<div align="center">**CASSIANO R. E. DE OLIVEIRA**</div>

WORK ADDRESS:

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I.   EARNED DEGREES

Ph. D.,   Nuclear Engineering, Queen Mary and Westfield College, University of London (1986)
M. Sc.,   Nuclear Engineering, Federal University of Rio de Janeiro, Brazil (1980)
B. Sc.,   Physics, Catholic University of Rio de Janeiro, Brazil (1976)

II.   EMPLOYMENT

2007- present	Professor, Department of Chemical and Nuclear Engineering, University of New Mexico
2003 – 2007	Professor, Nuclear and Radiological Engineering Program, George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology
2000 - 2003	Senior Lecturer, Department of Earth Science and Engineering, Imperial College London, UK
1996 - 2000	Senior Research Fellow in the T H Huxley School, Imperial College of Science, Technology and Medicine, London, UK
1990 - 1996	British Nuclear Fuels Research Fellow in the Mechanical Engineering Department, Imperial College of Science, Technology and Medicine, London, UK
1988 - 1989	Research Associate, Department of Mechanical Engineering, Queen Mary and Westfield College, London, UK
1979 – 1987	Research Officer at the Reactor Department of the Nuclear Engineering Institute, Rio de Janeiro, Brazil.

III.   TEACHING

A.   INDIVIDUAL STUDENT GUIDANCE

Students and Post-Docs advised listed in Appendices A and B

B.   COURSES TAUGHT

UNIVERSITY OF NEW MEXICO

Undergraduate

- CHNE 101 Introduction to Chemical and Nuclear Engineering
- CHNE 317 Chemical and Nuclear Engineering Analysis
- CHNE 410 Nuclear Reactor Theory
- CHNE 498 Nuclear Engineering Design

GEORGIA INSTITUTE OF TECHNOLOGY

Undergraduate

- NRE3301   Radiation Physics
- NRE 4204   Reactor Physics
- NRE 4234   Nuclear Criticality Engineering

Graduate

- NRE 6758   Radiation Physics
- ME 6756   Numerical Methods for Engineers
- NRE 6103   Computational Radiation Transport
- NRE 6201   Reactor Physics
- NRE 6434   Nuclear Criticality Safety Engineering

C. OTHER TEACHING ACTIVITIES

- Invited lecturer for 3-credit course *NSEN 608 – Advanced Radiation Transport* at Idaho State University during Summer 2005
- Organized during the spring semester informal out of hours sessions for the NRE junior and senior students at Georgia Institute of Technology on the use of the main nuclear engineering code packages and on computer programming languages.
- Advisor to Georgia Institute of Technology's College of Computing's new Computational Simulations in Engineering (CSE) MS and PhD program

IV. SCHOLARLY ACCOMPLISHMENTS

A. REFEREED PUBLICATIONS

Listed in Appendix C.

B. PRESENTATIONS

- Invited speaker, ANS Student Conference, Texas A&M, February 2008
- Invited seminar, University of Arizona, October 2006
- Invited seminar, University of Tennessee, October 2006
- Invited plenary speaker, ANS Radiation and Protection Topical Meeting, Carlsbad, NM, April 2006.
- Invited seminar, Oak Ridge National Laboratory, October 2005
- Invited seminar, Idaho National Laboratory, July 2005.
- Invited speaker, International Nuclear Atlantic Conference, Santos, Brazil, August 29-September 2, 2005
- Invited seminar, University of Wisconsin, March 2005.
- Invited speaker, Symposium on Computational Methods, 10th Brazilian Congress of Thermal Engineering and Sciences (ENCIT 2004), Rio de Janeiro, RJ, Brasil, Nov 29-Dec 03, 2004
- Invited seminar, Argonne National Laboratory, July 10, 2004
- Invited lecturer, Workshop on Computing Radiation Dosimetry, ITN, Lisbon, June 22-23, 2002.
- Invited lecturer, 3rd Meeting on Computational Modelling, Polytechnic Institute of the State University of Rio de Janeiro, November 12-14, 2001.
- Invited lecturer in A Short Course on Neutron and Radiation Transport Simulation: Theory and Applications, Korean Advanced Institute of Science and Technology, Taejon, South Korea, February 19-22, 2001.

- Invited lecturer in Deterministic Radiation Transport, Advanced Nuclear Reactor Physics Course, Dept. of Nuclear Science and Technology, Royal Naval College, Greenwich, February 1998.
- Invited lecturer on 3D Deterministic Transport Methods, 3rd Frederic Joliot Summer School on Reactor Physics, Cadarache, France, August 25 – September 3, 1997.
- Invited instructor, ANS Professional Development Workshop "Criticality Accident Analysis", 1996 ANS/ENS International Meeting, Washington, DC, November 10-14, 1996.
- Invited speaker, 10th National Meeting on Reactor Physics and Thermohydraulics (ENFIR), Aguas de Lindoya, Brazil, August 7 – 11, 1995
- Invited lecturer on Transport Theory, 13th International Summer School on Physics and Contemporary Needs, Nathiagali, Pakistan, June 08 – 18, 1994.

C. OTHER SCHOLARLY ACCOMPLISHMENTS

- Developed general purpose the neutral particle radiation transport code EVENT. The code is in use by Rolls Royce Marine Power for naval reactor shielding, and by Imperial College London, Technical University Delft and Idaho National Laboratory
- Co-developed nuclear criticality assessment code FETCH. The code is used by IRSN, France and JAERI, Japan.
- Contributed to the development of the global ocean circulation model ICOM.
- Developer of GERALD – A General Environment for Radiation Analysis and Design – in collaboration with the Nuclear Energy Agency in Paris

V. SERVICE

A. PROFESSIONAL CONTRIBUTIONS

❑ *Professional Society Membership*

- Vice-Chair of Georgia ANS Chapter (2005-2006)
- Member, Executive Committee of the Mathematics and Computation Division of the American Nuclear Society (2002-2005)
- Member, Honors Committee of the Mathematics and Computation Division of the American Nuclear Society
- ANS Undergraduate and Graduate Scholarship Committee (2005-present)
- Member, American Nuclear Society (1997-present)

❑ *Committee memberships*

- Member, Working Party Nuclear Criticality Accidents, NEA/OECD, Paris. (2005-present)
- Member, Executive Board of the Frederic Joliot and Otto Hahn Summer School on Nuclear Reactors (2003-2006)
- Chairman, Working Party on Nuclear Criticality Accidents, NEA/OECD, Paris. (2001-2003)
- Member, United Kingdom Nirex Post-Closure Criticality Assessment Committee (2001-2003)

❑ *Conference organization*

- Organizer of the 17th International Transport Theory Conference, July 1-7, 2001, Imperial College, London, with 73 papers and 80 participants. This is a biennial event which brings together experts from the fields of particle radiation transport, kinetic theory of gases, quantum transport among others.

❑ *Conference organization/support*

- Session Organizer, ANS Mathematics and Computation Topical Meeting, September 12-15, 2005, Avignon, France.

- Member, Organizing Committee and Session Organizer, 19th International Conference on Transport Theory, July 24-29, 2005, Budapest, Hungary.
- Member, technical Committee, Monte Carlo 2005 Topical Meeting, April 17-21, 2005, Chattanooga, TN.
- Member, Organizing Committee and Session Organizer, 18th International Conference on Transport Theory, July 20-26, 2003, Rio de Janeiro, Brazil.
- Member, Technical Program Organizing Committee, <u>International Conference on Nuclear Mathematics and Computational Sciences – M&C 2003</u>, April 6-10, 2003, Gatlinburg, Tennessee.
- Co-organizer, High-Performance and Large-Scale Computing Session, <u>16th European Simulation Multiconference</u>, Darmstadt, Germany, June 3-5, 2002.
- Member, International Organizing Committee, <u>International Conference on Mathematics and Computation, Reactor Physics and Environmental Analysis in Nuclear Application</u>, September 27-30, 1999, Madrid, Spain, reviewer.
- Member, Scientific Advisory Committee, <u>9th International Conference on Emerging Nuclear Energy Systems -ICENES '98</u>, Tel Aviv, Israel, June 28 – July 2, 1998.
- Member, Steering Committee, <u>3rd International Conference on Finite Element and Allied Methods for Radiation Transport</u>, Imperial College, 1990.

❑ *Professional development course organization*

- Organizer, in collaboration with the *Nuclear Energy Agency/OECD,* Paris, of six International Advanced Training Courses on the Monte Carlo neutral particle, radiation transport code MCNP totaling 144 participants, Imperial College, April 20 – May 5, June 28 – July 4, 1997, July 5-9, 1999. April 10-14 2000, April 2-6 2001, March 18-22 2002, 24-28 March 2003.
- Organizer, in collaboration with the *European Commission and the Concerted Action on Quality Assurance in Radiation Protection and Dosimetry*, "Training Course on the use of MCNP for Radiation Protection and Dosimetry", with 15 lecturers and 44 participants, Imperial College, September 30 - October 01, 1998.

❑ *Journal editing and reviewing*

- Member, Editorial Board of Annals of Nuclear Energy
- Member, Editorial Board of Journal of Geophysics and Engineering
- Guest editor of special issue of Transport Theory and Statistical Physics with proceedings of the 17th International Conference on Transport Theory.
- Reviewer for *Annals of Nuclear Energy*, *Nuclear Science and Engineering*, *Nuclear Technology*, *Transport Theory and Statistical Physics*, *International Journal of Numerical Methods in Fluids*, *International Journal of Heat Transfer*, *Journal of Nuclear Science and Technology*, *Journal of Hybrid Methods*, *Vacuum*, *Journal of Computational Physics*, *Medical Physics*, *Applied Optics*, *Optics Express*

B. CAMPUS CONTRIBUTIONS

- ANS Georgia Tech Student Chapter Mentor (2004-2007)
- Informal Advisor to Georgia Tech's College of Computing's Computational Simulations in Engineering (CSE) MS and PhD program
- Member, Computing Committee, George W. Woodruff School of Mechanical Engineering, Georgia Tech. (2003-2004, 2005-2006)
- Chair, Computing Committee, George W. Woodruff School of Mechanical Engineering, Georgia Tech. (2004-2005)
- Chair, Ad-Hoc Committee on Mathematics, George W. Woodruff School of Mechanical Engineering, Georgia Tech. (2004)

C. OTHER CONTRIBUTIONS

- Consultant to the OECD Nuclear Energy Agency
- Consultant to UK Ministry of Defense, British Energy, NIREX, Rolls Royce Marine Power, British Nuclear Fuels, Electrowatt, Edwards High Vacuum

VI. GRANTS AND CONTRACTS

A. AS PRINCIPAL AND CO-PRINCIPAL INVESTIGATOR

- DTRA Award DTRA01-03-D-0009-001 "Combined Application of Deterministic and Stochastic Transport Methods to Multi-Particle Interrogation Source Validation and Optimization", Oct 2008-Sep 2009, $300,000
- DOE NEER Grant DE-FG07-04ID14604 "Hierarchical Adaptive Solution of the Radiation Transport Problems on Unstructured Grids", Aug 2004-Jul 2007, $297,923
- DOE Idaho National Laboratory LDRD Grant, "A Unified Multi-Physics Algorithm for High-Resolution Analysis of Generation IV Gas-Cooled Reactor Systems", April 2005 -September 2007, $250,000.
- DOE Oak Ridge National Laboratory LDRD Grant, "Terascale Simulation Tools for Next-Generation Nuclear energy Systems", Oct 2005 – Sep 2007, $100,000.

Grants prior to 2004 listed in Appendix D

VI. HONORS AND AWARDS

- Fellow of the Institute of Physics, UK (2004)

Appendix A - PhD Students Advised

University of New Mexico (2008-present)

Funding	Title of Thesis Project	Student Name	Start Date	Gaduation Date
UNM	Multiphysics Methods for Fast Metal Systems	Mr William J. Martin	2008	2012 PhD

Georgia Institute of Technology (2003-2007)

Funding	Title of Thesis Project	Student Name	Start Date	Gaduation Date/Degree
GaTech Startup Funds/DOE	Algebraic Multigrid Solvers for the Secon-order Transport Equation	Mr HyengKae Park	2003	2006 PhD
GaTech Startup Funds/DOE	Parallel Radiation Transport Methods	Miss Aliva Patnaik	2004	2006 MSc
GaTech Startup Funds	Numerical Evaluation of Experimental Doses	Miss Virginia Maniquis	2004	2006 MSc
GaTech Startp Funds/INL DOE	Nuclear Reactor High-temperature Gas Flow Modeling	Mr Lander Ibarra	2005	2007MSc
GaTech Startup Funds	Beam Optimization for Radiotherapy Planning	Mr Scott Sample	2005	2007 MSc
INL DOE	Finite Volume Formulation for PCICE Scheme	Mr Brian Lockwood	2006	2007 MSc
ORNL/DOE	High-Fidelity Radiation Transport Methods	Mr Steven Hamilton	2006	2007 MSc
GaTech Startup Funds/DOE	Multiscale Acceleration of Radiation Transport Computations	Mr José Ignacio Marquez Damian	2006	2007 MSc

Imperial College London (1993-2003)

Funding	Title of Thesis Project	Student Name	Start Date	Graduation Date	Co-Advisor
EPSRC	A parallel computational model for the radiation transport finite element method	Mr Ralph Birnbaum	1993	1996	Prof AJH Goddard
Pakistan Government	Discontinuous finite element formulation of the neutron transport equation	Mr Anwar Mirza	1993	1996	Prof AJH Goddard
Self-funded	Particle transport solutions for problems involving transparent media	Mr Sotirios Katsimichas	1994	1998	Prof AJH Goddard
BNFL	Monte Carlo modelling of pulsed-neutron differential-away assay tool for reprocessing waste	Mr Robert Price	1995	1998	Prof AJH Goddard

Iranian Government	Multidimensional finite element modelling of thermal radiation in particpating media	Mr Ahmad Zolfaghari	1996	1998	Prof AJH Goddard
Iranian Government	Numerical investigation of fluidised bed dynamics	Mr Shahriar Mansoorzadeh	1996	1999	Prof AJH Goddard
Nuclear Electric	An enhanced method of calculating coupled reactor power and thermal hydraulics	Mr Stewart Lynas	1996	1999	Prof AJH Goddard
Turkish Government	A higher-order transport model for photon propagation and its application to optical tomography	Mrs Dilara Aydin	1996	1999	Prof AJH Goddard
Edwards High Vacuum	Multi-stage turbomolecular pump optimisation	Mr Lal Akash Lal	1996	2000	Prof AJH Goddard
Self-funded	Non-linear criticality assessment of fissile solutions	Mrs Charlotta Sanders	1996	-	Prof AJH Goddard
Self-funded	Application of the tabu search method to the optimisation of reactor fuelling strategies	Miss Iman Bin H'Hmaida	1996	2000	Prof AJH Goddard
CEC	Development of advanced numerical methods in the field of radiation protection and dosimetry	Miss Manuela Duglio	1998	2000	Prof AJH Goddard
Imperial College	Joint inversion of seismic and electric crosshole data	Mr Jorg Herwanger	1998	2001	Prof M Worthington
British Energy	Higher-order Riemann solvers for radiation transport modelling	Mr Matthew Eaton	1999	2004	Prof AJH Goddard
NERC	3D Cloud radiative transfer suing the finite-element spherical harmoncs method	Miss Natasha Trasi	1999	2002	Prof J Haigh
Brazilian government	3D Multiphase flow with chemical reactions	Mr Jefferson M Gomes	1999	2004	Dr C C Pain Prof A J H Goddard
NERC	Improved error measures for unstructured grid adapativity in ocean flows	Mr Phillip Power	2001	2005	Dr C C Pain Prof A J H Goddard
Self-funded	Heat transfer models for pebble bed reactors	Mr Bryan Miles	2002	-	Dr C C Pain
Bangladeshi Government	Automatic variance reduction for Monte Carlo methods	Mr Sabu Shahdatullah	1999	-	Prof A J H Goddard
Imperial College Consultants	Parallel self-adaptivity of unstructured finite element methods	Mr Gerard Gorman	2000	2005	Dr C C Pain
ABB	Electrical methods in sub-surface fluid flow monitoring	Mr Jonathan Saunders	2001	2005	Dr C C Pain
EPSRC	A Transport-based Inverse Scattering Framework for Near-Infrared Optical Tomography	Miss Victoria Barnard	2002	2006	Dr C C Pain

EPSRC/MOD	Angular multiresolution for radiation transport Modelling	Mr Andrew Buchan	2002	2006	Dr C C Pain

Appendix B - Research Associates/Fellows Managed

Source of Funds	Project	Name	Start Date	Termination Date
EPSRC	Deterministic Parallel Radiation Transport Methods	Dr Souhail Khaddaj	1990	1992
Department underpining	Numerical Radiation Transport, Computational Fluid Dynamics	Dr Christopher Pain	1992	-
Department underpining	Numerical Radiation Transport	Mr Adrian Umpleby	1992	-
EPSRC	Self-adaptive parallel finite element methods	Dr Xiao Xu	1996	1998
Shell International	C/O Modelling for Nuclear Borehole Logging	Dr Robert Price	1997	1998
Chinese Government	C/O for Nuclear Down-well Logging	Mr Zhang Qianmei	1999	2000
Chinese Government	Radiative Transfer in the Atmosphere	Dr Ruan Liming	1999	2000
British Energy	AGR fuel optimisation	Dr Kemal Ziver	1999	2002
CEC	Improved Numerical Techniques for Nuclear Logging	Dr Elsa Aristodemou	2000	2002
ABB	Electrical Seismology	Dr Jorg Herwanger	2001	2002
NERC	3D Non-hydrostatic ocean model	Dr Matthew Piggot	2001	2004

| NERC | 3D Radiative Transfer through Clouds | Dr Peter Cook | 2001 | 2003 |
| EPSRC | Coastal Flow Data Assimilation | Dr Fangxin Fang | 2002 | 2005 |

Appendix C - List of Publications

The publications list below reflects my main research interests ie. numerical radiation transport, unstructured finite element methods, high-performance computing, and also my growing emphasis on interdisciplinary collaborative work. Note that authorship order does not reflect or imply importance of contribution. The policy has been that students, Research Associates/Fellows lead author list. Also, lead is given in deference to collaborator's distinction/age.

Refereed papers

1. Wood, J. and de Oliveira, C. R. E., "A Multigroup Finite Element Solution of the Neutron Transport Equation-I: X-Y Geometry", Annals of Nuclear Energy, **11**, (1983), 229.

2. de Oliveira, C. R. E., "An Arbitrary Geometry Finite Element Method for Multigroup Neutron Transport with Anisotropic Scattering", Progress in Nuclear Energy, **18**, (1986), 227.

3. Rothenstein, W., de Oliveira, C. R. E. and Brandman, N., "Accurate Resonance Absorption Calculations Including 2-D Effects and their Representation in Multigroup Lattice Physics Codes", Annals of Nuclear Energy, **15**, (1988), 293.

4. Wood, J. and de Oliveira, C. R. E., "A Finite Element Study of Gamma Ray Transport", Annals of Nuclear Energy, **17**, (1990), 195.

5. Khaddaj, S. A., Al-Bahadili, H., Goddard, A. J. H., de Oliveira, C. R. E. and Wood, J., "The Solution of Radiation Engineering Problems on a Transputer-Based System", Concurrency: Practice and Experience, **3**, (1991), 423.

6. Rothenstein, W. and de Oliveira, C. R. E., "Discrete Energy or Multigroup Finite Element Transport Calculations in Lattice Physics", Progress in Nuclear Energy, **23**, (1991), 107.

7. Katsimichas, S., Goddard, A. J. H., Lewington, R. and de Oliveira, C. R. E., "General Geometry Calculations of One-Stage Molecular Flow Transmission probabilities for Turbomolecular Pumps", J. Vac. Sci. Technol. A, **13**, (1995), 2954.

8. Ackroyd, R.T. and de Oliveira, C. R. E., "A Variational Treatment for the Time-Dependent Boltzmann Equation as a Basis for Numerical Solutions Conserving Neutrons", Progress in Nuclear Energy, **30**, (1996), 417.

9. Schneider, T. N., Katsimichas, S., de Oliveira, C. R. E. and Goddard, A. J. H., "Analysis of Three-dimensional Single Stage and Two-dimensional Multistage Models of Flows in Turbomolecular Pumps", Vacuum, **48**, (1997), 55.

10. Schneider, T. N., Katsimichas, S., Oliveira, C. R. E., and Goddard, A J H, "Empirical and Numerical Calculations in Two-dimensions for Predicting the Performance of a Single Stage Turbomolecular Pump", J. Vac. Sci. and Techn. A, **16** (1998), 175.

11. Xu, X., Pain, C. C., de Oliveira, C. R. E. and Goddard, A. J. H., "An Automatic Mesh Coarsening Technique for Delaunay Triangulations", Comm. Num. Methods in Eng., **14** (1998), 59.

12. Pain, C. C., de Oliveira, C. R. E. and Goddard, A. J. H., "A Neural Network Graph Partitioning Procedure for Grid-Based Domain Decomposition", Int. J. Num. Meth. Eng., **44** (1998) 593-613.

13. Xu, X., Pain, C. C., Goddard, A. J. H. and de Oliveira, C. R. E. "An Automatic Adaptive Meshing Technique for Delaunay Triangulations", <u>Comp. Meth. Appl. Mech. Eng.</u>, **161** (1998) 297-303.

14. Mansoorzadeh, S., Pain, C. C., de Oliveira, C. R. E. and Goddard, A. J. H., "Finite Element Simulations of Incompressible Flow past a Heated/Cooled Sphere", <u>Int. J. Num. Meth. Fluids</u>, **28** (1998) 903-915.

15. Ackroyd, R. T., de Oliveira, C. R. E., Zolfaghari, A. and Goddard, A. J. H., "On a rigorous resolution of the transport equation into a system of diffusion equations", <u>Prog. Nucl. Energy</u>, **35** (1999) 1-64.

16. Pain, C. C., de Oliveira, C. R. E. and Goddard, A. J. H., "Simulated Annealing Task to Processor Mapping for Domain Decomposition Methods on Distributed Parallel Computers", <u>Concurrency: Theory and Practice</u>, **11** (1999) 155-165.

17. Xu, X., Pain, C. C., de Oliveira, C. R. E. Umpleby, A. P. and Goddard, A. J. H., "Self-adaptive Parallel Solution Methods for Complex FEM Problems in CFD and Radiation Modelling", High Performance Computing, Plenum Press (1999).

18. Ackroyd, R. T., de Oliveira, C. R. E., Zolfaghari, A. and Goddard, A. J. H., "On the Exact Resolution of the Transport Equation for an Anisotropic Medium into a System of Diffusive Equations", <u>Ann. Nucl. Energy</u>, **26** (1999) 729-755.

19. Pain, C. C., de Oliveira, C. R. E. and Goddard, A. J. H., "K-Way Neural Network Graph-Partitioning with Separator Vertices", <u>Biol. Cybern</u>. **80** (1999) 227-234.

20. Warner, P. and de Oliveira, C. R. E., "Verification and Validation of the 3D Finite Element Transport Theory Code EVENT for Shielding Applications", <u>J. Nucl. Sci. and Tech</u>., **Supplement 1** (2000) 466-470.

21. Pain, C. C., de Oliveira, C. R. E. and Goddard, A. J. H., "Dual-basis and Characteristic Discontinuous Finite Element Discretizations for the Boltzmann Transport Equation", <u>Transp. Theory and Stat. Phys.</u>, **29** (2000) 681-698.

22. Pain, C. C., de Oliveira, C. R. E. and Goddard, A. J. H., "Insights into Prolonged Solution Criticality Accidents using the Coupled Radiation/Multiphase Code FETCH", <u>Nuclear Energy</u>, **39** (2000) 381-385.

23. Pain C. C., Umpleby, A. P., de Oliveira, C. R. E. and Goddard, "Tetrahedral Mesh Optimisation and Adaptivity for Steady-State and Transient Finite Element Calculations", <u>Computer Methods in Applied Mechanics and Engineering</u>, **190** (2001) 3771-3796.

24. Pain, C. C., Mansoorzadeh, S., de Oliveira, C. R. E., "A Study of Bubbling and Slugging Fluidised Beds using the Two-Fluid Granular Temperature Model", <u>International Journal of Multiphase Flow</u>, **27** (2001) 527-551.

25. Pain, C. C., Mansoorzadeh, S., de Oliveira, C. R. E. and Goddard, A. J. H., "Numerical Modelling of Gas-Solid Fluidised Beds using the Two-Fluid Approach", <u>Int. J. Num. Meth. Fluids</u>, **36** (2001) 91-124.

26. Pain, C. C., de Oliveira, C. R. E. and Goddard, A. J. H., "Transient Criticality in Fissile Solutions – Compressibility Effects", <u>Nuc. Sci. and Eng.</u>, **138** (2001) 78-95.

27. Pain, C. C., de Oliveira, C. R. E. and Goddard, A. J. H., "Criticality Behaviour of Dilute Plutonium Solutions", <u>Nucl. Tech.</u>, **135** (2001).

28. Pain, C. C., de Oliveira, C. R. E., Goddard, A. J. H. and Umpleby, A. P., "Non-Linear Space-Dependent Kinetics for the Criticality Assessment of Fissile Solutions", Prog. Nucl. Energy, **39** (2001) 53-114.

29. de Oliveira, C. R. E., Umpleby, A. P., Eaton, M. D. and Pain, C.C.,"Finite Element-Spherical Harmonics Solution of the 3D Kobayashi Benchmarks with Ray-Tracing Void Treatment", Prog. Nucl. Energy, **39** (2001), 243-262.

30. Pain, C. C., Mansoorzadeh, S., Gomes, J. L. M. A. and de Oliveira, C. R. E., "A Numerical Investigation of Bubbling Gas-Solid Fluidized Bed Dynamics in 2-D Geometries", Powder Technology, **128**, (2002) 56-77.

31. Pain, C. C., Herwanger, J. V., Worthington, M. H. and de Oliveira, C. R. E., "Effective Multi-Dimensional Resistivity Inversion using Finite Element Techniques", Geophysical Journal International, **150** (2002), 1-20.

32. Aydin, E. D., de Oliveira, C. R. E. and Goddard, A. J. H., "A Comparison between Transport and Diffusion Calculations for Photon Migration", Journal of Medical Physics, **49**, (2002) 243-253.

33. Pain, C. C., Gomes J. L. M. A., Eaton, M. D. Umpleby, A. P., de Oliveira, C. R. E., Goddard , A. J. H. , Van Damm, H., van der Hagen, T. H. J. J. and Lathouwers, D., "Space-dependent Kinetics Simulation of a Gas-Cooled Fluidized Bed Nuclear Reactor", Journal of Nuclear Engineering and Design, **219** (2003) 225-245.

34. Ziver, A. K., Pain, C. C., Carter, J. N., de Oliveira, C. R. E., Goddard, A. J. H. and Overton, R. S. "Multi-cycle Optimisation of Advanced Gas Cooled Reactor Loading Patterns Using Genetic Algorithms", Nuclear Technology, **141** (2003) 122-141.

35. Pain, C. C., Eaton, M D., Bowsher, J., Smedley-Stevenson, R .P., de Oliveira, C.R.E., Goddard, A. J. H. and Umpleby, A. P., "Unstructured Finite Element Based Riemann Solvers for Time-Dependent and Steady-State Radiation Transport", Transport theory and Statistical Physics, **32**, (2003).

36. Pain, C. C., Eaton, M. D. Gomes J. L. M. A., de Oliveira, C. R. E, Umpleby, A. P., Van Damm, H., van der Hagen, T. H. J. J. and Lathouwers, D., "Space-Dependent Dynamics of a Stabilised Nuclear Fluidised Bed Reactor", Nuclear Science and Engineering, **144** (2003) 242-257.

37. Pain, C. C., de Oliveira, C. R. E., Goddard, A. J. H., Eaton, M. D., Gundry, S. and Umpleby, A. P., "Transient Analysis of the Tokaimura Criticality Incident", Nuclear Technology, **144** (2003) 16-33.

37. Aydin, E. D., de Oliveira, C. R. E. and Goddard, A. J. H., "A finite element-spherical harmonics radiation transport model for photon migration in turbid media", J. Quant. Spect. & Rad. Transf., **84** (2003) 247-260.

38. Pain, C. C., Herwanger, J. V., Saunders, J. H., Worthington, M. H. and de Oliveira, C. R. E., "Anisotropic Resistivity Inversion", Inverse Problems, **19** (2003) 1081-1111.

39. Ziver, A. K., Pain, C. C., Carter, J. N., de Oliveira, C. R. E., Goddard, A. J. H. and Overton, R. S. "Genetic Algorithms and Artificial Neural Networks for Loading Pattern Optimisation of Advanced Gas-Cooled Reactors", Annals of Nuclear Energy, **31** (2004) 431-457.

40. Herwanger, J. V., Pain C.C., Binley, A., de Oliveira, C. R. E., Worthington, M. H., "Anisotropic Resistivity Tomography", Geophysical Journal International, **158** (2004) 409-425.

40. Trasi, N. S., de Oliveira, C. R. E. and Haigh, J. D., "A Finite Element- Spherical Harmonics Model for Radiative Transfer in Inhomogeneous Clouds. Part I: the EVENT model", Atmospheric Research, **72** (2004) 197-221.(*)

41. Cook, P. A., de Oliveira, C. R. E., Haigh, J. D. and Goddard, A. J. H., "A Finite Element- Spherical Harmonics Model for Radiative Transfer in Inhomogeneous Clouds. Part II: some applications", Atmospheric Research, **72** (2004) 223-237.(*)

42. Keller, S. E. and de Oliveira, C. R. E., "Two-Dimensional C5G7 MOX Fuel Assembly Benchmark Calculations using the FEM-PN Code EVENT", Prog. Nucl. Energy, **45** (2004) 255-263.

43. Ziver, A. K., Shahdatullah, S., Eaton, M. D., de Oliveira, C. R. E., Ackroyd, R. T., Umpleby, A. P., Pain, C. C., Goddard, A. J. H. and Fitzpatrick, J., "Deterministic and Monte Carlo Neutron Transport Calculations of the Dounreay Fast Breeder Reactor", Nuclear Technology, **148** (2004) 122-141.(*)

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Appendix D - Research Grants and Contracts obtained prior coming to US

Source of Funds	Title of Project	Duration (months)	Date of Start	Total Value of Support	Co-Investigator
BNFL	Numerical modelling of active neutron interrogation for irradiated fuel hulls	36	1994	£ 54,000	Prof AJHGoddard
Nuclear Electric	Improved methods of predicting coupled reactor power and thermal hydraulics	36	1994	£ 54,000	Prof AJHGoddard
HSE(NII)	Three-dimensional, time-dependent criticality modelling	36	1994	£ 195,000	Prof AJHGoddard
MoD	Parallel domain-decomposition methods applied to time-dependent neutron transport	36	1994	£ 175,300	Prof AJHGoddard
EPSRC	Self-adaptive, Parallel Solution Methods for Complex FEM Problems in Nuclear Safety	36	1996	£ 123,000	Prof AJHGoddard
Edwards High Vacuum	Developmentand validation of full multi-row Monte carlo code for turbomolecular pump modelling	12	1997	£ 20,000	Prof AJHGoddard
Edwards High Vacuum	Turbomolecular pump optimisation	36	1996	£ 54,000	Prof AJHGoddard
NERC	Modelling the radiation exchange between and within clouds	6	1997	£ 17,500	Prof AJHGoddard Dr Jo Haigh
NERC	Investigation of ocean modelling with realistic topgraphy using 3D finite element methods	6	1997	£ 23,000	Prof AJHGoddard Dr Rupert Ford

SIEP	Modelling C/O and thermal neutron response in nuclear logging	12	1997	£ 72,000	Prof AJHGoddard
AEAT	Nuclear waste repository criticality simulation	6	1997	£ 11,900	Prof AJHGoddard
Magnox Electric	Feasibility study of the use of EVENT for 3D reactor lattice calculations	12	1997	£ 33,000	Prof AJHGoddard
NIREX	Criticality assessment of underground nuclear waste repository	12	1998	£ 15,000	Prof AJHGoddard
HSE (NII)	Validation and verification of the FETCH code	12	1997	£ 37,500	Prof AJHGoddard
EPSRC	Coarse-grained parallelisation in physics, mathematics and engineering	12	1998	£ 91,300	Dr Marco Luchini
EU	ERPET Training Course "The use of MCNP in Radiation Protection and Dosimetry"	1	1998	£ 10,500	
EU	Development of advanced numerical methods in the field of radiation protection and dosimetry	24	1998	£ 35,300	
RRMP	Development of EVENT code	12	1998	£ 20,000	Prof AJHGoddard
HSE(NII)	International contacts in criticality safety	6	1998	£ 30,000	Prof AJHGoddard
British Energy	Feasibility study of the use of EVENT for 3D ractor lattice calculations	12	1998	£ 50,000	Prof AJHGoddard
HSE(NII)	Independent advice in criticality safety	6	1999	£ 22,000	Prof AJHGoddard

British Energy	AGR Reactor Refuelling Optimisation	24	1999	£ 190,000	Prof AJHGoddard Dr J N Carter
British Energy	Feasibility study of the use of EVENT for 3D ractor lattice calculations	12	1999	£ 35,000	Prof AJHGoddard
RRMP	Development of EVENT code	12	1999	£ 15,000	
RRMP	Development of EVENT code	3	1999	£ 15,000	
BNFL	Invetigation of Molecular Separation	3	1999	£ 5,000	Prof AJHGoddard
HSE(NII)	International contacts in criticality safety	12	2000	£ 50,000	Prof AJHGoddard
RRMP	Development of EVENT code	12	2000	£ 20,000	Prof AJHGoddard
Electrowatt	Dounreay FBR shielding calculations	3	2000	£ 6,000	
EU	Development of advanced numerical methods for nuclear borehole logging	24	2000	£ 82,000	Prof AJHGoddard
EPSRC	Solution of Large-scale Problems in Engineering and Mathematics – Cost Effective Distributed Computing	24	2000	£ 90,000	Prof AJH Goddard
HSE(NII)	Development of FETCH code and dosimetry of criticality excursions	18	2001	£ 70,000	Prof AJHGoddard
RRMP	Development of EVENT code	12	2001	£ 15,000	
UKAEA	DFR activation calculations	12	2001	£ 22,000	Prof AJHGoddard
ABB	Electric tomography	24	2001	£ 100,000	Prof AJH Goddard Dr CC Pain

SONDEX	Development of an electroseismic model	12	2001	£ 30,000	Prof AJHGoddard Dr C Pain
NERC	3D non-hydrostatic ocean model	36	2001	£ 200,000	Prof AJHGoddard Dr C Pain
NERC	3D Radiative transfer through clouds	24	2001	£ 123,000	Prof AJHGoddard Dr C Pain
NIREX	Post-closure criticality assessment of underground nuclear waste repository	12	2001	£45,000	Prof AJHGoddard Dr C Pain
RRMP	Development of EVENT code	12	2002	£ 15,000	
BNFL	Fluidised bed modelling of TDN reactor	24	2002	£ 40,000	Prof AJHGoddard Dr C C Pain
BNFL	Heat transfer in gaseous sludges in waste tanks	6	2002	£ 12,000	Prof AJHGoddard Dr C C Pain
BP	Modelling the injector of a bus-loop reactor	6	2002	£ 15,000	Prof AJHGoddard Dr C C Pain
NERC	Environmental systems diagnostics and visualization using the GRID	36	2002	£ 69,000	Prof AJHGoddard Dr C Pain
EPSRC	Data assimilation for coastal flow using adjoint methods	24	2002	£ 165,000	Prof AJHGoddard Dr C Pain
NERC	RAPID Climate Change Modelling	36	2003	£ 200,000	Prof AJHGoddard Dr C Pain

Obs.   EPSRC – UK Engineering and Physics Research Council; UK NERC – Natural Environment Research Council;
RRMP – Rolls Royce Marine Power; SIEP – Shell International Exploration and Petroleum;
BNFL – British Nuclear Fuels; BP - British Petroleum; EU – European Union