PAAP Survey Results

& Preparation of inputs to SB PPAN

26/6/2024

- **PAAP:**
  - *Sergey Burdin (Chair, Liverpool)* - Direct (particle-like) Dark Matter searches
  - *Garret Cotter (Oxford)* - Gamma-ray Astronomy
  - *Djuna Croon (Durham)* - Theory
  - *Ed Daw (Sheffield)* - Direct (wave-like) Dark Matter searches & Quantum Technology for Fundamental Physics
  - *Teppei Katori (KCL)* - Neutrino Astronomy
  - *Laura Nuttall (Portsmouth)* - Gravitational Waves
  - *Blake Sherwin (Cambridge)* - Cosmic Microwave Background
- **Science Board representatives:**
  - *Francesca Di Lodovico (KCL)*, Anne Green (Nottingham), *Patrick Sutton (Cardiff)*
- **STFC:**
  - *Thomas Gray, Georgina Freeman (currently on maternity leave), Melanie Kidd, Jamie Parkin*

PAAP Survey purpose

- Inform preparation of inputs to the prioritised PPAN Roadmap
  - PAAP Roadmap 2022 is the starting point
  - Are the recommendations up-to-date?
  - Have there been any major scientific developments that should affect future support of relevant UK research
  - Have there been any significant updates to relevant international roadmaps?
  - Any new opportunities or risks?
  - Any external drivers and key decision dates?

Strengths	Weaknesses
Opportunities	Threats

PAAP Questions

- Career stage?
- Representing collaboration?
- What are the key STRENGTHS of the field of astroparticle physics currently and across the next 10 years?
- WEAKNESSES?
- OPPORTUNITIES?
- THREATS?
- Suggestions on the PAAP Roadmap update?
- Any comments?

PAAP Survey stats

- 32 inputs
  - 15 from collaborations/institutions
    - XLZD-UK
    - University of Liverpool
    - UK LISA
    - Trinity Neutrino Telescope
    - QTFP
    - DarkSide-UK
    - QuaDMOS
    - QI (QTFP)
    - KM3NeT
    - CTA-UK
    - Cardiff Gravity Exploration Institute
    - Institute for Gravitational Research, University of Glasgow
    - Armagh Observatory and Planetarium
    - LIGO
    - QSHS (QTFP)
  - 12 from tenured faculties
  - 4 from PDRAs
  - 1 from PhD student

Initial General Observations: Strengths

- Many emerging fields with large scientific impact which demonstrate potential for future growth
- Breadth of the program
- Leadership in large international collaborations despite relatively low investment (e.g., LIGO, LZ, CTAO, ADMX)
- Strong cross-links with non-STFC research in the UK
- Significant public interest with strong potential for educational and public engagement
- Strong scientific heritage
- Advanced technical capabilities and infrastructure

Initial General Observations: Weaknesses

- Insufficient funding given increasing importance of the area
- Lack of strategic long-term investment (e.g., project to operation, QTFP, CTA)
- Covers many fields with different scientific goals, tools and methods; lack of cohesion
- Not well aligned with the existing funding structures
- Unstable career prospects; lack of support for non-academic roles
- Insufficient support for theoretical research

Initial General Observations: Threats

- Insufficient funding threatens leadership in experiments, including high-energy gamma-ray, neutrino experiments, XLZD, QTFP
- Funding Gaps: research falling in between funding remits
- Insufficient R&D Investment
- Brexit and lack of visa support
- Public expectation for immediate, positive results can lead to reduced support for fundamental, long-term research

Initial General Observations: Opportunities

- Highly complementary science with collider physics
- Discovery potential for BSM physics via several different fields (e.g. dark matter, CMB, neutrino physics, gamma rays, GWs)
- Leverage the investment in UK-based Facilities (e.g., Boulby, hosting XLZD)
- Underpinning UK strength in multi-messenger astronomy
- Exploiting UK investment in quantum
- Possibility of further strengthening/building on existing leadership roles in major international collaborations

Digitial Research Infrastructure

- Computing hardware, software, and the use of AI
- How the role of DRI is reflected in the roadmaps?
- Explicit support of the community is vital to secure the required investment
  - DiRAC
  - IRIS
  - GridPP
  - STFC-SCD
- Comments on usage of the central resources are welcome!

Timeline

- Input to SB PPAN by 28th August
  - We will finalise the input by end of July

- Please send any comments/questions on the DRI and PAAP survey to s.burdin@liverpool.ac.uk by July 3rd