



Oxford Radiobiology Training

Sarah Norman

Course Coordinator

Gray Institute for Radiation Oncology & Biology

Department of Oncology

Gray Institute for Radiation Oncology & Biology

- Radiotherapy and Related Radiobiology Progress Review Group of the National Cancer Research Institute (NCRI) in 2003
- Unsustainable number of scientists active in clinically-applied radiobiology
- Critical mass / concentration of expertise
- New Institute for Radiation Oncology and Biology



Supported by CRUK & MRC

Professor W Gillies McKenna



Current Radiobiology training programme

- Growth in graduate training in past 5 years
 - From 7 to >50 registered graduate research students
 - Annual Student Symposium in June/July
- 100% 4-year DPhil submission rates
- Embedded Clinical Research Fellowship training
- Expanded Postdoctoral Training
- Establishment of MSc in Radiation Biology



DPhil in Radiobiology

- Attract a large number of excellent quality applicants
- Well funded doctoral programme
 - 45% funded from Research Councils; 45% Charities; 10% Industry/Overseas
- Capacity building in Radiobiology
 - 50% into research; 25% into clinical NHS positions



Simon Scrase

2008 cohort of DPhil students; CRUK funding

Supervised by Eric O'Neill

Published Radiosensitivity of lung cancer cells attributed to RASSF1A
(*Current Biology* 2009)

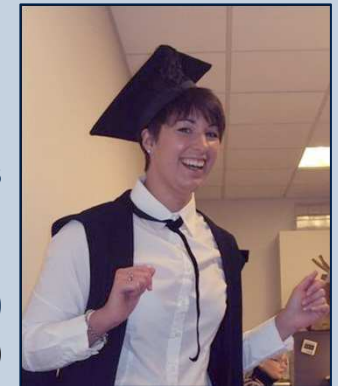
Laura Eccles

2006 cohort of DPhil students; MRC funding

Supervised by Peter O'Neill

Published in *Mutat Res* 2011 & *Nucleic Acids Res* 2010

Post doc Simon Powell (Memorial Sloan-Kettering Cancer Center, NY)



MSc & DPhil 4-Year Programmes

- 4-year funded students take a formal MSc course in their 1st year and progress onto the DPhil in Radiobiology
- Broaden the research students' knowledge base
- Sustainability in Radiation Biology



Monica Olcina del Molino

1st class degree in Pharmacy (Manchester)

Top in class 2009 cohort MSc Radiation Biology

Published in *Clin Cancer Res* 2010

DPhil Project with Ester Hammond

MSc in Radiation Biology

- The one-year, full-time, taught course in Radiation Biology leading to an MSc awarded by the University of Oxford
- First year of training for students for DPhil degree in Radiobiology
 - Or academic careers in Radiation Biology research at other Universities
 - Or a career in professions that require knowledge of Radiation Biology e.g. academic personnel associated with Radiation Protection issues



Course Director:
Prof Peter O'Neill



Deputy Course Director:
Prof Bleddyn Jones



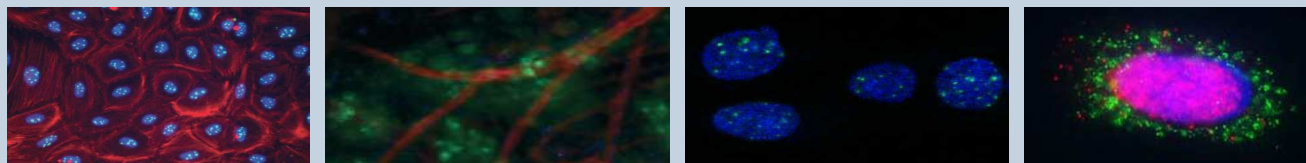
Course Coordinator:
Sarah Norman



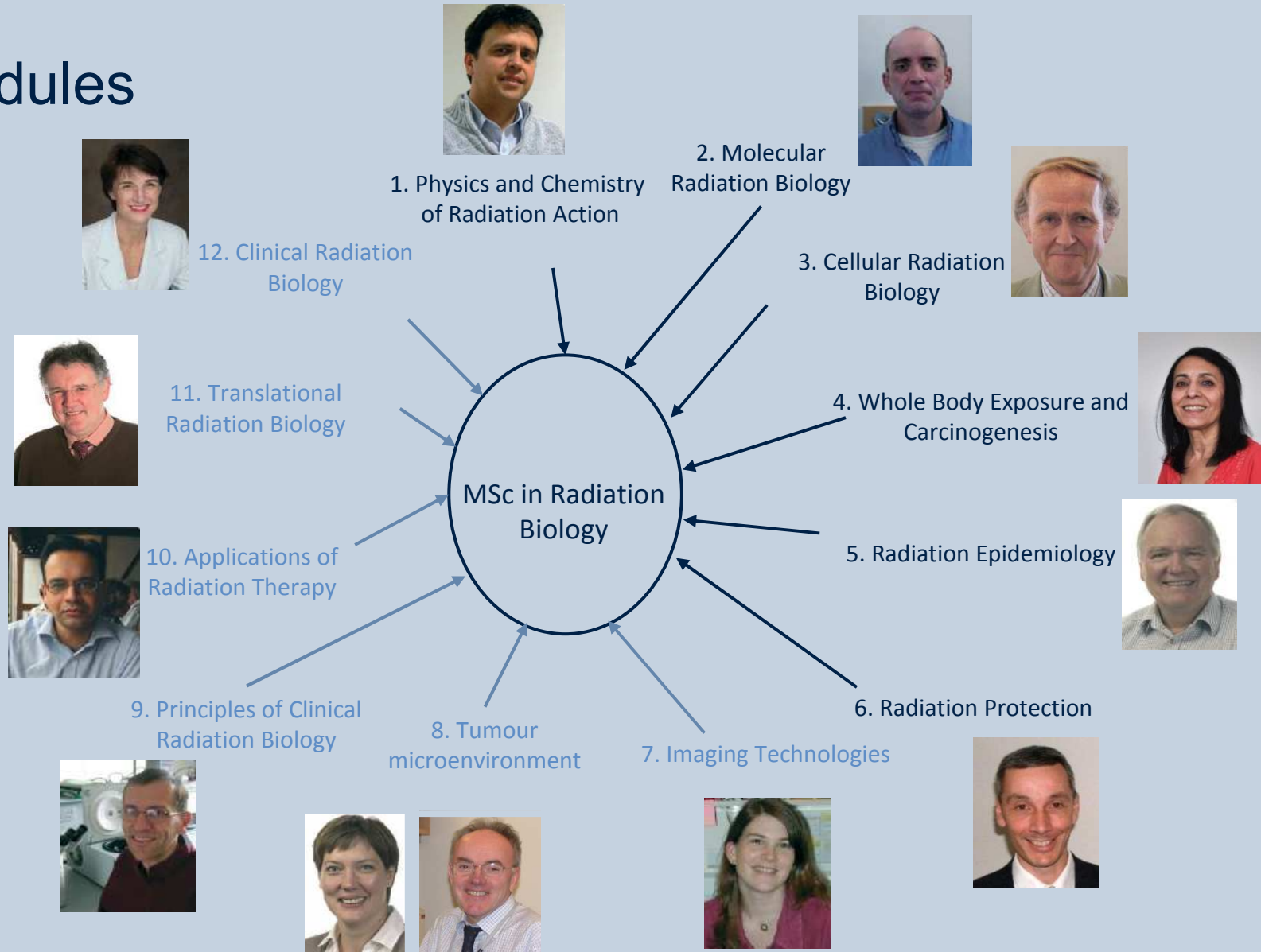
Course Assistant:
Katy Higgins

MSc Radiation Biology Course Structure

- High-quality basic and clinically-applied theoretical course
 - Fundamental low dose biology, DNA damage and repair
 - Current and future cancer treatment by radiotherapy
- Taught in the first 2 terms, over a series of 12 modules
 - Each module is delivered over one-two weeks
 - Lectures are be given by local, national and international experts
 - Tutorials, practical sessions, demonstrations and visits given/hosted by local staff
- Last 6 months - high quality research project in one of the associated laboratories, written up as a 10,000 word dissertation



Modules



External Speakers in Low Dose Risk

- Dudley Goodhead
- Jolyon Hendry
- Simon Bouffler, John Harrison, John Cooper et al HPA, Oxfordshire
- Sarah Darby, Oxford
- Mark Pearce, Newcastle
- Richard Wakeford, Manchester
- Chris Gibson and other NHS protection personnel, Oxford

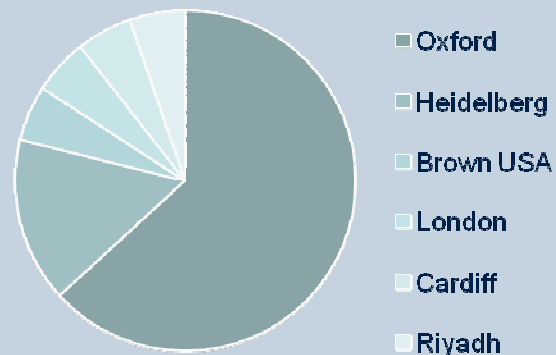
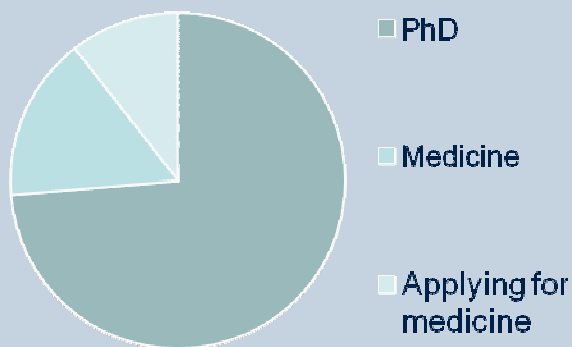
Normal Tissue (OncoRay Dresden)

- Wolfgang Dörr and colleagues



MSc in Radiation Biology Previous Cohorts

- 2009/2010 cohort
- 9 students: 2 physicists; 1 biomedical engineer; 5 biologists; 1 medic
- 3 gained distinctions & 6 passed
- 2010/2011 cohort
- 10 students: 1 chemists; 1 radiotherapist; 5 biologists; 3 medics
- 1 gained distinctions & 9 passed



Cindy Körner
1st class degree in Inorganic Chemistry (TU Dresden)
2010 cohort MSc Radiation Biology
DPhil Project with Ester Hammond & Stuart Conway (Chemistry)



Current year - 2011/2012

9 students:

2 x BSc Biomedical Science; 2 x BSc Biology; BSc Molecular Medicine;
3 x MBBS Medicine & Surgery; DDS in Dentistry.



We also allow DPhil students in Radiobiology, Medicinal Chemistry and Physics to attend the lectures, as well as local hospital personnel (clinicians, radiotherapists and cancer nurses).



Modules 1-3 including pre-sessional physics

PS1 Units, Measurements and Errors Claire Timlin

PS2 The electromagnetic spectrum Boris Vojnovic

PS3 Image, signals, information Boris Vojnovic

PS4 Mathematics for the radiation biologist Bleddyn Jones

PS5 Particle Physics, a brief history Bleddyn Jones

2.01 Molecular damage and damage detection Peter O'Neill

2.02 Cell cycle controls and radiation-induced checkpoints Isabel Pires

2.03 Repair mechanisms of base damage cross-links and SSB Jason Parsons

1.01 Introduction to ionising radiation and radioactivity Mark Hill

2.04 Repair mechanisms of double-strand breaks Natsuko Suwaki

1.02 Radioactivity and radioactive decay Mark Hill

2.05 Genome Stability and chromosomal rearrangements Tim Humphrey

1.03 Radiation source technology Boris Vojnovic

2.06 Tumour suppressor genes Eric O'Neill

1.04 Interaction of particles with matter Claire Timlin

2.07 Molecular events in apoptosis necrosis and autophagy Karen Yee

1.05 Interaction of particles with matter - Workshop Claire Timlin

2.08 Oncogenes Eric O'Neill

1.06 Chemical reactions after irradiation Peter O'Neill

3.01 Cell population kinetics Jolyon Hendry

1.07 Radiation detection techniques Mark Hill

3.02 Colony formation versus cell growth assays and dose-survival relationships Jolyon Hendry

1.08 Dose and dosimetry Liz Macaulay

3.03 LQ and 2-component exponential survival curve models Roger Dale

1.09 Track structure and microdosimetry Dudley Goodhead

3.04 Sublethal and potentially lethal damage repair and low dose hypersensitivity induced resistance Jolyon Hendry

1.10 Physics of photon and electron therapies Liz Macaulay

3.05 OER RBE and LET Bleddyn Jones

1.11 Physics of protons neutrons and ions Stuart Green

3.06 Radiosensitisers and radioprotectors Gillies McKenna

1.12 Physics of unsealed source therapies Glenn Flux

3.07 Non-targetted effects and microbeam technology. Boris Vojnovic

1.13 Nuclear physics and isotope production David Parker

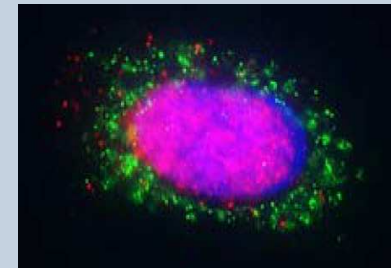
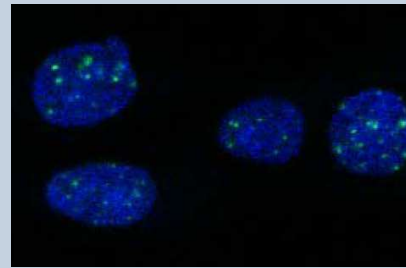
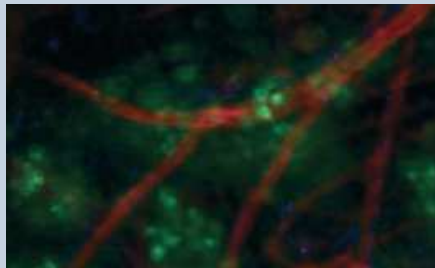
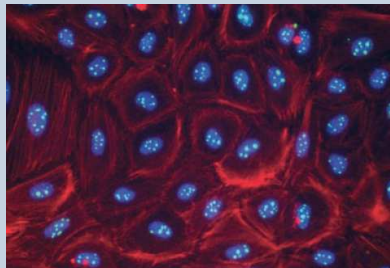
3.08 Statistics for radiation biology Francesca Buffa

Modules 4-6

4.01 Whole body irradiation syndromes Liz Ainsbury	
4.02 Established and emerging methods of biological dosimetry Kai Rothkamm	
4.03 Radiation accidents and medical management David Brown	
4.04 Multistage carcinogenesis Christophe Badie	
4.05 Genomic instability 1 Munira Kadhim	
4.06 Genetic susceptibility to radiation induced cancer Simon Bouffler	6.01 ICRP system of protection and population exposures John Cooper
4.07 Heritable effects of radiation exposure and risk models Liz Ainsbury	6.02 Legislative aspects of radiation protection Mark Bradley
5.01 Cohort vs case control studies Kate Venables	6.03 Risks and doses for stochastic and deterministic effects John Harrison
5.02 Risk modification, confounding and causality Sarah Lewington	6.04 Tissue/radiation weighting factors : effective doses and the LNT hypothesis John Harrison
5.03 Radiation-induced heart disease Sarah Darby	6.05 Accident scenarios Lesley Prosser
5.04 Radon and lung cancer Sarah Darby	6.06 Retrospective dosimetry and modelling Jane Simmonds
5.05 Cancer risks from Low- LET radiation Richard Haylock	6.07 Radiation protection: radionuclides Chris Gibson
5.06 Medical exposures Mark Pearce	6.08 Radiation protection: external irradiation Therese Crawley
5.07 Environmental exposures Richard Wakeford	6.09 Patient protection and optimisation for medical exposures Mary Cocker

MSc Radiation Biology Assessment

- Six short essays and a series of laboratory reports will be assessed to provide formative assessment of student progress
- Students sit:
 - A qualifying examination end of term 1 on Modules 1 – 6, MCQ format
 - A second examination comprising short essays is sat end of term 2
- Students submit:
 - An extended essay of approximately 3,000 words
 - A research dissertation of approximately 10,000 words based upon their project and they are examined on their research dissertation, by oral presentation and by a short *viva voce*



Bologna Process and the University of Oxford

- The UK has a well-established two-cycle system and several qualifications frameworks (nationally established for each of England, Scotland, Wales and Northern Ireland)
- within Bologna there is a very wide range of second-cycle qualifications, and no sense in which the Bologna Process imposes a single model of master's qualification, our integrated master's do not fit with the two-cycle system
- The doctoral level was established as the 'third cycle' by Ministers meeting in Berlin in 2003
- University will supply indicative credit values for its undergraduate and graduate programmes at whole programme level only
- We have no external accreditation
- the third cycle corresponds to 3-4 years full time, and meet the needs of the wider employment market by promoting interdisciplinary training and the development of transferable skills

Clinical Research Fellowships

- 7 CRFs currently registered at Oxford (1 at Leeds)
- Working alongside scientists in the laboratories
- Translation direct to the clinic
- 2 CRFs completed DPhils in 2010/2011



Dr Geoff Higgins

Supervised by Gillies McKenna, submitted in October 2010

Published in *Oncotarget* 2010 & *Cancer Research* 2010

Recently awarded a 4-year CR-UK funded Clinician Scientist Fellowship

Postdoctoral Training

- Expanded to > 60
- Give internal seminars, attend external conferences
- Supervise undergraduate FHS and post graduate MSc and DPhil students
- Informal mentoring system to support career development

Dr Eva Petermann

Supervised by Thomas Helleday; Mentored by Ester Hammond

Extensively published, recent: *Proc Natl Acad Sci USA* - Chk1 promotes replication fork progression by controlling replication initiation

Awarded a University Lectureship in the School of Cancer Sciences at the University of Birmingham

