Author/s:
Rae, ID

Title:
John Atherton Young 1936-2004

Date:
2024-05-29

Citation:
Rae, I. D. (2024). John Atherton Young 1936-2004. Historical Records of Australian Science, 36 (1), https://doi.org/10.1071/HR24007.

Persistent Link:
https://hdl.handle.net/11343/345333

BIOGRAPHICAL MEMOIR
https://doi.org/10.1071/HR24007
Historical Records of Australian Science

John Atherton Young 1936–2004

Ian D. Rae[A,*]

For full list of author affiliations and declarations see end of paper

***Correspondence to:**
Ian D. Rae
School of Chemistry, University of Melbourne, Vic. 3010, Australia
Email: iandrae@bigpond.com

ABSTRACT

John Atherton Young (1936–2004) graduated in medicine at the University of Queensland and undertook research in physiology at the Kanematsu Institute in Sydney for which he was awarded his PhD. After postdoctoral studies in Germany, he joined the department of physiology at the University of Sydney, rising to professor, then Dean of the Faculty of Medicine and finally Pro-Vice-Chancellor for Health Sciences. His research on the physiology of epithelial ducts, beginning with those of the kidney but later centring on salivary glands and the pancreas, brought him international recognition as a leader in the field. He made significant contributions to professional societies and was recognised with international and national awards including membership of the Order of Australia. A bronze portrait head of Young by sculptor Dan Lake is displayed in the foyer of the Edward Ford building at the University of Sydney. He was a man of great culture, a witty conversationalist and a great scientist.

Keywords: Atherton, Berlin, biochemistry, epithelial, governance, Kanematsu, kidney, physiology.

Introduction

John Young (1936–2004) (Fig. 1) was a world leader in exocrine physiology.[1] He trained many Australian physiologists and from his laboratory at the University of Sydney he maintained extensive collaborations with physiologists in other countries. This biographical memoir draws on information provided by Young to the Australian Academy of Science (AAS),[2] and from the numerous obituaries to which his colleague David I. Cook was a major contributor.[3]

Young was born in Brisbane on 18 April 1936 to William Young and his wife Betty Clare née Atherton. William was a graduate of the University of Queensland (Master of Applied Science, 1934) and member of the Australian Chemical Institute who was employed as a plywood and veneer technologist in the Government of Queensland Department of Forestry. Betty was a member of a prominent pastoral family, descendents of John Atherton (1837–1913) after whom a city and region in Queensland are named.[4]

School and university

After attending local primary schools, John Young was enrolled (1950–3) at Brisbane Church of England Grammar School where his father had also been a student. He was a talented student, winning prizes in the later years of schooling, participating fully in the life of the school and serving as a prefect in 1953. He represented the school in cricket, chess and debating and was a cadet pilot officer in the Air Training Corp. He took the state examinations in English, mathematics 1 and 2, chemistry, physics and logic, and was awarded a Commonwealth Scholarship for study at the University of Queensland.

[1]In contrast to endocrine glands that secrete their substances directly into the bloodstream, exocrine glands secrete their substances through ducts onto body surfaces or organs.
[2]The Australian Academy of Science holds biographical information provided by Young, including a list of publications and offices held and other material. It comprises the bulk of the Supplementary material that accompanies this biographical memoir.
[3]Cook (2003, 2004*a*, 2004*b*). Cook and Sefton (2004). Frömter and Cook (2004). Case (2019).
[4]Atherton (1969).

Published: 29 May 2024

Cite this: Rae, I. D. (2024) John Atherton Young 1936–2004. *Historical Records of Australian Science*, doi:10.1071/HR24007

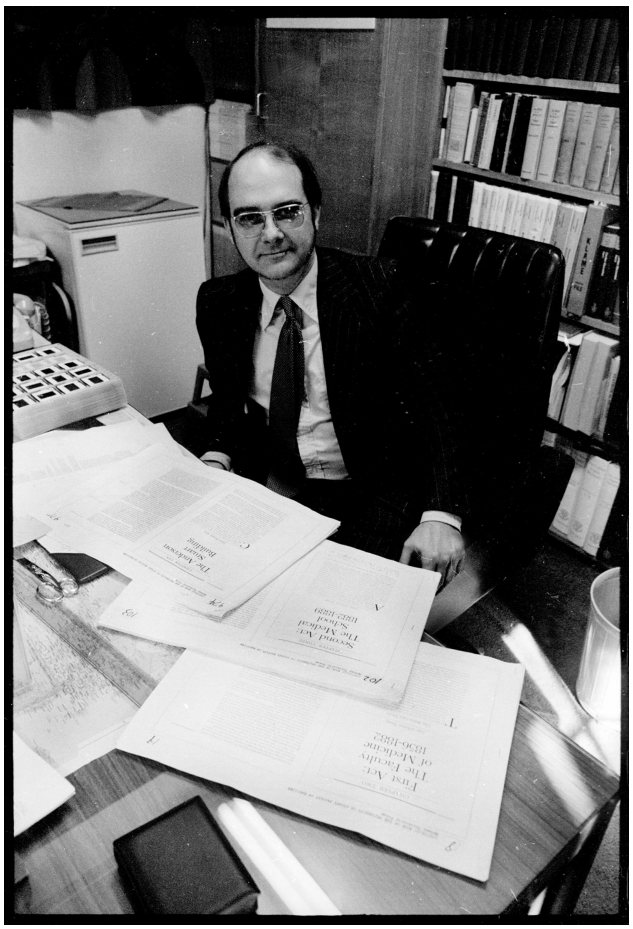

Fig. 1. Professor John Atherton Young with Proofs of Centenary History of the Faculty of Medicine (1983), [REF-00012920]. University of Sydney Archives, accessed 28/05/2024, https://archives-search.sydney.edu.au/nodes/view/31387.

Young enrolled in the medical course, graduating MB BS in 1960 with first class honours and the university medal. Already expressing a special interest in pathology, he had studied in that department in 1956 and graduated with BSc (Hons I) before completing his medical studies. He undertook an internship at the Royal Brisbane Hospital before moving to Sydney for postdoctoral study at the Kanematsu Institute.[5] His decision about where to continue his research studies was likely influenced by Professor A. J. Canny, the head of pathology at the University of Queensland, who had been deputy director of the institute before moving to Brisbane in 1946.[6]

Kanematsu Institute

At the Kanematsu Institute, Young worked with K. D. G. (David) Edwards (1929–2016),[7] who had established himself as an expert in renal studies. Together, they used the technique of stop-flow analysis that enabled equilibrium concentrations of secreted substances to develop in the nephron[8] of the dog, thus facilitating the measurement of individual constituents.[9] Their first paper was published in the journal of the recently-established Australian Society for Medical Research.[10] Over the next few years several papers describing the results of their experiments were published in local and international journals (see Supplementary material). They constituted an extended pharmacological investigation of way that α-methyldopa (α-methyl-3,4-dihydroxyphenlalanaine, a substance used in treatment of high blood pressure) and other catecholamines behaved in the kidney, notably, as predicted, that they interfered with behaviour there of neutral amino acids such as histidine and serine.

To undertake this research, Young needed a thorough knowledge of kidney structure and function, and a command of analytical chemistry that, because of the nature of the research, came under the heading of biochemistry. Details of this part of Young's research seldom appear in reviews or other accounts but they contained significant original research. In a 1964 paper, for example, Young and Edwards described how concentrations of sodium and potassium were measured by flame photometry.[11] Creatinine and other substances were converted by means of chemical reactions to coloured substances, the concentrations of which could be measured by colorimetry, as could the concentration of bright red phenolsulfonphthalein that had been used to monitor flow through the kidney. Amino acids were separated by paper chromatography or high-voltage paper electrophoresis, following which the separated spots were treated with ninhydrin stain and fixed with copper nitrate before being eluted so that solution concentrations could be measured spectrophotometrically.

[5]The institute, opened in 1933, was a gift to Sydney Hospital from the F. Kanematsu trading company, in memory of the founder Fusajiro Kanekatsu and his wife Sen and in recognition of the medical care and support provided to Japanese immigrants. Winton (1997).
[6]Robertson (1964).
[7]Kenneth David Gilmore Edwards was a graduate of the University of Sydney (MB BS 1953; MD 1962)—Edwards (1962)—who worked at the institute until the mid-1970s before relocating to the United States.
[8]Each kidney has about a million nephrons, the functional units involved in the removal of waste and excess substances from the blood and the production of urine.
[9]Malvin and others (1958).
[10]Young and Edwards (1963). The Society was founded in 1961, with most of its members in Sydney. Its journal was first published under the title *Medical Research*. In the first issue, its president Barry Firkin (1930–2001) of Royal Prince Alfred Hospital described the main purpose of the Society as enabling 'the young medical graduate to present his work to his own club, to benefit from the resultant discussion, and to meet colleagues of his own age from other disciplines, institutions and States'. Firkin (1961).
[11]Young and Edwards (1964).

In 1965, the University of Queensland awarded Young an MD degree for his work at the Kanematsu Institute. He was also awarded a C. J. Martin Fellowship by the National Health and Medical Research Council that enabled him to travel to Europe for post-doctoral studies that he undertook with Professor Karl Ullrich (1925–2010)[12] at the Free University of Berlin.[13]

Berlin

It was Young's intention to learn in Ullrich's laboratory the micropuncture techniques that he could use in further studies of renal flow, but while continuing with renal work, Ullrich was also extending his studies to salivary and sweat glands, and it was to the first of these that Young's research was directed. In the years ahead, salivary glands, and later the pancreas, were to replace the kidney as the main objects of Young's research. Results in Berlin were quick to come, with Young speaking at the December 1965 meeting of the Physiological Society in London about the micropuncture of rat salivary glands using glass capillaries.[14] This technique, which involved the collection of saliva samples in glass capillaries with sharpened tips (diameter 7–10 μm) that had been inserted at various parts of the duct system, was developed at the Free University by Ullrich's colleage, J. R. Martinez.[15] The work was reported in full in the following year,[16] but by then it had attracted the attention of a leading salivary physiologist, Sir Arnold Burge FRS (1922–2022), who sought permission to cite Young's data in a forthcoming presentation and secured an invitation for Young to be a plenary speaker at a conference in Birmingham, Alabama.

A major publication from Young's time in Berlin concerned the distribution of sodium and potassium in the salivary gland of the rat.[17] This followed earlier studies by the group on the way that a primary saliva was produced in the first part of the gland but then electrolyte secretion and resorption during passage along the salivary duct system reduced its sodium concentration and increased that of potassium. The researchers found that both cations underwent active transport in the main duct prior to excretion and that there was a logarithmic dependence of sodium concentration across the system on pH values measured by the glass microelectrodes. As with Young's physiological studies of renal ducts at the Kanematsu Institute, described above, biochemistry was important. Sodium and potassium concentrations were again measured by flame photometry, and 'osmolality'(a measure of solution ionic strength) was determined by freezing point depression using 0.5 nL samples. Concentrations of inulin-C^{14}, trace quantities of which had been included in the perfusate to track water movement across the duct epithelium, were followed by liquid scintillation counting.

University of Sydney

In late 1966, Young returned to Australia as a senior lecturer in the Department of Physiology at the University of Sydney where, ten years later, he became a professor. Most of his research in that period concerned salivary glands of rats and rabbits (see bibliography in Supplementary material). Initially the work was conducted with live animals,[18] but during a 1971 leave spent with H. Knauf at the Max Planck Institut für Biophysik in Frankfurt am Main, Young changed to perfusion experiments in isolated tissues and used this technique to study the transport of a number of hormones and neurotransmitters.[19] Individually and with his colleague Dr Ernest Willem van Lennep from the Department of Anatomy and Histology at Sydney he also published significant reviews that covered his work and that of others.[20] With his student W. E. Sewell he applied the techniques developed in his Sydney laboratory to the rat pancreas,[21] and this led to a fruitful collaboration with Maynard Case (1943–) at the University of Manchester where Young spent a period of sabbatical leave in 1981,[22] and Case made a reciprocal visit to Sydney in 1977. [23]

Young had a long term collaboration with David Cook (MBBS 1983, MSc 1984), who was appointed to a

[12] Frömter and Schulz (2011).
[13] The fellowships were inaugurated by the NH&MRC in 1951 to commemorate the work of physiologist and pathologist Sir Charles James Martin (1866–1955).
[14] Schögel and Young (1966).
[15] Martinez and others (1966). The use of extremely fine glass tubes, typically a few μm in diameter and filled with saline, as micro-electrodes had been introduced in 1946 by neurophysiologists Graham and Gerard at the University of Chicago (Graham and Gerard 1946). The technique was further developed by John Eccles (Curtis and Andersen 2001) who used it most successfully in his subsequent appointment at the Australian National University. Together with the technical staff members who had prepared the glass micro-electrodes (Brock) and the electrical circuitry (Coombs), Eccles published the experimental set-up in great detail (Brock and others 1952). Such acknowledgement of technical contributions was uncommon (Shapin 1989).
[16] Young and Schögel (1966).
[17] Young and others (1967).
[18] Martin and Young (1971*a*, 1971*b*).
[19] Denniss and Young (1975).
[20] Young (1979). Young and van Lennep (1978). Van Lennep and Young (1979).
[21] Sewell and Young (1975).
[22] Case (2019).
[23] Conigrave and others (1978).

lectureship in the Department of Physiology in 1987 after earlier intermitting his medical studies to conduct research with Young and graduating BSc (Medical) (Honours) in 1980.[24] Cook was a co-author with Young on several publications arising from this BSc work, and all of those after 1987 (Supplementary material) as Young was increasingly drawn into administrative work as Dean of Medicine and then Pro-Vice-Chancellor. Young and Cook were especially involved from the mid-1980s in studies of the electrical influences on duct transmission using the patch-clamp techniques that had been described some years earlier by Neher and Sakmann.[25] High resolution results were obtained by limiting the area from which current was measured to a small area (the 'patch') by pressing against the patch a glass pipette micro-electrode with tip diameter 3–5 μm. The electrical currents originating in the tissue flowed through the pipette, the potential of which was held to ground (the 'clamp'). The end result of this work was elucidation of the ductal salt and water transport in a number of glands.

Over the next decade, Young and Cook, together with van Lennep and other collaborators, made major contributions to the study of salivary glands (see bibliography in Supplementary material). These involved electrolytes (inorganic substances)—in particular the co-transport of Na^+ and Cl^- ions, and exchanges between Na^+ and H^+ and between HCO_3^- and Cl^-—and the movement of organic substances such as proteins and peptides, as well as the messenger substance, cyclic AMP. The expansion of research in this field, not only by the Sydney group, was captured in two major chapters they contributed to a work on gastrointestinal physiology. In 1987, with Young as first author, the chapter included 33 pages of text and 423 references.[26] The 1994 chapter, revised and brought up-to-date and with Cook as lead author, included 43 pages and included 625 references.[27] As reflected in the size of these reviews, the research field was extraordinarily complex, in respect of which Young and van Lennep, in the introduction of a 1979 review, issued a warning that although salivary glands were readily accessible to the 'interested investigator', the extent of the literature:

> reflects the enormous structural diversity of the glands, a diversity that contrasts strikingly with the structural homogeneity of the pancreas as seen in a wide range of mammalian species. This structural heterogeneity of salivary glands is associated with a comparable physiological heterogeneity that necessitates performance of many comparative physiological investigations before generalizations concerning salivary functions can be advanced with much confidence. The extent of this diversity of structure and function will become apparent in the following pages where differences among species will be emphasized in order to discourage development of simplistic (as distinct from simple) hypotheses.[28]

University governance

As a representative of academic staff, Young was involved with aspects of university governance at Sydney in a number of ways. In 1976 he was elected by his colleagues to the Council of the Sydney Association of University Teachers, and he was president of that organisation in 1977. He was deputy chair of the Academic Board (1978–80) with consequent membership of important university committees, and he served several terms during 1978–93 on the University Senate. At department and faculty level he was also gaining administrative experience as head of department (in rotation with Professor Liam Burke) and as Sub-dean for Academic Affairs of the Faculty of Medicine from 1978, before becoming Dean of Medicine in 1989 (Fig. 2). In 1994, he became Pro-Vice-Chancellor for Health Sciences, taking him to retirement in 2003.

As Dean he oversaw the study of medicine extended from a three- to a four-year postgraduate program with its first intake planned for 1997. The new medical course was based on problem-based-learning through which students were expected to 'efficiently and effectively' learn how to apply and to grow their knowledge.[29] Details of the processes leading to change at Sydney were provided in an article by Young's colleague, Ann Jervie Sefton, who noted that the University of Queensland and Flinders University who were also adopting the new style of medical curriculum. Although it was slow to be taken up by Australia's major medical schools, problem-based learning was integral to the five-year medical course at the University of Newcastle that had its first student intake in 1978,[30] and it was regarded by students and educators as successful.[31]

Young also led moves to decentralise medical education through the development of independent clinical schools that provided for medical education and research away from the Sydney campus, at first with the foundation of a

[24]Cook was one of the students who, intending to work in biomedical research after graduation and internship rather than go into clinical practice, chose to intermit their medical studies in this way, as Young himself had done.
[25]Cook and others (1986, 1988). Neher and Sakmann (1976). Hamill and others (1981).
[26]Young and others (1987).
[27]Cook and others (1994).
[28]Young and van Lennep (1979).
[29]Lazarus (1995).
[30]Clarke (1978).
[31]Colditz (1980). Clarke and others (1984). Foy (1986). Sefton (1995).

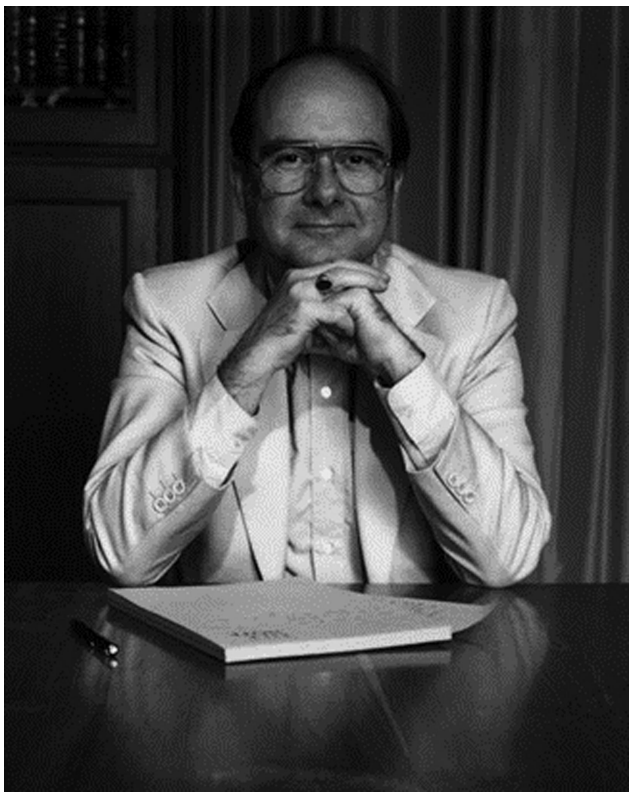

Fig. 2. John Young as Dean of the Faculty of Medicine, University of Sydney. Photo courtesy of the Australian Academy of Science.

clinical school in Canberra,[32] and then at the Menzies School of Health Research in Darwin,[33] the Kolling Institute at Sydney's Royal North Shore Hospital and the Anzac Institute at Concord Hospital.

Participation and recognition

Young was elected by his peers to significant positions in Australian science, but he was not one merely to accept these honours: he contributed time and expertise to a number of organisations. For the Australasian Physiological and Pharmacological Society he served as councillor (1969–73), editor of the *Proceedings* (1973–5), national secretary (1983–8) and president (1995–2000). He occupied similar offices in the Federation of Asian and Oceanian Physiological Societies between 1990 and 2002, and served as a member of council for the International Union of Physiological Sciences (1993–2001). He was a fellow of the Royal Australasian College of Physicians (1976) and he was elected to fellowship of the Australian Academy of Science in 1986. There he served in 1990 as a member of the 'border subject' working party that considered categories in which the merits of potential fellows working in non-traditional subject areas could be assessed; as a member of council 1989–92, 1998–2002; secretary (biological sciences) 1998–2002; and vice-president 1998–2002. He was editor of the proceedings of a symposium held in conjunction with the annual general meeting of the Academy in 1993 (*Biological membranes*), and organiser of the scientific discussion meeting held at Bowral NSW in April 1994, 'Ion transfer across epithelial membranes', to which his colleague Cook and long-term collaborator Frömter (who had travelled from Germany for the meeting) contributed. In 1988, Young was appointed to a research professorship of the highly-endowed Alexander von Humboldt Stiftung that supported him to work in Germany.

In January 1994, Young become an Officer of the Order of Australia (AO), for 'service to medical science, particularly in the field of physiology'. In January 2001, he was awarded a Centenary Medal, the citation reading 'for service to Australian society and science in epithelial transport and university administration'.

In October 1996, Young's colleagues from Australia and around the world gathered in Bowral, NSW, at a symposium on exocrine secretions in celebration of his sixtieth birthday and his thirty years' contribution to exocrine physiology.[34] Subscriptions from colleagues supported the production of a bronze portrait head of Young by Sydney sculptor Dan Lake and it was presented to the University of Sydney where it is now on display in the Edward Ford building that houses the School of Public Health and Tropical Medicine and the Poche Centre for Indigenous Health (Fig. 3).[35]

Young retained the plaster bust from which the bronze was cast and he willed it to the Australian Academy of Science. However, when the executors of Young's will were approached by the director of the Australian Institute of Archaeology in Athens, Greece, asking for it to be located there in view of Young's connection their work, they passed the request on to the academy which agreed to make it available to the Institute on permanent loan.

Personal life

While staying at St Paul's College at the University of Sydney in the early 1960s, Young began a close relationship with Alexander Cambitoglou (1922–2019) that ended only with Young's death in 2004. Cambitoglou joined the University of Sydney as senior lecturer in archaeology and in 1963 he was

[32]The school was attached to the Woden Valley Hospital and opened in 1993. Gatenby (1996).
[33]Mathews (1998).
[34]The published proceedings of the meeting (Dinudom and Komwatana 1996) include a biographical note and a scientific appreciation by David Cook and a foreword by Trefor Morgan.
[35]Sir Edward Ford (1902–1986), a bacteriologist and expert in tropical medicine, was dean of the faculty of medicine at the University of Sydney (1952–7) and a member of Australia's National Health and Medical Research Council (1947–68). Tyquin (2007).

Fig. 3. Bronze portrait head of Young, by Dan Lake. Photo courtesy of Professor Chris Dickmann.

appointed Professor of Classical Archaeology and, in the same year, curator of the university's Nicholson archaeological museum.[36] Together, Young and Cambitoglou initiated a series of Nicholson Museum Concerts at the University of Sydney and assisted in the creation of the Australian Institute of Archaeology in Athens, of which they were strong supporters.

Outside the fields of physiology that he researched, in the mid-1980s Young turned his hand to writing history, first as co-editor with two of his colleagues of a centenary history of the Faculty of Medicine.[37] Perhaps as a result of his work on that volume, he went on (writing as J. Atherton Young, presumably to differentiate himself from other 'John Young' authors, of whom there were several), to contribute biographies of three biomedical scientists to the *Australian Dictionary of Biography*.[38] During that time he also turned his attention to a member of his wife's Atherton family, editing the letters of Jane Bardsley (1877–1943), a pioneer settler in north Queensland who was married to Tom Atherton.[39]

Concluding remarks

A period working with Young as a student or a post-doctoral fellow was the foundation of many a successful career, because Young was a considerate and influential mentor. At least a dozen of those who emerged from his laboratory achieved the rank of professor in Australian (and in one case, overseas) universities. A list of twelve is included in the Supplementary material. Young's impact on the world of physiology was not limited to his scientific achievements but extended to his own cultural life and to the collegiality that he fostered among physiologists in Australia and world-wide. His biographers described him as having 'a true appreciation of the finer things of life', who chose Berlin over Chapel Hill, USA,[40] as a place to undertake postdoctoral studies because of the richer cultural life in Germany, and as 'a highly civilised humanist with a special interest in German history and literature and a deep love of music, in particular opera'.[41]

His close collaborator for many years, David Cook, wrote[42] that:

> Many will have fond memories of impromptu sightseeing tours or visits to the opera organized by John to fill in lulls in the scientific program and have been amused and educated by his knowledge and witty conversation over meals in interesting restaurants all over the world.

Young died of acute myeloid leukaemia in February 2004.

Supplementary material

Supplementary material is available online.

References

Atherton, L. (1969) John Atherton (1837–1913), *Australian Dictionary of Biography*, **3**, 57–58. https://adb.anu.edu.au/biography/atherton-john-2907, viewed November 2023.

[36] Papadopoulos (2020).
[37] Young and others (1984).
[38] Young (1988*a*, 1988*b*, 1990).
[39] Young (1987).
[40] The reference is to centres of research in North Carolina where, shortly before he took up the position at the Free University in Berlin, Karl Ulrich had spent a sabbatical with Bodi Schmidt-Nielsen at Durham and Carl Gottschalk at Chapel Hill (Frömter and Schulz 2011).
[41] Frömter and Cook (2004).
[42] Cook (2004*b*).

Brock, L. G., Coombs, J. S., and Eccles, J. C. (1952) The recording of potentials from motoneurones with an intracellular electrode, *Journal of Physiology*, **117**, 431–460. doi:10.1113/jphysiol.1952.sp004759

Case, M. (2019) John Atherton Young (1936–2004). https://static.physoc.org/app/uploads/2019/02/22200425/Young-John-full-obituary.pdf, viewed November 2023.

Clarke, R. (1978) The new medical school at Newcastle, New South Wales, *Medical journal of Australia*, **1**, 255–256. doi:10.5694/j.1326-5377.1978.tb112519.x

Clarke, R. M., Feletti, G. I., and Engel, C. E. (1984) Student perceptions of the learning environment in a new medical school, *Medical Education*, **18**, 321–325. doi:10.1111/j.1365-2923.1984.tb01276.x

Colditz, G. A. (1980) The students' view of an innovative undergraduate medical course: the first year at the University of Newcastle, N.S.W, *Medical Education*, **14**, 320–325. doi:10.1111/j.1365-2923.1980.tb02374.x

Conigrave, A. D., Novak, I., Case, R. M., and Young, J. A. (1978) The role of bicarbonate in the salivary secretory process, *Proceedings of the Australasian Physiological and Pharmacological Society*, **9**, 115P.

Cook, D. I. (2003) In memoriam: John Atherton Young AO, FAA, FRACP (1936–2004), *European Journal of Morphology*, **41**(2), 79–81. doi:10.1080/09243860412331282165

Cook, D. I. (2004*a*) John Atherton Young AO, FAA, BSc, MB BS, MD, DSc, FRACP, *Medical Journal of Australia*, **181**(1), 449.

Cook, D. I. (2004*b*) John Atherton Young AO, FAA FRACP (1936-2004), *Proceedings of the Australian Physiological and Pharmacological Society*, **34**, 151–155.

Cook, D. I. and Sefton, A. J. (2004) A force for change beyond science, *Sydney Morning Herald*, 8 March. https://www.smh.com.au/national/a-force-for-change-beyond-science-20040308-gdihvo.html, viewed September 2023.

Cook, D. I., Towner, S. P., and Young, J. A. (1986) Patch-clamp studies of cultured salivary cells, *Biomedical Research*, **1**(Supplement 2), 203–207.

Cook, D. I., Day, M. L., Champion, M. P., and Young, J. A. (1988) Ca^{2+} not cyclic AMP mediates the fluid secretory response to isoproterenol in the rat mandibular salivary gland: whole-cell patch-clamp studies, *Pflügers Archiv*, **413**, 67–76. doi:10.1007/BF00581230

Cook, D. I., van Lennep, E. W., Roberts, M. L., and Young, J. A. (1994) 'Secretion by the major salivary glands', in *Physiology of the Gastrointestinal Tract*, ed. L. R. Johnson, vol. 2, 3rd edn, Raven Press, New York, pp. 1061–1117.

Curtis, D. R., and Andersen, P. (2001) John Carew Eccles (1903–1997), *Historical Records of Australian Science*, **13**(4), 439–473. doi:10.1071/hr0011340439

Denniss, A. R., and Young, J. A. (1975) The action of neurotransmitter hormones and analogues and cyclic nucleotides and theophylline on electrolyte transport by the excretory duct of the rabbit mandibular gland, *Pflügers Archiv*, **357**, 77–89. doi:10.1007/BF00584546

Dinudom, A. and Komwatana, P. (eds) (1996) *Studies in honour of John Atherton Young: 60th birthday celebration*, Milton Park Estate, Bowral NSW 2–4 October 1996, Laboratory of Exocrine Physiology and Biophysics, Department of Physiology, University of Sydney, NSW.

Edwards, K. D. G. (1962) Renal tubular activities, *Australasian Annals of Medicine*, **11**(1), 59–70. doi:10.1111/imj.1962.11.1.59

Firkin, B. G. (1961) Presidential address, *Medical Research: Journal of the Australian Society for Medical Research*, **1**(1), 1.

Foy, A. (1986) The Newcastle experience, *Australian Drug and Alcohol Review*, **5**, 83–84. doi:10.1080/09595238680000201

Frömter, E., and Cook, D. I. (2004) John Atherton Young 1936–2004, *Pflügers Archiv*, **448**(5), 469–470. doi:10.1007/s00424-004-1294-1

Frömter, E., and Schulz, I. (2011) Karl Julius Ullrich, 1925–2010—obituary, *Pflügers Archiv*, **461**, 203–205. doi:10.1007/s00424-010-0896-z

Gatenby, P. A. (1996) Creation of an academic medical centre: management and service delivery at the Canberra Clinical School, *Australian Health Review*, **19**(1), 107–115. doi:10.1071/ah960107

Graham, J., and Gerard, R. W. (1946) Membrane potentials and excitation of impaled single muscle fibers, *Journal of Cellular and Comparative Physiology*, **28**(1), 99–117. doi:10.1002/jcp.1030280106

Hamill, O. P., Marty, A., Neher, E., Sakmann, B., and Sigworth, F. J. (1981) Improved patch-clamp techniques for high-resolution current recording from cells and cell-free membrane patches, *Pflugers Archiv*, **391**, 85–100. doi:10.1007/BF00656997

Lazarus, R. (1995) Medical education at the University of Sydney, *Australian Journal of Public Health*, **19**(5), 526–527. doi:10.1111/j.1753-6405.1995.tb00426.x

Malvin, R. L., Wilde, W. S., and Sullivan, L. P. (1958) Localization of nephron transport by stop-flow analysis, *American Journal of Physiology*, **194**(1), 135–142. doi:10.1152/ajplegacy.1958.194.1.135

Martin, C. J., and Young, J. A. (1971*a*) A microperfusion investigation of the effects of a sympathomimetic and a parasympathomimetic drug on water and electrolyte fluxes in the main duct of the rat submaxillary gland, *Pflügers Archiv*, **327**, 303–323. doi:10.1007/BF00588450

Martin, C. J., and Young, J. A. (1971*b*) Electrolyte concentrations in primary and final saliva of the rat sublingual gland studied by micropuncture and catheterization techniques, *Pflügers Archiv*, **324**, 344–360. doi:10.1007/BF00592462

Martinez, J. R., Holzgreve, H., and Frick, A. (1966) Micropuncture study of submaxillary glands of adult rats, *Pflügers Archiv*, **290**(2), 124–133. doi:10.1007/BF00363690

Mathews, J. D. (1998) The Menzies School of Health research offers a new paradigm of cooperative research, *Medical journal of Australia*, **169**(11–12), 625–629. doi:10.5694/j.1326-5377.1998.tb123439.x

Neher, E., and Sakmann, B. (1976) Single-channel currents recorded from membrane of denervated frog muscle fibres, *Nature*, **260**, 799–802. doi:10.1038/260799a0

Papadopoulos, J. K. (2020) Alexander Cambitoglou, 1922–2019, *American Journal of Archaeology*, **124**(4), 695–698. doi:10.3764/aja.124.4.0695

Robertson, A. (1964) Alan Joseph Canny: obituary, *Medical Journal of Australia*, 815–816.

Schögel, E., and Young, J. A. (1966) Micropuncture and perfusion investigation of sodium and potassium transport in the rat submaxillary gland, *Journal of Physiology*, **183**(Issue Supplement), 73–75P.

Sefton, A. J. (1995) Australian medical education in a time of change: a view from the University of Sydney, *Medical Education*, **29**, 181–186. doi:10.1111/j.1365-2923.1995.tb02827.x

Sewell, W. A., and Young, J. A. (1975) Secretion of electrolytes by the pancreas of the anaestetized rat, *Journal of Physiology*, **252**(2), 379–396. doi:10.1113/jphysiol.1975.sp011149

Shapin, S. (1989) The invisible technician, *American Scientist*, **77**(6), 554–563.

Tyquin, M. B. (2007) Sir Edward (Ted) Ford (1902–1986), *Australian Dictionary of Biography*, **17**, 400–401. http://adb.anu.edu.au/biography/ford-sir-edward-ted-12503/text22497, viewed November 2023.

Van Lennep, E. W. and Young, J. A. (1979) 'Salt glands', in *Membrane Transport in Biology*, *vol. IV B, Transport Organs*, ed. G. Giebisch, Springer-Verlag, Berlin, pp. 675–692.

Winton, R. R. (1997) *Kanematsu's Great Gift*, Kanematsu Fund, North Parramatta, NSW.

Young, J. A. (1979) 'Salivary secretion of inorganic electrolytes', in *International Review of Physiology, Gastrointestinal Physiology III*, ed. R. K. Crane, vol. 19, University Park Press, Baltimore, pp. 1–58.

Young, J. A. (ed.) (1987) *Jane Bardsley's Outback Letterbook Across the Years 1896–1936*, Angus & Robertson, North Ryde, NSW.

Young, J. A. (1988*a*) Henry Priestley (1884–1961), *Australian Dictionary of Biography*, **11**, 294–295. https://adb.anu.edu.au/biography/priestley-henry-8114, viewed November 2023.

Young, J. A. (1988*b*) Robert Scot Skirving (1895–1956), *Australian Dictionary of Biography*, **11**, 626–627. https://adb.anu.edu.au/biography/skirving-robert-scot-8448, viewed November 2023.

Young, J. A. (1990) Sir Thomas Peter Anderson Stuart (1856–1920), *Australian Dictionary of Biography*, **12**, 130–132. https://adb.anu.edu.au/biography/anderson-stuart-sir-thomas-peter-8707, viewed November 2023.

Young, J. A., and Edwards, K. D. G. (1963) Stop-flow analysis of renal tubular function adapted to the rat, *Proceedings of the Australian Society for Medical Research*, **1**, 83.

Young, J. A., and Edwards, K. D. (1964) Stop-flow analysis of renal tubular function in the rat undergoing osmotic diuresis due to creatinine loading, *Australian Journal of Experimental Biology and Medical Science*, **42**, 667–688. doi:10.1038/icb.1964.64

Young, J. A., and Schögel, E. (1966) Micropuncture investigation of sodium and potassium excretion in rat submaxillary saliva, *Pflügers Archiv*, **291**, 85–98. doi:10.1007/BF00362654

Young, J. A. and van Lennep, E. W. (1978) *The Morphology of Salivary Gland*, Academic Press, London.
Young, J. A. and van Lennep, E. W. (1979) 'Transport in salivary and salt glands, Part I, salivary glands', in *Membrane Transport in Biology*, eds G. Giebisch, D. C. Tosteson, H. H. Ussing, M. E. Tosteson, vol. IVB, Springer-Verlag, Berlin, pp. 562–692.
Young, J. A., Frömter, E., Schögel, E., and Hermann, K. F. (1967) A microperfusion investigation of sodium resorption and potassium secretion by the main excretory duct of the rat submaxillary gland, *Pflügers Archiv*, **295**, 157–172. doi:10.1007/BF00362747
Young, J. A., Sefton, A. J., and Webb, N. (eds) (1984) *Centenary Book of the University of Sydney Faculty of Medicine*, University of Sydney, Sydney.
Young, J. A., Cook, D. I., van Lennep, E. W., and Roberts, M. (1987) 'Secretion by the major salivary glands', in *Physiology of the Gastrointestinal Tract*, ed. L. R. Johnson, vol. 1, 2nd edn, Raven Press, New York, pp. 773–815.

Data availability. No new data were generated or analysed during this study and data sharing is not applicable.

Conflicts of interest. The author is an editor of *Historical Records of Australian Science*. To mitigate this potential conflict of interest they had no editor-level access to this manuscript during peer review. The author declares no other conflict of interest.

Declaration of funding. This work received no specific funding.

Acknowledgements. The author acknowledges Professor Chris Dickman, University of Sydney.

Author affiliation
[A]School of Chemistry, University of Melbourne, Vic. 3010, Australia.