30 October 2011

NEWSLETTER

Society of Crystallographers in Australia and New Zealand

http://www.sca.asn.au/

From the Prez

As a result of the fact that the IUCr Newsletter will now regularly be available on-line (see *e.g.* the current edition at http://free.yudu.com/item/embedded_reader/415406/Volume-19--Number-3?refi), we are trialling sending an electronic version of the SCANZ newsletter coupled with a link to the on-line IUCr newsletter. It will be much quicker, much cheaper for SCANZ and much easier for the Newsletter Editor (thanks Daniela!) to produce and to mail out. This is the first such newsletter and we hope you enjoy it.

A lot has happened both during and since the very well organized, very enjoyable and very well-attended Crystal 27 meeting held in Rotorua, New Zealand from April 27-30 this year. Our thanks go to our NZ colleagues (Ted, Chris, Shane, Peter and lots of others I've probably accidentally left out) for a great job and for a terrific meeting, including organizing the unique smell of Rotorua!! A round-up of the meeting along with photos of some of you performing at it are included in this newsletter courtesy of Chris Squire. Thanks Chris. First of all, during the Rotorua meeting a new SCANZ Executive was elected.

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We are:

From the Prez

Feel free to contact any of us if you think SCANZ should be doing something it isn't, or could be doing something better than it is, and we will do our best to respond appropriately! Also please send Daniela anything that you think would be of general interest to the wider SCANZ community (upcoming conferences, new equipment, appointments *etc*.) for the next newsletter.

The second big thing that has happened is the triennial IUCr XXII Congress recently held in Madrid, Spain from August 22-30. An initial report on this fantastic meeting is given on page 25 of the IUCr newsletter (click on the web-site link given above). There were around 2800 delegates from over 70 countries who attended, including some 13 Australian and New Zealand Ph.D students whose attendance was supported by the award of Maslen Scholarships from SCANZ, and who will tell us of their experiences at the Meeting in a later edition of this newsletter! Australians and New Zealanders were well-represented at this terrific meeting both in terms of the scientific program itself as well as on the business side of the meeting.

Above: *Mitch Guss*
Middle: *Ada Yonath & Peter Colman*
Below*: Ray, Mitch & Steve at the IUCr General Assembly*

With regard to the latter, there were four evening meetings of the General Assembly of the IUCr. Your representatives were Mitch Guss, Steve Wilkins and Ray Withers. Congratulations to Mitch Guss who was elected to the incoming Executive of the IUCr during the Assembly as well as to Peter Colman who stood down from the Executive after serving two terms, the latest as Vice-President. There were some important decisions made during the Assembly. These include: **1**. The decision to alter the constitution to ensure a minimum representation on the six-member executive of at least one member from each of the regions defined as: 1) the Americas, 2) Europe and Africa and 3) Asia and Oceania. **2**. The decision, after much lobbying from Prague and Hyderabad, that the 2017 IUCr meeting would be held in Hyderabad, India and **3**. The election of the incoming Executive including Gautam Desiraju from India as President and Claude Lecomte from France as Vice-President.

At the opening session, the outgoing Chair of the Union, Professor Sine Larsen, outlined exciting plans for an International Year of Crystallography (IYCr) to be celebrated in 2013. This will coincide with the publication of the Braggs' seminal work that showed how diffraction from crystals could be used to determine crystal structure. Australia's leading role in this event was highlighted by plans to issue an Australian stamp to celebrate the Nobel Prize awarded to William and Lawrence Bragg in 1915. The latter was born and educated in Adelaide and in celebration of this, Adelaide will host a joint meeting of the Asian Crystallographic Association (AsCA) and SCANZ in December 2012 as well as a special Bragg symposium (see http://www.sapmea.asn.au/crystal2012). This very special event will lead off the IYCr and the Executive of the IUCr will meet in Adelaide as part of the celebration. More details of this very important upcoming meeting and celebration are given elsewhere in this newsletter courtesy of John Carver and Steve Wilkins. This will be a very exciting and important meeting for SCANZ and we warmly encourage you to attend.

Finally, some information on other future meetings. Firstly, the Commission on Aperiodic Crystals of the IUCr warmly invite you to Cairns in tropical far north Queens-

From the Prez

land for the seventh meeting of the Aperiodic Commission of the IUCr (Aperiodic 12) to be held from September 2 to 7, 2012. Please visit the conference web-site (http://rsc.anu.edu.au/Aperiodic2012) for more details of what promises to be a most exciting meeting. An extra reason to celebrate at this meeting is the award of the 2011 Nobel Prize for Chemistry to a member of the Aperiodic community, Danny Schechtman, for the discovery of quasicrystals. Secondly, in early February 2012, the 10th Asia-Pacific Microscopy Conference (APMC 10), the 2012 International Conference on Nanoscience and Nanotechnology (ICONN 2012) and the 22nd Australian Conference on Microscopy and Microanalysis (ACMM 22) will be held in Perth, Western Australia, as a single, integrated event (see http://www.acmm-22.org/). Finally, there will be a regular meeting of the Asian Crystallographic Association (AsCA) held in Dhaka, Bangla Desh towards the end of 2013. When more details are available we will pass them on to you.

Danny Schechtman

As I finish writing this contribution, the end of the year looms. I hope your year to date has been enjoyable and productive, and I wish you all an interesting and successful 2012.

Ray Withers

Calendar

December 12-16, 2011

CSIRO Australian Course in Macromolecular Crystallisation, Melbourne.

February 5-9, 2012

Joint 10th Asia-Pacific Microscopy Conference (APMC 10) & International Conference on Nanoscience and Nanotechnology (ICONN 2012) & 22nd Australian Conference on Microscopy and Microanalysis (ACMM 22), Perth.

September 2-7, 2012

7th Meeting of the Aperiodic Commission of the IUCr (Aperiodic '12), Cairns.

December 2-5, 2012

AsCA12 & CRYSTAL 28: Celebrating 100 years of Crystallography, Adelaide.

December 6, 2012

Bragg Symposium: Celebrating 100 years of Crystallography, Adelaide.

Crystal 27

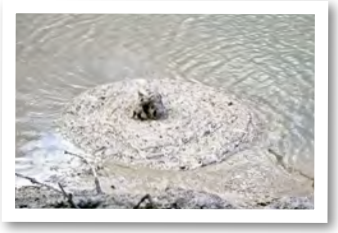
Crystal 27, the 27th biennial SCANZ meeting was held in Rotorua, New Zealand from 27-30 April, 2011. This was only the second to be held in New Zealand, following CRYSTAL 20, held in Queenstown in 1997 and was well attended with close to 150 registrants including 20 exhibitors and sponsors. The split of Australian and Kiwis was around 50:50 with a few notable attendees from further abroad. Many of our delegates took advantage of Rotorua as one of New Zealand's premiere tourist destinations taking time to participate in bungy jumping, zorb rolling (look it up), white water rafting, and of course exploring the geothermal areas and discovering the unique culture of New Zealand's Māori people. What a place to visit!

Of course, most of the time we were inside the venue enjoying the exciting and diverse program. The jam-packed program boasted 68 speakers and 30 poster presentations of such quality is it clear that Crystallography in Australia and New Zealand is in a healthy and vibrant state.

We had two plenary speakers with very different topics. First up was Jeff Tallon from Industrial Research Ltd, a world leader in the field of high temperature superconductivity. He summarised the state of the field and highlighted his numerous contributions over 3 decades, as well as discussing particle physics, the Large Hadron Collider and Higgs Boson! The topic of our second plenary by Todd Yeates from UCLA was equally fascinating. He described his work on protein-based metabolic organelles in bacteria such as the carboxysome, found in all cyanobacteria and containing all the enzymes required for CO2 fixation (RuBisCO, carbonic anhydrase), and encased in a protein shell.

The Chemical Crystallography sessions were dominated by inorganic chemistry in its various guises. The various sessions highlighted emerging strengths in the field of metal-organic frameworks (MOFs) in the Australasian region and underscored the continued high calibre of research in traditional solid state inorganic materials and coordination chemistry. Contributions to the joint sessions illustrated the diversity of research activity with topics ranging from supramolecular assemblies to crystallographic hardware and neutron diffraction. Selected highlights include Mark Spackman's (University of Western Australia) talk on using CrystalExplorer to determine the surface area of porous materials (v3.0 is eagerly awaited), and Graeme Gainsford's (Industrial Research Ltd, NZ) "valedictory" address relating his experiences as an editor of Acta Cryst C and E.

The Structural Biology program covered four special sessions that were held separately from the Chemists and Physicists along with several biology lectures scattered throughout the joint sessions. Special biology sessions ranged from "Complex Macromolecular Structures", chaired by Mitch Guss, "Complementary Methods in Structural Biology", by Vic Arcus, and "Enzymes and Enzyme Function", by Geoff Jameson to "Hot Structures", chaired by Ted Baker. The consensus of the lectures was that in fact all of the proteins were extremely complex and that in most cases more than one technique had to be used to solve the problem – the majority of course being X-ray crystallography! No one seemed to be dealing with easy problems and every single lecture described heroic efforts to overcome incredible difficulties, the consensus being that the only thing that always works is not giving up – ever!



Rotorua

Crystal 27

In the general spirit of the SCANZ meetings the social events were easy-going and helped along with excellent catering from the Millennium Hotel and unbreakable bar tabs! The social program started with a poolside welcome, continued the next night with the poster session, and finally the conference dinner on Friday night. The conference dinner started with everyone congregating in the brisk evening air outside the historic Blue Baths to receive a customary Maori welcome. Richard Welberry, a transplant from the UK but now patriotic Australian accepted the Maori "challenge" (loud, stick waving confrontation) and was left clearly shaking in his boots! Richard was then invited to sing a song in return, as is custom. Spurning the more neutral suggestion of "You are my sunshine", a basic song in an easy key, he chose a rendition of "Waltzing Matilda" - many Kiwis, choking their pride, joined in the choruses! Another first for many was the Hongi (nose pressing and sharing of breath) with the Maori group - a little scary with that huge bald guy with the spear (the cause of shaking boots mentioned above). The conference dinner was an important event not only to celebrate with new acquaintances but also to remember old friends and particularly Bryan Wise who died suddenly in December 2010. Bryan was a constant presence in the crystallography community in our part of the world and remembered by many in attendance.

The meeting was a great success and we look very much forward towards the next in Adelaide in 2012! See you all there.

Shane Telfer,
Daniela Stock &
Chris Squire

IUCr XXII Congress, Maslen Scholarship Reports

I would like to give my greatest thanks to SCANZ for providing me with support to attend the XXII International Congress and General Assembly of the IUCr in Madrid through the Maslen Scholarship.

On arriving in Madrid, it seemed a little deserted – later it became clear that we had in fact arrived during the siesta time, which the Spanish take fairly seriously! Nevertheless, we made our way to the conference. At the opening mixer, it was really good to see a lot of old friends and colleagues that have now been scattered around the world.

The program was very good, starting with finally seeing the eponymous 'SHEL' in 'SHELX' and his talk on the history of that program so many of us are familiar with. My field of research is metal-organic framework materials, and Prof. Yaghi, the most famous (though perhaps also most controversial) scientist in the field gave a talk that certainly provided a lot of food for thought. There were a lot of other talks on framework materials as well. However, also interesting were the technique specific talks which exposed me to a whole range of things that I otherwise wouldn't have known about – sneaking into the biological camp for a talk on X-ray lasers and their use in micro-crystal and single-molecule diffraction was particularly fascinating.

This conference was an excellent experience, and I'd highly recommend that other PhD students make the most of opportunities like the Maslen scholarship to attend international conferences in order to present their work, meet others in their field, and broaden their horizons.

Yue Wu

Sydney University

The IUCr 12th International Congress was held this year in Madrid. Thanks to financial support from SCANZ in the form of a Maslen Scholarship and an R. J. W. Le Fèvre Travelling Scholarship, I was able to attend this conference to present a poster showcasing some of the research I've been doing for my PhD (supervised by Professor Cameron Kepert at the School of Chemistry, University of Sydney).

Some of the highlights of the conference included the plenary lectures given by Nobel laureate Thomas Steitz on the structure and function of the ribosome, and Omar Yaghi on the history and future uses of metal-organic frameworks. Keynote lectures of note included Len Barbour's elegant presentation on host-guest interactions and properties of inclusion compounds, and the discussion of symmetry elements present in Islamic tile art in the Alhambra, Cordoba and Sevilla presented by Emil Makovicky. Three large poster sessions and daily microsymposia sessions (including non-ambient powder diffraction, macroscopic properties of flexible frameworks, and atomic dynamics using x-rays and neutrons) showcased a variety of interesting and relevant research utilising crystallography.

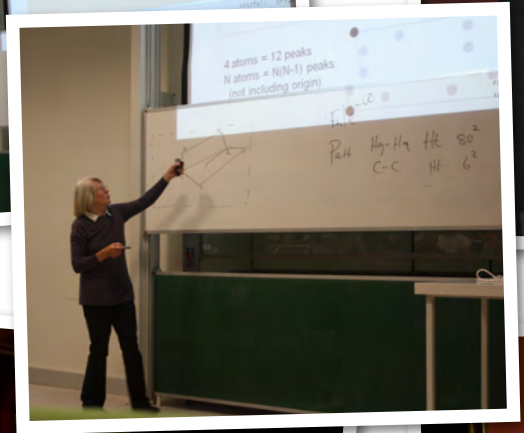
Madrid also had a lot to offer culturally, so it was nice to take a little time off to see some of the sights, including the Museo Nacional del Prado, Museo Nacional Centro de Arte Reina Sofia, Parque del Buen Retiro, and Palacio Real de Madrid.

Jessica Chadbourne

3rd Australasian Crystallography School, Perth

The 3rd Australasian Crystallography School took place from July 13-22 2011 on the beautiful campus of the University of Western Australia. Organised by Alice Vrielink, Charlie Bond and Mark Spackman and supported by tutors from UWA and lecturers from Australasia and around the world it covered everything from basic maths to refinement and validation. The early lectures were given jointly to Chemists and Biochemists, but as the course went on to more specialised topics including data collection, processing, structure determination and refinement they were taught separately and supported by hands-on sessions in the UWA computer rooms. Both students and lecturers had great fun, learned a lot and enjoyed the special evening events including "how to crystallise crystallographers", taught by a "small molecule" crystallographer (!) and what CDs and DVDs are REALLY good for. All together a very memorable event!

Daniela Stock



3rd Australasian Crystallography School, Perth

NCCr Report

The National Committee for Crystallography (NCCr) provides advice to the Australian Academy of Science on issues impacting on Crystallography (http://www.science.org.au/natcoms/nc-crystallography.html). NCCr has provided recent submissions on, inter alia: the DIISR Research Workforce Strategy; the Australian Synchrotron; funding for Access to Major Research Facilities; and the Strategic Roadmap for Australian Research Infrastructure.

Raising awareness of crystallography has also been high on our agenda, in light of the upcoming centenary/celebration years. At the Crystal 27 Conference in Rotorua (April 2011), I reported that our lobbying for an Australia Post stamp to recognize Lawrence Bragg and the centenary of Bragg's Law in 2012, had come to nought. Now, though, I am delighted to report that Australia Post has had a change of heart and WILL be releasing a 2012 stamp of Lawrence Bragg, as part of a broader issue commemorating several Australian Nobel prize winners. All going well, sheets of the Bragg stamps will be available for purchase at the Bragg symposium and joint AsCA/SCANZ meeting in Dec 2012 (and in your local Post Office from August 2012).

At the end of 2011, I will be stepping down as Chair of NCCr and handing over to Mitchell Guss. Mitchell brings strong links with the International Union of Crystallography, having just been elected to the IUCr Council, and to the Asian Crystallography Association as Past President. I extend my warmest wishes to Mitchell, and thank current NCCr members for their support during my term as NCCr Chair. Finally, I look forward to celebrating with all crystallographers in the exciting commemorative years ahead.

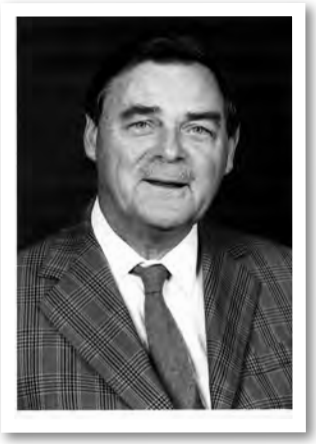
Jenny Martin

Chair, National Committee for Crystallography

Obituary

Alexander ("Sandy") McLeod Mathieson, FAA (1920-2011)

"Father of X-Ray Crystallography in Australia"



Alexander ("Sandy") McLeod Mathieson made landmark contributions to Australian science over a 64-year time span and received high international recognition for his pioneering contributions in crystallographic methods, molecular structure determination and related instrument development. He was an understated man who pursued science with vigour and passion, always preferring the lab to the limelight. Sandy was universally admired and respected by his peers.

Born into a staunch Presbyterian family on 17 July 1920 in Aberdeen Scotland and educated at the Universities of Aberdeen (BSc, Hons, 1942) and Glasgow (PhD, 1948). His PhD research was carried out in structural crystallography at the University of Glasgow under Professor J Monteath Robertson. In 1947, much to the surprise and concern of his parents, Sandy accepted a position in CSIR and came to Australia to work in the Section of Chemical Physics in the Division of Industrial Chemistry. At CSIR, with the benefit of the high quality workshop capabilities developed during the Second World War, Sandy rapidly established an X-ray single-crystal diffraction laboratory that became a mecca for local budding crystallographers with Sandy a strong mentoring influence for many young local crystallographers. These mentees included Harold Welch, Neville Stephenson, Hans Freeman, Jeff Wunderlich, Jack McConnell, John Taylor, and Maureen Mackay who invariably went on to set up their own crystallography groups in universities around Australia.

Sandy was an early exponent and one of the pioneers of "large molecule" structure determination by direct methods, which, prior to the vast computational resources available to crystallographers today, related to structures of 20 to 50 non-hydrogen atoms. His work helped to allay the prevailing scepticism of the organic chemists by providing valuable examples demonstrating that, provided suitable crystalline derivatives could be prepared, such organic structures could be determined ab initio, i.e. using crystallographic data and the empirical formula. In one famous instance, using X-ray crystallographic data (plus some chemical insight) he and Janis Fridrichsons pipped at the post a group of Swiss organic chemists who were using conventional analytic methods to try to determine the structure of lanostenol, an important component of wool wax. In his research work in CSIRO, Sandy pursued a wide range of such structural studies covering amino acids (e.g. methionine), minerals (e.g. vermiculite) and natural products (e.g. sporidesmin that caused severe liver damage in sheep).

On the crystallographic methods and instrumentation side, Sandy was an early exponent of the "heavy atom" method, e.g. using sulphur, iodine or bromine as heavy atoms and made important contributions to the determination of absolute structures. Sandy also made significant contributions to the development of instrumental techniques including, in the early days, the design of a linear diffractometer that arose from a single night's contemplation, the design of liquid N2 cooling stages and a high power generator. In later years, Sandy developed a polarization analysis device to study the micro-structural properties of graphite with the aim of being able to better control beam properties for

Obituary

Alexander ("Sandy") McLeod Mathieson, FAA (1920-2011)

"Father of X-Ray Crystallography in Australia"

diffraction studies (before the availability of synchrotron sources). He also developed a range of other experimental methods aimed at the clean separation of sample and instrumental effects contributing to the distribution of intensity in Bragg reflections, and also the elimination of extinction from structure factor measurements using extrapolation to the "zero interaction" (extinction free) limit.

For his early contributions to X-ray instrument development, Sandy was appointed as a Member (1960-63) and then Chair (1963-72) of the IUCr Commission on Crystallographic Apparatus. In this role, he ran a major "round-robin" IUCr international collaboration on accuracy in single-crystal structure determination that led to an important series of papers in Acta Cryst. A. He was also a Member of the Commission on Structure Reports (1960-72). From 1967-75, Sandy served on the Executive of the IUCr. As a reflection of his scientific standing, Sandy was elected a Fellow of the Australian Academy of Science in 1967, and was a member of the Academy Council from 1975-1978.

Among Sandy's closest scientific collaborators and/or group members at various times in CSIRO were: Dave Wadsley, Barrie Dawson, Dai Davies, Jeff Wunderlich, Janis Fridrichsons, Andrew Hurley, Tony Beecham, Jock Mackenzie, Victor Maslen, Bruce Poppleton, Charlie Kowala, Bill Denne, Sylvia Mair, Steve Wilkins, Barbara Moss and Andrew Stevenson. Some of his international collaborators at various times were Uli Arndt, Reg Killean, Larry Calvert, Jim Lawrence and Benno Schoenborn.

Sandy never lost his thirst for knowledge and understanding. He thought deeply about science and pursued his chosen scientific objectives with a steely determination. This included a love of discussing scientific objectives with colleagues and engaging them in each new pursuit. He saw science as a great good in its own right, without the need for further justification. Sandy combined great insight with technical thoroughness in his work, seeking to extract the maximum meaning from experimental results. His heroes in latter times were WH Bragg, whom he affectionately called "papa Bragg", and Charles Galton Darwin (grandson of the author of "Origin of Species"), a pioneer in the theory of X-ray scattering from real crystals. Even in his last few years, Sandy was thinking deeply about fundamental problems in crystallography, particularly "extinction" and seeking to make further advances.

From 1965 to 1985, Sandy was a Chief Research Scientist in CSIRO and leader of the X-Ray Diffraction Section. During this time he served as Acting Chief of the Division (1978-80). Among the various awards that he received for his work during his career were: the David Syme Medal from the University of Melbourne (1954), the Royal Australian Chemical Institute's Smith Medal (1963), a DSc from the University of Melbourne (1956) and an Honorary DSc from the University of St Andrews (1989). He was awarded a Centenary Medal in 2003. In the area of scientific conferences, Sandy was responsible for chairing the organizing committees of two international meetings, namely the 1968 IUCr "Accurate Determination of X-Ray Intensities and Structure Factors" meeting in Cambridge, UK and the 1974 IUCr/AAS "Diffraction Studies of Real Crystals and Real Atoms" in Melbourne.

Obituary

Alexander ("Sandy") McLeod Mathieson, FAA (1920-2011)

"Father of X-Ray Crystallography in Australia"

On his retirement from CSIRO in 1985, Sandy was appointed Honorary Professor of Chemistry at La Trobe University where his colleague Jim Morrison and one of his former postgraduate students, Maureen Mackay, were installed. He was generous with the expansive knowledge and scientific passion acquired over an exemplary career, and was able to continue working there for close to 20 years, during which time he felt he made some of his major achievements. During that time he went on a mini-sabbatical to St Andrews, Scotland, in 1989, with Reg Killean in Physics, and on to LMB, Cambridge. While at La Trobe Sandy took a fatherly interest in young scientists, and it would not be drawing too long a bow to say that one of the authors (Gulbis) would not have enjoyed the fruits of success had it not been for his inspiration, gentle guidance and support.

While Sandy was struck down by polio at the age of two and relied on walking sticks to get around and then a wheelchair for the rest of his life, this did not restrict his leading a very full life and to travelling widely to conferences and scientific meetings, both local and overseas.

Sandy was a great friend and mentor to many. He took great interest in talking to and relating to much younger scientists. The term "lad" was one he used often with various intonations, sometimes indicating enthusiastic support for an idea, and other times with a slightly admonishing tone to indicate that he thought you were "barking up the wrong tree". His presence, gentle humanity and scientific insights will be greatly missed. For his seminal role in pioneering single-crystal X-ray crystallography in Australia and profoundly influencing at least 2 generations of crystallographers, Sandy unquestionably deserves the mantle of "Father of X-ray Crystallography in Australia". It is therefore a fitting tribute that SCANZ has decided to name its biennial award for outstanding scientific achievement by a young scientist based in Australia or NZ, "The Sandy Mathieson Medal". A portrait of Sandy by leading sculptor Michael Meszaros was completed shortly before Sandy's death and the first award is scheduled for the AsCA/CRYSTAL meeting in Adelaide in Dec 2012. This is one among many of the ways that the memory of Sandy Mathieson will endure.

Sandy died peacefully in Melbourne on 30 August and is survived by his wife Lois (nee Hulme) of 58 years, daughters Fiona and Sheena and their families.

Stephen Wilkins,
Andrew Stevenson &
Jacqui Gulbis

20 October, 2011

The beginnings of X-ray crystallography: why? how? and by whom precisely?

A talk given at CRYSTAL 26 by John Jenkin, Emeritus Scholar, La Trobe University, Melbourne

In 1885, having just graduated with first-class honour from the Cambridge Mathematical Tripos, William Henry Bragg was appointed to the chair of mathematics and experimental physics in The University of Adelaide, recently vacated by Horace Lamb. Bragg was just 23 years old and had never presented a university course nor undertaken any research.

On his very first day in Adelaide, he was taken to meet the only other major scientist in Adelaide, Charles Todd, and his wife Alice and their six children. He soon fell in love with their third daughter, Gwendoline, and the couple were married three years later. Two sons, and then a daughter, were born in the years that followed: William Lawrence ('Lawrence') in 1890, Robert Charles ('Bob'), and Gwendolen Mary ('Gwendy').

William's teaching improved rapidly and he was soon regarded as the university's pre-eminent lecturer; and when X-rays, radio and other wonders were discovered, William's public lectures and demonstrations became the talk of Adelaide.

Having established himself, William Bragg embarked on his first major research program early in the new century. He quickly became the recognised authority on alpha-particles from radioactive decay, and was made an FRS in 1907 on his first nomination. More important for the present discussion, he next tackled the knotty question of the nature of X- and gamma-rays: were they waves, as most of the world believed, or particles?

William proposed that each was a neutral-particle-pair, a beta-particle (electron) coupled with an alpha-particle, then not known to carry two positive charges. The neutral pair exhibited most of the known properties of radiation, and William conducted an experimental program and a vigorous debate with Charles Barkla in the pages of Nature to justify his hypothesis. He concluded, with extraordinary perception, that ultimately a new model of radiation would be required that embraced both wave and particle characteristics.

Meanwhile, Lawrence and Bob were educated in Adelaide, Lawrence being promoted to higher and higher grades at St Peter's College because of his outstanding academic ability. At fourteen years of age and in the sixth-form, he was socially isolated from his peers, aged 17 and 18. And the same situation continued at the university, where Lawrence led his classmates in his chosen science subjects, the majority of which were taught by his father! He recalled later that it was a productive but rather unhappy time. He graduated with first-class honours in mathematics only a few weeks before the family sailed for England: William to the chair of physics at Leeds and Lawrence to the mathematical course at Cambridge that his father had done.

Persuaded by William to change to physics and the Natural Sciences Tripos after one year in Cambridge, Lawrence again graduated with first-class honours and entered the

Above: *The Bragg family in Adelaide, circa 1902. L to R: Lawrence, Gwendoline, Bob and William (courtesy Dr Stephen Bragg).*

Inset: *Lawrence Bragg, Cambridge research student, circa 1913 (courtesy Dr Stephen Bragg).*

The beginnings of X-ray crystallography: why? how? and by whom precisely?

A talk given at CRYSTAL 26 by John Jenkin, Emeritus Scholar, La Trobe University, Melbourne

Cavendish Laboratory to do research. The project allotted to him by J.J. Thomson was unrewarding, and in June 1912 he left it behind to join his family on the Yorkshire coast for the summer holidays. There he read, with his father, a letter that had just arrived from Germany, reporting in detail the experiment of Friedrich, Knipping and Laue that showed that X-rays could be diffracted, seeming to prove beyond doubt that they were waves and not particles.

The holidays over, William returned to Leeds to contemplate the news, while Lawrence went back to the Cavendish, already aware of the deficiencies in the analysis of the German experiment and determined to try and find a better solution. He was glad to abandon his earlier project.

In his analysis of the best German photograph – the diffraction pattern from zinc-blende – Laue had assumed that the X-rays impinging on the photographic plate were those excited in the crystal by the incident X-rays, and that the structure of ZnS was simple cubic. This produced a plethora of spots, both seen and unseen, as well as other problems, and to the Braggs the analysis seemed unsatisfactory.

Lawrence consulted the Cambridge professor of chemistry, William Pope (an authority on likely crystal structures), as well as his own lecture notes from C.T.R. Wilson's excellent course on optics. He now assumed that the X-rays on the plate were those from the incident, continuous ('Bremsstrahlung') spectrum, reflected from the planes of atoms in the crystal and interfering to produce the spots, and that the crystal structure of ZnS was face-centred-cubic. Lawrence then found that he could explain the German photograph precisely, and he presented his findings to a meeting of the Cambridge Philosophical Society on 11 November 1912. They were published shortly thereafter in the Proceedings of the Society.

In the following year, William developed his X-ray spectrometer, and Lawrence and his father had 'a wonderful time … discovering a new goldfield where nuggets could be picked up on the ground … until the war [WWI] stopped our work together'. The year 1915 brought a joint Nobel Prize, but neither could celebrate it: Lawrence was at the front line in Flanders, William was engaged on other war work, and Bob had been killed at Gallipoli.

Lawrence subsequently published up to 30 papers recounting these details, but it is to the 1912 Cambridge paper that I suggest crystallographers turn when seeking the origin of their field. It is surely 'a classic', for it contains Bragg's Law – due entirely to Lawrence Bragg alone – and recounts its use in the solution of a structure (ZnS), both presented for the very first time. The data was German, but this paper surely marks 'the beginning' of X-ray crystallography.

Its centenary will therefore occur late in 2012, and perhaps on 11 November if a particular date is to be chosen. This date has other resonances, of course, and both events have very strong Australian connections. A really major celebration in Australia of the beginning of X-ray crystallography would not be out of place, it seems to me, perhaps late in 2012.

Further Reading:

W.L. Bragg, 'The diffraction of short electromagnetic waves by a crystal', Proc. Camb. Phil. Soc., 17, 1912, 43-57. Lawrence did not use the term 'X-rays' in deference to his father's particle model.

John Jenkin, William and Lawrence Bragg, father and son: the most extraordinary collaboration in science (Oxford, UK: OUP, 2008).

Announcement of Nomination for SCANZ Medals

As detailed in previous newsletters, SCANZ is instituting two new medals to be presented by the Society at our CRYSTAL meetings. There will be an open award and a mid-career award. The proposed guidelines for the medals were published in previous issues of the Newsletter and are reproduced here. The first award of the medals is intended to occur at AsCA 12/CRYSTAL 28 in Adelaide. The two medals are:

The Lawrence Bragg Medal

for distinguished contributions to science involving X-ray, neutron or electron diffraction and/or imaging

1. The Medal shall be awarded to a financial member of the Society who, in the opinion of the SCANZ executive or duly appointed representatives, has contributed most towards the development of a branch of science associated with X-ray, neutron or electron diffraction and/or imaging.
2. The award is based on consideration of the candidate's published scientific work, together with other evidence of his or her standing in the international community. A major portion of the relevant scientific work must have been carried out in Australia and/or New Zealand while the candidate was a member of the Society.
3. The medal shall be awarded to coincide with SCANZ conferences, and the successful candidate will be required to deliver a lecture at the appropriate conference.
4. The award will consist of a medallion, free registration at the SCANZ conference at which they will receive the award, a return economy airfare from the awardee's home city and $750 towards accommodation expenses (if the awardee is not a resident of the city in which the meeting is held). This will be provided by SCANZ in conjunction with the conference organisers.
5. The nominee must have been a member of SCANZ for the previous 10 years.
6. Nominations (including self-nominations) should contain the following information: a brief curriculum vitae; a list of publications; reprints of no more than 10 of the most significant of these publications; and any supporting information that could be helpful to the Selection Committee. Nominees should also arrange for two independent testimonials to be forwarded to the SCANZ Secretary.
7. Nominations should be forwarded electronically to the SCANZ Secretary (Stuart Batten; stuart.batten@monash.edu) by **30th June, 2012.**

The Sandy Mathieson Medal

for distinguished contributions to science involving X-ray, neutron or electron diffraction and/or imaging by a researcher under 40 years of age

1. The Medal shall be awarded to a financial member of the Society who, in the opinion of the SCANZ executive or duly appointed representatives, has contributed most towards the development of a branch of science associated with X-ray, neutron or electron diffraction and/or imaging. This person shall be under the age of 40 at the time of close of applications, except in the case of significant interruptions to their research careers.
2. The award is based on consideration of the candidate's published scientific work, together with other evidence of his or her standing in the international community. A major portion of the relevant scientific work must have been carried out while the candidate was a member of the Society. Due consideration will be given to nominees with interrupted careers.
3. The medal shall be awarded to coincide with SCANZ conferences, and the successful candidate will be required to deliver a lecture at the appropriate conference.
4. The award will consist of a medallion, free registration at the SCANZ conference at which they will receive the award, a return economy airfare from the awardee's home city and $750 towards accommodation expenses (if the awardee is not a resident of the city in which the meeting is held). This will be provided by SCANZ in conjunction with the conference organisers.
5. The nominee must have been a member of SCANZ for the previous 5 years.
6. Nominations (including self-nominations) should contain the following information: a brief curriculum vitae; a list of publications; reprints of no more than 10 of the most significant of these publications; and any supporting information that could be helpful to the Selection Committee. Nominees should also arrange for two independent testimonials to be forwarded to the SCANZ Secretary.
7. Nominations should be forwarded electronically to the SCANZ Secretary (Stuart Batten; stuart.batten@monash.edu) by **30th June, 2012.**

2-5 December 2012

AsCA 12/ CRYSTAL 28:

Celebrating 100 years of Crystallography

To be held at the Adelaide Convention Centre, Adelaide, South Australia

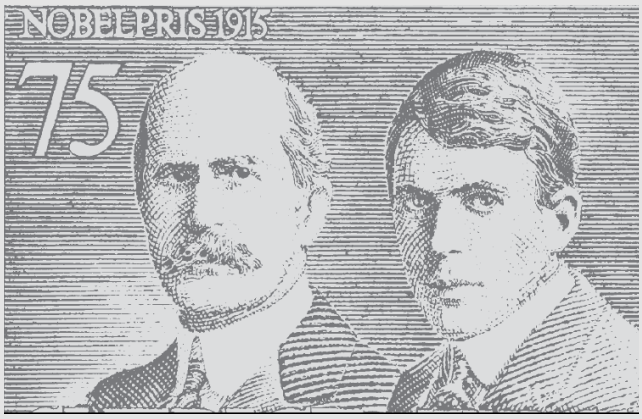
A Joint Meeting of the Asian Crystallographic Association (AsCA), Society of Crystallographers in Australia and New Zealand (SCANZ) in association with the BRAGG Symposium.

Microsymposia Topics:

- ***Hot structures in Biology***
- ***Diffraction Physics and applications of crystallography***
- ***Membrane Proteins***
- ***Energy related materials***
- ***Macromolecular assemblies (Viral proteins)***
- ***Small angle scattering***
- ***Structural proteomics and bioinformatics***
- ***Diffraction imaging and XFELS***
- ***Metallo-organic structural chemistry***
- ***Non-ambient and in-situ Diffraction Studies***
- ***Synchrotron and neutron sources, instrumentation and application***
- ***Dynamic aspects of molecular and solid state crystals***
- ***Macromolecular assemblies (Viral proteins)***
- ***Crystal growth and engineering***
- ***Drug discovery***

Further details on invited speakers and the program will be available as updates at

www.sapmea.asn.au/crystal2012



6 December 2012

Bragg Symposium: Celebrating 100 years of Crystallography

To be held at the Elder Hall, University of Adelaide, South Australia

Featuring eminent lecturers discussing topics relating to the early days of crystallography, the institutions where the Braggs worked and the impact of their work including current exciting research activities in crystallography

Invited speakers include:

Prof Dame Louise Johnson (Oxford)
Mrs Patience Thomson (youngest daughter of Sir Lawrence Bragg)
Prof Tony Kelly (Univ. of Cambridge)
Prof Brian Matthews (Univ. of Oregon/Univ. of Adelaide)
A/Prof John Jenkins (author of "William and Lawrence Bragg, Father and Son: The Most Extraordinary Collaboration in Science")
Prof Thom Mason (Oak Ridge)
Prof Anthony Cheetham (Cambridge/Santa Barbara)
Prof Anders Liljas (Univ. of Lund) - TBC

Further details on other speakers and activities will be available as updates at

www.sapmea.asn.au/crystal2012