

# CARL MCCOMBE

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## 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.

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## Education

<b>The Australian National University, Australia</b> Ph.D. candidate in the Research School of Biology	<u>2020 - Present</u>
<b>The Australian National University, Australia</b> B.S. with First Class Honours in Biology. GPA: 7.00/7.00 Awarded University Medal	<u>2019</u>
<b>Flinders University, Australia</b> B.S (Biotechnology) GPA: 6.95/7.00	<u>2016 - 2018</u>

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## Publications

- **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>

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## Awards

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

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## 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

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## 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
- Western blotting
- Molecular cloning (especially GoldenGate cloning)
- Nanopore library preparation for COVID-19 genome sequencing
- The Python programming language (especially for organizing large datasets and data visualization)

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## 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-year students

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## Peer review

**Molecular Plant Pathology**

2023

**Journal of Experimental Botany**

2021 & 2022

*References available on request*