CARL MCCOMBE

Website: https://carl-mccombe.github.io
Email: carl.mccombe@anu.edu.au
ORCID: https://orcid.org/0000-0001-9347-8879

Brief profile

A current Ph.D. candidate in the Research School of Biology at The Australian National University. I am a molecular biologist/biochemist investigating the functions of proteins involved in plant-microbe interactions.

Education

The Australian National University, Australia 2020 - Present
Ph.D. candidate in the Research School of Biology

The Australian National University, Australia 2019
B.S. with First Class Honours in Biology. GPA: 7.00/7.00
Awarded University Medal

Flinders University, Australia 2016 - 2018
B.S (Biotechnology) GPA: 6.95/7.00

Preprints & Publications

- **CL McCombe**, A Wegner, CS Zamora, F Casanova, S Aditya, JR Greenwood, L Wirtz, S Paula, E England, S Shang, DJ Ericsson, E Oliveira-Garcia, SJ Williams, U Schaffrath (2023). " Plant pathogenic fungi hijack phosphate starvation signaling with conserved enzymatic effectors" *bioRxiv* *https://doi.org/10.1101/2023.11.14.566975*
- **CL McCombe**, AM Catanzariti, JR Greenwood, AM Desai, MA Outram, DS Yu, DJ Ericsson, SE Brenner, PN Dodds, B Kobe, DA Jones, SJ Williams (2023). "A rust-fungus Nudix hydrolase effector decaps mRNA *in vitro* and interferes with plant immune pathways" *New Phytologist* *https://doi.org/10.1111/nph.18727*
- DS Yu, MA Outram, A Smith, **CL McCombe**, PB Khambalkar, SA Rima, X Sun, L Ma, DJ Ericsson, DA Jones, SJ Williams (2023). "The structural repertoire of *Fusarium oxysporum f. sp. lycopersici* effectors revealed by experimental and computational studies" *eLife* *https://doi.org/10.7554/eLife.89280.1*
- **CL McCombe**, JR Greenwood, PS Solomon, SJ Williams (2022). "Molecular plant immunity against biotrophic, hemibiotrophic, and necrotrophic fungi." *Essays in Biochemistry* *https://doi.org/10.1042/EBC20210073*

Awards

Hirota Naora award – Best presentation at the RSB HDR conference 2022
CPG award presentation at Combio 2022
Runner-up best student presentation at East Coast Protein Meeting 2022
Postgraduate research award – Australian Institute of Nuclear Science and Engineering 2020
Australian Government Research Training Program stipend 2020
University medal – The Australian National University 2019
RSB director's prize in Honours – The Australian National University 2019
Honours scholarship – Australian Institute of Nuclear Science and Engineering 2019
Chancellor's letter of commendation – Flinders University 2016/2017/2018

Research experience

The Australian National University
PhD candidate 2020 - Present

- Designed and executed experiments to investigate the enzymatic activity of uncharacterized proteins involved in plant-microbe interactions both *in vitro* and *in planta*
- Assisted in the training of new students, including a primary supervisor role for three semester-long undergraduate student projects
- Disseminated experimental results in research publications and conference presentations
- Helped manage ordering for lab consumables. Assisted in routine lab maintenance and organization

The Australian National University
Technical assistant – COVID-19 genomic sequencing 2021

- I was a member of the team responsible for COVID-19 genomic surveillance in the Australian Capital Territory during 2021. I received cDNA samples and prepared multiplexed libraries for Nanopore sequencing.

The Australian National University
Honours student 2019

- The Honours project aimed to determine the function of AvrM14, a protein involved in the pathogenesis of flax rust. This project had a focus on structural biology and linking protein structure to biochemical function.

Flinders University
Research assistant 2018

- Worked both independently and in a team completing various general molecular biology techniques to aid in research projects

Research skills

A non-exhaustive list of the research techniques/tools used during my research career.

- Recombinant protein expression (*E. coli*) and purification
- Fast protein liquid chromatography (FPLC) using AKTA systems
- X-ray crystallography and structural biology
- Agroinfiltration of *N. benthamiana* for transient gene expression
- Various enzyme assays (especially for Nudix hydrolases)
- Plant RNA extraction, purification and RT-qPCR
- RNA-sequencing data analysis
- RNA synthesis, 5’ capping, and radiolabeling
- Various general molecular biology techniques (e.g., western blotting, molecular cloning etc.)
- Nanopore library preparation for COVID-19 genome sequencing
- Python programming language (especially for organizing large datasets and data visualization)

Teaching experience

The Australian National University 2022

General microbiology (BIOL2142) laboratory demonstrating

- Teaching and supervising students in microbiology lab classes
- Marking of scientific reports

The Australian National University 2021 and 2022

Molecular gene technology (BIOL2162) workshop tutor

- Providing guidance to, and teaching, students who were completing online zoom workshops covering a variety of molecular biology research techniques

The Australian National University 2021 - Present

Biochemistry and human nutrition (BIOL2171) laboratory demonstrating

- Teaching and supervising students in biochemistry lab classes
- Marking of laboratory reports

The Australian National University 2020, 2022/23

Advanced studies course (SCNC2101) research project design and lab supervision

- Designing and supervising semester-long undergraduate research projects for second- and third-year students

Peer review

Molecular Plant Pathology 2023

Journal of Experimental Botany 2021 & 2022

References available on request