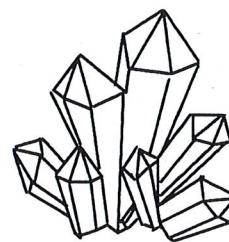


# SCANZ NEWSLETTER

## SOCIETY OF CRYSTALLOGRAPHERS IN AUSTRALIA AND NEW ZEALAND



No 58, August 2004

### FROM THE PRESIDENT

Dear SCANZ members,

Welcome to 2004!

You might think it a little late in the year to be saying that, but this happens to be the first "Letter from the President" written in 2004. We are somewhat belated in getting the newsletter out because of a change in editor, with Brian Skelton stepping down recently. Needless to say, it took some time to find a replacement. However I am very happy to announce that Geoff Jameson (Massey University, NZ) has accepted the challenge. Welcome aboard, Geoff!

So now to the news. And, unless you have been living in a vacuum (tube) this past year, it won't be news to you that Australia is well on the way to having a synchrotron. The Victorian Government has contributed \$157M towards the synchrotron including the building and the storage ring at a site near Monash University. The beamlines are in the process of being designed and developed and four beamlines are expected to be delivered in 2007. Another 5-8 beamlines are due a year or so thereafter. Raising the funds for the beamlines is still in progress, despite the short timeline for their design and delivery.

Next year will be a busy one for we SCANZ crystallographers, with both the Crystal24 conference and IUCr Congress to be held. Steve Wilkins and Co have been busy arranging the Crystal24 meeting, to be held in April in the delightful village of Marysville in Victoria. Further details can be found elsewhere in the newsletter. The IUCr congress will take place in Florence in August 2005. I was fortunate to be involved in the program deliberations for the congress and, although not yet formally approved by the IUCr Executive, I can tell you confidentially that the program is an excellent one. It is anticipated that the SCANZ 1987 fund will provide student support for both conferences, though details are yet to be finalised. Information on applications, funding limits, timelines and eligibility will be sent to SCANZ members by email later this year. Don't forget to pay your subscription!

The SCANZ executive agreed recently that it would set aside up to \$2000 pa (beginning in 2005) for projects in Australia and NZ that raise awareness of science or improve our members' access to new techniques. In the past, events have been supported on an *ad hoc* basis, and most recently these have been in the form of support for workshops, school contests and postcards for commemorative events. We will call for applications in the next newsletter, and these will be evaluated by a sub-committee with the results

published in the following newsletter.

Finally, and on a sad note, David Blow and John Cowley, two world-renowned leaders in crystallography, and Francis Crick, Nobel laureate for the structure of DNA, passed away in 2004. It is timely to remember their pioneering contributions to our field, and obituaries for these scientists are included in this issue of the newsletter.

With best wishes to all,

Jenny Martin

### AUSTRALIAN SYNCHROTRON

*In the last several months two new contributors to the beamline pool have been announced: ANSTO and New Zealand:*

*1 July 2004: ANSTO provides \$5 million boost for the Australian synchrotron*

The Minister for Innovation, John Brumby, today announced the Australian Nuclear Science and Technology Organisation (ANSTO) would provide \$5 million towards initial beamlines planned for the Australian Synchrotron. Mr Brumby said the funding commitment was great news for the project, on top of the over \$15 million committed by Melbourne University, Monash University, the CSIRO and Scoresby-based company MiniFAB.

"ANSTO is a very welcome foundation partner in the Australian Synchrotron, which is on track and on budget to open in 2007," he said. "It's terrific that Australia's leading science organisations are contributing towards one of the most significant investments in Australia's scientific infrastructure for decades."

ANSTO's Executive Director, Dr Ian Smith, said ANSTO was delighted to contribute to the development of the Australian Synchrotron.

"The Australian Synchrotron Research Program (ASRP), run out of ANSTO, offers researchers opportunities to use overseas synchrotrons, but we need our own national facility," Dr Smith said. "The ASRP and ANSTO have grown the user base for Australia's own synchrotron facility, and ANSTO is now a proud partner in building the Australian Synchrotron: landmark infrastructure that will keep this nation at the forefront of science."

Mr Brumby said strong partners such as ANSTO would help make the Australian Synchrotron a truly national centre for research excellence.



## *12 August 2004: New Zealand joins synchrotron partnership*

Victoria's Premier, Steve Bracks, and New Zealand's Minister for Research, Science and Technology, Pete Hodgson, today announced New Zealand had agreed in principle to contribute AUD\$5 million towards the Australian Synchrotron beamlines.

Mr Bracks said scientific collaboration between New Zealand and Australia was vital for the economic development of both countries, and warmly welcomed New Zealand participation in the Australian Synchrotron project.

Mr Hodgson said the Australian Synchrotron would give the New Zealand science community ready access to an essential tool for groundbreaking research.

"The Victorian Government has been bold and farsighted in committing to the capital cost of this crucial science infrastructure," Mr Hodgson said. "New Zealand R&D will benefit substantially, and our in-principle commitment announced today will give this nation a seat at the table in determining how the facility develops. "Like Australia, New Zealand has so-called 'suitcase scientists' forced to go to the Northern Hemisphere to undertake leading edge R&D. This new Australian facility will bring the tools they need much closer."

Victoria's Innovation Minister, John Brumby, said the funding commitment was great news for the project, on top of the over \$20 million committed by Melbourne University, Monash University, the CSIRO, ANSTO and Scoresby-based company MiniFAB.

"With the support of New Zealand and these organisations, we are on track to have all the beamline funding in place well before the facility is commissioned," Mr Brumby said.

New Zealand's contribution to the synchrotron will be funded equally by the New Zealand Government and research providers, including universities and Crown Research Institutes (i.e. a 50:50 split between government and providers). The Government is also committing, on a similar basis, funding for operating costs.

*[Newsletter Editor: This direct Government involvement marks a significant and vital change in science-funding policy in New Zealand]*

## **ASCA'04 6TH MEETING OF THE ASIAN CRYSTALLOGRAPHIC ASSOCIATION HONG KONG, 27-30 JUNE 2004**

*From Ted Baker:*

AsCA 2004 provided a return to a central Asian location, Hong Kong, after last year's very successful Broome meeting. It was also a reminder of how much we, in Australia and New Zealand, benefit from being part of the wider AsCA community. The ride in from the airport was stunning, with its views of clusters of high-rise buildings sprouting up against a backdrop of green hills, with the harbour in the foreground. It is years since I was last in Hong Kong. It has changed, of course, but it is still full of energy and colour, and the food was great. For the

conference we found ourselves up in the hills, at the relatively new Hong Kong University of Science and Technology, - exceptionally good facilities, and a spectacular view looking out over the sea. It was also curious to see how much, both at HKUST and in Hong Kong proper, had been sponsored by the Hong Kong Jockey Club!

Scientifically, the meeting was excellent. With three parallel streams of microsymposia, over two and a half days, I found myself mostly in the biological, macromolecular sessions. At first sight the attendance in this area seemed quite small, and the number from Australia and New Zealand was disappointing - I do think we should support AsCA better than this. On the other hand, the quality was extremely high. Broad themes included molecular recognition, including drug development, assemblies, and structural genomics. Personal highlights included Satoshi Murakami's description of multidrug efflux machinery, Soichi Wakasuki's dissection of some of the many complexes involved in vesicle transport, and Peter Colman's (impromptu) discussion of bifunctional neuraminidase/haemagglutinin proteins from paramyxoviruses. There were fascinating accounts of quite different structural genomics initiatives (but with rather similar conclusions) from Bostjan Kobe and Ming Luo, and some very exciting views into the future, via the Japanese structural genomics initiative, Japan 3000. These included some creative new approaches to crystallization, various robotic developments, and a new X-ray detector 100 times more sensitive than a CCD. It was also an eye-opener to me to see how macromolecular crystallography is expanding in Asia, with new groups from Korea, Hong Kong, Taiwan and Thailand all well represented on top of strong contingents from Japan and India.

Ian Williams, Alvin Siu and their willing helpers made this a superb meeting. Great facilities, food, and entertainment - from the energetic Chinese dragon dance that opened it to the harbour cruise and the closing dinner generously sponsored by Rigaku. And I'll also remember the heat - a tropical blast on stepping outside. Auckland seemed blessedly cool (some might say cold) on getting home!

*From Brendan Kennedy:*

The Sixth Conference of the Asian Crystallographic Association (ASCA) was held at the Hong Kong University of Science and Technology June 27-30 2004. In addition to a full (in every sense) social program delegates were treated to some exciting science. As noted in the opening address some of the most dramatic growth in crystallographic facilities is occurring in Asia, with new synchrotrons and neutron sources being constructed. In this context the quality of the science coming from the existing facilities was as breathtaking as the conference surrounds. Personal highlights from the meeting were the presentation by Prof Akimitsu on novel superconductors. The number of new superconductors, found by this group and their structural diversity, was amazing. This was closely followed by a second plenary lecture given by Professor Peng on metal containing polymers. Australian science was well represented by both the old guard Chris Howard and the new blood Valeska Ting talking on structural complexity in perovskites. If there was one disappointment for me at this



meeting it was the small number of Australian and New Zealand post-graduate students in attendance.

The future program of ASCA meetings was also sorted out in the Council meeting that saw that saw Prof Vijyan elected as president. 2005 sees the IUCR congress, in 2006 ASCA will meet jointly with the Japanese Society of Crystallographers in Tsukuba. Then in 2007 there will be a full ASCA meeting most probably in Taiwan

## TREASURER'S REPORT

1<sup>st</sup> July 2003 – 31<sup>st</sup> June 2004

The accounts are presented for the period 1<sup>st</sup> July 2003 – 31<sup>st</sup> June 2004. Funds currently held by the Treasurer have increased by 8.3% over this period. Income from membership fees, bank interest, and profits derived from SCANZ meetings continues to adequately fund the Society's expenditure.

The share of the profits from the Broome meeting is foreshadowed to add a further \$7005 in the next financial year. Advances to facilitate the organisation of CRYSTAL-24 to be held at Marysville, Victoria, 29<sup>th</sup> March – 1<sup>st</sup> April 2005, are likely to be of the order of \$6000.

The Society had two major expenses for the promotion of crystallography in the current financial year. Firstly a \$1250 contribution towards producing postcards showing a X-ray diffraction image obtained from a DNA fibre. This was part of the celebrations marking the 50<sup>th</sup> anniversary of the determination of the DNA double helix structure. The project was jointly funded by the Australian Academy of Science and SCANZ. The second expenditure comprised payments of ~\$500 each towards the costs of the RACI NSW Crystal Growing Competitions for 2003 and 2004.

A payment of \$500 towards the costs of running a protein crystallisation workshop, to be held in Brisbane on 4<sup>th</sup> November 2004, has been authorised for the next financial year. All subsequent promotional support by SCANZ will be subjected to a yearly review process and limited to an annual budget of \$2000.

Membership of SCANZ to both FASTS (Federation of Australian Scientific and Technological Societies) and AsCA (Asian Crystallographic Association) were also funded.

*Location of Funds (All figures listed in A\$)*

CBA cheque account	5,546.64
CBA Term Deposit 1 matures 11/11/04 @ 5.3%	56,911.16
CBA Term Deposit 2 matures 11/11/04 @ 5.2%	23,686.28
CBA Term Deposit 3 matures 15/11/04 @ 4.4%	5,000.00
<b>Total</b>	<b>91,144.08</b>

(c.f. Total 31<sup>st</sup> June 2003 as reported at Broome \$84,180.59)

*Income*

Membership Fees	2,679.76
Bank Interest	4,728.62
Couran Cove meeting <sup>1</sup>	2,961.40
Broome meeting <sup>2</sup>	5,000.00
<b>Total</b>	<b>15,369.78</b>

Notes:

- <sup>1</sup> This figure includes repayment of \$2000 advance plus profit of \$961.
- <sup>2</sup> This figure is \$535.79 less than the total advanced to the meeting organisers. However a payment of \$7005 will be forthcoming in the next financial year from the profit made from the meeting.

### Expenditure

Expenses for 1987 Fellow at Broome	3,535.79
DNA postcard	1,250.00
RACI Crystal Growing Competition <sup>3</sup>	1,013.50
Broome scholarship <sup>4</sup>	900.00
FASTS subscription	830.00
Newsletter Printing and Postage	378.40
AsCA subscription	240.00
Bank and government account fees	109.60
Science meets Parliament <sup>5</sup>	100.0
Website parking fee	49.00
<b>Total</b>	<b>8,406.29</b>

Notes:

- <sup>3</sup> \$513.50 for 2003 and \$500 for 2004
- <sup>4</sup> One scholarship cheque not cashed until this financial year
- <sup>5</sup> Expenses paid for Darren Goossens to attend Science meets Parliament day to represent SCANZ

Paul Carr

## FUTURE CONFERENCES and WORKSHOPS

### Crystal Growing Workshop

A workshop on protein crystallization will take place at the University of Queensland (UQ), Brisbane, on Wednesday 3 November 2004. The objective of the workshop is to introduce state-of-the-art methods and strategies for protein crystallization to researchers actively involved in structural biology projects, and also to researchers interested in pursuing structural biology research in the future. The principal invited speaker will be Janet Newman from San Diego who will be conducting a large part of the workshop, with local experts contributing other aspects. The workshop will also incorporate demonstrations using robotic equipment.

The workshop will be limited to 50 participants on a first-come basis. Registration will include a full-day workshop, plus lunch and morning/afternoon teas. Registration is \$50 +\$5 GST (\$30 +\$3 GST for students); but a discount fee of \$25 +\$2.50 GST (\$15+\$1.50 for students) is available for SCANZ members through the generous support of SCANZ.

To register, visit the website (which will be ready in early September):

<http://www.imb.uq.edu.au/index.html?page=20855>

### SCANZ Meeting CRYSTAL-24

**Tuesday 29th March to lunchtime Friday 1 April, 2005**  
**Marysville, Victoria**

Marysville is a picturesque village verging on state forest and at the foot of Lake Mountain (a popular X-country skiing area) and is located about 90km from Melbourne (across the Great Divide and past many renowned wineries



of the Yarra Valley). There are many scenic walks through rainforest including the "Beeches Walk" and to towering mountain ash emanating from around Marysville.

*Provisional deadlines:*

Registration: 10 December 2004  
 Abstracts deadline: 14 Jan 2005  
 Accommodation: Favourable accommodation rates at the venue (the Marylands) will be available to those who book early (a 30% deposit will be required). The deadline for this is 24 December.

Conference dinner is included in accommodation cost for those staying at Marylands but will be extra (\$55) for those staying elsewhere.

Costs:  
 Full: A\$450 (late A\$525)  
 Student/retired: A\$250 (late A\$300)

A Registration Form is enclosed.

For more information, please contact Steve Wilkins:  
 Steve.Wilkins@csiro.au

## IUCr XX

The twentieth Congress and General Assembly of the International Union of Crystallography will be held in Florence, Italy from 23-31, August 2005 at the Congress Centre. The committee chairpersons are Carlo Mealli (Scientific Program) and Paolo Dapporto (Local Organising Committee). The Congress Centre is located in the very heart of the city, within walking distance of the main tourist attractions and most of the hotels. Further information, including an Interest Form, can be found at the Congress website: <http://www.iucr2005.it>.

## CRYSTAL FRAGMENTS

Attention is drawn to the very recently published book by SCANZ member Richard Welberry, *Diffuse X-Ray Scattering and Models of Disorder* (288 pages), published by Oxford University Press in the series IUCr Monographs on Crystallography.

## SUBSCRIPTIONS

The Treasurer wishes to remind members that annual membership dues for 2004 are to be paid by December 31, 2004. The amount payable is \$130 for a corporate member, \$25 for a full member and \$7 for a student member, with these discounted to \$100, \$20 and \$5 respectively if payment is made by April 1, 2004. Members who are over 60 years of age at the time subscriptions are due can elect to become Life Members of the *Society* by paying a one-off amount of five times the current (discounted) subscription rate (i.e. \$100).

Paul Carr

## FROM THE NEWSLETTER EDITOR

It is probably time to consider distribution of the newsletter by electronic means -- this would allow colour to be used. Extreme responses in favour or against this idea could be communicated to the Editor.

The Editor would also like to use the newsletter to highlight papers and results from the membership. We are a diverse group and this newsletter offers a way, between SCANZ meetings, to profile research across the disciplines in Australia and New Zealand.

As this is your newsletter, please send any items of news or commentary to the Newsletter Editor.

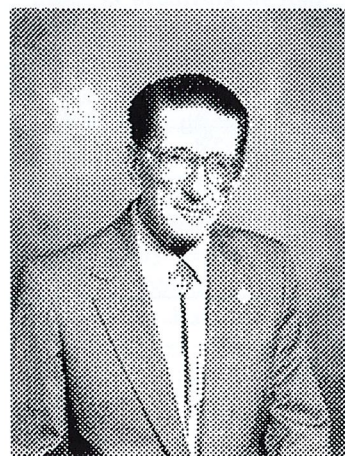
The Editor apologises for the delay in getting out this newsletter (and the IUCr newsletters) to members.

## OBITUARIES

### Vale John Cowley (1923-2004)

John Maxwell Cowley, who died suddenly at home on 19 May in Phoenix Arizona, was one of Australia's most eminent and influential physical scientists. His early research career was with CSIRO, Division of Industrial Chemistry (1949-1961), during which time he made numerous outstanding contributions to the fields of electron microscopy and diffraction physics, many of these in collaboration with Alec Moodie.

John Cowley was born in Adelaide in 1923 and studied physics at the University of Adelaide, obtaining an M.S. in 1945. At the time, a higher degree meant traveling overseas, usually to Oxford or Cambridge. John broke with tradition by going to MIT for his Ph.D. (under Prof Bert Warren), which he obtained in 1949. He then returned to Australia, joining the group of young talent being assembled by Lloyd Rees in the newly formed Chemical Physics Section (later to become the Division of Chemical Physics) at Fishermen's Bend. He joined a group starting in the new field of electron microscopy/diffraction, which was to become his life's work. His partnership with Alec Moodie was to prove particularly fruitful; starting in 1957, a remarkable series of papers by Cowley and Moodie laid the foundations of a new theory of electron diffraction by crystals, which was developed by these and many other authors over the years to become eventually perhaps the main theoretical/computational tool for the analysis of electron diffraction and microscopy images of crystalline materials.



In 1961 he left CSIRO to take the Chamber of Manufacturers Chair of Physics at the University of Melbourne, and in 1970 moved to Arizona State University as Galvin Professor of Physics, establishing there one of the world's leading electron microscopy laboratories. He publish-



ed extensively; his widely used textbook *Diffraction Physics*, first published in 1975, has gone through many printings in three editions. He held office on many committees associated with electron microscopy and crystallography in the United States, and for the International Union of Crystallography. He was a Fellow of the Royal Society of London, of the Australian Academy and of the American Physical Society, and among numerous other awards and prizes, he and Alec Moodie shared the inaugural Ewald prize of the IUCr in 1987.

He 'retired' in 1994, but as Regents Professor Emeritus continued to work and publish up to the time of his death. He is survived by his wife Robbie and two daughters (Jill and Deborah).

During his life John Cowley was a supervisor, colleague and friend to a generation of Australian scientists working in the fields of electron microscopy and diffraction physics. The Diffraction Group at Melbourne University that he led for many years spawned a large number of the world's leading figures in these fields. His loss will be deeply felt by many.

### David Mervyn Blow (1931-2004)

David Blow, who died 8 June 2004, was an early pioneer of protein crystallography, making key contributions to the theory and practice of isomorphous replacement [with Max Perutz (1914-2002) and Francis Crick (1916-2004)] and molecular replacement (with Michael Rossmann).

Born in Birmingham in 1931, he won an open scholarship to Corpus Christi College, Cambridge. As a young scientist graduating in Physics from the Cavendish Laboratory at Cambridge in 1954, he was looking for an exciting area of research when a friend told him about an Austrian scientist, Max Perutz, working in the Cavendish, who was good at getting money. When Blow joined the unit in late 1954, there was still no sign of any protein structure and opinion among many was that the task was impossible.

In 1953, Perutz had recognised that the "isomorphous replacement" method, placing heavy metal ions at precise locations on the protein, might be able to solve the structure of protein crystals. Blow came up with a rigorous general method for data analysis, implemented it on the Edsac I computer to determine the projection structure of horse haemoglobin, and published with Francis Crick a famous paper, "The Treatment of Errors in the Isomorphous Replacement Method", 1959. By the end of his PhD work in 1957, the first three-dimensional images of the protein myoglobin had been obtained by John Kendrew (1917-1997) and his colleagues using the isomorphous replacement method.

After two years as a Fulbright scholar in the USA working with Alex Rich on fibres, Blow returned to the MRC Unit at Cambridge, where he began a remarkable collaboration with another young scientist, Michael Rossmann. During the next five years, they pioneered "molecular replacement" - the second major approach to solving protein structures that is used the structure of a similar protein is known.

Blow then tackled the structure determination of the digestive enzyme from the gut, chymotrypsin, beginning a long-term association with Brian Hartley, who had worked on the mechanism of chymotrypsin for years. The atomic

structure of chymotrypsin was determined in 1967 with colleagues Brian Matthews and Paul Sigler (1934-2000). It was only the third or fourth protein structure to be determined.

Blow had a strong commitment to teaching and trained many PhD students. This led him first to take up a teaching fellowship at Trinity College, Cambridge, in 1969, and then a Professorship of Biophysics at Imperial College in 1977, where he remained until retirement in 1994 due to a serious heart problem.

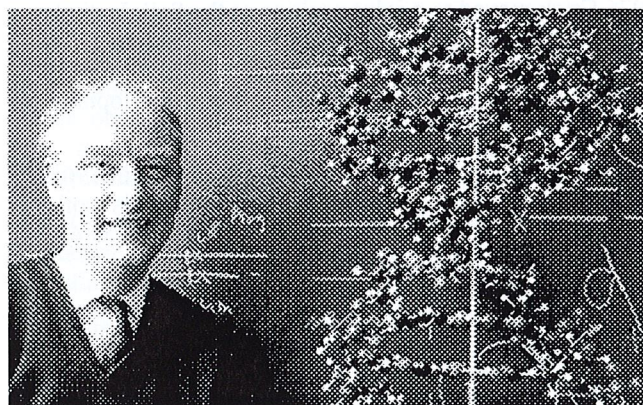
Blow's students and colleagues found him to be generous, modest, kind, fair, far-sighted and persuasive. He earned many scientific honours, being elected FRS in 1972 aged 40, and winning the CIBA prize of the Biochemical Society, the Charles Léopold Meyer prize of the French Academy and the Wolf Prize for Chemistry, Israel's most prestigious scientific award. These last two were awarded to Blow jointly with David Phillips (1924-1999) for their work on the first enzyme structures, lysozyme and chymotrypsin.

In retirement, Blow produced *Outline of Crystallography for Biologists* (2002), a biographical memoir of his mentor Perutz, a prehistory of the British Crystallographic Association that he helped to found in 1982, and even a short novel. He and his wife Mavis had settled in 1994 in Appledore, Devon, and had become enthusiastic members of the local community. Mavis survives him, as does his son Julian, a biologist at Dundee University, and his daughter Elizabeth.

*Abridged from an obituary in The Independent  
by Richard Henderson*

### Francis Harry Compton Crick (1916-2004)

Francis Crick's entrance into the Eagle pub in Cambridge on February 28, 1953 has gone down as one of the most famous moments in history. "We've discovered the secret of life," the co-discoverer of the DNA 'double helix' is reputed to have told his stunned colleagues. Francis Crick, who died 28 July 2004 at the age of 88, was one of that rare group of scientists whose work changed human's perception of self and of the natural world.



Francis Crick was born near Northampton in 1916. Fiercely inquisitive from a young age, he read avidly and conducted scientific experiments in his kitchen at home. After Northampton Grammar School and Mill Hill School, London, he read physics at University College, London.

The Second World War interrupted work on his PhD in Physics under Prof EN de C Andrade, one of the pioneers of



research into high-stress failure in engineering materials. Crick put his studies on hold to work for the British Admiralty, where he specialised in researching acoustic and magnetic mines. On leaving the Admiralty in 1947, and influenced by JD Bernal (1901-1971), he turned from physics to biology, as did also Maurice Wilkins, moving to Cambridge on a studentship from the Medical Research Council. Crick continued with his studies, joining the Cavendish Laboratory's Medical Research Council unit in 1949 and completing a PhD in 'X-ray diffraction: polypeptides and proteins' in 1954.

In 1951 he first met the man with whom his name would forever be linked. Chicago-born James Watson, who had just arrived at the Cavendish, was particularly interested in the structure of nucleic acids and proteins; Crick believed that DNA was the means by which genetic information passed from one generation to the next. The two men quickly realised that they shared a common interest in unlocking the structure of DNA.

The historic moment came at their second attempt to build an accurate model of DNA - their work, in association with Maurice Wilkins and Rosalind Franklin (1920-1958) from King's College, London, showed its structure was that of a 'double helix', like a twisted ladder. It was Crick who, in the famous paper in *Nature* of April 25 1953, offered one of the great understatements of literature, scientific or otherwise: "It has not escaped our notice that the specific pairing [of purine and pyrimidine bases] that we have postulated immediately suggests a possible copying mechanism for the genetic material." They were the first to reach this fiercely sought biological Holy Grail.

He went on to postulate the characteristics of the genetic code in much greater detail, invoking, on the way, the term "codon" for the individual base-pair triplets that were soon accepted as the specific codes for particular amino acids, and are now written indelibly into the language of science. With Sidney Brenner and others, he embarked on the demanding investigation of how long sequences of base pairs - providing the codes for amino acid sequences in individual proteins - are isolated from the huge mass of information in the nucleus, and then read, with very few errors, during their rapid transcription in the living cell.

In 1976 Crick moved to a joint position at the Salk Institute and, as professor of biology, chemistry and psychology, at the University of California, San Diego, California, where he turned his attention to understanding brain development and the nature of consciousness.

In addition to winning the Nobel Prize in Medicine in 1962, Crick received numerous awards and honours for his work. He was elected a Fellow of the Royal Society in 1959 and appointed to the Order of Merit in 1991.

Crick was married twice: in 1940, to Ruth Doreen Dodd, with whom he had a son, Michael, who went into science. This marriage ended in divorce in 1947, partly as a result of Crick's decision to switch careers and become a student again. Two years later, he married Odile Speed, with whom he had two daughters, Gabrielle and Jacqueline. His wife and children survive him.

*Compiled from obituaries provided by the University of Cambridge and by Anthony Tucker of The Guardian*

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