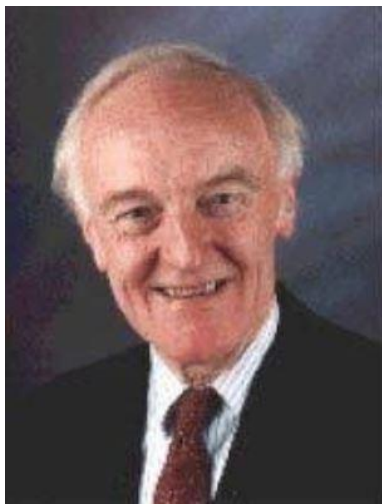


# David Buckingham

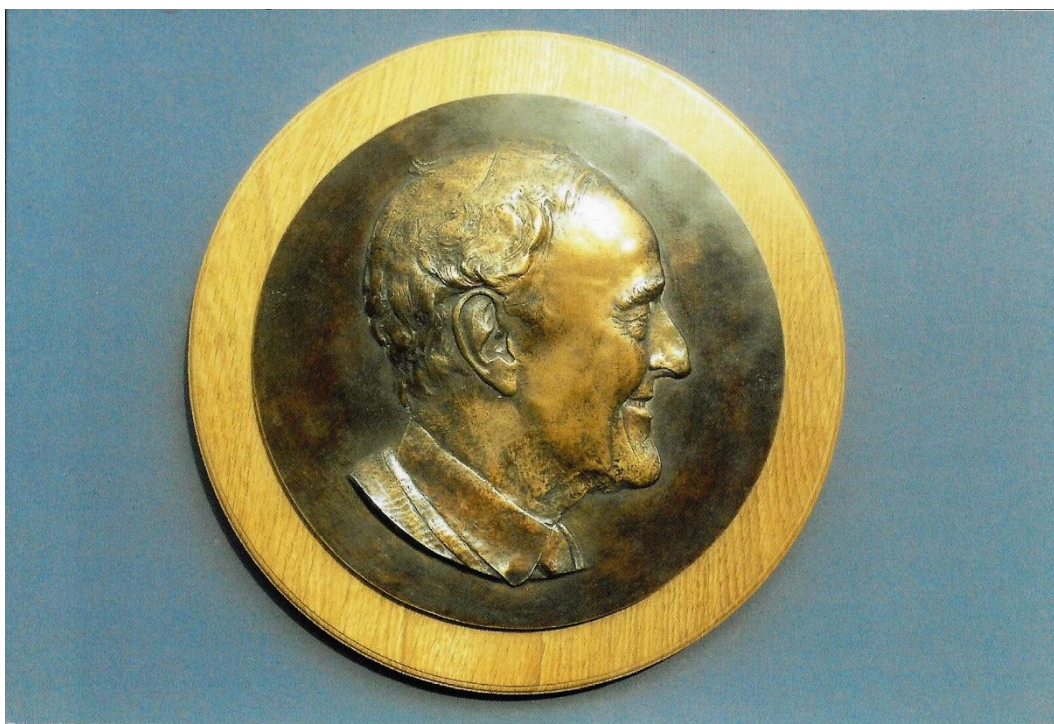
Born 1930. Professor of Chemistry and cricketer.  
Available online at [www.livesretold.co.uk](http://www.livesretold.co.uk)



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# 1. Introduction



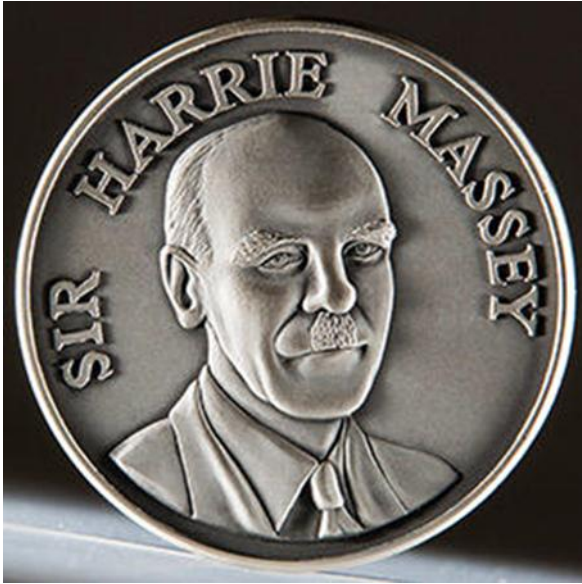
*Bronze portrait of David Buckingham by the sculptor Harry Gray.*

David Buckingham obtained a Bachelor of Science and Master of Science, from the University of Sydney and a PhD from the University of Cambridge. He was an 1851 Exhibition Senior Student in the Physical Chemistry Laboratory at the University of Oxford from 1955 to 1957, Lecturer and then Student (Fellow) at Christ Church, Oxford from 1955 to 1965 and University Lecturer in the Inorganic Chemistry Laboratory from 1958 to 1965.

He was Professor of Theoretical Chemistry at the University of Bristol from 1965 to 1969. He was appointed Professor of Chemistry at the University of Cambridge in 1969.

He was elected a Fellow of the Royal Society in 1975, a Fellow of the American Physical Society in 1986 and a Foreign Associate of the United States National Academy of Sciences in 1992. He was a member of the International Academy of Quantum Molecular Science. Buckingham was elected to the Australian Academy of Science in 2008 as a Corresponding Fellow.

He was awarded the first Ahmed Zewail Prize in Molecular Sciences for pioneering contributions to the molecular sciences in 2006. He won the Harrie Massey Medal and Prize in 1995. Professor Buckingham finished his career as Emeritus Professor of Chemistry at the University of Cambridge, United Kingdom and Emeritus Fellow at Pembroke College, Cambridge. He died seven days after his 91st birthday.



*The Harrie Massey Medal.*

The Harrie Massey Medal is jointly awarded every two years by the Institute of Physics and the Australian Institute of Physics. These International Bilateral Awards are made jointly by the Institute of Physics with physical societies in Germany, France, Italy and Australia. They are designed to strengthen relationships between the institutions and acknowledge outstanding physicists who are pioneering research and physics applications across borders.

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## 2. Obituary by Brian Orr

*The following chapter was archived in 2021, with acknowledgement and thanks, from the website of the Sydney Morning Herald at [www.smh.com.au](http://www.smh.com.au). It was written by Brian Orr, and was published in March 2021.*

Professor A. David Buckingham was one of the world's leading molecular and optical scientists. He explored the fundamentals of physical phenomena as diverse as intermolecular forces (relevant to aspects of molecular biology and genomics) and nonlinear optics (intrinsic to laser-based technology and telecommunications). Although based in England for most of his career, he was clearly proud of his Australian origins.



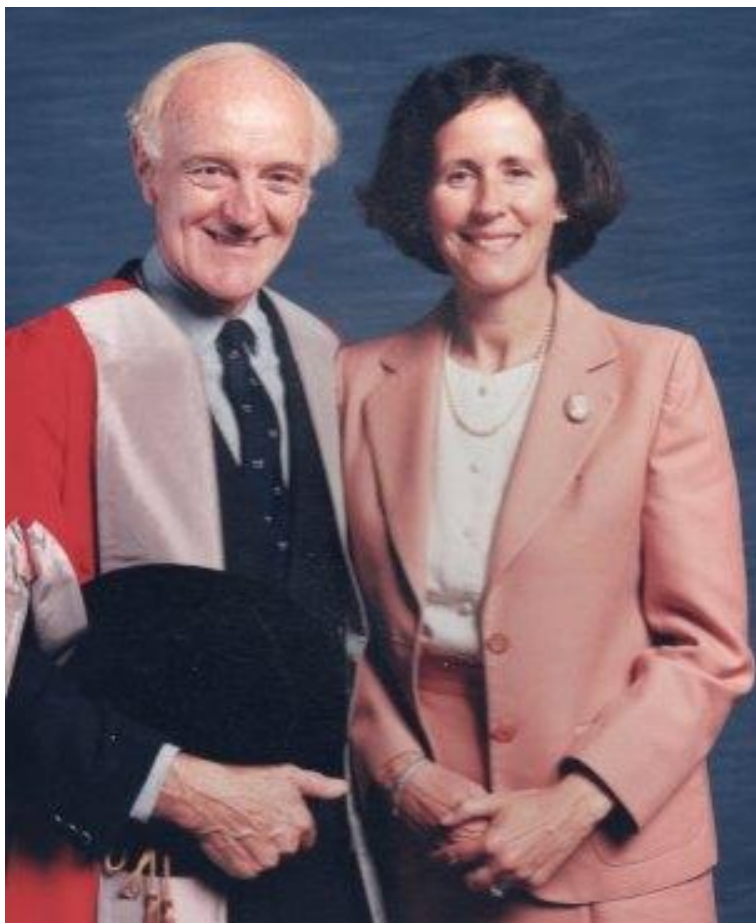
*Ted Dexter makes a presentation to David Buckingham.*

David grew up in Pymble on Sydney's North Shore with his parents Reginald and Grace (née Elliot) and his twin siblings Joslin and Michael. Reginald and Grace had emigrated separately from England to Australia before World War I. Reginald worked for Dalgety and Company Limited, dealing with stud animals. Grace had trained as a nurse and was a pioneer of Australian baby health clinics. David's unusual first name was in memory of Grace's brother John Amyand Elliot, who died at Gallipoli in 1915 aged 24.

David was sent to Barker College where he excelled at cricket and on the rugby field. Both David and his brother Michael entered Sydney University's Faculty of Science, where each won a University Medal (Michael's in Physics and David's in Chemistry) before they took their respective doctorates in England.



At Sydney University, David's B.Sc. Honours and M.Sc. research projects were supervised by Professor R.J.W. Le Fèvre, a renowned physical-organic chemist. David's cohort of first-year undergraduates in 1948 was exceptionally gifted, including four who later became Fellows of The Royal Society (FRS). Many of his contemporaries went overseas for doctoral studies, before returning to enhance the pool of academic staff in Australia's maturing universities.



*David and Jill Buckingham.*

In 1953 he was awarded the Shell Postgraduate Scholarship and chose to study for a Ph.D. at Cambridge in the Theoretical Chemistry Department headed by Professor J.E. Lennard-Jones – a famous name in the field of intermolecular forces where David himself would gain comparable fame. However, Lennard-Jones was moving away from Cambridge and David was therefore supervised by Dr John Pople, who was only four years older than he (and who went on to win a Nobel Prize in 1998). Together, they made important scientific discoveries that are significant to this day.

After gaining a cricket blue at Sydney University in 1953, David played rugby in Cambridge and English first-class cricket (1955-60). He later became one of the longest-serving (1990-2009) presidents of the Cambridge University Cricket Club, in a distinguished 150-year line.

After completing his PhD, Buckingham held chemistry lectureships at Oxford University with college responsibilities at Christ Church. Although primarily a theoretician, he also initiated key experiments at the National Physical Laboratory in Teddington.

There, Dr R.L. Disch and he accomplished an ingenious experiment to measure the electric quadrupole moment of carbon dioxide molecules. The “Buckingham” is now the CGS unit (centimetre, gram and second measurement system) for this structural property of any molecule, indicating its charge distribution and strength of interactions with other molecules.



His equipment was moved to Bristol University after he took up its inaugural Chair of Theoretical Chemistry in 1965. It may have surprised the Bristol management that a theoretician needed more than office space, pencils, paper and computer time.

Buckingham’s time in Bristol was cut short by his return to Cambridge in 1969 as Professor of Chemistry and Head of the Theoretical Chemistry Department, with a Fellowship in Pembroke College. He attracted an impressive team of students, research scientists and academic staff to the department, establishing an enduring tradition of research on a rich variety of topics.

He lectured the main quantum mechanics course at Cambridge for more than 25 years. He aimed to make his lecture material intellectually demanding, challenging the most able students in the class. With elegance and clarity, he tended to focus on a single topic and treat it as thoroughly as possible.

His lectures were often attended by other academics who were keen to learn what they could from him. On one such occasion in Bristol, he asked his audience: “Is that clear?”. The loud response from a senior colleague was: “No, it is not.” Using his best cricketing skills, Buckingham played a straight bat and explained, patiently and respectfully, the point that his much-respected colleague had missed. This incident was regarded in awe by PhD students who were present.



*The house in Millington Road, Cambridge, where the Buckinghams lived and brought up their family.*

His research expertise has produced discoveries ranging widely from basic physics to molecular biology and from materials science to chemical engineering, all of which are influenced by properties of individual molecules and interactions between them. Buckingham had the foresight to recognise many such applications far in advance of their practical realisation. For instance, the nonlinear-optical phenomena inherent in electro-optic processes that he pioneered, both theoretically and experimentally, are at the core of modern fibre-optical telecommunications and laser technology.

He also made a substantial contribution to scientific publishing, as editor of several leading international journals in the field of chemical physics. At scientific seminars, he would usually ask a provocative or probing question of the speaker. He had a quick-witted ability to perceive the merit or frailty of an argument, but always behaving as a perfect gentleman – sometimes with a dash of the Australian larrikin. On one occasion (in 1973, at a conference in Houston, Texas), his fearless questioning even challenged the controversial Dr Edward Teller, so-called “father of the hydrogen bomb”.

Around the world, many distinctive honours and awards were bestowed on David. These included his FRS (1975), his Foreign Associateship of the US National Academy of Sciences (1992), his CBE (1997), and his Corresponding Membership of the Australian Academy of Science (2008).

Cambridge was his final resting place. His retirement at age 67 was marked in mid-1997 by a memorable scientific and social symposium at Pembroke



College. He remained active in the university and on the international conference circuit for over 20 years after that. Throughout his distinguished career in the northern hemisphere, David maintained active interests in Australian science (not to mention cricket and politics). A warm welcome always awaited him in numerous Australian research centres. His lectures and personal interactions during regular visits to Australia influenced many young scientists here, some of whom worked in his research groups in Bristol and Cambridge and returned to significant positions in the Australian community.



*The Buckingham's home in retirement at Snailwall, near Newmarket.*



*The Cunard liner RMS Franconia. David and Jill Buckingham met as passengers crossing the Atlantic to Montreal on the Franconia in 1964.*



Enriching his life were his wife Jill (née Bowles), children Lucy, Mark and Alice, and eight grandchildren (one born in Australia). The atmosphere in the Buckingham household has always been happy and hospitable. Jill and David had met in July 1964 on a trans-Atlantic liner bound for Canada and they were married in Oxford 12 months later. Jill, a physiotherapist, brought shared interests, astute guidance and unfailing support to their partnership of more than 55 years.

David Buckingham exhibited exceptional talent, always striving for excellence in science, sport and daily life. He was quick to speak up for what he believed to be true and encouraged others to do likewise. His legacy is a formidable body of scientific knowledge, together with enduring memories of his engaging personality.

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### 3. Cricket

*The following chapter was archived in 2021, with acknowledgement and thanks, from the website of the Sydney University Cricket Club at [www.sydneyuniversitycricket.com.au](http://www.sydneyuniversitycricket.com.au). It was written by James Rodgers and was published in March 2021.*

Professor Buckingham played for the Club from 1949 (beginning in 4th Grade in 1949-50) until 1953 (finishing with two seasons in 1st Grade), mainly as a top order batsmen and occasional off spinner. He made his only century in low-scoring seasons, when his 103 was instrumental in 2nd Grade's victory over Cumberland in early 1952, the game before he was deservedly promoted to 1st Grade. He was awarded a Blue for Cricket in 1952.

When he studied at Cambridge University, he represented Cambridge in ten 1st class games. Although he spent most of his years in England after graduation from the University of Sydney, Professor Buckingham continued to take a practical interest in the Club and was a Member of the SUCC Foundation.

#### **1st class cricket 1955-60:**

<b>Matches</b>	<b>Innings</b>	<b>Not Outs</b>	<b>Highest Score</b>	<b>Runs</b>	<b>Ave</b>	<b>Wkts</b>	<b>Runs</b>	<b>Ave</b>
10	20	1	61	349	18.4	0	43	-

#### **SUCC 1st Grade 1951-53:**

<b>Innings</b>	<b>Not Outs</b>	<b>Highest Score</b>	<b>Runs</b>	<b>Ave</b>	<b>Wkts</b>	<b>Runs</b>	<b>Ave</b>
15	2	67no	501	29.5	0	11	-

#### **SUCC all grades 1949-53**

72	7	103	1586	24.4	3	84	28.0
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## 4. The Buckingham Unit of Measurement

The Buckingham (symbol: B) is a CGS (centimetre-gram-second) unit of electric quadrupole, named in honour of the chemical physicist A. David Buckingham who was the first to measure a molecular quadrupole moment. It is defined as  $1 \times 10^{-26}$  statcoulomb-centimetre<sup>2</sup>. This is equivalent to 1 Debye-Ångström, where 1 Debye =  $1 \times 10^{-18}$  statcoulomb-centimetre is the cgs unit of molecular dipole moment and 1 Ångström =  $1 \times 10^{-8}$  cm.

One Buckingham corresponds to the quadrupole moment resulting from two opposing dipole moments but an equal magnitude of 1 Debye which are separated by a distance of 1 Ångström, a typical bond length. This is analogous to the Debye unit for the dipole moment of two opposing charges of  $1 \times 10^{-10}$  statcoulomb separated by 1 Ångström, and the name Buckingham for the unit was in fact suggested by Peter Debye in 1963 in honour of Buckingham.

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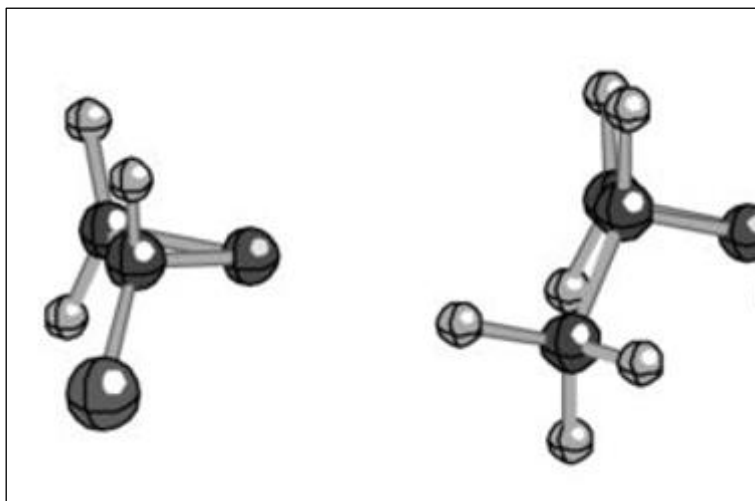
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## 5. Research



*The following listing of research papers by David Buckingham was archived in 2021, with acknowledgement and thanks, from the Academic Tree website at [www.academictree.org](http://www.academictree.org).*

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