

# Nuclear Physics Community meeting

## 13.30 – 15.15 Session 1

- **Strategic reports**

- Report from programmes directorate Grahame Blair (15+5)
- Update from Science Board Tara Shears (15+5)
- Report from NPAP Andy Boston (15+5)
- Nuclear Physics Programme Evaluation Don Pollacco (20+10)
- External Innovations update Stephen Loader (10+5)

- **15.15 – 15.45pm Tea/Coffee**

# Nuclear Physics Community meeting

**15.45 – 17.30      Session 2**

- **Networks & other opportunities**

- Report from NPGP                      Douglas MacGregor (10+5)
- Report from Cross Community Group   Tom Davinson (10+5)
- Nuclear Physics Projects status report   Mike Bentley (20+5)
- Update from Theory Community   Judith McGovern (10+5)
- UK Accelerator Driven Neutron Facility Carl Wheldon (10+5)

**18:00 Reception hosted by Mirion Technologies**

**19:00 Dinner**

# Nuclear Physics Community meeting

09.00 – 10:30      Session 3

- **Report from NuPECC**                      **Andy Boston (10+5)**
- **Report from IOP NP Group**              **Tzany Wheldon (10+5)**
- **Education and training**
  - Report from NP Graduate School              John Smith (10+5)
  - STFC Education and Training report              Alison Laird (10+5)
- **Nuclear Engineering and Industrial Liaison**
  - EPSRC Nuclear community                      Karl Whittle (20+5)
  - NAILS and NI                                      John Roberts (10+5)

**10.30am Tea/Coffee**

# Nuclear Physics Community meeting

## 11.00 – 13.00 Session 4

- **Networks & other opportunities**

- Nuclear Data Network Paul Davies (10+5)
- STFC Global Challenge opportunities Alison Bruce (10+5)

- **Upcoming conferences**

- INPC Glasgow David Ireland (5)
- IEEE NSS MIC Manchester Andy Boston (5)

- **Outreach activity update**

- Nuclear Physics Outreach Elizabeth Cunningham (10+5)
- Leadership Fellowship report Christian Diget (10+5)

- **AOB**

- Community committee membership
- IOP awards and prizes
- Date and location of next meeting

# UK Nuclear Physics

NPAP update

January 2019

Andy Boston

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# Members of NPAP

Andy Boston (chair)	University of Liverpool
Christian Diget	University of York
Kieran Flanagan	University of Manchester
Judith McGovern	University of Manchester
Daria Sokhan	University of Glasgow
Phil Walker	University of Surrey

## Public webpage:

<http://www.stfc.ac.uk/about-us/how-we-are-governed/advisory-boards-panels-committees/nuclear-physics-advisory-panel/>

# NPAP Activity

- Input into STFC Science Pillars update
- Update to Roadmap June 2018
- Provided input to the 2018 Nuclear Physics Programme Evaluation Exercise
- STFC Detectors and Instrumentation Strategic Review
- STFC priority projects
- STFC Consultation on Advanced Instrumentation for the UKRI Strategic Priorities Fund
- UK Community meeting(s) inc NPF meetings

# The Nuclear Physics Strategy document

- Scope and range of Physics
- Current projects
- Future projects
- Other issues
- 10 year horizon
  
- Last revision June 2018



<https://stfc.ukri.org/about-us/how-we-are-governed/advisory-boards-panels-committees/nuclear-physics-advisory-panel/>

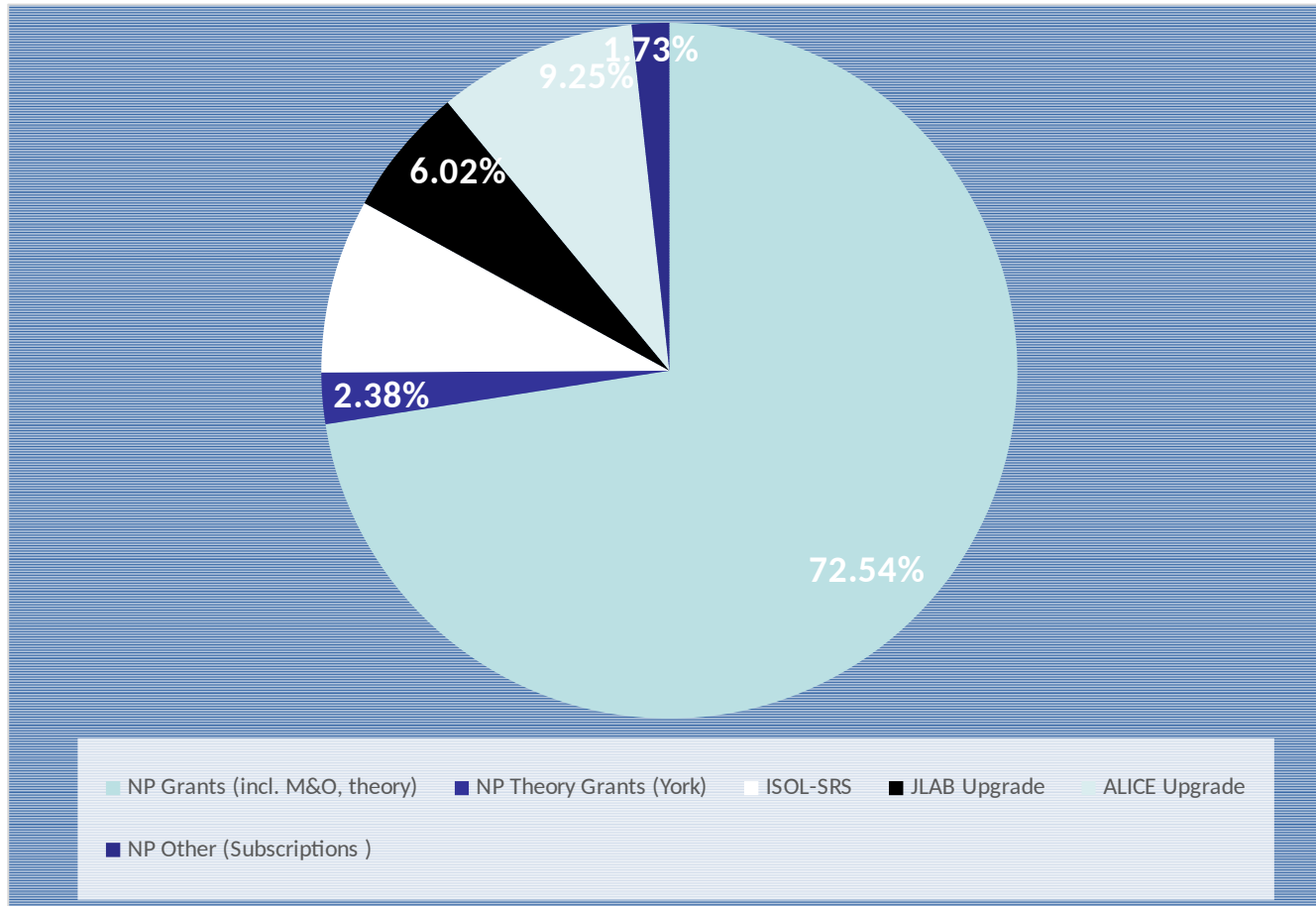


# Key Science Questions

- What governs the structure and behaviour of atomic nuclei?
- What is the origin of the elements?
- What is the nature of nuclear matter?
- How do the properties of hadrons and the quark-gluon plasma emerge from fundamental interactions?

The first three questions are associated with “nuclear structure and nuclear astrophysics” and the final one “hadronic physics”

# Balance of existing programme



**$\frac{3}{4}$  Exploitation,  $\frac{1}{4}$  Projects going forward**

# Size of the UK community

- There are 68 academic/faculty staff @ 11 institutions carrying out nuclear physics research
  - Number has been growing with recent new appointments
  - All (except 3 at STFC Daresbury) are University funded
- There are 60 Research and Professional staff supporting the academic staff
- There are 90 Research students working with the academic staff
- Approximately 48 funded by STFC

# NUCLEAR PHYSICS ROADMAP

# Roadmap for existing projects and future opportunities

	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25		
Hadronic Physics	ALICE upgrade (LHC)									
	JLAB upgrade									
					Jlab 2					
					EIC R+D					
								.....	2030	
							Electron Ion Collider			
	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25		
Nuclear Structure & Astrophysics	ISOL/SRS									
	NuSTAR at FAIR									
	AGATA exploitation		AGATA upgrade							
							STAR			
				ACPA@ELI						
				DRACULA FRIB						
							Instrumentation@JYFL			
							.....	2030		
							Future ISOL/EURISOL NuSTAR UG			
	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25		
Nuclear Theory			Neutrino-nucleus							
			Fission							
		ongoing		future		exploitation		horizon		
				PRD		exploitation at other facilities inc GSI				

# Future projects and opportunities

## Near-term

- Advance charged-particle array (ACPA@ELI)
  - Silicon based granular array with a focus on **ELI-NP** Gamma-beam applications
- DRACULA
  - Direct Reaction Array for the Core Understanding of Light-nuclei and Astrophysics
  - Silicon based granular array with a focus on **FRIB** for use with GRETA
- AGATA upgrade
  - Beyond 1pi
  - Additional gamma detectors and optimisation of signal decomposition
  - Focus on **SPES** and **FAIR** (HISPEC)

# Future projects and opportunities

## Mid-term

- Jlab 2
  - Kaon Flux Monitoring apparatus as part of the high intensity and clean neutral kaon beam (Klong@**JLAB**) development
- Instrumentation@Jyväskylä
  - Instrumentation to enhance the core physics programme at **JYFL**
  - MARA Low Energy Branch (LEB)

## Horizon

- NuSTAR 2: DEGAS Ge, Schottky pickup for storage ring, MAPS
- EIC
- EURISOL

# Future projects and opportunities

## Mid-term (PRD)

- Scintillator tracking array (STAR)
  - SiPM based highly granular gamma-ray array for ISOL facilities
- EIC
  - R+D to support the future UK contribution to the EIC. Bid likely to follow CD0 decision.

## Proposed Theory project

- Neutrino-nucleus interactions
  - Use modern ab-initio methods and effective field theory. Calculate experimentally-crucial cross-sections with greater precision and sophistication than most currently-used codes.
- Theoretical studies of spontaneous and induced fission
  - Leadership hub for theoretical studies of spontaneous and induced fission.

## Proposed User facility

- UK Accelerator Driven Neutron Facility



# Roadmap for existing projects and future opportunities

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# KEY TECHNOLOGIES

# Key technologies and technology development

- Miniaturisation of discrete readout electronics (JFET based PAs) for germanium detectors. CMOS readout. Germanium ASIC and associated mounting of the digital processing chain on the detector.
- MAPS (DMAPS)
- Photo-sensors with sub-picosecond timing resolution
- SiPM (position sensing)
- Key engineering and design support
- **Recommendation:** PRD line should be re-instated when possible

# INTERNATIONAL FACILITES

# FAIR

- **Broadly supportive**
  - From 36 responses, 52% of the Nuclear Structure Physics and Nuclear Astrophysics community indicated YES to the question.
- **Scope of programme has changed**
  - Lost PANDA and LASPEC
  - Gained ring internal spectrometer CRYRING
- **Current programme at GSI is limited. Future programme will benefit greatly from FAIR**
- **Instrumentation has been successfully redeployed**
- **Need to get scientific return on investment**

# GENERAL COMMENTS

# General comments

- Programme aligns with NuPECC and US LRPs
- Exploitation at a wide range of facilities (short/medium term)
- Clear opportunities at CERN (ISOLDE), FRIB, FAIR, Jlab, ELI-NP, EIC longer term
- ECT\* received strong support from Theory and experimental communities
- Adding breadth and diversity: In recent years projects were funded to bring more breadth into the UK programme, but breadth is fragile and vulnerable to even small cuts.

# General comments

- The relative size of the UK Nuclear Physics Community means that small changes in funding will have a big impact on the science programme, both in a positive and negative sense.
- The continuing effects of flat-cash funding cannot be ignored.
- The outcome of the recent Consolidated Grant round clearly indicates that areas not attracting funding are internationally excellent/world leading.
- This is damaging the credibility of UK science and impacting an internationally leading science programme.



# General comments

- **PDRAs have reached a level too low to properly support the programme**
- **Recommendation from the previous BoP exercise related to the number of PDRA posts supporting the core science programme**
  - no additional money was available
  - funding was reallocated from the projects line to support PDRA numbers.
- **Although welcome in the short term, this has had two unfortunately consequences.**
  - The PDRAs allocated vary in length (are shorter than the CG period) and therefore continuity has been lost in some science themes
  - Support for the projects line has been impacted which will have long term negative consequences
- **The nuclear physics community therefore regard the current level of funding for the whole programme as critically low.**

# IMPACT

- The science programme was endorsed in the recent STFC IMPACT report (2017) which ranked our community **second in the world by measure of impact and citations.**

<b>Nuclear physics</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
Number of publications	347	296	489	496	476	393	520
UK position	7	7	7	7	7	7	7
Citation Impact (CI)	6.74	13	16	15.4			
UK position	2	2	1	1			
Normalised Citation Impact (NCI)	1.62	1.72	5.12	3.1	2.6	1.8	1.6
UK position	2	2	1	2	2	1	2

# UK Nuclear Physics

## NPAP update

### January 2019

