



ARC Centre of Excellence in Precision Fundamental Physics

title not yet decided

Paul Jackson

April 1st, 2021

Centre name

ARC Centre of Excellence in Precision Fundamental Physics
ARC Centre of Excellence for Fundamental Discovery Physics
ARC Centre of Excellence for Discovery in Fundamental Physics
ARC Centre of Excellence for the next Discovery in Fundamental Physics
ARC Centre of Excellence for Discovery in Precision Fundamental Physics
ARC Centre of Excellence in Fundamental Symmetries

Comment: Our research branch felt that “precision” gave the feeling of “just doing something that’s already been done a bit better” and that it wasn’t transformational.



Since the last meeting

- I've had conversations with representatives from each node.
 - Productive and useful, really appreciate people being open, and honest
 - discussed at length with several of you after these conversations
- I've been working on the first template for a CV (for myself) and can share this with you all ~soon.
- Our research branch will also be providing me with templates for this I'll share those soon also
- LHCb has released a beautiful new result on $B \rightarrow K l^+ l^-$ (congrats to Ulrik!)



Since the last meeting

- Very productive meeting with Andre Luiten and members of their precision measurement group. Andre is keen to be included as a CI.
- For those who don't know Andre
 - <https://www.linkedin.com/in/andre-luiten-174b8157/>
 - He's the director of the institute for photonics and advanced sensing (IPAS) in Adelaide. He has formed several spin off companies and has had a lot of success translating research into industry
 - He'd be fantastic at showcasing how precision technologies used in fundamental measurements have practical uses for Australian industries (defense in particular) – think translation portfolio
 - Currently collaborating with Jacinda (and Ben) at UQ - atomic parity violation
- While he's not been a long-term collaborator of our particle/nuclear group he's a natural person to bring in to lead precision table-top atomic measurements

Key dates

ARC CENTRES OF EXCELLENCE (FOR FUNDING COMMENCING IN 2023) - IMPORTANT DATES

	ARC Dates	Research Services Due Date	ARC Due Date
Recommended draft Expression of Interest (EOI) - based on the CE20 ITAs		10 May 2021	
Expression of Interest (EOI)	EOI period: 8 June 2021 to 28 July 2021	7 July 2021 <i>(3 weeks ahead of ARC EOI deadline)</i>	28 July 2021
Request not to Assess		7 July 2021 <i>(1 week ahead of ARC EOI deadline)</i>	14 July 2021
Rejoinder	Rejoinder period: 30 September to 14 October 2021	11 October 2021 <i>(3 days ahead of ARC EOI deadline)</i>	14 October 2021
ARC notifies shortlisted EOIs and invites full applications	TBA (Note - Full application period: 8 December 2021 to 23 March 2022)		



Today's meeting

- The Project
 - We only have 8 pages (less than a DP!) to write a concise and compelling project.
 - We should prepare a few people willing to draft a few paragraphs each on specific topics
- Chief Investigators
 - I'll introduce what my current thinking is and discuss (openly) how that might change/evolve
 - Number of nodes - shouldn't have small nodes - why? They only get some fraction of the funds but if they can leverage centre involvement as a multiplier at their university, is this bad? We've been informed that smaller nodes could be "clustered", think Sydney/UNSW
 - Gender balance and balance across the institutes
 - I'll make one further suggestion of a potential CI to approach
- Partner Investigators
 - We should cover a broad range both from the scientific perspective and to get global coverage
 - We must strive to get a good gender and diversity balance in the PIs
 - Will introduce a long-list
- Who will be our seven highlighted participants?
 - Suggest we aim for a long-list of ~10, all complete the CV step, and select the best
 - By "best" we mean the 7 that maximize our chances of success at the EOI stage



Any Questions/Thoughts/Discussion before we move on?

CIs

Adelaide: Paul Jackson, Andre Luiten, Martin White, James Zanotti, Ross Young

ANU: John Close/Simon Haine, Joe Hope, Cedric Simenel

Melbourne: Matthew Dolan, Martin Seviour, Andrea Thamm, Ray Volkas,

Monash: Ulrik Egede, Jordan Nash, Peter Skands, German Valencia

UNSW: Michael Schmidt

UQ: Jacinda Ginges, Pat Scott, Magdalena Zych

Sydney: Archil Kobakhidze, Kevin Varvell, Bruce Yabsley

Comments on composition:

Some variation from previous lists, trying to keep the CI list short (as possible)

Possible to be CIs on two EOIs in a Centre round.

Centre's in the CE20 round had between 14 and 27 CIs from up to 8 EOIs.

EOI we know of: CoEPP2 (18 CIs, 13 PIs), DM (20 CIs, 9 PIs), CTP (16 CIs, 17 PIs)

Gender/diversity: *hiring of female staff at all/most nodes* as a result of the Centre award.

Project

Aims and Objectives of the Centre

Research Program

- overview
- significance and innovation
- sub program 1,2,3,4) a) significance b) innovation
- outcomes, impacts, benefits and translation
- collaborative arrangements and critical mass
- Centre framework design and planning
- International advances and recognition arising from the Centre

Investigators

- Centre director and key researchers in section A2(i.e. the six key researchers)
- Other CIs and their roles (this is a brief comment about each of the others CIs)
- Centre manager/other CIs and PIs.

PIs

Phiala Shanahan (MIT) – Leading Lattice Collaborator

Aida El-Khadra (UIUC) – Lattice flavour theorist

Gudrun Hiller (Dortmund) – Leading flavour theorist

Val Gibson (Cambridge) - LHCb

Tim Gershon (Warwick) – LHCb, Warwick/Monash alliance

Clara Matteuzzi (Milan) – LHCb

Stephanie Hansmann-Menzemer (Heidelberg) - LHCb

Toru Iijima (Nagoya) – Belle II Spokesperson

Andreas Hoecker (CERN) – ATLAS Spokesperson

Frederic Deliot (Saclay) – Leader of Saclay group and ATLAS 4-top analysis team

Anastasia Borschevsky, University of Groningen, Netherlands – computational theorist

Marianna Safronova, University of Delaware, USA – Atomic theorist

Xiao-Gang He (Taiwan) - Flavour theorist

Someone from Nvidia/Xilinx, another company? Leaders in HPC?

Others from theory, atomic and nuclear, quantum gravity (expt and theory)?

Expert input required here! See list attached to agenda

Node Leaders

Each node is free to decide who they consider a node leader. We can discuss this if you wish.
I provide some suggestions below:

James Zanotti (Adelaide)

Kevin Varvell/Archil Kobakhidze (Sydney) - depends on other Centre roles

Cedric Simenel/Joe Hope (ANU) - depends on other Centre roles

Matt Dolan/Martin Seviator/Ray Volkas (Melbourne) - depends on other Centre roles

Peter Skands/Ulrik Egede/Jordan Nash (Monash) - depends on other Centre roles

Jacinda Ginges (UQ)

Michael Schmidt (UNSW)

Who takes these roles for a given node will depend on the leadership positions within the Centre and how each nodes sees this for themselves in terms of their own governance.



Theme Leaders – Leading roles

I provide some suggestions below:

Scientific Theme	Theory Leader - Volkas (Melbourne)	Experiment Leader - Egede (Monash)
Quantum Gravity	J Hope (ANU)/A Kobakhidze (Sydney)	USyd New Hire
Atomic/Nuclear/EDM	J Ginges (UQ)/C Simenel (ANU)	A Luiten (Adelaide)
Lepton Collider	M Schmidt (UNSW)/G Valencia (Monash)	K Varvell (Sydney)
Hadron Collider	M Dolan (Melbourne)	U Egede (Monash)
Compute/Accelerators	P Skands (Monash)/J Zanotti (Adelaide)/M Sevier (Melbourne)	
Global Fits	P Scott (UQ)/M White (Adelaide)	

Deputy Director Candidates

- I feel the director, would be best served with two deputies
 - My preference would be for a “senior” figure to counter-balance any potential suggestion that I am too junior to manage the Centre and someone either at or around mid-career
- Deputy Director Candidates
 - We should strike a balance across the country/theory/experiment and also age/gender.
 - Shouldn’t be someone who becomes too oversubscribed by taking on the role (i.e. a node leader/theme leader AND deputy director)
- Jordan, Ray, Joe, Jacinda, Ulrik are still the names that fit best for me

Participant Summary Composition

Need 7 people that broadly cover the Centre activities.

Experiment Theory

Potentially:

Paul Jackson (Adelaide)	Director, Experimental
Jacinda Ginges (UQ)	CI, Node Leader, Low Energy Theory (potential DD)
Raymond Volkas (Melb)	CI, Theory program Leader (potential DD)
Joe Hope (ANU)	CI, Quantum Gravity Leader (potential DD)
Phiala Shanahan (MIT)	PI, Computational Theory
Peter Skands (Monash)	CI, Computational Theory (potential Node Leader)
Kevin Varvell (Sydney)	CI, Node Leader, Experimental
Jordan Nash (Monash)	CI (potential DD), Experimental
Ulrik Egede (Monash)	CI (potential DD), (potential Node Leader), Experimental
Andre Luiten (Adelaide)	CI Atomic Experimentation Leader
Martin Seviar (Melbourne)	CI Experimental/Computing (potential Node Leader)

My preference would be that we make a long-list of ~ 10 and write out the two-page CVs for each then decide which 7 make the strongest case.

Governance and other roles

- Doesn't need to be completely fleshed out for the EOI stage but we should at least say a few words as to structure:
 - Mention Chief Operating Officer, portfolio managers and how we envision various Centre roles being taken.



Another potential CI

- A/Prof Maria Parappilly (Flinders University) – Uni Adelaide graduate in theoretical particle physics <https://www.linkedin.com/in/maria-parappilly-oam-7043b331/>
 - Physics education specialist
 - Medal of the Order of Australia (2020)
 - Director of the STEM enrichment academy
- Based in Adelaide, Maria would be a single CI at Flinders but we imagine would work as part of a South Australian cluster.
- Her focus would be on the portfolio of education and growing women in STEM nationally.
- We have not yet been in contact with her but wanted to ask people's opinion on reaching out to Maria.

- Face-to-face meeting?
- Who?
 - All are welcome. Can we put together a list of those interested?
- When?
 - Soon, it doesn't make too much sense to leave it for a long time.
 - 2nd half of May, early June? (too late?)
- Where?
 - Adelaide or Melbourne presumably given the critical mass of people and the covid restrictions

Centre thoughts



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PHYSICS

Atomic/Nuclear – EDM in atomic physics, CP- and P-violating studies in tabletop experiments

Flavour physics (Lepton Colliders) – Precision tests of Lepton flavour universality anomalies at Belle II, channels with missing energy, unique sensitivity in $\mu \rightarrow e$ conversions

Flavour physics (Hadron Colliders) – Precision on FCNC and anomalies at LHCb and ATLAS in the 3rd generation

Quantum gravity and quantum atomic interferometry - measure inertial quantities with unprecedented stability, calibrated to universal properties of atoms

TECHNOLOGY/COMPUTE

High-Performance compute – Ultimate precision needs huge datasets and vast compute resources

Advanced Technologies - a paradigm shift in how we interact with experiments to best leverage the huge investment in the facilities. New readout methodologies

Precision frontier – quantum gravity and atomic experiments need new leaps in sensitivity, industry involvement

Synergies

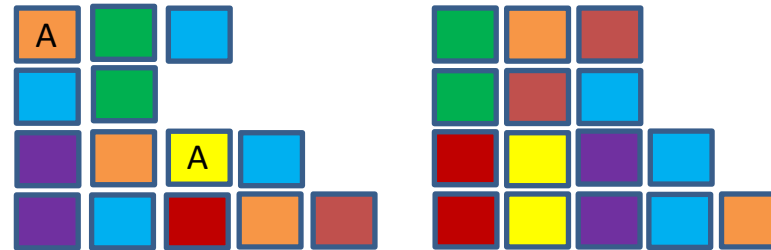


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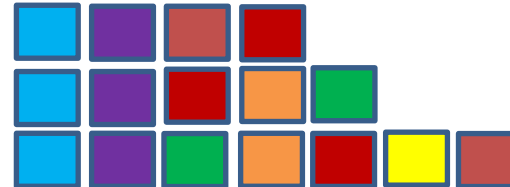
Experiment

Theory

Quantum gravity
Nuclear/Atomic Physics
Lepton Collider
Hadron Collider



Global Fitting
Technology
HPC



A = Aspirational (will be seeded by the Centre)
There will be others....



Additional Material

Synergies

