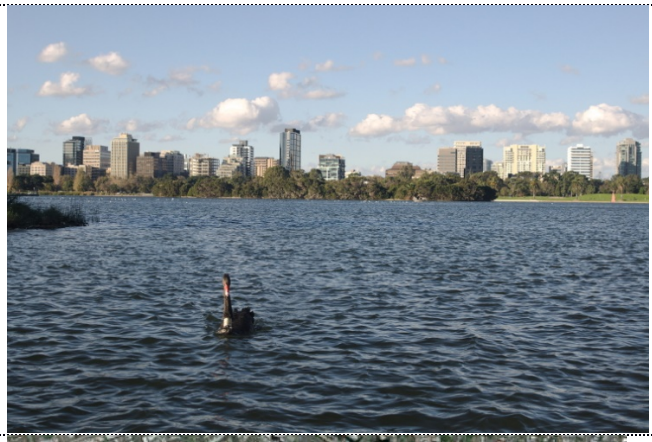
Exploring an Australian microbial world: freshwater green algae in the Albert Park Lake

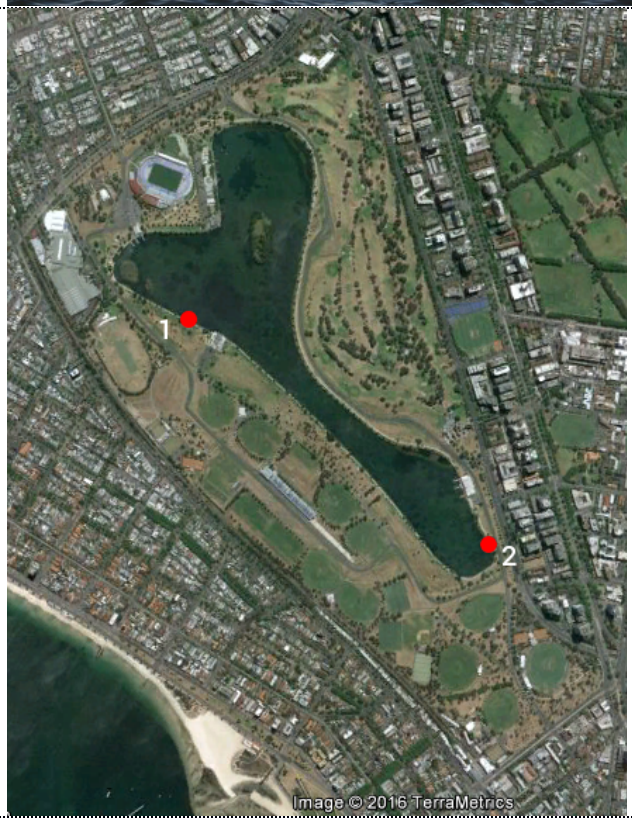
by Yu Wan, China

This is an exciting opportunity for me to appreciate Australian biodiversity when I am doing my postgraduate study in Melbourne, Australia. As I have grown up in the northern hemisphere, native Australian plants and animals appear to be so exotic to me, and of course, microbes. Indeed, I brought my microscope from my home to Melbourne this January to explore this amazing world.

The work I am presenting here is my observations of freshwater green algae in the Albert Park Lake, which is a large freshwater lake situated three kilometres south to the Melbourne CBD. It was a lagoon on the Yarra River Delta, separated by the St. Kilda Beach from the northeast bay of the Port Phillip. The park was established in 1864, named in honour of Prince Albert (1819–1861), Queen Victoria's husband.



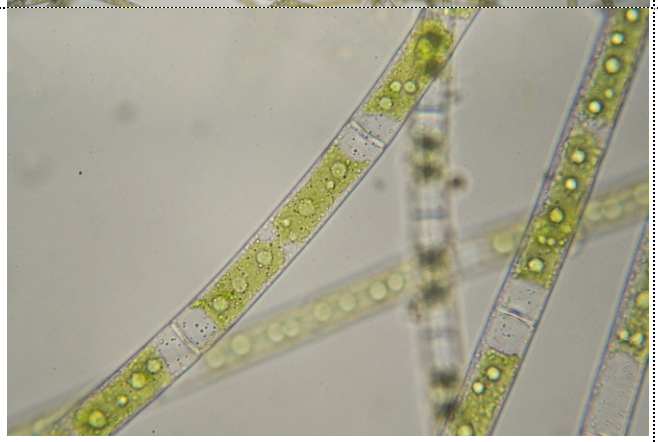
The lake gets plenty of sunshine and its water is quite clear, making it an ideal environment for algae. Walking around this lake, I always enjoy looking at the skyline of Melbourne, reeds, black swans and other water birds.



I sampled surface water from two sites on the lake. The lake is surrounded by a vast area of lawns. Grass and tree leaves that are blown into the lake provide external nutrition to the lake flora. The famous St Kilda Beach lays between the lake and the Port Phillip Bay (bottom left).

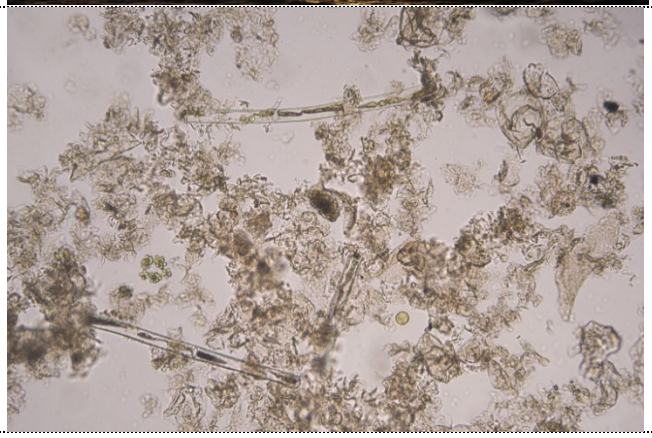
At the first site, I collected some yellow-green algal filaments that were floating on the surface. A Kimchi jar was a handy container for storing my samples temporarily. This sample was collected on 14 May 2016, when Melbourne was in autumn.

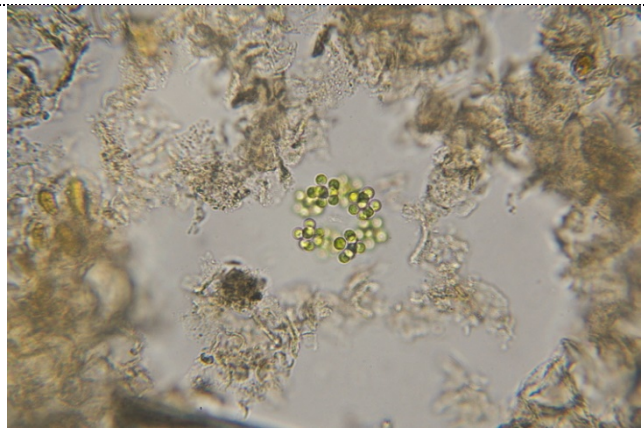
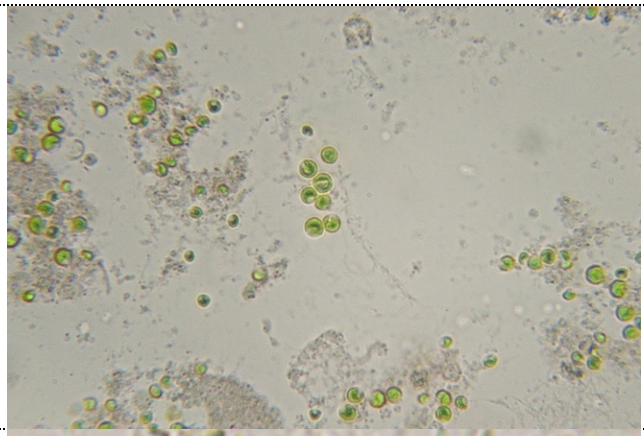
Under my microscope, this sample turned out to be a mixture of two kinds of green algae, differing in their cellular sizes and shapes of chloroplasts. This photo was taken using a 10× objective, a 10× wide-field eyepiece (10×10 for short hereafter) and a Nikon D90 DSLR with a 35mm/F1.8 lens. This configuration was introduced in my article published in the June 2010 edition of Micscape.



Mougeotia sp. (40×10)

The lager algal filaments belonged to a species of the genus *Mougeotia* in the family *Zygnemataceae*. Furthermore, *Mougeotia* is one of the three members of the so-called *Spirogyra* group (Canter-Lund and Lund, 1995; the other two genera are *Spirogyra* and *Zygnema*). It is a filamentous green alga characterised by a large, centralised, flat and rectangular chloroplast, which often twists around its central long-axis in the middle. This characteristic renders the meaning of "an alga with an intracellular rotated plate" in its Chinese name. In addition, there are several pyrenoids lining up in chloroplasts as shown in this picture. A book says that there are three of 6–8 described *Mougeotia* species have been reported in Australia (Entwisle, Sonneman and Lewis, 1997). The authors also commented that *Mougeotia* species are widespread and often mix with other algae, which is exactly what I have observed.

	*Zygnema* sp. (40×10) The second kind of filamentous green algae on my slide belonged to a species of the genus *Zygnema*, which is characterised by two star-shaped chloroplasts flanking the nucleus of each cell. There is a single massive pyrenoid located at the centre of every chloroplast. Cells of my *Zygnema* specimen were both shorter and thinner than the *Mougeotia* cells. According to Entwisle *et al*, *Zygnema* species are common but seldom abundant in nature. On the right side of this photo, a *Mougeotia* filament breaks at the junction between two cells.
	I noticed that there were many foams piling up by the lakeside because of wind when I was walking at the second site in the winter afternoon on 23 July 2016. Actually, I had no idea what could be found within these foams. So I collected some of them with a plastic jar. It was a challenging process because the water fluctuated all the time.
	I enjoyed a beautiful sunset after collecting my sample. It was time to go home and have a look at this collection.
	Under my microscope (10×10), the lake foams appeared to be a mixture of massive dead plant cells and a few living microorganisms besides water and air bubbles. Filaments of dead *Mougeotia* are evident in this photo.

	*Pseudosphaerocystis* sp. or *Sphaerocystis* sp. (40×10) There was still something alive within the foams. This photo shows a small colony of free-floating and immotile algal cells embedded within a transparent gelatinous envelop. There seems to be a cup-shaped chloroplast and a pyrenoid in every cell. I am inclined to classify this alga into a species of *Pseudosphaerocystis* or *Sphaerocystis* in the green algae family of *Palmellaceae*. I would appreciate it if someone could correct me.
	Another kind of free-floating green algae, unidentified (40×10) This large colony of algal cells were loosely embedded within a colourless gelatinous envelop as well. Every cell had a cup-shaped chloroplast. I did not observe any mobilisation of these cells either. I suspect that they may belong to the *Tetrasporidium*, a member of the family *Gloeocystaceae*.
	A diatom, unidentified (40×10) Finally, I found several diatom cells of this kind surrounded by cellular debris. It differed from green algae in the yellow-brown colour of its chloroplast. It was not motile under my microscope.

References

1. Timothy J. Entwisle, Jason A. Sonneman and Simon H. Lewis. (1997). *Freshwater Algae in Australia*. Sainty and Associates Pty Ltd., New South Wales, Australia.
2. Hilda Canter-Lund and John W. G. Lund. (1995). *Freshwater Algae: their microscopic world explored*. Biopress Ltd., Bristol, England.

All comments to the author Yu Wan are welcomed.

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