



DEPARTMENT OF
PHYSICS
UNIVERSITY OF CAPE TOWN

M e A S U R e

Metrological and Applied Sciences University Research Unit

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Applied nuclear physicist, with a focus on radiation metrology, and tertiary physics education

Research outputs

(a) Refereed journal publications:

D.T.L. Jones, J.E. Symons, T.J. Fulcher, F.D. Brooks, M.R. Nchodu, M.S. Allie, A. Buffler & M.J. Oliver. "Neutron Fluence and Kerma Spectra of a p(66)Be(40) Clinical Source." *Medical Physics* **19** (1992) 1285-1291.

M.S. Allie, F.D. Brooks, D.G. Aschman, A. Buffler, W.A. Cilliers, R.W. Fearick, C.G.L. Henderson, M.J. Oliver, M.R. Nchodu, S.M. Perez, D. Steyn, W.R. McMurray, B.R.S. Simpson, F.D. Smit, H.G. Miller, K. Bharuth-Ram & I.J. van Heerden. "Differential Cross Section for n-p radiative capture at $E_n = 63.4$ MeV." *Physics Letters* **B314** (1993) 173-178.

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S. Allie and A. Buffler. "A Course in Tools and Procedures for Physics I." *American Journal of Physics* **66 7** (1998) 613-624.

"New neutron and proton production cross sections measurements for cosmic ray studies"

J.M. Sisterson, J. Vincent, S. Yen, A.Y. Zyuzin, A.J.T. Jull, D.J. Dohahue, S. Cloudt, S. Klandrud, D.T.L. Jones, J.E. Symons, P.J. Binns, F.D. Brooks, A. Buffler, M.S. Allie, M.R. Nchodu, J. Ullmann and R.C. Reedy
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(b) Chapters in books

S. Allie, A. Buffler, L. Kaunda & M. Inglis. "The development of an instrument for writing-intensive laboratory reports." In *Access to Success: Literacy in Academic Contexts*, Ed: S. Angelil-Carter. (Cape Town: University of Cape Town Press, 1998, ISBN 1-919713-17-4) 178-191.

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- S. Allie, D. Dameree, J. Taylor, F. Lubben, & A. Buffler. "Making sense of measurements, making sense of the textbook." *Proceedings of the AIP Physics Education Research Conference, Edmonton, Canada, July 2008*.
- A. Buffler, S. Pillay and F. Lubben. "Effective computational modelling in the introductory physics course." *Proceedings of the 17th Annual Meeting of the Southern African Association for Research in Mathematics, Science and Technology Education, Grahamstown*. Eds: M. Schafer and C. McNamara (2009) pp. 51-57 ISBN 978-92-990043-7-1.

S. Röttger, M. S. Allie, F. D. Brooks, A. Buffler, V. Dangendorf, J.-P. Meulders, R. Nolte, F. D. Smit, and H. Schuhmacher. "Measurement of ^{235}U , ^{238}U , ^{209}Bi and ^{nat}Pb fission cross sections using quasi-monoenergetic neutrons with energies from 30 MeV to 200 MeV." *4th International Workshop on Nuclear Fission and Fission-product Spectroscopy*, AIP Conf. Proc. 1175 pp. 382-388.

S. Röttger, R. Böttger, F. D. Brooks, A. Buffler, J.-P. Meulders, R. Nolte, F. D. Smit, and F. Wissmann. "The PTB neutron reference fields (PIAF) - quasi-monoenergetic neutron reference fields in the energy range from thermal to 200 MeV." *4th International Workshop on Nuclear Fission and Fission-product Spectroscopy*, AIP Conf. Proc. 1175 pp. 375-381.

A. Buffler, I. Govender, J.J. Cilliers, D.J. Parker, J.-P. Franzidis, A. Mainza, R.T. Newman, M. Powel, A. van der Westhuizen. "PEPT Cape Town: a new positron emission particle tracking facility at iThemba LABS." *Proceedings of International Topical Meeting on Nuclear Research Applications and Utilization of Accelerators*, 4-8 May 2009, Vienna (IAEA, Vienna, 2010) STI/PUB/1433 ISBN 978-92-0-150410-4 ISSN 1991-2374

M. Bickell, A. Buffler, and I. Govender, "A fully 4D mesh parameterization PET image reconstruction algorithm for list-mode data," *IEEE Nuclear Science Symposium Conference Record*, **MIC9.S-223** (2011) 2620-2424 ISBN 978-1-4673-0120-6.

M. Maucec, R. Dusterhoft, R. Rickman, R. Gibson, A. Buffler, M. Stankiewicz, M. van Heerden, "Dynamic Imaging of Fluid Mobility in Low-Permeability Matrices Using Positron Emission Tomography," *Unconventional Resources Technology Conference*, 12-14 August 2013, Denver, Colorado, USA. SPE-168734-MS ISBN 978-1-61399-302-6

M. van Heerden, A. Buffler, M. Maucec, R. Dusterhoft, R. Rickman, R. Gibson, M. Stankiewicz, "Imaging of Fluid Mobility in Fractured Cores Using Time-lapse Positron Emission Tomography," *SPE Annual Technical Conference and Exhibition*, 30 September-2 October 2013, New Orleans, Louisiana, USA. SPE-166402-MS ISBN 978-1-61399-240-1

M. Stankiewicz, A. Buffler, M. van Heerden, R. Gibson, M. Maucec, R. Dusterhoft, "Imaging of Dynamic Positron Emission Tomography: Application to Imaging Fluid Mobility in Fractured Cores," *SPE Unconventional Resources Conference and Exhibition-Asia Pacific*, 11-13 November 2013, Brisbane, Australia. SPE-167004-MS ISBN 978-1-61399-255-5

M. Maucec, R. Dusterhoft, R. Rickman, R. Gibson, A. Buffler, M. Stankiewicz, M. van Heerden, "Dynamic 3D Imaging of Fluid Mobility in Natural Fractures Using High-resolution Positron Emission Tomography International," *Petroleum Technology Conference*, 19-22 January 2014, Doha, Qatar. IPTC-17478-MS ISBN 978-1-61399-322-4

(d) Invited plenary conference presentations:

"Contraband detection with fast neutrons." *9th International Symposium on Radiation Physics*, Cape Town, 26-31 October 2003.

"Using fast neutrons to detect explosives and illicit materials." *International Symposium on Utilization of Accelerators*, Dubrovnik, Croatia, 6-10 June 2005.

"How many readings do we need to take?" What is the role of measurement in the modern introductory physics lab?" *18th National Congress of the Australian Institute of Physics*, Adelaide, Australia, 30 November - 5 December, 2008.

"Detecting Contraband Using Neutrons: Challenges and Future Directions." *11th Neutron and Ion Dosimetry Symposium*, Cape Town, 12-16 October 2009.

Conference summary presentation, *11th Neutron and Ion Dosimetry Symposium*, Cape Town, 12-16 October 2009.

"The first year of research at PEPT Cape Town: an overview" *Mineral Processing 2011*, Cape Town, 4-5 August 2011.

"PEPT research at iThemba LABS" *6th International Symposium on Process Tomography (ISRP6)*, Cape Town, 26-28 February 2012.

"Application of positron emission particle tracking to studies of flow for the minerals industry," *12th International Conference on Applications of Nuclear Techniques*, Crete, Greece, June 2013.

"Student-generated visual models using VPython in an introductory physics course for freshmen," *Gordon Research Conference on Visualization in Science & Education*, Rhode Island, USA, July 2013.

(e) Other conference presentations:

"Differential Cross Section for n-p Radiative Capture at 195 MeV." *Annual Conference of the South African Institute of Physics*, Stellenbosch, 1993.

“The Academic Support Programme in Physics at the University of Cape Town (3 parts)” *Winter meeting of the American Association of Physics Teachers*, San Diego, United States, January 1994.

“Elemental analysis by neutron backscattering.” *5th International Conference on Applications of Nuclear Techniques*, Crete, Greece, June 1996.

“First year physics students’ perceptions of the quality of experimental measurements.” *Workshop on Students’ Understanding of the Procedures of Scientific Enquiry* (invited), DidaScO Université Paris XI, Paris, France, July 1997.

“Detection of explosives and narcotics by Fast Neutron Scattering Analysis (FNSA).” *Annual Conference of the South African Institute of Physics*, Cape Town, 1998.

“Procedural understanding of first year university science students.” *Annual Conference of the South African Institute of Physics*, Cape Town, July 1998.

“Contraband detection by fast neutron scattering.” *6th International Conference on Applications of Nuclear Techniques*, Crete, Greece, June 1999.

“Measurement of neutron energy spectra from 15-150 MeV using stacked liquid scintillators.” *International Workshop on Neutron Field Spectrometry in Science, Technology and Radiation Protection*, Pisa, Italy, June 2000.

“Toward effective teaching of measurement in the freshman physics laboratory.” *Summer Meeting of the American Association of Physics Teachers*, Rochester, New York, July 2001.

“Contraband detection by fast neutron scattering.” *2nd National Nuclear Technology Conference*, Cape Town, May 2001

“The point and set paradigms: towards the effective teaching of measurement in the first year physics laboratory.” *3rd International Conference of the European Science Education Research Association*, Thessaloniki, Greece, August 2001

“A stacked scintillator neutron spectrometer for measuring the fluence of mono-energetic neutron beams up to 150 MeV.” *Annual Conference of the South African Institute of Physics*, Stellenbosch, July 2003.

“Students’ understanding of measurement and uncertainty.” *Annual Conference of the South African Institute of Physics*, Stellenbosch, July 2003.

“Evaluation of a research-based curriculum for teaching measurement in the first year physics laboratory.” *4th International Conference of the European Science Education Research Association*, Noordwijkerhout, The Netherlands, August 2003.

“Security and contraband detection.” *ISRP Workshop on Radiation-based Analytical Techniques*, iThemba LABS, Cape Town, 24-26 October 2003.

“Using fast neutrons to detect explosives.” Specialist (invited) meeting at IAEA Headquarters in Vienna, Austria, on “*Neutron generators for detection of explosives and illicit materials*”, 13-17 June 2005.

“Positive epistemological change through the development of multi-representational problem solving skills.” *Winter meeting of the American Association of Physics Teachers*, Anchorage, Alaska, January 2006.

“Visual modeling in physics teaching and learning.” *Round Table Discussion Session at the 15th Annual Meeting of the Southern African Association for Research in Mathematics, Science and Technology Education*, Maputo, January 2007.

“The relationship between introductory physics students’ views on the nature of science and the nature of scientific measurement.” *6th International Conference of the European Science Education Research Association*, Malmö, Sweden, August 2007.

“Using a model-based view of physics when designing computational physics activities for the introductory physics course.” *Gordon Research Conference on Physics Research and Education: Computation and Computer-Based Instruction*, Bryant University, Rhode Island, June 2008.

“A Modern View of Modeling in Physics Teaching and Learning.” Keynote lecture at the *18th National Congress of the Australian Institute of Physics*, Adelaide, Australia, 30 November - 5 December, 2008.

“PEPT Cape Town: a new positron emission particle tracking facility.” *Minerals Processing 2009*, Cape Town, August 2009.

“Studies of the effect of tracer activity on time-averaged positron emission particle tracking measurements on tumbling mills at PEPT Cape Town.” *Comminution 2010*, Cape Town, April 2010.

“A model-based view of physics for effective teaching and learning.” Gordon Research Conference on Visualization in Science & Education, 10-15 July 2011, Bryant University, Rhode Island, USA, July 2011.

“The influence of introductory physics laboratories on views about physics and measurement”, the opening contribution to the symposium “Physics students’ views on the nature of measurement and consequences for laboratory teaching,” *8th Conference of the European Science Education Research Association*, Lyon, France, September 2011.

“Quasi-monoenergetic fast neutron beams at iThemba LABS”, *2nd International Workshop on Fast Neutron Detectors and Applications*, Ein Gedi, Israel, 6-11 November 2011.