

The scientific legacy of the Rev. W. B. Clarke

R. W. Young

4 Roxburgh Ave, Thirroul, NSW 2515

Email: aryoung1453@gmail.com

Abstract

That the collective memory of even so dominant a figure in Australian colonial science as W. B. Clarke has faded 140 years after his death is hardly surprising. What is so striking is the marked variation in the degree to which his legacy is recognised, even where he was arguably the major contributor in his time. He is of continued interest to the Royal Society of NSW, but not so to most other learned societies. Though the focus of much work by Australian historians of science, he is virtually ignored in general histories of the country; remembered in geology, he is almost totally forgotten in meteorology. And when remembered, he has at times been reinterpreted; portrayed as Darwin's colonial 'bulldog', he actually had grave reservations about such theoretical constructs. Clarke's legacy is considered here as Memory Maintained and Restored, Memory Lost, and Myth as Memory.

Key words: Clarke, Australian, Science, History.

Introduction

When William Branwhite Clarke arrived in Sydney in 1839 he already had a considerable cultural and scientific reputation. He had published five books of poetry, had forty-one scientific papers to his name, mostly dealing with meteorology and geology, and had been elected to the prestigious Geological Society of London. Over the next four decades he played a major role in the development of colonial society in the broadest sense of the term. By the year of his death in 1878 he had published over 500 articles ranging from various aspects of science, especially geology, to free trade and the promotion of education (see Michael Organ's *Bibliography of W. B. Clarke*), and had established a worldwide network of scientific correspondence (see Ann Moyal's *The Web of Science*). He had also been very active in the revitalisation of the colony's

essentially moribund Philosophical Society in 1866 (under its new name of the Royal Society of New South Wales), the substantial upgrading of the Australian Museum in Sydney, the founding of the University of Sydney and its associated St. Paul's College, the setting up of the Academy of Art (that later became the Art Gallery of New South Wales); and he had served as a Trustee of the Free Public Library. Furthermore, he had been a prolific journalist for Sydney newspapers, especially *The Sydney Morning Herald*, occasionally acting as editor of that journal, and had given strong journalistic support to the expeditions by Leichhardt and Kennedy into remote areas of the continent. His efforts had received international recognition, notably in the awarding to him of the *Murchison Medal* of the Geological Society of London, and by his election to the Royal Society of London, with Charles

Darwin and the eminent economist William Stanley Jevons¹ as sponsors; and locally by the *Clarke Medal* of the Royal Society of New South Wales. All this was achieved in spare time from clerical duties as a priest of the Church of England (see R. W. Young *This Wonderfully Strange Country, Rev. W. B. Clarke Colonial Scientist*).

Clarke was certainly remembered with much respect by scientists who had known him. In the words of his friend, the eminent botanist Rev. Dr. William Woolls, “Mr. Clarke had a remarkable versatility of genius: he was a poet of no mean powers, a liberal theologian, an eloquent classic, an observing naturalist, whilst to the depth of philosophy he added the simplicity of a child and a fund of never failing humour.” In the next generation, it was not only geologists such as Richard Daintree and Charles Wilkinson who admired him, but also the highly respected chemist Archibald Liveridge (see Roy Macleod’s *Imperial Science under the Southern Cross*). Yet memory fades with time, and less than two decades after his death, Price Warung lamented in *Cosmos Magazine* that the public had so quickly all but forgotten this “Nestor of Australian Philosophers” (a title he attributed to the great botanist von Mueller). Whereas the memory of the general public is notoriously short, Clarke was still remembered well enough in 1887 to be given a substantial entry in the British publication *Dictionary of National Biography* edited by Leslie Stephen. A century later, however, he was dismissed in three condescending sentences over the two volumes of Manning Clark’s *A History of Australia*, and was not mentioned

in either the *Oxford Companion to Australian History* or Alan Atkinson’s recently published *The Europeans in Australia*. Of course, the lengthening of historical experience leads to a thinning out of collective memory, and scholarly specialisation leads to its fragmentation. Nonetheless, with a polymath such as Clarke, who had played an important role in a wide range of scientific, cultural and social aspects of colonial life, fading memory is more problematic.

What then of Clarke almost 140 years further on? To what extent is his legacy maintained in collective memory, and what has been the variable role of historians in its continuation or its loss? I consider these questions especially in the light of comments made by Eugen Rosenstock-Huussy in his controversial, though deeply insightful, *Out of Revolution, Autobiography of Western Man* (1969 pp. 697-8): “the historian is as often the grave-digger of our memories as their restorer. His work tests the duration of living memory, strengthens the rising, and buries the withered,” and “Myth, as modern literati use the word, is a substitute for lost memory.” The extent to which memory of Clarke has been retained, lost or converted into “myth” varies considerably both between and within the fields of interest in which he worked. As Michael Organ (1998) put it, “A knowledge of the breadth of his output leaves one with the belief that to simply proclaim him ‘the Father of Australian geology’ is to fail to do justice to his life’s work,” but dealing with his complete range of interests is beyond the scope of this review, which concentrates on his major scientific work.

¹ During his time at the Sydney Mint in the 1850s, Jevons had first known Clarke when both were members of the Philosophical Society of N.S.W.. — Ed.

Memory Maintained and Restored: Royal Society of New South Wales

The founding and nurturing of the Royal Society was undoubtedly one of Clarke's greatest achievements. As noted above, the Society honours him with the annual award of the Clarke Medal for original research, and he has certainly figured in the publications of the Society, especially in its *Journal & Proceedings*. In *A Contribution to the History of the Royal Society of New South Wales*, that was to have marked the 50th Anniversary of the Society, but which was delayed until 1918 largely owing to the stringencies of war, the prominent botanist J. H. Maiden did much to restore the memory of Clarke's efforts in the founding of the Society and especially in the changing of its name. He reminded his audience that according to Clarke's *Inaugural Address* of 1867 the old Philosophical Society had languished because its previous title gave the impression that the subjects discussed were of an "abstruse and abstract character ... which assigns to it an exclusiveness by which many are deterred from becoming members," and that Clarke had recommended "the more comprehensive and expressive title of the Royal Society" be adopted. Maiden also drew attention to Clarke's recognition of the need for the Society to be multidisciplinary, a stance that it has maintained in the face of the seemingly ever-increasing specialisation of scientific and literary journals.

In the Society's *Centenary Oration, The Challenge to Science, 1866: the Challenge of Science, 1966*, the well-known anthropologist A. P. Elkin praised Clarke as "the 'founding father' of our Royal Society," who, "In true Baconian spirit steered the Society along that path in which it would be able to take up the challenge of the country and the nation to science." In the second part of the *Ora-*

tion, entitled *The Passing of the Former Challenge*, Elkin proposed that the Society turn its attention to "the philosophical problems raised by science" that "are moral and social on the one hand, and cosmological on the other." Elkin rightly emphasised the importance of such issues in a world of nuclear weapons, and suggested that "the Society pay serious attention to the Philosophy, and by implication to the History of Science." Curiously, however, he made no mention of the assault on contemporary philosophy that was a major part of Clarke's *Inaugural Address* (see below).

In recent decades the *Journal & Proceedings* have included several notable reviews dealing with Clarke's scientific work, such as *The Bibliography of the Rev. W.B. Clarke* by Michael Organ (1994), *...a small fish in a big pond... the Reverend W.B. Clarke (1798-1878): what did he actually do?* by the same author (1998-99), and *Friends, Savants and Founders: W. B. Clarke and J. D. Dana* by Ann Moyal (2012).

Historical books and papers

Important contributions on Clarke were by no means limited to publications by the Royal Society. Indeed, the first really detailed account of Clarke's life and work appeared in 1944 when James Jervis wrote his first-rate review in the *Journal of the Royal Historical Society of Australia*. Clarke's scientific work was later placed in a broader context in Ann Mozley's (1967) *Evolution and the Climate of Opinion in Australia 1840-1876*, and was continued in Moyal's *A Bright and Savage Land* (1986). Popular interest in Clarke was markedly boosted by the details of his personal and family life given in *The Remarkable Reverend Clarke* by Elena Grainger (1986). The appreciation of his scientific effort increased markedly during the next decades

with the publishing of Moyal's (2003) *The Web of Science*, a two-volume compilation of Clarke's scientific correspondence (including all of Clarke's letters referred to here), and by R. W. Young in *This Wonderfully Strange Country, Rev. W. B. Clarke Colonial Scientist* (2015). Significant comment on Clarke has also been made in works on other subjects, as for example, in E. M. Webster's *Whirlwinds in the Plain* (1980), where his journalistic support of Ludwig Leichhardt in the confrontation with Sir Thomas Mitchell was reviewed in much detail.

Geology

Given Clarke's pioneering work on the geology of Australia, it is hardly surprising that he is best remembered in that science. For example, in 1911 C. A. Süßmilch said of him, "This great worker, the pioneer geologist of this State, laboured for many years singlehanded in a thinly populated area of vast extent;" and in 1999, when replying to the comment by T. G. Vallance that Clarke had been "a small fish in a small pond," Michael Organ wrote that "Perhaps 'a big fish in a big pond' would be a more appropriate epitaph." But it was not just in volumes recording the history of the development of Australian geology that he is remembered. To the contrary, the naming of the W. B. Clarke Geoscience Centre, at Londonderry, west of Sydney, is clear testimony of his ongoing legacy to Australian geology. That legacy is conveyed by the very site of the Centre on the clays and gravels of Tertiary age that were first described by Clarke in 1842, and by the view westward from it, "where the escarpment of the Blue Mountains forms the side of a great fault, the Wianamatta beds abut against the Hawkesbury rocks or recline at a high angle on the slopes" (Clarke 1867) — reference to the

easterly inclination of the Wianamatta beds shows that he recognised the escarpment to be the result of folding rather than just faulting *sensu stricto*. Moreover, the Wianamatta and the Hawkesbury are two of the major stratigraphic units named and mapped by him. The narrow gorges exiting from the Blue Mountains are likewise testimony of that legacy, for it was in a series of articles on these gorges published in *The Sydney Herald* on 12th December 1842 and 3rd January 1843 that Clarke first noted the shortcomings of Charles Darwin's theory of marine erosion of valleys, and tentatively proposed instead that they had been eroded by the streams that flow through them, albeit with once greater discharges. His subsequent mapping of river gravels along the summit and flanks of the escarpment into which the gorges were incised, together with his recognition by 1844 that the fossil fish preserved in the Wianamatta and Hawkesbury sediments were fresh water species, made Darwin's claim of marine erosion of the valleys unlikely (see Young 2007).

An important, although partly forgotten matter, was Clarke's own assessment of the early development of geology, the key to which is probably his *First Lecture on Geology to the Church Book Society* reported in *The Sydney Herald* on 7th April 1843. James Hutton, lauded in most histories as the founder of the discipline, was mentioned only briefly; the real founder in Clarke's eyes was William Smith:

It was not till the year 1790 that any correct observations appeared to have been made respecting the real state of the surface of the Earth. Mr. William Smith (a man who could never be mentioned without honour as the parent of English Geology), being employed as a surveyor, made the

observation that the island of England and Scotland was divided into bands of rocks and clays which succeeded each other in a certain order, never reversed, and that the certain distinguishing fossils, found in the rocks and clays, always belonged to the same formation, a discovery which had laid the foundations of the present science. From this dated all that could properly be called Geology.

Smith's forte was systematic mapping, and Clarke was soon to be known as the "Australasian Smith" (see Young 2015).

As important as the Blue Mountains were in Clarke's early work in Australia, the recognition and mapping of major stratigraphic units that figured so prominently in his geological work was initially the product of seven surveys in the Illawarra and Shoalhaven districts on the coast south of Sydney. His first trip southward was early in 1840 with J. D. Dana, who had recently arrived with the U.S. Exploring Expedition; their major findings were summarised on the map of the Illawarra district drawn by Dana in 1840 and, with additions from Clarke, published in 1849. Clarke returned to this district in 1841 with the British geologist J. B. Jukes; their observations, together with those by Clarke elsewhere in the colony, were included in the first geological map of the continent published by Jukes in 1846. During these trips, Clarke had paid specific attention to coal-bearing strata, and by the end of 1847 he had mapped coal over some 17,000 square miles. His mapping was then greatly extended during two major expeditions to the newly discovered goldfields between northern Victoria and southern Queensland in 1851-53. Four decades of geological mapping by him culminated in *The Geological Sketch Map of New South Wales*

Compiled from the Original map of the Late Rev. W. B. Clarke by Charles Wilkinson Government Geologist, that was published by the Department of Mines in 1882. Subsequent mapping in the state has essentially been built on the foundation of those pioneering endeavours, and reference to him is scattered throughout numerous geological reports.

Yet this had not been mapping for mapping's sake, but was driven by Clarke's outlining to the Philosophical Society in 1861 of what he saw as "the principal object now in view which is the correlation of our Australasian formations with those of Europe." He has recently been criticised for being "perhaps too wedded to European stratigraphic concepts, tending to 'push' his observations to fit them" (Branagan 2012); perhaps, but how else could Australasian research be integrated into a global stratigraphic system? And behind that endeavour was Clarke's rejection, forcefully stated in his lecture to the Church Book Society in 1843 (reported in *The Herald*, 7 April), of earlier speculation about this land being fundamentally *different*; of being for example, as argued by Blumenbach, part of the sun displaced by a comet, then populated by *different* life forms.

Indeed, it was Clarke's pursuit of the similarities in the geological histories of the continents, especially those of the Southern Hemisphere, that gave rise to perhaps his most important theoretical contribution, that of the sundering of a once vast super-continent. He first speculated on this idea in a letter to his mentor at Cambridge, Adam Sedgwick, after arriving in Australia via southern Africa in 1839. He developed the idea more fully by correspondence with geologists in New Zealand and especially in India, where Ottakar Feistmantel, among

others, had begun working in detail on the Gondwana System. Whether Clarke believed in continental drift in its modern sense is uncertain (c.f. Grainger 1982, Moyal 2007, Young 2015), but he certainly was speculating on some form of large-scale continental sundering three-quarters of a century before Alfred Wegener published *Die Entstehung der Kontinente und Ozeane*. Grainger suggested that Clarke “may even have influenced Wegener,” but there is no mention of him in *Die Entstehung*—nor, for that matter, in any major reviews of the development of ideas on continental movement.

Colonial life in Australia was transformed by the great gold rushes after 1850, in which Clarke played a very significant, though still disputed, role. Although Edward Hargraves is still widely believed—though not by some experts in the matter—to have been the first discoverer of gold in Australia, both Clarke and Strzelecki claimed to have discovered it at least a decade earlier. The lack of a clear recording of events seems to have been the result not just of the conflicting claims by various “discoverers” (see Young 2015), but also both of government policy and the judgement of later historians. Clarke maintained that when in 1844 he had told Governor Gipps of his discovery of gold several years earlier, the Governor had replied, “Put it away, Mr. Clarke, or we will have our throats cut.” Clarke was later accused of fabricating this claim, as for example in *The Rush That Never Ended*, where Geoffrey Blainey wrote “While he has gone down in history as the author of that pithy sentence, ‘Put it away etc,’ Clarke himself was the author.” But, as Clarke had pointed out in *Researches in the Southern Goldfields*, Strzelecki had stated in his *Discovery of Gold in Australia* that Gipps had requested him to

remain silent about gold for the same reason that he gave to Clarke.

Memory Lost: Meteorology

The scientific field in which Clarke’s important pioneer contributions have been almost completely forgotten is meteorology, even though his output there was second only to that in geology. Before he departed for Australia, Clarke had already published 14 papers on the broad topic of meteorology, especially on the apparent relationships between atmospheric phenomena and volcanic activity, and between vegetation and climate. He then published four more in British journals, mainly from observations recorded on the voyage south. Although useful, these early papers gave little indication of the depth of understanding revealed in 1842 when he published 20 long articles, under the general heading of *Meteorology As Applicable to Australia*, in *The Sydney Herald* (16, 22 January, 7, 12 February, 1, 7, 11 March, 7, 14, 16, 22, 26, 30 April, 6, 16, 24 May, 3, 13, 15, 17 June). These were by no means just summaries of local events, but attempted to explain the major meteorological systems of varying scales operating over and around Australia, and displayed a thorough grasp of relevant knowledge worldwide at that time. These articles essentially formed the foundations of atmospheric studies in Australia.

Of particular importance was his grasp of the dominant role of weather systems moving across the continent from the west, and thereby the need to modify ideas about general circulation in the Southern Hemisphere.

Now this constant tendency of the wind from the west must materially modify any lower current, should the upper strata

descend, of which there is no question in many great aerial commotions ... But it is clear that, if westerly winds be constant, the doctrine which gives to the southern hemisphere a complete inverse condition of the direction of the wind must be modified: and then, in some cases, there can be no question, that the law of storms in the southern hemisphere will not appear as a complete reversal of those in the northern.

He also emphasised the importance of varying scales of phenomena, noting that while local winds were essentially a response to thermal and barometric conditions, atmospheric circulation on a much larger scale was dominant in the general movement of weather systems.

The last five of the articles in *The Herald* series dealt with “Hot Winds” and their bearing on the problem of the postulated arid interior. Clarke suggested that aridity might not be the dominant control, but rather that the wind might well be the cause of the desert, as was apparently the case in the deserts that lay between latitudes 15° to 30° N.

Should this be applicable to the southern hemisphere, then would the interior of Australia, within the course of circuit NW winds be placed within the desert zone of no rain, and the question of the cause of the desert zone might be satisfactorily resolved upon the principles we have adopted.

He was here close to the concept of the dominance of high-pressure systems moving from the west over the arid lands of that latitudinal belt.

Clarke published at least another 35 articles on meteorology between 1843 and 1863. He expanded on Strzelecki’s idea of

the switch in dominant rotation of winds from left to right in summer, to right to left in winter, thereby laying the foundation of understanding the seasonal change of cells of high and low pressure across the continent. He made valuable additions to Captain Henry Piddington’s *The Law of Storms*, especially in noting the great scale of cyclones in the Tasman Sea, that were of real importance in the age of sail. So too was his emphasis on the influx of tropical weather systems into southern Australia. And his highly detailed description in *The Herald* on 28th December 1850 of the great storm at Sydney a week earlier, which drew on observations from six barometers and 10 thermometers, gave weight to his comment in a letter to Adam Sedgwick in 1847, “I have logged about 100 thunderstorms — I put down every wink of lightning, and every grunt of thunder. I am sure that I have made out the law of such storms in the Colony so clear that I could wind one up and set it going.”

After about 1845 he became increasingly interested in temporal variations, both short and long term, especially of extreme events such as the cold weather of 1844 that he attributed to the movement of Antarctic icebergs observed as far north as 35° latitude. By 1847 he was propounding changes at the global scale by comparing the fluctuations in temperatures, recorded in the colony and in England, with observations of ice in adjacent oceans: “The cold and wet felt occasionally in New South Wales is probably also due to the ice set free from the Antarctic regions floating northwestwards, just as it flows southwards in the other hemisphere.” Then in 1851 he recognised evidence of much greater climatic fluctuations in the remains of former glaciation and frost action near Mt. Kosciuszko, and in the former outlet of Lake

George at Geary's Gap that indicated water levels "96 feet" above the now partly dry lake bed. As most of his observations appeared as articles in *The Sydney Morning Herald*, and as vivid descriptions in his *Researches in the Southern Goldfields*, details of the source and content of them are listed by Moyal (2003) and Young (2015).

The importance of Clarke's contribution in laying the foundations of atmospheric science in Australia was well appreciated by many of his contemporaries and by experts in the succeeding generation. When revising his *Climate of New South Wales* in 1877, the government meteorologist, H. C. Russell, drew substantially on Clarke's observations, and said of him, "In Meteorology, as in all that he did, Mr. Clarke was a most indefatigable worker and painstaking investigator." A decade later in his *Astronomical and Meteorological Workers in New South Wales*, Russell (1888, p 45) again paid tribute to "the very important contributions which came from his busy brain and pen." Clarke's contributions were still recognised after the turn of the century in the short historical review at the beginning of Griffith Taylor's *Australian Meteorology* (1920). But he received no mention among the prominent colonial researchers listed in W. J. Gibbs' *The Origins of Australian Meteorology* (1975) or in the revised edition of that work published by the Bureau of Meteorology in 1998. The only mention of Clarke in the Bureau's *Metarch Papers* is in the reprinting of Russell's 1889 paper, and in the *Australian Meteorological Magazine* a deprecating comment about him quoted from a letter by Ludwig Leichhardt that his "head is full of vortices and wind-classification, as you may well suppose from his extraordinary deductions" (Nicholls 2005).

Why Clarke's contributions have been overlooked remains speculative. Gibbs' review certainly extends to contributions made prior to Clarke's arrival in the colony, including those of Philip Parker King, who was Clarke's friend and meteorological correspondent. Perhaps it was Clarke's well-known reputation as a geologist which obscured his meteorological efforts, or it was that their publication mainly in newspapers rather than scientific journals resulted in them being overlooked. But how Russell's work, which was cited by Gibbs, could be read without the tribute to Clarke being noted seems very odd indeed! And the same could be said of a reading of Taylor's book without noting his reference to Clarke. Yet such was the case, and once Clarke was left out of the list of pioneers, the historian essentially had become the "grave digger."

Myth As Memory: Clarke as Darwinist

On page 11 of *The Remarkable Reverend Clarke* Elena Grainger declared that "if T. H. Huxley was Darwin's 'bulldog' in Britain and America, Clarke played the same role in Australia." Is this an accurate statement, or is it really to be seen in the context of a prevailing "myth"? C. S. Lewis in *The Funeral Of A Great Myth*, published in 1967 though written somewhat earlier, argued that "What the Myth uses is a selection from the scientific theories — a selection made at first, and modified afterwards, in obedience to imaginative and emotional needs." The central idea of the mythical vision that Lewis had come to bury (at least philosophically) had its roots early in the 19th Century, and was what its believers called "Development" or "Emergence," and which had attached to itself the scientific hypothesis of "Evolution," especially in the form advanced by Darwin.

Of course, the fossil record of changes in the history of life on earth must be distinguished from the hypotheses advanced to explain that history, and Darwin's major contribution was in the latter category. As the following quotation from *On the Origin of Species* (p 81) regarding the operation of the principle of the survival of the fittest shows, it already had its own metaphysical aura: "we may feel sure that any variation in the least degree injurious would be rigidly destroyed." And the penultimate sentence of that book leaves little doubt about why it was so rapidly incorporated into that prevailing "myth:" "Thus from the war of nature, from famine and death, the most exalted object of which we are capable of conceiving, namely the production of the higher animals, directly follows." That far more than a new scientific theory was being proclaimed is abundantly clear from Thomas Huxley's well-known description of Darwinism as the "New Reformation."

As noted above, while urging the Royal Society to pursue the philosophical setting and impact of science, Elkin in his *Centenary Address* made no mention of Clarke's polemic in the *Inaugural Address* against the then dominant philosophies, which he dismissed by quoting George Lewes' description of them as "a Desert whose only resemblance of vegetation is a mirage." For, Clarke said, "It is one thing to respect the method by which a logical argument is to be maintained, and another to defend the introduction of investigations which are often based on conjecture, and are altogether speculative." He made no attempt to gloss over his Christian commitment, remarking in the *Inaugural Address* that "there appears to me to be only one true Philosophy that which is given to and not elaborated by man," but

he was certainly no fundamentalist clinging to the Mosaic account of a six-day creation. To the contrary, in his lecture to the Church Book Society in 1843, he attacked the so-called "Scriptural Geologists" who held such views, and in reference to claims in Cowper's *The Task*, he stated that "if the date of the Earth, called 'in the beginning' was revealed to Moses, he had never been able to find where Moses said so; it was a pity that if Cowper knew the date he had not told us, and saved all the controversy." Moreover, he was the leading colonial palaeontologist and knew better than anyone else in Australia the great changes in the form of life that had occurred on this continent: as Richard Owen commented in a letter to him in 1872, "*Timeo Clarkeum et fossilia mittentem*" (I fear Clarke and the fossils he sends).

Although Clarke was also on generally cordial terms with Darwin, who eventually was one of his sponsors for his election to the Royal Society of London, care must be taken against reading too much into these relationships. Grainger entitled the chapter in which she discussed *The Origin of Species* as "Mr. Darwin's Book," but as is clear from a letter to Adam Sedgwick in 1839, the book to which Clarke actually referred by this title was not *The Origin of Species*, but rather Darwin's *Voyage of H.M.S. Beagle*. Indeed, in *The Geology of Australia*, a lecture given to the Philosophical Society of New South Wales in 1861, the year in which he first read *The Origin of Species*, Clarke's only reference to it was dismissive. Much also has been made of a passage in the *Inaugural Address* of 1867: "Nor is there any objection to the statement of arguments relating to the Origin of Species, or observations on which these arguments are based." But as Darwin is not mentioned by name, nor Origin of

Species set in the same format as all other references in the *Address*, Clarke was presumably commenting on the general hypothesis rather than the specific book. His rejection of Darwin's hypothesis was shown beyond doubt in *Extinct Animals* published in *The Sydney Herald* on 31st May 1869 where he wrote that he could not accept that "recent animals are the *offspring of the olden forms*; I believe that species as such were made by the Creator." This was not a clinging to fundamentalism in response to any Darwinian challenge, for the operative words were *species as such*. Clarke was well aware of variations within species, of the numerous examples of the sterility of cross breeding between species, and of the problematic nature of the extinction of species in the context of both space and time. It expresses rather his belief in structure and purpose, not chance, as the basic determinant of the history of life on Earth. That belief owed as much to his classical Aristotelian training, with its emphasis on change being limited to the *attributes* of species (*substances*) rather than to species *per se*, as it did to his Christian theology.

Furthermore, given Clarke's well-known deep concern for social welfare, especially that of convicts and Aborigines, his estrangement from Darwinism was surely completed by the rise of Social Darwinism that applied the rule of survival of the fittest to human affairs, and which was perhaps most aptly expressed in Darwin's own words from the *Descent of Man*:

... we institute poor-laws, and our medical men exert their utmost skill to save the life of every one to the last moment ... Thus the weak members of civilised societies propagate their kind. No one who has attended to the breeding of domestic animals will doubt that this must be highly

injurious to the race of man. It is surprising how soon a want of care, or care wrongly corrected leads to the degeneration of a domestic race; but excepting in the case of man itself, hardly any one is so ignorant to allow his worst animals to breed.

Ultimately Clarke's unwaveringly orthodox Christian faith could not be reconciled with, as he put it in a letter to John Dunmore Lang in 1877, "those who derive 'Man' from a speck of albuminous [albuminous] matter in a dirty ditch." To call him "Darwin's bulldog" was substituting myth for memory!

Research into comparative anatomy and molecular biology since Clarke's time has put paid to his claim that species are independent of their predecessors, but the Darwinian concept of life progressing from very limited beginnings to an increasingly complex array of forms has been subject to doubt in recent decades. As Simon Conway-Morris wrote in the *Crucible of Creation*, "... although the Darwinian framework provides the logical underpinning to explain organic evolution, the actual pattern of life we observe may require a more complex set of explanations." Thus, Clarke's misgivings about the Darwinian band-wagon, especially of the triumphalism trumpeted by Huxley, now seem more to the point than they did several decades ago.

Conclusion

Memory, whether personal or collective, obviously may range from true recollection to apparently total loss, while what may seem to be true can be actually a reconstruction to fit prevailing ideas or sentiments. Clarke's role as a founding father does much to account for the continuing and prominent memory of him in the Royal Society of New South Wales and in Australian geology in

general. Yet in both cases there is a prevailing tendency to look to the past as well as the present; geology is by its very nature an historical science, and is conscious of the major shifts that have occurred in its own development, while in deliberately maintaining a broad range of interests the Royal Society has essentially avoided the tight focussing on the latest discoveries characteristic of many specialist societies. Of course, pitfalls are ever present, as for example the dressing up of Clarke in Darwinian clothing. Australian historians of science have shown the importance of Clarke to our understanding of colonial society, and he remains relevant today especially because the theme of “Advancing Australia” underlay so much of his work, and, as he warned in *The Sydney Morning Herald* on 1st January 1847, “... we see in the present indefatigable exertions to develop [sic] the capabilities of New Holland something more than the solution of hydrographical or geographical problems.”

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