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The Journal

The Official Journal of The Institute of
Science & Technology

The Professional Body for Specialist,
Technical and Managerial Staff

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Editor's welcome



Welcome to the Spring edition of the IST's Journal.

2013 was an eventful year, one that has been a mix of good news and sad news for the IST.

It was with enormous sadness that on the 5 December 2013 we learned of the death of John Robinson, our President and former long-standing Chairman. The IST is tremendously indebted to John and it is perhaps fitting that we acknowledge and celebrate his many achievements through a short tribute article in this edition.

There has been quite a lot of good news for the IST with some exciting developments now coming to fruition. Terry Croft highlights these for us in his "Chairman's View" in this edition.

One thing that I'm really pleased about is that in this particular edition we have a large section of articles and news from our arts and media colleagues.

I was very interested to read in a recent government report how valuable and important this sector is to the UK economy and that the demand for highly skilled technicians continues to diffuse into ever widening areas. The areas with the biggest growth requirements are perhaps surprisingly now in those traditionally people orientated businesses such as arts, media, publishing, and business services.

Some key findings of the government report released in January 2014 show that in 2012 the creative economy accounted for 2.55 million jobs, or one out of every 12 jobs in the UK. It also found that employment within the creative economy grew by 143,000 (6.0%), a higher rate than for the UK economy as a whole (0.7%).

The value of the creative industry to the UK economy in 2012 amounted to £71.4 billion and accounted for 5.2% of the total UK economy, with exports accounting for £15.5 billion measuring 8% of total UK service exports.

Alongside this it is also interesting that the 2012 HESA figures show that there was an increase in arts media and design students since 2006 of >14%.

However, those subjects with a need for potential high levels of highly skilled technical support have risen by >23% over the same period. This is against a backdrop of declining technical staff numbers overall, highlighting perhaps a technical skills shortage akin to engineering and science.

I hope you find the arts and media articles in this edition interesting. There is also a major historical article by Alan Gall that I'm sure you will find fascinating, along with a mix of articles from the natural sciences and also science & technology.

I was particularly taken by the piece on digging into data, which for me highlighted our ability to collect that much data that we don't quite know what to do with it. I also, somewhat obtusely, wondered if the effect of data overload on us is similar to the effect that flocking birds or schooling fish have on their predators, where faced with so many moving targets they often chase none.

Still, in our world knowledge and understanding is all important and remains the key to success – as long as we know how to use it properly!

Ian Moulson
Editor



¹Department for Culture, Media & Sport - Creative Industries Economic Estimates January 2014 Statistical Release

Chairman's view



This Chairman's view was going to start by focusing on all the positives in 2013 but sadly it is tempered by the sad news of the death of John Robinson, our President and former Chairman.

John would not have wanted me to focus on his passing instead he would

be the first to celebrate our successes in 2013 and the further embedding of the IST as **THE** professional body representing the technical community.

In November I visited John and watched his face as he opened the grant award letter from the Gatsby Charitable Foundation providing funding to support the Professional Registration Scheme for Technicians - a scheme, which John passionately supported, and actively encouraged technicians to engage with.

This is his legacy as he has heard many technical staff up and down the country saying their professional contribution is never recognised and how they often felt as though they were a second class citizen, now you have that recognition.

All you have to do is **REGISTER**.

The IST has worked and continues to work in partnership with HEaTED and UnionLearn to promote professional registration, CPD and a variety of training and development opportunities through the HEaTED portfolio.

2014 will see a number of joint events where each body will be supporting each other to bring further benefits to the technical community at large. From regional events to masterclasses to the S-Lab Conference in September, many exciting opportunities for technicians, managers and specialists to engage and network.

There will be University Technician Days delivering training in how to complete the registration process in both the HE sector and across the various industrial sectors.

New partnerships are being developed across all sectors with other groups and associations. So another exciting and productive year in prospect which we hope will be as successful as 2013.

I want to finish my statement by quoting from one of the many emails and letters I received from members, colleagues and friends of John, expressing their pride in knowing and working with him and recognising his commitment and dedication to the technical Community. The email ended with:

"...every one of us owes a debt of gratitude to John Robinson. I pray that we shall cherish his memory by fulfilling what he set out to achieve."

So now I'm (again) asking for your help to finish off the work John started.

We need YOU as we still need more members to be involved – this is YOUR professional body.

Be an IST Champion at your university, institution or company. Be an IST Ambassador working with one of the teams visiting other universities and institutions proving help and advice and career development for example.

Be part of the Events group providing and delivering seminars and workshops on a variety of subjects. Use your knowledge and experience by joining the assessment team as part of the Professional Technician Accreditation Scheme.

Please help **YOUR** Professional Body. Contact the office on office@istonline.org.uk or call **0114 2763197** today.

I would like to thank all of those who have given up their valuable time on behalf of the IST and the Technical Community during the past year.

Also to the hard working members of the IST Executive and the supporting backroom team without whom I would not be able to successfully deliver my role as your Chairman.

With sincere thanks,
Terry Croft
Chairman

Tribute to John Robinson

John Robinson 1948–2013



It was with enormous sadness on the 5 December 2013 that we learned of the death of John Robinson, our President (and former Chairman). His death followed a prolonged period of serious ill-health, which he faced

with his customary dignity, determination, and unflinching good humour. His loss will be keenly felt by all his colleagues and friends within the IST, the higher education sector and the wider technical community and our condolences and best wishes are with his family and close personal friends.

It is fitting at this point to acknowledge and celebrate the many achievements in John's professional life, and pay tribute particularly to his vision, his hard work and his commitment toward the development of the IST for the benefit of technical community it serves. During his long professional career and also his time as IST Chair (and latterly President) John made many friends up and down the country who will now feel his loss, and here we voice our appreciation on their behalf.

His professional journey started way back in 1966 as a laboratory assistant at the ICI facility at Alderley Edge, where he undertook drug screening and related biochemical analysis. Following 2 years at ICI John left for his first taste of working in Higher Education when he became a Senior Technician in the Biology Department at the University of Salford.

He subsequently moved to the Paterson Laboratories for five years, before joining the University of Manchester as a Senior Technician in the Physiology Department in 1980. His career at Manchester then took off with a number of promotions to take him through:

- Departmental Superintendent, Department of Environmental Biology – 1987
- Laboratory Superintendent, School of Biological Sciences – 1995
- Communications and Development Manager, Faculty of Life Sciences – 2002
- Head of Technical Services, Faculty of Physical Sciences - 2005

He remained in his role in the Faculty of Physical Sciences until his retirement in 2010. In July 2013 the University of Manchester recognised John's outstanding career when they presented him with a "Distinguished Achievement Award" during their summer degree ceremony. Professor Martin J. Humphries, FMedSci FSB Vice-President & Dean, Faculty of Life Sciences, University of Manchester, acknowledged John's contribution in his presentation address. The following is an excerpt:

"It is impossible to capture 35 years of commitment and hard work in a few words, but suffice to say that John's career was littered with massive organisational achievements. From integrating student practical classes into the first coherent provision to consolidating the whole of the School of Biological Sciences onto a single Stopford site. From developing the first database to underpin our submission to the national Research Assessment Exercise to driving a successful bid for Investors in People status, John successfully delivered a range of transformational projects. He was unfazed by the need for change, he thrived in the academic environment around him, and he was always willing to do as much as he could to enable cutting edge research and deliver high standards of teaching".

The IST was delighted to be able to support John's DAA award, and impressive though his career at the University of Manchester was, it was only half of the story. John was always passionate about how the technical community was perceived both at local institution and national level. He strongly believed that there should be opportunities for training and development, for career progression, and that there should be mentoring and support in general not only for trainees but for technicians across all the grades. He was a very strong advocate of CPD - Continuous Personal Development - and the need for the acknowledgement of the "Professional Technician". To that end he was actively involved with technical groups not only within his own University but also within specialist Higher Education Technical Managers groups such as EMUⁱ, UCLAⁱⁱ and UBMAⁱⁱⁱ. Within UBMA, John held the post of Association Secretary, successfully hosting their conference in Manchester in 1996 and then later in 2008. John was also heavily involved with other national bodies and organisations, including HEFCE, Gatsby Charitable

Foundation, HEaTED and the Science Council, and the list goes on and on.

As we all in our institute know he also played an active and influential role within the IST, joining the Institute at MISCT level in 1987. In 2001 he was elected as Chairman, gaining Fellowship in 2002. His period as Chairman was not only a time of change in the Higher Education Sector but also within Professional Bodies and the wider community and John was to lead our major reform. He understood well the needs of the IST, and more importantly its members and he recognised the importance of providing guidance and training that would position them to meet the demands of the ever-changing environment. His drive to establish the IST as a modern professional body dedicated to the recognition and support of the technical community led to a restructuring exercise within the IST that would deliver a leaner, more efficient structure that is now geared to respond our members' needs and to future environmental developments.

John's foresight, vision, and sheer determination were responsible for ensuring that the IST was integral in the establishment of the HEaTED initiative, and also that the IST was positioned appropriately to be able gain recognition by the Science Council as one of their Licensed Bodies for the Registered Scientist (RSci) and Registered Science Technician (RSciTech) awards on their new Technical Registers. This highlights just two examples of the way in which the technical community as a whole will continue to benefit for many years to come from John's leadership, hard work and dedication. the new Registers are without doubt now providing a mechanism for enhancing and developing the professional status of those technicians, specialists and managerial staff that the IST supports.

Ill-health prevented John being as active in the Institute as he would have liked and in May 2012 he stood down as Chairman. However, he was then unanimously elected as President and, as President of the IST, he continued to advise and support the Institute whenever he could.

Following John's death the IST received many messages acknowledging and voicing appreciation of his major contributions to the technical environment/community and it is perhaps pertinent to quote a short extract from one of those messages. Ken Bromfield said:

"During my professional life, the people who have been prepared to show sustained commitment to the aims of a cause or ideas that reach out to the wider community have commanded my deep admiration. John was clearly in that category. His unswerving support, including hard work, for the IST is well known throughout the UK."

"He recognised these issues of national significance that will have a major impact on what technicians have been striving for throughout my life time, namely to achieve professional recognition for what their skills bring to all branches of science, technology and art. John has been in the vanguard in laying the foundations that will enable technicians to take full advantage of what is a paradigm shift."

"For all of this, every one of us owes a debt of gratitude to John Robinson. I pray that we shall cherish his memory by fulfilling what he set out to achieve."

Although we have focused this piece mainly on the professional side of John's life, he was above all a devoted and proud family man, who revelled in family life with his wife Pam, daughter Mel, son-in-law John and grandchildren Leo and Zoe. He had a wicked sense of humour, which was never far from the surface (even in difficult times). He had passions for rock (the louder the better!), his guitar, and chocolate, fine single malt, and of course cars particularly his beloved classic Hillman convertible. He had a wide circle of friends including numerous ex-work colleagues and staff and there will be many who feel his loss.

John achieved much during his career and although modest about his own contribution, he leaves a huge legacy for the whole of the technical community, but more importantly one that his family and friends can be proud of. He inspired many along the way and he certainly 'made a difference'. Colleagues and friends at IST will work hard to ensure that the legacy he leaves continues to flourish - we consider ourselves truly fortunate to have had him on board and we are determined to carry his work forward. Take a bow, John, we will miss you.



"A beacon will never go out, if it has lit up hundreds more along the way."

ⁱ Engineering Managers in Universities

ⁱⁱ University Chemistry Laboratory Administrators and Supervisors

ⁱⁱⁱ University Bioscience Managers Association

IST members' news

We always welcome your suggestions, comments, and news

11 August 2013

Dear Ms Taylor,
IST Member's Diary - A Suggestion

My members diary - for which I thank you - usually arrives with me towards the end of December each year, and I presume that is the case for most of the membership.

By tradition, the dates in the diary run from early December of the dying year up to and just into January next year but one. My suggestion is that, in view of the date distribution, it would be more useful if dates ran from the last few days in the current December up to the end of January in the next year but one. For example, from 30th December 2013 up to February 1st 2015 for the next edition. I make this suggestion now, perhaps before it has gone to press, so that it might be considered.

Although long since retired, I continue to read the Journal with interest, and, as you might guess, those articles concerning times now but history interest me the most!

Yours sincerely
David Clarke
Member 7022

Earlier in the year I was contacted by a group of "Science Communication Students" here at Imperial College who had found me through the Colleges Technician Directory, the Directory was a suggestion that I made at a meeting with Steve Rathbone, Head of Learning and Development.

They chose my expertise Scientific Glassblowing for their Masters project and were awarded a distinction for their efforts, they then went on to have an article included in Chemistry World and set up a blog presented for "TEDxalbertopolis" at the Victoria and Albert Museum, please see links below.

Regards
Steve Ramsey

www.rsc.org/chemistryworld/2013/06/last-retort-transparent-problem
www.tedxalbertopolis.com/blog/59411342671/forever-blowing-bubbles

IST chairman in UK's top 100 scientists



The Science Council has been shining a spotlight on the UK's technical community and picked out the IST's chairman as one of its most valuable members.

Terry Croft MBE FIScT was named in January as one of the country's leading scientists. He said:

"For me, the important thing to take away from this is the message that science is about more than academic research. If you are from a technical background, you can still be a scientist who is as valuable as anyone else in the scientific community."

On 14 January, the Science Council unveiled its list of 100 leading UK practising scientists. The list was broken down into ten categories and Terry was listed in the service provider/operational scientist category.

Its aim was to challenge the perception that the term 'scientist' only refers to academics and researchers. As such, people working right across science and technology were put forward for a place in the list by Science Council member organisations. Nominators were asked to choose people that other scientists might look to for leadership in their area.

Terry said:

"It's a huge honour to be included in this list by the Science Council, alongside so many people who are making such important contributions across science and technology."

Others in the list were chosen for their laboratory expertise, their experience in policy and regulations, and their contributions to industry. All have been essential to the advancement of science and technology, even if their work falls outside what most people would associate with traditional scientists.

Science Council Chief Executive Diana Garnham said:

"It is vital that this narrow vision is challenged urgently because it is inhibiting education policy, the career ambitions of young people and investment in developing the skills we need to deliver a world class economy."

"Science is like an orchestra. It takes many instruments working together to produce a fine performance. At the moment, almost exclusively, it is the virtuosity of the soloists being addressed and praised. Of course, they are essential to science and should be valued accordingly. However, we must, at the same time, recognise and encourage the many other types of contributory scientific talent and experience."

David Willetts, Minister for Universities and Science said:

"This list helpfully challenges the perception that there is only one kind of scientist and highlights the different types of skills and challenges a career in science involves. If we want more people to enter a career in science we need to show that the scientific community is not some exclusive club but people with a wide variety of vocations and interests who have rewarding careers and are making a significant contribution to the wealth and well-being of the UK."

The judging panel that compiled the final list was chaired by Science Council President Sir Tom Blundell. He said:

"Most emphatically the list shows that not all scientists wear white coats and that scientists are not only found in universities and research labs: they are literally everywhere in a wide variety of careers and occupations."

In defence of the university technicianⁱ



Kelly receiving her IST Registered Scientist award from Terry Croft, IST Chairman

Technicians are often a department's most experienced fixture, says Kelly Vere – so why are we still invisible to the sector?

Don't shrink into the background, Kelly Vere urges her fellow technicians – find your voice.

In August 2013 Kelly had her first ever scientific book chapter published, she taught an excellent cohort of students in a lab class, had a paper accepted in an international journal, become a teaching fellow of the Higher Education Academy and was invited to give a seminar at another university – in California.

This may read like just an average month in academia. But, Kelly is not an academic – she is a university technician. She is not unique. There are 20,680 technicians working in universities in England and they make a crucial contribution to research and teaching activities.

Alongside the provision of essential traditional technical duties, technicians can also present at international conferences, publish research papers, teach, lecture, even convene degree modules and

mark students' work. Given the increasing pressures on academics, it's hardly surprising that the technical role has diversified so much over the years.

Kelly has been a technician since the age of 18 and she admits that she didn't even know the role existed until she saw the job advertised. Kelly was looking for any position that would fund a part time degree and fell into a junior technical post by accident. From day one she loved it.

Kelly loves the diversity, breadth and frankly the sheer randomness of her role. Every day is different and she says that she gets a real buzz from it, whether it's finally getting that all-important result or the look of realisation on a student's face when they eventually grasp a scientific concept or technique.

When Kelly started out in 1999, she discovered that technicians are often the first port of call for both staff and students. Amid the frequent turnover of research staff, it's the technician who is the reassuringly permanent fixture in an academic department, equipped with a wealth of knowledge and expertise that you won't find elsewhere.

Beyond the department, however, the technical staff are often invisible to all but their immediate co-workers. Kelly feels that there are countless examples of this invisibility on a local level: advertisements for hall wardens that specify administrators/academics only; that initial meeting regarding departmental mergers that neglected to mention the 100+ technicians affected; the lack of technical representation at a senior management level in most universities.

The full extent of their contribution isn't always formally recognised and so there are limited development opportunities. But it's not just locally, it's nationally too.

Technicians rarely make higher education news, are notably absent in sector wide award ceremonies, are not featured in the National Student Survey – the list goes on. Is it that they have nothing to offer or do they just fall under the radar?

It's hard to define technicians. There's no such thing as a typical university technician because the job title encompasses many disciplines – from art to zoology – and many grades – from those employed to undertake basic, essential duties to those with specialist expertise. Inevitably this causes communication problems between themselves, between departments, between HEIs and with external agencies.

They are a hard group to pin down in a sector that is dominated by many well defined occupations. Maybe technicians get lost in the system. But if the university technician is not seen as important to higher education, why would young people aspire to the role?

In 2011 the UK Commission for Employment and Skills identified a shortage of technicians across all sectors, estimating that the UK would require an additional 450,000 technicians by 2020. Technical skills are vital for the UK economy and technicians in higher education have a double contribution to make, both driving innovation (through knowledge transfer activities) and educating technicians of the future through the University Technical Colleges initiative.

A professional registration scheme has been launched for technical staff working across science, engineering and technology to ensure recognition and development. If quality standards can be linked to future funding – as the Roberts report did for research staff – it will ensure universities invest in our development.

Times are changing for technicians. The HEA now formally recognises the technicians' contribution to the teaching and learning experience through its annual Technician of the Year award launched earlier this year. It also encourages technical staff to gain accreditation through the UK Professional Standards Framework (UKPSF) in the same way as their academic colleagues.

So, it's an exciting moment to be a technician. The opportunities are there for technicians to gain voice, visibility, recognition and support.

To her fellow technicians Kelly says:

We must engage. Let's take ownership of our profession, make ourselves heard and actively seek accreditation and recognition for our roles.

To stake holders both within and outside our universities:

Please recognise our talents, invest in our development, utilise our skills and listen. We have so very much to contribute.

Kelly Vere is a senior technician in life sciences and engineering at the University of Nottingham, is a Fellow of the IST and registered scientist – follow her on Twitter @kellyvere

'Adapted from Kelly's article which appeared in the Guardian, August 2013

New members and registrations

New members July - November 2012

Mem No.	Name	Grade			
T14981	Ms B Czajkowska	MIScT	T15117	Mr A E Egbenoma	Assoc IScT
T14982	Dr J K Deans	MIScT	T15118	Miss H Salih	MIScT
T14983	Mr D Finn	MIScT	T15119	Miss K J Taylor	MIScT
T14984	Mr I A Imonifegwo	Assoc IScT	T15120	Mr V H Ogwugwa	MIScT
T14985	Mr C B Birchall	MIScT	T15121	Dr L Woodbine	MIScT
T14986	Mrs K Brown	MIScT	T15122	Mr F A Akinnate	MIScT
T14987	Mr E A Owhere	MIScT	T15123	Mrs S Gumusgoz	MIScT
T14988	Mrs M O Okon	MIScT	T15124	Mr O Cooper	MIScT
T14989	Mr K K Agbanyo	MIScT	T15125	Mr A K Millin	MIScT
T14990	Miss E Connolly	MIScT	T15126	Ms Campbell	MIScT
T14991	Mr D Stanton	MIScT	T15127	Mr S Kumar	MIScT
T14992	Mr J G Bradford	MIScT	T15128	Mr R Markwell	Assoc IScT
T14993	Mr B J Fisher	MIScT	T15129	Mr R J Fitzgerald	MIScT
T14994	Dr I Dobrinovitch	MIScT	T15130	Mr L R Callaghan	Assoc IScT
T14995	Mrs O G Aguebor	Assoc IScT	T15131	Mr M G Herbert	Assoc IScT
T14996	Miss W A O Abimbola	MIScT	T15132	Miss L Crook	MIScT
T14997	Mr D C Wainwright	MIScT	T15133	Miss S Robles Viñuela	MIScT
T14998	Dr M A Bokowiec	MIScT	T15134	Mrs S A Ohomina	MIScT
T15000	Dr E J Koper	MIScT	T15135	Dr J Callaghan	MIScT
T15001	Mr M G Schofield	FIScT	T15136	Dr C A Farrugia	FIScT
T15002	Mrs W G V Dep	MIScT	T15137	Prof. E Sinagra	FIScT
T15003	Mrs A Murtagh	MIScT	T15138	Ms D L Yates	MIScT
T15004	Mr D J Hunter	MIScT	T15139	Miss D F Idahosa	Assoc IScT
T15005	Mr J Kilby Tech	MIScT	T15140	Mr P A Okocha	MIScT
T15006	Ms F Iqbal BA	MIScT	T15141	Mrs E A Lucas	MIScT
T15007	Ms A L Heywood	MIScT	T15142	Ms S Akhtar	MIScT
T15008	Mr J Suret	MIScT	T15143	Mr A S Akinyanju	MIScT
T15009	Mr J Schofield	MIScT	T15144	Mr P E Brown	MIScT
T15010	Miss A Edebor	Assoc IScT	T15145	Mr S Terkimbi	MIScT
T15011	Mr S I Ofili	Assoc IScT	T15146	Mrs M Bauch	MIScT
T15012	Mrs R Watkins	MIScT	T15147	Mr R Cooke	MIScT
T15013	Dr M Kamjoo	MIScT	T15148	Dr D S G Sanchez	MIScT
T15104	Mr U P Eke	Assoc IScT	T15149	Mr O Ukato	MIScT
T15105	Mr L J Jenkins	MIScT	T15150	Mr J I Omigie	MIScT
T15106	Ms F J Wright	MIScT	T15151	Mr A U Mamza	MIScT
T15107	Miss E I Omorodion-Osagie	Assoc IScT	T15152	Miss O R Akpeji	Assoc IScT
T15108	Mr A P Krupa	MIScT	T15153	Miss I Udoh	Assoc IScT
T15109	Miss B Sivalingam	Assoc IScT	T15154	Miss C Bedford	MIScT
T15110	Mr J B Roberts	MIScT	T15155	Dr C Osarinmwian	MIScT
T15111	Mr K G Nkanta	Assoc IScT	T15156	Mrs M Sakuma	MIScT
T15112	Mr A V Akenbor	Assoc IScT	T15157	Mrs L Grady	MIScT
T15113	Mr U D Archibong	Assoc IScT	T15158	Mr A L Smalley	MIScT
T15114	Dr M T Simon	MIScT	T15159	Ms S Tait	MIScT
T15115	Mr E E Ikpe	MIScT	Total: 88		
T15116	Mr N J Isuk BEng	Assoc IScT			

Science Council registrations

Mem No.	Name	Grade
T14913	Taylor	RSci
T14892	Duran	RSci
T14959	Michalik	RSci
T14867	Lewis	RSci
T14923	Saer	RSci
T14952	Walker	RSci
T14981	Czajkowska	RSci
T14927	Jackson	RSci
T14960	Webb	RSci
T15000	Koper	RSci
T14973	Stacey	RSci
T14889	Singleton	RSci
T14954	Hart	RSci
T14869	Williams	RSci
T14961	Collins	RSci
T15126	Campbell	RSci
T14930	Williamson	RSciTech
T14957	Kennerley	RSci
T15003	Murtagh	RSci
T14862	Leigh	RSci

T14924	Chittock	RSci
T14486	Pambou	RSci
T15135	Callaghan	RSci
T15005	Kilby	RSciTech
T14789	Conte	RSci
T15132	Crook	RSci
T14859	Jones	RSci
T15105	Jenkins	RSciTech
T15142	Akhtar	RSci
T14983	Finn	RSci

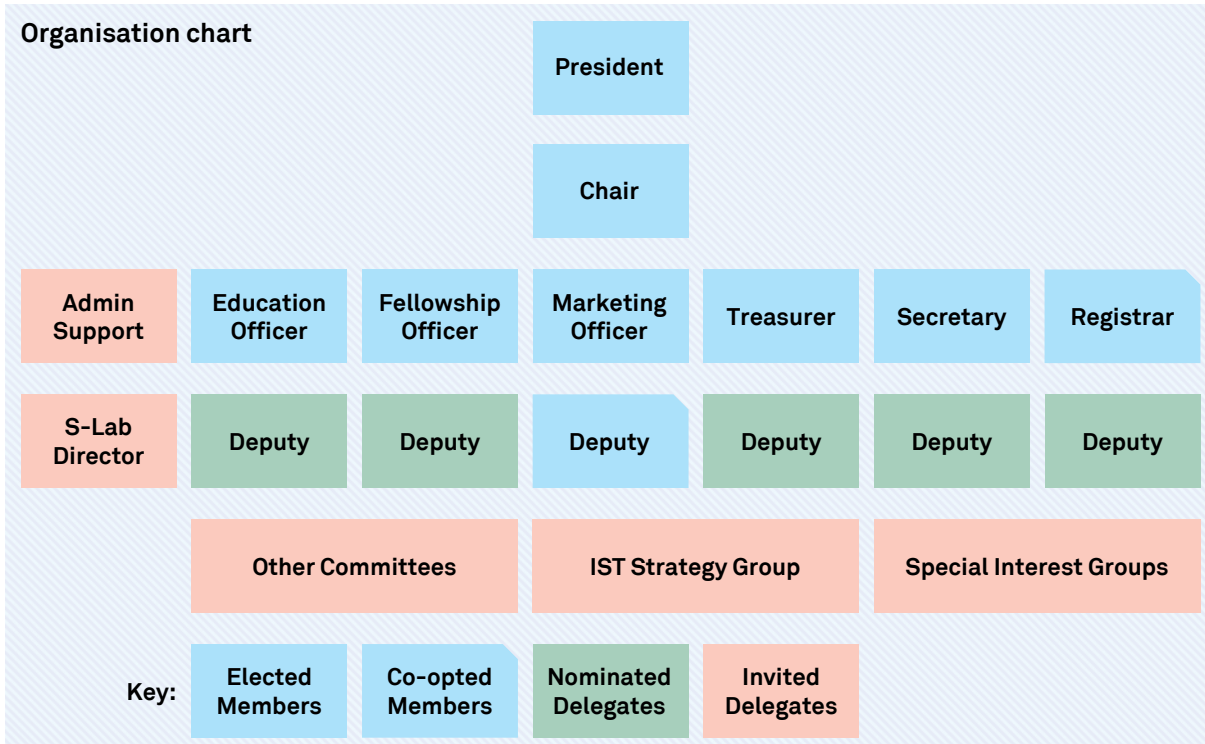
Total: 30

Upgrades

Mem No.	Name	Grade
T4318	Mr P Durkin	FIScT
T14646	Mrs L Baxter	FIScT
T14815	Mrs M Jones	MIScT
T14816	Mr J H Powell	MIScT
T14817	Mr P N Trend	MIScT
T14818	Mr M Z Khan	MIScT

Total: 5

Organisation chart



The hanging burettes of Eiloart

Alan Gall, IST Archivist

Utopias new and old have met with but scant mercy from an ignorant world, and have usually shattered their enthusiasm against the iron laws of society. Thus it is feared, will it be with the Whiteway Colony, one of the newest and feeblest communities of self-made outlaws which two years and a half ago perched itself upon the Cotswold Hills to defy convention and live the primitive life.

(*Evening Telegraph*, Saturday 16 March 1901)

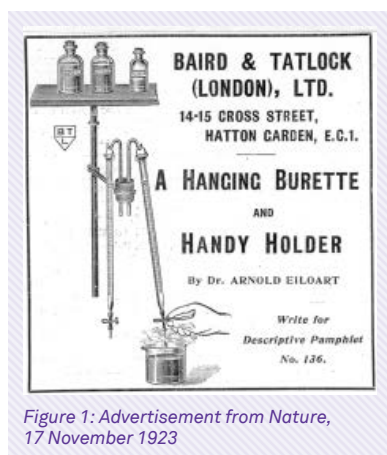


Figure 1: Advertisement from *Nature*, 17 November 1923

Introduction

Armed with a PhD from Leipzig and a number of published papers, Arnold Eiloart may have seemed like just another young chemist about to embark on a long (and perhaps

relatively mundane) career. By applying for fellowship of the Chemical Society in 1895 he indicated that this was his chosen path. Yet he gave up the profession shortly after, seeking utopia.

An inheritance that could have supported a comfortable living did not receive a grateful acceptance. On the contrary, the large bequest represented a burden that he was only too willing to shed and much of it went towards funding the rescue of an obscure Russian religious sect.

A love of camping and the adoption of socialist ideals led Arnold to take up the lifestyle espoused by the author of *War and Peace*, Count Leo Tolstoy. Dwelling in a commune, then later in a farmer's field, his beliefs occasionally brought him into conflict with the authorities. Household bills were difficult to pay by those who had given up the use of money.

His family lived in a tent for a number of years, even when snow lay deep upon the ground. In this field, and into the world, arrived Arnold junior.

To commemorate the location of his birth, on a summer's day in 1907, baby Arnold was given the middle name of Beaupré (beau pré is French for "beautiful meadow"). He became known as "Bushy".

Arnold senior wrote on the subject of healthy eating for a number of specialist magazines while living "under canvass". During this period he also attracted press attention with his scheme for reading poetry to prisoners in gaol.

The charm of the great outdoors notwithstanding, Arnold Eiloart later adapted to a more conventional way of life, moving to suburbia and using his scientific training and fluent German to translate books into English.

For a time, his hanging burette assembly could be bought from one of the leading laboratory suppliers. This "invention" fits in perfectly with his image as a great eccentric.

Relatives affectionately remember him today as "Eilo".

Family background

Ferdinand Eiloart (pronounced eye-low-art), a German piano-maker from Danzig, came to live in London and by 1825 had an established business selling his musical instruments in "a variety of elegant rosewood and mahogany", claiming: "As F. Eiloart employs much machinery in the manufacturing, he can sell cheaper than any other maker."¹



Figure 2: Arnold Eiloart clad in knickerbockers and sandals (courtesy of Joy Thacker)

On 13 February 1820, Ferdinand married Esther Gozna in the civil parish of St George, Hanover Square, London. Their son, Carl Julius Gozna Eiloart, was born 22 January 1822 at Marlebone. Carl became an articled clerk to Thomas Borrett of the solicitors White & Borrett, in the City of London, at the age of 17. He would go on to have a successful career as a solicitor himself and acquire a large number of houses in London.

Carl's wife, Elizabeth Darby (née Adams), spent much of the nineteen years from 1850 to 1868 bearing and rearing sons and daughters. Arnold Eiloart, eight of eleven children, arrived in 1862. The year before, the third son, called Frank, had died at the age of two. Another Frank, the son of Carl's brother Ferdinand, only lived long enough to see his first birthday. Infant deaths were common in both branches of the family. On Carl's death, only five of the eleven children were still alive. Ferdinand lost three out of seven.

Domestic duties apart, Elizabeth distinguished herself as an author with a substantial output of books and maybe Arnold's later urge to write had early stimulation as a result. Her first novel came out in 1865 entitled *Ernie Elton, The Lazy Boy*, followed by *Ernie at School and What Came of His Going There*. These were likely to have been inspired by her son, Ernest. She was also a feminist and wrote articles for the *English Women's Journal*.²

Studying and practising chemistry

The *Illustrated London News* of 22 August 1868 contained an advertisement for a newly established college on Middle Lane, Hornsey. The Alexandra Park College specialised in technical and scientific education, boasting workshops for mechanical instruction and a chemical laboratory, with the availability of "Plunge Bath, Drilling and Gymnastics". The founder, Cornelius Prout Newcombe, had left the firm of Griffiths, Newcombe & Co when it went bankrupt in 1854, to become a schoolmaster. One notable student, the Nobel Prize-winning biochemist Frederick Gowland Hopkins, studied at the college from 1874 to about 1877.

In preparation for a University of London degree, Arnold attended Alexandra Park, possibly in the laboratory when Hopkins was there. Following this, with the extra benefit of some private tuition, Arnold passed the entrance examination required to enrol for the London degree, in the honours division (1879). He was successful in the final examinations (although not with honours) and received a BSc in 1883. Published short reports show that Arnold spent the next several years at King's College, London, engaged on research.

One of the earliest pieces of work, printed in the periodical *Chemical News* (see Appendix 1), describes a test for quinine, narcotine and morphine, using bromine in combination with other reagents. At the 1885 International Inventions Exhibition in London he received a bronze medal for his "gas tap for chemical apparatus".³

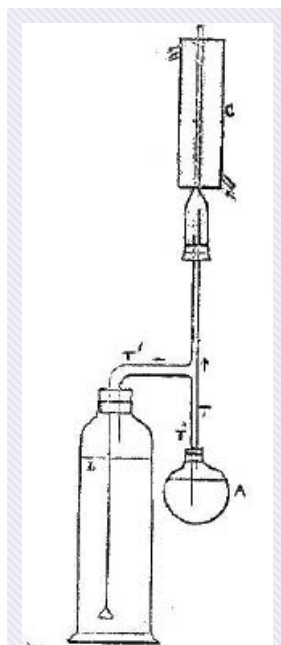


Figure 3: Apparatus for the Extraction of Dissolved Substances from Liquids with Light Volatile Solvents (Arnold Eiloart, 1886)

Leipzig

The PhD degree did not exist in the UK at the time Arnold graduated so chemists desiring a higher qualification often went to study for one in Germany. Arnold's destination was the university at Leipzig where Johannes Wislicenus held the chair of chemistry. Wislicenus had found that lactic acid could exist in two almost identical forms, with the same empirical formula. The measured physical properties, for example density, melting point and dissociation constant, were the same; except solutions were found to rotate the plane of polarised

light by the same angle but in different directions. These two forms of the compound are now named d-lactic acid (d for dextrorotatory, a clockwise rotation) and l-lactic acid (l for laevorotatory, an anticlockwise rotation). The discovery indicated that a two dimensional formula was insufficient to fully describe certain molecules and with the announcement of a theory about the arrangement of atoms in space by Jacobus van't Hoff in 1874, the subject of stereochemistry, to be Arnold Eiloart's speciality in the early years, started to establish itself (although not unopposed).

The chemistry department at Leipzig enjoyed a rapid expansion in facilities with the appointment of Hermann Kolbe, an organic chemist who is often credited with being the founder of the subject⁴. Unfortunately, the disciple of stereochemistry and the father of modern organic chemistry were at loggerheads over van't Hoff's theory of three-dimensional structures. Kolbe, senior to Wislicenus by 17 years, opposed the very concept.

Arnold made reference to this disagreement in a paper of 1896, "Progress in Stereochemistry", quoting one of Kolbe's personal attacks on Wislicenus: "Hereby he declares that he has left the ranks of men of science, and has gone over to those philosophers of ill-omen, who are separated from the spiritualists by only a very thin medium!"⁵ When Kolbe retired, it was Wislicenus who succeeded him.

At the Leipzig laboratory, Arnold investigated the two isomers of tolane dichloride. Tolane is more commonly known now as diphenylacetylene⁶, with the empirical formula $C_{14}H_{10}$. The work involved synthesis of the compounds, characterisation of their properties and deduction of the structures. By 1889, Arnold's thesis had been presented. The investigations over, and now with a doctorate, it was time to plan for the future. Wislicenus had spent several years in America as a youth so it is possible that he influenced the next step.

America

Arnold set sail for the United States in 1889 where he joined the College of Pharmacy of the City of New York as an instructor in chemistry. The next year Arnold accepted a position at Cornell University, also as an instructor, where he helped supervise practical classes in quantitative analysis and ran a course entitled "German Chemical Readings". At this time he lived at 163 East Buffalo Street, an address shared by the Assistant Professor of Geology and Mineralogy. From later accounts we know that he stayed with a family (un-named) who invited him to join their camping trips. This experience made a deep impression and he would later start a campsite himself.

The days at Cornell proved to be quite productive. His first paper outlined some of the PhD work done in Leipzig on the chlorine compounds of tolane.⁷ He gave introductory lectures on stereochemistry and used the course as the basis for a book on the subject. As an aid to describing molecular structures, he developed wooden models in the form of tetrahedrons.⁸ These were designed with the help of Lester James Young, a demonstrator in architecture at the University.

Quickly removable corner caps allowed various compounds to be represented. Figure 8 shows the two forms of lactic acid on the left and those of tartaric acid on the right. In a paper⁹, Arnold refers to them as right and left-handed forms and describes how a hinge with a pin is used for changing from a single bond to a double bond representation. A number of other papers were also published in American journals (see Appendix 1).

After spending the 1890-91 academic year at Cornell, Arnold returned to New York as a professor of chemistry at the New York Post-Graduate Medical School.

In *Lectures on Appendicitis and Notes on Other Subjects*,¹⁰ Professor of Surgery at the Medical School, Robert T. Morris, acknowledges the "aid in research work given by Dr. Arnold Eiloart". In another publication, *The Preservation of Cow's Milk*,¹¹ by Henry Dwight Chapin, Professor of Diseases of Children: "At my request Dr. Arnold Eiloart performed a few experiments with milk treated by electricity at the laboratory of the New York Post-Graduate Hospital." Arnold also gave lectures on "Chemistry of Hygiene", a special course made available at external centres under the University's Extension scheme (a way of providing advanced tuition to the general population).

While in New York, Arnold became interested in social conditions. During the period around 1892-1893 he lived at 26 Delancy Street, New York, premises known as Settlement House and run by The University Settlement Society. This body acquired the building as "a place where all classes of society meet on common ground." Available in the building were: a gymnasium, two large assembly rooms, library and reading room, a section for the cookery school and other rooms used for classes and club meetings. Arnold occupied one of the three flats on the top (4th) floor in his role as one of the resident workers for the Society. In conjunction with Dr Stanton Coit¹², he endeavoured to improve the lot of New York's slum dwellers.

The Daisy Chain Club provided one of the group activities at Settlement House:

Club is composed of twenty-six little girls, eight to twelve years old. Kitchen, gardening, singing, marching, games, fairy stories and sewing. Misses Goldmark and Johnson superintend the class. The objects of the club are to train the social instincts and to inculcate order and neatness. Initiation fee, five cents; weekly dues three cents.¹³



Figure 4: Arnold Eiloart's tetrahedral molecular models

Return to the UK

After spending the years 1889 to 1894 in America, Arnold returned to England.¹⁴ He resumed lecturing and an application to become a Fellow of the Chemical Society (FCS) in 1895 (figure 5) names the Royal College of Science, South Kensington, as his employer. By this time, *A Guide to Stereochemistry* had been published (in 1892) and several eminent members of the Chemical Society supported his election.



Figure 5: Reproduced courtesy of the Library of the Royal Society of Chemistry

Chief amongst these proposers was William Augustus Tilden FRS, recently appointed to the chair of chemistry at the Royal College of Science, Arnold's boss. Colleagues from King's College, John Millar Thomson and Professor Herbert Jackson also gave their support.

Curiously, there is no mention of Arnold's brief tenure as a professor of

chemistry at New York in the application, or his degrees.

Arnold's acceptance into the Chemical Society on 20 February 1896 did not represent the usual step in professional advancement; rather, it was an event at the end of his career as a university lecturer. By 1898 he had moved from 2 Lansdowne Road, East Croydon, to "The Colony", Purleigh, and resigned from the Chemical Society in that year or shortly after. From then on, life would be very different.

Living the simple life

Carl Eiloart died on 11 April 1895 leaving an estate worth over £11,000 and his wife followed on 22 February 1898. Carl had invested part of his money in property, owning a considerable number of houses off Gloucester Road, Regents Park. Elizabeth's wealth had been boosted by the income from her books.

Arnold's ample inheritance presented a problem – he no longer believed in the right to have personal wealth. Adhering to the teachings of Leo Tolstoy, he looked for ways and means to disperse the legacy, finding willing recipients via the Croydon Brotherhood Church, at 46 Tamworth Road, West Croydon.

Formed in 1894, the Croydon Brotherhood Church attracted a membership with a wide variety of beliefs. Largely composed of socialists, most were also vegetarians and pacifists. There were also those who opposed the use of railways, money, or vaccination and were anti-government in most respects. A desire to live in groups of like-minded individuals, get back to nature and (to a degree) discard conventional behaviour, led to the acquisition of land on which to establish communes, largely as Tolstoy had envisioned them.¹⁵

In "Paths to Utopia", Matthew Thomas says that some of the Brotherhood found suitable land in 1897 near Purleigh and the first colony members were Tolstoyans: William Sinclair, [William] Sudbury Protheroe and Arnold Eiloart.¹⁶



Figure 6: A Doukhobór family (Aylmer Maude, 1904)

The Doukhobórs

One dictionary definition for the word "peculiar" is "distinct from others". An alternative meaning is "odd", intended to be derogatory. Aylmer Maude, a convert to Tolstoyism,

most likely intended the first interpretation when he wrote *A Peculiar People: The Doukhobórs*, published in 1904. This book gives an account of certain persecuted Russian peasants and their re-settlement in Canada. The Doukhobórs followed Christian doctrines, but with their own interpretation, lived communally, and were pacifists. This last characteristic did not endear them to the Russian State when soldiers were needed.

Concerned with the plight of this religious sect, a group of British Quakers formed a committee to organise a mass exodus from Russia to somewhere with a more tolerant government. Cyprus was considered but found to be unsuitable.

Aylmer Maude wrote:

Arnold Eiloart (an eccentric member of a queer Colony that had a brief existence at Purleigh, Essex)¹⁷ provided funds to the extent of some £1200 to assist the Doukhobór movement; and out of this money the expenses of the above-mentioned visit to Cyprus were paid, as well as the expenses to America of the two Doukhobór delegates with their wives and children.¹⁸

The S.S. Vancouver sailed from Liverpool to Canada on 1 September 1898. Aylmer Maude, with an apology for the self-indulgence, treated himself to a first-class ticket. The Doukhobórs endured the discomfort of steerage class. As for the rest of Arnold's inheritance, this went on buying land for colonists, which left him in the situation he wanted – virtually penniless.

Money, money, money

"I have one penny. It was given to the children to play with, and taken from them because they got it into their mouths. It is of no use to me. You are welcome to it. It is all I possess." He then threw the penny on the floor.
(Arnold Eiloart quoted in *The Citizen*).¹⁹

Following a disagreement over who should and who should not be allowed to join the Purleigh community, a splinter group set about finding somewhere else to plant potatoes. The leading lights in the initial search were Joseph Burt, Jack Bent, Samuel Veale Bracher, Charlotte (Lottie) Elizabeth Dunn, Arnold Eiloart, Nellie Shaw and William Sinclair. After a few setbacks, Bracher and Burt clubbed together to purchase just over forty acres of land at a place called Whiteway, some six miles from Stroud. Samuel Bracher provided most of the money.

Nellie Shaw prepared the first history of the Whiteway Colony in 1935.²⁰ She changed some names and in doing so inadvertently created confusion for future historians. In *Chocolate Islands: Cocoa, Slavery and Colonial Africa*, Catherine Higgs refers to Daniel Thatcher (actually Samuel Veale Bracher) and Clara Lee (actually Charlotte Elizabeth Dunn). The connection in *Chocolate Islands* with Whiteway is through Joseph Burt, who received a commission from William Cadbury of the firm Cadbury Brothers Ltd to investigate the working conditions in the cocoa plantations.

A policy of distain for the use of money featured for a period in the early history of the colony. It has been said that the colonists took it in turns to be imprisoned for non-payment of rates. Arnold and William Sudbury Protheroe both had their time in court, often providing some amusement for spectators. In one report, it says that Arnold had demanded to be carried by the police when arrested but agreed to walk after being dragged through a field. It goes on to comment:

The condition of things in the colony is deplorable. A lady colonist complained at the beginning of the winter of the “general exodus of the chicken-hearted ones”. The only food they have in stock consists of potatoes and wheat, which they roast and boil alternately.²¹



Figure 7: William Sudbury Protheroe. He was charged with indecency after being stopped on a public road by the Reverend Herbert Hadow who stated in court: “the defendant was wearing short pants but his body was visible some considerable distance below the waist.”²² (Image courtesy of Joy Thacker)

A piano used for sing-songs, and one of the few entertainments available to the colonists, was taken away by the authorities in lieu of payment.

This, and other actions by the local council, seems mean-spirited given that council road menders were supplied with free stone from the colony's own quarry.²³

Mac and May

Local gossip held that in addition to open-air nude bathing, the colonists at Whiteway went in for “free love”.

In fact, couples did “marry” but without the attendant pomp and ceremony, or the legal trappings, calling it “free union”. In other words much like many relationships today. A problem arose when one couple fell out and the “husband” left, returning to London. Known as Mac and May in Joy Thacker's book, they were William Macdonald and Iris May Pinnell. Mac and May arrived at Whiteway in 1898 with one-year-old daughter Kathleen²⁴ and a son on the way. The birth of Keith was registered in January 1899, just over three months after the actual event.

With the absence of Mac, May transferred her affections to Arnold and they moved into rented accommodation at the nearby village of Wishanger, while still remaining members of Whiteway. A group led by Samuel Veale Bracher, the colony's main benefactor, whose money had secured the land, took exception to these events. Moves to have Arnold and May ejected failed as the majority of colonists saw no reason to pass judgement on the couple, but the situation resulted in bad press.

Sharon Butler, in *Feminist Review*, quotes from *The New Order* of September 1899:

...it has been represented to me that the Whiteway Colony is now a hotbed of lust, and that the life consists principally in exciting each other's passions... Whiteway Colony is no more a hotbed, etc., than any other home, village, or town in this most Christian England, and it will be disappointing if the Whiteway folk turn out to be less clean-thinking and clean-living than the people who are now revelling in the nasty talk about them...

The passage goes on to suggest, without actually naming anyone, that Mac returned in a distressed state and as a result May and Arnold parted company. Certainly, May is listed back with her parents in the 1901 census where she is recorded as Mrs May Macdonald. The same source places Arnold at his brother Clarence's house in Putney. Before too long, they were reunited to the extent that May gave birth to Daphne Eiloart in 1902 and Sinclair Eiloart²⁵ in 1903. A third child followed in 1907, marriage much later.

After leaving Whiteway, it is believed that the Eiloarts spent the next four years living in a tiny wooden cottage, with a plot of land, courtesy of a friend. The occupation must have been rent-free since Arnold continued to avoid the use of money. This phase was coming to an end and eventually he had to accept the “root of all evil” as a necessary part of his plans.

Towards the end of November 1905, Arnold took off for America by way of The British West Indies.

He was shocked by the poverty he saw in Barbados, describing the people there as “A population clothed in rags and housed in cow-sheds”. A tram driver told him “I am weak because I am hungry”.²⁶

His ship finally arrived at New York on 16 January 1906 where the official forms to be completed required him to confirm that he was neither deformed nor crippled, did not engage in polygamy and was not an anarchist.²⁷ After (most likely) visiting friends made at Cornell and New York his next adventure beckoned – a health and holiday camp at Ditton Hill, Surrey.



Figure 8: “Natures bedroom” at the Ditton Hill campsite. Is this Iris May Pinnell with the children? (Arnold Eiloart, 1907)

and the campers buying farm produce. The enterprise aimed to attract city types for a healthy, summer camping experience: “Why sleep in London? If a man must spend his days in the stifling city, it is the more necessary that his nights should be spent in the open air.”²⁸ By this time, Arnold had resumed the use of money but an early experience demonstrated that it could be difficult to extract payment from others.

A domestic servant by the name of Edith Wise joined the camp in the first year of operation, bringing with her a box of clothes. For some reason she did not pay an outstanding sum (said to be 15s 6d), so Arnold confiscated the box. Edith complained that a lack of suitable clothes had compromised her ability to secure a job. Local magistrates then dispatched constable Mortimer to reclaim the goods. The policeman did not have the authority of a court summons at the time so Arnold refused to cooperate, saying that if the magistrates were so interested in the case they should come to the camp themselves. After sorting out the paperwork, forcing Arnold to appear before the bench, it emerged that the case should have gone to the County Court anyway, and that the magistrates had no power to continue. The court case attracted comments about what was regarded as Arnold’s unorthodox attire: “Mr Eiloart was dressed in a flannel coat and knickerbockers, sandals covered his feet, which were without socks or stockings, his legs being tanned a dark brown.”²⁹

“Camp Eiloart”

Arnold established what he called The Campers and Farmers’ Union; a union in the sense that the two parties could enjoy the benefits of co-operation – the farmers providing land,

The Eiloarts did not restrict their own camping experience to the warm months of the year. Braving slush and snow in the early part of 1909 a reporter from the *Daily News* made his way to the camp from Surbiton station. At “Camp Eiloart” he found three tents, a shanty and a lean-to. Arnold was absent but “Mrs Eiloart” and children were in residence.³⁰

It is now difficult to precisely pinpoint the campsite’s location, described as 14 miles from London and in a meadow on the slope of Ditton Hill. The field probably belonged to Ditton Hill Farm, although not necessarily adjacent to it. The emissary from the *Daily News* recorded his journey along “a narrow lane leading from the cross-roads by Ditton’s pretty church” so it is likely that the camp stood close to St. Mary’s Church, next to where the Long Ditton Cricket Club once played.

News of the camp reached New Zealand:

“Oh Yes” said Mr. Eiloart to an interviewer, “we all sleep in tents however bad the weather, and, unless wind or snow beat in, one side of the tent is always open.”...

The family pride and the king of the camp is the baby [Bushy Eiloart], a boy of eighteen months, born in a tent on this spot, and the jolliest, healthiest little fellow imaginable.³¹

Writing and dress-making (the latter, May’s speciality) were difficult when the weather turned bitterly cold. The Eiloarts had to be content with a Salamander oil-stove since the field’s owner had vetoed anything more substantial. However, Arnold devised a means of using a small lamp to provide localised heating to the extremities of anyone working at either a table or desk. In 1915 he obtained a patent on the idea.

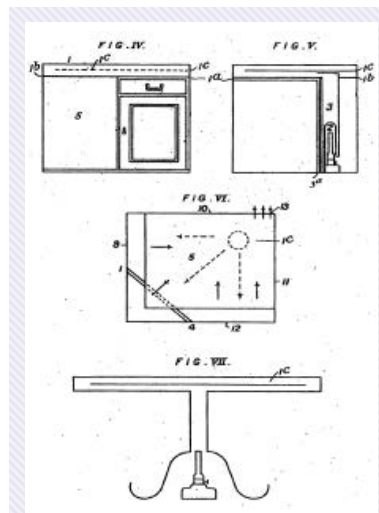


Figure 9: Drawings for patent number 22551 of A.D. 1914

Poetry please

Between educating the children at home, growing food for the family’s strictly vegetarian diet, writing, and running the camp, Arnold was able to pursue his love of poetry by reading and lecturing.

If vegetarianism and fresh air benefited the body then poetry enriched the mind. A particular liking for Shelly (an active vegetarian also) is evident from items in the publication *Notes & Queries*.³² A letter to the periodical in 1910 asks readers to help find a publisher of the complete edition of Henry Alford's works, in particular the poem "Be Just and Fear Not".

A plan to read selected poems to prison inmates came to nought when the Commissioners declined to take up the offer. *The Observer* of 18 July 1909 couldn't resist poking fun:

Perhaps, if application were made to the Home Secretary, he might make an exception in the case of the recalcitrant Suffragettes, on the condition that the verses were appropriately selected. Kingsley's "Be good, sweet maid, and let who will be clever"; Scott's "A ministering angel thou," and "The angel in the House" may be suggested.

And so to the hanging burette

Figure 1 shows Eiloart's system, with the form of burette pioneered by Karl Friedrich Mohr. What was once called a pinchcock, i.e. the clamp controlling the flow from the burette, is still known as Mohr's spring clip. This offered a cheaper piece of apparatus than those with ground-glass stopcocks.

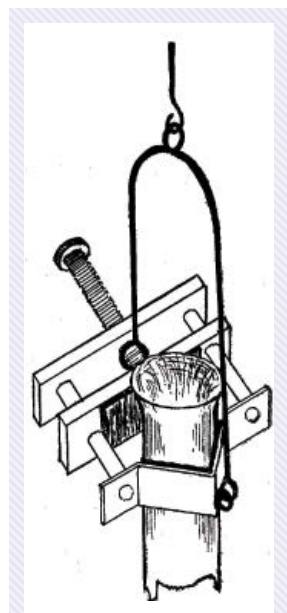


Figure 10: Gallenkamp's Compensating Adjustable Burette Clamp (Gallenkamp catalogue 1910, courtesy of John Barlow)

adjustable burette clamp" in their 1910 catalogue. Figure 10 shows the suspension method using a Hofmann style screw clip.

Also illustrated in the catalogue is a much more elaborate way of space saving (figure 11) and a

range of simple wooden stands with hardwood screw clamps (figure 12).

Arnold had used Baird & Tatlock (London) Ltd to market his molecular models so the connection existed for the firm to also promote his hanging burettes. Unfortunately, the concept has not stood the test of time.



Figure 11: Revolving burette clamps (Gallenkamp catalogue 1910, courtesy of John Barlow)

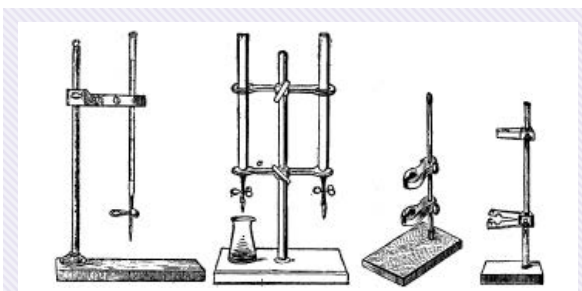


Figure 12: A selection of wooden burette stands (Gallenkamp catalogue 1910, courtesy of John Barlow)

Back to conventional living

According to an obituary in *Vegetarian Messenger*: "When he [Arnold Eiloart] returned to the more ordinary ways of the world it was to find himself behind the times in the science he had left to follow impossible ideals."³³ So it was that Arnold took up school teaching in 1914 when there were vacancies created by the departure of young men for the war front. The patent for the table-warmer provides some details of Arnold's locations at the start of his new occupation. At the time of the patent application on 14 November 1914 he gave his address as Stevens Estate, Kingston Road, Leatherhead, Surrey. The complete specification, dated 12 May 1915, names 2 Highbury Place, London.

His last known post was at King Alfred School, Hampstead, where a note in the Financial Committee minutes suggests that the term of employment

lasted from October 1920 to April 1922. In all probability, the incoming head, Joseph Wicksteed, made the appointment.

The ethos of King Alfred School no doubt made the position congenial to a radical like Arnold. Disregarding conventional practice, the school's founders aimed to establish a system for teaching boys and girls together, free from religious and other influences. There were to be no prizes or awards given since education conferred its own reward.

To set the tone, the president of the National Union of Women's Suffrage Societies, Millicent Fawcett, performed the official opening on 2 May 1898.

Eventually, Arnold settled at Headley Down, in Hampshire. There, he owned two houses on a 1½-acre plot of land with access from Stonehill Road. These were called Way o' th' Wind, and Casetta (figure 13). The first to be occupied, Casetta, was of a modest construction; a prefabricated bungalow that housed Kathleen (the daughter of May and William Macdonald) at a later date.

Arnold now spent much of his time editing and translating German books. A number of these were published by C. W. Daniel, a man who exercised freedom of expression to a level that invited trouble. The publication of a pamphlet in 1916 calling for the end of the war landed Charles Daniel in prison. A second incarceration followed in 1919 after he published a novel dealing with both homosexuality and pacifism.³⁴

Iris May Pinnell and Arnold were finally married in 1927, the same year that William Sudbury Protheroe, once a fellow Whiteway colonist, entered his second marriage. Arnold tended the large garden of his home and translated texts until about three months before his death on 7 October 1932 at Park Prewett Mental Hospital, Basingstoke. Clearly, he feared being trapped in a coffin while still alive. His will, dated 26 May 1928, requested that after certification of death a small artery be cut: "...if this should not bleed... a larger artery is cut so as to ensure death before burial". He also wanted to rest in the grounds of Way o' th' Wind, with a tree planted on the spot.

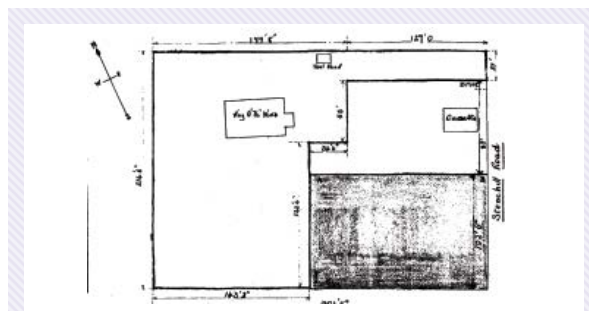


Figure 13: Arnold's houses at Headley Down.

The exploits of Bushy

Bushy Eiloart continued the now established family tradition of leading a colourful life. Along with Peter Elstob, he was convicted in 1942 of selling sawdust as poultry food.³⁵

This followed on from fines imposed by various courts for the mislabelling of a sugar product, produced under the business name of Puresweet.³⁶ He then went on to establish a ballooning record.

A specially designed craft, named the "Small World", set off from Tenerife in December 1958 on a transatlantic crossing. Attempting the feat were Bushy and his son Timothy, with navigator Colin Mudie and his wife.

Four days into the expedition a turbulent updraft caused them to release so much gas from the balloon that they landed in the sea.

As it was designed to do, the catamaran-like shape of the gondola allowed the crew to sail the remaining distance to Barbados. In Colin Mudie's estimation, 1200 miles were covered in the air and 1500 miles by sea. With Peter Elstob, ex-partner from the sawdust business, Bushy wrote a book about the adventure.³⁷



Figure 14: The "Small World" Balloon (image from Colin Mudie, 1959)

Postscript

The land once occupied by Way o' th' Wind and Casetta has been redeveloped. Witherslack Close, 7 detached houses, and number 42 Stonehill Road, stand on the site.

Whiteway colony still exists although it is now much harder to become a member.

The last survivor of the original founders, William Sudbury Protheroe, died in 1955 at the age of 81.

Bushy's son, Tim, had a very varied career as an engineer and entrepreneur, dabbling in politics and social issues. He died 4 March 2009.

The name Beaupré has passed down the male line of the Eiloart family from 1907 to the present.

Appendix 1: Scientific publications by Arnold Eiloart in chronological order (not necessarily a complete record) ed = editor. trans = translator.

Title	Publication (publisher)	Author(s)
Bromine As a Test for Quinine, Narcotine, and Morphine	<i>Chemical News</i> , 50 (1885) 102-103	A.Eiloart
Reactions with Carbonic Anhydride, Carbon Bisulphide and Sulphurous Anhydride	<i>Chemical News</i> , 52 (1886) 183-184	A.Eiloart
Absorbents for Carbon Bisulphide Vapour	<i>Chemical News</i> , 52 (1886) 184	A.Eiloart
Estimation of Nitrogen by Combustion	<i>Chemical News</i> , 53 (1886) 76-77	George Stillingfleet Johnson & A.Eiloart
Apparatus for the Extraction of Dissolved Substances from Liquids with Light Volatile Solvents	<i>Chemical News</i> , 53 (1886) 281	A.Eiloart
Reduction of Carbonic Anhydride by Potassium Cyanide	<i>Chemical News</i> , 54 (1886) 88.	A.Eiloart
Calorimetric Bomb As a Combustion Furnace for Ultimate Analysis	<i>Chemical News</i> , 58 (1889) 284	A.Eiloart
On the Chlorine Compounds of Toluene	<i>American Chemical Journal</i> , 12 (1890) 131-253	A.Eiloart
The Relative Motion of Singly-Bound Carbon Atoms (translated title)	<i>Journal für Praktische Chemie</i> , 43 (1891)	A.Eiloart
Stereochemistry of Carbon	<i>American Chemical Journal</i> , 13 (1891) 496-504	A.Eiloart
Solid Formulae: Models for Use in Teaching Organic Chemistry	<i>American Chemical Journal</i> , 13 (1891) 559-564	A.Eiloart
A Guide to Stereochemistry	(New York: Alexander Wilson, 1892)	A.Eiloart
Progress in Stereochemistry	<i>Nature</i> , 54 (1896) 321-324	A.Eiloart
The Space Relations of Atoms	(London: Scientific Press Ltd, 1896)	A.Eiloart
The Arrangement of Atoms in Space, 2nd edition	(London, New York & Bombay: Longmans, Green & Co, 1898)	J.H.van't Hoff A.Eiloart (trans & ed)

Appendix 2: Works by Arnold Eiloart, post-1900 (not necessarily a complete record)

Some titles are abbreviated.

Title	Date	Pages	Publisher	Author(s)
The League Against Health (<i>In Healthy Life</i> , issue 1)	1908		C.W.Daniel	A.Eiloart
Instead of Drugs (<i>In Healthy Life</i> , issue 3)	1908		C.W.Daniel	A.Eiloart
Man Versus Medicine (<i>In Healthy Life</i> , issues 1 & 3)	1908		C.W.Daniel	A.Eiloart
<i>No Rheumatism: How to Cure Rheumatism, Gout etc</i>	1909	58	A.C.Fifield	A.Eiloart
Nature Versus Medicine (<i>In Healthy Life</i> issue 5)	1909		C.W.Daniel	A.Eiloart
<i>Shakespeare & Tolstoy</i>	1909	47	Garden City Press	A.Eiloart
No Plant Disease (<i>In Healthy Life</i> , issue 8)	1913		C.W.Daniel	A.Eiloart
<i>Food for All, and a New Sunlight Theory of Nutrition</i>	1928	140	C.W.Daniel	Maximilian Oskar Bircher-Benner A.Eiloart (trans & ed)
<i>Psycho-Analysis for All</i>	1928	63	C.W.Daniel	Rudolf Urbantschitsch A.Eiloart (trans)
<i>Individual Psychological Treatment</i>	1929	160	C.W.Daniel	Erwin Wexberg A.Eiloart (trans)
<i>Psycho-Analysis and Neuroses</i>	1931	192	C.W.Daniel	Hans von Hattingberg A.Eiloart (trans)
Hypnosis and Hypnotherapy (In E.Jolowiez, <i>Suggestion Therapy</i>)	1931	237	C.W.Daniel	Gustav Heyer A.Eiloart (trans)
<i>The Techniques of Psycho-Analysis</i>	1932	136	C.W.Daniel	Hans von Hattingberg A.Eiloart (trans)
<i>Psychology: Its Nature, Its Assumptions, Its Limitations</i>	1932	352	Jonathan Cape	Hans Prinzhorn A.Eiloart (trans & ed)

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HIGGS, Catherine, *Chocolate Islands: Cocoa, Slavery and Colonial Africa* (Ohio University Press, 2012).

MUDIE, Colin, "Navigating the 'Small World'", *Journal of Navigation*, 12 (1959), 190-194.
MAUDE, Aylmer, *A Peculiar People: The Doukhobors* (London: Grant Richards, 1904).
PORTER, Roy (ed), *The Hutchinson Dictionary of Scientific Biography* (Oxford: Helicon Publishing, 1994).
THACKER, Joy, *Whiteway Colony: The Social History of a Tolstoyan Community* (Stroud: Joy Thacker, 1993).
THOMAS, Matthew James, "Paths to Utopia: Anarchist Counter-Cultures in Late Victorian and Edwardian Britain 1880-1914", PhD Thesis (University of Warwick, 1998).

Other references are given in the text and in the notes.

Notes

¹"Pianofortes on Sale", *The Times*, 24 December 1825.

²For a list of books see the Wikipedia entry at http://en.wikipedia.org/wiki/Elizabeth_Eiloart. NB this biography incorrectly states that she had six children.

³*The London Gazette*, 12 August 1885, 3760.

⁴Adolph Wilhelm Hermann Kolbe synthesised acetic acid from inorganic starting materials. He was a student of Friedrich Wöhler who had converted ammonium cyanate into urea, in 1828. These reactions showed that organic chemistry did not just concern compounds derived from living organisms.

⁵Arnold Eiloart, "Progress in Stereochemistry", *Nature*, 54 (1896), 321.

⁶Using IUPAC nomenclature the name is 2-phenylethybenzene.

⁷Arnold Eiloart, "On the Chlorine Compounds of Tolane", *American Chemical Journal*, 12 (1890), 231-252.

⁸These were based on cardboard models that van't Hoff had devised.

⁹Arnold Eiloart, "Solid Formulae: Models for Use in Teaching Organic Chemistry", *American Chemical Journal*, 13 (1891), 560.

¹⁰Robert T. Morris, *Lectures on Appendicitis and Notes on Other Subjects*, 3rd edition (New York and London: G. P. Putnam's Sons, 1899).

¹¹Henry Dwight Chapin, "The Preservation of Cow's Milk", *Transactions of the American Pediatric Society*, 5 (1893), 35-43.

¹²Stanton Coit (1857-1944) was an American reformer who became a British Citizen in 1903. He edited the *International Journal of Ethics* 1893-1905 and stood for Parliament in 1906 and 1910 (unsuccessfully).

¹³From a report "What is the University Settlement" printed in 1893. Accessed through Columbia University Libraries at <http://www.columbia.edu/cu/lweb/digital/collections>.

¹⁴Perhaps his father, who died in 1895, was ill at this point – so prompting a return.

¹⁵Except that Tolstoy advised against sex, a step too far for some of the colonists.

¹⁶Mike Protheroe's family tree shows that William Sudbury Protheroe and Arnold Eiloart are distantly related.

¹⁷A strange comment for one Tolstoyan to make about another.

¹⁸Aylmer Maude, *A Peculiar People: The Doukhobors* (London: Grant Richards, 1904), 47.

¹⁹Arnold Eiloart quoted in "The Whiteway Colonists and Their Rates" a report of court proceedings in *The Citizen*, Friday 22 February 1901.

²⁰Nellie Shaw, *Whiteway: A Colony on the Cotswolds* (London: C.W.Daniel, 1935).

²¹"Utopia Very Limited", *Evening Telegraph*, 16 March 1901.

²²"Summer Garb at the Whiteway Colony", *Gloucester Citizen*, 26 July 1901.

²³"Whiteway Colonists and Their Rates: Defaulters taken to Gloucester Gaol", *Gloucester Journal*, 9 March 1901.

²⁴The name Katherine is given in Joy Thacker's book. Nellie Shaw, in *Whiteway: A Colony on the Cotswolds* (London: C.W.Daniel, 1935), changes the name to "Madge".

²⁵Sinclair Eiloart was no doubt named after William Sinclair, one of the Whiteway pioneers.

²⁶Arnold Eiloart, "A West Indian Ireland", *The Independent Review*, 9 (1906), 299.

²⁷Records at www.ellisland.org.

²⁸Advertisement in Good Heath: *An Illustrated Monthly Magazine Devoted to Hygiene and the Principles of Healthful Living*, August 1907.

²⁹"The Paying Guest. Discord in a Simple-Life Camp",

Gloucester Citizen, 14 September 1906.

³⁰The report can be viewed at <http://trove.nla.gov.au/ndp/del/article/90156014>.

³¹"Simple Life in the Snow", *New Zealand Herald*, 24 April 1909. Accessed through <http://paperspast.natlib.govt.nz/cgi-bin/paperspast>.

³²For example, "Shelley's 'The Question'", *Notes & Queries*, 155 (1928).

³³"Arnold Eiloart PhD BSc 1862-1932", *The Vegetarian Messenger and Health Review* (December 1932), 384.

³⁴See the website for the International Institute of Social History <http://www.iisg.nl/archives/en/files/c/ARCH00279full.php>.

³⁵"Poultry Food Was Sawdust", *Gloucestershire Citizen*, 28 January 1942.

³⁶"Sugar Substitute", *The British Food Journal*, 45 (1943), 28.

³⁷Arnold Eiloart and Peter Elstob, *The Flight of the Small World* (London: Hodder & Stoughton, 1959). Peter Elstob had previously written of his exploits during the Spanish civil war in *Spanish Prisoner* (Macmillan, 1939).

The “Royal Protein”: a review of the bioinformatics process of peptide mass fingerprinting analysis

Raffaele Conte

Abstract

PMF (Peptide Mass Fingerprinting) analysis is a technique for the identification of proteins based on the combined use of mass spectrometry and Bioinformatics. Although a number of research works have used this approach to publish results elsewhere in the literature the acronym PMF has been called “Perfect Meaningless Fingerprinting” due to the fact that results can be obtained using fictitious values of molecular weight. The aim of this review is to give an explanation of this procedure, using as an example identification of the “Royal Protein” that derives from the date of birth of the monarchs of the United Kingdom and making a prediction about the future heir to the throne.

Introduction

Peptide Mass Fingerprinting (PMF) is a proteomics methodology. The term “Proteome” was introduced by Mark Wilkins in 1994 to indicate the entire protein content expressed by a genome.

From this originated the expression “Proteomics” that is the systematic analysis of cellular extracts, tissue proteins, entire micro-organisms or proteins sharing a common biological function. There are three kinds of Proteomics analysis: “Structural Proteomics” - with the aim to create a database of the separation patterns of the identified proteins; “Differential proteomics” - that is useful to evaluate the differences on the protein content of control cells compared to that of pathological cells; and “Functional proteomics” - with its goals to identify multi-protein complexes and to make a prediction of their biological action. Peptide mass fingerprinting can be used in each of these types of applications.

Peptide mass fingerprinting analysis

PMF analysis requires several processes. Firstly, there is a step to prepare the sample for protein extraction. Secondly, there is the separation of the proteins through two-dimensional electrophoresis.

Components	Actions	Examples
Denaturing agents	<ul style="list-style-type: none">• The provision of a unique conformation and consequently, of a unique isoelectric point at the proteins• Inhibition of enzymatic activities that can be present in the cellular extract• Interference on the hydrophobic interactions that are useful to stabilize the proteic native structure	<ul style="list-style-type: none">• Mixture of Thiourea 2M and Urea 5-8M
Detergents	<ul style="list-style-type: none">• Destabilization of the hydrophobic interaction, producing an improved proteic solubility• Prevention of the protein-electrophoresis gel interactions	<ul style="list-style-type: none">• Octyl-glucoside• CHAPS• CHAPSO <p>These molecules (“carrier ampholytes”) act thanks to their zwitterionic nature;</p>
Reducing agents	<ul style="list-style-type: none">• Destruction of the disulfide bonds	<ul style="list-style-type: none">• Dithiothreitol (DTT)• Tributyl-phosphine (TBP)
Protease inhibitors	<ul style="list-style-type: none">• Contrast to the action of degradation of the enzymes proteases	<ul style="list-style-type: none">• NaF• Disodium EDTA
Precipitating agents	<ul style="list-style-type: none">• Division of the proteins from the “non-interesting” components	<ul style="list-style-type: none">• Ammonium Sulfate• Ammonium Acetate in Methanol• Chloroform-Methanol

Table 1: Components of a buffer for protein extraction

Following this, there is the protein identification by mass spectrometry and, finally, the data handling using bioinformatics tools.

Sample preparation\protein extraction:

The cellular extract must be solubilised in a mixture of denaturing agents, non-ionic detergents, IPG-Buffer, and reducing agents. There isn't a universal protocol for making this solubilising solution, but the "urea-reducer-detergent mixture" usually achieves the disruption of disulfide bonds and of non-covalent interactions and, for this reason, is the most widely used. The components of a typical buffer are shown in Table 1.

Two-dimension (2-D) electrophoresis:

The protein extract goes through an initial purification with two consecutive steps of electrophoresis.

In the first dimension, proteins are separated by their isoelectric point (pI) in an immobilised pH gradient. The sample is placed on a strip with a pH gradient distributed throughout the entire length. Then an electric field is applied. The charged proteins migrate within the pH gradient. When the proteins reach the pH in the gradient equal to their pI, their net charge drops to zero and they focus as distinct zones. The immobilised pH gradient can be obtained using "Immobilines" that are derivatives of the acrylamide used to make the electrophoresis gel with additional weakly acidic or basic groups such as ammonium or carboxylic.

In the second dimension, proteins are separated according to their molecular size in a homogeneous or gradient SDS-PAGE gel. The strip coming from the first dimension is equilibrated in a solution of sodium dodecyl sulphate (SDS) and a reducing agent (e.g. DTT). This strip is encased in a gel of polyacrylamide with SDS detergent that gives to the proteins a negative charge permitting them to migrate towards a +ve charge. The electric field is then applied. The negatively-charged proteins migrate towards the anode. The velocity of this movement is inversely proportional to their size.

The theory behind this behaviour is that the velocity of migration (v) of a protein (or any molecule) in an electric field depends on the electric field strength (E), the net charge on the protein (z), and the frictional coefficient (f ; it depends on both the mass and shape of the migrating molecule and the viscosity of the medium), according to the formula $v = Ez/f$. Finally, the obtained gel is immersed in a bath containing a colouring solution to permit the detection of proteins. Examples of dyes are colloidal Coomassie Blue, Silver stain, Fluorescent stains.

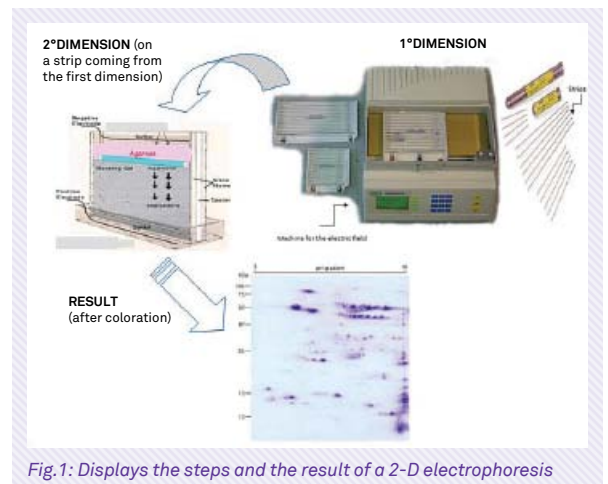


Fig.1: Displays the steps and the result of a 2-D electrophoresis

MALDI-TOF mass spectrometry:

The strip containing the protein of interest is cut from the gel and inserted in a Eppendorf tube to be prepared for enzymatic digestion. In fact, there is a preliminary treatment with alternate washes with Acetonitrile (ACN) and Ammonium bicarbonate (AMBIC) to hydrate the pieces of gel and to permit the leakage of the colorant. The sample is then treated with DTT, to destroy the disulphide bonds and to promote the alkylation that is made using Iodoacetamide. Finally, there is the enzymatic digestion adding trypsin in AMBIC, which cuts the protein into smaller peptide chains. The liberated peptides, that are in the supernatant, are mixed in proportion 1:1000 (w/w), 1:1 (v/v) with crystallizing agents such as α -cyano-4-hydroxycinnamic acid (CHCA) or Sinapinic acid (SA) to act as a matrix. This solution is loaded on a metallic "maldi plate" and air-dried to get the formation of crystals.

In the mass spectrometer, this plate undergoes (Nitrogen) laser desorption, a process where the matrix molecules absorb energy from the laser light and transfer it into excitation energy of the solid system with the aim to induce an instantaneous phase transition of the sample into gaseous species of single charged ions. (MALDI is the acronym for Matrix-assisted Laser Desorption Ionization).

These ions reach the analyser after their passage in a tube with an electro-magnetic potential. Their molecular weight has an influence on the time required to reach the detector, called TOF (time of flight), with larger molecular weight peptides taking longer. The theoretical concept is that, in the flight tube, the potential energy of each ion as it leaves the ion source must equal its kinetic energy,

$zV = \frac{1}{2} mv^2$ where *m*, mass; *v*, velocity; *z*, charge; *V*, potential.

The velocity of the ion during its journey to the detector is simply the length of the flight tube *D* divided by the time *t*.

$v = D/t$

Therefore,

$zV = \frac{1}{2} m (D/t)^2 ; m/z = 2Vt^2/D^2$

D is fixed by instrument design, *V* can be held constant electrically, *m/z* is proportional to the square of the travel time *t*. This means that ions with different molecular weight have different time of flight. Technically, ions that differ by 1 ns can be recorded. The obtained spectrum has peaks characterized by their *m/z* ratio on the x-axis and their percentage of relative abundance on the y-axis.

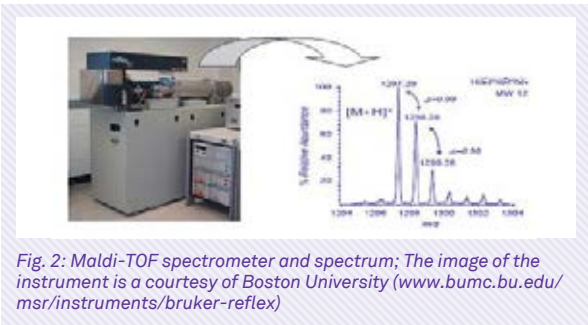


Fig. 2: Maldi-TOF spectrometer and spectrum; The image of the instrument is a courtesy of Boston University (www.bumc.bu.edu/msr/instruments/bruker-reflex)

Software is used in the Peptide Mass Fingerprinting analysis that, through the indication of the enzyme used for the digestion, compares the accurate molecular weight of the peptides analysed in the MALDI-TOF experiment with those originating from the theoretical hydrolysis of all the proteins in the database of choice, allowing the identification. (See acknowledgments).

Bioinformatics analysis

The royal protein

We can use simulated data to test the bioinformatics analysis. If we consider the dates of birth of the sovereigns of the United Kingdom as the *m/z* peaks of the peptides in a MALDI-TOF spectrum then it is possible to define the protein obtained as the “Royal Protein”.

Starting the count from the formation of the United Kingdom of Great Britain on 1 May 1707 with the merger of the Kingdom of England and the Kingdom of Scotland, there have been 12 monarchs.

To be specific, on 1 January 1801, Great Britain merged with the Kingdom of Ireland to form the United Kingdom of Great Britain and Ireland. But, after that most of Ireland left the union on 6 December 1922, its name was amended on 12 April 1927 to the United Kingdom of Great Britain and Northern Ireland.

In Table 2 are listed all the monarchs in the period of time indicated in the preamble¹.

Name	Birth	Name	Birth
Anne 1 May 1707 – 1 August 1714	6 February 1665 St James's Palace	Victoria Alexandrina Victoria 20 June 1837 – 22 January 1901	24 May 1819 Kensington Palace
George I George Louis 1 August 1714 – 11 June 1727	28 May 1660 Leineschloss	Edward VII Albert Edward 22 January 1901 – 6 May 1910	9 November 1841 Buckingham Palace
George II George Augustus 11 June 1727 – 25 October 1760	30 October 1683 Herrenhausen	George V George Frederick Ernest Albert 6 May 1910 – 20 January 1936	3 June 1865 Marlborough House
George III George William Frederick 25 October 1760 – 29 January 1820	4 June 1738 Norfolk House	Edward VIII Edward Albert Christian George Andrew Patrick David 20 January – 11 December 1936 (abdicated)	23 June 1894 White Lodge
George IV George Augustus Frederick 29 January 1820 – 26 June 1830	12 August 1762 St James's Palace	George VI Albert Frederick Arthur George 11 December 1936 – 6 February 1952	14 December 1895 Sandringham House
William IV William Henry 26 June 1830 – 20 June 1837	21 August 1765 Buckingham Palace	Elizabeth II Elizabeth Alexandra Mary 6 February 1952 – present	21 April 1926 Mayfair

Table 2: List of the sovereigns of the United Kingdom

As shown in Table 3, considering the day and the month of birth as the entire part of the molecular weight and the last two digits of the year of birth as the decimal part, is possible to “calculate” the molecular weight of the peptides: Having got the data, the first step in conducting the bioinformatics analysis is to open the internet sites of proteomic search engines. Some examples are:

- Matrixscience, Mascot www.matrixscience.com/
- ProteinProspector www.prospector.ucsf.edu/
- ProFound www.prowl.rockefeller.edu/
- EMBL www.narrador.embl-heidelberg.de/
- BLAST www.ncbi.nlm.nih.gov/
- FASTA www.ebi.ac.uk/

This review is focused on MASCOT software. In this program there is the need to set several parameters through the interface displayed in Fig. 3

Monarch	Date of birth	“Peptide mass”
Anne	6 February 1665	602.65
George I	28 May 1660	2805.60
George II	30 October 1683	3010.83
George III	4 June 1738	406.38
George IV	12 August 1762	1208.62
William IV	21 August 1765	2108.65
Victoria	24 May 1819	2405.19
Edward VII	9 November 1841	911.41
George V	3 June 1865	306.65
Edward VIII	23 June 1894	2306.94
George VI	14 December 1895	1412.95
Elizabeth II	21 April 1926	2104.26

Table 3: “Peptide mass” of Monarchs

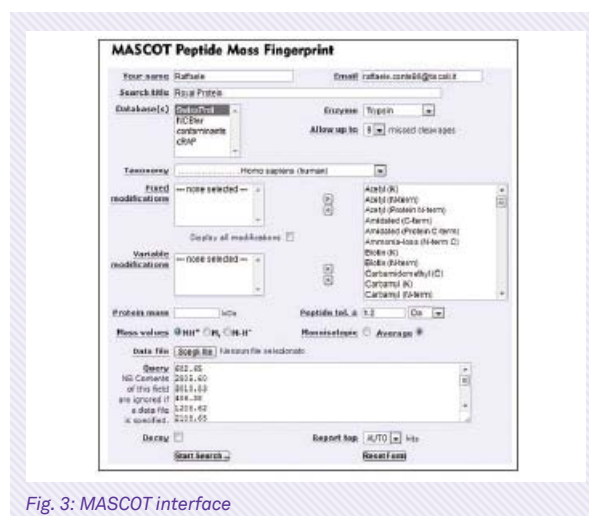


Fig. 3: MASCOT interface

Name and Email: The reason for requiring this information is to allow the results of a search to be returned by email.

Search Title: This is only a text string that will be printed at the top of the results report pages. This parameter can be left blank.

Database: Through this selection it is possible to adopt a sequence database. The databases available on the free, public Mascot server are shown in Table 4:

Database	Characteristics (What is present in the database)
EST	EST divisions of EMBL, (Environmental_EST, Fungi_EST, Mammals_EST, Human_EST, Invertebrates_EST, Mammals_EST, Mus_EST, Plants_EST, Prokaryotes_EST, Rodents_EST, Vertebrates_EST)
NCBI nr	Comprehensive, non-identical protein database
SwissProt	High quality, curated protein database
contaminants	Common contaminants compiled by Max Planck Institute of Biochemistry, Martinsried
cRAP	Common contaminants compiled by the Global Proteome Machine Organization

Table 4: Characteristics of Databases; From Matrixscience website

For a “Peptide Mass Fingerprinting” analysis the most used is SwissProt. It makes no sense to search in an EST database, due to the fact that the entries are just short stretches of sequence, not complete proteins. On the other hand, there is the possibility to multi-select more than one information bank for a search.

Enzyme: In this field the enzyme used for the digestion in the preparation of the sample for the MALDI-TOF analysis must be selected. This parameter is necessary to get the theoretical hydrolysis of all the proteins in the chosen database.

Missed Cleavages: In this drop-down menu is set the number of allowed missed cleavage sites to simulate a limit in the digestion. If the enzymatic digestion is perfect, with no partial fragments present, is possible to select 0. If experience shows that there are missed cleavage sites, is best to set 1 or 2.

A rule is to avoid higher numbers due to the fact that additional level of missed cleavages increases the number of calculated peptide masses compared with the experimental data. This improves the number of random matches and reduces the discrimination.

Taxonomy: This field allows the limitation of searches to particular species or groups of species, speeding up the process.

In the “unclassified” level there are database entries for which the species is undefined or is a species which doesn’t fit into any current classification.

Modifications: Experimentally, some residues may be modified during the sample preparation procedure introducing discrepancies in the expected and observed masses. In the MASCOT simulation it is possible to select “Fixed modifications” to use a different mass for the modified residue (for example, if is selected Carbamidomethyl (C), the MASCOT software will use the molecular weight of this specie instead of that of pure cysteine in its calculations) or “Variable modifications” if there is the possibility of a modification but there isn’t the certainty (e.g. with “Oxidation (M)”, MASCOT software will test for a match with the experimental data for all the methionine in the peptides in the oxidized form and in the normal one). Using these parameters, especially “Variable modifications”, the analysis is longer and the discrimination is reduced due to random matches.

Protein Mass: In this field the mass of the intact protein in Dalton must be indicated. In other terms this is the mass of the contiguous stretch of sequence which contains all of the matched peptide mass values.

This will generally be less than the mass of the entire sequence entry. If this field is left blank, the software assumes that there is no restriction on protein mass. Also if the protein molecular weight can change between search engines, the software Mascot, for each database entry, looks for the highest scoring set of peptide matches which are within a contiguous stretch of sequence less than or equal to the specified protein molecular weight. Consequently, the specified value for the protein molecular weight is only an indication.

Peptide tolerance: This window can be filled with the indication of the expected error on experimental peptide mass values. The measurement is expressed as the fraction of the error as percentage (%), as the absolute milli-mass units (mmu), as the fraction in parts per million (ppm), or as the absolute units of Dalton (Da).

Mass values: The experimental peptide mass values, in a mass analysis, can be obtained as the mass of the charge carrier (MH⁺ or M-H⁻) or that of the neutral fragment (Mr). For a PMF, which is used in the MALDI-TOF spectrometer, MH⁺ must be selected due to the fact that the matrix of the ionizer, once heated by the laser, acts as proton donor forming pseudo molecular ions MH⁺ type.

Monoisotopic\Average: This parameter is necessary to simulate the presence of isotopes at their natural abundances. It is then possible to select either “average” - if the centroid of the complete isotopic envelope in the experimental mass value is taken, or “monoisotopic” - if the mass of the first peak of the isotopic distribution is taken. This choice also depends on the accuracy of the spectrometer. In practice, most instruments report monoisotopic molecular weights up to a certain cut-off point. Above this cut-off, average mass values are provided.

Data file\Query: In this field the path to a data file containing mass data can be entered. If a file name is present in “Data file”, any contents in the Query window are ignored. Alternatively, data can be typed or pasted in “Query”. This must contain a list of peptide mass values, one per line. Further, is possible to add an intensity (this is the information of the relative abundance of a peak respect the others; it is indicated on the y-axis of the spectrum). Anything after the second numeric value on each line is ignored. If intensity information is available, values will be selected according to their intensity to get the best score.

Report top: This parameter determines the maximum number of hits displayed in a search results report. “Auto” can be selected to display only protein hits with significant scores. In a protein summary report, it reports one additional hit after the cut-off at the significant score. This is to ensure that the report provides some feedback, even though there are no significant matches.

Decoy: A Decoy is a recommendation to repeat the search, using identical parameters, against a database in which the sequences have been reversed or randomised. In this type of inquiry the expectation is to get no matches. Then, the number of matches that are found through the decoy is an excellent estimation of the number of false positives that are present in the results from the real database. On the other hand, the current guidelines, imposed by many journals, require “For large scale experiments, the results of any additional statistical analyses that estimate a measure of identification certainty for the dataset, or allow a determination of the false discovery rate, e.g., the results of decoy searches or other computational approaches”². Overall, this scrutiny is an excellent validation method for searches of large data sets but it is not useful for a small number of spectra, because the number of matches is too small to give an accurate estimate. By selecting this checkbox in Mascot it is possible to get an automatic decoy test.

In the simulation used to get the “Royal Protein” non-strict conditions of analysis are chosen to promote a result. Despite of this, no protein has a statistical significant score. This is a proof that the available information in the current databases is sufficient to minimize the possibility of a “Perfect Meaningless Fingerprinting” result³. On the other hand, the provided feedback highlights that the best “protein match” is obtained by the Human TFPI1 (Tissue factor pathway inhibitor).

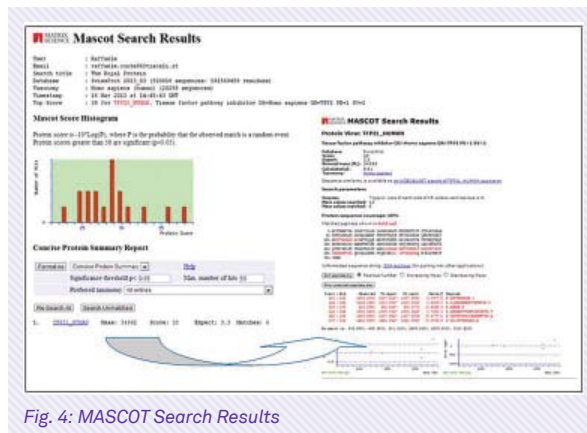


Fig. 4: MASCOT Search Results

As shown in Fig. 4, the result of the MASCOT analysis is a one page summary of the search called “Concise Protein Summary Report”. On the other hand, it is possible to switch to the “Protein Summary” where each protein hit is listed separately, together with details of individual mass value matches.

Further, by selecting the hyperlink of each of the matched proteins it is possible to open the “Protein View” page containing information on the amino acid sequence with matched peptides highlighted in bold and coloured red.

The Concise Protein Summary for a “Peptide Mass Fingerprinting” is divided into:

Header: This part summarizes data regarding search title, date, user name, database version (identified with either a release number or an ISO date stamp) and other information to uniquely identify the search. In addition, the score, accession number, and description for the top scoring protein hit are listed.

Score distribution: Is a histogram designed to illustrate the protein score distribution. Specifically, the 50 best matching proteins are divided into 16 bins according to their score, and the heights of the bars show the number of matches in each bin. In addition, in this histogram there is a measure of the statistical significance of a PMF analysis where the region in which random matches are expected is shaded green.

This region extends up to the significance threshold, which has a default setting of 5% (this mean that if a score falls in the green shaded area, there is greater than a 5% probability that the match was a random event, of no significance. Conversely, a match in the un-shaded part of the histogram has less than a 5% probability of being a random event).

Often, there are several proteins with the same high score. This can happen when the same group of fragmentations occur in multiple proteins, even if the protein sequences in the database are non-identical.

Format controls: These are functions that permit you to modify some of the parameters of the result such as the “Format” (the choice is between Concise Protein Summary, Normal Protein Summary or “Export search results” that permits to download the outcome), the “Significance threshold” (this is set at $p < 0.05$. It can be changed to any value in the range 0.99 to $1E^{-18}$), the “Preferred taxonomy” useful to visualise the hits that refer to a selected specie) and the “Maximum number of hits” (this value is decided when the search is submitted but the report shows a maximum number of 50 hits also if a greater amount was stated. On the other hand, it is possible to select “AUTO” or “0”, to display all of the hits that have a protein score exceeding the significance threshold plus one extra hit).

Repeating a search: It is possible to choose “Re-Search All” to repeat the search with all mass values or “Search Unmatched” to repeat the search with only the mass values that did not get a match in the top hit. This type of simulation is used to study protein mixtures.

Protein Hit List: This is a tabular summary in which each matched protein is listed, up to a maximum of 50. In this part there is the hyperlink to the Protein View and there are data regarding the protein molecular mass, the score, the number of mass values matched to the protein, “Expect” that is the number of times expected to obtain an equal or higher score of hit purely by chance (the lower this expectation value, the more significant the result), and a brief description of the protein. Overall, the “Concise Protein Summary” includes only the most important information but, as said, it is possible to switch to the “Protein Summary”, to get further details of individual mass matches for all proteins or to load the “Protein View”, to integrate the information of above with the sequences and the matched fragment ions. (See acknowledgements)

Prediction of the future sovereign

In Great Britain, the right of succession is regulated by “The line of succession to the British throne” that is contextualised by the Act of Settlement 1701, by the Royal Marriages Act 1772 and by common UK law.

The succession is ordered with a male-preference cognate primogeniture and with the obligation to meet three requirements:

- He or she is a legitimate descendant of a legitimate line from the Electress Sophia of Hanover
Legitimised children remain ineligible.
- He or she has never been a Roman Catholic and has never married a Roman Catholic.
- At the time of accession, the heir to the throne must be a Protestant and enter into communion with the Church of England.^{4,5}

According to these considerations, the most likely successors and the related “peptide masses” are in the order reported in Table 5.

	Name	Date of Birth	Kinship relations	Peptide Mass
1.	HRH The Prince of Wales (The Prince Charles)	14 November 1948	Firstborn of Queen Elizabeth II	1409.48
2.	HRH The Duke of Cambridge (Prince William)	21 June 1982	Third-eldest grandchild of Queen Elizabeth II	2106.82
3.	Prince Williams first child			
4.	HRH ‘Harry’ of Wales (Prince Henry)	15 September 1984	Fourth grandchild of Queen Elizabeth II	1509.84
5.	HRH The Duke of York (The Prince Andrew)	19 February 1960	Second son and third child of Queen Elizabeth II	1902.60

Table 5: Potential heirs to the throne with their “peptide mass”

To make a prediction on the future King of Britain the “peptide mass” of each candidate is added separately to the previous PMF analysis observing if the result indicates the same protein as the “Royal one” and analysing the score of the matches.

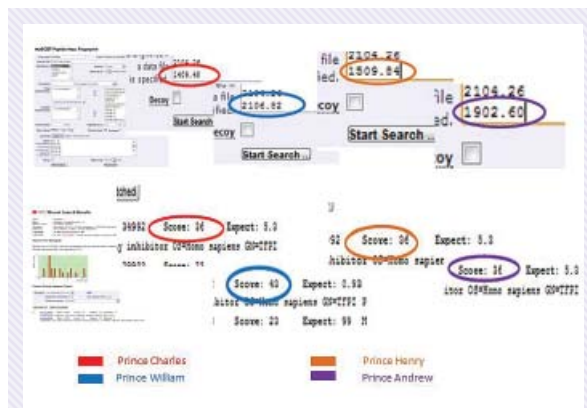


Fig. 5: “PMF score” of the candidates to the British throne

As noticeable in Fig. 5 all the analysed members of the royal family give the Human TFPI1 result in the MASCOT analysis. On the other hand, adding the peptide mass derived from the date of birth of Prince William gives the best score. This response indicates that The Duke of Cambridge should be the next British monarch.

Time will tell if this prediction will be confirmed by the facts. Regarding the “Royal Protein” or “Human Tissue factor pathway inhibitor”, it is a lipoprotein associated coagulation inhibitor. This protein acts through the direct inhibition of factor X (X(a)) and, consequently, the VIIa/tissue factor activity, presumably by forming a quaternary Xa/LACI (lipoprotein associate coagulation inhibitor) /VIIa/ issue Factor complex.

As result, it possesses an antithrombotic action and also the ability to associate with lipoproteins in plasma⁶. Despite of the fact that it is a ubiquitous human protein, the TFPI1 is proclaimed noble through an accurate process of bioinformatics analysis!



Fig. 6 The “Royal Protein”, Human TFPI1

Conclusion

In conclusion, this work aims to be a guide in the effective use of the “Matrix Science software”, to get the right feedback of a PMF analysis. Further, it highlights the improved discriminatory ability of MASCOT in the recognition of the fragmentations (in fact, the simulated “Royal Protein” has not a statistical significant score) due to the growing databases and to the advanced information in literature.

Acknowledgments

The inspiration to write this article came from the work of John Cottrell which, to explain the database searching for protein identification and characterisation, coined the term “Perfect Meaningless Fingerprinting”. His work showed that by using the dates of birth of Presidents of the United States instead of the molecular weight of the peptides a significant match could be obtained. Moreover, the instructions on the bioinformatics process rely on the “help” section of the internet site “matrixscience.com”. Finally, the author would like to thanks Prof. Piero Pucci of the University of Naples “Federico II” for the lessons of “Molecular biotechnology and proteomics”, organized by Cosvitec Soc. cons.a r.l and by the department of “Biomolecular Chemistry” and that of “Biochemistry of Proteins” of the National Research Council (CNR) for the project “BIAM EPI FORM”, from which the information presented in the introductory part of this review is derived.

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Killer whales may have menopause so grandma can look after the kids

Killer whales are just one of three species - we're one of the others - that continue to live long after they've stopped reproducing. But scientists still don't know why these three alone evolved this unusual menopausal trait.

In a bid to find out, NERC has agreed to fund a project worth nearly £500,000 to look at why killer whales stop reproducing a third of the way through their lives, dedicating the rest of their lives to protecting and caring for children and grandchildren.

The researchers suspect that the menopause, which the whales experience in their 30s or 40s, is related to the animals' social structure.

"Killer whales have a very unusual social system whereby sons and daughters don't disperse from their social group but instead live with their mother her entire life. As a female ages she shares more genes with group members, and theory predicts that older females can benefit more from helping their offspring and grand offspring than reproducing themselves," says Dr Darren Croft of the University of Exeter a lead investigator on the study.

"The situation with killer whales is quite different to humans. When a killer whale couple reproduces, the male will go to another group to mate with a female there. But, unlike the human population, he will later return to the group where his mother is. So in whales we have different ideas for why older females maybe have more pressure to look after their offspring, and grand-offspring," says Dr Dan Franks of the University of York a lead investigator on the study.

To discover why the menopause developed in the whales, the team will use information collected over the last 30 years about two populations of killer whales with over 550 individuals between them. The unique dataset includes birth and death dates as well as more complex data, like the genetic and social relationships between the different animals.

From preliminary work the scientists expect to show that having a female around who no longer reproduces greatly increases the chances of children and grandchildren surviving.

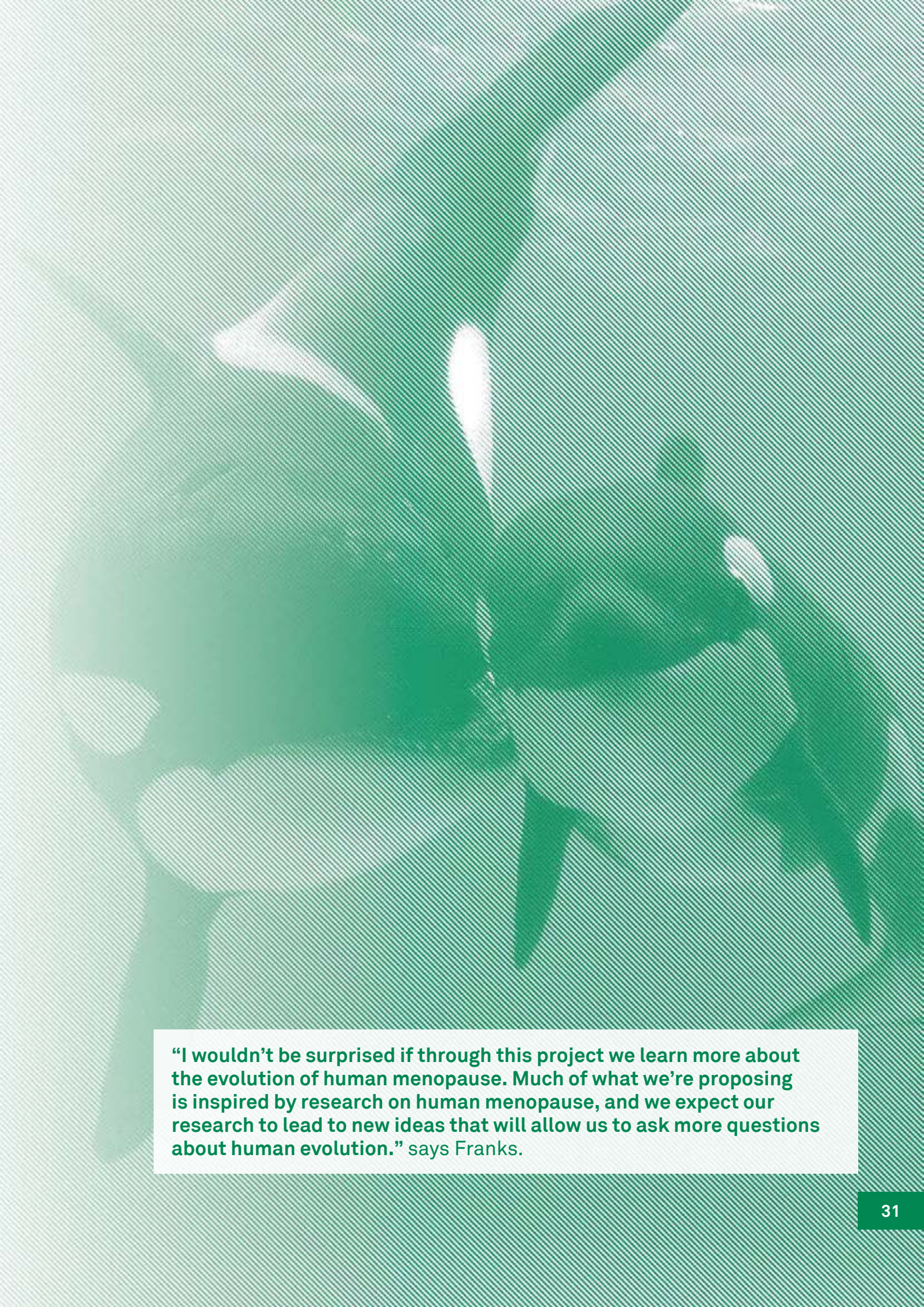
In addition to the benefits to children and grandchildren, theory predicts that competition over resources may also have contributed to the evolution of menopause.

"There is often a conflict over resources between offspring of different generations," Franks says. "If an older female gives birth at the same time as one of her daughters then the two calves will be in competition. Theory predicts that the calves of the older mother should lose out in this competition. So it makes sense for the older female to give up her reproductive rights and instead help raise the younger generation's offspring."

They will then look at how a female who has undergone menopause helps offspring survive. They suspect it is because older females take a leadership role in the social group and have more knowledge on where and when food is available.

While human menopause is fairly well understood, the scientists hope to be able to assess their findings against the human menopause and provide greater insight into this unusual animal trait.





“I wouldn’t be surprised if through this project we learn more about the evolution of human menopause. Much of what we’re proposing is inspired by research on human menopause, and we expect our research to lead to new ideas that will allow us to ask more questions about human evolution.” says Franks.

Guppies and platies in studies of the transovarian transmission of fish mycobacteriosis

David Conroy



Tuberculosis and leprosy, caused by the acid-fast bacteria *Mycobacterium tuberculosis* and *M. leprae*, are two of the oldest diseases known to affect Man throughout history. Other similar mycobacterial infections also affect cattle, poultry, and a wide variety of vertebrates and invertebrates. Fish are susceptible to mycobacteriosis, and a number of comprehensive reviews have been published on that specific topic (Nigrelli & Vogel, 1963; Conroy, 1970; Ishikawa et al., 2004; Decostere et al., 2004; Jacobs et al., 2009; Gauthier & Rhodes, 2009; Lewis & Chinabut, 2011). Among the several aquatic invertebrates known to be infected by mycobacteriosis are included species of shrimps and prawns, a situation which has opportunely been made known to the aquaculture and microbiology communities (Conroy et al., 1997; Conroy, 1998). The first case of an acid-fast infection affecting a fish species was discovered in an aquarium-held carp, *Cyprinus carpio* (Bataillon et al., 1897), later identified as *M. piscium* (Bataillon et al., 1902). By the year 1963, when Nigrelli & Vogel published their review, there had been reports of mycobacterial infections in 157 species of fish, belonging to some 40 families. Since that time, the number of susceptible freshwater and marine fish species has been extended considerably. For mainly aesthetic and technical reasons, Parisot & Word (1960) suggested that the name of fish tuberculosis be changed to that of fish mycobacteriosis.

Runyon (1959) proposed that the term 'tuberculosis' be reserved for human and bovine infections caused by *M. tuberculosis* and *M. bovis* respectively, and that the mycobacteria from other animal species be known as 'atypical mycobacteria'. Those recommendations have generally been followed by most workers since then (Frerichs, 1993).

Fish, together with other cold-blooded vertebrates such as amphibians and reptiles, are being increasingly utilised as laboratory animals in biological and biomedical research programmes to study the disease conditions affecting human beings, and in trials with new compounds and technologies designed to prevent and treat such human diseases, including mycobacteriosis, by the use of animal models (Messner, 1981). Several fish models have been proposed for that purpose, including the goldfish, *Carassius auratus* Linn. (Talaat et al., 1998), and the zebrafish, *Danio rerio* (Hamilton), an egg-laying cyprinid species native to parts of S. E. Asia. The use of zebrafish has become common in laboratories where research on human aging and diseases is undertaken (Keller & Murtha, 2004). The popularity of zebrafish as experimental fish in biomedical research projects has made necessary the preparation of special practical publications on their care, maintenance, management and pathology (Harper & Lawrence, 2010; Kent et al., 2012). There are many articles in the published literature, however, which make known the susceptibility of zebrafish to piscine mycobacteriosis. One of the practical advantages of using certain species of small tropical fish as laboratory animals is the relative ease with which they can be maintained and reared in captivity, thereby making available a sufficient number of specimens to be incorporated into experimental trials.

It is important to emphasise that many cases have been reported in which 'atypical mycobacteria' associated with fish diseases



have been transmitted to humans (Puttinaowarat, 1999). One such example of that is *Mycobacterium marinum*. The human develops a localised condition known as 'fish tank granuloma' and 'fish fanciers' finger' (Wheeler & Graham.,1989; Kullavanijaya et al., 1993; Boyce, 1997; Ryan & Bryant, 1997; Lewis et al., 2003), which is often quite difficult to treat in medical practice (Laing et al.,1997). Persons handling fish for leisure or scientific purposes should, therefore, bear in mind the need to adopt strict biosecurity measures when handling their pets or experimental animals. The popular and readily available 'fish fingers' are meant for human consumption, whereas 'fish fancier's finger' in humans is also readily available, but is an entirely different kettle of fish.

Numerous isolations of mycobacteria from fish have been effected, and the isolates have been identified as belonging to various nominal species of *Mycobacterium*. Runyon (1959) proposed that such mycobacterial isolates other than *M. tuberculosis* be grouped together and known as 'anonymymous' or 'atypical' mycobacteria, to avoid confusion with *M. tuberculosis sensu stricto*. Runyon (op. cit.) introduced a new form of identifying the atypical mycobacteria based on their growth and pigment-producing capacities. In that way, four groups can be distinguished:

GROUP 1. Photochromogens: On exposure to light during growth, an intense yellow colour develops within 6 – 24 hours (e.g. *Mycobacterium marinum*), which pigmentation does not develop in the dark.

GROUP 2. Scotochromogens: A yellow or orange-yellow pigment develops when the organism is grown both in the light and in the dark (e.g. *Mycobacterium scrofulaceum*).

GROUP 3. Non-pigmented: Normally do not produce pigment during growth (e.g. *Mycobacterium xenopi*).

GROUP 4. Rapid growers: Members if this group normally grow rapidly in less than one week, as opposed to the 'slow growers' which may need up to 3 months for growth to occur (e.g. *Mycobacterium chelonae*, *M. fortuitum*).

Some examples of the nominal species reported, and their relationship as synonyms with the now three generally accepted species *Mycobacterium chelonae*, *M. fortuitum* and *M. marinum*, as proposed by Wayne & Kubica (1986), are shown here in Table 1. It might be mentioned, en passant, that this proposed limitation of the more common fish pathogenic mycobacteria to those three mega-species seems to have been universally accepted by workers in the area (Frerichs, 1993). Wayne & Kubica (op. cit.) also corrected the erroneous name of the species from chelonei to chelonae.

VALID NAMES	SYNONYMS
<i>Mycobacterium chelonae</i>	<i>M. chelonei</i> , <i>M. abscessus</i> , <i>M. borstelense</i> , <i>M. friedmannii</i> , <i>M. runyonii</i> , <i>M. salmoniphilum</i> (*)
<i>Mycobacterium fortuitum</i>	<i>M. giae</i> , <i>M. minetti</i> , <i>M. peregrinum</i> , <i>M. ranae</i> , <i>M. salmoniphilum</i> (**)
<i>Mycobacterium marinum</i>	<i>M. anabanti</i> , <i>M. balnei</i> , <i>M. piscium</i> , <i>M. platypocillus</i>
<i>Mycobacterium scrofulaceum</i>	<i>M. marianum</i>
(*) according to Grange (1981) (**) according to Gordon & Mihm (1959)	

Table 1: Some nominal species of mycobacteria which have been isolated from fish and other poikilotherms, and their accepted asignation to currently recognised species

The occurrence of spontaneous mycobacterial infections is commonplace in many different species of freshwater and marine fish, particularly those which are held in aquaria or similar maintenance facilities. Besse (1949) encountered such infections in 243 specimens of 288 tropical fish examined. The clinical signs observed included ascites, haemorrhagic ulcers on the skin, loss of scales, exophthalmos or sunken eyes, among other several pathogonomic signs of fish mycobacteriosis. On a basis of the clinical signs displayed by the fish, Besse (op. cit.) reported that species of anabantids, characins and cyprinodonts seem to be particularly susceptible to piscine mycobacteriosis, which was tenatively divided into the following types of clinical manifestations:

- (a) paradise fish (osphronemids) mycobacteriosis;
- (b) ascites in the anabantids;
- (c) exophthalmos in *Danio* spp.;
- (d) nodular granulomas in the cyprinids;
- (e) emaciation ('marasme') in the poecilids.

Mycobacteriosis in fish is a chronic inflammatory systemic infection which normally manifests itself in the form of granulomas in the organs and tissues of the diseased animal. Among the principal histological changes which can be observed is the formation of granulomas in the target organs and tissues such as the intestinal walls, kidney, lips, liver, oesophagus, spleen, and ovary (the last named in the case of female fish). The granulomas harbour epithelioid macrophages, which act as phagocytes of the bacteria (which are also present), in the centre of the lesions, the whole mass being encapsulated by layers of connective tissue.

There is general agreement that the horizontal transmission of piscine mycobacteriosis is principally by the ingestion of contaminated food or organic detritus, including that which is taken in when the fish 'grub around' in their environment, or by direct contact with mycobacteria harboured in the biofilm of the environment. This modus operandi of possible mycobacterial infection being acquired from sewage has been considered in the case of golden mullet, *Liza aurata* (Risso) in marine waters of Libya (Othman, 1980), and of silver mullet, *M. curema* Val., in marine and hypersaline lacustrine waters of Venezuela (Pérez et al., 2001). Once acquired, the aetiological agent circulates in the blood to lodge in the body organs, especially the kidney, liver, and spleen, from which the bacterium can normally be preferentially isolated and cultured *in vitro*. Harrieff et al. (2007) have confirmed experimentally that, in the case of the zebrafish, the gastro-intestinal tract appears to be the primary route of infection, once the fish have been exposed to *Mycobacterium marinum* and *M. peregrinum*. Sodchit (1995) has also confirmed experimentally that the exposure of Siamese fighting fish to bath challenges by mycobacteria at varying concentrations for two weeks led to the formation of granulomas in the oral cavity and on the skin within 7 – 10 days of challenge, and that granulomas had been formed in all of the internal organs (most particularly the kidney and spleen) by the third week. All of the fish had become infected on termination of the trial at 4 months.

The use of live foods such as water fleas (small cladoceran crustaceans of the genera *Daphnia* and *Moina*) has long been suspected as a source of mycobacterial infection in fish. Grange (1985) reported a case in which *Mycobacterium marinum* was isolated from aquarium fish, and traced back to a population of *Daphnia* sp. which had been used as live food for fish. Sodchit et al. (1994) and Somsiri et al. (2005) have effectively demonstrated that mycobacteriosis in Siamese fighting fish can

be transmitted by the use of water fleas (*Moina* sp.) as live food. It is interesting to note that the water fleas concerned had been collected from water contaminated by raw sewage. In a replicate group of fighting fish fed with brine shrimp (*Artemia* sp.) larvae, the incidence of mycobacterial granulomas was far less.

B.I.	READING
6+	numerous masses of AFB in all of the fields
5+	100 – 1 000 AFB per field
4+	10 – 100 AFB per field
3+	1 – 10 AFB per field
2+	1 – 10 AFB in 10 fields
1+	1 – 10 AFB in 100 fields

Table 2: Bacterial Index (B.I.) used to express the numbers of mycobacteria detected in stained smears of fish faeces (based on Grange, 1985)

The transovarian transmission of piscine mycobacteriosis is one very important aspect of the disease which merits further research concerning the vertical mode of transmission for the causative agent of the disease. In this respect, the term 'transovarian' is derived from the prefix 'trans-', meaning across, or through, the ovary. When it comes to the transmission of the mycobacteria via the eggs, the mechanism may be described as 'intra-ovum', as in 'intra-'= within, or 'super-ovum', where 'super-' = above or on.

Kanayati (1993) and Chinabut et al. (1994) reported the detection of mycobacteria within the eggs of diseased female Siamese fighting fish (*Betta splendens* Regan) broodstock, and isolates of the bacteria were obtained when using Ogawa egg medium. A recent report by Kent et al. (2013) has indicated that *Mycobacterium marinum* is a potentially virulent pathogen which is capable of being transmitted horizontally or vertically in zebrafish. Those workers noted that the ovaries of diseased female zebrafish are usually heavily infected, and that the mycobacteria can also be observed within the eggs themselves. Experimentally, the mycobacteria were injected into the embryos of the fish immediately after the eggs had been fertilised, and infection was found to have occurred a few days later, leading to the production of pre-infected eggs. The mycobacteria may have been transmitted on the surface of the eggs from the ovaries of infected female fish. The use of 25 – 50 ppm chlorine as a surface disinfectant was not capable of killing all the mycobacteria, for which reason those workers suggested that infected

broodstock not be used as a source of supply of zebrafish eggs, because of the possibilities of the causative organism of fish mycobacteriosis being transmitted via the maternal route from such sources.

Evidence to support the earlier suggestion by Nigrelli & Vogel (1963) that fish mycobacteriosis is spontaneously transmitted from the mother by the transovarian route to the eggs and embryos was published by Conroy (1966), in the case of a population of a viviparous species, the Mexican platyfish (*Poecilia maculata*), bred and reared for commercial purposes in Argentina. The affected fish showed marked emaciation of the body, with loss of their characteristic colour, and the presence of sunken eyes and moderate lordosis. Some of the fish also had small ulcerated areas on the head and body. The clinical signs were very similar to the ones reported by Baker & Hagan (1942), who were the first to report mycobacteriosis from Mexican platyfish, and who isolated an organism which they reported as *Mycobacterium platypoecilus*. One of these platies was a gravid female, from which 7 well-developed embryos were removed on autopsy and reserved for subsequent bacteriological and histological studies.



The adult platies were placed individually in chemically clean beakers, which were allowed to float on the surface water

of an aquarium. Samples of the extruded faeces were obtained with a sterile Pasteur pipette, and emulsified in a drop of distilled water on a microscope slide. The preparation was heat-fixed (with the material towards the flame) for staining by the Bullock method (where 70% ethanol incorporating 1% hydrochloric acid is used instead of acid and alcohol as per the Ziehl-Neelsen standard technique) and examination. Small amounts of the faeces, together with other samples taken aseptically from the kidney and spleen of the adults, plus five whole embryos, were submitted to Petroff's concentration method for acid-fast bacteria, and the centrifuged sediment was neutralised and streaked onto the surface of slopes of Lowenstein-Jensen medium incubated at 28°C. Cultures of acid-fast bacteria were obtained from those sources, the reactions of which (in retrospect) would correspond to an identification as *Mycobacterium marinum*.

The remaining two embryos were fixed in formol saline and processed for histology. Kinyoun-stained and mounted as longitudinal and transverse 3µ sections, the material from these embryos was examined microscopically. Mycobacteria similar to those detected in smears of the faeces and internal organs were detected in minute folds in the skin, and at a depth of approximately 150µ–200µ in the pharyno-oesophageal region of the embryos. It was concluded that the embryo, whilst still in the egg within the ovary of the gravid female, had become infected with the mycobacteria, presumably whilst feeding on the egg yolk (lecitotrophic feeding) during its early development. It is known that, in the poeciliids, the ovary per se experiences little modification during gestation, but that its walls are highly vascularised and in close association with the embryonic pericardium and the yolk sac (Dépeche, 1973). A histopathological study by Gómez (2008) included 34 guppies (*Poecilia reticulata*), 22 variegated platies (*Xiphophorus variatus*) and 8 swordtails (*X. hellerii*), as representatives of the family Poeciliidae. Of those fish, 17 guppies, 4 swordtails and 19 variegated platies had granulomas associated with acid-fast bacteria, and the gonads were among the organs infected.

A further opportunity to obtain evidence for the transovarian transmission of fish mycobacteriosis arose when an important outbreak was investigated on a fancy guppy farm in Venezuela (Conroy & Conroy, 1999). These fish had been routinely fed with a reputable commercial flaked feed, and with water fleas produced on site in special and separate ponds populated with an imported strain of *Daphnia magna*. The diseased animals showed anorexia, lethargy, and loss of their typical colour. Five adult females and three adult males were sacrificed, and smears were prepared and stained from the kidney, mesentery and liver. Fresh faecal strings were also collected and examined. One of the female guppies was gravid, and yielded six well-formed embryos which were washed with sterile physiological saline and pooled for the preparation of smears. A random selection of water fleas was likewise obtained and emulsified in sterile physiological saline for preparation as smears. 50 different microscopical fields of each smear were examined, and the numbers of acid-fast bacteria detected were registered as the Bacterial Index (B.I., as defined by Grange, 1985, for the examination of smears for the detection of *Mycobacterium leprae*) for the corresponding organ or source. The results are shown here in Table 3. It must be placed on record that no acid-fast bacteria were observed in any of the water fleas produced from the imported strain for use as live food.

SOURCE	B.I./SAMPLE
kidney	5 +
mesentery	4 + - 5 +
liver	4 + - 5 +
spleen	4 + - 5 +
embryos (pool of 6)	2 +
faeces	3+ - 4 +

Table 3: Bacterial Index (B.I.) of acid-fast bacteria in smears from the internal organs, embryos, and faeces of male and female fancy guppies from an ornamental fish farm in Venezuela

At the present moment in time, there has been sufficient evidence obtained from the study of spontaneous cases of mycobacteriosis in fish to indicate that the transovarian transmission of that disease does exist, as much in the natural environment as in conditions of confinement such as in aquaria or on ornamental fish farms. From the author's personal experience of mycobacteriosis in guppies and platies, those varieties of ornamental ovoviparous poeciliid fish could prove to be ideal candidates for experimental studies to investigate unsolved aspects of the transmission of fish mycobacteriosis. One of the advantages of the poeciliids is that their embryonic development, and the various stages of that, have been studied and documented in the scientific literature (Hopper, 1943; Tavalga, 1949; Rocha et al., 2010). In such a way, it would be feasible to follow the progress of the infection in situ, as much in naturally as in experimentally infected fish. Biomedical research would be one great beneficiary, as possible teratogenic and other similar effects of any novel compounds could be studied in vivo and in situ by using poeciliid fish such as guppies, platyfish and swordtails and their embryos as models. Kazianis & Walter (2002) have already raised that possibility, and it would be convenient and profitable to act upon the proposal.

Guppies and platyfish, together with swordtails, are live-bearing tooth-carps of the family Poeciliidae, classified as within the Order Cyprinodontiformes. Their natural distribution in the Americas is on the Atlantic slopes of the southern USA, Mexico, Central and South America, to Brasil and northern Argentina. They tend to form shoals, and normally feed on small aquatic crustaceans, mosquito larvae, oligochaetes (e.g. *Tubifex*) and plant material in the bodies of water which they inhabit. They have been widely distributed worldwide through the aquarium and ornamental fish trade. The females and the males are clearly differentiated. In the sexually mature male, the anal fin is modified to form a gonopodium, or copulatory organ, which serves to fertilise the eggs in the ovarian cavity of the female.

The sperm may be stored by the female for some considerable time, enabling future batches of eggs to be fertilised.



In the platyfish, the adult female measures up to 4 cm in length, and the male up to 6 cm. The male guppy measures up to 3 cm, and the female up to 6 cm. Both species are very prolific, and a female platyfish may carry up to 100 embryonated eggs. Hatching usually takes place in the early hours of the morning, and the details of that event should be duly witnessed when it occurs, and registered in the records of the research establishment where it takes place. The offspring must always be separated from the female when hatching occurs, as the embryos can easily be mistaken for live food! The optimum temperature for the maintenance of guppies and platyfish is 22–25°C, and they are regarded as being very hardy fish which easily adapt to artificial confinement. Many fancy varieties of both species exist, and competitions are held to reward the producers of the most colourful specimens. Further information on their care and maintenance is available in a number of books and manuals on their breeding which are available.

The fertilised eggs are nourished in the ovary of the female during their development by the yolk sac (lecitotrophy). The embryonated eggs are extruded at birth by the female as a result of pressure, and in such a manner that the least contact will cause them to hatch. The normal period of pregnancy is 30–49 days, and depends on the water temperature and the nutritional status of the gravid female. In the guppy, the pregnancy lasts for 22–25 days, followed by a brief resting period of 22–25 days before the next pregnancy occurs. At birth, the embryos are fully developed, and they start to grow rapidly and feed independently. For scientific research purposes, aspects of the breeding cycle, development, and stages of the embryology of poeciliid fish have been published by Hopper (1943), Tavalga (1949), Haynes (1995) and Rocha et al. (2010), to which reference should be made for detailed descriptions.

Martyn et al. (2006) have described the in vitro culture of guppy embryos in the laboratory, a tool which opens up a further door to their use in research.

It hardly needs to be emphasised that research of this nature, and on this type of topic, requires a keen pair of eyes, plenty of manual dexterity, and a wide-open mind, which conditions characterise science and technology laboratory practitioners during their training and subsequent professional experience.



Author

David Conroy, FIScT, is Emeritus Professor of Fish Pathology, Faculty of Veterinary Sciences, Central University of Venezuela.

In this article, he shares some ideas on the transovarian transmission of fish mycobacteriosis, drawn from on his 'on' and 'off' field experiences with that topic in Argentina and Venezuela.

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Branching for food: how nutrients remodel fruit fly vessels

Research in fruit flies suggests a new mechanism explaining how diet may affect cancer, obesity and adaptations to malnutrition.



New research from the MRC Clinical Sciences Centre suggests that nutrients in the diet may play a role in changing the architecture of blood vessels in the gut and other organs. The study, in fruit flies, found that small changes in their diet alter the nerve signalling guiding branching of new oxygen-delivering tubules – a process reminiscent of adaptive angiogenesis. In turn, this affects how the fly handles and stores different nutrients from its diet.

It is not yet clear whether a similar process takes place in humans or other mammals, but if it does it might mean that this mechanism could be targeted as a way of modifying how organs store nutrients and fat. It also opens up the possibility that diet influences the arrangement of blood vessels in mammals, contributing to conditions such as obesity (and the improvements seen after gastric bypass), cancer or to the way the body adapts to malnutrition.

Adaptive angiogenesis is a process by which the structure of blood vessels surrounding a tissue or organ changes in response to demand for nutrients and oxygen. For example in certain cancers, tumours send out signals that create new blood vessels to deliver the oxygen and nutrients they need to grow.

Although the control of this process is not fully understood, the prevailing view has been that signals from the target organ – that requiring the blood supply – underlie this process.

Here scientists have identified an alternative mechanism in the fruit fly that might be controlled by nutrients consumed in the diet. The model is the *Drosophila's* tracheal system – a network of tubes that deliver oxygen, akin to mammalian blood vessels.

This mechanism appears particularly prominent in the intestine where it drives, rather than responds to, metabolic change.

The remodelling is controlled by distinct subsets of nerves that respond to oxygen and nutrients, which sculpt the tracheal system through delivering molecules called insulin-like and VIP-like peptides. These molecules are conserved across species, including humans.

The research, published in *Cell*, was funded by the Wellcome Trust, the Biotechnology & Biological Sciences Research Council and the Medical Research Council, among others.





Dr Irene Miguel-Aliaga from the MRC Clinical Sciences Centre, who led the research, said:

“The vasculature of the fruit fly is far more active than we previously thought. It doesn’t only listen to the target tissue; it listens to the nervous system. The implication is that we could target either the neurons or their vascular targets genetically, pharmacologically or otherwise to regulate how these organs are storing nutrients.

“However, we don’t know yet what the relevance of these findings is to humans. We’ve found it in flies because we can turn genes on and off in small groups of neurons and/or oxygen-delivering cells. In humans, we would first need to find out whether, at the anatomical level, there is correlative evidence of gut vasculature changing in response to poor or imbalanced diets, or for example following gastric-bypass operations. If we find evidence for such changes we could then try to establish whether these are causative or not.”

The University Zoology Museum in Maracay, Venezuela

José Clavijo



Three maps indicating the South American sub-continent, part of Venezuela where the Henri Pittier National Park is located, and the extension of the Park (note Caribbean coast and inland and lacustrine areas)

The 'Dr. Francisco Fernández Yépez' Museum of the Institute of Agricultural Zoology (MIZA) is part of the Faculty of Agriculture of the Central University of Venezuela (FAGRO-UCV), which is the oldest University in Venezuela, having been founded in the year 1721. Both the Faculty and the Museum are located in the city of Maracay (capital of Aragua State), 120 km distant from Caracas (the capital of Venezuela) and 43 km distant from Valencia (capital of Carabobo State). The Museum is located at 430 metres above sea level, and is on the outskirts of the Henri Pittier National Park, the first to be established in Venezuela, and which has a rich biodiversity of species endemic to the area. Within that Park, the Faculty has a collaborative agreement with the Ministry of the Environment and Natural Resources to conjointly share the 'Dr. Francisco Fernández Yépez' Biological Station, which was established 70 years ago, and is located at 1100 metres above sea level in an environmentally-rich tropical rain forest.



The museum



The reception area of the museum

The MIZA commenced operations in 1948 under the leadership of the brothers Drs Francisco and Alberto Fernández Yépez, both of whom were Professors of Zoology in the Faculty, and who dedicated their attention to various vertebrates and invertebrates, especially arthropods (and insects in particular). Dr Francisco Fernández Yépez is considered the 'Father of Venezuelan entomology', and the MIZA is named in his honour. It possesses the largest collection of insects in the country, with more than 3.5 million specimens preserved there. Work on the vertebrates has continued in the Museum of Zoology of the Faculty of Veterinary Sciences of the Central University of Venezuela (FCV-UCV), and with which the FAGRO-UCV shares the same University Campus.

As with other natural history museums, the MIZA fulfils a number of functions which go beyond the merely institutional ones.



Part of the collection of tropical butterflies



Another view of part of the collection of tropical butterflies



A research worker using the reference collection

It complies with making the community at large more aware of the biological diversity of the tropical parts of the Americas. Its goal is to cover the A – Z, from agriculture to zoology, and where B = Biodiversity and Biota, C = Classification and Conservation, D = Development and Documentation, E = Education and the Environment, and so forth (as examples). It is an institution of fundamental importance to the conservation of the biological patrimony and faunistic diversity of the tropical zones of the Americas, and most particularly those of Venezuela and the Andean Region.

The MIZA is also an educational centre with a staff of scientists and technicians, 14 of whom have Doctorates in their specialised fields. It provides training at the undergraduate and post-graduate levels. Members of the technical staff have been able to graduate as agronomists, and are encouraged to study for the novel first degree of higher technician (= TSU = 'Técnico Superior Universitario') in agriculture and associated fields, whilst in their normal employment.

Among the most important tasks of the MIZA are included:

1. Serve as a reference centre for endangered species and for those to which access is difficult;
2. Serve as a teaching centre for the formal teaching of professionals and technicians in entomology, agricultural entomology, and entomology with reference to animal and human health;
3. Serve as a research centre for ecological, evolutionary, faunistic and taxonomic aspects of the Animal Kingdom;
4. Serve as the National Reference Centre for those whose interests are in the identification of important species, such as ones negatively affecting agriculture (e.g. pests and plagues), vectors of animal and human diseases, and venomous animals;
5. Serve to generate information on the wild native fauna and of species of interest to agriculture and human health. The information is available for consultation on www.miza-ucv.org.ve;

6. Serve as an open space to inform the public (particularly younger people and adults) about different aspects of the neotropical fauna, animal diversity, and the environment in general.

The MIZA is well equipped not only with regard to its collections, but also because of the specialised personnel who work there. The group has produced more than 300 formal scientific publications, in English and in Spanish, in peer-reviewed international journals. It has exchange and working agreements with several important institutions abroad, among which are the American Museum of Natural History, the British Museum of Natural History, and the Swedish Museum of Natural History.

The photographs which accompany this article show the new buildings of the MIZA as the infrastructure upon which to receive exchange students and scientists from home and abroad. That building was financed by grants from the Government of Aragua State, The Polar Foundation, the Pepsi Cola Co. Inc., and the Central University of Venezuela.

The doors will always be open to receive visitors interested in working in collaboration with the MIZA and its Staff.

Acknowledgements

The author thanks his long-time friend and colleague Prof. David Conroy, FIScT, for his encouragement, and for assistance in writing this article in English. The maps and photos are by Mr. Marco Gaiani, of the MIZA Staff.



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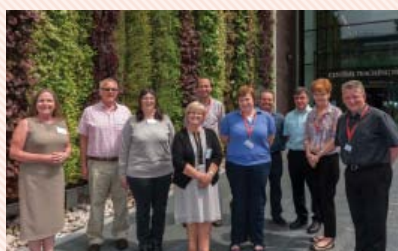
He is the author or co-author of numerous publications, and has been a Guest Lecturer and Research Scientist in many countries, including in the UK. His e-mail address is pepeclavijoA@gmail.com.

The Effective Laboratory Conference 18-19 June 2013

Michelle Jackson



UBMA members attending the conference



UCLAS members who attended



Some of the EMU members who attended

This June saw over 350 university Technical Managers, Health and Safety Managers, Sustainability/Energy Managers, academics, lecturers and senior managers congregate at the Central Teaching Hub (CTH) in The University of Liverpool for the second Effective Laboratory Conference. The conference was organised by S-Lab (Safe, Successful, and Sustainable Laboratories) in association with a number of university managers associations, Engineering Managers in Universities (EMU), University Bioscience Managers Association (UBMA) and University Chemistry Laboratory Administrators and Supervisors (UCLAS) and in partnership with the Institute of Science and Technology (IST). The key theme for the conference was to address the issue that there is scope for considerable improvements in many aspects of laboratory effectiveness.

Feedback from many delegates was that there was a fantastic buzz about the conference, and that it was unique in giving them the opportunity to network with colleagues from different areas of university departments and faculties, who all have a role to play in laboratory effectiveness but don't necessarily get the chance in everyday life to meet and exchange views.

The Venue

During the conference delegates had the opportunity to visit the laboratories in the award winning CTH and experience some of the novel approaches to teaching science that the University of Liverpool



Central Teaching Hub, University of Liverpool

has developed, including some fascinating demonstrations of the 'portable' planetarium used by the Physics Department for outreach activities. The three storey building was designed to enhance the student experience by creating high quality, contemporary learning facilities, to support new modular teaching courses and promote inter-disciplinary learning between the sciences. The building is extremely energy efficient harnessing all of the natural advantages the site offers and incorporating all the latest sustainable initiatives into the design to help the University reach its ambition of achieving a BREEAM 'excellent' rating for the building. These include rainwater harvesting, a heat recovery system, air sourced heat pumps and solar panels, the building has a low carbon footprint as it utilizes heat and power from the new constructed Energy Centre via the UoL own network of district heating pipes and high voltage electricity network. More information about the building can be found at www.liv.ac.uk/facilities-management/campus-development/central-teaching-labs



A £28.6m investment in facilities and equipment. The Central Teaching Hub is a unique, multi-disciplinary teaching facility. The state-of-the-art building is located in the heart of the University precinct. (Image courtesy University of Liverpool)

The Conference

The Effective Laboratory conference encompassed conferences within a conference for EMU, UBMA and UCLAS, with special focus on subjects of interest to these groups on the first day of the conference and more general content on the second day. Pre-conference meetings were held by the associations, followed by dinner in the Royal Liver Building during which a number of new IST Registrants and Fellows were presented with certificates.



Pre-dinner drinks on the balcony of the Royal Liver Building



A number of new IST Registrants and Fellows were presented with certificates

For the conference there was a packed programme with keynotes from Jim Smith, Director, MRC National Institute for Medical Research, Dr Martino Picardo, CEO, Stevenage Bioscience Catalyst, Paul Jansenwillen Workplace Solutions R+D Lead Pfizer, Don Levy, Vice-President for Research and On-Campus National Laboratories, University of Chicago,

Stephen Holloway, Pro Vice-Chancellor, University of Liverpool and Sir Ian Diamond Vice-Chancellor, University of Aberdeen.



Over lunch there were a number of short sessions intended to provide concise briefings on topics that could not be squeezed into the breakout sessions, and/or to enable connections between delegates around topics of interest. Delegates were spoilt for choice in the afternoons with 16 themed breakout sessions on offer each day, from 'How to Change Scientists' Expectations and Behaviour' and 'Effective Briefing and design processes for new research laboratories – aligning Estates, users and Suppliers' to 'IT in teaching laboratories' and 'Technicians as teachers'. Many of the lunchtime and breakout sessions were delivered by winners of the S-Lab awards giving delegates the chance to learn about ground breaking approaches and initiatives in areas of laboratory building and renovation, teaching, laboratory effectiveness, laboratory environmental improvement, and laboratory information technology.



A full programme for the conference along with downloads of most of the presentations are available from The Effective Laboratory website www.effectivelab.org.uk.

Specialist areas were available for delegates to visit the stands of a number of Professional Bodies to explore what they can provide to support personal development including the IST, the Royal Society of Chemistry and the Society of Biology, and there were dedicated areas for the technical managers associations and those in estates roles.

Delegates enjoyed a string quartet at the canapés reception following the first day's events which gave them more opportunities to network and mingle with colleagues from a variety of roles, and as with last year's conference many delegates viewed the networking opportunities as one of the most useful outcomes of the conference.

A ceremony to present the S-Lab awards for 2013 was held on the second day of the conference including presentations to winners of the '(individuals) making a difference' and the 'HEA Physical Sciences Technician of the Year' Awards, won by Dr Peter Reid, University of Manchester (who described his work on 'Eliminating Ethidium Bromide and UV Radiation Hazards from Molecular Biology Experimentation') and Mr Stephen Baker, Cardiff University respectively.

Video discussion

See what delegates, organisers, speakers and sponsors thought of the conference at

www.youtube.com/channel/UC6ndUMWnpOrfTQBgZa74n7A/videos

Caption competition

On a lighter note delegates were invited to enter a photo caption competition (see photo below) which incorporated some reproductions of skeletons of



a neanderthal, and Lucy a hominid known as the 'Mother of Man' used by the University for teaching purposes. Some of the best entries were 'This diet is killing me' (Elizabeth Wood)

'3 bears finally get revenge on Goldilocks family'
(S Pearson)

'They work you to the bone here'
(Dermot McGrath)

'Neanderthal to the other two, 'does my brow look big in this?'' (Malcolm Holley)

'Senior management meet to consider the implications of sharing resources' (John Stephens)

'All 'are you sure this walking upright will catch on?'
(Malcolm Holley)

'One nutrition and dietetics experiment that went too far ...' (Allison Hunter)

'Hear nowt, see nowt, say nowt' (Dave Hunter)

'Efficient - super efficient- stupidly efficient'
(Paul Coolis)

'The need for succession planning for some of the S-Lab team was becoming an urgent matter'
(Michelle Jackson)

The Future

The next Effective Laboratory conference will also be held in partnership with the IST, and is planned for the first week in September 2014 at Kings College London (to be confirmed).

S-Lab awards

The 2014 S-Lab Awards are going to open for applications in December 2013, details will be available shortly on the Effective Laboratory website www.effectivelab.org.uk/awards.html, where you can also find details of the winners shortlisted applicants from the 2013 Awards. The Awards scheme covers any aspect of laboratory design, operation and management in all sectors and all countries.

Sponsors

The conference was generously supported by a number of sponsors and exhibitors and the conference organisers would like to thank them for their participation.



About S-Lab

The S-Lab initiative originated in projects supported by the UK HE funding bodies, but is now self-financing and covers commercial and public sector laboratories as well as those in universities. Its aim is to publicise the outputs of their own activities, and also to provide brief updates on other developments within the field. S-Lab is a partner of the International Institute for Sustainable Laboratories (I2SL). See www.goodcampus.org for more details on their work including copies of previous newsletters, and www.effectivelab.org.uk for details of their Conference and Awards.

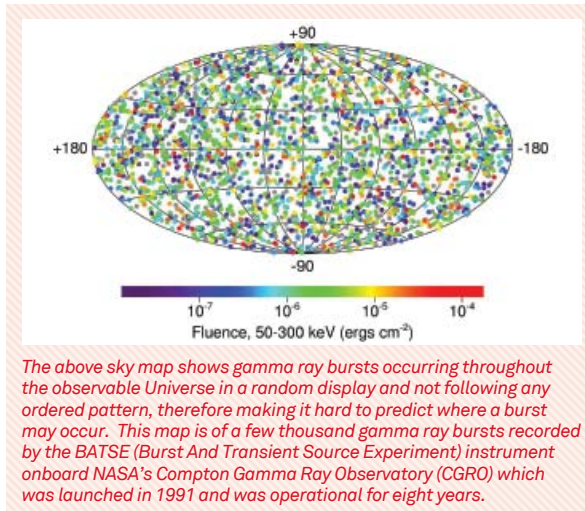
ⁱ www.tmu.uk.net

ⁱⁱ www.ubma.org.uk

ⁱⁱⁱ www.istonline.org.uk

Gamma ray bursts

Colin Neve



Introduction

Gamma ray bursts (GRBs) were first discovered by the US military spy satellite group 'Vela' which was searching for signs that the Russians might be testing nuclear weapons (which produce gamma rays) after they had signed the Nuclear Test Ban Treaty in 1963. The Vela satellites did detect many gamma ray bursts, but they didn't come from Earth, they had come from deep space.

Astronomers were puzzled as to what had caused them to appear in the sky from these vast distances. The theorists had a field day proposing new ideas about colliding black holes, collapsing neutron stars, and a variety of other possibilities which might have caused these brilliantly radiating bursts of gamma rays that were being detected.

It was also speculated that it might happen when a black hole and neutron star collide or two neutron stars are in collision; therefore creating an intense burst of gamma rays as a beam of radiation that is brighter than the millions of stars in a galaxy.

Only hard evidence and more advanced ground-based and space telescopes would solve this tantalising puzzle.

What are GRBs?

Gamma ray bursts are now believed to occur throughout the Universe and are linked to neutron stars, black holes and supernova events as possible sources.

Their bursts have been categorised as short (a few milli-seconds) and long (up to a 1000 or more seconds) of intense gamma ray energy with ejected matter travelling near to the speed of light as an intense beam (gas jets).

It is well known that super-massive stars will eventually collapse in on themselves due to their intense gravity as the "equal-and-opposite" forces become unbalanced.

One explanation, while there are others, is that this will trigger a supernova's outward blast as the neutron star collapse into an extremely dense black hole, which may create the right conditions for a gamma ray burst. These gamma ray bursts, depending on their type, could have more energy in their short lifespan (in seconds) than the total star energy of the Sun that will be produced in 10 billion years of its very energetic life span.



The left GRB digitised image (NASA/Dana Berry/SkyWorks Digital) shows a gamma ray burst ejected from both ends of its central source and surrounded by the material of an expanding supernova. This is just

one example of how GRBs might be created. Other possibilities will no doubt emerge over time using different methods, up-to-date theories, technologies, and computer models that will begin to give us greater insights into the different processes that create long and short gamma ray bursts.

Where do GRBs come from?

Astronomers believe that gamma ray bursts originate from deep space in galaxies that have a large number of super-massive stars, taking millions or billions of light-years for their highly energetic light photons to reach our telescope detectors.

The distance they travel through space and Earth's atmosphere to our ground-based telescopes contains gas and dust, and therefore much of the gamma radiation emitted is absorbed by passage through this material, thus reducing their true brilliance.

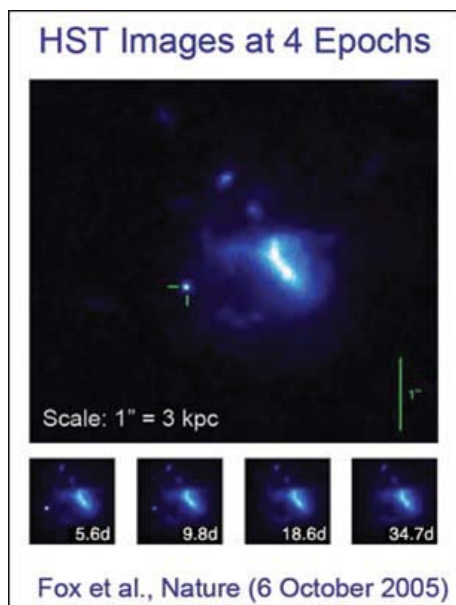


The above image is of NASA's Swift satellite observing a gamma ray burst.

NASA's Swift satellite launched in 2004 carried telescopes that are sensitive to gamma rays, X-rays, ultraviolet light, and visible light, and offered the opportunity for quicker and clearer images independent from ground-based telescopes.

How do we find GRBs?

To continue to investigate and better understand gamma ray bursts we will need new computer models, theories, and advanced telescopes to accurately scan the skies for the tell-tale signs that new outbursts are about to appear. Some of today's technology is beginning to do this. The Hubble Space Telescope already has built-in and up-to-date gamma ray detectors which can lock-on to an emerging GRB in seconds and record the required data. The information it collects includes energy intensity, afterglow period, and distances from source. Taken by the Hubble Space Telescope the following image is of a short gamma ray burst following a collision between two compact stars discovered by the Massachusetts Institute of Technology and an international team of astronomers using NASA's High energy Transient Explorer (HETE) satellite in 2005 (MIT news).

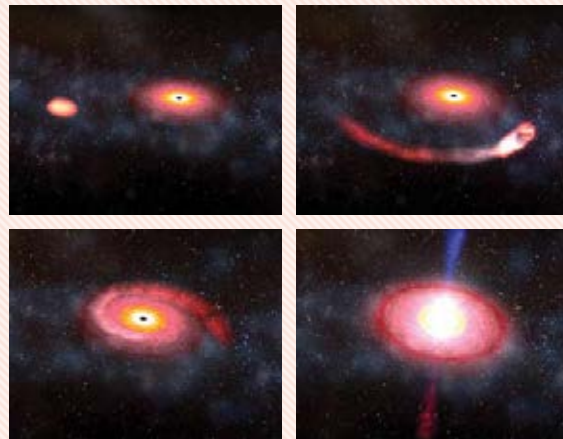


The above image (Derek B. Fox/Caltech) is of a collision between two compact stars, and was included in a 2005 MIT and co-authors joint paper published by the journal 'Nature' which claimed to have solved the mysteries surrounding short burst gamma rays.

In 2010 a new type of gamma ray burst named GRB101225A was discovered by the Liverpool Telescope and it was believed by astronomers to be a 'spiral merger of a neutron star and a red giant star'. The resulting merger is believed to have created a thick envelope of hydrogen gas which absorbed the low-level energy and created a huge glowing shell containing a supernova. The following simulated image shows the collision between these two cosmic heavyweights as they create a black hole at their centre and ejected material that is so energetic it produces gamma rays and other forms of electromagnetic radiation.



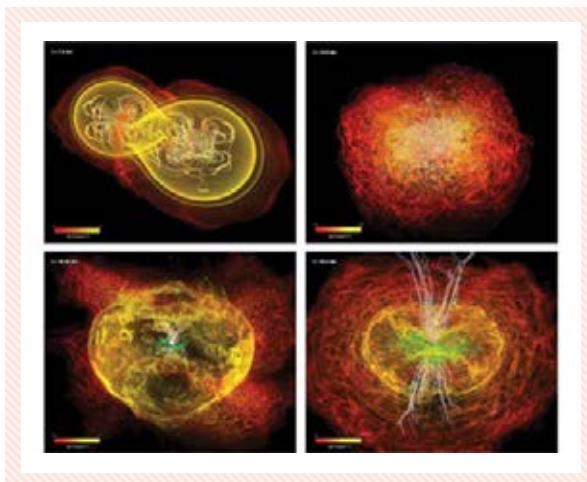
In 2013, scientists using ground-based telescopes and NASA satellites discovered first-time evidence of what may be a black hole eating a neutron star.



These four NASA simulated images (2013) show a neutron star being pulled apart by a black hole and devoured bit by bit, the result is a short gamma ray burst (gas jets) of intense energy emitted along the supernova's rotational axis (credit: Dana Berry/NASA).

There is also evidence that two colliding neutron stars can produce gamma ray bursts (super heated gas jets) from their creation of a black hole. Gamma ray bursts may also be the key to observing the never seen before gravitational waves, which are ripples in space-time. Einstein had mentioned gravitational waves in a letter as early as 1915. However, Einstein actually did not mention gravity waves in a publication formally until 1918¹.

In the following images, a supercomputer was used by astronomers at the Max Planck Institute for gravitational physics to create a simulated model of two colliding neutron stars that formed a black hole, and a strong magnetic field was also formed on the rotational axis which created an ultra-hot jet like structure (like a short gamma ray burst).



Conclusion

The future of GRBs research is already advancing at a speedy pace using new ground-breaking technologies and techniques that make spotting gamma ray bursts easier and more precise than ever before. Hopefully many remaining questions will be answered and the deeper understanding sought by astronomers will be unveiled. The future of GRBs research is looking very bright!

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How do we find GRBs? –
1st image is credited to NASA's High Energy Transient Explorer (HETE) satellite in 2005, at www.web.mit.edu/newsoffice/2005/gamma-ray.html
2nd image is credited to Liverpool Telescope in 2010, a new type of gamma ray burst named GRB101225A was discovered by the Liverpool Telescope. At www.schoolsobservatory.org.uk/astro/grb
3rd image is of four NASA images (2013) show a neutron star being eaten by a black hole. <http://www.nasa.gov/topics/universe/features/gamma-ray-engines.html>
4th image shows four images of two neutron stars colliding in a computer model, credited <http://www.phys.org/news/2011-04-powers-short-gamma-ray.html>
 Data credit to Berkeley University astrophysics Education in gamma ray bursts, and found at www.astro.berkeley.edu/research/grbs/grbinfo.html

Author

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Colin is studying towards a BSc (Hons) degree in Astronomy with the University Of Central Lancashire. He has Certificates of Professional Development in Astronomy, Cosmology, and Planetary Geology from Liverpool John Moores University (Astrophysics Research Institute).

Digging into Data Challenge

Ten international research funders from four countries jointly announced the winners of the third Digging into Data Challenge, a competition to develop new insights, tools and skills in innovative humanities and social science research using large-scale data analysis. A total of fourteen projects have been funded of which nine involve UK investigators.

Fourteen teams representing Canada, the Netherlands, the United Kingdom, and the United States will receive grants to investigate how computational techniques can be applied to 'big data'; changing the nature of humanities and social sciences research. Each team represents collaborations among scholars, scientists, and information professionals from leading universities and libraries in Europe and North America.

The projects with UK collaborators cover a wide variety of topics:

- **Automating Data Extraction from Chinese Texts** Principal Investigators: Peter K. Bol, Harvard University, US; Hilde De Weerd, King's College London, UK
- **Commonplace Cultures: Mining Shared Passages in the 18th Century using Sequence Alignment**
- **and Visual Analytics Principal Investigators:** Robert Morrissey, University of Chicago, US; Min Chen, University of Oxford; UK
- **Digging Archaeology Data: Image Search and Markup (DADAISM) Principal Investigators:** Maarten de Rijke, University of Amsterdam, NL; Helen Petrie, University of York, UK; Mark Eramian, University of Saskatchewan, CAN
- **Digging into Linked Parliamentary Data Principal Investigators:** Maarten Marx, University of Amsterdam, NL; Jane Winters, University of London, UK; Christopher Cochrane, University of Toronto Scarborough, CAN
- **Digging into signs: Developing standard annotation practices for cross-linguistic quantitative analysis of sign language data** Principal Investigators: Onno Crasborn, Radboud University Nijmegen, NL; Kearsy Cormier, University College London, UK
- **Mining Biodiversity** Principal Investigators: William Ulate Rodriguez, Missouri Botanical Garden, US; Sophia Ananiadou, University of Manchester, UK; Anatoliy Gruz, Dalhousie University, CAN

- **Mining Relationships Among variables in large datasets from CompLEx systems (MIRACLE)**
Principal Investigators: C. Michael Barton, Arizona State University, US; Tatiana Filatova, University of Twente, NL; Terence P. Dawson, University of Dundee, UK; Dawn Cassandra Parker, University of Waterloo, CAN
- **Resurrecting Early Christian Lives: Digging in Papyri in a Digital Age** Principal Investigators: Philip Sellew, University of Minnesota, US; Dirk Obbink, Oxford University, UK
- **Trees and Tweets: Mining Billions to Understand Human Migration and Regional Linguistic Variation** Principal Investigators: Diansheng Guo, University of South Carolina, US; Jack Grieve, Aston University, UK

With a total of ten international funders the UK funding bodies include the Arts and Humanities Research Council and the Economic and Social Research Council will additional professional programme management support provide to the UK projects by Jisc.

Samantha McGregor, Senior Policy Manager at the Economic and Social Research Council comments:

“The ESRC has now participated in two rounds of Digging into Data, a programme which demonstrates brilliantly the added value that can be gained through international cooperation both for the projects themselves and the research funders. Looking to the future, we hope to continue working together with Digging into Data partners to address the challenges of ‘big data’.”

Pam Mason, Head of Creative and Performing Arts;

“The Digging into Data Scheme is not only developing important new insights and tools to better understand large scale data but supports the development new research skills and international knowledge exchange. Having ten international funders working together to solve the challenge of the changing nature of humanities and social science research through such a large scheme is a real success story.”

Dementia isn't the end of fun!

"Dementia is so often equated with decline and a 'doom and gloom' perspective, our approach challenges that, as living with dementia can still be a life full of fun," says Anthea Innes, Director of the Bournemouth University Dementia Institute (BUDI).



Ways in which popular technologies can be used to enable people with dementia to have fun as well as unlock memories and enhance communication with relatives and carers

will be showcased during the Economic and Social Research Council's (ESRC) Festival of Social Science.

"One of our ideas at BUDI was to try out different 'fun' technologies like the iPad, the Wii, the Nintendo DS or Xbox in groups for people with dementia but we had no idea they would prove so popular," says Innes. "But why wouldn't they really? Most people like to learn new things, have a sense of purpose and to have fun doing so."

"Anybody with dementia can be engaged to some extent with iPad and gaming technologies such as the Wii, Xbox or Nintendo," says Ben Hicks, researcher at BUDI. "Improved social interaction and communication are just some of our positive observations from introducing these technologies to people with dementia."

Researchers have found Google Earth for iPad to be really popular among people with dementia in terms of helping them remember earlier times in their lives – such as where they were born, favourite holiday destinations and familiar landmarks. Having images and photos available at the touch of a screen is a tremendous conversation boost, Hicks points out. **"As just one example, an older man was playing a Nintendo DS game involving looking after a pet dog which reminded him that he used to keep German Shepherds. We switched to an iPad and brought up videos of German Shepherds similar to those he had owned in his youth. Then, using Google Earth we were able to refresh his memories with views of places he knew from his childhood – giving him even more to talk about."**

Exploring the uses of computer game technology is just one of several creative projects currently led by the Dementia Institute which aim to improve the experience of living with dementia. At the Festival of Social Science event, the general public will be able to try out some of the things that researchers

from the Institute will demonstrate. These include innovative ways to engage those with dementia in fun activities, as well as highlighting new research on supporting people to live independently and safely.

Giving people with dementia the opportunity to experience the smells and sounds of the sea by way of a small-scale maritime archaeological dig is just one of the activities on offer. Designed jointly by Bournemouth University Dementia Institute and School of Applied Sciences, the 'Tales of the Sea' project delivers a stimulating and highly unusual maritime archaeological experience specifically for people with dementia.

In 'Tales of the Sea', researchers went to five different community locations with a three session activity designed to include people with dementia - by way of interactive activities - through the process of a marine dig. **"We brought smells of the sea such as sea water and tar to the community locations as well as sights and sounds of the sea ranging from photographs to a diving suit," says researcher Clare Cutler. "Participants could dig with their hands in fish tanks filled with sand for artefacts such as coins and tiles as well as learning how to 'bag' these finds exactly as archaeologists would do and even experiment in putting broken pieces back together."**

In this project, the unusual activities proved hugely successful in sparking engagement, interest and conversation among participants. **"For some people it brought back memories of being part of a sea-faring family, for others just the process of digging sparked memories of a previous interest in gardening and some said how touching the sand reminded them of childhood seaside holidays," Cutler explains.**

"Many people assume that people can't do certain things because they have dementia, but these and other Dementia Institute projects show just how much is possible and how great the benefits in terms of stimulation, engagement and enjoyment can be."

Dementia doesn't need to take away the fun from life, humour is a key aspect of supporting a person with dementia as well as a coping strategy used by those with dementia, Innes insists. **"It is this sense of fun that the researchers at BUDI seek to take forward which in turn makes our research fun."**

Anglo-Saxon entertainment: board game piece uncovered



University of Reading archaeologists, funded by the Arts and Humanities Research Council (AHRC), have discovered an ancient and extremely rare Anglo-Saxon board gaming piece while excavating a royal complex at Lyminge, Kent. The piece would have been used for a game similar to that of backgammon or draughts.

The Anglo-Saxons had a strong tradition of playing board games. Individual gaming pieces, and sometimes complete sets in burials of the period, have been discovered. However not only is the piece the first of this type to be found since the Victorian period, it is the first ever piece to be discovered in a 'gaming' setting, an Anglo-Saxon Royal Hall.

Beautifully crafted from a hollow cylinder of bone, the piece has delicate lathe-turned end caps secured with a central bronze rivet. It is difficult to establish the precise nature of the games played given a lack of contemporary written descriptions, but archaeological evidence from the Germanic continent, the cultural home of the Anglo-Saxons, provides clues.

Both Tablula, a form of backgammon and latrunculi, the aim being to capture the opponent's pieces, can be traced to these regions and were likely transported to England during the 5th century as a consequence of Anglo-Saxon migrations.

Alongside this astonishing discovery, Dr Gabor Thomas and his team have also uncovered items of jewellery, numerous fragments of luxury vessel glass and pits with animal bones, confirming that feasting and social display were integral to Lyminge's role as a place of royal ceremonial events and gatherings during the late 6th and 7th centuries.

Dr Gabor Thomas, who is leading the AHRC-funded dig, said: "Our excavation is providing an unprecedented picture of life in an Anglo-Saxon royal complex.

Gaming, along with feasting, drinking, and music, formed one of the key entertainments of the Anglo-Saxon mead-hall as evoked in the poem Beowulf.

"The discovery of Anglo-Saxon gaming-pieces and gaming-boards has previously been restricted to male burials, particularly those of the Anglo-Saxon elite. To find such a well preserved example in the hall, where such board games were actually played, is a wonderfully evocative discovery."

Lyminge's royal complex first emerged in 2012 with the spectacular discovery of an Anglo-Saxon feasting hall, the first such building to be excavated in its entirety in over a generation. This year's dig on an adjacent site also revealed remarkable evidence for the core of the royal complex.

The researchers discovered a sequence of three timber halls, bearing unusual and highly elaborate architectural features. This included mortar and crushed tile floors (opus signinum) previously only seen in the earliest generation of Anglo-Saxon churches, and massive entrance portals on a scale previously unparalleled in Anglo-Saxon England.

Dr Thomas continued: "By combining these fascinating structural remains with a stunning array of artefacts, our excavations are providing new insights into the role played by Anglo-Saxon royal complexes in forging kingdoms and royal dynasties during this key period in English history."

The Lyminge Archaeological Project is funded by the Arts and Humanities Research Council and supported by project partners Kent Archaeological Society and staff from the Canterbury Archaeological Trust. The final year of the dig begins summer 2014.



High growth businesses fuse technology and arts

An Arts and Humanities Research Council (AHRC) funded study finds the first empirical evidence of what is fuelling above average levels of innovation among a new generation of business radicals.

The Brighton Fuse Report provides deep empirical evidence of the economic impact of arts and humanities skills as drivers of innovation and growth in the digital economy. The findings identify a new type of business known as ‘superfused’, combining creative, digital and business skills to achieve growth figures almost three times as fast as other businesses and ten times that of the British economy overall. With creative industries accounting for 9.7% of the UK economy, greater than construction, advanced manufacturing, and financial services, this research is significant in classifying a new sector of business fusing the arts, humanities, and design with digital technology to achieve growth, as well as significantly higher levels of innovation, across a wider range of areas.

Conducted over two years by academics at the Universities of Brighton and Sussex, and overseen by the National Council for Universities and Business and Wired Sussex, the Brighton Fuse project focused on Brighton’s vibrant cluster community to map and measure the activity and performance of creative, digital, and IT businesses (CDIT). The research findings call for a reappraisal of how creativity and technology are ‘fusing’ and ‘superfusing’ to provide businesses with a new type of competitive edge linked to innovation in business management and production.

According to this research, 65% of the Brighton sector is fused or superfused, breaking down traditional siloes between arts and ICT. 85% of CDIT leaders possess degrees and one quarter are postgraduates. This evidences that firms are employing specialists but creating an interdisciplinary environment and workforce to harness the best of arts and humanities graduates (32%) and scientists and computer engineers (21%).

“Creating a culture that supports the continuous innovation in practice and process through interdisciplinary working is not easy. This research underlines that fact, but also the rewards of high growth. While innovation has long been a corporate byword for growth, arts and humanities graduates are key players in building it into the work of our creative digital businesses; delivering new processes (70%) and new services (62%). It’s significant that almost half of business leaders in the fast growth Brighton cluster are arts and humanities and design graduates.”

The Brighton Fuse research also finds:

- Superfused firms grow nearly three times faster than unfused firms, and 40% faster than the average Brighton CDIT firm
- 99% of Brighton CDIT firms engaged in at least one type of innovation, but superfused firms are over three times more likely to be involved in 5 or 6 types of innovation. 47% are even willing to disrupt their processes, showing intensity of innovation
- The average superfused entrepreneur is 40
- 48% of Brighton CDIT entrepreneurs are arts, design, and humanities graduates
- 50% of Brighton CDIT firms produce material for copyright but only 8% identify royalties as important source of revenue
- Growth in employment in the Brighton cluster grew by 13%
- Fused and superfused businesses are finding intense competition and major skill gaps, and are more likely to face barriers recruiting skilled talent than other firms

Professor Rick Rylance, Chief Executive and Deputy Chair of the AHRC, underlined the crucial role of arts and humanities graduates and skillsets in the fusion effect.

Phil Jones, Managing Director, of Wired Sussex, says,

“As the research shows clusters are not necessarily based around a single industry, but can develop around a range of sectors that share common resources and inputs, and achieve scale economies by co-location even in a digital age. Brighton is a great example of this. A diverse ecosystem of private firms, together with public sector and University involvement, can assist in reusing and diffusing knowledge and innovative practice within a local context.”

“The job for policymakers is to help creative businesses better capture the value of what they produce and address barriers, such as ensuring education and government systems value interdisciplinary skills and avoid creative and digital skill silos.”

The growth of the Brighton creative digital cluster, like most clusters, is driven by the continuous innovation and exploitation of existing technologies and the presence of a vibrant artistic and creative community, rather than the commercialisation of new-to-the-world technology in new firms.

The ability to share, collaborate, and diffuse new knowledge within the network of businesses has proved key in its ability to pioneer new ways of working.

Superfused clusters show the social and economic benefits of creating space and opportunity for collaboration and networking. 64% of respondents collaborate with other businesses and 46% attend technology related meet ups frequently.

Notably, technology and digital platforms are being used as much to drive offline socialisation as they are online work and collaboration.



National Network of Arts Technicians

Steve Carroll

NNATs Survey

With a background in fine art, video and performance, Steve Carroll is proud to lead the highly skilled team of over 40 Technicians in the Faculty of Arts and Humanities at Plymouth University. Specialists in a wide and diverse range of disciplines and practices, they support the students and staff of the Faculty with their expertise in architecture and design, art and media, the performing arts and education.

Steve was frustrated by the lack of networking opportunities for arts technicians. Dispersed across the country and often the sole specialist in their field, it was difficult for them to share ideas and best practice with others. Steve explains how, with the backing of HEaTED, he launched the new National Network of Arts Technicians:

"I had been looking for a network of Arts Technicians for some time but couldn't find one. 'What about the arts?' had become my mantra at Technical regional forums and conferences when confronted with the wide array of Chartered Institutes, Societies and Associations available to those in the STEM subjects. After a workshop at the HEaTED National Conference (January 2013 York) confirmed that there was interest in such an organisation from other Arts Technical colleagues HEaTED immediately offered their support."

In April 2013 HEaTED launched a survey amongst member organisations to find out what was wanted from the National Network of Arts Technicians (NNATs)

Responses came from 21 HEaTED member institutions from 52 individuals supporting 58 different specialisms.

The survey confirmed that there was significant interest in networking and specialist training opportunities for technicians in the arts as well as recognising the importance of professional registration.

Following on from the Survey Steve has been on the road presenting at several HEaTED Regional Network Events and will be one of the Guest speakers at the HEaTED Conference in 2014.

The national conference will be the first NNATS event and will have workshops and networking opportunities designed specifically for Technicians in the Arts.

Responses from 21 HEaTED member institutions

Anglia Ruskin, Derby, Dundee Contemporary Arts/ Dundee Rep Theatre, Edge Hill, Edinburgh, Falmouth, Huddersfield, Middlesex, Newcastle, Northumbria, Plymouth, Sheffield, University for the Creative Arts, Suffolk, Central Lancashire, Cumbria, Hertfordshire, Salford, Stirling, Strathclyde, Westminster.

Supporting 58 different specialisms

3d Design, Fine Art, Architecture, 3D printing and rapid prototyping, Vector Graphics, Animation, CNC Machining, Software Training, Photography, Art Conservation, Painting, AV and Media, Website Content Management, IT support, Ceramics, Glass, Plaster, Civil Engineering, Cabinet Making, Silversmithing, Digital Art, Digital Embroidery and Textile Printing, English, History, Languages, Drama, Music, Exhibitions, Fashion Pattern Cutting, Scanning, Servers, Networking, Apple Computers, Primary and Secondary Art, Knitwear Design, Language Labs, Letterpress and Typography, LX SX FX Stage Management, Radio, Product Design, Furniture, Professional Development Support, Resource Management, Rigging, Lighting, Health and Safety, Sound Engineering, Soundstage Technician, Garment Construction, TV and Broadcast Production, Interior Design, Event Management, Trend/Innovation research, Wood and Metal work, CAD/CAM

Steve Carroll, National Network of Arts Technicians Co-ordinator. Steve is the Faculty Technical Manager, Faculty of Arts and Humanities, at Plymouth University.

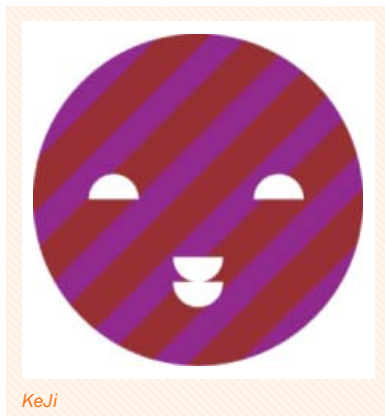
See also:
www.heated.ac.uk/our-courses/hc0026
arts@heated.ac.uk



¹Higher Education and Technician Education & Development - HEaTED is a membership organisation dedicated to supporting Professional Development of Technical staff from all disciplines and specialisms in Higher Education and related fields.

KeJi at Cheltenham Science Festival 2012

Steve Carroll



KeJi

KeJi is Anglicised Mandarin meaning science and technology and was a collaborative commission by the Cheltenham Science Festival, i-DAT, Plymouth University and

artist and designer Nathan Gale. It was a playful digital organism that visitors could talk to via Twitter and SMS texts. There was also a game called KeJi Bounce. Players of the game gave birth to a unique KeJi whose behaviour and physical appearance were linked to the ECG of the players' heart rate and biological data. The player had to bounce on a trampoline to keep their KeJi afloat to successfully complete the game.

Participants of the game then had the opportunity to drop their own personal KeJi onto the main installation at the Cheltenham Science Festival. The KeJis would then cluster with others with similar heart rates and generally bounce around with the bigger 'moma' KeJi. Each spawned KeJi displayed a name and heart rate of its owner/creator. Moma KeJi's appearance was affected by the average heart rate of the players fed from the KeJi Bounce game and its colours indicated its mood. For example, red was angry and stressed, yellow was happy, blue was chilled & relaxed and green was lonely. This mood was also reflected in the responses sent via Twitter and SMS texts. If they were short or moody then KeJi was feeling a bit out of sorts.

KeJi's personality and the means of communicating with it were created by Chris Saunders, a creative technician at Plymouth University. It was largely based on the work he did for Noogy, a building sized animation, which the residents of Plymouth could chat to via SMS text. Noogy won the Mobile Communications Category at the inaugural Media Innovation Awards. It uses an open source version of the natural language processing bot A.L.I.C.E (Artificial Linguistic Internet Computer Entity) or Alicebot.

By using heuristical pattern matching, the bot is able to engage in conversation and over a period of time it 'learns' answers and so gives the impression of a personality. The original Noogy personality was that of a bored teenager. For KeJi this was watered down somewhat and factors affecting its mood were changed to use the data collected via the game. It also had to give

information about the Science Festival. The timetable of events was added which allowed KeJi to answer most questions about it on given days. As far as was known, no-one got lost on any advice given.



A spawned KeJi

The installation was a huge success with over 1000 players of the KeJi Bounce game over the three days of the festival. These also included the politician Vince Cable although unfortunately his ECG and bio-data are not available at the time of writing.



Vince Cable playing KeJi Bounce

Author

Steve Carroll is Faculty Technical Manager in the Faculty of Arts and Humanities at the University of Plymouth.

Enchanted Garden

The making of a Cyanotype print

Alex Tymków

Digital imaging has, ironically, increased the interest of photographers and other artists in 'alternative' or historic photographic processes. This is because these processes are made by contact printing. A negative is laid in contact with the hand coated light sensitive paper and exposed to UV light. The negative has to be the same size as the finished print. This meant that a large format camera needed to be used or an enlarged copy negative had to be made in the darkroom. This was both expensive and complicated. With the arrival of inkjet printers all that changed. Suitable images can be made into negatives with Photoshop, and printed onto clear acetate with an inkjet printer. Images can be originated on digital cameras or scanned from analogue negatives.

For this piece of work I started with a very basic pinhole camera, made from a soft drink can. I curved a piece of 5"x 4" film inside it and made an exposure, photographing a part of my back garden. I then processed the film and made a black & white positive print, [Figure 1](#).

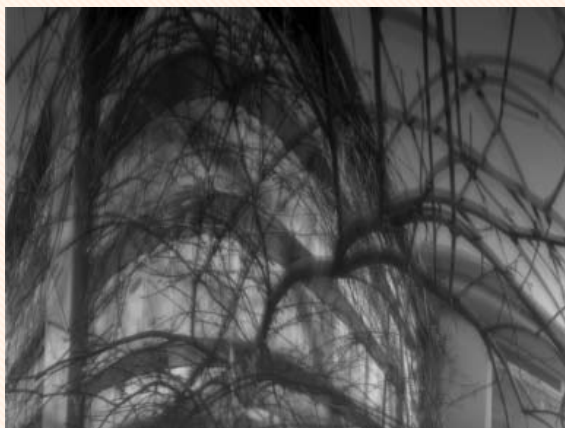


Figure 1

The distortion caused by curving the film inside the camera, and the low viewpoint, make for a dynamic and 'unworldly' looking picture. To emphasise this 'unworldliness' I thought I would make a print using the cyanotype process, [Figure 2](#).

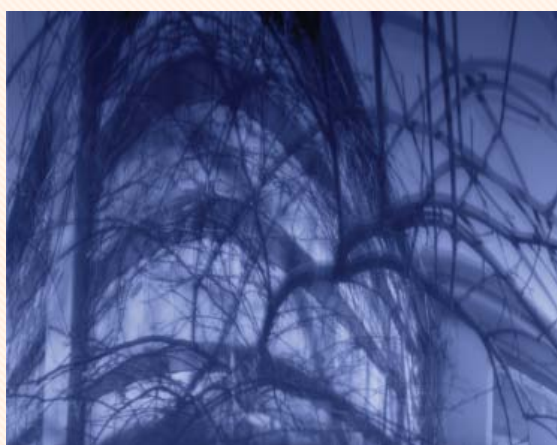


Figure 2

The cyanotype process was invented by Sir John Herschel in 1842. Herschel made numerous contributions to the early development of negative/positive photography. He was a great friend of the inventor of the process William Henry Fox Talbot. He suggested the use of sodium thiosulphate as a fixing agent to make Fox Talbot's print permanent. He also coined the words 'positive', 'negative' and 'snapshot' and also the word 'photography' itself. Photography is an amalgam of two Greek words, 'photos', meaning light, and 'graphos' meaning to draw. 'To draw with light', is a perfect description of the process.

Herschel started making experiments with the light sensitive properties of various metals. Silver nitrate was used by Fox Talbot.

His experiments brought him to potassium ferricyanide and combining it with ammonium ferric citrate he made a 'cyanotype' print. Cyanotype is another word coined by Herschel. In 1843 a botanist called Anna Atkins used the process to produce the first photographic book *British Algae: Cyanotype Impressions*. She laid specimens onto the cyanotype coated paper and made photograms. Apart from the important pioneering work of Anna Atkins, cyanotypes didn't really take off in the beginning; many photographers were put off by its strident blue colour. In the 1870s it was commercially produced as a coated paper and used to reproduce architectural and engineering drawings, the source of the word 'blueprint'.

Cyanotypes are usually the first alternative process people try, because of its low cost and simplicity. Potassium ferricyanide and ammonium ferric citrate are combined and brushed onto watercolour or etching paper. A darkroom isn't required, dim tungsten light and the exclusion of sunlight is all that is needed. When the paper is dry it is put into contact with the negative under glass and exposed to UV light. The sun is the cheapest source, but in Britain not the most reliable. I use a UV printing unit for repeatability. As it's a 'printing out' process you can check the progress of the exposure visually. When the picture is sufficiently exposed all that needs doing is to wash it in water. This washes away the unexposed yellow chemicals leaving a blue print.

After making a cyanotype print from my pinhole negative I thought I could take the picture further. I scanned the negative and opened the file in Photoshop. I then made three more copies of the image and flipped them around to make a 'mandala', something I'd never tried before. The resulting picture jumped out of the screen! It had taken on a new form. I then inverted

the new image to make a negative and reversed it so that it printed 'backwards' onto the acetate. The printed side of the acetate would be put into contact with the cyanotype coated paper. When exposed the picture would be printed the right way round.

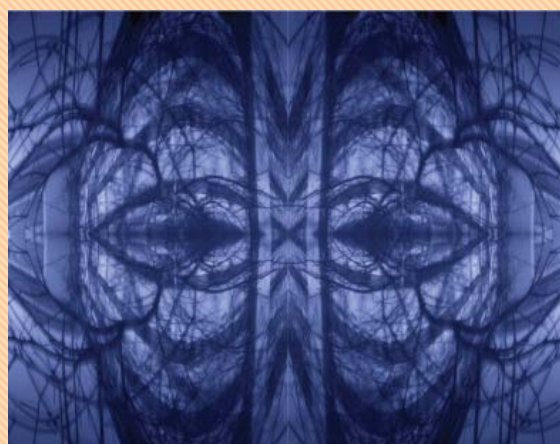


Figure 3

The picture that resulted from this, *Figure 3*, has surpassed my initial concept. The cyanotype print has transformed that small corner of my garden and imbued it with an enchantment this process is renowned for. The picture embodies some of the contradictions in photography, about what we see, what we photograph, how we print it, and what it can mean.

Author

Alex Tymków MA ARPS

Alex is a Senior Photography Technician at Plymouth University

Covering up: the art of skin camouflage

Julia Hyland

“Skin camouflage represents a quick, inexpensive, non-invasive treatment which, in helping to lessen the impact of most disfiguring skin conditions, helps to significantly reduce patients’ distress.”¹

Society largely ignores the topic of skin problems, facial disfigurement and physical trauma in general, even though they often have a major impact on the way people live their lives. Apart from the visual nature of skin disorders and injury, people may endure physical discomfort, while suffering the inconvenience and embarrassment associated with skin disease and disability. People often have less contact with the opposite sex, participate in sports less often, eat out less and have impaired academic performance, to list but a few of the consequences. They may experience anxiety and depression, as well as a lack of confidence, all of which can have a serious effect on lifestyle. Sufferers may quickly become aware of the prevailing lack of understanding concerning skin disorders and disfigurements by being made to feel that they have a contagious disease for example, which further leads to a lack of acceptance within a peer group or community more generally. Because these conditions are visible to others, the impact they have, beyond the actual physical toll, may be devastating².

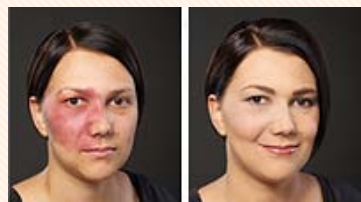


Photo courtesy of Dermacolor

Whether a condition is due to discolouration, such as port-wines stains, or caused by injury such as burns or post-

operative damage, there is often little treatment available and skin camouflage may be accessed by referral from a GP or consultant.

Skin Camouflage is a much-needed service, especially within the diverse ethnic groups of Birmingham, where a range of conditions are referred. The overriding and essential part of the service is to treat the clients with respect, match the skin tone and teach the sufferers how to apply the products themselves. This generally happens at a dedicated clinic with further follow up appointments should the condition or the skin tone change.

Consideration of the client’s experience should be taken into account as this may be a difficult experience for them; they may be embarrassed talking to a stranger while having their condition touched and assessed at close range. Sometimes the practitioner may be the first person to see the scars, as occurs in many cases of self-harm.

Camouflage uses specially designed creams and powders to cover up a range of skin conditions including and not exclusive to the following:

- Acne
- Birthmarks
- Chloasma
- Melasma
- Scarring
- Rosacea
- Skin grafts
- Stretch marks
- Vitiligo



The preparations are medically produced concealing creams and powders which can significantly reduce the appearance of scars and skin conditions whilst providing effective, long-lasting, waterproof, sweat and smudge-proof cover. These are available on prescription, but this is at the discretion of the GP or they may be purchased privately and on-line.

Camouflage creams are not to be confused with “over the counter” foundations and concealers which do not have the high pigment concentration required to provide the coverage required for many skin disorders, including the covering of tattoos.

The NHS range incorporates products from five specialist companies with a vast range of skin tone colours to choose from (I personally have 135 colours in my kit).

The product range is not exclusively for use on the face, a special range has been developed for the legs and other parts of the body. The companies involved in producing the creams and powders each specialise in a slightly different way. Their formulations are medically produced, perfume free, often free of parabens or lanolin. They have high pigmentation to give full cover and are hypoallergenic.

The application of skin camouflage products varies with each individual or condition. The use of a brush, sponge or finger is decided on consultation; the key is to teach the client how to apply the cream and powder to fit in with their personal lifestyle. For example, men prefer something that is quick and easy to apply.

Unfortunately there are a number of situations where this treatment is of no benefit. These include viral or fungal infections, open wounds, allergic reactions, skin cancers or any contagious condition affecting the skin, such as measles or chicken pox.

History

Archive sources from the twentieth century have enabled a time-line to be created for the introduction of Skin Camouflage and its use in disguising skin lesions.

The wearing of cosmetics dates back to pre-history and is loaded with symbolism and ritual, whereas the introduction of mass-produced general cosmetics, mainly aimed at women, can be identified with the rise of the film industry in the early part of the last century.

The women's suffrage movement and the First World War made the wearing of cosmetics more socially acceptable, indeed, during the Second World War women were expected to wear make-up. Cosmetic companies and the government joined together in a campaign that gave free red lipstick to women, especially those working in working in munitions, and it was the responsibility of women to "keep their beauty on duty"³.

One of the main contributors (and who's name is still synonymous with make-up) is Max Factor (1877-1938), who by 1914 had pioneered his 'pan-cake' greasepaint which quickly became an international brand. His ideal was that all products should



naturally harmonise with the wearer's skin tone and it was at this point that he worked with plastic surgeons to create a suitable skin camouflage product for performers with lesions and dermatoses as well as for veterans with burns and scarring.

He also formulated pan-cake make-up for commando camouflage (ie. Jungle Green)⁴.

Moving on, it was the work of Harold Gillies (1882-1960) and Archibald McIndoe (1900-1960) who together with Eve Gardiner (1916-1992), Joyce Allsworth (d 1985), Elizabeth Arden (1884-1966), Thomas Blake (d 1979) and the British Red Cross, provided "scar cream" and "topical cream" to help those badly injured and scarred during World War II, teaching them how to apply the products and conceal burn tissue. This ultimately led to the development of the range we have today.

It was recognised in 1975 that the then Department of Health and Social Services and consultant dermatologists were keen to provide skin camouflage and together with the British Red Cross funded a training programme for skin camouflage practitioners, offering the service within the National Health Service (with a DHSS grant of £1500).⁵

The Skin Camouflage service as we know it today is now run by the charity Changing Faces (formerly under the British Red Cross) a UK-based charity giving support and information to people with disfigurements to the face, hands or body, and their families. It is through them that I run a voluntary skin camouflage clinic at City Hospital in Birmingham. Meanwhile, the British Association for Skin Camouflage (BASC), of which I am also a member, the organisation that Joyce Allsworth created, is still actively involved in the teaching of practitioners and has written many articles and continually looks at ways of improving products and training, including a manual for qualified medical and health professionals.

Many practitioners have favourite products and most feel that certain varieties suit certain conditions. For example, Veil Cover Cream in my opinion is excellent for covering rosacea in men, whilst Derma Blend is handy for women as the product is supplied in the size and shape of a lipstick making it easy to apply and carry in a handbag.

The product I use most of all is the Dermacolor range. I came to this product before I was even aware of skin camouflage creams, having worked in the film and television industry. The product was developed by Kryolan and BASC and offers by far the largest range of colours.

Apart from the NHS, clients may wish to be seen privately where there are additional products available. The use of silicone gels to fill out atrophic scars, a fixer spray to ensure the cream or powder is fixed (thus enabling the wearer to leave the product on over-night or to go swimming without having to re-apply).

Accreditation for the Skin Camouflage service has been recognised by the following professional bodies:

- The Royal College of Nursing
- Institute of Maxillofacial Prosthetists and Technicians
- College of Occupational Therapists
- Hair and Beauty Association (HABIA)
- Association of Anatomical Pathology Technology
- The British Association of Dermatologists.

Cover creams available on NHS or private prescription

Derma UK

The Covermark range is a relative newcomer, limited to only ten colours. Derma UK have been able to establish efficient management of stock levels held by all the major UK pharmaceutical wholesalers which in turn helps ensure next day delivery to pharmacies.

Dermablend

Created in 1981, Dermablend is paraben, perfume and lanolin free, has excellent wearability and skincare benefits recognised by the medical community. Unfortunately there are currently only seven colours available on prescription, although the range is much larger when buying privately. There is also a 28g setting powder in the range but this product is not available on NHS prescription. Coverage should last for at least 12 hours when correctly applied and fixed. For clients who are not obtaining the product on prescription, Dermablend is available over the counter in larger branches of Boots so potential users are able to see the product before buying.

Dermacolor

The Dermacolor Camouflage System is the paramedical line developed by Kryolan Professional Make-up in the 1970's. Dermacolor is especially effective in minimising post-surgical conditions - either aesthetic or medical.

Lornamead UK – Keromask

Keromask is a camouflage make-up range designed for all skin types and suitable for coverage of most marks and scarring. The range includes 24 shades of easy to apply camouflage creams that give a perfect colour match for all complexions as well as four mineral rich finishing powders to guarantee results are waterproof and heat resistant.

Varama (not available on prescription)

Varama is a different type of product in that it does not require a setting powder to "fix" the cream and because of this is popular with men as it is quick and easy to apply.

Veil Cover Cream

Veil Cover Cream was first formulated in 1952 by Thomas Blake and was created to effectively mask post-operative scars and a range of other skin conditions. Its immediate success in the field of remedial camouflage has continued now for nearly 60 years. Veil Cover Cream follows the original and unique manufacturing process using simple raw materials which makes their products effective and easy to use.

Links:

Covermark – www.dermauk.co.uk

Derma Blend – www.dermablend.com

Dermacolor – www.dermacolor-camouflage.com

Keromask – www.lornamead.com/keromask-cosmetic-and-skin-care

Varama – www.varama.co.uk

Veil – www.veilcovercream.com

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¹ The Skin Camouflage Network, <http://www.skincamouflagenetwork.org.uk/whatis.html>

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³ Niederriter A, 2010, "Speak Softly and Carry a Lipstick": Government Influence on Female Sexuality Through Cosmetics During WWII, [http://twp.duke.edu/uploads/assets/Neiderriter\(1\).pdf](http://twp.duke.edu/uploads/assets/Neiderriter(1).pdf)

⁴ British Association of Skin Camouflage, 2011, A History of Skin Camouflage, http://www.skincamouflage.net/index.php?option=com_content&view=article&id=53&Itemid=104

⁵ Allen E, 2010, Cover, the principles and art of para-medical skin camouflage, British Association of Skin Camouflage (BASC), Authorhouse, p187.

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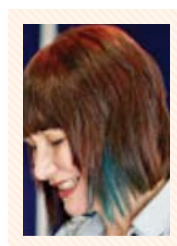
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Author

Julia Hyland is an Honorary Research Fellow in Medical Education at the Medical School, University of Birmingham, where she uses medical moulage and simulated role-play to educate medical students.

In addition Julia is a Skin Camouflage Practitioner, running a voluntary clinic at City Hospital, Birmingham as well as acting as an Expert Witness to the Law Society on matters of disfigurement claims.

IST Who are we?

The Institute of Science and Technology has been supporting specialists with the technical skills that the world's economy needs for more than 65 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 Registered Scientist (RSci), Registered Science Technician (RSciTech) or Registered Practitioner (MIScT(Reg) or FIScT(Reg)) to prove it.

By registering, technicians are helping to promote 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 HEaTED 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 in 2013. 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 Registered Scientist (RSci) or Registered Science Technician (RSciTech) status to experienced technicians.

To register, technicians must be able to show that they have the skills to qualify for professional status, while always continuing their 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

In addition, the IST has been 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

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

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IST Journal Publication

The Journal Back Issues



Our bi-annual publication The Journal back copies from recent years have now been converted so that they are viewable online, but access to the publications is restricted to our current members only.

Members will be required to login using their Surname as the Username and their Date of Birth (format: yyyy-mm-dd) as their Password.

If you experience any problems accessing the publications please contact us (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 science and all areas of applied technology, including non-science, such as IT, media, and the arts. We cover existing, historical, and new technological advances, and unusual aspects of science.

We particularly encourage submissions from people who may wish 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
Or the IST office: office@istonline.org.uk

The guidelines for article submissions to the IST Journal are:

1. Article submission deadlines;
 - Summer edition is 31st May.
 - Winter 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.
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 that fail to meet basic standards of literacy may be declined by the editors.
7. Article submissions should be submitted via email to 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.

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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 two 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.

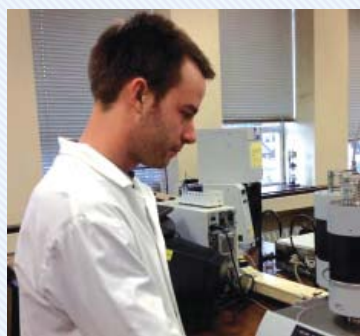
Key features

- 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 dedicated 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 'The IST CPD Award and the 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.



"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

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

IST CPD Award
Registered Practitioner

Registered Science
Technician
Registered Scientist

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

Communications and the IST

At The IST we are working hard to ensure that we provide the best service to our members and one of the areas that we have been updated recently is communications.

We now have a number of ways in which we contact and provide information for our members and we thought it might be useful at this stage to bring all those channels to your attention.

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 as follows:

office@istonline.org.uk – general enquiries

memberships@istonline.org.uk – enquiries regarding new memberships and renewals

registrations@istonline.org.uk – enquiries regarding RSci/RSciTech registrations and renewals

It is important that we have up-to-date email addresses for all our members so if yours changes please let us know.

Website (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](#)

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.

Application for membership

Before completing this form please read the Notes for Guidance for Applying, available at 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:

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.....

B. PREVIOUS EMPLOYMENT HISTORY

Date	Employer	Type of Work/ Status/Title/Discipline
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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
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D. COURSES & OTHER RELEVANT DETAILS

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
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.....
.....
.....

E. REFEREE

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 SE1 4EB

Email: 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:

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

www.istonline.org.uk



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