

Melbourne Quantum Summit (MQS)

Quantum theory provides the theoretical foundations for a wide range of emergent technologies, such quantum computing, quantum cryptography, quantum simulations and many more. As one of the largest metropolitan regions of Australia, Melbourne is home to a number of universities hosting a multitude of research groups in quantum technologies.

The goal of the **Melbourne Quantum Summit** is to provide an annual opportunity for these research groups to meet and interact to foster collaboration and coordinate joint initiatives. The summit is particularly beneficial for PhD students and postdocs to build connections within the Melbourne research community, but the summit should also provide an opportunity to discuss strategies and joint initiatives on the more senior level.

Organizing and Advisory Committee

The two committees serve the purpose to represent all Melbourne universities and research institutions pursuing theoretical quantum science (this currently excludes La Trobe University).

- The **Organizing Committee** consists of younger researchers (level A-C or PhD Student).
Ben Baragiola (RMIT), Neil Dowling (Monash University), Lucas Hackl (UniMelb-Math), Harini Hapuarachchi (RMIT), Ria Rushin Joseph (Deakin University), Gary Mooney (UniMelb-Physics), Behnam Tonekaboni (CSIRO), Jia Wang (Swinburne).
- The **Advisory Committee** consists of more senior researchers (roughly level D-E or equivalent).
Agreed members: Jan de Gier (UniMelb-Math), Peter Drummond (Swinburne), Lloyd Hollenberg (UniMelb-Physics), Nicolas Menicucci (RMIT), Kavan Modi (Monash University), Anna Phan (IBM), Muhammad Usman (CSIRO).

Topic

The overarching theme of the first MQS is proposed to be **Theoretical Quantum Information**, which includes quantum computing, algorithms, quantum information theory, aspects of quantum many-body physics, topological phases of matter, quantum communication, relativistic quantum information etc.

Date and Length

The organizing committee proposed that the workshop should last two days with some dinner / evening activities on the first day and the option to hang out longer on the second day (voluntary).

The organizing committee identified **February 12-13, 2024**, as potentially a good time. It avoids a clash with [ANZAMP Meeting 2024](#) (Feb 7-9, 2024, held in Sydney), [Quantum Australia](#) (Feb 20-22, 2024, held in Sydney) the week after and is before any classes start. At the same time it is sufficiently late in summer that (hopefully) most academics are back from travel/vacations. There is some small clash with [ICONN](#) (Feb 13-15, 2024, held in Melbourne), but this likely only affects a small part of the participants, who would still be able to join on the first day of the workshop.

Format

Times	Day 1 (Monday) - 2023-02-12	Day 2 (Tuesday) - 2023-02-13
09:30-12:00	Overview: Quantum in Melbourne (incl. Coffee)	Block 2 (Lecture + Talks + Coffee)
12:00-13:00	Lunch (provided)	Lunch (provided)
13:00-13:30	Lunch and Workshop Picture	Lunch and Open Feedback
13:30-16:00	Block 1 (Lecture + Talks + Coffee)	Block 3 (Lecture + Talks + Coffee)
16:00-17:00	Poster Session and drinks (provided)	Panel Session: Vision for Melbourne Quantum
17:00-18:00		Overflow Buffer
evening	Dinner	Dinner

The organizing committee proposes the following content of the various sessions:

- **Overview: Quantum in Melbourne (incl. Coffee)**

The goal of this session is to give a broad overview of what type of theoretical quantum information science is conducted at the various institutions. The idea is that representatives of each institution / various groups give a broad overview of what the overarching research questions are and also give a little bit of a perspective of how quantum science is organized (different research groups, different departments etc.). The presentations should not be technical and also not be very long, but mostly driven by the questions and maybe the larger results / accomplishments without going into much detail (which can be referred to in the posters and individual talks).

A rough estimate could be: UoM 40 minutes, RMIT 20 minutes, Swinburne 20 minutes, CSIRO 20 minutes, Deakin 15 minutes, Monash 15 minutes with an additional 20 minutes for a coffee break.

- **Blocks (Lecture + Talks + Coffee)**

The goal of this session type is to have two different formats:

- A pedagogical lecture to teach some new skill that is relevant for the research in a given group. It should be fairly general and easily motivated from quantum science (so not cutting edge research) and the goal is that every participant leaves the lecture with the happy feeling “I learned something cool!”. These lectures could last 45-60 minutes and be given by mid- or senior-level academics. They are not research talks, but really lectures (and could even include some tutorial-style questions for the audience at the end or a voluntary homework).
- A collection of contributing talks given by early career academics, i.e., mostly PhD students and postdocs, though outstanding honors / Master students or some lecturer-level academics may also be selected. The idea is that members of the organizing committee will advertise this opportunity by word-of-mouth at their own institution and then the whole committee puts together a program with the aim to emphasize connections between different groups (e.g., not just blocks of similar talks from one research group). The committee will also aim to choose a diverse group of speakers.
There could be 3-4 talks of 20-25 minutes each (including questions).
- *1 x 40+10 minutes lecture, 4 x 15+5 minute talks would still leave a 20 minutes coffee break.*
- *There will be three sessions of this type (leading to a total of 3 lectures and 9-12 contributing talks).*

- **Poster Session**

The goal of the poster session is to bring people together and create discussions. We could serve ice cream. There is also the opportunity to transition nicely into the evening by starting to serve drinks at 17:30 or so. Essentially, we want that particularly PhD students and postdocs talk to each other, but also present their work to more senior people (who are actively encouraged to get a glimpse of what's done in other research groups).

- **Open Feedback**

In the last 30 minutes of lunch on the second day, there will be an open discussion on feedback by the participants. What did they like about the workshop? What could be changed? Are there volunteers interested in organizing something similar the year after? The goal is to have a relaxed and open conversation with some brainstorming. We can still have some anonymous feedback survey at the end, but having an open discussion with the organizers will hopefully spark some new ideas.

- **Panel Session: Vision for Melbourne Quantum**

The goal of this session is to encourage some more strategic thinking of the Melbourne Quantum Community. How can we position ourselves (also in light of the Sydney Quantum Academy) to advocate for strong quantum science in Victoria and Melbourne? The discussion could start by having a mixed panel of junior & senior researchers who have some suggestions or ideas, potentially also experience from other institutions. The aim is to come up with a few ideas and initiatives, which could then be pursued later. As there is no dinner provided, people can mingle and organize themselves to go for dinner and continue to discuss some of the ideas. In this context, it is expressively suggested that some of the more senior people reserve this evening timeslot to join for dinner with the hope some more concrete plans may grow out of this session. A few ideas what could be done:

- Establishing a **Melbourne Quantum Email List**, where events, opportunities etc. for the Melbourne Quantum Community are advertised.
- Start of a **Melbourne Quantum Seminar** held once per quarter at different institutions, whenever a more prominent speaker is invited to a respective institution.
- Creation of a simple **Melbourne Quantum Website**, where the different research groups are listed and one can sign up for the mailing list (and maybe see recordings of previous seminars). Of course, this website should be largely static, i.e., created once and then updated once a year or so, because nobody has time to update websites, unless there is a budget to hire somebody.
- Joint application for **ARC Linkage Programs**, such as the [Industrial Transformation Research Hubs](#) or [Industrial Transformation Training Centres](#).
- Application for a [Program at the MATRIX Institute](#) on a topic across mathematics and physics.
- Consideration of some **Joint Educational Initiatives**, e.g., joint Master in Quantum Science or Technology or some opportunity for students to take courses at other institutions in Melbourne.

Open feedback and some plans

- Colloquium style - maybe every 2-3 months - branding "Melbourne Quantum Colloquium"
- Encouraging students/postdocs to come, e.g., poster sessions with some drinks/snacks
- Melbourne Quantum Meetup
- Too frequently means more senior people won't come, but that's what the young ones care about (among other things)
- Melbourne Quantum Organizing Committee - with student representatives?
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Promotional activities for the future: an exhibition / demonstrations / activities involving super cool, visually appealing and mind-blowing quantum computing applications for (probably in that order of priorities): (1) high-school students, and/or (2) general public, and/or (3) primary school children and parents, and/or (4) university students and academics

A few ideas for both the upcoming summit and initiatives for the quantum community in general: - A semi-regular (perhaps every few months) lecture/tutorial series aimed at teaching more advanced theory/computational methods to PhD students/postdocs. This could be lectured by PhD students or postdocs, with the idea of teaching theory that either isn't usually taught in undergraduate or postgraduate courses, or simply tips and tricks that are usually glossed over in textbooks or aren't covered in detail in postgraduate courses. I think this would serve as good lecturing experience for early career researchers, and would help broaden the knowledge base between institutions. - Organizing non-academic related social events e.g. dinner, pub crawl, badminton, bowling, board game nights, etc maybe once every six months to help facilitate a community between institutions. - This may already be planned, but I think it would be great if the academics giving lectures in Blocks 1, 2 and 3 made either their lecture slides, or perhaps even some lecture notes with a bit more detail, available online to be accessed after the summit.

This is probably not the best format to keep track of this but I am aware of 1. Mathematical Physics Seminar (JEB+MK)), 2. Generalized Symmetries Reading Group (TQ), 3. Random Matrix Theory Seminar (LH+MK), 4. Condensed Matter Physics Seminar (SR), 5. IBMQ Seminar Series (GM), all at the University of Melbourne. But it would be great to have regular (but not too frequent, maybe 2-4 times per year) activities across the institutions.

Online seminars from members of the community on a regular basis, whether, weekly, bi-weekly or monthly. This would be an ideal space for PhD students to give talks and gain valuable experience in presenting their work, but also for early career academics to show case recent findings.

Something like a panel discussion on how quantum computing could play a part in future AI systems.

N/A

I think that semi-frequent visits and seminars between the universities in Melbourne and Victoria so that people can have the opportunity to get a taste of others' research would be a great help for strengthening ties between the quantum groups.

Please note - as I am unsure how much I can attend, please do not purchase food on my behalf.

It will be good to organise a similar event once a year where it would provide opportunity for PhD students to show case their work via posters and short talks. Another suggestion would be to have online talks every two weeks (or once a month on a evening where you get a series of short talks) for students,postdocs etc.