

John Adams Institute

Philip Burrows, Director



Outline

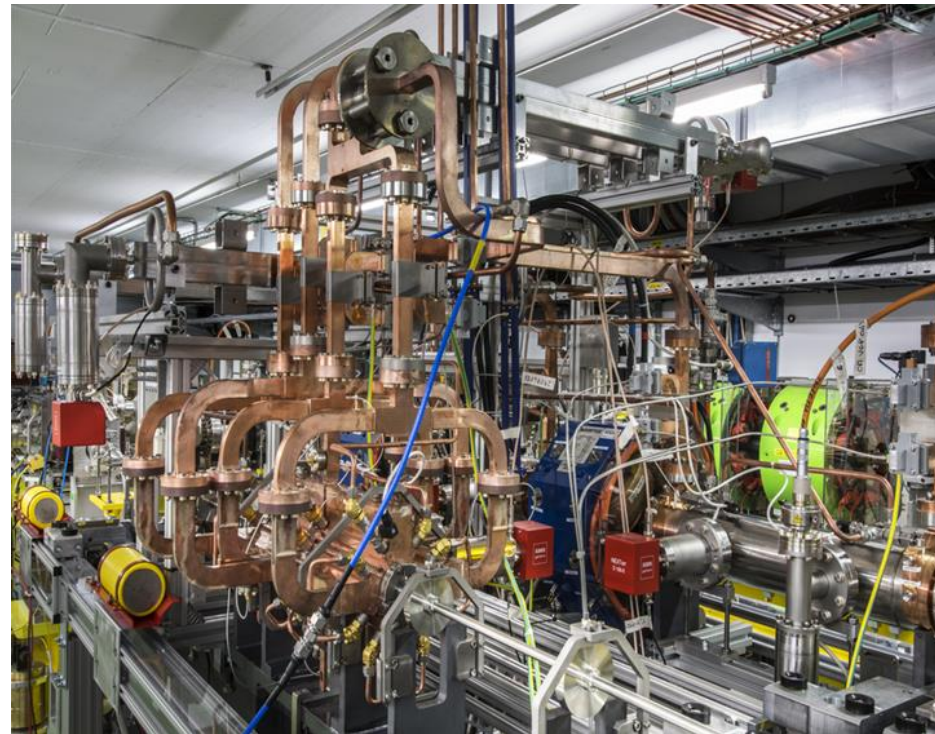
- **JAI mission + overview**
- **Research strategy**
- **Strategic partnerships**
- **Resources**
- **Outlook**

JAI Mission

A centre of excellence for advanced and novel accelerator technology:

provide expertise, research, development and training in accelerator techniques, and

promote advanced accelerator applications in science and society



JAI Overview

One of two UK national academic centres of excellence in accelerator science & technology, set up in 2004

Oxford University, Royal Holloway, Imperial College

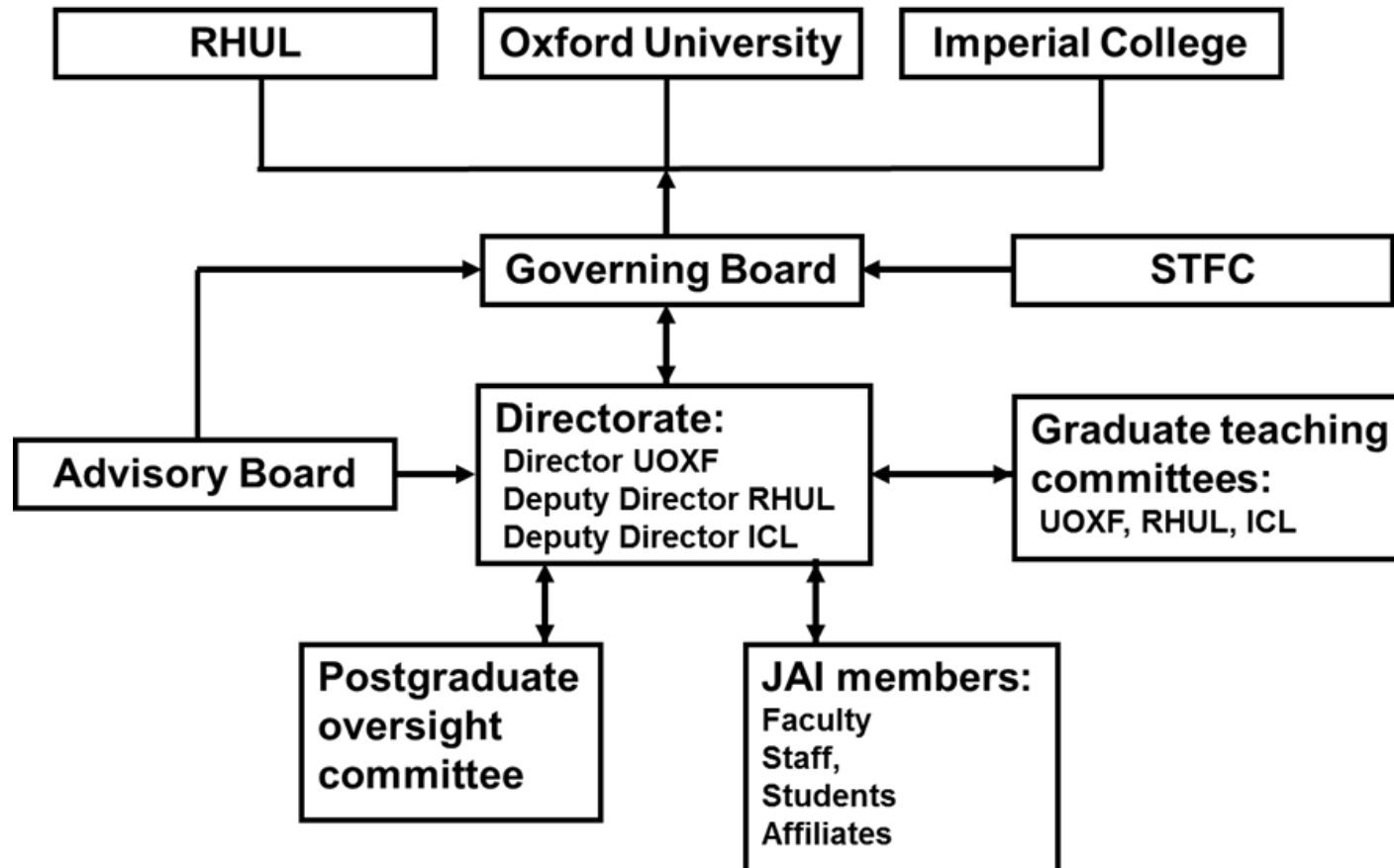
- **Research & development**
- **Education & training**
- **Knowledge exchange, impact, public engagement**

109 members:

- **20 faculty**
- **36 staff**
- **53 PhD students**

+ 46 affiliates (STFC labs, CERN ...)

Governance



JAI Advisory Board



- Deepa Angal-Kalinin (ASTeC, Cockcroft)
- Bill Barletta (ex-LBNL, MIT/UCLA)
- Oliver Bruning (CERN)
- Jonathan Dorfan (SLAC)
- Eckhard Elsen, Chair (ex-CERN, DESY)
- Christoph Quitmann (ex-MAXIV, Research Instruments)
- Akira Yamamoto (KEK, CERN)

Meets annually + ad hoc

JAI Research Strategy

- **World-class R&D at the cutting edge of accelerator science and technology**
In collaboration with our UK and international partners
- **Lead and support UK's strategic accelerator interests**
Domestic and overseas accelerator facilities/programmes
- **Capitalise on our strengths to make an impact**
- **Train next generation of accelerator scientists + engineers**
Provide outstanding R&D opportunities on forefront projects

Proactive and nimble in securing resources to support these ambitions

JAI faculty

Royal Holloway:

Stephen Gibson, Pavel Karataev, New Hire

Imperial College:

Ken Long, Stuart Mangles, Zulfikar Najmudin, Jaroslav Pasternak,

Juergen Pozimski, Steven Rose

Emeritus: Bucker Dangor

Oxford:

Philip Burrows, Richard d'Arcy, Simon Hooker, Peter Norreys, Adrian Oeftiger,

Armin Reichold, New Hire

Visiting: Manjit Dosanjh, Ian Martin, Suzie Sheehy, Emmanuel Tsesmelis

Emeritus: Brian Foster, George Doucas, Ken Peach, Roman Walczak

JAI faculty – Oxford Physics

Philip Burrows

Richard d’Arcy

Simon Hooker

Peter Norreys

Adrian Oeftiger

Armin Reichold

New Hire

Visiting: Manjit Dosanjh, Ian Martin, Suzie Sheehy, Emmanuel Tsesmelis

Emeritus: Brian Foster, George Doucas, Ken Peach, Roman Walczak

JAI faculty – Oxford PP

Philip Burrows

Richard d’Arcy

Adrian Oeftiger

Armin Reichold

New Hire

Visiting: Manjit Dosanjh, Ian Martin, Suzie Sheehy, Emmanuel Tsesmelis

Emeritus: Brian Foster, Roman Walczak

JAI faculty – Oxford PP

2018:

Riccardo Bartolini

Philip Burrows

Brian Foster

Ivan Konoplev

Armin Reichold

Andrei Seryi

Suzie Sheehy

Roman Walczak

2024:

Philip Burrows

Richard d’Arcy

Adrian Oeftiger

Armin Reichold

New Hire

Welcome!

Richard d'Arcy

**Appointed Associate
Professor at JAI/Oxford**

Started June 2023



Welcome!

Adrian Oeftiger

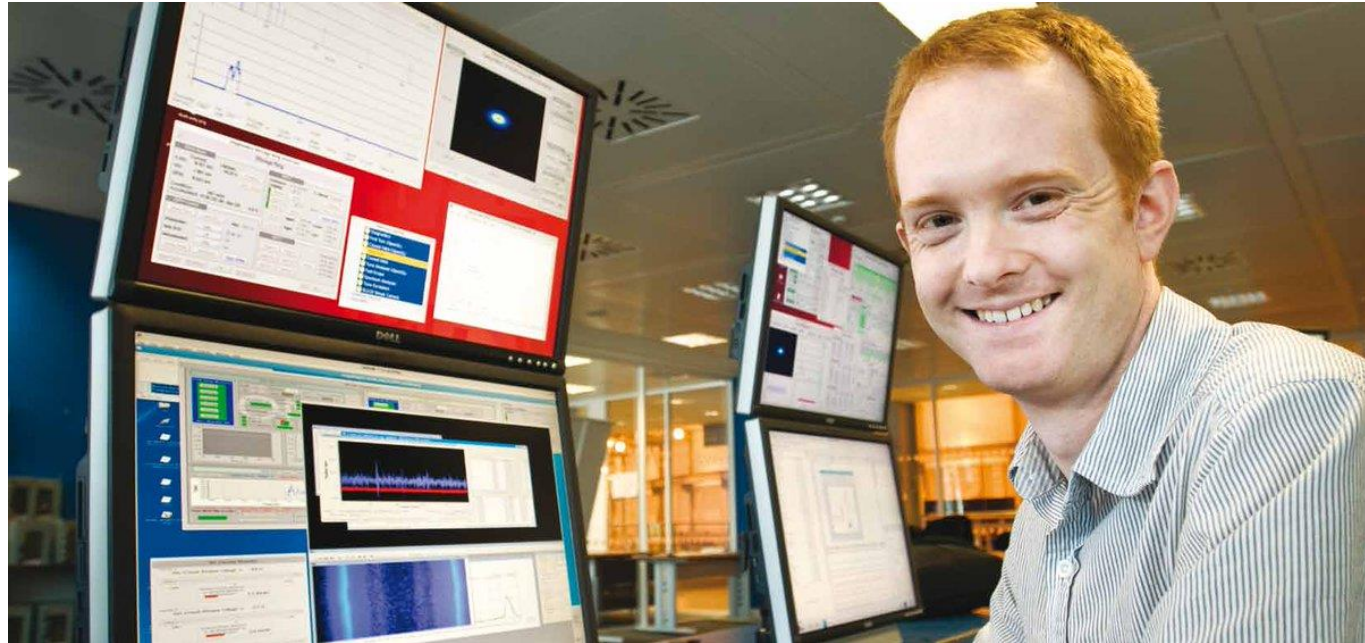
**Appointed Associate
Professor at JAI/Oxford**

Started September 2024



Welcome!

**Ian Martin,
Head of
Accelerator
Physics,
Diamond
Light Source**



Appointed Visiting Professor at Oxford

JAI faculty – Oxford PP

2018:

Riccardo Bartolini

Philip Burrows

Brian Foster

Ivan Konoplev

Armin Reichold

Andrei Seryi

Suzie Sheehy

Roman Walczak

2024:

Philip Burrows

Richard d’Arcy

Adrian Oeftiger

Armin Reichold

New Hire

2035:

Richard d’Arcy

Adrian Oeftiger

New Hire (2024)

New Hire (2032?)

New Hire (2033?)

Strategic partnerships

- **STFC national laboratories:**

Diamond Light Source

ISIS

Central Laser Facility + Extreme Photonics Applications Centre

ASTeC, Daresbury Laboratory

- **Cockcroft Institute**

- **CERN**

- **DESY**

- **KEK**

- **BNL, Jlab, SLAC**

Diamond Light Source



Strong links in particular with Accelerator Physics, Diagnostics + Controls groups

PhD students (* = joint JAI/DLS):

Ji Li *	(Oxford)	graduated 2021
Dan Harryman	(RHUL)	graduated 2021
Niki Vitoratu *	(RHUL)	graduated 2020
Seb Wilkes *	(Oxford)	started October 2021
Alec Clapp *	(RHUL)	started October 2021
Corey Lehman *	(Oxford)	started October 2023
Shaun Preston *	(Oxford)	started October 2023



Joint PDRA (Oxford):

Maxim Korostelev	2018-21
Riyasat Husain	2023-24



ISIS neutron + muon source



Strong links with Intense Beams, Accelerator Physics and Operations groups

PhD students (Oxford):

Jake Flowerdew

IBEX Paul trap

graduated 2023



Max Topp Mugglestone

beam dynamics

graduated 2024

Rob Williamson

ISIS staff

graduated 2023

David Posthuma de Boer

ISIS staff

Carl Jolly

ISIS staff

started PhD October 2023

Joshua Appleby

transverse tune

starts October 2024



Joint PDRA (Oxford):

Emi Yamakawa

now ISIS staff

Hannah Wakeling

since March 2023



ASTeC + Cockcroft Institute

Strong collaborations on UK projects + programmes:

- High-Lumi LHC-UK2
- AWAKE-UK2
- ILC, CLIC, EIC
- MuHIG
- CLARA (H3Beams, VHEE/FLASH ...)
- ITRF/LHARA, STELLA
- Centre of Excellence for Sustainable Accelerators (CESA)
- UK-FEL
- Training: joint seminars + lectures
- **Burrows** on ASTeC AB + CLARA Beam Allocation Panel, **Gibson** on Cockcroft SAB

International

CERN

LHC, HL-LHC, AWAKE, FCCee, CLIC/ILC, CLEAR
Physics Beyond Colliders / Scientific Diversity

DESY

FLASHForward

KEK

Accelerator Test Facility (ATF2), ILC Technology Network

BNL + JLab

Accelerator Test Facility, EIC

SLAC

FACET2

Placements of PP students/staff

@CERN:

Bencini, Howling, Horney, Kennedy, Korysko, Musat, Salvesen

@ISIS:

Appleby, Jolly, Posthuma de Boer, Wakeling

@Diamond:

Husain, Lehmann, Preston

@LBNL:

Wilkes

@DESY:

Cowley

@KEK:

Bett

New developments

- **Sustainability: an important driver for future facility design**

Hannah Wakeling full-time on CO2 LCA for ISIS-II
connected to Arup studies of CO2 for ILC and CLIC construction/operation
supporting UK Centre of Excellence for Sustainable Accelerators (CESA)

- **Machine Learning/AI: becoming ubiquitous for accelerator design and operations**

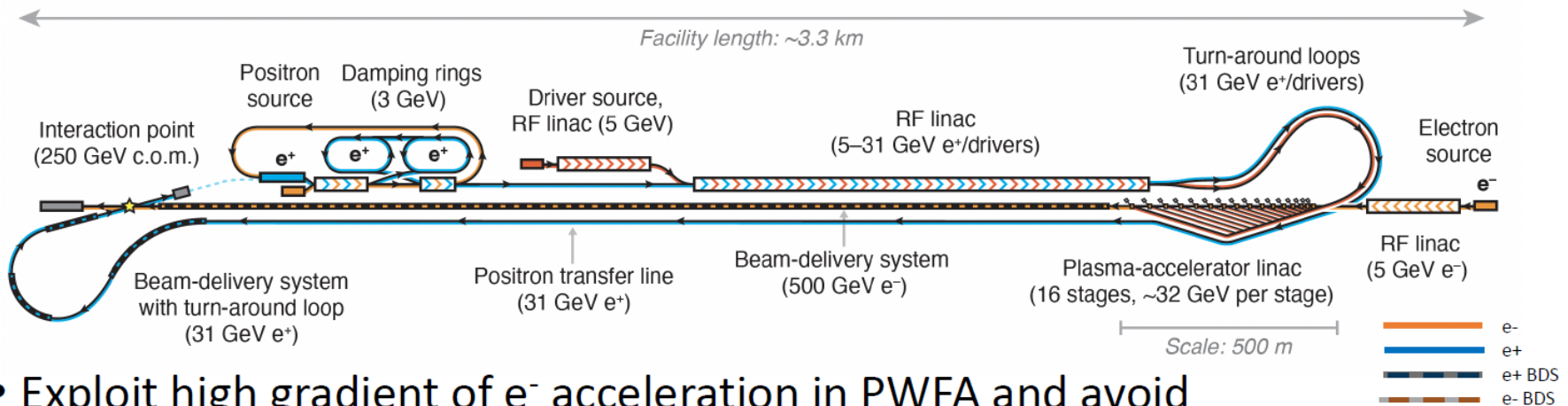
design/performance optimisation, fault prediction for Diamond, STELLA, LHC
nanobeam beam dynamics optimisation at KEK/ATF2 ...
optimisation of wakefield accelerators

- **Medical beamlines: strengthening collaborations with clinicians**

Oxford Dept. of Radiation Oncology, HUG, UVic – FLASH therapy
IC Centre for Clinical Applications of Particles (CCAP) – LHARA
International Cancer Expert Corps (ICEC) collaboration on STELLA

- **HALHF**

Hybrid Asymmetric Linear Higgs Factory (HALHF) Concept



- Exploit high gradient of e^- acceleration in PWFA and avoid difficulty of e^+ acceleration by using conventional RF linac, reducing cost by low $E(e^+)$ (31 GeV) \Rightarrow high $E(e^-)$ (500 GeV), boost $\gamma \sim 2.7 \Rightarrow E_{CM} \sim 250$ GeV.
- Reduce running costs by increasing current $I(e^+)$ and reducing $I(e^-)$; this & asymmetric emittance (increased for e^-) ease PWFA requirements.
- ~ 400 m length PWFA stage (PWFA gradient ~ 6.4 GV/m; \langle gradient $\rangle \sim 1.2$ GV/m) \Rightarrow facility length ~ 3.3 km and cost $\sim \frac{1}{4}$ of ILC/CLIC - \$1.9B (2022 \$).

STFC request 2025-28

Total numbers	Oxford	RHUL	ICL	Total
Investigators (months)	10.8	5.0	8.4	24.2
Researchers (months)	436.2	288.6	210.0	934.8
Administrative staff (months)	8.4	12.6	0	21.0
Consumables (k£)	134	86	52	272
Travel and subsistence (k£)	125	70	32	227
Exceptional items (k£)	147	0	0	147
Capital items (k£)	432	228	278	938
Total cost (k£)	5728	3448	2840	12016

JAI/Oxford-PP 10-year strategy

Particle Physics (Burrows, d'Arcy, Oeftiger, Reichold, Tsesmelis):

LHC / HL-LHC

AWAKE

(FLASHForward, CLARA, EPAC)

(HALHF - subject to resources)

The next collider @ CERN (subject to resources)

Light Sources (Burrows, Martin):

Diamond / Diamond-II

UK-FEL (if it proceeds + subject to resources)

Intense hadron beams (Oeftiger, Sheehy):

ISIS / ISIS-II

Societal applications (Dosanjh, New Hire, Reichold, Sheehy):

Medical beamlines – growing interest with Oxford Radiation Oncology

Commercialisation of metrology systems