

Education and Training at JAI

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Introduction

- The JAI programme is organized around three pillars:
 - Research in accelerator science.
 - Training the next generation of accelerator scientists.
 - Outreach to industry and the public.

Graduate Accelerator Physics Course (I)

■ Term I October-December 2018

- **Lectures** – Types of Accelerators*, Live Connection – LHC Control Centre*, Application of Accelerators*, Transverse Optics (2), Longitudinal Dynamics, Momentum Effects, Basic Plasma Physics Concepts for Plasma Accelerators, Lattice Design, Beams & Imperfections, Plasma-based Ion Accelerators, Synchrotron Radiation (2), Plasma-based Electron Acceleration, RF Cavities (3), Beam Diagnostics & Instrumentation, Electron Dynamics, Wigglers & Undulators, Parameters for scSPS Student Design
- **Exercise Classes** – Introduction to Accelerators*, Transverse Optics, Longitudinal Dynamics, RF Cavities (2), Synchrotron Radiation

** Re-structured for combined Particle Physics / Accelerator Physics cohort*

Graduate Accelerator Physics Course (II)

- Term II January-March 2018
 - **Lectures** – Magnet Design (2), Non-linear Dynamics (2), Beam-Beam Effects, Space Charge Tune Shift, Beam Transport, Linear Colliders (4), Instabilities (2), **Beamlines for Fixed Target Experiments***, Injection, Beam Transport & Extraction, Particle Sources, Free Electron Lasers, Vacuum and Surface Science
 - **Exercise Classes** – Magnet Design, Introduction to scSPS Design Project (Physics Motivation and General Parameters, Lattice, RF Cavities)
 - **Tutorials** – Design Project – scSPS (8)

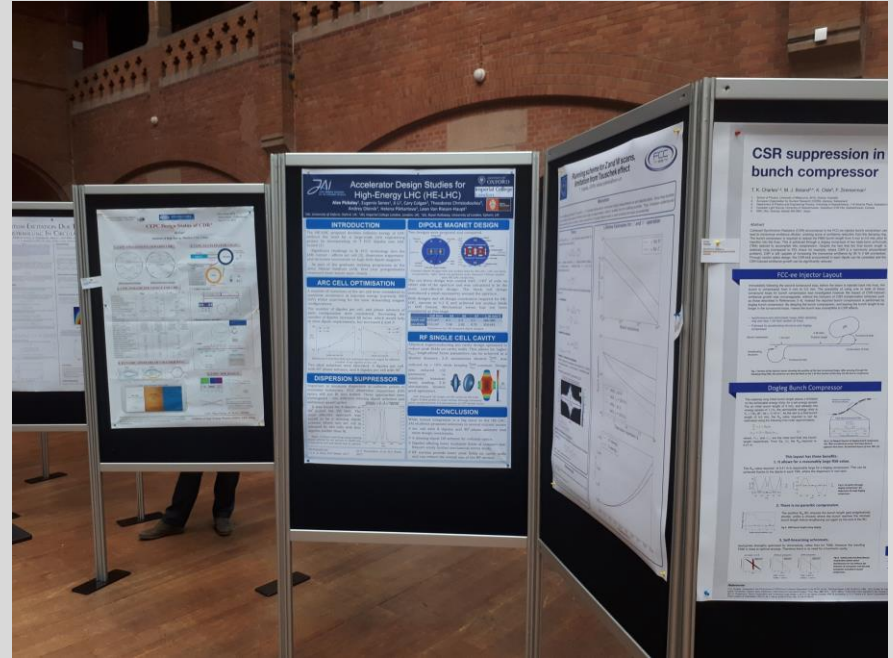
* *New for Term II 2019*

Consolidated Accelerator Course

- Graduate lecture course includes plasma lectures provided by ICL, as part of development of **integrated accelerator-laser-plasma training**.
- Lecturers & Instructors
 - R. Bodenstein (Oxford), S. Boogert (RHUL), M. Fraser (CERN), A. Gebershagen (CERN)*, S. Lawrie (RAL)*, S. Mangles (ICL), I. Martin (Diamond)*, A. Milanese (CERN), Z. Najmudin (ICL)*, S. Patel (RAL), C. Plostinar (ESS), S. Sheehy (Oxford/RAL), F. Tecker (CERN), E. Tsesmelis (CERN/Oxford),
** New lecturers for 2018-2019 academic year.*
 - Lecturers and instructors from **all** JAI universities and from external institutes beyond – CERN, DIAMOND, ESS, RAL.

Accelerator Design Project

- Accelerator Design Studies for the Superconducting SPS for 2018-2019.
 - The aim of this year's JAI student project work was to prepare a design for the scSPS.
 - Design work consisted of study of the lattice, magnet systems and RF cavities.
 - See student presentation at JAI AB.
- Present poster at FCC Week in Brussels in June 2019.
- Student presentation at CERN planned for June 2019 (together with visits to accelerator facilities).



As per JAI AB recommendation, continue presenting at poster session at international forums (like HE-LHC Student Poster at FCC Week Amsterdam in April 2018)

Resources

- Continued use of dedicated site on INDICO for JAI accelerator courses
 - <https://indico.cern.ch/category/5869/>
- Incorporates
 - Timetable
 - Slides and Documents
 - Vidyo connection

The screenshot shows the INDICO event page for 'Hilary Term 2019'. The header is blue with the text 'Hilary Term 2019'. Below the header, the event dates are '14 January 2019 to 8 March 2019' and the location is 'Denys Wilkinson Bldg., Oxford'. A search bar is visible in the top right. The main content area is divided into two columns. The left column contains a navigation menu with items: Overview (highlighted), Timetable, Contribution List, Week 1 (16-17 JAN), Week 2 (23-24 JAN), Week 3 (30-31 JAN), Week 4 (6-7 FEB), Week 5 (13-14 FEB), Week 6 (20-21 FEB), Week 7 (27-28 FEB), Week 8 (6-7 MAR), Videoconference Rooms, and How to join remotely. Below the menu is the text 'JAI Education & Training in Accelerator Physics (Student Handbook)'. The right column features the title 'John Adams Institute - Accelerator Courses Accelerator Physics'. It includes a clock icon with the text 'Starts 14 Jan 2019, 08:00' and 'Ends 8 Mar 2019, 19:00' with 'GB' below it. A location pin icon indicates 'Denys Wilkinson Bldg., Oxford' and 'Videoconference Room'. A paperclip icon is followed by a list of documents: '2014_Book_AcceleratorPhysicsAtTheTevatr...', 'CERN-ACC-NOTE-2014-0065.pdf', 'CM-P0007738-e.pdf', 'scSPS Conceptual Design Considerations.p...', and 'scSPS General Parameters.pdf'.

Students 2019-2020 Academic Year (I)

■ Oxford

- STFC Studentship
- 2 Royal Society Studentships
- STFC Industrial CASE Studentship
- CERN Doctoral Student Programme
- ISIS Full Studentship + Part-time Studentship
- Jefferson Laboratory

■ RHUL

- STFC Studentship
- CERN Doctoral Student Programme
- RHUL Funding

■ ICL

- STFC Studentship
- STFC Industrial CASE Studentship

Process for graduate student selection on-going at all JAI universities.

Graduate Student Funding

Continue to explore wide range of possibilities for sustainable funding.

- JAI member universities.
- STFC (including JAI grant co-funding).
- STFC Industrial CASE Studentship
- RAL / DSTL
- Helmholtz Foundation.
- Marie Skłodowska Curie Actions.
- Royal Society.
- Russian Global Education Programme.
- RHUL Reid Studentship
- Joint RHUL-Diamond LS Studentship Scheme
- Support of part-time students engaged as staff at accelerator labs (e.g. ISIS, Diamond) while simultaneously pursuing PhD at JAI.
- Studentship funding from non-UK sources (CERN Doctoral Student Programme, ERC).
- Jefferson Laboratory

Summer Student Programme


- Oxford University Internship Programme (to CERN)
 - Interns are in 3rd year (or exceptionally 2nd year) of their 4-year course in Physics or Engineering.
 - Will participate in CERN Summer Student lecture series and in an accelerator project.
 - For 2019 (July-August)
 - Selection process underway.
 - For example, CLEAR accelerator project supervised by Oxford faculty & graduate students.

Expect programme to attract undergraduate students to accelerator science.

APPEAL

- Accelerator and Particle Physics Education at A-Level
- Annual training event started in 2010. **10-year Anniversary!**
- APPEAL-10 2019 Theme

Future Accelerator Projects Big Science at the Energy Frontier

Venue	APPEAL 9 – Year of Engineering 2018
Timetable	<i>Making Big Science Happen</i>
Participant List	<p>With the designation of 2018 as the Year of Engineering, now is a great time to discuss with A-level pupils the connections between engineering, particle physics and particle accelerators.</p> <p>Particle accelerators present engineers with a variety of challenges at the forefront of technology. Engineers build and test the equipment and systems required by accelerators. Building a particle accelerator, for example, can require civil engineering: digging tunnels and installing large infrastructure projects. Other engineers design and build accelerator components: radiofrequency cavities must be crafted to just the right shape and size to boost particles along accelerators; thousands of large custom-built electromagnets focus particle beams and guide them around bends in circular accelerators; and the world's largest cryogenic system cools magnets on the Large Hadron Collider (LHC) to close to absolute zero, so that the wires supplying their electricity can work in a superconducting state without losing energy to resistance.</p> <p>The University of Oxford is organising in collaboration with CERN a one-day school to give A-level teachers an opportunity to learn about the phenomena and challenges which connect engineering, particle physics and particle accelerators. This school is designed for physics teachers who are not necessarily physics specialists. Preference will be given to teachers coming from schools which usually send very few pupils to University.</p> <p>Teachers will have the opportunity to learn more about particle accelerators, connections between engineering and particle accelerators, and phenomena being studied with particle accelerators – such as the Higgs boson(s) and the search for dark matter. The school will address questions such as "What is the origin of the Universe and of matter?", "How do the LHC and other particle accelerators work?", "What are some of the engineering challenges for particle accelerators?" and "What are the applications of particle accelerators in our daily lives?"</p> <p>Past APPEAL events were very successful and we are looking forward to a very interesting and thought-provoking event this year as well.</p> <p>The APPEAL-9 event will take place on Saturday, 30 June 2018 at the University of Oxford.</p> <p>To take part in this school please register here before the Friday, 15 June 2018.</p> <p>There are no registration fees for the teachers to participate in the event. The organisers are grateful for the support received from the following organisations:</p> 

APPEAL 9 in 2018

Accelerate! Show

- The *Accelerate! Show* is an award-winning, live, interactive science show aimed at audiences of high school pupils.
- The show uses a series of exciting demonstrations from exploding hydrogen balloons and liquid nitrogen with levitating superconductors through to giant beach balls - all to tell the story of how particle accelerators work.
- Led by Suzie Sheehy & all JAI students are welcome to join.



Accelerate!

www.physics.ox.ac.uk/accelerate
accelerate@physics.ox.ac.uk

Learn how to drive the world's biggest machine in live-action science show *Accelerate!*

Explosions, hair-raising experiences and objects which float in mid-air are just some of the things you'll see in the *Accelerate!* show. It's all in the name of science and, best of all, it's FREE!

Accelerate! lets you get up close and personal with the exciting world of particle and accelerator physics. You'll learn how particle accelerators can do everything from recreating conditions just after the Big Bang to finding new ways to treat cancer.

Join working scientists and PhD students from top universities in this 45-minute show taking you on a guided tour of the science behind atom smashers. Enjoy exciting demonstrations with oodles of audience involvement—all whilst learning about some of the most exciting science of our time!

Find out more about the show inside, or turn to the back cover and **BOOK NOW!**

The poster features three inset photographs: a large blue hydrogen balloon, a man holding a glowing pink plasma ball, and a woman holding a small glowing sphere. The background is dark with blue particle tracks.

The Big Bang Experience!

- A brief history and future of the LHC revealing the wonders of the Large Hadron Collider at CERN, and how it is unravelling the mysteries of the universe.
- Presented by Stephen Gibson and assisted by his colleagues from RHUL Andrew Casey, Sophie Bashforth and Andrey Abramov.



The RHUL Department of Physics wins three awards at SEPnet Expo 2017.

Get-togethers

- Full day annual **JAlfest** (7 Dec. 2018)
 - Academic staff & student presentations
- **JAI Lecture Series**
 - Distinguished lecturers from JAI and other laboratories/universities.
 - Scheduled for students to attend.

John Adams Institute for Accelerator Science Lecture Series

This page gives information on the John Adams Institute Lecture Series. Lectures will usually be held on Wednesdays at 4:15 pm, during term time, in the Dennis Sciama Lecture Theatre, Denys Wilkinson Building, Keble Road, Oxford.

Upcoming lectures

Presenter	Title	Date	Time	Venue	WebEx/stream
Dr. Alexander Gerbershagen (CERN)	CERN Test Beamlines	Thursday 21st Feb 2019	16:15	Dennis Sciama lecture theatre	

Previous lectures

▼ 2019

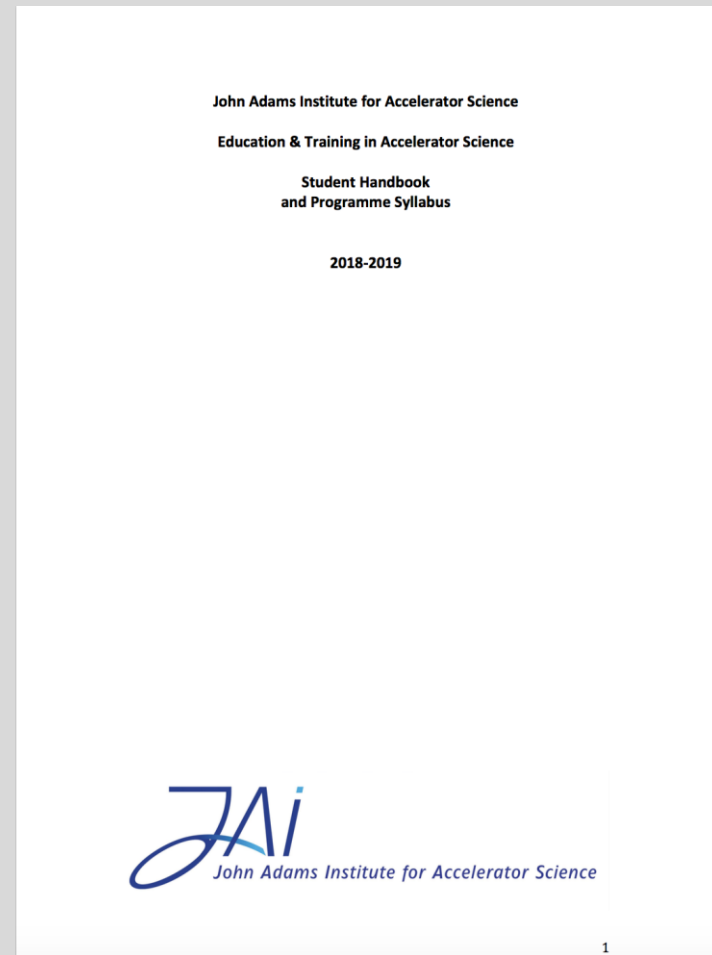
Presenter	Title	Date	Slides	Video (download)	Video (stream)
Dr. Laurence Court (University of Texas MD Anderson Cancer Center)	Physics approaches to improving access to cancer care in low- and middle-income countries	Thursday 17th January 2019			
Dr Stephen Brooks (Brookhaven National Laboratory)	Permanent Magnet Accelerator Arcs with Linear Fields	Tuesday 15th January 2019			

▸ 2018

▸ 2017

JAI Student Handbook 2018-2019

- Following recommendation of JAI AB 2017.
- Provides information to the students of the training programme in accelerator science at JAI.
 - Including syllabus & course content, course resources, assessment, evaluation, recommended textbooks.
 - Supplementary information (public engagement, lecture series, summer student programme etc.)



External Lecture Programmes

- JAI participating in external lecture programmes
 - CERN Accelerator School (CAS).
 - Joint Universities Accelerator School (JAI is partner institute).
 - Centre for Postgraduate Training - Plasma Physics & High Energy Density Science
 - Trans-Siberian School on High Energy Physics
 - High Power Laser Meeting - Laser Wakefield Acceleration of Electrons
 - *Physics of Particle Accelerators*, an intercollegiate course for students from King's College, Queen Mary, and UCL.

Conclusions

- JAI continues to deliver a world-class accelerator science education & training programme.
 - Intense accelerator physics course
 - Innovative and educational accelerator design projects
 - Recognised outreach activities
 - Successful placement of students once they enter professional careers.