

Professor Tony Bracken

PhD (Adelaide), 1970



Mathematics

Web: www.maths.uq.edu.au

Email: ajb@maths.uq.edu.au

RESEARCH INTERESTS

Quantum mechanics

- Symmetries in the relativistic and non relativistic theory
- Relativistic wave equations
- Localisation of relativistic particles
- Properties of the Wigner distribution function and the phase space description
- Quantum random walks

Biomathematical modelling

- Elimination of drugs by the liver
- Drug delivery through the skin
- Flux-ratio theorems in membrane transport
- Urban growth

RESEARCH PROJECTS

Quantum random walks

As part of an international collaboration, we are investigating the mathematical properties of these recently discovered structures in quantum mechanics, in particular the associated rates of entropy and entanglement increase.

Phase space description of quantum mechanics

With colleagues overseas, we are investigating the ways that quantum symmetries are expressed in this framework, and also the ways that entanglement of quantum systems with continuous degrees of freedom can be quantified using properties of the Wigner function.

Relativistic localisation

A causally well-behaved solution of the localisation problem for the Dirac electron has recently been developed. Further properties are being explored.

Biomathematics

With colleagues in the School of Medicine, we are extending our earlier work to develop mathematical models of the way the liver eliminates drugs from the blood, and of the way drugs diffuse through the skin.

School of Physical Sciences

The University of Queensland
Brisbane Qld 4072
Australia

Web: www.sps.uq.edu.au
Email: admin@sps.uq.edu.au
Telephone: (07) 3365 6004
Facsimile: (07) 3365 3328

SELECTED PUBLICATIONS

L. Bass & **A.J. Bracken**, 1978, 'The problem of the thrown string', *Nature*, **275**, pp. 205-206 (1978).

A.J. Bracken, 1982, 'Inconsistency in an external field of Dirac's positive-energy wave equation with generalized internal variables', *Proc. R. Soc. Lond. A*, **383**, pp. 447-456.

A.J. Bracken & H. C. Tuckwell, 1992, 'Simple mathematical models for urban growth', *Proc. R. Soc. Lond.*, A 438, pp.171-181.

A.J. Bracken, M.D. Gould, J.R. Links and Y.Z. Zhang, 1995, 'New supersymmetric and exactly solvable model of correlated electrons', *Phys. Rev. Letts.*, **74**, pp. 2768-2771.

Y. Amissimov, **A.J. Bracken** & M.S. Roberts, 1997, 'Interconnected-tubes model of hepatic elimination', *J. Theor. Biol.*, **188**, pp. 89-101.

A.J. Bracken, H.D. Doebner & J.G. Wood, 1999, 'Bounds on integrals of the Wigner function', *Phys. Rev. Letts.*, **83**, pp. 3758-3761.

A.J. Bracken & G.F. Melloy, 1999, 'Localising the relativistic electron', *J. Phys. A*, **32**, pp. 6127-6139.

A.J. Bracken, 2003, 'Quantum mechanics as an approximation to classical mechanics in Hilbert space', *J. Phys. A*, **36**, L329-L335.

A.J. Bracken, 2004, 'Entangled subspaces and quantum symmetries', *Phys. Rev. A*, **69**, 052331.

A.J. Bracken, D. Ellinas & I. Tsohantjis, 2004, 'Pseudomemory effects, majorisation and entropy in quantum random walks', *J. Phys. A.*, **37**, pp. L91-L97.