

# JOSH IZAAC

josh.izaac@uwa.edu.au

## EDUCATION

- MAR 2013 - Present    **Doctor of Philosophy in Physics**  
UNIVERSITY OF WESTERN AUSTRALIA | Supervisor: Prof. Jingbo WANG  
Thesis: *Continuous-time Quantum Walks & Applications*
- DEC 2013-JAN 2014    **The 31st Jerusalem Winter School in Theoretical Physics**  
ISRAEL INSTITUTE FOR ADVANCED STUDIES, HEBREW UNIVERSITY OF JERUSALEM  
Frontiers of Quantum Information Science. Topics included quantum computing, quantum algorithms, quantum information and black holes.
- JAN-NOV 2012    **Bachelor of Science (Hons) in Physics**  
UNIVERSITY OF WESTERN AUSTRALIA | Supervisor: Jingbo WANG  
WEIGHTED AVERAGE MARK: 91.4% | GPA: 7.0/7.0 | FIRST CLASS HONOURS  
Thesis: *Continuous-time Quantum Walks: Disorder, Resonance & Interactions*
- MAR 2009-Nov 2011    **Bachelor of Science in Physics and Applied Mathematics**  
UNIVERSITY OF WESTERN AUSTRALIA  
WEIGHTED AVERAGE MARK: 92.1% | GPA: 6.9/7.0

## RESEARCH EXPERIENCE

- Current  
MAR 2013    **Doctor of Philosophy (Physics)**  
UNIVERSITY OF WESTERN AUSTRALIA | Supervisor: Prof Jingbo WANG  
Exploring potential real world applications of quantum walks. Preliminary work involves investigating quantum walk based models of electron transport in molecules, in collaboration with Prof. Dylan Jayatilaka of the Computational Quantum Chemistry research group.
- NOV-DEC 2014    **AsiaBound Collaboration**  
OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY  
Supervisors: Dr C M CHANDRASHEKAR and Prof Thomas BUSCH  
Worked with the Quantum Systems Unit to model and analyse quantum percolation in continuous-time quantum walks.
- NOV 2012-MAR 2013    **iVEC Internship**  
UNIVERSITY OF WESTERN AUSTRALIA | Supervisor: Asst/Prof Peter METAXAS  
Worked with the spintronics and magnetisation dynamics research group at UWA, investigating hybrid vortex-domain wall dynamics. This required high performance computing techniques using GPUs in addition to a good physical understanding of nanomagnetism, and could lead to significant advances in manufacturing memory storage devices.
- JAN-NOV 2012    **Bachelor of Science (Hons.) Research Project**  
UNIVERSITY OF WESTERN AUSTRALIA | Supervisor: Prof Jingbo WANG  
Explored the dynamics and computational potential of quantum walks. Complex numerical analysis was performed using the Pawsey supercomputing facilities.

## PUBLICATIONS

- [1] J. A. Izaac and J. B. Wang. pyCTQW: a continuous-time quantum walk simulator on distributed memory computers. *Computer Physics Communications*, 186(0):81–92, January 2015.
- [2] J. A. Izaac, J. B. Wang, and Z. J. Li. Continuous-time quantum walks with defects and disorder. *Physical Review A*, 88(4):042334, October 2013.
- [3] Z. J. Li, J. A. Izaac, and J. B. Wang. Position-defect-induced reflection, trapping, transmission, and resonance in quantum walks. *Physical Review A*, 87(1):012314, January 2013.
- [4] A. Mahasinghe, J. A. Izaac, J. B. Wang, and J. K. Wijerathna. Phase-modified CTQW unable to distinguish strongly regular graphs efficiently. *Journal of Physics A*, 48(26):265301, July 2015.

## CONFERENCE PRESENTATIONS

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[1] J. A. Izaac and P.J. Metaxas. Nanomagnetism with GPUs: simulations of hybrid vortex - domain wall devices. Paper presented at the annual *iVEC Symposium*, Perth, Australia. February 2013.

## SCHOLARSHIPS AND AWARDS

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- 2012 Hackett Postgraduate Scholarship (*awarded to the top-ranked PhD applicants*)
- 2011 John and Patricia Farrant Scholarship (*awarded to the top physics student undertaking honours*)  
Physics (Level 3) Prize (*top student in 3rd year physics*)
- 2010 Convocation, the UWA Graduates Association Prize – Physics, Geology & Chemistry  
Digby Fitzhardinge Memorial Prize (*top student in 2nd year physics*)
- 2009 Convocation, the UWA Graduates Association Prize – Physics, Geology & Chemistry  
Lady James Prize in Chemistry (*top student in 1st year chemistry*)

## WRITING

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AUG 2015 - PRESENT	<b>Freelance science writer</b> This involves keeping up to date with scientific research across disciplines, developing and pitching story ideas to editors, interviewing researchers, and writing short articles. My work has so far appeared in <i>Australian Geographic</i> .  [1] J. A. Izaac. Female fairy-wrens sing for other females. <i>Australian Geographic</i> . October 2015.
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## TEACHING

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<b>Current Employment</b> FEB 2013 - PRESENT	<b>Academic Tutor, University of Western Australia</b> LECTURER/TUTOR FOR HONOURS AND MASTERS COMPUTATIONAL PHYSICS This involved helping students tackle problems in physics and mathematics through the use of various numerical algorithms, providing FORTRAN and UNIX support, presenting guest lectures and writing lecture notes.
FEB 2012 - PRESENT	TUTOR FOR SECOND AND THIRD YEAR COMPUTATIONAL MATHEMATICS This involved helping students with problems in applied mathematics/physics, and demonstrating how computational tools such as Mathematica can be used to complement traditional methods.
AUG-SEP 2012	MARKER FOR THIRD YEAR QUANTUM COMPUTATION Compiled assignment solutions and marked third year physics students. This required a good understanding of introductory quantum computing in order to produce detailed solution guides.
<b>Past Employment</b> MAY 2009-JUN 2012	<b>Tutoring Australasia Pty Limited</b> SUBJECT SPECIALIST TUTOR (MATHS AND SCIENCES) <ul style="list-style-type: none"><li>• Effectively collaborate with team members to ensure knowledge is shared between tutors, enabling superior educational outcomes for students.</li><li>• Provide high quality subject support for Tutors as part of normal duties.</li><li>• Knowledge of contemporary educational techniques and practices.</li></ul>

## UPCOMING VOLUNTEER WORK

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FEB 2016	<b>Postgraduate Mentor at UWA</b> UniMentor is a university-wide peer mentoring program aimed at supporting students as they transition into postgraduate uni life.
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## SKILLS AND INTERESTS

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Basic Familiarity: Visual Basic, Matlab, C#, C  
Advanced Proficiency: Mathematica, FORTRAN, Python, Unix-based systems, Git, SVN,  
Bash scripting,  $\LaTeX$ , Excel, Word, PowerPoint, Photoshop, After Effects

Experience using high performance computational tools such as OpenMP, CUDA and MPI

Other interests include: Strength training, Technology, Open-Source, Programming, Kayaking (*Two Star Award*), Piano, Taekwondo (*Low Red belt, 5th Kup*), Travelling

## RESEARCH INTERESTS

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Quantum walks, whilst a relatively new area of research, have become an incredibly exciting field due to their potential applications in quantum information theory and quantum simulations; perhaps even leading to the future production of quantum computers and with that the possibility of revolutionizing the way we carry out computation and information processing.

My current research interests mainly lie in the characterisation and applications of quantum walks, with specific focus on quantum simulation of complex biochemical systems such as photosynthesis and electron transport in functional nano-materials. This requires a high degree of analytic and computational work, and enabled me to develop a high level of expertise using high performance computing techniques. With the growing importance of high performance computing in physical research, these skills have enabled me to cross disciplines, and perform magnetisation dynamic simulations that could lead to significant advances in manufacturing non-volatile memory storage devices.

## REFERENCES

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Professor Jingbo WANG	Doctoral Supervisor, School of Physics, UWA	+61 8 6488 3790
Winthrop Professor Ian McARTHUR	Head of School of Physics, UWA	+61 8 6488 2737