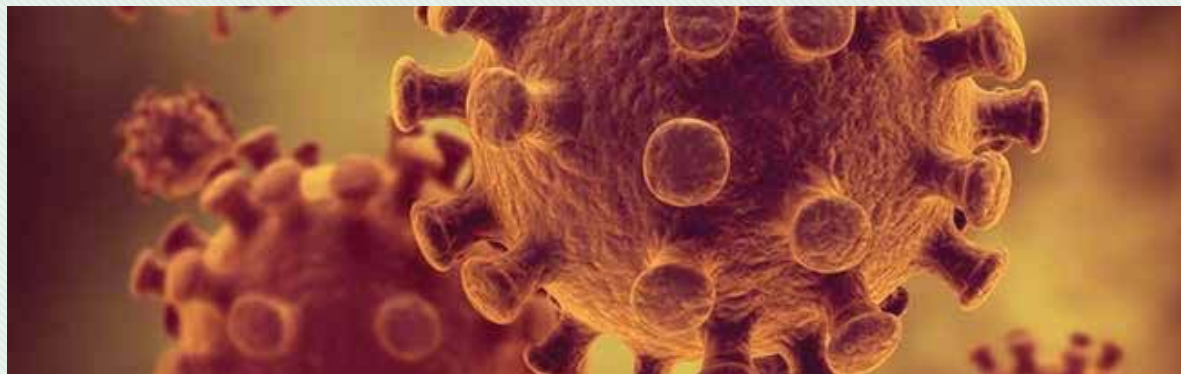
The project is part of the Insect Pollinators Initiative, jointly funded by the Biotechnology and Biological Sciences Research Council (BBSRC), Defra, the Natural Environment Research Council (NERC), the Scottish Government and the Wellcome Trust under the auspices of the Living with Environmental Change (LWEC) partnership.

The paper “A Virulent Strain of Deformed Wing Virus (DWV) of Honeybees (*Apis mellifera*) Prevails after Varroa destructor-Mediated, or In Vitro, Transmission” is published in PLOS Pathogens.

---

# H10N8 bird flu is unlikely to threaten public health

---



The most recent avian influenza virus to infect humans, H10N8, is unlikely to cause a threat to public health without further changes, according to Medical Research Council (MRC) scientists.

Researchers at the MRC National Institute for Medical Research (MRC-NIMR) investigated whether H10 viruses had the potential to cause a pandemic by uncovering the molecular structure of H10 and looking at its receptor binding properties, as the strength of the interaction between virus and host is a major factor in determining the likelihood of an animal influenza virus causing a pandemic. The study, published in *Nature*, found that although the H10 influenza virus bound strongly to human receptors, it attached more tightly to avian receptors. They believe that for H10N8 to pose a threat to human health it would need to lose some of its binding capacity for avian receptors.

The binding characteristics of H10 are shared with other pandemic strains of influenza such as H1 (1918 Spanish flu) and with recent H7 viruses that have infected humans. However, the H1 and other pandemic viruses have a clear preference for human receptors, binding to them up to 100 times more tightly than to avian receptors. With the H10 strain, the interaction with the avian receptor is approximately 150 times stronger than with the human receptor.

H10N8 follows H7N9 and H5N1 as the latest in a line of avian flu viruses that cause serious disease in humans. The first human H10N8 infection was detected in a fatal case of pneumonia in December 2013 in China. Since then there have been two further cases of avian H10N8 infection, and an additional death.

**“We pay special attention to viruses that show changes in receptor binding preference because it is likely to be a requirement for more efficient transmission to humans.**

**A change in receptor binding is the essential first step in generating a pandemic virus. These results are the output of the NIMR/WHO Influenza Centre collaboration that illustrates the sophisticated scientific basis of monitoring influenza viruses and the importance of the WHO global influenza surveillance for public health.”**

(Dr John McCauley, Director of the WHO Influenza Centre at the MRC-NIMR, London)

**“Outbreaks and epidemics can strike quickly with a substantial impact on society. It is essential that we respond swiftly to potential pandemic strains.**

**The team at the MRC-NIMR has been at the forefront of this endeavour and their work here shows exactly how the latest influenza virus identified from birds is able to bind to human cells. The work will be very important in allowing us to monitor for mutations that could lead to the virus gaining the ability to spread between humans.”**

(Professor Paul Moss, Chair of the MRC Infection and Immunity Board)

The paper “Receptor binding by H10 influenza viruses” is published in *Nature*. doi:10.1038/nature13443

---

# UK invests in world's most advanced crystallography facility

---



The UK's structural biology community will have access to the most advanced crystallography technology in the world thanks to a £5.64M investment from UK research funders.

The Biotechnology and Biological Sciences Research Council (BBSRC), the Medical Research Council (MRC) and the Wellcome Trust will contribute the funds towards the European X-ray Free Electron Lasers (XFEL) project, under construction in Hamburg, Germany.

The money will guarantee UK researchers the chance to use serial femtosecond crystallography (SFX) at the European XFEL, a cutting-edge technique to determine the three-dimensional shape of biological molecules at high resolution and incredible speeds.

A hub for scientists who wish to use SFX will also be established at the Diamond Light Source in Oxfordshire to train and prepare UK researchers.

Crystallography is used to determine the 3D structure of the molecular machines of life, and has transformed our understanding of living things. It can be used to develop new pharmaceutical drugs, antibiotics and new sources of chemicals and energy.

From 2017 the European XFEL facilities will represent a new generation of crystallography technology and will allow scientists to work at finer resolutions and faster speeds than ever before.

**"The incredible power of the European XFEL will allow researchers to look at the smallest building blocks of life in new detail, from 'filming' biochemical reactions to studying drug targets of the future. Structural biology has been the basis for some of the most exciting developments in biomedical science, and investing in new technology is a vital part of the field's continuing success."**

(Michael Dunn, Head of Genetics and Molecular Science at the Wellcome Trust)

Over five years between 2014 and 2019 the UK funders will contribute £5.64M to the European XFEL project.

2014 is the United Nations International Year of Crystallography, reflecting its global importance and contribution to human life.

# Safe, Successful Sustainable Laboratories

Steve Carroll



The S-Lab project, now based in the Institute of Science and Technology, promotes effective and sustainable design, operation and management of laboratories. Its initial focus was on improving energy and environmental performance, but its emphasis has broadened to cover many other features. This is reflected in its current involvement in supporting the 'Diamond 2' task force on efficiency and modernisation of universities.

S-Lab is unique in providing a space for the key players involved in laboratory design, operation and management – technical staff, academics, estates and facilities, procurement, suppliers and others – to interact and have strategic discussions. It also emphasises the synergy between safety, business and sustainability rather than compartmentalising and/or seeing them as competing with each other. Originally focussing on Higher Education the project now also supports action in public and private sector laboratories and is keen to build links with them.

## Current activities include

- Running events to profile good practice, discuss key issues and develop networks
- The S-Lab Awards scheme which recognises excellence in laboratory design, operation and management
- An annual Conference this year entitled 'Supporting World Class Science'
- The award of small grants for laboratory improvement projects

- Developing case studies of best practice and briefing paper in key laboratory issues
- A laboratory assessment framework to gauge environmental performance and associated Environmental Good Practice Guide
- Development of Good Laboratory Design Principles.

S-Lab runs a wide variety of events all of which aim to equip delegates to improve the way their laboratories are run. For example at a recent event 'Cold Storage in Laboratories: Actions to Cut Costs, Free Space and Reduce Energy Consumption' delegates learned about how to organise samples efficiently, use the lowest temperature necessary to preserve samples, maintain storage devices and the economic benefits of purchasing energy efficient cold storage devices. Another recent event focussed on 'Effective Use of Laboratory Equipment and Resources: Inventory and Booking Systems', and like the first example was based around the work done by some of the shortlisted entries for the 2014 S-Lab Awards.

The S-Lab Awards have been running for 3 years now and are an initiative which is open to all kinds of laboratories including government and private sectors, in any country. The scheme recognises excellence in laboratory design, operation and management that creates improved performance whilst maintaining and enhancing safety and sustainability, and shares this best practice through an Awards report and presentations at the conference and other events. This year there were 58 entries to the Awards from four continents, and the winning and highly commended entries will be recognised at a Gala dinner on the 1st September at Kings College London.

It will feature Lewis Dartnell, UK Space Agency Research Fellow & STFC Science in Society Fellow at the University of Leicester, and author of the best selling book 'The Knowledge'. This is a guide to the science and technology that underlies modern life, given piquancy by imagining the need to recreate it from scratch in the event of global catastrophe such as a large meteor impact. (See <http://www.effectivelab.org.uk/awards.html> a shortlist and details about the dinner).

The S-Lab conference is also a vehicle to promote and share best practice and many of the presentations are based around the winners and shortlisted entries for the S-Lab Awards.

The programme ensures that there is specialist content for designers, educators, engineers, estates staff, IT staff, managers, purchasers and suppliers, and technical staff. The conference is also a unique opportunity for different laboratory stakeholders to network and learn from each other, and to help them engage in cross-functional and strategic thinking about their activities. This year it will feature almost 100 presentations. A programme and booking details can be found at <http://www.effectivelab.org.uk/>.



For more information about S-Lab activities and resources visit [www.goodcampus.org](http://www.goodcampus.org)  
S-Lab is grateful for the support of the following sponsors:



## Keynotes

Presenters tbc, Medical Research Council on:  
Next Generation Biomedical Research: The MRC  
Laboratory for Molecular Biology

Professor Ian Dunn, Deputy Vice Chancellor, Coventry University on: Creating Communities of STEM Learning Through Innovative Design

Professor Christopher Mottershead, Vice Principal, Research and Innovation, and Ian Caldwell, Director of Estates, on: STEM Strategies and Support at King's College

Michael Johnson, Head of Engineering and Estates, and Alan Grimonsway, Change Director, on: The New Pirbright Institute:



MRC Laboratory for Molecular Biology (shortlisted for the S-Lab Awards)

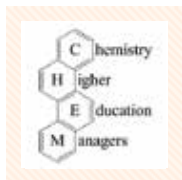


Oklahoma Medical Research Foundation, Research Tower (shortlisted for the S-Lab Awards)

# BUCLAS-UCLAS-CHEM!

## What's going on??

Harry Adams



At the recent excellent Associations Joint Annual Conference which ran over April 9th, 10th & 11th 2014 at the University of Strathclyde it was decided to rename UCLAS.

For the reasons behind this we have to look into the past...

The British Universities Chemistry Laboratory Administrators and Superintendents, BUCLAS, was formed in 1968. However, when in 2008 colleagues from Chemistry Departments in Southern Ireland joined the organisation 'British' was dropped from the title. So in 2008 UCLAS was formed!

The group continue to meet on an annual basis at a host university to:

- Provide a forum for exchange of ideas
- Influence university policy by the representation of the group's views
- Encourage training and development of staff at all levels
- Disseminate best practices.

However, as time has gone by and work and jobs got bigger and bigger the single role of Laboratory Administrator and Superintendent has gradually been modified into two quite separate succinct roles. Separating administration and finance management from technical management, with the new title "Laboratory Manager" or "Laboratory Technical Manager" becoming the term more widely used now.

Recently, we in UCLAS believed that our old name of "Universities Chemistry Laboratory Superintendents" was too narrow, and didn't quite reflect the much wider chemistry based activities that are now found across the multi-discipline activities in many universities. We believed that it was probably therefore having a rather deleterious effect on enrolment of new members. It was, we felt, time for action!!

So, after a long debate the idea of the acronym CHEM (Chemistry Higher Education Managers) was born!

The new name CHEM we hope will encourage more and wider cross section of technical managers to join. It is hoped that by encouraging new people in more diverse and varied chemistry roles we can create a more reactive and proactive group that is ready to meet the demands of a much more corporate form of higher education. CHEM, as a special interest group of the IST is ideally placed to offer help and advice to people taking up the new role of technical manager. I personally found this network group to be most useful when I took up my role as Departmental Technical Manager last year. I found the depth of experience invaluable.

**CHEM is not just for departmental technical managers. If you are a teaching lab manager or a research lab manager you belong to this elite club!**

**Enrolment in to CHEM is free. Why not join?**

We are a friendly, informal group. The meetings are always interesting and inspiring.

Let's get the CHEMistry right!

For more information contact:

**Alaine Martin**  
alaine.martin@strath.ac.uk  
0141 548 2257  
079211808



CHEM at Strathclyde 2014

# EMU, TMU, and the IST

Geoff Howell & Ian Lyne

## Technical Managers in Universities Engineering & Technology

TMUs are an informal voluntary association of technical managers and supervisors working with technology & engineering to support a wide range of disciplines in universities throughout the United Kingdom.

In 1992 Richard Verrall from Sussex University started it all off. Without his initial vision and hard work our association would not have been formed. He also chaired the organising committee for several years until his retirement in 2001.

Richard put together a proposal to a number of like-minded engineering technical managers across the UK for a conference and the creation of a subsequent network. The idea was met with great enthusiasm and so, in 1992, Richard, together with a great deal of help from Jim Horsfield of Sheffield University, put on our very first Engineering Managers in Universities Conference. TMU was born.

Between 1992 and 2013 we were simply known as UK Engineering Managers in Universities). In 2009 we became a special interest group of the IST.

In 2014 we have now changed our name to TMU (and also killed the bird with a new logo) to reflect the wide and tremendously diverse environments that engineering and technology supports in today's universities.



Conference delegates outside Kelham Island Industrial Museum, Sheffield 2005

TMU is a completely voluntary association of HE technical managers and supervisors working in technology

& engineering environments in support of a wide range of disciplines in universities throughout the United Kingdom. The broad term "technical manager" encompasses a wide range of activities, employment categories and job titles in HEIs. But such a person will normally have some responsibility for managing resources such as a technical service, a facility, or laboratory where they provide technology or engineering support to academic teaching and/or research.

This area of technical support can be found in and across an enormously diverse range of disciplines. For example below are just some of the areas where our current members work:

Aerospace	Automotive technology
Advanced Additive Manufacturing	Arts – fabrication technologies
Bio bacterial technology	Bio technology
Biomechanics	Biomaterials technology & tissue engineering
Chemical engineering	Communications technology
Computer science	Computing, IT, & media technologies
Computer graphics & virtual reality	Concrete & earthquake engineering
Control & systems engineering	Civil & structural engineering & technology
Electron microscopy	Electronics
Electrical engineering	Fuel technology
Geotechnical engineering	Imaging technology
Materials technology & engineering	Materials science
Manufacturing & design	Mechanical engineering & technology
Nanomaterial technology	Polymer & glass technology
Robotics	Steel technology
Sports technology & engineering	Semi-conductor materials technology
Soil technology	Space systems technology
Water engineering	

TMU has a growing membership and continues to welcome new members who are in a senior technical, a supervisory or a management role in any discipline where their work has a technology or engineering element. We are a very varied and diverse collective that thrives because of the informality of its network, where individuals and groups can benefit from advice and experience of colleagues working in like environments.

We get together just once a year for a conference held at a university in the UK, where we can enjoy and participate in a relevant programme of presentations, talks and discussion that encourage and support collective networking opportunities.

TMU is not a formal professional body, and does not have a formal committee or hierarchy. Its administration currently consists of just a voluntary chair and deputy chair of its conference organising team.

## There are no membership fees.

TMU's aims are to:

- enable sharing of best practice
- add to individual and corporate knowledge
- broaden understanding of our technical profession
- foster a collegiate spirit across its membership
- act as a focus for feeding legitimate and common concerns with respect to our support for teaching and research in Higher Education Institutions (HEIs) to the Institute of Science & Technology, of which TMU is a registered special interest group



[tmu.uk.net](http://tmu.uk.net)

Contact: [tmu.enquiries@gmail.com](mailto:tmu.enquiries@gmail.com)

Geoffrey Howell on: 01142225807

# Promoting an effective learning environment In science and technology

Kevin Fletcher

## Introduction

Adults learn differently to children in school. Lecturers can do two simple things to ensure they serve the learning needs of their students, whether it be in Science or Technology or other subjects to promote effective learning:

1. **Ask them:**  
A good Lecturer can use activities, questionnaires or discussion to discover how students prefer to learn.
2. **Understand them:**  
Lecturers need to have a robust understanding of the commonalities of adult learners.

## Learning processes in a nutshell

In short, attention makes learners receptive to information. They process this information alongside prior knowledge, until they arrive at understanding which enables them to draw conclusions, that they then apply and test against reality and experience for confirmation.

## Attention

The first thing a Lecturer should do is ensure they have the learner's attention. Not by shouting, but by helping the learner to understand why the topic at hand is important to them. Its relevance can make the difference to its mental acceptance or rejection.

## Information

Groups of adults have a variety of learning styles, even within "single subjects" such as Science or Technology, so the teaching information needs to be presented in a variety of ways. These ways can include use of the written word, visuals, audio, live action, practice, experiments, laboratory sessions and theory sessions. Ideally, there needs to be a mixture within every session. If that were not the case, and if everyone learned the same way, it would be easy enough to give everyone a book and tell them to come back at the end of term for an exam!

## Processing and comparing to prior experience

All learners compare new information against their previous knowledge and experience. Lecturers need to give learners the chance to reflect, question and compare. Perhaps using small group discussions to give learners the chance to draw from their past and link it to current information. A good Lecturer builds this step into the Science or Technology program, because the learners are most likely to do it anyway without realising it. You may hear learners say things like: "This isn't the way we did it before." "When I was at school, we did it this way" or "We don't do it that way at work". It makes common sense that a Lecturer will allow the learners to discuss these thoughts and practices in an open and supportive way and link them to current learning activities, so that all may benefit from the experience of others.



### Conclusions and understanding

It is the learner's job to draw conclusions for themselves about how learning experience will be used. All learners have their own perspective, experience and learning style, and that will affect how they finally understand subject matter. The Lecturer's job is help the learners move through the material in an orderly and effective way, giving them time to practice new skills and draw their own conclusions.

### Application and testing

After a session is over, learners will go home or back to a work placement or employment, and try to decide if the information they received in a session was worthwhile or of no value.

The learner will experiment, test, and ultimately accept or reject the subject matter. There is nothing the Lecturer can do to stop them. A good Lecturer builds this into the program: encouraging learners to experiment and share findings. During the follow-up phase of the program, the Lecturer can check on the experimentation and eventual application of the teaching and theory against accepted practice and understanding. Hopefully a match will exist.



### Feelings

We must not forget one particular issue that can cloud the adult learning process: feelings. Adults usually manage to look calm and rational, especially at work or in a laboratory setting (we hope!), but the prospect of teaching, learning, discussing, sharing experiences or practices can stir up unexpected feelings.

When dealing with learning, especially with adults, it is important to address the feelings the learners may have about certain aspects of their learning or certain subjects to ensure effective learning can ensue. We may need to consider

- Anger
- Anxiety
- Depression
- Embarrassment
- Excitement
- Fear
- Frustration
- Happiness
- Resentment

It makes sense, then, that a good Lecturer will plan for the emotions that accompany learning and plan for an environment that encourages, welcomes, and rewards the sharing of feelings or ideas.

### Conclusion

All in all, the creation of a supportive learning environment will encourage learners to be attentive, link their existing knowledge to current learning, share experiences, test ideas, and generally benefit from experiencing effective learning.

### Acknowledgement

I freely acknowledge the source for this article was a collection of handouts typically used in Initial Teacher Training, and developed by the Teacher Training Team at Hull & Gloucester Colleges. I have adapted these handouts and condensed them, hopefully distilling the key ideas and their application in Science and/or Technology Teaching.

Thanks also to some of my learners whose archived photographs I have used in this article.



### Author

Kevin Fletcher, BA, BSc(Hons),  
AdDipEd, MA, MEd, MEd, Cert.  
IT & Comp, FIFL, Emeritus ProBiol, CBiol,  
MSB, MIScT, QTLS.

---

# Supporting the technical workforce

---

**Technicians are vital in ensuring the success of the UK and it is essential that they have access to support and training. With an increasing need for technicians, HEaTED is working across the UK to ensure that we provide this support and give our technical workforce the backing it deserves.**

**Rachel Crossley and Katherine Forsey, explain how HEaTED is meeting this key need:**

HEaTED is a membership organisation dedicated to supporting the professional development of technical staff from all disciplines and specialisms in Higher Education, Further Education and related fields. Through HEaTED we work with technicians in all disciplines to:

1. support HE FE technicians in their professional and personal development;
2. improve the quality of HE FE technicians across all disciplines, therefore contributing to improvement of the student experience and research; and
3. ensure a long term supply of a high quality HE FE technical workforce striving for improvement.

From our work with technical staff we know that they are working in some of the most complex areas of the UK economy with more and more being asked of them. We provide a representative voice for the UK technical community and work to ensure that everyone has the access to the training and support needed to be world class.

Our support ranges from the development of specialist training courses and regional networks to enable colleagues from neighbouring institutions to meet and discuss hot topics, share best practice, and promote development opportunities to an online community where members can expand on discussion from regional network events with colleagues from other institutions.

Since 1 September 2013, 21% of attendees at HEaTED courses and regional network events have stated their attendance contributed to their application for/renewal of Professional Registration and 28% of attendees requested more information on Professional Registration.

With three PPD points available for regional network event attendance, and more available for course attendance, HEaTED are able to support technical staff on their personal journey to achieving Professionally Registered status.

**“Great course! Very helpful in identifying how to maintain our own pipettes in the lab, as far as reasonably practicable.”**

(Course participant, Newcastle University, Use and Maintenance of Pipettors)

**“A very good course on abrasive wheels, with all current legislation explained fully by the lecturer, and as a practitioner himself was able to give exact answers to any questions that were asked during the session. Very well done in my opinion.”**

(Course participant, Newcastle University, Abrasive Wheels)

We work with HE organisations across the UK with the numbers growing each year. Newcastle University have been members of HEaTED for over four years, and regularly take advantage of the training and development opportunities available. To make it easier for technical staff to access training locally, reducing travel time and expense, HEaTED works directly with Newcastle's staff development team to arrange on-site training for technical professionals. In the last 18 months, courses covering a range of specialist skills have been scheduled including; Abrasive Wheels, Carriage of Dangerous Goods by Air, Safe Lifting and Sliding Procedures, Servicing and Maintaining Routine Optical Microscopes and Use and Maintenance of Pipettors. Over 90 staff have benefited from on-site training over this period with more courses planned for the future.

**“Feel confident to carry out more thorough maintenance cleaning and checks on university microscopes.”**

(Course participant, Newcastle University, Servicing and Maintaining Routine Optical Microscope)

In addition to attending courses arranged by HEaTED to run at their own institution, technical professionals from Newcastle have also attended courses delivered at other venues across the UK, benefiting from the interaction with colleagues from other institutions.

In the same time period, staff have attended 22 days of training covering areas such as Introductory TIG Welding, the Theory and Practice of Molecular Biology, Rapid Prototyping, Adobe After Effects, Advanced Practical HPLC and HEaTED's own popular Teaching and Learning Skills for Technical Staff, and Leadership and Management Skills for Technical Staff courses.

### Increase Your Skill Set and Profile by becoming a Course Provider with HEaTED



Technical Staff attending HEaTED South Coast Regional Network

A great way of developing your skill set and raising your profile is to become a course provider with HEaTED. Often, technical professionals struggle to find courses that meet their unique training and development needs and this training could be provided by other technicians through the HEaTED network. We regularly publish lists of courses we are looking to source on the News page of our website and through our biweekly newsletters. Engaging with HEaTED's courses helps our member institutions address skills gaps and supports succession planning.

But don't just take it from us, Colin Wright is Chief Mechanical Technician in the School of Engineering at Durham University, a HEaTED Member. Colin and his team provide several courses for HEaTED.

Colin and his eight-strong team of experienced and highly trained technicians normally work with a wide range of engineering undergraduates, post graduates, teaching staff and researchers, but recently he has added to this mix by becoming a HEaTED course provider. As well as enjoying this new challenge immensely, Colin also believes it has brought great benefits. Initially offering training in TIG Welding, Colin now offers four courses through HEaTED. Colin commented:

"I first spoke to HEaTED in 2009 about offering training as we have an immense pool of knowledge and practical skills within our team, something which we value highly and which we felt could be shared with others. HEaTED gave us the opportunity to do this by enabling us to offer courses to their members, and since we began the benefits have been significant.

"Firstly, it is a great way for us to expand our networks and meet technicians from both outside our region and outside our normal engineering circles. It is also great for the people who are actually giving the training, as it provides another dimension to their jobs, enhances their ownership of their individual roles and is very rewarding.

"When we train people who are not from an engineering background, which we often do, it is interesting how we have to start thinking and communicating in a slightly different way. We can't assume that our trainees know any of our technical terms or rules, so whether they are a computer scientist or a graphic designer, we tailor everything to their needs. This has been great for our own staff development and it's also fascinating for us to see how our skills can be applied in new ways.

"Running the courses through HEaTED has been very straightforward and easy to manage. They are great to work with. Finally, whilst we will never make a huge profit from running the courses, I have an agreement with my school that whatever income it does generate can be invested in either our own staff training or new equipment and consumables for the workshop. So overall, it's been a great experience and I would encourage other HEaTED members to do the same."

Colin's team offer the following courses through HEaTED: **The vehicle to Professional Registration**

- Introductory TIG Welding
- Rapid Prototyping (3D Printing)
- Introduction to Laser Profiling and Grinding
- Introductory CNC Milling - Protrak Control

We also work with our members to deliver bespoke training drawing on the experience of departments and individuals as needed. In December 2012, Victoria Talbot, Laboratory Manager at Harper Adams University approached HEaTED with a training request for her staff relating to the use and basic maintenance of pipettors. The commercially available courses didn't quite meet the needs of her staff and the costs were prohibitive. HEaTED put a call out through the membership and Morag Witworth, Technical Team Leader at the University of Nottingham stepped forward.

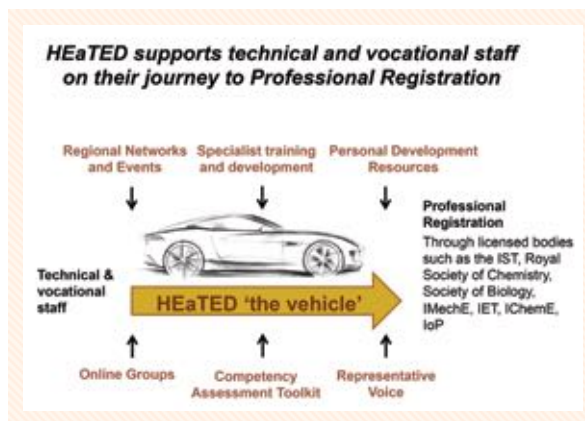
Morag regularly delivered this training internally for undergraduates and postgraduates and was well placed to train other technical staff. Of her experiences of becoming a HEaTED course provider Morag said;

**"Being a course provider with HEaTED is good fun, I enjoy going out meeting technical staff and the variety it brings to my work. It helps me look at my own skills and update them regularly. I encourage people to take the equipment apart and put it back together, the opportunity to do this without worrying is of great benefit to course participants and gives them confidence to maintain their own equipment following the training."**

**"I would recommend becoming a HEaTED course provider to other technical staff, it brings valuable income into my department and I find HEaTED very easy to work with – there's always someone on the end of the phone if I need them".**

Morag's course, Use and Maintenance of Pipettors, has been promoted across the whole HEaTED Network since its first outing at Harper Adams and has subsequently been delivered at Newcastle University.

For those people that don't yet feel ready to deliver training to an external audience our Teaching and Learning Skills for Technical Staff (Module 2) can help. This is an ideal way of building your skills and sharing your knowledge with colleagues and we have dates and venues all over the UK, see the courses page of our website ([www.heated.ac.uk](http://www.heated.ac.uk)) for details.



21% of the people who attend our training and networks are using HEaTED activities as evidence for the Professional Registration application

- 26.5% of the people who attend our training and networks have requested more information
- working closely with the IST to ensure that our members are fully supported on their journey

If you would like to know more about how we can help you, or would like to know if your organisation is already a member so that you can start to use our services please email us at: [admin@heated.ac.uk](mailto:admin@heated.ac.uk) or visit the website: [www.heated.ac.uk](http://www.heated.ac.uk).

Follow HEaTED on Twitter @HEaTEDtechs

Dr Rachel Crossley is HEaTED's Head of Programme and Dr Katherine Forsey is Membership and Networks Manager.

## HEaTED

Myscience.co Limited  
University of York  
York YO10 5DD  
T +44 (0) 1904 328 300  
F +44 (0) 1904 328 328  
[info@heated.ac.uk](mailto:info@heated.ac.uk)  
[www.heated.ac.uk](http://www.heated.ac.uk)  
@HEaTEDtechs

HEaTED is operated by Myscience.co Limited, company registered in England and Wales, No. 0508097. Registered office address: Myscience.co Limited, University of York, York, YO10 5DD.



# The UK's oldest working compressors



University of Sheffield's 1936 CompAir compressor

Gardner Denver recently ran a competition across the UK to find the oldest working CompAir and Hydrovane compressor. In April 2014 they proudly announced the two winning entries.

Flying the flag for the reliability and durability of CompAir compressors is a 1936 CompAir Broomwade machine, which has clocked up an incredible 78 years of service and an equally amazing history. Slightly younger, but "fighting fit" in its fifties is a 1963 Hydrovane compressor.

The 1936 CompAir compressor is owned by Sheffield University Research Centre and is in daily operation at the University's field centre at Harpur Hill near Buxton, one of the few facilities in the UK where large-scale or hazardous experiments can be performed.

Entered on behalf of the customer by Gardner Denver distributor, Chris Hall from Air Compressors and Blowers North (ACB), the machine, which is located in an old World War Two bunker, is still serviced regularly by ACB and in fact, has just passed its annual maintenance inspection this week with flying colours.

As well as being a veteran of the compressed air world, the machine is also a seasoned traveller, having been stationed at a U boat service yard in Germany after World War Two before making the trip across the channel to be donated to a professor at the University in 1967, when the research facility first opened.

The machine still has all its original starters, which are filled with oil and, although this type of starter is no longer in use, it has been preserved on this machine.

Entered for the customer by Gardner Denver distributor, Richard Coar from Airline Compressors, the 51-year old Hydrovane unit is in daily operation at the University of Manchester, a site that has been at the forefront of engineering since it opened.

Pioneering the development of the world's first computer and achieving numerous firsts in both the space and aerospace industries, the research centre has 25 Nobel laureates among its present and past research fellows and was recently awarded a Nobel prize for engineering for the development of graphene.

The compressor is one of approximately 70 other Hydrovane compressors that are in use across the university, all of which are serviced and maintained regularly by Airline Compressors.

**"Our compressors have always been built to last, but even we have been "blown away" by the age of some of the machines entered, which are still in perfect working order. It really is testament to the UK's great engineering heritage that these machines are still going strong after all these years; but it is also because the compressors have been serviced regularly, by factory-trained engineers, using genuine parts and the right maintenance techniques.**

**"It's that combination of quality engineering and regular servicing by an accredited agent, which remains as important today for our brand new machines as it was seventy years ago.**

**"We had many more fascinating entries and, although we could only have two winners, it would be a shame not to mention some of the other highlights. These include a Series 3 Landrover-based vane compressor driven by the vehicle's engine dating from the late 1970s and four CompAir Reavell BC6 compressors, each over fifty years old that are still working and supplying the production process for one of the oldest companies in Ipswich.**

**"Gardner Denver would still like to encourage other companies to send in their oldest compressor stories and pictures, which we will share on Twitter and other online channels."**

(Colin Mander, Regional Director at Gardner Denver)

Gardner Denver is a global leader in the design, manufacture, installation and service of innovative compressor technologies for a diverse range of industries. <http://www.gardnerdenver.com>

# Hydrogen breakthrough could be a game-changer for the future of car fuels

UK researchers announced in June 2014 what they believe to be a game changer in the use of hydrogen as a green fuel.



Prof. Bill David (right) and Dr Martin Jones with the ammonia decomposition reactor. (Credit: STFC)

A new discovery by scientists at the UK's Science and Technology Facilities Council (STFC), offers a viable solution to the challenges of storage and cost by using ammonia as a clean and secure hydrogen-containing energy source to produce hydrogen on-demand in situ.

Hydrogen is considered by many to be the best alternative fuel for automotive purposes but there are complications with its safe and efficient storage and very significant concerns surrounding the costs of a hydrogen infrastructure for transportation. This new discovery may well have found the answers to both these challenges.

When the components of ammonia are separated (a technique known as cracking) they form one part nitrogen and three parts hydrogen. Many catalysts can effectively crack ammonia to release the hydrogen, but the best ones are very expensive precious metals. This new method is different and involves two simultaneous chemical processes rather than using a catalyst, and can achieve the same result at a fraction of the cost.

Ammonia can be stored onboard in vehicles at low pressures in conformable plastic tanks. Meanwhile on the forecourts, the infrastructure technology for ammonia is as straightforward as that for liquid petroleum gas (LPG).

"Our approach is as effective as the best current catalysts but the active material, sodium amide, costs pennies to produce. We can produce hydrogen from ammonia 'on demand' effectively and affordably.

Few people think of ammonia as a fuel but we believe that it is the natural alternative to fossil fuels. For cars, we don't even need to go to the complications of a fuel-cell vehicle. A small amount of hydrogen mixed with ammonia is sufficient to provide combustion in a conventional car engine. While our process is not yet optimised, we estimate that an ammonia decomposition reactor no bigger than a 2-litre bottle will provide enough hydrogen to run a mid-range family car."

"We've even thought about how we can make ammonia as safe as possible and stop the release of NOx gases," added Professor David. "This fundamental science therefore has immense potential to change the use of hydrogen as a fuel." (Professor Bill David, who led the STFC research team at the ISIS Neutron Source)

"Having developed this new approach to decompose ammonia, we are now in the process of creating a first low-power static demonstrator system. Our technology will no doubt evolve, but our research invites scientists and technologists to address a different set of questions." (Dr. Martin Jones, also from STFC and who with Professor David invented this new process)

"This is exactly the sort of innovation we need UK researchers and engineers to develop to secure our role as a global leader in this field, putting Britain at the forefront of solving modern day transportation problems. This breakthrough could also hugely contribute to our efforts to reduce our greenhouse gases by 80% by 2050." (David Willetts, the UK Minister for Universities and Science)

Ammonia is already one of the most transported bulk chemicals worldwide. It is ammonia that is the feedstock for the fertilisers that enable the production of almost half the world's food. Increasing ammonia production is technologically straightforward and there is no obvious reason why this existing infrastructure cannot be extended so that ammonia not only feeds but powers the planet.

2015 will be a significant year in the development of the car. While there is currently substantial interest and excitement in all electric vehicles such as the Nissan Leaf and the Tesla Model S, next year car manufacturers will begin to roll out a new generation of fuel cell electric vehicles. Batteries play a significant role in these cars but the vehicle range, which will be equivalent to conventional cars, will be provided by a fuel cell powered by hydrogen.

These hybrid vehicles are touted to be the way ahead but while all-battery cars have issues with driving range, hydrogen provision is a major headache both on-board for the fuel cells and on the forecourt for refuelling. The hydrogen in these 2015 cars will be stored on-board in very high pressure tanks, and at even higher pressures at the forecourts. The safety issues of storing hydrogen on-board at these pressures are substantial while the cost issues of installing a new high-pressure infrastructure at the forecourts across the nation are currently massively prohibitive.

**"We believe that there is no single solution to the challenges we face in decarbonising the fuel chain, but this research suggests that ammonia based technologies are worth further consideration and may well play an important part in the future energy landscape."**

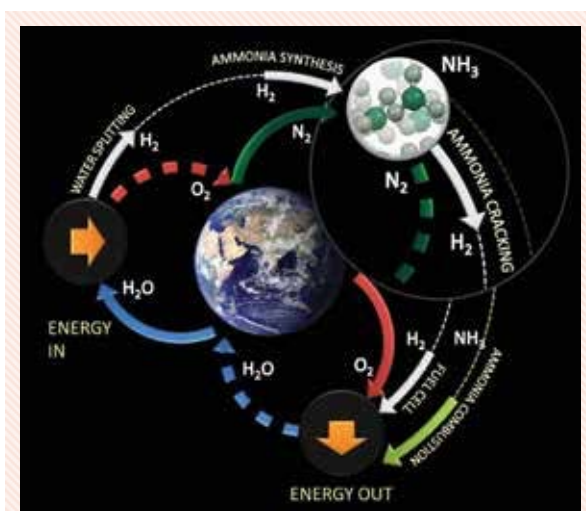
(Professor David MacKay FRS, Chief Scientific Advisor at the Department of Energy and Climate Change (DECC))

Five years ago, Professor Steven Chu, Nobel Prize winner and, at that time, the US Secretary of State for Energy in the Obama administration, sounded a death knell for the hydrogen economy with his statement that, while it takes only three miracles to be declared a saint, it would take four miracles to achieve a hydrogen-based energy economy. This work from STFC researchers could well be a turning point.

**"This exciting research has the potential to dramatically influence the static and mobile energy solutions of the future. While still at an early stage, this innovative work offers a very elegant solution to some of the major challenges in harnessing the power of hydrogen as a fuel source."**

(Kate Ronayne, Head of Innovation at STFC)

The research paper 'Hydrogen Production from Ammonia using Sodium Amide' is published in the Journal of the American Chemical Society and is available to download.

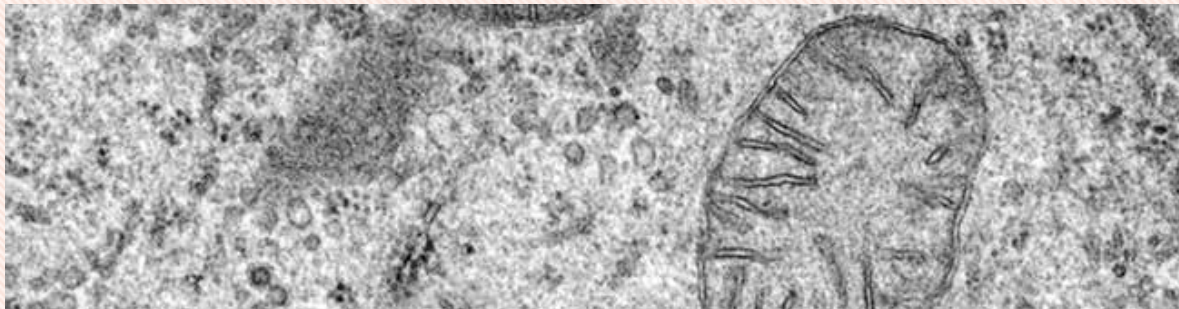


Hydrogen-Ammonia Cycle (Credit: STFC)

---

# Molecular “scaffold” could hold key to new dementia treatments

---



Researchers at King's College London have discovered how a molecular “scaffold” which allows key parts of cells to interact, comes apart in dementia and motor neurone disease, revealing a potential new target for drug discovery.

The Medical Research Council, Wellcome Trust, Alzheimer's Research UK and the Motor Neurone Disease Association funded the study, published in Nature Communications.

Researchers looked at two components of cells: mitochondria, the cell “power houses” which produce energy for the cell; and the endoplasmic reticulum (ER) which makes proteins and stores calcium for signalling processes in the cell. ER and mitochondria form close associations and these interactions enable a number of important cell functions. However the mechanism by which ER and mitochondria become linked has not, until now, been fully understood.

By studying cells in a dish, the researchers discovered that an ER protein called VAPB binds to a mitochondrial protein called PTPIP51, to form a “scaffold” enabling ER and mitochondria to form close associations. In fact, by increasing the levels of VAPB and PTPIP51, mitochondria and ER re-organised themselves to form tighter bonds.

Many of the cell's functions that are controlled by ER-mitochondria associations are disrupted in neurodegenerative diseases, so the researchers studied how the strength of this “scaffold” was affected in these diseases.

TPD-43 is a protein which is strongly linked to Amyotrophic Lateral Sclerosis (ALS, a form of motor neuron disease) and Fronto-Temporal Dementia (FTD, the second most common form of dementia), but exactly how the protein causes neurodegeneration is not properly understood.

The researchers studied how TPD-43 affected mouse cells in a dish. They found that higher levels of TPD-43 resulted in a loosening of the scaffold which reduced ER-mitochondria bonds, affecting some important cellular functions that are linked to ALS and FTD.

Professor Chris Miller, from the Institute of Psychiatry at King's and lead author of the paper, said:

**“At the molecular level, many processes go wrong in dementia and motor neuron disease, and one of the puzzles we're faced with is whether there is a common pathway connecting these different processes. Our study suggests that the loosening of this “scaffold” between the mitochondria and ER in the cell may be a key process in neurodegenerative diseases such as dementia or motor neuron disease.**

Professor Miller concluded:

**“Our findings are important in terms of advancing our understanding of basic biology, but may also provide a potential new target for developing new treatments for these devastating disorders.”**

# New easel reveals secrets of old masters



A state-of-the-art easel is literally shedding new light on the ingenious variety of materials that have been used

over the centuries to create artists' paint pigments.

The micropositioning easel is giving scientists at The National Gallery, London, the ability to examine great works of art in unprecedented detail and is being used to analyse the paintings in a major new exhibition, Making Colour. Around six metres long, the easel is capable of holding and slowly moving around a painting up to 2.8 metres high and wide.

Funded through the support of the Engineering and Physical Sciences Research Council (EPSRC), the computer controlled easel is capable of safely holding a very large painting and moving it in minute steps to make the most of the latest digital technology. Identifying the materials used as pigments provides information on aspects such as the age of a picture and the painting technique used.

Scientists and other researchers at the National Gallery use digital imaging to build up a high-resolution image of paintings to learn about their structure, the way they are made and what needs to be done for their preservation. The easel will open up opportunities to try out new types of research such as hypersepectral imaging.

Infrared imaging, X-ray imaging, electron microscopy and mass spectrometry are all used to discover more about the materials used by artists in the past and how they are likely to change over time.

From ultramarine to regal gold and zinging silver, the National Gallery's new 'Making Colour' exhibition traces the history of how materials, natural and artificial, such as minerals and dyes were used to create colour in paintings from the Middle Ages to the end of the 19th century. Through a series of colour themed rooms visitors can experience how artists used colour and materials in their art.

Sassoferrato's Virgin in Prayer, one of the paintings in the exhibition, is painted in a rich deep royal blue. Joseph Padfield, conservation scientist at the National Gallery explains:

**"Look at it from a distance and you might only see a single, strong blue, but if you're able to look at it much more closely you will see more subtlety to it. You will see the different brushstrokes that form the shadows and the highlights on the cloak and the details of how the fabric has been portrayed."**

In the past the only way to really see this amount of detail was to take the painting down and look at it under a microscope, an option which was reserved for a very few people. Using the new easel to capture extremely high-resolution images of a painting, that special experience of beginning to explore how such a fabulous painting was created can be accessible to many more people.

The easel is also helping inspire a part of the "Making Colour" exhibition. Visitors can get involved in an interactive experiment that will feed into future research on human colour perception. It involves capturing the responses of people as they view a picture under different conditions, using a tuneable LED light source.

Philip Nelson, EPSRC's Chief Executive said:

**"Many people see the Arts and Science as existing in isolation. This is far from the truth, scientific and engineering techniques can help us understand how great works were made, how they are perceived by the human brain and how they can be preserved for future generations to appreciate. EPSRC is proud to be working in partnership with the National Gallery both in the Making Colour Exhibition and on other projects."**

The partnership between EPSRC and the National Gallery London began in 2010. It highlights the contribution that science and scientists make to the world of art, and the intellectual value that emerges when scientific and artistic traditions come together.

The National Gallery has an internationally recognised Scientific Department.

# UK sitting on robotics goldmine



In the light of mounting competition from countries such as Japan, Korea and the United States the UK's strategy for stimulating growth in robotics and autonomous systems (RAS), published in July, is calling for action

to improve the business prospects of the nation's world-leading technical capabilities.

**"Robots have often been positioned as a thing of the future, but today's strategy launch emphasises the fact that they are very much of the here and now. Technologies that have traditionally been the preserve of science fiction are becoming increasingly commonplace; from robotic limbs through to driverless cars."**

**"Britain has a wealth of expertise in robotics and autonomous systems that is why it has been identified as one of our eight great technologies. This strategy provides an ambitious guide for how the UK can build the foundations for a thriving robotics industry that can become an engine of growth."**  
(Universities and Science Minister David Willetts)

The Technology Strategy Board's RAS Special Interest Group (SIG), in consultation with the Engineering and Physical Sciences Research Council (EPSRC) and the UK robotics industry, developed the strategy for the Government's Department for Business, Innovation and Skills.

It highlights the fact that the UK is in a prime position to become a world leader in an industry estimated to be worth between \$1.9 - \$6.4 trillion per year by 2025 in terms of its global economic impact (source: McKinsey).

**"The UK is a substantial contributor to some of the world's best research in the field of robotics and autonomous systems, but countries such as Japan, Korea and the USA have had greater success in developing companies to exploit those opportunities. We need to provide a business environment in the UK that is geared towards helping robotic and autonomous technologies out of the lab and into the marketplace."**

**"The UK has an exceptional heritage in many of the industries where robotics can be most useful, and our world-leading research base makes us ideally placed to exploit the opportunities arising in these fields, but we need to act quickly if we don't want to be left behind. With the right course of action, we believe the UK could achieve 10% of the global market share by 2025."**

(Professor David Lane FRSE, Chair of the Robotics and Autonomous Systems special Interest Group)

A key recommendation of the strategy is to develop existing UK assets, such as decommissioned nuclear sites, farms, factories, mines and whole towns, for use as valuable robotics test beds. For example, identifying farm sites to test the deployment of autonomous crop management systems, and equipping mobility-friendly towns to safely test driverless cars on real roads. Combined with a flexible regulatory framework, this would present a unique opportunity to attract robotics developers and investors from around the world.

The strategy, introduced by David Willetts MP, Minister of Universities and Science, at an event in London, highlights that the biggest opportunities for the UK to exploit its robotics talent are in transport, health, energy and manufacturing. From driverless cars and rail systems that can monitor and repair the track autonomously, through to assistive technologies for the elderly and remote nuclear plant safety monitoring, the UK's technical know-how could be worth billions of pounds if it can be successfully exploited.

Current estimates indicate that the market for RAS products and technology, in non-military sectors, will be in the order of £20 Bn by 2025.

In order to capitalise on the robotics opportunity, the strategy which has been developed to inform future Government resourcing and organisation, and to guide future policy - identifies five core strands of activity that it recommends as the focus for UK investment and action going forward.

### **Five core strands of action:**

**RAS Grand Challenges** - Grand Challenges, whereby teams compete to build RAS demonstrators, should be focused on real scenarios in vertical markets that stimulate collaboration, identify what is possible, and excite the public. Using RAS Assets as staging grounds, the competitions will also help to establish regulation.

**RAS Clusters** - Investing in areas of emerging robotics growth, such as Edinburgh and Bristol, in order to foster “clusters” that will help stimulate innovation across industry, academia and finance and provide support networks throughout the RAS supply chain.

**RAS Skills** - Because robotics generates so much interest it has the potential to attract the brightest and best to STEM subjects that are critical to a knowledge economy. All actions should be designed with skills development in mind; engaging with schools, apprentices, graduates and the general public.

**RAS Assets** - Make UK the RAS destination of choice for international research, innovation and market exploration by developing tangible assets for the RAS community. For example, turning UK wasteland and decommissioned assets into usable robotics technology test beds. Alongside this, providing intangible assets such as a flexible legal and regulatory environment, pervasive software skills, and a willingness to try new ideas.

**RAS Coordination** - Aligning investment in research, business and regulation so that UK efforts form a cohesive, coherent innovation pipeline, shaping a common and competitive approach in different industry sectors.

A pressing need to improve the process of technology transfer from UK scientific research into viable businesses is also highlighted, as well as the importance of entrepreneurial support schemes, such as the Royal Academy of Engineering’s Enterprise Hub.

The strategy also recommends proactive public engagement to raise awareness and debate on the role of robotics in overcoming major global challenges and international outreach to promote the UK globally as an attractive place to invest in bringing RAS technologies to market.

In order to implement the recommended actions, the strategy recommends the establishment of a RAS Leadership Council to engage with senior leaders across a range of sectors in industry, academia and Government, and to provide independent advisory direction.

**“At Shadow, we’ve been developing key robotics technologies like the Dexterous Hand for over a decade. Getting joined-up thinking between government, research and industry to position the UK as the best place in the world for robotics and autonomous systems is a fantastic opportunity for technology SMEs like us. The unified Strategy will help make the UK a powerhouse in robotics globally, and will help us take our technologies into places we could never previously hope to reach.”**  
(Rich Walker, Managing Director of Shadow Robot Company)

# Leading Your Technical Team

## The Leading Your Technical Team Programme Set

LYTT - Leading Your Technical Team

BYLS - Building on Your Leadership Skills

The Leading Your Technical Team programme set of **Leading Your Technical Team** and **Building on Your Leadership Skills** is geared toward delivering the fundamental and key skill elements for leading and managing people, particularly in a technical team.

The nature of technical support in many universities and higher education colleges is changing. Technicians have become both increasingly specialised and also high impact in terms of directly supporting teaching, research or infrastructure. Recent surveys have shown that high quality technical support is now seen as essential in delivering a high value student experience and quality research.

For many universities one of the key challenges is how to effectively channel, develop and manage their highly valuable technical resource. Increasingly, what has been highlighted when realigning and grouping together technical support is the need to prepare and train technicians to manage, and above all, lead technical teams. We have designed the Leading Your Technical Team programme set to meet this need.

Both LYTT and BYLS are delivered in the context of a higher education technical environment but they are not aimed at any specific job role or discipline. Our participants come from a very broad range of higher education institutions, and from a very diverse range of academic disciplines and departments or service sections. For example our recent courses have included people from institutions such as Glasgow Caledonian University, University of Leeds, University of Oxford, Canterbury College, University of Bristol, University College Cork, and Norwich University College of Arts to name but a few. Similarly our participants also have a wide variety of job roles. These range, for example, from Technician, Senior Technician, Laboratory Manager, IT Network Team Leader, Workshop Manager, Biological Facilities Manager, Textile Workshop Manager and Biorepository Manager.

**Leading Your Technical Team** has a long and well respected history. It has been running for 30 years with more than 1,200 technicians having been through the programme over this time.

The programme content has continued to adapt and develop in line with changes in HE and it continues to be held in very high regard by HE senior managers and staff developers. Its high reputation is maintained through delivering a very high standard of technical management training via experienced HE managers, in a practical context with the reality of managing in a university technical environment.

**How the programme works:** Both programme follow a similar format, in that the learning is enhanced through informal and highly participative sessions that include active discussion, exchange of ideas and delegate group work. There is no role playing.

There are a strictly limited number of places and applicants are advised to apply early in order to secure a place.

### Leading Your Technical Team Specific programme goals

The programme introduces the fundamental building blocks of management and leadership specifically in the context of technical support in universities and higher education colleges. It provides an opportunity to look at the practical challenges of managing and supervising technical staff from both academic and service areas, as well as examining a range of essential management and leadership skills and techniques. The programme links practical leadership theories to dynamic team leading in context with the reality of managing in a technical university environment.

By the end of the programme participants will have:

- Identified the main management/leadership/supervisory skills required of them within their own working environment.
- Gained information on key issues, changes in higher education and current initiatives and developments which affect technical staff.
- Reflected upon the practices and processes affecting management and leadership in technical units, sections and departments.
- Practised a number of leadership and management skills and identified ways to develop these skills further.
- Had an opportunity to share with presenters and fellow participants from a wide number of universities and higher education colleges, their views, experiences, expertise etc.

### Content

The programme will cover topics including:

- Key issues - roles and responsibilities.
- Management v leadership.
- Motivation and delegation - individuals and team.
- Communication skills & team briefing.
- Influencing skills and analysing your network.
- Managing and leading your team through change.
- People management issues & case studies.
- Positive team leadership

### Who should attend

This programme is intended for chief/ principal/ senior technicians, laboratory/ workshop/unit managers, recently appointed departmental superintendents or senior colleagues from UK universities and colleges, who might now or in the future, have managerial or supervisory responsibilities and are interested in developing their fundamental management/leadership skills. The programme content will be delivered within the context of working in an university environment and will be applicable to support staff from academic and service areas. It is most important that participants are, wherever possible, residential and therefore available to attend the programme throughout.

### Building on Your Leadership Skills

#### Specific programme goals

The programme builds on the fundamentals learned in Leading Your Technical Team and provides a further opportunity to look at the practical challenges of managing or supervising technical staff from both academic and service areas, as well as examining a range of essential management and leadership skills and techniques. The programme again links practical leadership theories to dynamic team leading in context with the reality of managing in a technical university environment. The programme content incorporates a range of topics that were suggested by attendees on Leading Your Technical Team as

areas that they would most like to explore further, e.g. Managing Staff Performance, Dealing with Difficult People and Influencing Skills. Toward the end of the programme we begin to explore the topic of Leadership Intelligences, which introduces you to themes covered in greater depth in more advanced leadership programmes.

By the end of the programme participants will know how to:

- Lead and motivate by identifying the key skills and characteristics of successful leaders and to develop the key people management skills you need to ensure success.
- Improve performance through developing personal strategies for enhancing the effectiveness of your team by using flexibility across the leadership styles.
- Manage performance through developing your team's strengths by setting and reaching both personal and team objectives using delegation and leadership skills.
- Lead a team made up of different personalities and encourage mutual respect and cooperation from all team members and understand how to overcome barriers to communication.
- Work with difficult people through resolving conflict and dealing with difficult people and situations confidently and positively.
- Understand yourself, your influencing environment and your impact and to develop multidirectional influencing skills and an influencing strategy.

### Content

The programme will cover topics including:

- Leadership & motivation - The differences of motivation, influence and manipulation.
- Managing performance - Where and when to improve team and/or individuals performance.
- Working with difficult people - How to take control & case studies.
- Influencing - Influencing teams & influencing individuals.
- Leadership intelligences - Personality based leadership, leadership and team performance.

### Who should attend

This programme is particularly suited to people who have completed Leading Your Technical Team or those who have previously attended similar programmes and have a few years' experience in a technical managerial or supervisory role and want to further develop their management/leadership skills. The programme content will be delivered within the context of working in a university environment and will be applicable to support staff from academic and service areas. It is most important that participants are, wherever possible, residential and therefore available to attend the programme throughout.

## Previous course feedback

### Leading Your Technical Team

'I have learned more about the supervisor y skills that I require in my job, how to develop these skills and especially in the way I communicate to other members of staff. I really enjoyed sharing ie ws and experiences with fellow participants from other universities.'

'The course was run in a relaxed and informal manner, at the same time being really informative which led to an interesting and useful experience.'

'This course is well structured and presented. It taught me to look at my management technique and to focus my efforts on areas where I can succeed'

'Good course that hits a lot of the main areas and interesting areas regarding management and team leadership. It's motivational to the point that you return to work with more ideas and your own motivation to tackle day to day leadership.'

'For me the course was a positive experience and directly related to my day to day working life.'

'It was useful to find that many people are in the same position with the same worries and the programme provided useful information on dealing with many of our issues.'

### Building on Your Leadership Skills

'A Different way of looking at the way I respond to my team to improve all our performances. A way of understanding the individual members of my team. A chance to discuss with people from different institutions and areas of work how they deal with difficult members of their teams.'

'Felt I came away from the course feeling better about being a team leader and focusing on management issues.'

'A fun and informative way of helping me explore my leadership skills and how they affect my team.'

'The course was very informative and inspirational with lots of ideas and discussions throughout the sessions. A very useful programme delivered in a fun relaxed environment.'

'A very relaxed and informative course with like-minded delegates; the course was inclusive and challenged delegates with thought provoking ideas and concepts.'

'Interaction and problems experienced between people across the HE spectrum away from your place of work is of great value and should not be forgotten. In-house training is not necessarily the way forward.'

## The Leading Your Technical Team Programme Set

LYTT - Leading Your Technical Team

BYLS - Building on Your Leadership Skills

### 2014/15 Programme Dates and Cost:

#### Building on Your Leadership Skills

**Date:** Thursday 20 November 2014 to Friday 21 November 2014

**Times:** Start 09.30 close at 16.00 Day Two

**Venue:** York Marriott Hotel

<http://www.marriott.com/hotels/travel/qyyk-york-marriott-hotel/>

**Application Deadline:** Friday 31 October 2014

#### Leading Your Technical Team

**Date:** Thursday 12 February 2015 to Friday 13 February 2015

**Times:** Start 09.30 close at 16.00 Day Two

**Venue:** York Marriott Hotel

<http://www.marriott.com/hotels/travel/qyyk-york-marriott-hotel/>

**Application Deadline:** Friday 9 January 2015

### Cost:

**£500 IST Members** - Residential fees are inclusive of all meals and one night's en suite accommodation

**£570 (Non IST members)** - Residential fees are inclusive of all meals and one night's en suite accommodation

**Extra night accommodation £89**

### Additional dates, bespoke courses:

We would be happy to discuss running these courses at your host institution or at a suitable venue, if a number of attendees from a single institution wish to undertake the courses. Please contact Wendy Mason.

## Presenter profiles



### Kevin Oxley

Kevin is the Programme Director for the LYTT & BYLS courses, which are now run through the Institute of Science & Technology (IST). He is the departmental manager of the Department of Infection &

Immunity within the Medical School at the University of Sheffield. He began his career at Sheffield as a trainee Medical Laboratory Scientific Officer over 30 years ago and has subsequently experienced a series of diverse technical roles within the School. Over the last 10 years he has undertaken a range of senior managerial positions, leading technical and support staff teams, under various administrations and has been involved with small and large project teams across the University. As well as helping to redesign and co-deliver the LYTT & BYLS programmes from 2010 Kevin is also actively involved in both promoting and delivering staff development and training at Sheffield.



### Lisa Woods

Lisa has significant experience managing large teams in both private and public sector organisations. After graduating from Loughborough University she worked for airport operator BAAplc

in a variety of operational, change management and training roles across all the London airports. Whilst with BAA she also gained her MBA from the University of Surrey. In 2000 Lisa moved with her family to the USA where she undertook volunteer work which included the American Red Cross and the Small Business Administration in Texas. Lisa joined the University of Sheffield in 2005 and currently manages a team of 400+ staff in her role as Head of Campus Services.



### Ian Moulson

Before his retirement in December 2013 Ian was the departmental manager of the Department of Electronic and Electrical Engineering at the University of Sheffield. He was at Sheffield for

40 years, beginning his career there as an electronics technician following a number of years in the electronics industry and an electrical engineering apprenticeship in the steel industry. Throughout his career Ian built up a wealth of experience in managing a diverse range of support staff teams. He has managed technical teams ranging in size from 2 to 40 people as well as small to medium sized administrative and managerial teams. For many years Ian has been actively involved in both promoting and delivering technical training at Sheffield and also more widely since 2002 through the Leading Your Technical Team programmes.

To book a place on either of these programmes please contact:

**Wendy Mason,**  
LYTT & BYLS Programme Administrator

**T: 0114 276 3197**  
**e: [office@istonline.org.uk](mailto:office@istonline.org.uk)**

---

# IST Journal Publication

---

Back copies of our biannual Journal publication are available online, but access is restricted to our current members only. Members can log in using their surname as the username and their date of birth in the format: yyyyymmdd as their password.

## The Journal Back Issues

<http://istonline.org.uk/membersarea/>



*If you experience any problems accessing the publications please contact us ([office@istonline.org.uk](mailto:office@istonline.org.uk)), quoting your Surname, Membership Number and Date of Birth.*

## Article submissions for the IST Journal

We welcome article submissions from all areas of pure and applied science, and all areas of technology, including areas such as IT, media, and the arts. We like to cover existing, historical, and new technological advances, and also unusual aspects of science. We particularly want to encourage submissions from people who want to publish for the first time, and can offer help and assistance in putting a first article together.

Contact the editor: [i.moulson@istonline.org.uk](mailto:i.moulson@istonline.org.uk)

Or the IST office: [office@istonline.org.uk](mailto:office@istonline.org.uk)

The guidelines for article submissions to the IST Journal are:

1. Article submission deadlines;
  - Summer/Autumn edition is 31st May.
  - Winter/Spring edition is 30th November.
2. Articles should be submitted electronically in Microsoft Word .doc format with images sent separately as JPEG files (in the highest resolution possible please as we may not be able to reproduce low resolution images). Please cross reference to images and captions in your article text.

This is our preferred option but other formats can sometimes be accommodated; please contact the Editor.
3. Short articles: these can be submitted in any length up to roughly 2000 words.
4. Major articles: these are normally no longer than roughly 6000 words per edition, but please contact the Editor for longer submissions as they can usually be accommodated across two or more editions.
5. All accepted articles will be edited into the IST Journal's house-style and may be corrected for grammar. Text layout and images may be changed, altered or omitted.
6. All articles must be written in UK English. (If English is not your first language, you should ask an English-speaking colleague to proofread your article.) Poorly translated articles may be declined by the editors.
7. Article submissions should be submitted via email to [office@istonline.org.uk](mailto:office@istonline.org.uk). Your email should clearly state "Journal Article Submission" and the article and images sent with it as separate email file attachments.

---

# Communications and the IST

---

We are working hard to ensure that we provide our members with the best service that we can, and one of the areas that we have updated is our communications. There are now a number of ways in which we can stay in contact and provide information for our members.

Email - This continues to be our preferred method for direct contact with our members, particularly as we have a significant number of overseas colleagues for whom hardcopy mailings can be problematic (and costly).

Our main email addresses are:

[office@istonline.org.uk](mailto:office@istonline.org.uk) - general enquiries

[memberships@istonline.org.uk](mailto:memberships@istonline.org.uk) - enquiries regarding new memberships and renewals

[registrations@istonline.org.uk](mailto:registrations@istonline.org.uk) - enquiries regarding CSci/RSci/RSciTech registrations and renewals

It is important that we have everyone's up-to-date email address so if yours changes please let us know.

Website ([istonline.org.uk](http://istonline.org.uk)) - We post both important announcements and general information that we think will be useful for our members on our website, so visit us there on a regular basis to see updates.

Social Media – We use social media routes for quick communications, networking and hope to encourage both members and non-members alike to engage in online discussions and provide ideas and feedback. The platforms that we use are:

Twitter (@istonline) - we encourage ideas, feedback, and discussions using [#istforum](https://twitter.com/istforum)

Facebook (institute.of.science.and.technology) - feedback, ideas and comments welcome

LinkedIn and Google+ - join in group discussions, links through to these groups (and our Twitter account and Facebook page) are available on our website.

# The IST CPD Award

## The IST Continuing Professional Development Award

The **IST CPD Award** has been developed specifically for technicians to ensure that you have a clear route to professional and personal development and recognition for the work you do. The award means that you will be able to demonstrate to a current or future employer your professionalism and competence.

As a CPD candidate you can plan and undertake activities based on competencies associated with your professional role over a period of up to 2 years.

The award provides a framework within which you can identify your development needs and demonstrate that you are actively keeping abreast of new technologies, processes, and developments in your area of work.

The award is designed to be flexible in application and content, covering the needs of the more 'traditional' skills groups as well as those related to new and developmental aspects of the role and also easily tailored to meet any 'specialist' nature of a technician's role.

### Key features

- On-line induction
- Development of a Personal Development Plan
- 16 generic role profiles to work from
- Evidence based competencies
- Personalised development activities
- Work based project OR dissertation
- Use of a reflective CPD log
- Underpinned by extensive learning resources

Candidates will have the support of a dedicated team of mentors, professional assessors, and access to a wide range of resources through both the IST and the **HETB** website. In addition the communities of technicians undertaking the award share best practice and network with each other to aid their journey through the award. On completion technicians can retain professional status by joining one of the registration schemes (see 'IST CPD Award, Chartered Scientist, Registered Scientist, Registered Science Technician, and Registered Practitioner' on our web site).

Ben Palmer, a technician working in the Department of Materials Science & Engineering at the University of Sheffield completed the IST CPD award earlier this year, explains why he undertook the award.



Ben Palmer

**"I enrolled on the CPD Award as I wanted to complete a qualification that was, specific to technical staff, tailored around my role and flexible in its approach.**

**The scheme looked a good way of documenting all of my CPD, developing my skills and driving my career forward."**

**Want to find out more?**

**Visit: [www.istonline.org.uk/cpd](http://www.istonline.org.uk/cpd)**

# Not working in science or science technology?



## IST Registered Practitioners

The Institute of Science and Technology is uniquely an organisation run by technicians for technicians. We support these incredibly important staff in all areas, not just science but technologists in all fields.

As the professional body for specialist, technical and managerial staff, we are actively involved in the professional recognition of technical staff in education, research, government, and industry. It is our view that our Registration Schemes are essential to establish your professional standing, acknowledge your expertise and to enhance your career prospects.

Technicians and technologists working in non-science fields may not be eligible to join the Science Council's Registers but the IST recognises the exceptional work that technicians and technologists working in non-science fields do. We are committed to providing all our members with a means to endorse their status and to enable them to demonstrate transferable skills, up-to-date professional competence, and continuing professional development. We do this through our **Registered Practitioner Scheme** and by the designation of **MIScT(Reg)** or **FIScT(Reg)** status to members who meet the criteria.

Registered Practitioners must have attained a high level of technical proficiency supported by sufficient knowledge of modern technology to enable them to relate to operating practices in their chosen field.

### Criteria for Registration include:

- Corporate Membership of the Institute of Science & Technology
- Higher National Certificate or Diploma (other qualifications judged to be of equivalent standard also satisfy the requirements)
- NVQ/SVQ level 3 or 4 in an appropriate occupational area
- Completion of the HEaTED/IST CPD award\*
- Appropriate experience (in terms of breadth, depth and length)

Importantly, there is also a route for mature applicants who have achieved a high standard of professional competence but who may not have the formal academic qualifications.

Registration is renewed each year with evidence of Professional and Personal Development. There is a small fee for admission to the Register and a nominal annual renewal fee.

\* The IST CPD award can be used to demonstrate CPD activity for the RSci, RSciTech and RegPrac schemes and fulfill associated registration scheme competencies. Individuals automatically become members of the IST, and although the IST CPD award is not a qualification it does allow the individual to formally demonstrate work based experience and learning.



Want to find out more?  
Visit <http://istonline.org.uk/>  
Follow us on Twitter @istonline

**iST** The Institute  
of Science  
& Technology

Chartered Scientist  
Registered Practitioner  
IST CPD Award

Registered Scientist  
Registered Science  
Technician

Since 1987, the Institute of Science & Technology has operated a Register of competent and qualified technical practitioners

# IST What we're about

The Institute of Science and Technology has been supporting specialists with the technical skills that the world's economy needs for more than 66 years. We represent all sorts of technicians, experts, and managers wherever they work: from science labs and engineering facilities to recording studios and IT departments.

As technology continues to develop at a tremendous pace, the IST is there to help technicians be the best they can be. We encourage our members to further their careers by pursuing professional and personal development, and by attaining a professional status that recognises the value of their experience and expertise.

In that way, we are always thinking about the future for our members and the organisations they work for. It is our mission to ensure that industry, business, research, schools, colleges, and universities have the staff they need to keep up with constant advances in science and technology.

Central to this is the IST's belief that technicians deserve formal recognition for the work that they do, the experience they've racked up and the expertise they have to share. We know that our members are skilled professionals, and now we can give them official accreditation as a Chartered Scientist (CSci), Registered Scientist (RSci), Registered Science Technician (RSciTech) or Registered Practitioner (MIScTR eg) or FIScTR eg) to prove it.

By registering, technicians are promoting the professional standing of themselves and their colleagues. They are showing that they are making a vital contribution in their fields and achieving a status that makes them a key asset for the long-term.

We are working hard to bring technicians from all disciplines into our international community of specialists. Our members work across a wide range of fields, which gives each of them the chance to make contacts across business, industry, research, and education, and address the challenges these areas face together.

There is advice and guidance available for members (particularly new or young ones) through the

IST's Mentoring Support Network. Our work with organisations such as HE TB and unionlearn, promotes the professional development of technicians in all areas. Together, we are ensuring technicians get the support and opportunities they need to achieve their potential.

We know how important it is for technicians to be able to develop their skills and have their expertise recognised. We know too, as we look to the future, that many more highly skilled technicians are needed. That's why the IST has dedicated itself to continuing to raise the status of specialist, technical and managerial staff and to continue to support their progression.

## The IST is an organisation run by technicians for technicians.

The number of skilled technicians joining the IST's registration scheme is growing fast. That's because more and more of our members are discovering the great benefits and opportunities that professional recognition can bring.

The IST is one of the Science Council's Licenced Bodies and can now award Chartered Scientist (CSci), Registered Scientist (RSci) or Registered Science Technician (RSciTech) status to experienced technicians.

To register, you simply need to show that you have, and use, the skills that qualify for professional status, while always continuing with your professional development. A full explanation of what you need to do to get registered status can be found on the IST website: [istonline.org.uk/professional-registration](http://istonline.org.uk/professional-registration)

In addition, the IST is running workshops in different organisations to explain the application process in more detail. If you are interested in one of these workshops, and there is enough interest where you work, email [office@istonline.org.uk](mailto:office@istonline.org.uk)

You can also meet some of the people who have registered so far by visiting our website: [istonline.org.uk/professional-registration/case-studies](http://istonline.org.uk/professional-registration/case-studies)

**The Institute  
of Science  
& Technology**

Kingfisher House, 90 Rockingham Street  
Sheffield S1 4B

T: 0114 276 3197  
F: 0114 272 6354

---

# IST Organisation

---

## The Executive Committee

### President:

*Vacant - (John Robinson FIScT, MinstLM to December 2013)*

### Chairman:

*Terry Croft MBE, FIScT*

### Secretary:

*Chris Smith MIScT, RSci*

### Treasurer:

*Joan Ward FIScT*

### Education Officer:

*Philippa Nobbs FIScT*

### Registrar:

*Michelle Jackson PhD, FIScT (Co-opted Member)*

### Recruitment Officer:

*Kevin Oxley FIScT, RSci*

### Marketing Officer:

*Ian Moulson FIScT, RSci*

### Deputy Marketing Officer:

*Chris Smith MIScT, RSci*

## Fellowship & Overseas Secretary:

*Derek Sayers FIScT*

## Education Board:

*Philippa Nobbs FIScT (Chair)*

*Geoff Howell MIScT*

*David Forster FIScT*

*Chris Pambou MIScT, RSci*

*Michelle Jackson FIScT*

## Marketing and Editorial Board:

*Ian Moulson FIScT, RSci (Chair)*

*Alan Gall FIScT, CSci*

*Stephen Gamble MIScT FIBMS*

*Chris Smith MIScT, RSci*

*Joan Ward FIScT*

## Strategy Group:

*Matt Levi FIScT*

*Kelly Vere MIScT*

*John Dwyer FIScT*

## Vice Presidents:

*John Burns FIScT, M.Univ.Sx*

*Dr K Christie*

*Maida Davidson FIScT*

*Dr D Duerden*

*Terry Evans MIScT*

*Simon Fairnie FIScT*

*Ian Gray MIScT*

*Robert Hardwick FIScT*

*Dr L J F Youlten FRCP, MRCS*

*Prof. N-S Zhong*

# Association Conference – 2014

In April of this year an association of university technical managers held a combined conference, supported by the IST, in Glasgow, hosted by The University of Strathclyde.

Alaine Martin, Laboratory Superintendent of the Department of Pure and Applied Chemistry at Strathclyde organised the highly successful event, which was attended by over 120 technical managers, supervisors, and senior technicians.

Alaine, chair of UCLAS (Universities Chemistry Laboratory Administrators and Superintendents), began organising the Conference in November 2013 together with the other IST special interest group TMU (Technical Managers in Universities). They also teamed up with UBMA (University Bioscience Managers Association), with the aim of bringing the groups together in one single conference.

The theme was “The Technical Profession, New Horizons, and Shared Perspectives” Keynote speakers included:

Terry Croft, Chairman of the IST

**“The current state of the nation, the national position, and the need for the Professional Technician”**

Stella Matko, Acting Director of Estates Services, University of Strathclyde

**“Challenges and Opportunities”**

David Robinson, Deputy University

**“Massive Open On-line Courses (MOOC’s) – a transitory phenomenon or a profound transformation of Higher Education?”**

Ian Moulson, University of Sheffield

**“Supporting the future of engineering teaching and research at the University of Sheffield”**

Ann Allen, Director of Estates Buildings, University of Glasgow

**“How an effective campus can support the aspirations of the scientific community”**

The two day conference also included a comprehensive timetable of special interest group sessions, talks and discussions, plus guided tours of facilities and laboratories.



CHEM members at the conference



TMU members at the conference



UBMA members at the conference



Conference dinner at Barony Hall

Sponsors who exhibited at the conference:



# Application for membership

Before completing this form please read the Notes for Guidance for Applying, available at [www.istonline.org.uk](http://www.istonline.org.uk). All relevant sections of the following form must be completed, even when additional information is provided on a separate sheet. New members apply to join on the basis that the appropriate grade of membership will be awarded by the Institute on acceptance, and that the level will be determined by the details supplied on this form.

When the applicant is notified of the grade of membership offered by the Institute a request for the appropriate membership fee will be made. Personal details collected in respect of applications will be treated in the strictest confidence and every effort is made to ensure that data is held securely.

**I agree to my details being passed onto individuals involved in the application review process.**

**Please accept my application for membership. If accepted I agree to abide with the by-laws of the Institute.**

**Signed:** ..... **Date:** .....

## PERSONAL DETAILS

Title (Dr/Mr/Mrs/Miss/Ms): .....

Surname: .....

Other Names: .....

Date of Birth: .....

Home Email address: .....

Telephone: .....

Address for correspondence: .....

.....

.....

## A. DETAILS OF PRESENT POST

Job Title: .....

Date of Appointment: .....

Employer Name: .....

Employer Address: .....

.....

Email: .....

Type of work or discipline: .....

.....

Brief details of practical work undertaken in the year prior to application:

.....

.....

.....

## B. PREVIOUS EMPLOYMENT HISTORY

Date	Employer	Type of Work/ Status/Title/Discipline
------	----------	--

.....	.....	.....
-------	-------	-------

.....	.....	.....
-------	-------	-------

.....	.....	.....
-------	-------	-------

## C. QUALIFICATIONS

Give details below of any examinations passed, prizes or scholarships awarded etc. (Documentary evidence must be forwarded with this form, scanned images in jpg format are acceptable)

Date	Examinations/Prizes/ Scholarships etc	Institution
------	--	-------------

.....	.....	.....
-------	-------	-------

.....	.....	.....
-------	-------	-------

.....	.....	.....
-------	-------	-------

.....	.....	.....
-------	-------	-------



#### D. COURSES, PROFESSIONAL BODIES, PUBLISHED WORK ETC.

Give details below of any courses you have, or are attending, membership of other professional bodies, published work etc.

Date	Courses/Professional Bodies/Publications etc
.....	.....
.....	.....
.....	.....
.....	.....

#### E. REFERENCE

Give name, qualifications and full address of your manager or Head of Department/Supervisor, who need not be a member of the Institute, who knows you personally and who would confirm the particulars on this form and who would support your application for membership of the Institute.

Name: .....

Position: .....

Organisation: .....

Qualification(s): .....

Email: .....

Address: .....

.....

.....

Send to: Institute of Science Technology  
Kingfisher House  
90 Rockingham Street  
Sheffield S10 4B

Email: [office@istonline.org.uk](mailto:office@istonline.org.uk)

#### FOR OFFICE USE ONLY

Application received: .....

Registration fee received: .....

Referee form sent: .....

Applicant notified: .....

Grade awarded: .....

Membership fee received: .....

Membership No: .....

Membership card & Diploma sent:

.....

Direct debit instruction received:

.....

For further information, and an on-line application form, visit our website.

[memberships@istonline.org.uk](mailto:memberships@istonline.org.uk)



---

# Promote your business with the IST

---

Advertising in the journal offers a cost-effective method of reaching the specialist technical community.

The Institute of Science & Technology's bi-annual Journal is a practically focused high quality publication, aimed at all levels of the technical and specialist community, who work in a wide and diverse number of areas. These areas range through industry, business, and education disciplines, from science labs and engineering facilities to recording studios and IT departments. Its main focus is the opportunity to keep our members, and also the very many other colleagues in the wider community of professional technicians who read it, informed.

The IST is an international organisation with members from across the UK and Europe, South America, Africa, Malaysia, and Australia.

We strive to help industry, business and education to maintain and grow the quality of their technical staff, and help them to keep up with constant advances in science and technology.

The Journal offers an ideal opportunity for suppliers of services to industry, business, and education disciplines to promote their products, develop new contacts, and reinforce existing relationships. Suppliers and manufacturers are much more likely to reach the people who are directly using their services and products through the IST and its Journal.

## Advertisement opportunities 2014/15

### 1 insertion

Full page colour: £800 / mono £700

1/2 page colour: £600 / mono £500

1/4 page colour: £350 / mono £250

Double Page Spread = 2 x Full page rates

(Corporate Affiliates receive a discount of 10%)

Artwork needs to be CMYK and a 300dpi jpeg or a print ready PDF with the following dimensions (mm)

### Full page

Artwork: 267 x 180

Trim: 297 x 210

Bleed: 303 x 216

### 1/2 page (Vertical)

Artwork: 267 x 75

Trim: 297 x 105

Bleed: 303 x 111

### 1/2 page (Horizontal)

Artwork: 118.5 x 180

Trim: 148.5 x 210

Bleed: 154.5 x 216

### 1/4 page

Artwork: 118.5 x 75

Trim: 148.5 x 105

Bleed: 154.5 x 111

### Double page spread

Artwork: 267 x 390

Trim: 297 x 420

Bleed: 303 x 426

**The Official Journal of The Institute of  
Science & Technology**

The Professional Body for Specialist,  
Technical and Managerial Staff

**ISSN 2040-1868**

Kingfisher House, 90 Rockingham Street  
Sheffield S1 4EB

T: 0114 276 3197      [office@istonline.org.uk](mailto:office@istonline.org.uk)  
F: 0114 272 6354      [www.istonline.org.uk](http://www.istonline.org.uk)