

Publications: Prof Andy Beavis PhD FIPEM MInstP CSci CPhys

Book chapters

A. W. Beavis and G.P. Liney. 'The Role of MRI in Radiotherapy' in Recent Research Developments in Radiology, Vol-1 (2003) Pages: 39-61 ISBN: 81-7895-074-X. M/S. Transworld Research Network, 37/661(2) Fort, Trivandrum, Kerala, India.

A. W. Beavis and G. Budgell. 'IMRT acceptance testing and commissioning' in IPEM report 94: Acceptance Testing and Commissioning of Linear Accelerators. ISBN 978 1 903613 30 6

IPEM IMRT working Party document 'Guidance for the Clinical Implementation of Intensity Modulated Radiation Therapy' IPEM Report 96 ISBN 978 1 903613 34 4

Refereed Journals

Beavis A W Image-guided radiation therapy: what is our Utopia? Br J Radiol 2010 83: 191-193.

Moore C S, Beavis A W and Saunderson J R 2009 Investigating the exposure class of a computed radiography system for optimisation of physical image quality for chest radiography Br. J. Radiol. 82 705-10

S. Jefferies, A. Taylor, R. Reznek and the Radiotherapy Planning Working Party, Results of a National Survey of Radiotherapy Planning and Delivery in the UK in 2007, Clinical Oncology, 21 204-217 2009

Smith L, Qutob O, Watson M, Beavis AW, Potts D, Welham K, Veerabhadram Garimella V, Lind M, Drew P and Cawkwell L. Proteomic identification of putative biomarkers of radiotherapy resistance: A possible role for the 26S proteasome? Neoplasia 11 (11) 1194—1207 2009

Moore CS, Beavis AW, Saunderson JR. Investigation of optimum X-ray beam tube voltage and filtration for chest radiography with a Computed Radiography system. BJR 81 771-777 2008

Phillips R, Ward JW, Page L, Grau C, Bojen A, Hall J, Nielsen K, Nordentoft V, Beavis AW. Virtual reality training for radiotherapy becomes a reality. Stud Health Technol Inform. 2008;132:366-71.

Moore CS, Liney GP, Beavis AW, Saunderson JR. A method to optimize the processing algorithm of a Computed Radiography system for chest radiography. BJR 80 724-730 2007

Ward JW, Phillips R, Williams T, Shang C, Page L, Prest C, Beavis AW. Immersive visualization with automated collision detection for radiotherapy treatment planning. Stud Health Technol Inform. 2007;125:491-6.

Beavis AW, Ward JW, Bridge P, Appleyard R, Jessop AJ, Phillips R. Enhancing Radiographer Training using Virtual Reality Training Systems. Clin Oncol (R Coll Radiol). 2007 Apr;19(3 Suppl):S8

P. Bridge , R.M. Appleyard, J.W. Ward, R. Philips, A.W. Beavis. 'The Development and Evaluation of a Virtual Radiotherapy Treatment Machine using an Immersive Visualisation Environment.' Computers and Education, 49(2), pp 481-494, 2007.

Moore CS, Liney GP, Beavis AW, Saunderson JR. A method to optimize the processing algorithm of a Computed Radiography system for chest radiography. BJR 2007 Br J Radiol. 2007 Sep;80(957):724-30

Beavis AW. 'Treatment planning challenges in breast irradiation: The ideal and the practical.' Clinical Oncology. (2006) 18: 200-209

Garcia-Alvarez R, Liney GP, Beavis AW. 'Reproducibility of Functional MRI for conformal avoidance Radiotherapy Planning'. *Journal of Magnetic Resonance Imaging* **23**: 108-114, (2006).

A. W. Beavis, A. Hamid and S. Upadhyay. Re-treatment of a lung tumour: an IMRT case study. *British Journal of Radiology*. 78: 358-361 2005

Phillips R, Ward JW, Beavis AW. 'Immersive visualization training of radiotherapy treatment.' *Stud Health Technol Inform.* 2005;111:390-6.

C.S. Moore, G.P. Liney and A.W. Beavis. Quality Assurance of Registration of CT and MRI Data Sets for Treatment Planning for Radiotherapy of Head and Neck Cancers. *Journal of American College of Medical Physics* 5(1) 2004

A. W. Beavis. (Invited Review) Is Tomotherapy the future of IMRT? *British Journal of Radiology*. 77:285–95. 2004

G.P. Liney, A Heathcote, A.G.Jenner, L.W. Turnbull, A.W. Beavis. Absolute Radiation Dose Verification using Magnetic Resonance Imaging I: Feasibility Study. *Journal of Radiotherapy in Practice* 3(3): 120-127 2003.

R. Garcia-Alvarez, G. P. Liney, A. W. Beavis. "Use of functional magnetic resonance imaging for planning intensity modulated radiotherapy". *Journal of Radiotherapy in Practice* 3(2): 66-72 2003.

J.Markman, D.A.Low, A.W.Beavis, J.O.Deasy. 'Beyond Bixels: Generalizing the Optimization Parameters for Intensity Modulated Radiation Therapy' *Med Phys* 29 (10): 2298-2304 2002

M. Miften, A. W Beavis and L. Marks. The influence of the dose calculation model on treatment plan evaluation in conformal radiotherapy: A three case study. *Medical Dosimetry*, 27 2002

A. W. Beavis, P S Ganney, V J Whitton and L Xing. 'Optimisation of the step-and-shoot leaf sequence for delivery of intensity modulated radiation therapy using a variable division scheme.' *Phys Med Biol* 46 (2001) p2457-2465

Miften M., Wiesmeyer M., Takahashi K., Beavis A. W., Broad S. E.; 'Implementation of Enhanced Dynamic Wedge in the FOCUS Treatment Planning system' *Medical Dosimetry*, **25(2)** 81 2000

Beavis, AW; Gibbs, P; Dealey, RA; Whitton, VJ. 'Radiotherapy Treatment Planning of Brain Tumours using MR Images Alone.' *British Journal of Radiology*. **71** 544-548, 1998.

Beavis AW 'Implementation of Enhanced Dynamic Wedge into the Multidata DSS Radiotherapy Treatment Planning System.' *Medical Dosimetry* **22** 219-225, 1997.

Beavis, AW; Weston, SJ; Whitton, VJ. 'Implementation of the Varian EDW into a commercial RTP system. *Physics in medicine and biology*' **41** 1691-1704 (1996)

Articles

Is Virtual Reality training really a Reality? AW Beavis, R Phillips and JW Ward, *Synergy – journal of the SCoR*, Synergy, pp 22-24, September 2007.

Radiotherapy training tools for yesterday's future, AW Beavis, R Phillips and JW Ward, *Imaging and Oncology*, ISBN1871101360, p30-35 2007.

PTVs, CTVs, 3dCRT, IMRT, IGRT, ping pong balls and Easter eggs. *RAD magazine* 2007

The need for more intelligence in Radiotherapy. *RAD magazine* 2004

IMRT – in our real (NHS) world? *RAD magazine* 2003

MRI, DCE, MRS, FOCAL, XiO, IGT, IMRT & PRH UK! *Sphere of Influence (CMS journal)* 2003

Published abstracts in Journals

Enhancing Radiographer Training using Virtual Reality Training Systems. A.W. Beavis, J.W. Ward, P. Bridge, R. Appleyard, A.J. Jessop and R. Phillips *Clinical Oncology*, Volume 19, Issue 3, April 2007, Page S8

A.W. Beavis, J.W. Ward, R.M. Appleyard and R. Phillips. 'A Virtual Environment for the Training and Development of Radiotherapy Techniques.' *International Journal of Radiation Oncology Biology Physics*, 66(3) Supplement 1, 2006, Page S714

T.R. Williams, C. Shang, A. Beavis, J. Ward, C. Sims, C. Prest, L. Page and R. Phillips. A New Simulation Technique Using Virtual Reality Visualization to Optimize Beam Geometry in Prostate Cancer IMRT. *International Journal of Radiation Oncology Biology Physics* 66(3), Supplement 1, Page S355

A.W. Beavis, J.W. Ward, P. Bridge, R.M. Appleyard and R. Phillips. 'Virtual Reality based tools in Oncology training.' *Radiotherapy and Oncology*, **81** Supplement 1 2006 Page S69

JKA Jameel, V Garimella, A Beavis, E Long, PJ Drew, L Cawkwell. p53 and bcl-xl – markers of axillary recurrence following axillary radiotherapy for primary breast cancer. *British Journal of Surgery* (2006) **93(S3)** 53.

O Qutob, MB Watson, A Beavis, MJ Lind, PJ Drew, L Cawkwell. Expression microarray analysis of a novel radioresistant breast cancer cell line. *European Journal of Surgical Oncology* (2006) **32**:1024.

Qutob O, Watson MB, Beavis A, Lind MJ, Drew PJ, Cawkwell L. The development and microarray analysis of a novel radioresistant breast cancer cell line. *Breast Cancer Research and Treatment* (2006) 100 (suppl 1):S170.

Smith L, Qutob O, Watson MB, Beavis AW, Welham KJ, Drew PJ, Lind MJ, Cawkwell L. Proteins associated with radiotherapy resistance in human breast cancer cells. *Breast Cancer Research and Treatment* (2006) 100 (suppl 1):S140.

JKA Jameel, V Garimella, E Long, A Beavis, PJ Drew and L Cawkwell. Over expression of apoptotic markers - p53 and bcl-xl are associated with axillary recurrence following radiotherapy in breast cancer patients. *Breast Cancer Research and Treatment* **94** (suppl 1) S182 (2005)

R. Phillips, JW Ward, P. Bridge, RM Appleyard, and AW Beavis. An immersive virtual environment for training of radiotherapy students and developing clinical experience. *Medical Physics* 33(6) 2006 p2164

C. Shang, T.R. Williams, A. Beavis, J. Ward, C. Sims and R. Phillips. Can Current Prostate IMRT be further improved with Immersive Virtual Reality Simulation. *Medical Physics* 33(6) 2006 p2075

M.D. Wiesmeyer, A. W. Beavis, G.P. Liney, T Munger. 'A method for the Direct use of Biological imaging data in Inverse planning objectives.' *Medical Physics* 31(6) 1856 2004

A. W. Beavis, R. Garcia-Alvarez, J. E. Wilson and A. Abdel-Hamid. Virtual Simulation (Inverse) planning for Intensity Modulated Radiotherapy for Head and Neck Treatments. *Clinical Oncology* 2004 16(7): S11

A. W. Beavis, R. Garcia-Alvarez and G. P. Liney. The use of fMRI in IMRT treatment planning: a case study. *Medical Physics* 30(6) 1384 2003

A. W. Beavis, C.S. Moore, and G. P. Liney. QA and assessment of image registration for planning treatments in Head and Neck. *Medical Physics* 30(6) 1454 2003

M.D. Wiesmeyer and A. W. Beavis. A method for using biological imaging data to further modulate equivalent uniform dose based inverse planning. *Medical Physics* 30(6) 1334 2003

A. W. Beavis and J. Vaarkamp. Radiobiology: A view from the Trenches. *Clinical Oncology* (to be published in September 2003)

G. P. Liney, A Heathcote, L.W. Turnbull, A.W. Beavis. An optimised gel dosimeter for verification of absolute radiation doses using MRI. *Clinical Oncology* 2003;15(2):S28

A.W. Beavis and G. P. Liney. Dynamic Contrast Enhanced MRI in the Inverse planning of IMRT: Prostate case study. *Clinical Oncology* 2003;15(2):S5

C.S. Moore, G.P. Liney and A.W. Beavis. Quality Assurance of CT and MR Registration for Radiotherapy Planning of Head & Neck Cancers *Clinical Oncology* 2003;15(2):S8

R. Garcia-Alvarez, G.P. Liney, A. W. Beavis. Conformal Avoidance in Intensity Modulated Radiotherapy using Functional Magnetic Resonance Imaging. UK Radiation Oncology Conference, Bath, UK, April 2003. *Clinical Oncology*. 2003;15(2):S13

A. W. Beavis, E. Bubula and V.J. Whitton. "Pre-treatment QA for IMRT: the Princess Royal Hospital protocol." *Radiotherapy and Oncology* 64 (Sup1) S85 2002

A. W. Beavis and G.P. Liney "The application of an advanced magnetic resonance technique for planning boost delivery with IMRT." *Radiotherapy and Oncology* 64 (Sup1) S210 2002

A. W. Beavis and G.P. Liney, "Delineation of IMRT boost volumes for Prostate treatments using advanced Magnetic Resonance techniques", *Medical Physics* 29(6) 1257 2002

A.W. Beavis, E. Bubula, P.S. Ganney and V.J. Whitton "Pre-treatment Quality Assurance for IMRT treatments of Pancreatic Cancers", *Medical Physics* 29(6) 1267 2002

Coldham CM, Langley G, Whitton VJ and Beavis AW; 'Production of Ellis type compensating filters for IMRT.' (Published abstract) *BJR* 32 (Sup) 2000

L. Xing, S. Crooks, J. G. Li, C. Ozhasoglu, Y. Chen, V. Metha, D. Goffinet, A. Beavis and A. Boyer. Incorporating respiratory motion into the design of intensity maps in IMRT treatment of breast cancer. *International Journal of Radiation Oncology Biology Physics*, **48(3)**, Supplement 1, 2000, Page 199

Beavis AW, Whitton VJ and Xing L.; 'A combination delivery mode for Intensity Modulated Radiation therapy based on specific patient cases'. (Published abstract) *International journal of Radiation Oncology, Biology and Physics* 45(3) 164 1999

L. Xing, Y. Chen, A. Kapur, A.W. Beavis, J. Li, B. Curran, and A. L. Boyer; 'Minimizing the dosimetric effects of the rounded MLC leaf ends.' (Published abstract) *Medical Physics* 26 (6) 1087 1999

Beavis AW, Ganney PS, Whitton VJ and Xing L.; 'Optimisation of Intensity Map, in level and resolution, for the delivery of IMRT'. (Published abstract) *Medical Physics* 26 (6) 1087 1999

Beavis AW, Coldham CM, Koya A and Whitton, VJ ; 'Film Dosimetry for Intensity Modulated Radiotherapy.' (Published abstract) *BJR* 72 (Sup) 40 1999

Gibbs P, Marwood N, Beavis AW, Whitton, VJ and Turnbull LW; 'Minimisation of geometric distortions in MRI.' (Published abstract) *BJR* 72 (Sup) 77 1999

Beavis AW, Ma L, Xing L, Ma C-M, Boyer A ; 'Delivery of IMRT with Ellis type compensating filters'. (Published abstract) *Medical Physics* 25 (7) A202 1998

Kendrew A J, Beavis AW, Brown W E, Dealey RA and Whitton, VJ ; 'A Multidisciplinary approach to implement the transition from 2D to 3D conformal therapy.' (Published abstract) *BJR* 71 (Sup) 9 1998

Beavis AW, Kennerley J and Whitton, VJ ; 'Virtual Dosimetry: quality control of dynamic Intensity Modulated Radiation Therapy.' (Published abstract) *BJR* 71 (Sup) 9 1998

Beavis AW; Enhanced Dynamic Wedge; the introduction of Intensity Modulated Radiation Therapy into widespread Clinical practice? (Published abstract) *BJR* 70 (Sup) 16 1997

Gibbs, P; Beavis, AW; Dealey, RA; Whitton, VJ and Horsman A . 'MRI of the brain: applications in Radiotherapy Treatment Planning.' *British Journal of Radiology*. 70 (Sup) 39, 1997.

Beavis AW, Weston SJ, Whitton VJ; 'Enhanced Dynamic Wedge - the coming of age of intensity modulated conformal therapy planning.' *BJR* 69 (Sup) 99 1996

Conference proceedings (short papers)

R. Phillips, J.W. Ward, L. Page, C. Grau, A. Bojen, J. Hall, K. Nielsen, N. Nordentoft, A.W. Beavis, Virtual Reality Training for Raditherapy becomes a Reality, Proceedings of Medicine Meets Virtual Reality 16, Studies in Health Technology and Informatics, 132, pp 366-371, January / February 2007, IOS Press

J.W. Ward, R. Phillips, T. Williams, C. Shang, C. Prest, L. Page, A.W. Beavis, 'Immersive Visualization with Automated Collision Detection for Radiotherapy Treatment Planning.' Proceedings of Medicine Meets Virtual Reality 15, Studies in Health Technology and Informatics, 125, pp 491-497, February 2007, IOS Press.

VERT: A Virtual Environment for Radiotherapy Training, AW Beavis, R Phillips and JW Ward, Proceedings International Conference on the use of Computers in Radiation Therapy - ICCR, Toronto, 4-7 June 2007, Journal of Physics: Conference Series, p605-609, ISBN 978-0-9780496-2-1 IOP, 2007.

R. Phillips, J.W. Ward, P. Bridge, R.M. Appleyard, A.W. Beavis. 'A Hybrid Virtual Environment for Training of Radiotherapy Treatment of Cancer.' Proceedings of SPIE and IS&T Electronic Imaging: Stereoscopic Displays and Applications, San Jose, USA, Jan 2006, SPIE Vol 6505, pp 6055008 1-12.

GP Liney, P Gibbs, PAA Kassinda, AW Beavis, LW Turnbull. The Role of Magnetic Resonance Imaging in Radiotherapy of the Prostate. British Oncological Assoc. September 2002, Cambridge

A.G. Jenner*, A.W. Beavis, S. Sia, G.P. Liney, A.W. Hall, and J.W. Goodby. 'Chemical aspects in the formation and processing of acrylamide gels'. Proc of 2nd International Conference on Radiotherapy Gel Dosimetry 2001 page 104-106

Liney GP, Manton DJ, Hutton J, Beavis A, Turnbull LW. MRI and MRS of radiation distributions using a polymer-gel dosimeter. *Proc. 9th Meeting of ISMRM 2001*: 903.

Gibbs P, Kassinda PA, Beavis AW, Turnbull LW. Quantification of Short term Prostatic Motion due to Bladder filling. *Proc. 9th Meeting of ISMRM 2001*: 1.

Kassinda PA, Gibbs, P, Beavis AW and Turnbull LW. 'Quantification of prostatic motion due to bladder filling using MRI.' Proceeding of UK Radiology Congress 2001 p84

A. W Beavis, P S Ganney, V J Whitton and L Xing. 'Optimisation of MLC orientation to improve accuracy in the Static field delivery of IMRT.' Proceedings of the 2000 World Congress of Medical Physics.

Xing L, Jiang S and Beavis AW. 'A simple method of registering radiographic films in Intensity Modulated Radiation Therapy.' Proceedings of the 2000 World Congress of Medical Physics

Beavis AW, Ganney PS, Whitton VJ and Xing L.; 'Slide and Shoot: A new method for MLC delivery of IMRT.' Proceedings of XIII ICCR. 2000 Ed Schlegal and Bortfeld. Springer-Verlag ISBN 3540 67176 5

Beavis AW, Whitton VJ. 'Clinical use and Quality Control of the Varian Enhanced Dynamic wedge.' Proceedings of the XIth International conference on the use of computers in Radiation therapy. Medical Physics Publishing, Madison, USA p414 1997

P Gibbs, AW Beavis, RA Dealey, VJ Whitton, and A Horsman. 'MR based Radiotherapy.planning of the brain.' 5th Annual Meeting of ISMRM, Vancouver 1997.

Awards

1. Medilink Innovation award for Virtual Environment for Radiotherapy Training (VERT) 2008
2. Finalist for Health and Social Care Awards for Virtual Environment for Radiotherapy Training (VERT) project 2008.
3. Service Improvement Day, Local NHS Combined Trusts Award for Virtual Environment for Radiotherapy Training (VERT) project 2008
4. University of Hull's Vice Chancellor's Prize 2007 for Virtual Environment for Radiotherapy Training (VERT) project.
5. BCS IT Industry Awards, Winner of 2007 Project Excellence Awards for BT Flagship Award for Innovation and Social Contribution Project for Virtual Environment for Radiotherapy Training (VERT).
6. BCS IT Industry Awards, Runner-up for 2007 Project Excellence Awards for Social Contribution Project for Virtual Environment for Radiotherapy Training (VERT).
7. First prize winner of the Medipex 2006 Yorkshire and Humber NHS Innovation Competition 2006 under the Innovation category for Immersive (Virtual Reality) tools for Clinical Training of Therapy Radiographers. £2,000 prize money.
8. National finalist for Healthcare Service Journal Award 2006 under the Skills Development category for Using Virtual Reality for Clinical Training and Development of Therapy Radiographers.

Television

1. News feature on opening of first VERT facility in Denmark, Danish TV, 15 June 2007, www.tv2regionerne.dk/?id=369710&r=7
2. News feature on Channel 4 News, 3 June 2007, www.channel4.com/news/watchlisten/video/day.jsp?date=03_Jun_2007
3. News feature on Look North, BBC, 30 March 2007, www.hive.hull.ac.uk/vert/
4. News feature on Look North, BBC, July 2004,

Other Media

1. Virtual training boosts radiotherapy services, Yorkshire Post, 18 May 2007.
2. Virtual guide to treat cancer, Hull Daily Mail, 17 May 2007.
3. Virtual teaching offers new style of radiotherapy teaching, British Medical Journal, 333, pp 715, 7 April 2007, online version at <http://www.bmj.com/cgi/content/full/334/7596/715-b>

Papers published - Solid State Physics.

Refereed Journals:

Jaros, M; Beavis, AW; Corbin, E; Hagon, JP; Turton, RJ; Wong, KB. 'Effect of ordering, Interface imperfections and clusters, and external electric-fields on optical-spectra of Si-SiGe hetero-structures.' Journal of vacuum science & technology B **11** 1689-1692(1993)

Jaros, M; Beavis, AW. 'Localization at imperfect interfaces and its role in optical-spectra of quantum-well structures.' Applied physics letters **63** 669-671 (1993)

Beavis, AW and Phillips C. 'Porting a dusty deck Fortran program to a Shared-memory multiprocessor.' Concurrency: practice and experience **4** 575-587 (1992)

Jaros, M; Beavis, AW; Hagon, PJ; Turton, RJ; Miloszewski, A; Wong, KB. 'Quantitative theory of optical-properties of Si-Ge hetero-structures.' Thin solid films **222** 205-208 (1992)

Beavis, AW; Jaros, M; Morrison, I. 'Electronic-properties of HgTe-Hg_{1-x}Cd_xTe and HgTe- Zn_{1-y}Cd_yTe super-lattices with ideal and non-ideal interfaces.' Super-lattices and microstructures **9** 371-375 (1991)

Beavis, AW; Jaros, M; Zoryk, A; Morrison, I 'Electronic-structure, effective masses and optical-properties of Perfect and imperfect HgTe-Hg_{1-x}Cd_xTe and HgTe-Zn_{1-y}Cd_yTe super-lattices.' Semiconductor science and technology **5** 1051-1061 (1990)

Jaros, M; Zoryk, A; Beavis, AW; Morrison, I 'Electronic-structure, effective masses and non-linear optical-response in Hg_{1-x}Cd_xTe-Hg_{1-y}Cd_yTe and Hg_{1-x}Cd_xTe-Cd_{1-y}Zn_yTe super-lattices.' Journal of crystal growth **101** 559-565 (1990)

Beavis, AW; Jaros, M 'Electronic-properties of HgTe-CdTe super-lattices with non-ideal interfaces.' Physical review B-condensed matter **41** 7903-7905 (1990)

Morrison, I; Jaros, M; Beavis, AW 'Large optical nonlinearities in semiconductor super-lattices.' Applied physics letters **55** 1609-1611 (1989)

Invited talks

May 1995, meeting: SCRAP, Birmingham UK

September 1995, lecture tour/ visits: Mallinckrodt St. Louis, Salt Lake City, Stanford, Palo Alto, USA.

October 1996, meeting: Beta test site working party - Varian EDW, Los Angeles, USA

March 97 - Andy Beavis - 'Life after a degree in Physics' - invited seminar at Newcastle University.

May 1997, conference: Radiology 1997, Birmingham UK.

September 1998, study day; Virtual Simulation Sheffield, UK.

February 1998 Sabbatical: Lecture given at Stanford University School of Medicine.

February 1999 meeting; British Oncology Data Managers Association. State of the Art Radiotherapy Treatment planning, Hull, UK

April 2000 Stanford University IMRT course, Stanford, USA

April 2000 CMS US Users meeting, S. Louis USA

May 2000 meeting: Frontiers of Radiotherapy meeting – Varian, Sheffield, UK

Jan 2001 course: Stanford University IMRT course, Stanford, USA

April 2001 meeting: European CMS Users meeting Leipzig, Germany

Aug 2001 conference 11th Inter-Balkan Inter-University Symposium on Conformal Therapy, Thessalonica, Greece

Nov 2001 course: Stanford University IMRT course, Stanford, USA

Dec 2001 conference: 3rd Takahashi International Conformal Therapy Conference, Nagoya, Japan

Jan 2002 CMS UK Users seminar, BIR London, UK

April 2002 CMS US Users meeting, S. Louis USA

Aug 2002 Stanford University IMRT course, Stanford, USA

April 2002 French EPU – National Medical Physics Update Training meeting. (IMRT), Dijon, France

January 2003 – AZVU (Free University Hospital) (IGT), Brussels, Belgium

March 2003 Presentation at CMS Head office, St. Louis USA.

March 2003- Commissioning 3D Treatment planning systems (3 talks), BIR London, UK.

April 2003 French EPU – National Medical Physics Update Training meeting. (MRI), Dijon, France

April 2003 Stanford University IMRT course, Stanford, USA

May 2003 CMS UK Users meeting, BIR London, UK

Sept 2003 conference: European Society Therapeutic Radiation Oncology, Geneva, Switzerland

Sept 2003 conference: Radiotherapy in Practice, Sheffield, UK

October 2003 conference: Swiss National Medical Physics and Radiobiology group, Geneva, Switzerland.

December 2003 Radiotherapy Standards Users' Group at the National Physical Laboratory, Teddington, UK

January 2004 CMS Training seminar in Valencia Spain.

February 2004 CMS Users Meeting, IMRT training lecture. Madrid, Spain.

March 2004 Conformal Therapy/ IMRT Seminars in Serbia and Croatia.

April 2004 CMS US Users meeting, S. Louis USA

October 2004. Talk at Newcastle Hospital, Newcastle, UK.

April 2005 Talk at Nottingham Hospital, Nottingham, UK.

May 2005 Seminar at Princess Margaret Hospital, Toronto, Canada

July 2005: BIR IMRT meeting, Manchester UK

September 2005: ERR05 conference, Leicester UK

February 2006 Dubai – IMRT Seminar, Dubai, UAE.

April 2006 Turkish IMRT training meeting. Istanbul, Turkey.

May 2006 BIR New Technologies meeting, London UK.

July 2006 Talk at Christie Hospital. Manchester, UK

September 2006 Radiotherapy in Practice 3 conference, Sheffield, UK

October 2006 conference: European Society Therapeutic Radiation Oncology, Leipzig, Germany

March 2007 Seminar at Aarhus university Hospital. Aarhus Denmark.

June 2007 Talk on the Christie FRCR lecture course. Manchester, UK

June 2007 Talk on the RCR/ Cambridge Advanced treatment planning course. Cambridge, UK

July 2007 Seminar at the IAEA (International Atomic Energy Agency). Vienna, Austria.

September 2007 5th Takahashi International Conformal Therapy Conference, Sendai, Japan

Invited member of discussion panel at meeting.

September 2006 ACORRN – IGRT meeting - London UK