

The Parson to the Plankton: George Israel Playfair (1871–1922)

Stephen Skinner

*Royal Botanic Gardens and Domain Trust, National Herbarium of New South Wales,
Australian Botanic Garden, Locked Bag 6002, Mount Annan, New South Wales 2567
Correspondence: Stephen.Skinner@botanicgardens.nsw.gov.au*

Abstract

It is one hundred years since ‘the late G.I. Playfair, Australia’s foremost student of freshwater algae’ died, in Tauranga, New Zealand, but the value of his collection, and descriptions of many freshwater photosynthetic organisms from New South Wales, is current and growing.

Introduction

The beginnings of freshwater phycology in Australia were patchy and disparate (Cowan & Ducker, 2007). Ronald Gunn (1808–1881) included freshwater algae among his wide-ranging collections in Tasmania for William Henry Harvey. Henry Watts (1828–1889) collected across much of Victoria, corresponded with Harvey and other European scholars, and published in the *Victorian Naturalist*. Alfred Douglas Hardy (1870–1958), who worked for the Victorian Water Board, sent his specimens to George Stephen West, and published his findings in the *Victorian Naturalist*. Thomas Lane Bancroft (1860–1933) sampled algae in parts of Queensland, looking for mosquitoes, and passed on his algal collections to F.M. Bailey (1827–1915), who sent them to Martin Möbius, Oscar Borge and Wilhelm Schmidle, and then re-published their papers in translation in the *Botany Bulletin* (Queensland Department of Agriculture).

In New South Wales, George Israel Playfair investigated freshwater organisms at Lake George, on *Moura* station near Molong, and then, while fulfilling his duties as a Non-Conformist minister, at numerous sites around Sydney, Lismore and in the Richmond River catchment.

Playfair, born in Kent in 1871 and brought up in Wakefield, West Riding, Yorkshire, was the son of a woollen mill manager. Playfair was educated at nearby Silcoates Hall and travelled to the antipodes in the early 1890s. George, and his brother Thomas, left England on the SS *Oceana* on 2nd February 1893. His occupation is given as Auctioneer. According to the curriculum vitae on the fly of one of his notebooks, Playfair landed in New South Wales on ‘*Fri March 23rd 1893*’. He arrived with a fascination for microscopy and very likely an inherited microscope. He worked as a tutor at *Winderradeen*, near Lake George in 1894, at *Moura*, via Molong, in 1895, and *Everimar*, near Orange in 1897. He also taught at Scots College, Bellevue Hill in 1896. From 1898 to April 1900 Playfair worked as bookkeeper for a guano mining company in the Capricorn and Bunker Group off the Queensland coast, probably living on North West Island. For more on the mining operations see Daley & Griggs (2006).

On his return to Sydney, he looked for work, even though he appears to have had some ‘private means’. The colourful Rev. Edward Tremayne Dunstan had him appointed the lay pastor at Auburn Congregational Church in August 1900, and George threw himself into the task with gusto and skill. He raised funds and completed the building of the chapel, in Queen St, diagonally opposite St John of God Roman Catholic Church (Sands Directory, 1905, p204). [The building is long gone, lost under St John’s Primary School.] He joined with the other non-conformist clergy to set up a Protestant Endeavour Group for the youth. He arranged musical evenings, public prayer meetings, family picnics and much more. And while doing this he started writing papers on freshwater organisms for the Linnaean Society of New South Wales.

Playfair completed his ecclesiastical training in 1905 and was given a three-month position with a Presbyterian minister in Muswellbrook, and then returned to work at Dunstan’s *Whitefield Institute*, Pitt St, until May 1907. In May that year he returned to Auburn and continued there until July 1912. He was never ordained.

In 1907 Joseph Henry Maiden, the Director of the Royal Botanic Gardens, Sydney, had made him ‘honorary in charge of freshwater algae’ (Maiden 1913) a position he retained until 1912. His controversial paper on polymorphism in desmids (Playfair 1910) brought him some notoriety. He was awarded a Government Science Research Scholarship of the University of Sydney, in Hydrobiology and Plankton in 1913, through the Linnaean Society of NSW (*Daily Telegraph*, Thursday 27 March 1913: 12).

While his scientific fortunes were on the rise, his clerical star had faded a little. In August 1912 he moved to the northern rivers. He became a popular organist, marriage celebrant and lay preacher on the Presbyterian circuit around Lismore. He was involved in the tennis club and in fund raising for the war effort. He was given an extension of the scholarship by the University of Sydney in early 1915 (*Daily Telegraph*, Tuesday 13 April 1915: 8) and he was still publishing at that time. After finishing his research for the University of Sydney, he was appointed an assistant teacher at Murwillumbah Superior Public School in 1918 (*Northern Star*, Friday 16 August 1918: 4). Playfair did not appear to earn tertiary qualifications for his effort.

He became unwell in 1921 and went to the Bay of Plenty to stay with his brother and family to recover. Before he left for New Zealand, Playfair donated his scientific library, 111 items, to Linnaean Society of New South Wales (*Proc. Linn. Soc. NSW* 46(4): 531 1921). As the Society no longer has a library, Playfair’s books and journals are now scattered between the University of Sydney, the Australian Museum and the library of the Royal Botanic Gardens, Sydney. He didn’t stop collecting as there is a folder of notes and a number of specimen bottles from Tauranga.

He died in Tauranga, New Zealand on 8 October 1922 (New Zealand Register of Births, Deaths and Marriages 1922/8594; *Bay of Plenty Times*, 9 October 1922: 2). Despite searches, a grave or headstone is yet to be located (Dr Phil Novis, pers. comm.).

Methods

The on-line British Census site and the New Zealand Register of Births Deaths and Marriages, the National Archive of Australia, including the Trove search engine for Newspapers and magazines, were all used, as was the Daniel Solander Library at the National Herbarium of New South Wales. By providing access to local newspapers of the period, when articles on church events made good copy, Trove provided much background on Playfair’s non-scientific activities and dates for his awards. The special collections in the Daniel Solander Library included the notebooks and papers of Playfair and notes made by Valerie May when she was the Phycologist at NSW. These, along with the Journals, provided the material for a picture of Playfair the researcher.

Results

The Notebooks

There are ten notebooks. Some are records of collections, with tiny drawings, specimen dimensions and locality data (in code). Others are lists of bottles by contents and by locality. There is the one which gives a catalogue of all the bottles in the spirit collection with contents, an index to sites and an index to genera. In addition, there is a later catalogue, on lined paper folded in an envelope.

The list of books in the collection is as follows:

1. the little brown exercise book, with the 1894 pencil and water colour drawings;
2. the large Black Book, the foolscap exercise book referred to by Maiden (1913);

3. folder made from an exercise book cover marked *Cleve 1868*, loose leaves with various cross-referenced lists;
4. *Mathematics*, a red and blue exercise book from his Silcoates Hall days, used as a reference and library catalogue to 1914;
5. The small green exercise book, with plenty of collections and notes;
6. The red-edged black exercise book, an illustrated compilation of freshwater organisms from all kinds of sources..., his reference book and primer on taxa;
7. The little black book, a second bottle catalogue;
8. The book called ‘list of bottled specimens’ which has the lists of correspondents and who had received what, and more;
9. The very thin book, full of tracings and their sources;
10. *Future Use*, a letter writing paper pad used as a folder, with his New Zealand collection notes in it.

These were digitally imaged in 2007, and the images stored on a floppy disc. Fortunately, there has been a digital copy kept. A copy of the Catalogue is available on request from the librarian, Daniel Solander Library, Royal Botanic Gardens, Sydney.

There are also bundles of notes for almost all collecting sites, and of algal groups he wrote about. The folder covers are made from stiff brown paper, about A3 size and the better-preserved ones still have a double long stitch, to hold the contents in the folder. The notes are on both lined and unlined paper, and both sides are crammed with information about the organisms and where they were found.



Fig. 1. The Playfair spirit collection at the National Herbarium of New South Wales (NSW).

All the notebooks are interleaved with loose pieces of paper. Many of these are tracings of illustrations from major works which were not in his possession, but they also include lists of prices for Zeiss ocular pieces, lists for music for M (morning prayer) and E (evensong) for the coming month, charity receipts, and addresses

for international correspondents. There is a list of commonly encountered German adjectives and his English equivalents on the back of a letter from Gilbert Morgan Smith, the American phycologist, thanking Playfair for a reprint. Playfair comes through as very normal and familiar as a researcher.

The Bottles

He kept his samples in rubber stoppered glass vials, over 350 of them, initially in formalin. They were carefully numbered and a look at the catalogue that went with them demonstrates he saved a very substantial quantity of his field collections. Because by their very nature field collections of freshwater organisms, particularly plankton, are mixed, they are less than useable as Type specimens, but they remain Type-Site collections. As the plates for printing have long ago been misplaced, and the graphite drawings are often part of working notes, the published illustrations are considered Iconotypes when cited as such, and this has been done on few occasions. The individual bottles have not yet been incorporated in the NSW database.

If Playfair had a collection of slides they have not come down to us. There are four slides in the A.H.S. Lucas Collection (NSW), where Lucas attributes the material to Playfair's collections (see table 1). Mounted by Lucas in glycerine jelly, they are all in moderate condition.

Table 1. Slides from Playfair's collections held in the A.H.S. Lucas Collection (NSW).

Tray No.	AHSL slide no.	GIP bottle no.	Determination on slide label
37	202	23	<i>Oscillatoria nigroviridis</i> Nordsteadt, incl. <i>Peridinium tabulatum</i> . Pipehead Basin
37	203	23	<i>Oscillatoria nigroviridis</i> Nordsteadt, incl. <i>Peridinium tabulatum</i> . Pipehead Basin
53	277	29	<i>Oedogonium borisianum</i> (Le Cleve) Wittrock
68	339	102	<i>Botryococcus braunii</i> , with <i>Aphanothece microscopica</i>

Playfair had a wide collection of lenses, Watson, Beck, Leitz and Zeiss, which he had worked out ways of interchanging to achieve the levels of enlargement he required. He left details of how he did this among his notes. At least for some, we can also read from where and for how much those lenses were purchased.

The published work

George Playfair published thirteen papers in the *Proceedings of the Linnaean Society of New South Wales*, one for the *Australasian Society for the Advancement of Science* (Playfair 1911) and Supplement 1 to Maiden & Betche's *Census of New South Wales Plants* (Playfair 1917). The four earliest papers are on desmids (Playfair 1907, 1908, 1910, 1911). Seven later papers are about plankton (Playfair 1912, 1914, 1915b, 1916b, 1918, 1921, 1923). Playfair (1921) concentrated on the flagellates in the plankton and approached a monograph in form, while the three other papers are monographic treatments of certain groups (Playfair 1915a, 1916a, 1919).

Discussion

On reading Playfair's papers it becomes abundantly clear that he took much more than a philatelist's approach to his work. He is a natural historian rather than an ecologist but the descriptions of waterways with observations of catchment vegetation and soil type show a keen eye for correlations. He realised very soon after starting to collect that repeated sampling of sites gives the observer a better and better picture of what is going on.

On Desmids

Desmids are haploid unicellular or colonial plants with the cell having two mirror image half-cells, fitted with a complete set of organelles in each half and one central nucleus. They multiply by mitosis followed by the production of a full new half-cell on the other side of the isthmus, with the most recent halves back-to-back between the former halves. Sexual reproduction is by conjugation, and the resulting diploid zygospore is a resting phase.

In 1910 Playfair claimed to have spent fourteen years looking at desmids. He pointed out, (and not only for the desmids) that frequently he was constrained by the availability of certain publications in the libraries to which he had access. He cited many of the leading researchers of the day, and corresponded with them, gradually building a very creditable reference collection in several European languages.

Playfair (1907, 1908) both contain descriptions of a number of species new to science, and plenty of forms and variations. The localities cover the Goulburn area, and the Central Western Slopes as well as sites round Sydney. Playfair used the literature he had to hand and would happily acknowledge mistakes and make corrections in following papers.

Playfair (1910) includes a very large number of examples of morphological variation, across numerous genera, which he refers to as *degeneration*. He then makes the point by presenting Plate xi, as ‘*Docidium trabecula* (Ehr.): forms’ (Playfair 1910). He drew attention to his Figure 7 in that plate, with the sequence of divisions indicated, of the result of rapid division in the taxon he described as *Docidium ehrenbergii* var. *delpontei* Playfair. He points out that the chains often fall apart during collection, but: *In hot weather, and in shallow stagnant water, however, they are quite the rule of life, and are the origin of the immense number of degenerate forms connected with a species* (Playfair 1910: 461).

Playfair (1911) contains a discussion of the extrapolations he had made from his observations of fresh and standing live collections of desmids and his very careful cross checking of published names for species, varieties, and forms in numerous genera. He felt that people were looking at the evidence incorrectly: *In other words, we have considered the Desmids in some ways too much in the light of the growth of the higher orders of plants, ...their life history a continuous upward growth to a sexual maturity; whereas among the Desmidiaceae the succession of polymorphic forms, which constitutes the life history of any species, exhibits in the characteristics of the several forms a gradual degeneration from a perfect sporangial type, and the objective of desmid life is not the production of zygospores but the multiplication of cells.* (Playfair 1911: 279).

He had charts, referred to in the text but unpublished, to illustrate his arguments and extrapolations. We have not located the charts. Without the backing of controlled growth cultures his opinions remained just that. Time has supported much that he proposed: there were many fewer species than had been described.

Every Desmid species holds a certain number of distinct possibilities as regards form, length, breadth, and ornamentation, and it is the immense number and variety of the combinations that can be made out of these that is the cause of the vast bulk of the species and the intricate character of its life history – the connection, that is, of its innumerable polymorphic forms. (Playfair 1911: 296).

By modern standards Playfair’s ‘bottles on window-sills’ were very poorly designed experiments, but his observations were still valid: as the conditions changed, the successive half-cells reflected the stresses placed on the organism; the sculpturing and even the shape were dependant on prevailing conditions. He was attempting to replicate what he observed and noted in fresh field collections. This contrasted with the ‘perfect symmetry in mature specimens’ idea, championed by G.S. West. That concept allowed the description of forms, varieties and even new species based on minor changes in shape or decoration...even the idea that one half-cell could be in a different taxon to the other half-cell!

In the early 20th Century neither the mechanics of cell division in desmids nor the impact of environmental conditions or rapidity of the processes were understood. As Playfair (1910) stated he had corresponded with G.S. West about his descriptions in the two earlier papers and felt it necessary to publicly defend his position as West (1909), when describing algae from Yan Yean Reservoir in Victoria, had publicly challenged his determinations.

When taking stock of Playfair (1910, 1911) it is well to remember that cell theory was in its infancy. While the existence of chromosomes and their behaviour in the phases of nuclear division had been described, the significance of the information they were carrying was yet to be widely understood. It is unlikely that either West or Playfair appreciated the role of the chromosomal crossings-over. Playfair described what he observed and argued from observation. Standing up to the Mason Professor of Botany, Birmingham, was a brave gesture.

In *The Biology of the Desmids* (1981), A.J. Brook makes passing reference to Playfair (1910). The Tasmanian phycologists P.A. Tyler and H.U. Ling cited Playfair (1907, 1908) but appear to have passed over Playfair’s (1910, 1911) discussions of polymorphism in their experimentally based work (Tyler 1970; Ling & Tyler 1972, 1974, 1976). Many of their conclusions appear to support his observations.

The Plankton

Playfair (1912) demonstrates that he understood the complexity of the Sydney water supply system. The richness of the biodiversity across the numerous sites is well documented. His surprise at the dominance of the diatom *Melosira granulata* is an interesting observation. Today it is common to find white watermarks of diatoms on rocks and snags in inland rivers in New South Wales, indicating high diatom populations in the plankton of those rivers. The two papers on the planktonic organisms of the Richmond River area (Playfair 1914, 1915b), show Playfair working to compare the floristics of these two distinct river systems, and linking the differences to environmental factors.

He continued to describe new taxa, and the sixteen celled colonies of *Volvulina steinii* Playfair are first described in Playfair (1915b).

While working to complete the *Supplement to the Census* (Playfair 1917) he continued to review his collections and to correct and expand his descriptions of flagellated green algae (Playfair 1916b) and right across the range of plankton (Playfair 1918).

The monographic papers

Recent interest in Playfair's (1915a) work on the Euglenoid genus *Trachelomonas*, where the flagellated, and frequently photosynthetic protist lives inside a housing called a theca/lorica, has demonstrated the accuracy of his morphological observations (Townsend & Huisman 2021). Townsend and Huisman are generous in their praise of his diligence and his efforts to stay as well informed as possible in the antipodes, in a time when most things came by sea.

Playfair (1916a) on *Oocystis* and *Eremosphaera* has been largely passed over. Ling & Tyler (2000) do not cross-reference his treatment. Playfair was clearly still wrestling with the impact of polymorphism on speciation: 'I do not, however, consider any of the species of *Oocystis* to be biologically distinct, but merely polymorphic forms of one organism. It may be argued that the various types always retain their specific characteristics. They do, and they do not.' (Playfair 1916a: 109).

Playfair's (1919) work on freshwater dinoflagellates remains the baseline study on this continent. Moestrup & Calado (2018) give him a favourable mention: "Australia was put firmly on the freshwater dinoflagellate map by George Israel Playfair (1871–1922) ...It will be interesting to compare Playfair's many forms and species with material from elsewhere using molecular methods." (Moestrup & Calado 2018: 10–11).

Playfair (1921) is another monograph-like treatment, but with a wider scope, green flagellates of many kinds. He was still unsure how biologically sound all the varieties and forms he and his contemporaries describe really are: '...the rarer varieties, on the other hand, are generally polymorphic forms without any local attachment whatever, but merely the result of unusual combinations of rain and shine, temperature, movement and stagnation in their habitat. In a very large number of cases also, they are simply stages of growth which have become fixed at that point either by the induration of the cell-wall or by the lack of any stimulus to further growth.' (Playfair 1921: 99).

The Census

Maiden had already included Playfair in his plans for the Census (Maiden 1913: 15) before Playfair left for Lismore. The *Census of New South Wales Fresh-water Algae* (Playfair 1917) is a comprehensive list of his findings to that date, with minor contributions from others, and became the baseline for freshwater algal work in the state. Unfortunately, it does not provide localities, but these can be found through the references to his papers. The nomenclature is current for the time of publication. Given the isolation of the researcher, and where he was working, it is a remarkable document, really not bettered until Day *et al.* (1996).

For a detailed list of published described taxa by Playfair see Table 20 in Cowan & Ducker (2007).

There are preliminary notes and drawings for work on planktonic Cyanobacteria, and some notes on his New Zealand gatherings, including from Dunedin.

He had collated a set of drawings for a paper on *Scenedesmus*. When these were returned to the National Herbarium of New South Wales around 1970, they inspired Valerie May to include the information, together with her own work from across the state, in May (1973). Although Playfair's drawings were not included, May called them: *a valuable series of drawings by the late G.I. Playfair, Australia's foremost student of freshwater algae* (May 1973: 432). She went on: *It is useful to combine various literature references and information from Playfair's extensive drawings with my own observations* (May 1973: 433).

In a gentler paced time, with less complex value systems, where fun was a performance and experiences were shared face to face, George Israel Playfair was a success. As a Congregational Minister he had the personality and drive, and the appropriate level of the common touch, to make a real success of things. He appears, from the local newspaper snippets, to have been a really nice bloke. Both in Auburn (*Auburn News*, Saturday 11 March 1905: 4) and in the Richmond region (*Northern Star*, Tuesday 31 May 1921: 4), he succeeded with the ordinary parishioners.

We have his list to whom he sent 'separates', his word for reprints. There are Swedes and Germans, French and Italians, and British and Americans, as well as Dr Edward Sutherland Stokes (NSW Government Medical Officer), Marjorie Isabel Collins, a Macleay Fellow, and Alfred Douglas Hardy in Melbourne. He also sent his work to his father and uncle. He also corresponded with Arthur Henry Shakespeare Lucas but doesn't record if they exchanged papers. Sadly, we don't have many letters in the NSW collection.

J.H. Maiden's comments from 1913 are worth quoting in full: *The Rev G.I. Playfair, in honorary charge of this section, left Sydney in August last, and to my great regret, relinquished his honorary work for the Herbarium.*

He was almost a solitary worker on these plants in New South Wales. He has left a register, and bottles containing all the species and varieties referred to. The register is charmingly neat, an example to all workers in this respect. (Maiden, 1913, p12).

Playfair's careful critical observations, his careful reading of the latest literature, backed up by well executed illustrations, demonstrate he was a competent biologist, and well able to keep up with his peers. Gustavus Athol Waterhouse noted in his obituary: *...he was one of those who was always willing to talk freely of his work, but said little about himself* (Waterhouse 1923: vii).

It is as a natural historian that he shines. His careful observations laid the groundwork for later taxonomists and ecologists to follow. He didn't have the opportunity to gain the training in experimentation, or the support to make the step to ecologist level. His contribution to our general understanding of freshwater microorganism diversity in our inland waters has yet to be surpassed.

Acknowledgements

The author would like to thank Dr Peter G. Wilson for his help finding the English Census information and the New Zealand death notice, Ms Karen Wilson for her encouragement, Dr Roberta Townsend for reawakening my interest in GIP, and most importantly Mr Miguel Garcia for his librarian's insights, and the access to the documents in the Royal Botanic Gardens Library Special Collections.

References

- Brook AJ (1981) *The Biology of the Desmids. Botanical Monographs Vol. 16.* (University of California Press: Berkeley & Los Angeles)
- Cowan RA, Ducker SC (2007) A history of systematic Phycology in Australia. In: *Algae of Australia: Introduction.* pp. 1–65. (Australian Biological Resources Study: Canberra; CSIRO Publishing: Melbourne)
- Daley B, Griggs P (2006) Mining the reefs and cays: coral, guano and rock phosphate extraction in the Great Barrier Reef, Australia, 1844–1940. *Environment and History* 12: 395–433. <http://www.jstor.org/stable/20723590>
- Day SA, Wickham RP, Entwisle TJ, Tyler PA (1996) *Bibliographical checklist on non-marine algae in Australia. Flora of Australia Supplementary Series Number 4.* (Australian Biological Resources Study: Canberra)
- Ling HU, Tyler PA (1972) The process and morphology of conjugation in desmids, especially the genus *Pleurotaenium*. *British Phycological Journal* 7:65–79. <https://doi.org/10.1080/00071617200650091>
- Ling HU, Tyler PA (1974) Intraspecific hybrids in the desmid genus *Pleurotaenium*. *Journal of Phycology* 10: 225–230. <https://doi.org/10.1111/j.1529-8817.1974.tb02703.x>
- Ling HU, Tyler PA (1972) Meiosis, polyploidy and taxonomy of the *Pleurotaenium mammillatum* complex (Desmidiaceae). *British Phycological Journal* 11: 315–330. <https://doi.org/10.1080/00071617600650371>
- Maiden JH (1913) *Botanic Gardens and Government Domain (Report for the year 1912) No. 9.* (Legislative Assembly: Sydney, New South Wales)
- May V (1973) The algal genus *Scenedesmus* in Australia. *Contributions to the New South Wales National Herbarium* 4: 431–452.
- Moestup Ø, Calado AJ (2018) *Süßwasserflora von Mitteleuropa, Bd 6 Freshwater Flora of Central Europe 6 Dinophyceae.* (Springer: Berlin) <https://doi.org/10.1007/978-3-662-56269-7>
- Playfair GI (1907) Some new or less known Desmids found in New South Wales. *Proceedings of the Linnaean Society of New South Wales* 32: 160–201. <https://www.biodiversitylibrary.org/item/30115#page/176/mode/1up>
- Playfair GI (1908) Some Sydney Desmids. *Proceedings of the Linnaean Society of New South Wales* 33: 603–628. <https://www.biodiversitylibrary.org/item/123081#page/655/mode/1up>
- Playfair GI (1910) Polymorphism and life-history in the Desmidiaceae (Algae: Conjugatae). *Proceedings of the Linnaean Society of New South Wales* 35: 459–494. <https://www.biodiversitylibrary.org/item/21738#page/477/mode/1up>
- Playfair GI (1911) Growth, development and life history of the Desmidiaceae. *Report of the Thirteenth Meeting of the Australasian Association for the Advancement of Science:* pp. 278–298. <https://www.biodiversitylibrary.org/item/52791#page/420/mode/1up>
- Playfair GI (1912) Plankton of the Sydney water supply. *Proceedings of the Linnaean Society of New South Wales* 37: 512–552, Plates <https://biodiversitylibrary.org/page/2903744>

- Playfair GI (1914) Contribution to the knowledge of the biology of the Richmond River. *Proceedings of the Linnaean Society of New South Wales* 39: 93–151, 5 Plates. <https://www.biodiversitylibrary.org/item/30114#page/105/mode/1up>
- Playfair GI (1915a) The genus *Trachelomonas*. *Proceedings of the Linnaean Society of New South Wales* 40: 1–40, Plates. <https://www.biodiversitylibrary.org/item/30116#page/37/mode/1up>
- Playfair GI (1915b) Freshwater algae of the Lismore District, with an appendix on algal fungi and Schizomycetes. *Proceedings of the Linnaean Society of New South Wales* 40: 310–362, 10 figs, plates XLI–XLVI. <https://biodiversitylibrary.org/page/6384577>
- Playfair GI (1916a) *Oocystis* and *Eremosphaera*. *Proceedings of the Linnaean Society of New South Wales* 41: 107–147, Plates <https://biodiversitylibrary.org/page/3349373>
- Playfair GI (1916b) Australian freshwater phytoplankton (Protococcoideae). *Proceedings of the Linnaean Society of New South Wales* 41: 823–852, pls LVI–LIX. <https://biodiversitylibrary.org/page/3350169>
- Playfair GI (1917) *Supplement 1* – Fresh-water algae. In Maiden JH, Betche E† *A Census of New South Wales Plants*. (Government Printer: Sydney)
- Playfair GI (1918) New and rare freshwater algae. *Proceedings of the Linnaean Society of New South Wales*, 43: 497–543, plates LIV–LVII. <https://biodiversitylibrary.org/page/6186943>
- Playfair GI (1919) Peridineae in New South Wales. *Proceedings of the Linnaean Society of New South Wales* 44: 793–818, Plates. <https://www.biodiversitylibrary.org/item/23871#page/873/mode/1up>
- Playfair GI (1921) Australian freshwater flagellates. *Proceedings of the Linnaean Society of New South Wales* 46: 99–146, Plates. <https://www.biodiversitylibrary.org/item/23930#page/111/mode/1up>
- Playfair GI † (1923) Notes on freshwater algae. *Proceedings of the Linnaean Society of New South Wales* 48: 206–228, Plates. <https://www.biodiversitylibrary.org/item/109055#page/252/mode/1up>
- Sands J (1905) *Sands' Sydney, Suburban and Country Commercial Directory for 1905*. (John Sands: 374 George St, Sydney) <https://archives.cityofsydney.nsw.gov.au/nodes/view/1898954>
- Townsend RA, Huisman JM (2021) Nomenclatural considerations of names associated with the euglenoid flagellate genera *Strombomonas* and *Trachelomonas* (Euglenaceae, Euglenophyceae) in Australia. *Notulae Algarum* No. 203. 56 pp. <https://notulaealgarum.org/2021/documents/Notulae%20algarum%20No.%20203.pdf>
- Tyler PA (1970) Taxonomy of Australian algae I. The genus *Micrasterias* in south-eastern Australia. *British Phycological Journal* 5: 211–234. <https://doi.org/10.1080/00071617000650271>
- Waterhouse GA (1923) Presidential address. *Proceedings of the Linnaean Society of New South Wales*, 48: i–xxiv. <https://www.biodiversitylibrary.org/item/109055#page/807/mode/1up>
- West GS (1909) Algae of the Yan Yean Reservoir, Victoria: a biological and oecological study. *Journal of the Linnaean Society of London (Botany)* 39: 1–88. <https://www.biodiversitylibrary.org/item/8404#page/10/mode/1up>

Received 2 September 2022, accepted 30 November 2022