Sarah Post

September 17, 2016

Current Position

Assistant Professor, **University of Hawai'i at Mānoa**, Honolulu, HI.

Contact Information

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Research Interests

General: Symmetry Analysis in Mathematical Physics, Integrable Systems, Hamiltonian Systems, Representation Theory, Special Functions and Orthogonal Polynomials.
Emphasis: Superintegrable Systems, Polynomial algebras and Soliton Surfaces.

Education

University of Minnesota Minneapolis, MN USA. Ph.D. in Mathematics July 2009, MSc. in Mathematics January 2008. Direct passage to Phd. program. Dissertation Title: "Models of Second Order Superintegrable Systems." Advisor: Prof. Willard Miller Jr.

St. Lawrence University Canton, NY USA. B.S., Mathematics and Physics, Magna Cum Laude, Honors in Mathematics, May 2004

Grants

Simons Foundation Collaboration Grants for Mathematicians Project titled "Quadratic Algebras and Orthogonal Polynomials." **September 2016-2021**

Employment History

University of Hawai'i (UH), Department of Mathematics, Honolulu HI USA
Assistant Professor **Fall Semester 2012 -Present**

Centre de Recherches Mathématiques (CRM), Université de Montréal, Montréal, QC
Postdoctoral Fellow **September, 2009 - 2012**

University of Minnesota (UMN), School of Mathematics, Minneapolis, MN USA
Teaching Assistant **September 2004 - 2009**
IT Coordinator: Women in Mathematics group **Fall 2006-Spring 2008**

Teaching Experience

University of Hawai'i at Mānoa, Department of Mathematics
Lecturer for the following courses:

- MATH241 *Calculus 1*, Fall 2012, Spring 2016
- MATH251 *Accelerated Calculus 1*, Fall 2013
- MATH252 *Accelerated Calculus 2*, Spring 2014
- MATH301 *Introduction to Discrete Mathematics*, Fall 2012
- MATH311 *Linear Algebra*, Spring 2013 & 2015
- MATH402 *Partial Differential Equations*, Fall 2013, 2014, & 2016
- MATH403 *Partial Differential Equations*, Spring 2014
- MATH444 *Complex Analysis*, Spring 2016

- MATH480 *Senior Seminar*, Spring 2015
- MATH603 *Partial Differential Equations*, Fall 2015

University of Hawai'i West O'ahu
Coordinator for Math Boot Camp Summer 2015: supported by the UH West O'ahu PIKO Project.

University of Minnesota, School of Mathematics
Teaching Assistant for the following courses: MATH1001, MATH1273, MATH1031, MATH1151, MATH2283, MATH2374,and MATH3283.

Service

Conference and Seminar Organization :

1. Co-organizer for AMS Special Session at the JMM with Clara Nucci on "Symmetries, Integrability, and Beyond." The special session will be held Jan. 6, 2017.
2. Co-organizer for Lie Groups Seminar at U. Hawai'i Mānoa, Department of Mathematics. Fall 2016.
3. Member of organizing committee for a Doppler Institute - CRM workshop in Prague, May 30th - June 3rd, 2016, on the occasion of forthcoming 80th birthdays of professors Jiri Patera and Pavel Winternitz.
4. Co-organizer for Undergraduate Seminar at U. Hawai'i Mānoa, Department of Mathematics. Spring 2015.
5. Organizer for Math. Physics Seminar at U. Hawai'i Mānoa, Department of Mathematics. Fall 2015.
6. Organizer for Image Analysis Seminar at U. Hawai'i Mānoa, Department of Mathematics. Spring 2013-Fall 2014.
7. Member of international organizing committee for Superintegrability, Exact Solvability, and Special Functions: Cuernavaca, Mexico, February 20-24, 2012.

Editorial Work :

1. Co-editor for the electronic newsletter *OP-SF NET* of the SIAM activity group on Orthogonal Polynomials and Special Functions.
2. Member of the advisory panel for *Journal of Physics A: Mathematical and Theoretical.*
3. Co-editor of special journal issue "Superintegrability, Exact Solvability, and Special Functions" in Symmetry, Integrability and Geometry: Methods and Applications (SIGMA). Completed February 15, 2013. Contains 20 papers with the total of 313 pages. `http://www.emis.de/journals/SIGMA/SESSF2012.html`

Refereed for : Advances in Mathematical Physics, Analysis and Applications, Annals of Physics, Canadian Journal of Physics, Constructive Approximations, European Journal of Physics, Foundations of Physics, J. Math. Phys., J. Phys. A, Nonlinearity, and Physics Letters A.

Outreach Activity

- Guest lecturer Honors 101 speakers series, Sept. 25 2014 and Sept. 13, 2016.
- "What I wish I knew in grad school", welcome lectures for incoming graduate student. Member of panel August 22, 2014, organizer and participant Aug. 18, 2016.
- Alumni Panel for U. Minnesota Graduate Student Open House, April 2, 2016.
- Participated in the Expanding Your Horizons Mānoa conference, 2014-2016.
  - Member of Career Panel, April 16, 2016.
  - Organized workshop **The Mathematics of Card Tricks** April 26, 2014, with three graduate and one undergraduate math student and again on April 16, 2016 with another faculty member from Kapiolani Community College and one undergraduate student.
  - Organized workshop **The Amazing Race** April 18, 2015 with one graduate student. Middle school girls participated in the activity which required them to use a kid version of RSA encryption to find puzzle pieces to 'win' the race.
- Co-organizer for **Honeybee Math Summer Workshop** June 16-21, 2014 at the CTAHR Urban Garden Center Pearl City, with E. Villalobos (CTAHR UHM) and E. Widiasih (UHWO). Supported with SEED Grant from UHM.
- Instructor for **Native American Summer Institute** in Tucson, AZ May 21 to June 12, 2013. Worked with high school students from Pasqua Yaqui tribe studying bee population dynamics.
- Organized Mathematics Department table at **Mānoa Experience** 2013 and 2014.

List of Publications

Review Articles :

Published

1. W. Miller Jr., S. Post and P. Winternitz 2013 Classical and quantum superintegrability with applications. *J. Phys. A* **46** 423001 arXiv:1309.2694

Research Papers :

Forthcoming

2. VX Genest, S. Post and L Vinet. An algebraic interpretation of the multivariate q-Krawtchouk polynomials. *The Ramanujan Journal.* arXiv:1508.07770

Published

3. VX Genest, S. Post, L Vinet, G Yu, and A Zhedanov 2016 q-Rotations and Krawtchouk polynomials. *The Ramanujan Journal* **40** (2), 335-357. arXiv:1408.5292
4. S. Post 2015 Racah Polynomials and Recoupling Schemes of su(1, 1). *SIGMA* **11**, 057, 17 pages. arXiv:1504.03705
5. A. Marchesiello, S. Post and L. Šnobl 2015 Third-order superintegrable systems with potentials satisfying only nonlinear equations. *J. Math. Phys.* **56** (10), 102104. arXiv:arXiv:1501.00470
6. S. Post and P. Winternitz 2015 General Nth order integrals of the motion. *J. Phys. A: Math. Theor.* **48** 405201. arXiv:1501.00471
7. J. Kress, J. Capel and S. Post 2015 Invariant Classification and Limits of Maximally Superintegrable Systems in 3D. *SIGMA* **11,** 038, 17 pages. arXiv:1501.06601

8. S. Post and D. Riglioni 2015 Quantum integrals from coalgebra structure. *J Phys. A: Math. Theor.* **48** (7), 075205. arXiv:1410.4495
9. S. Post 2015 Quantum Perfect State Transfer in a 2D Lattice. *Acta Applicandae Mathematicae.* **135** (1), 209-224.
10. A. M. Grundland, S. Post and D. Riglioni 2013 Soliton surfaces and generalized symmetries of integrable systems. *J. Phys. A* **47** 015201. arXiv:1302.6887
11. E. Kalnins, W. Miller and S. Post 2013 Contractions of 2D 2nd order quantum superintegrable systems and the Askey scheme for hypergeometric orthogonal polynomials. SIGMA **9** 057. arXiv:1212.4766
12. C. Nucci and S. Post 2013 Lie symmetries and superintegrability. *J. Phys. A* **45** 482001.
13. H. Miki, S. Post, L. Vinet and A. Zhedanov 2013 A superintegrable finite oscillator in two dimensions with SU(2) symmetry. *J. Phys. A* **46** 125207. arXiv:1208.4142
14. D. Levésque, S. Post and P. Winternitz 2012 Infinite families of superintegrable systems separable in subgroup coordinates. *J. Phys. A* **45** 465204. arXiv:1207.6976
15. S. Post, S. Tsujimoto and L. Vinet 2012 Families of superintegrable Hamiltonians constructed from exceptional polynomials. *J. Phys. A* **45** 405202. arXiv:1206.0480
16. P. Goldstein, A. M. Grundland and S. Post 2012 Soliton surfaces associated with sigma models; differential and algebraic aspects. *J. Phys. A* **45** 395208. arXiv:1207.1340
17. I. Popper, S. Post and P. Winternitz 2012 Third-order superintegrable systems separable in parabolic coordinates. *J. Math. Phys.***53** 062105. arXiv:1204.0700
18. A. M. Grundland and S. Post 2012 Soliton surfaces via zero-curvature representation of differential equations. *J. Phys. A* **45** 115204. arXiv:1111.4162
19. A. M. Grundland and S. Post 2012 Surfaces immersed in Lie algebras associated with elliptic integrals. *J. Phys. A* **45** 015204. arXiv:1106.2080
20. A. M. Grundland and S. Post 2012 Analysis of CP^{N-1} sigma models via projective structure. *Nonlinearity* **25** 1 arXiv:1010.2183
21. S. Post, L. Vinet and A. Zhedanov 2011 An infinite family of superintegrable Hamiltonians with reflection in the plane.*J. Phys. A* **44** 505201 arXiv:1108.5208
22. S. Post, L. Vinet and A. Zhedanov 2011 Supersymmetric Quantum Mechanics with Reflections.*J.Phys. A* **44** 435301 arXiv:1107.5844
23. E. G. Kalnins, W. Miller Jr. and S. Post 2011 Two variable Wilson polynomials and the generic superintegrable system on the 3-sphere. *SIGMA* **7** 051 arXiv:1010.3032
24. S. Post 2011 Models of quadratic algebras generated by superintegrable systems in 2D. *SIGMA* **7** 036 arXiv:1104.0734
25. S. Post and P. Winternitz 2011 A nonseparable quantum superintegrable system in 2D real Euclidean space. *J. Phys. A* **44** 152001 arXiv:1101.5405
26. A. M. Grundland and S. Post 2011 Soliton surfaces associated with generalized symmetries of integrable equations *J. Phys. A* **44** 165203 arXiv:1102.1874
27. E. G. Kalnins, J. Kress, W. Miller Jr. and S. Post 2011 Laplace-type equations as conformal superintegrable systems. *Adv. Appl. Math.* **46** 396-416 arXiv:0908.4316
28. S. Post and P. Winternitz 2010 An infinite family of superintegrable deformations of the Coulomb potential. *J. Phys. A* **43** 222001

29. E. G. Kalnins, W. Miller Jr. and S. Post. Coupling constant metamorphosis and Nth order symmetries in classical and quantum mechanics. J. Phys. A 43, 035202 (2010).
30. E. G. Kalnins, W. Miller Jr. and S. Post 2010 Models for the 3D singular isotropic oscillator quadratic algebra. *Physics of Atomic Nuclei* **73** 359-366
31. E. G. Kalnins, J. M. Kress, W. Miller Jr. and S. Post 2009 Structure theory for second order 2D superintegrable systems with 1-parameter potentials. *SIGMA* **5** 008
32. E. G. Kalnins, W. Miller Jr. and S. Post 2009 Models of quadratic quantum algebras and their relation to classical superintegrable systems. *Physics of Atomic Nuclei* **72** 801-808
33. E. G. Kalnins, W. Miller Jr. and S. Post 2008 Models for quadratic algebras associated with second order superintegrable systems in 2D. *SIGMA* **4** 008
34. E. G. Kalnins , W. Miller Jr. and S. Post 2007 Wilson polynomials and the generic superintegrable system on the 2-sphere. *J. Phys. A* **40** 11525-11538

Papers in Peer Reviewed Conference Proceedings :

35. H. Miki, S. Post, L. Vinet and A. Zhedanov 2012 A Finite Model of the Oscillator in Two-Dimensions with SU(2) Symmetry. *Proceedings of the XXIX International Colloquium on Group-Theoretical Methods in Physics.* World Scientific Publishing (Singapore) Eds. C. Bai, J-P Gazeau, and M-L Ge **11** 217
36. A. M. Grundland and S. Post 2012 Soliton surfaces associated with CP^{N-1} sigma models.*J. Phys.: Conf. Ser.* **380** 012023 arXiv:1112.2420
37. A. M. Grundland and S. Post 2012 Soliton surfaces associated with symmetries of ODEs written in Lax representation. *J. Phys.: Conf. Ser.* **343** 012001
38. S. Post 2011 Coupling constant metamorphosis, the Stäckel transform and superintegrability. In *Symmetries in Nature: Symposium in Memoriam Marcos Moshinsky* (Cuernavaca, Mexico, August 9-14, 2010), Ed. by L Benet, PO Hess, JM Torres, and KB Wolf, AIP Conference Proceedings 1323, 265-274

Conferences Attended

1. The Doppler Institute-CRM Conference celebrating the 80th birthdays of Jiri Pater and Pavel Winternitz May 30-June 3, 2016. Prague, Czech Republic.
   - Gave an invited address on "Special Functions and the Smorodinsky-Winternitz Potentials."
2. The Australian and New Zealand Association of Mathematical Physics Annual Conference December 9-11, 2015. Newcastle, NSW, Australia.
   - Gave a plenary address on "Superintegrable Systems and Special Functions". Travel was supported by the organizing committee.
3. 13th International Symposium on Orthogonal Polynomials, Special Functions & Applications (OPSFA-13 in 2015) June 1-5, 2015. Gaithersburg, MD.
   - Gave a plenary address on "Limits of Orthogonal Polynomials and Contractions of Lie Algebras". Travel was supported by SIAM.
4. 13th International Symposium on Orthogonal Polynomials, Special Functions & Applications (OPSFA-13 in 2015) June 1-5, 2015. Gaithersburg, MD.

- Gave a plenary address on "Limits of Orthogonal Polynomials and Contractions of Lie Algebras". Travel was supported by SIAM.

5. Orthogonal Polynomials and q-series, March 7-9, 2015. Orlando, FL.
   - Gave an invited talk on "q-Rotations and Krawtchouk polynomials."
6. Foundations of Computational Mathematics, December 11-20, 2014. Montevideo, Uruguay.
   - Gave an invited talk on "Quadratic Algebras of Orthogonal Polynomials." Travel was supported by NSF grant awarded to organizing committee.
7. Exact Solvability and Symmetry Avatars, August 25-29, 2014. Montreal, QC.
   - Gave an invited talk on "Superintegrability and Orthogonal Polynomials."
8. The 30th International Colloquium on Group Theoretical Methods in Physics (Group30) July 14-18, 2014, Ghent, Belgium.
   - Gave an invited talk on "The Classification of Superintegrable Systems and Contractions of Quadratic Algebras". Travel supported by NSF grant awarded to organizing committee.
9. Symmetry Methods, Applications, and Related Fields, May 13-16, 2014, Vancouver, BC.
   - Gave an invited talk on "Classification of Superintegrable Systems and Algebra Contractions".
10. Workshop on Control and Observation of Nonlinear Systems with Application to Medicine, 5-7 Sept. 2013, Honolulu, HI.
    - Gave an invited talk on "Integrability and Superintegrability with Applications".
11. Physics and Mathematics of Nonlinear Phenomena, 22 - 29 June 2013, Gallipoli, Italy.
    - Presented a poster on "Contractions of quadratic algebras and limits of superintegrable systems."
12. International Conference on Integrable Systems and Quantum symmetries, 11-16 June 2013, Prague, Czech Republic.
    - Gave a contributed talk titled "Limits of superintegrable systems and contractions."
13. Joint Math Meeting (JMM), 9-12 Jan 2013, San Diego, CA.
    - Attended AMS short course on Random Matrices. Helped organize table at the graduate fair for the University of Hawai'i graduate program.
14. Canadian Mathematics Society (CMS) winter meeting, 8-10 Dec. 2012, Montreal, QC.
    - Gave an invited talk entitled " Contractions of superintegrable systems and limits of orthogonal polynomials" in the special session "Symmetries of Differential and Difference Equations."
15. Canadian Mathematics Society (CMS) summer meeting, 2-4 June 2012, Regina, SK.
    - Gave an invited talk entitled "Recent advances in the theory of superintegrable systems."
16. Special Functions and Orthogonal Polynomials of Lie Groups and their Applications, 14-20 Aug. 2011, Decin, Czech Rep.
    - Gave an invited talk entitled "Quantum Hamiltonian Systems with Reflections."

17. Quantum Theory and Symmetries (QTS7), 7-12 Aug. 2011, Prague, Czech Rep.
    - Gave a contributed talk entitled "Superintegrability beyond separability."
18. Symmetries in Science XV, 31 July-5 August 2011, Bregenz, Austria.
    - Gave an invited talk entitled "Generalized Symmetries and Soliton Surfaces."
19. Foundations of Computational Mathematics (FOCM) Workshop on Special Functions and Orthogonal Polynomials, 4-6 July 2011, Budapest, Hungary.
    - Gave an invited talk entitled "Two-variable Wilson polynomials and the generic superintegrable system on the 3-sphere"
20. Symmetry, Superintegrability and Special Functions, 17-20 Sept. 2010, Minneapolis, MN. A conference in honor of Prof. Willard Miller, Jr.'s retirement.
    - Gave an invited talk entitled "The Coupling Constant Metamorphosis and Superintegrable Systems."
21. Workshop on "Superintegrability, exact solvability and canonical transformations" 17-27 Aug. 2010. International Center of Science (CIC), Cuernavaca, Mor. Mexico.
    - Attended workshop as an invited researcher and gave talk entitled, "Some general structure results for general nth-order symmetries."
22. Symmetries in Nature, Symposium in Memory of Marcos Moshinsky, 9-14 Aug. 2010, Cuernavaca, Mor. Mexico.
    - Gave an invited talk entitled "An infinite family of superintegrable deformations of the Coulomb potential."
23. Pacific Rim Mathematical Association (PRIMA) Congress, 6-10 July 2009, Sydney Australia.
    - Gave an contributed talk entitled "Models of quadratic algebras generated by second order superintegrable system," with support through an NSF grant awarded to the organizing conference.
24. Séminar de Mathématiques Supérieure 2008 Summer School.
    - Attended two week seminar titled *Symmetries and Integrability of Difference Equations* with support through an NSF grant awarded to the organizing conference.

Seminar or Colloquium Presentations

1. Quadratic Algebras and Orthogonal Polynomials associated with superintegrable systems. Math. Physics seminar, U. Minnesota. 4/1/2016.
2. Quadratic algebras and orthogonal polynomials. Combinatorics Seminar, U. Wisconsin. 3/28/2016.
3. Harmonic Maps and their Applications. Undergraduate Math Club, U. Hawai'i Mānoa. 10/22/2015.
4. Introduction to classical and quantum walks, application to Grover's algorithm. Math. Physics seminar, U. Hawai'i Mānoa. Series of four lecture beginning 9/15/2014.
5. Singularity detection using wavelets and shearlets. Image Analysis seminar, U. Hawai'i Mānoa. (3/7 & 14/2013)
6. The Askey scheme of orthogonal polynomials and contractions of superintegrable systems. Analysis Seminar, U. Hawai'i Mānoa. (2/14/2013)
7. Quantum computing, perfect state transfer and orthogonal polynomials. U. Hawai'i Mānoa Math Colloquium. (11/30/2012)

8. Soliton surfaces associated with generalized symmetries of integrable equations. CRM Math Physics Seminar (3/08/2011).
9. Superintegrability and Special Functions. U. of Arizona Math Physics Colloquium (10/20/2010).
10. Coupling Constant Metamorphosis and Infinite Families of Superintegrable Systems. CRM Math Physics Seminar (10/9/2010).
11. Analysis of CP^{N-1} sigma models via projective structure. UMN Math Physics Colloquium (9/23/2010).
12. CP^{N-1} sigma models and associated surfaces. CRM Math Physics Seminar (3/9/2010).
13. Coupling constant metamorphosis and Nth order symmetries in classical and quantum mechanics. CRM Math Physics Seminar (10/13/2010).
14. Superintroduction to Supersymmetry. UMN Math Physics Colloquium (4/30/2009).
15. Models of quadratic algebras generated by second order superintegrable systems. UMN Math Physics Colloquium (11/13/2008).
16. Models of quadratic algebras generated by second order superintegrable systems in 2 dimensions. UMN Junior Colloquium (11/23/2007).