September 2016

MARK ALLAN WALTON

CURRICULUM VITAE

Position: Professor of Physics
University of Lethbridge

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Citizenship: Canadian
Languages: English, French

Education: Ph.D., M.Sc., in Theoretical High Energy Physics
McGill University (1987, 1983)
(supervisor: Professor Harry C.S. Lam)

B.Sc. in Honours Physics
Dalhousie University (1981)
(GPA 4.0/4.0, finished 2nd in Science)

Award: Dalhousie University Medal in Physics, 1981

Scholarships/ Fellowships: NSERC Postdoctoral Fellowship, 4/1987 - 3/1989
(SLAC Theory Group, Stanford University)

McGill Major Fellowship, 1985 - 1987

NSERC Postgraduate Scholarship, 1981 - 1985

Research Grant: NSERC Discovery Grant (Individual)
$19,000/y for 5 years, awarded 4/15

Other:

Member of Quantum Alberta network, 2015-
University Scholar (Sciences), University of Lethbridge, 2013-15
Member of NSERC Physics Evaluation Group EG 1505, 2010-2013
Perimeter Institute for Theoretical Physics, Affiliate, 04-present
Editorial Board Member, ISRN Algebra, 3/11-5/13
European Science Foundation Peer Reviewer, 06-present
PIMS String Theory Collaborative Research Group, 4/03-4/05

Work Experience:

Visitor, Statistical Physics Group, SISSA, Trieste, Italy,
January - July 2016 (sabbatical)

University Scholar in the Sciences, University of Lethbridge,
1 August 2013 - 31 July 2015

Professor, Physics Department, University of Lethbridge,
July 1, 2001- present

Visitor, Instituto Matemática,
Universidad Nacional Autónoma de México, Unidad Morelia
February, 2009 - April, 2009 (sabbatical)

Visitor, Department of Applied Mathematics,
University of Western Ontario,
January, 2005 - July, 2005 (sabbatical)

Chair, Physics Department, University of Lethbridge,
July 1, 2002- June 30, 2005

Associate Professor, Physics Department,
University of Lethbridge,
July 1, 1995 - June 30, 2001

Visitor, Dept. of Applied Math. & Theoretical Physics,
Cambridge University,
July, 1997 - June, 1998 (sabbatical)

Assistant Professor, Physics Department,
University of Lethbridge,
January 1, 1991 - June 30, 1995

Postdoctoral Fellow, Université Laval,
September 1, 1989 - December 31, 1990

Visiting Scientist, Physics Department, McGill University,
July - August, 1989

NSERC Postdoctoral Fellow, Stanford University,
Stanford Linear Accelerator Center, Theory Group
April 1, 1987 - March 31, 1989

Research Support:

NSERC Discovery Grant, $19,000/year for 5 years, awarded 4/15
NSERC Discovery Grant, $40,000/year for 5 years, awarded 3/06;
extended 3 years, during service on NSERC
Physics Evaluation Group, 2010-2013
NSERC Research/Discovery Grant, $24,000/year for 4 years,
awarded 3/01; extended 1 year, 5/04
NSERC Research Grant, $11,025/year for 2 years, awarded 3/99
NSERC Research Grant, $16,600/year for 4 years, awarded 3/95
NSERC Research Grant, $10,000/year for 3 years, awarded 3/92

University Scholar Research Grant, $6500, 2013-2015

NATO Science Fellowship (Dr. S. Kryukov, U of L, 02-04)
$33,000/year for 2 years *(1st one for the U of L)*

Pacific Institute for the Mathematical Sciences
Postdoctoral Fellowship (Dr. J. Rasmussen, U of L, 00-01)
$18,000/year for 2 years *(1st one for the U of L)*

U of L International Research Engagement Fund (IREF) Seed Grant
$3,000, awarded 2/15
University of Lethbridge Research Fund grant, $4,500, awarded 2/12
University of Lethbridge Research Fund grant, $2,980, awarded 2/03
University of Lethbridge Research Fund grant, $3,558, awarded 1/00
University of Lethbridge internal NSERC Awards, totalling $15,805

NSERC Undergraduate Student Research Awards
(M. Robbins, 2014 & 2015 (co-supervised) & 2013; S. Neale, 2009;
M. Tahic, 2002; G. Flynn, 2000; S. Irvine, 1999) ~$27,000

Total: ~$800K

Theses:

'Two-Scale Compactification of the $E_8 \otimes E_8$
Heterotic String', Ph.D. (McGill, 1987)
supervised by Professor C.S. Lam
(1st string theory Ph.D. thesis in Canada, to my knowledge)

'Two-Quark Processes in a Scalar Model
of Deep Inelastic Scattering', M.Sc. (McGill, 1983)
supervised by Professor C.S. Lam

Impact–Miscellaneous Evidence:

External Reviewer Report, NSERG DG Application (awarded 4/2015):
"Mark Walton is an accomplished researcher. University of Lethbridge is a smaller institution and it is close to a miracle that Walton has maintained scholarship, top-level research activities and high quality THQP for all these years."

14 citations in the leading monograph in my main field:
P. Di Francesco, P. Mathieu, D. Sénéchal, *Conformal Field Theory* (Springer, 1997),
(Google Scholar: more than 2000 citations)
From the Acknowledgments: "In particular, we thank M. Walton for numerous discussions on the subjects covered in Part C of this volume [361/859 pages] and his constant interest in this project."

From the Preface of J. Fuchs, C. Schweigert, *Symmetries, Lie Algebras and Representations* (Cambridge, 1997): "Using these tools we can explain rather deep results like" ... "the Kac-Walton formula for fusion rule multiplicities."

3 citations in T. Curtright, D. Fairlie, C. Zachos, *A Concise Treatise on Quantum Mechanics in Phase Space* (World Sci./Imperial College, 2013)

5 citations in J. Fuchs, *Affine Lie Algebras and Quantum Groups* (Cambridge, 1992).

Funded invitations to Seoul, Korea (Prof. Changrim Ahn) and to
Australia (Prof. Norman Wildberger); declined, because of teaching obligations.
Invitations (declined) to Math workshops: AMS Sectional Mtg., Bard College, NY, 10/05;
32nd Prairie Discrete Math Workshop, Winnipeg, 8/05; CMS Summer Mtg., Regina, 6/12

Nominated in 2012 for the University of Lethbridge
Ingrid Speaker Medal for Distinguished Research, Scholarship or Performance

Organizational

Chair, organizing committee, Theory Canada 7 meeting,
(national theoretical physics conference, satellite meeting of the CAP Congress)
University of Lethbridge, 7-9 June 2012.

Member, local organizing committee, Canadian Prairie Theoretical Physics Network (CPTPN) Meeting # 1, University of Lethbridge, 25-26 August 2010.

Co-organizer with T. Gannon of the Conformal Field Theory session
at the Canadian Mathematical Society's Summer Meeting, University of Alberta,
June 14-16, 2003.

Member, local organizing committee,
1994 Banff Summer School in Theoretical Physics, Particles and Fields '94, 16-24/8/94

Refereeing/ Reviewing:

Grants: Member of the Physics NSERC Evaluation Group 2010-13,
European Science Foundation Peer Reviewer,
NSERC Research/Discovery Grant proposals,
University of Lethbridge Research Fund proposals

Journals: Editorial Board Member, ISRN Algebra, 3/11-5/13,
Referee for *Journal of Physics* **A**, *Physics Letters* **B**,
Nuclear Physics **B**, *Annals of Physics*, *Canadian Journal of Physics*,
Journal of Mathematical Physics, *Classical and Quantum Gravity*,
Modern Physics Letters **A**, *Physical Review Letters*.

Reviewer for *Mathematical Reviews*.

In 2000, e.g., I refereed 4 papers for the *Journal of Physics* **A**, 1 for *Nuclear Physics* **B**, 1 for the *Canadian Journal of Physics*, 1 for *Classical and Quantum Gravity*, and reviewed 7 papers for *Mathematical Reviews*.
From 1991-2000, per year I refereed a little more than 3 papers per year, and wrote a little more than 4 *Mathematical Reviews*, on average.

Administrative Service:

Nominated: Gordon Walter Semenoff, D.Sc. 2011, U of L.
Nominated: James Edgar Till, D.Sc., 2007, U of L.
Co-nominated: Richard Edward Taylor, D.Sc., 1993, U of L (Nobel, Physics, 1990).

Member of the Self Study Committee, Review of the Department of Physics and Astronomy, Academic Quality Assurance, 2013-14

Member: Salary, Tenure & Promotion Committee; Faculty of Arts & Science, 2014-15, 2009-10.

Acting Chair of the Physics Department, July 1, 2006 - December 31, 2006.
Chair of the Physics Department, July 1, 2002 - June 30, 2005.

Member of the University's Study Leave Advisory Committee, 02-03.
Member of the Executive Committee of the Arts and Science Faculty for one year.
Member of the University Research Committee for 2 years.
Member of the UofL NSERC General Grant/Schol. Selection Committee (2×2-years).
Member of the Faculty Association's Academic Welfare Committee for 2 years.

Member of 2 department committees almost every year.

Teaching Experience:

1st year courses:
intro. mechanics (18 times: Spring 91-6,06; Fall 94-6,98-9,00,02-4,14,15),
intro. electricity
& magnetism (15 times: Fall 94-5; Spring 95-7,99-00,02-3,06,08[2],11,14,15),
liberal education course (co-director Fall 00, Spring 01)
2nd year courses:
intro. quantum (wave) mechanics (Spring 02)
intermediate electricity & magnetism (Spring 03)
physics of everyday life (Fall 08-11)
3rd year courses:
mechanics (13 times: Fall 91-3,96,98-9,00,06,08,15,16; Spring 95-6),
statistical mechanics (5 times: Spring 93-4,13; Fall 96,11),
mathematical methods (3 times: Spring 99,00; Fall 07)
intermediate electricity & magnetism (Spring 06,08)
4th year courses:
relativity (Spring 91),
nuclear & particle physics (10 times: Fall 91-3,98,10,16; Spring 97,03,06,15),
advanced mechanics (half-course, Spring 91),
advanced quantum mechanics (4 times: Fall 99; Spring 01-2,10)
graduate course (5th/7th year):
theoretical physics (Spring 12)
graduate reading courses:
quantum field theory (Fall 15),
advanced theoretical physics (Summer 10),
advanced theoretical physics (Spring 06),
theoretical physics (Spring 06),
conformal field theory (Fall 94),
advanced quantum mechanics (Spring 94)
independent study courses:
4th year programming for research
in mathematical physics (Summer 99),
3rd year problems course (Spring 99),
special relativity (Fall 95),
1/2 of 4th year course on special and general relativity (Spring 94)
applied study courses:
programming for mathematical physics (Fall 00)
deformation and non-commutative
quantum mechanics (Summer 04)

Teaching Load:
1991-2003: 5 (13-week) courses per year.
2003/04-present: 4 courses per year.
No credit is normally given for undergraduate or graduate independent study (reading) courses, or for undergraduate applied study courses (completed as part of a research assistantship).
I got my first official credit for graduate teaching in the Spring 2012 semester
when I taught Physics 5850/7850: Theoretical Physics II.

Undergraduate Supervision:

Matthew Robbins (NSERC USRA, Summer 15 (co-supervised))
Matthew Robbins (NSERC USRA, Summer 14 (co-supervised))
Hugh Ramp (Research Assistant, Spring 2013)
Matthew Robbins (NSERC USRA, Summer 13)
Iain Martin* (Research Assistant, Summer 12)
Andrew Urichuk (Research Assistant, Summer 12)
Joel Norris* (Research Assistant, Summer 12)
Sam Neale (Research Assistant, Summer 11)
Oba Powis* (Research Assistant, Summer 11)
Brent Peterson* (Research Assistant, Summer 10)
Sam Neale (NSERC USRA, Summer 09)
Torry Oravec* (Research Assistant, Summer 09)
Matt Eubank (Research Assistant, Summer 04)
Surhud Shrikant More (IIT Mumbai student, co-supervisor of summer internship, 04)
Jason Hancock (Research Assistant, Summer 03)
Bryan Wynder (Research Assistant, Summer 02)
Margaret Tahic (NSERC USRA, Summer 02; Research Assistant, Summer 01)
Geoff Flynn (NSERC USRA, Summer 00; Research Assistant, Fall 00, 5/01)
Paul Schultz (Research Assistant, Fall 00)
Scott Irvine (NSERC USRA, Summer 99)
Boyd Hansen (Research Assistant, Summer 95)
Derek Sorgard (U. Lethbridge Teaching Fund†, Summer 96)
Jeremy Thompson (U. Lethbridge Teaching Fund†, Summer 96)
Doug Sandilands (U. Lethbridge Teaching Fund†, Summer 95)
Denny Winkler (U. Lethbridge Teaching Fund†, Summer 95)
Sheri Hlady (U. Lethbridge Teaching Fund†, Summer 94)
Corey Clayton (Research Assistant, Summer 93)

*Iain Martin, Joel Norris, Oba Powis, Brent Peterson and Torry Oravec were the first 5 beneficiaries of a new program I suggested for recruitment of undergraduate students into physics research. They both won what is now known as the Arvid Schultz Summer Research Award. One excellent first-year student is chosen to work in and to become familiar with several research programs in the Department of Physics and Astronomy. The salary cost is shared among the research supervisors involved. Normally, the contribution of a first-year student to a physics research program is minimal. On the other hand, it is difficult to compete for more advanced undergraduates if they are able to start after their first year in other disciplines. By sharing the costs (time, effort and research funds) the recruitment opportunity is taken while the problems are minimized.

†The students funded by the University of Lethbridge Teaching Fund devised classroom demonstrations and constructed the required apparati. I co-supervised 5 students over 3 summers.

Graduate Supervision:

M.Sc. student, Matthew Robbins, 9/15-

M.Sc. student, Andrew Urichuk, 9/12-8/15
Thesis: *Affine Fusion Tadpoles*,
successfully defended 31 August 2015.

Ph.D. student, Ali Nassar, 9/09-1/14
(co-supervised with Prof. Saurya Das)
Thesis: *Strings on Complex Multiplication Tori and Rational Conformal Field Theory with Matrix Level*,
successfully defended 17 January 2014.

M.Sc. student, Steve Sidhu, 1/10-4/12
(co-supervised with Prof. Saurya Das)
Thesis: *Conformal Field Theory and Black Hole Physics*,
successfully defended 20 April 2012.

Ph.D. student, Borislav Belchev, 9/05-3/10
Thesis: *Deformation Quantization for Contact Interactions and Dissipation*,
successfully defended 2 March 2010.
First U of L Ph.D. in Theoretical Physics, second in Physics.

M.Sc. student, Nnamdi Okeke,
Thesis: *Character Generators and Graphs for Simple Lie Algebras*,
successfully defended 19 January 2007.

M.Sc. student, Cvjetan Jakovljevic,
Thesis: *Conformal Field Theory and Lie Algebras*,
successfully defended August 9, 1996.
First M.Sc. in Physics at the University of Lethbridge.

External examiner:

- Lenka Motlochova (Ph.D., Math, U. Montreal, 2014)
- Michelle Larouche (Ph.D., Math, U. Montreal, 2012)
- Elaine Beltaos (Ph.D., Math, U. Alberta, 2009)
- John Koblanski (M.Sc., Physics, UNBC, 2007)
- Glen Goodvin (M.Sc., Physics, UNBC, 2005)
- Phoebe Elliot (M.Sc., Math, U. Alberta, 2001)

I have been a member of ~ 16 U of L M.Sc. Supervisory Committees

I have been a member of 4 U of L Ph.D. Supervisory Committees

Postdoctoral Supervision:

Dr. Pablo Diaz, 2/15 - (co-supervisor with Saurya Das)
(Ph.D., University of Zaragoza, Spain, 2009);

Dr. Wissam Chemissany, 10/08 - 9/10
(Ph.D., Gröningen University, The Netherlands, 2008);

Dr. Sourav Sur, 9/06 - 8/08 (co-supervisor with Saurya Das)
(Ph.D., Jadavpur University, Calcutta, India, 2005);

Dr. Sergei Kryukov, 9/02 - 10/04
(Ph.D., Bogoliubov Laboratory of Theoretical Physics, JINR, 2001);
NATO Science (Postdoctoral) Fellow

Dr. Jian-Ge Zhou, 10/01 - 12/03
(Ph.D., University of Science and Technology of China, 1994;
Humboldt Fellow, 94-97; JSPS Fellow, 97-99; Meitner Fellow, 99-01)

Dr. Jorgen Rasmussen, 02/00 - 11/01
(Ph.D., Neils Bohr Institute, 1996)
Pacific Institute for the Mathematical Sciences (PIMS)
Postdoctoral Fellow, 04/00 - 11/01

Invited Talks:

Doppler Institute-CRM Workshop
on the occasion of 80th birthdays of Jiri Patera & Pavel Winternitz
Villa Lanna, Prague, 30 May - 3 June 2016

Workshop: Lie Theory and Mathematical Physics
CRM, U. de Montréal, 19-23 May 2014

Canadian Association of Physicists (CAP) Congress:
Calgary, June 2012
Toronto, June 2010
Saskatoon, June 2007
Winnipeg, June 2004
Quebec City, June 2002
Regina, June 1994

Theory Canada 1, UBC, Vancouver, June 2005

Workshop on Symmetry in Physics
in memory of Robert T. Sharp
CRM, Université de Montréal, 12-14 September 2002

Theoretical Physics Institute 2002 Symposium,
University of Alberta, 27-28/9/02

Lecturer (10 hours) at the Summer Research Semester,
Gursey Institute, TUBITAK-Bogazici University
Istanbul, August, 1998

Canada-China Joint Workshop in Mathematical Physics,
Nankai University, Tianjin, China, 19-23 August, 1996

CRM-CAP Workshop in Theoretical and Mathematical Physics
Université Laval, Québec, June, 1995

RESEARCH HIGHLIGHTS

Numbered citations refer to my list of journal publications, the next item in this cv.

Papers [9, 10] report my discovery of what is now known as the Kac-Walton algorithm, for the computation of affine fusion rules, which count the independent 3-point couplings of Wess-Zumino-Witten (WZW) conformal field theories. Together, they have been cited 180 times now, according to Google Scholar. In addition, I know of several articles that refer to the "Kac-Walton algorithm", but do not cite my articles. This work is relevant in part because the WZW models are extremely important among conformal field theories, and fusion rules are crucial data in any conformal field theory. The algorithm is proved using the famous Verlinde formula for fusion rules, and makes manifest the physically obvious: that the fusion rules are integers. I must mention, however, that it doesn't make clear that they are non-negative, and fixing that has motivated much work, including several of my other papers: [11, 16-19, 25], e.g. This old work continues to have impact, although most citations now occur in the mathematical literature (see recent work by C. Korff, e.g.). I believe that this indicates the newer research in math is due to inject useful ideas into the physics literature, and plan to contribute to that effort.

[4] builds on my thesis, the first one in string theory in Canada (to the best of my knowledge). It was completed in the first part of my NSERC Postdoctoral Fellowship at SLAC, Stanford University. Cited now 63 times, it continues to be relevant, with 11 citations since 2011, e.g. It has had some impact because 1) K3 is the unique compact Calabi-Yau space in 4 dimensions, and so provides a very useful toy model for the much more complicated and numerous 6-dimensional spaces that figure in the more realistic string compactifications; and 2) K3 is prominent in the important string dualities that have been discovered and led to the realization that the "different" string theories are merely distinct low-energy limits of an over-arching theory, sometimes called M-theory.

Article [5] reports the calculation of branching rules for an important example of a special kind of embedding of affine (Kac-Moody) algebras, and their application to WZW models. It is the application of this technical computation that was exciting: I showed that sensible (modular-invariant) partition functions could be written for an $su(k)$ theory at level N from a known partition function for the $su(N)$ WZW model at level k. This work helped lead to the surprising "level-rank duality" of WZW models by two groups: Naculich and Schnitzer; and Kuniba and Nakanishi. This duality gives rise to interesting physics in the string context.

[13, 15, 28] together are cited 64 times. Surprisingly, the distinction between unitary and non-unitary theories is secondary when it comes to the beautiful structure of rational conformal field theories. In WZW models, this points to the relevance of non-integer level, and the corresponding admissible representations of affine Kac-Moody algebras. With Mathieu (and Sénéchal) I was the first to apply the representation theory of these admissible representations

for general, rank>1 algebras to conformal field theory. Among other things, we were able to understand how the so-called W_N minimal models arise as coset models and worked out certain properties of those theories.

Much of my work in conformal field theory deals in a counting way, with two fundamental questions: 1. Which fields are present? 2. Which fields interact? The fusion rules furnish a first answer to question 2. A similar answer to question 1 is provided by the modular-invariant partition function of a conformal field theory. I did some early work on the construction of modular invariants in papers [5, 6, 7]. Later, I had the privilege of working on the same kind of problem 3 times with Terry Gannon (the true leader in this area) and once with Philippe Ruelle [20, 22, 27]. Together these 6 papers have been cited 110 times.

Paper [41] marks the beginning of a second main line of my current research. Motivated by the non-commutative geometry that appears in certain string theory backgrounds, I studied the Wigner-Moyal method of phase-space quantization, or deformation quantization, as it is also known. With two undergraduates, I wrote [41] as a truly pedagogical introduction to the subject, accessible to senior-level undergraduates. I continued to work on the subject in part because it affords opportunities for the training of highly qualified personnel at all levels, as my co-authors demonstrate. We have analyzed two types of extreme systems, that test any quantization method, and investigated their treatment by phase-space quantization: point-interactions [42-44, 47, 48], and the damped harmonic oscillator [46]. The goal was to push and test phase-space quantization as well as to see if it reveals aspects of the physics in a simpler way than other quantum methods. Most interestingly, [47] explains why Dirichlet boundary conditions are standard for the wave function at an infinite potential wall, even though a continuum of mixed boundary conditions are mathematically sensible. Our paper supported the beautiful renormalization-group argument of Ohya, Sakimoto and Tachibana, that appeared shortly afterward, and led to work by Kunstatter and Louko on polymer quantization, motivated by loop quantum gravity techniques.

PUBLICATIONS

Note that author order on papers in my field is almost always alphabetical. The two papers listed below with non-alphabetical author order are on subjects outside my usual area. **Student authors** are indicated in **boldface**. Postdoctoral fellows I supervised are underlined. E-print numbers, such as hep-th/0004055, indicate the papers can be accessed online at arxiv.org/hep-th/abs/0004055, for example.

Journal Publications

56. J. Hrivnák, M.A. Walton, 'Weight-Lattice Discretization of Weyl-Orbit Functions', *Journal of Mathematical Physics* **57** (2016) 083512; arxiv.org/abs/1608.01452

55. A. Urichuk, M.A. Walton, 'Adjoint Affine Fusion and Tadpoles', *Journal of Mathematical Physics* **57** (2016) 061702; arxiv.org/abs/1606.03842

54. S. Das, **M.P.G. Robbins**, M.A. Walton, 'Generalized Uncertainty Principle Corrections to the Simple Harmonic Oscillator in Phase Space', *Canadian Journal of Physics* **94** (2016) 139; arxiv.org/abs/1412.6467

53. J. Hrivnák, M.A. Walton, 'Discretized Weyl-orbit functions: modified multiplication and Galois symmetry', *Journal of Physics A: Mathematical and Theoretical* **48** (2015) 175205; arxiv.org/abs/1412.6450

52. M.A. Walton, 'Polytope Expansion of Lie Characters and Applications', *Journal of Mathematical Physics* **54** (2013) 121701; arxiv.org/abs/1311.3913

51. A. Nassar, M.A. Walton, 'Rational Conformal Field Theory with Matrix Level and Strings on a Torus', *Canadian Journal of Physics* **91** (2013); arxiv.org/abs/1211.2728

50. M.A. Walton, 'On Affine Fusion and the Phase Model', *SIGMA* **8** (2012) 086, 13 pages; arxiv:1208.0809)

49. B. Belchev, **S.G. Neale**, M.A. Walton, 'Flow of S-matrix Poles for Elementary Potentials', Canadian Journal of Physics **89** (2011) 1127-1140; arxiv:1110.4902

48. B. Belchev, M.A. Walton, 'Solving for the Wigner Functions of the Morse Potential', *Journal of Physics A: Mathematical and Theoretical* **43** (2010) 225206 (13 pp); arxiv:1002.2139

47. B. Belchev, M.A. Walton, 'On Robin Boundary Conditions and the Morse Potential in Quantum Mechanics', *Journal of Physics A: Mathematical and Theoretical* **43** (2010) 085301

(13 pp); arxiv:1001.4816

46. B. Belchev, M.A. Walton, 'On Wigner Functions and a Damped Star Product in Dissipative Phase-space Quantum Mechanics', *Annals of Physics* **324** (2009) 670-681; arxiv:0810.3893

45. N. Okeke, M.A. Walton, 'On Character Generators for Simple Lie Algebras', *Journal of Physics A: Mathematical and Theoretical* **40** (2007) 8873-8901; arxiv:math-ph/0702017

44. M.A. Walton, 'Wigner Functions, Contact Interactions, and Matching', *Annals of Physics* **322** (2007) 2233-2248; arxiv:quant-ph/0609213

43. S. Kryukov, M.A. Walton, 'Star-quantization of an Infinite Wall', *Canadian Journal of Physics* **84** (2006) 557-563 (Proceedings of Theory Canada I, UBC, 6/05); quant-ph/0508005

42. S. Kryukov, M.A. Walton, 'On Infinite Walls in Deformation Quantization', *Annals of Physics* **317** (2005) 474-491; quant-ph/0412007

41. J. Hancock, M.A. Walton, **B. Wynder**, 'Quantum Mechanics Another Way', *European Journal of Physics* **25** (2004) 525-534; physics/0405029

40. M.A. Walton, J.-G. Zhou, 'PP Wave Green-Schwarz Superstring, Polygon Divergent Structure and Conformal Field Theory', *Physical Review* **D68** (2003) 066004-066015; hep-th/0305228

39. M.A. Walton, J.-G. Zhou, 'D-branes in Asymmetrically Gauged WZW Models and Axial-Vector Duality', *Nuclear Physics* **B648** (2003) 523-541; hep-th/0205161

38. G. Flynn, J. Rasmussen, **M. Tahic**, M.A. Walton, 'Higher Genus $su(N)$ Fusion Multiplicities as Polytope Volumes', *Journal of Physics* **A35** (2002) 10129-10147; hep-th/0209020 (based in part on work supported by Flynn's and Tahic's NSERC Undergraduate Research Awards)

37. T. Kubota, J. Rasmussen, M.A. Walton, J.-G. Zhou, 'Maximally Symmetric D-branes in Gauged WZW Models', *Physics Letters* **B544** (2002) 192-198; hepth/0112078

36. J. Rasmussen, M.A. Walton, 'Purely Affine Elementary Couplings', *Modern Physics Letters* **A17** (2002) 1249-1258; hep-th/0110223

35. J. Rasmussen, M.A. Walton, 'Affine $su(3)$ and $su(4)$ Fusion Multiplicities as Polytope Volumes', *Journal of Physics* **A35** (2002) 6939-6952; hep-th/0106287

34. J. Rasmussen, M.A. Walton, 'Fusion Multiplicities as Polytope Volumes: N-point and Higher-genus su(2) Fusion', *Nuclear Physics* **B620** (2002) 537-550; hep-th/0104240

33. J. Rasmussen, M.A. Walton, 'Higher $su(N)$ Tensor Products', *Journal of Physics* **A34** (2001) 7685-7699; math-ph/0102031

32. J. Rasmussen, M.A. Walton, 'On the Level-dependence of Wess-Zumino-Witten 3-point Functions', *Nuclear Physics* **B616** (2001) 517-536; hep-th/0105294

31. J. Rasmussen, M.A. Walton, '$su(N)$ Tensor Product Multiplicities and Virtual Berenstein-Zelevinsky Triangles', *Journal of Physics* **A34** (2001) 11095-11105; math-ph/0010051

30. P. Mathieu, J. Rasmussen, M.A. Walton, 'Fusion in Coset CFT from Admissible Singular-Vector Decoupling', *Nuclear Physics* **B595** (2001) 587-604; hep-th/0007088

29. S.E. Irvine, M.A. Walton, 'Schubert Calculus and Threshold Levels of Affine Fusion', *Nuclear Physics* **B504** (2000) 795-809; hep-th/0004055 (based on work supported by Irvine's 1999 NSERC Undergraduate Research Award)

28. P. Mathieu, M.A. Walton, 'On Principal Admissible Representations and Conformal Field Theory', *Nuclear Physics* **B553** (1999) 533-558; hep-th/9812192

27. T. Gannon, M.A. Walton, 'Heterotic Modular Invariants and Level-Rank Duality', *Nuclear Physics* **B536** (1999) 553-574; hep-th/9804040

26. T. Gannon, M.A. Walton, 'On Fusion Algebras and Modular Matrices', *Communications in Mathematical Physics* **206** (1999) 1-20; q-alg/9709039

25. M.A. Walton, 'Demazure Characters and WZW Fusion Rules', *Journal of Mathematical Physics* **39** (1998) 665-681; hep-th/9612159

24. M.R.A. Shegelski, R. Niebergall, M.A. Walton, 'The Motion of a Curling Rock', *Canadian Journal of Physics* **74** (1996) 663-670

23. T. Gannon, M.A. Walton, 'Galois Relations on Knot Invariants', *Letters in Mathematical Physics* **38** (1996) 185-194; q-alg/9509018

22. T. Gannon, P. Ruelle, M.A. Walton, 'Automorphism Modular Invariants of Current Algebras', *Communications in Mathematical Physics* **179** (1996) 121-156; hep-th/9503141

21. T. Gannon, **C. Jakovljevic**, M.A. Walton, 'Lie Group Weight Multiplicities from

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