Curriculum Vita – V. Sam Nelson

I. Biographical Data

Education

Ph.D.	Mathematics	Louisiana State University, August 2002 Advisor: R.A. Litherland Dissertation: *Racks, Quandles and Virtual Knots*
M.S.	Mathematics	Louisiana State University, June 1998
B.S.	Mathematics (with Honors) Philosophy minor	University of Wyoming, June 1996

Academic Positions

2019-2022	Chair, Department of Mathematical Sciences, Claremont McKenna College
2018-Present	Professor, Claremont McKenna College
2016-2019	Vice Chair/Cair/Past Chair, MAA SoCal-NV section
2012-2018	Associate Professor (with Tenure), Claremont McKenna College
2009-Present	Extended Graduate Faculty, Claremont Graduate University
2009-2012	Assistant Professor, Claremont McKenna College
2008-2009	Visiting Assistant Professor, Claremont McKenna College
2007-2008	Visiting Assistant Professor, Pomona College
2006-2007	Visiting Assistant Professor, Whittier College
2003-2006	Visiting Assistant Professor, University of California, Riverside
2002-2003	Visiting Assistant Professor, Whittier College

II. Research

Grants and Awards

1. Claremont McKenna College Faculty Career Mentor Recognition, 2021.
2. Simons Foundation Collaboration Award ($42,000), 2020-2024.
3. Claremont McKenna College Faculty Scholarship Award, 2019-2020.
4. Simons Foundation Collaboration Award ($35,000), 2014-2019.

Editorships

1. Associate Editor, *Communications of the Korean Mathematical Society*, 2019–Present.
2. Co-editor, *Encyclopedia of Knot Theory* CRC Press, 2020.
3. Associate Editor, *J. Knot Theory Ramifications* 2015–present.
4. Co-editor, *Contemporary Mathematics* proceedings of AMS Special Sessions on Algebraic and Combinatorial Structures in Knot Theory and Spatial Graphs, 2015.

Publications

1. G-Family Polynomials (with Madeline Brown[†] (Scripps/CGU)). To appear in *J. Knot Theory Ramifications* arXiv:2103.02710.

[†] undergraduate student [‡] graduate student

2. Tribracket Polynomials (with Fletcher Nickerson† (HMC)). To appear in *Osaka J. Math.*, arXiv:2103.02704.

3. Biquandle Brackets and Knotoids (with Neslihan Gügümcü (Izmir Inst. Tech.) and Natsumi Oyamaguchi (Shumei U.)), to appear in *J. Knot Theory Ramifications*, arXiv:1909.00262.

4. Legendrian rack invariants of Legendrian knots (with Jose Ceniceros (Hamilton College) and Mohamed Elhamdadi(USF)). *Commun. Korean Math. Soc.* **36** (2021), no. 3, 623–639.

5. Cocycle enhancements of psyquandle counting invariants (with Jose Ceniceros (Hamilton College)). *Internat. J. Math.* **32** (2021), no. 5, Paper No. 2150023, 14 pp.

6. Quandle coloring quivers of surface-links (with Jieon Kim and Minju Seo, PSU)). *J. Knot Theory Ramifications* **30** (2021), no. 1, Paper No. 2150002, 13 pp.

7. Quandle Module Quivers (with Karma Istanbouli† (Scripps)), To appear in *J. Knot Theory Ramifications*, arXiv:1912.12500

8. Quantum Enhancements via Tribracket Brackets (with Laira Aggarwal† (CMC) and Patricia Rivera† (CMC)), *Mediterr. J. Math.* **18** (2021), no. 1, Paper No. 10.

9. Kaestner brackets (with Forest Kobayashi† (HMC)) *Topology Appl.* **282** (2020), 107324, 14 pp.

10. Biquandle Module Invariants of Oriented Surface-Links (with Yewon Joung (MSU)), *Proc. Amer. Math. Soc.* **148** (2020), no. 7, 3135–314.

11. Multi-tribrackets (with Evan Paultisch† (CMC)). *J. Knot Theory Ramifications* **28** (2019), no. 12, 1950075, 16 pp.

12. Tribracket Modules (with Deanna Needell (UCLA) and Yingqi Shi† (CMC)). *Internat. J. Math.* **31** (2020), no. 4, 2050028, 13 pp. *J. Knot Theory Ramifications* **28** (2019), no. 4, 1950026, 12 pp.

13. Psyquandles, singular knots and pseudoknots (with Natsumi Oyamaguchi (Shumei U.) and Radmila Sazdanovic (NCSU)). *Tokyo J. Math.* **42** (2019), no. 2, 405–429.

14. Quandle cocycle quivers (with Karina Cho† (HMC)). *Topology Appl.* **268** (2019), 106908, 10 pp.

15. Biquandle Virtual Brackets (with Kanako Oshiro (Sophia U.), Ayaka Shimizu (Nat'l Inst. of Tech,. Gunma College) and Yoshiro Yaguchi (Nat'l Inst. of Tech,. Gunma College)). *J. Knot Theory Ramifications* **28** (2019), no. 11, 1940003, 22 pp.

16. Finite Type Enhancements. To appear in *J. Knot Theory Ramifications*, arXiv:1506.00979.

17. Quandle Coloring Quivers (with Karina Cho† (HMC)), *J. Knot Theory Ramifications* **28** (2019), no. 1, 1950001, 12 pp.

18. Local biquandles and Niebrzydowski's tribracket theory (with Kanako Oshiro (Sophia U.) and Natsumi Oyamaguchi (Shumei U.)), *Topology Appl.* **258** (2019), 474–512.

19. A Survey of Quantum Enhancements (Invited survey paper). *Knots, low-dimensional topology and applications*, 163–178, Springer Proc. Math. Stat., 284, Springer, Cham, 2019.

20. Biquandle Coloring Invariants of Knotoids (with Neslihan Gügümcu (Nat'l Technical U. of Athens)). *J. Knot Theory Ramifications* **28** (2019), no. 4, 1950029, 18 pp.

21. Virtual Tribrackets (with Shane Pico† (CMC)). *J. Knot Theory Ramifications* **28** (2019), no. 4, 1950026, 12 pp.

22. Boltzmann Enhancements of Biquasile Counting Invariants (with WonHyuk Choi† (Pomona) and Deanna Needell (CMC)). *J. Knot Theory Ramifications* **27** (2018), no. 14, 1850068, 12 pp.

23. Niebrzydowski Algebras and Trivalent Spatial Graphs (with Paige Graves† (U. of La Verne) and Sherilyn Tamagawa‡ (UCSB)). *Internat. J. Math.* **29**, 1850102 (2018)

24. Quasi-trivial Quandles and Biquandles, Cocycle Enhancements and Link-Homotopy of Pretzel links (with Mohamed Elhamdadi (USF) and Minghui Liu (Florida College). *J. Knot Theory Ramifications* **27** (2018), 1843007, 16 pp.

25. Virtual Links with Finite Medial Bikei (with Julien Chien† (CMC)). *J. Symbolic Computation* (2018), doi:10.1016/j.jsc.2018.04.015

26. Biquasile colorings of oriented surface-links.(With Jieon Kim (Pusan Nat'l U.)) *Topology Appl.* **236** (2018), 64–76.

27. Symmetric Enhancements of Involutory Virtual Birack Counting Invariants (with Melinda Ho†). *J. Knot Theory Ramifications* **27** (2018), no. 5, 1850032, 14 pp.

28. Trace Diagrams and Biquandle Brackets (With Natsumi Oyamaguchi (Shumei University)). *Internat. J. Math.* **28** (2017), no. 14, 1750104, 24 pp.

29. Singular Knots and Involutive Quandles (with Indu R. U. Churchill‡, M. Elhamdadi and M. Hajij (U. South Florida)). *J. Knot Theory Ramifications* **26** (2017), Article ID 1750099, 14 pp.

30. Biquasiles and Dual Graph Diagrams (with D. Needell (CMC)). *J. Knot Theory Ramifications* **26** (2017) Article ID 1750048, 18 pp.

31. Quantum Enhancements via Biquandle Brackets (with Michael E. Orrison (HMC) and Veronica Rivera†). *J. Knot Theory Ramifications* **26** (2017) Article ID 1750034 24 pp.

32. Partially Multiplicative Biquandles and Handlebody-Knots (with Atsushi Ishii (Tskuba University)), *Contemp. Math.* **689** 159–176 (2017)

33. Bikei Homology (with Jake Rosenfield†). *Homotopy Homology Appl.* **19** 23–35 (2017).

34. Parity Biquandle Invariants of Virtual Knots (with Aaron Kaestner (Northpark U.) and Leo Selker†). *Topology Appl.* **209** 207-219 (2016).

35. What is a Quandle? (Invited survey paper) *Notices Am. Math. Soc.* **63** 378-380 (2016).

36. Lie Ideal Enhancements of Counting Invariants (with Gillian Grindstaff†). *Osaka J. Math.* **53** 1015–1027 (2016).

37. Bikei Invariants and Gauss Diagrams for Virtual Knotted Surfaces (with Patricia Rivera†) *J. Knot Theory Ramifications* **25** Article ID 1640008, 14 p. (2016).

38. Quotient Quandles and the Fundamental Latin Alexander Quandle (with Sherilyn Tamagawa†). *New York J. Math.* **22** (2016) 251–263.

39. Quantum enhancements of involutory birack counting invariants. (with Veronica Rivera†) *J. Knot Theory Ramifications* **23** (2014) 1460006, 15 pp.

40. Augmented biracks and their homology. (with Mohamed Elhamdadi (USF), Matt Green† and Jose Ceniceros†) *Internat. J. Math.* **25** (2014) 1450087, 19 pp.

41. Link invariants from finite biracks. *Knots in Poland. III. Part 1,* 197–212, Banach Center Publ., 100, Polish Acad. Sci. Inst. Math., Warsaw, 2014.

42. Polynomial birack modules. (with Evan Cody†) *Topology Appl.* **173** (2014), 285–293.

43. Link invariants from finite racks. *Fund. Math.* **225** (2014) 243–258.

44. Hom quandles (with Alissa Crans, LMU) *J. Knot Theory Ramifications* **23** (2014) 1450010, 18 pp.

45. Kei modules and unoriented link invariants (with Michael Grier†) *Homology Homotopy Appl.* **16** (2014) 167–177.

46. Birack Dynamical Cocycles and Homomorphism Invariants (with Emily Watterberg[†]). *J. Algebra Appl.* **12** (2013) 1350049 14 pp.

47. Birack Shadow Modules and Their Link Invariants (with Katie Pelland[†]). *J. Knot Theory Ramifications* **22** (2013) 1350056 12 pp.

48. Birack modules and their link invariants (with Regina Bauernschmidt[†]). *Comm. Contemp. Math.* **15** (2013) 1350006, 13 pp.

49. Twisted virtual biracks (with Jessica Ceniceros[†]). *Topol. Appl.* **160** (2013) 421–429.

50. Link invariants from the Alexander virtual biquandle (with Alissa Crans (LMU) and Allison Henrich (Seattle U)), *J. Knot Theory Ramifications* **22** (2013) 134004, 15 pp.

51. Virtual shadow modules and their link invariants (with Jackson Blankstein[†], Catherine Lepel[†], Susan Kim [†]and Nicole Sanderson[†]). *Int'l. J. Math.* **23** (2012) 1250096, 22 pp.

52. Enhancements of the rack counting invariant via N-reduced dynamical cocycles (with Alissa Crans (LMU) and Aparna Sarkar[†]), *New York J. Math* **18** (2012) 337-–351.

53. BiKei and invariants of unoriented links (with Sinan Aksoy[†]). *J. Knot Theory Ramifications* **21** (2012) 120045 13 pp.

54. N-Degeneracy in rack homology and link invariants (with Mohamed Elhamdadi (USF)). *Hiroshima Math. J.* **42** (2012) 127–142.

55. (t, s)-racks and their link invariants (with Jessica Ceniceros[†]). *Int. J. Math.* **23** (2012) 1250001 19 pp.

56. Rack module enhancements of counting invariants (with Garret Heckel[‡], Aaron Haas[†], Jonah Yuen[†], and Qingcheng Zhang[†]). *Osaka J. Math* **49** (2012) 471–488.

57. The column group and its link invariants (with Johanna Hennig[†]). *J. Knot Theory Ramifications* **21** (2012) 1250063 15 pp..

58. On rack polynomials. (with Tim Carrell[†]). *J. Alg. Appl.* **10** (2011) 1221–1232.

59. Rack shadows and their invariants (with Wesley Chang[†]) *J. Knot Theory Ramifications.* **20** (2011) 1259–1269.

60. Semiquandles and flat virtual knots. (with Allison Henrich (Seattle U.)). *Pacific J. Math.* **248** (2010) 155-–170.

61. Link invariants from finite Coxeter racks. (with Ryan Wieghard[†]) *J. Knot Theory Ramifications* **20** (2011) 1247–1257.

62. The combinatorial revolution in knot theory. (Invited survey paper) *Notices Am. Math. Soc.* **58** (2011) 1553–1561.

63. The 2-generalized knot group determines the knot (with Walter D. Neumann (Barnard College)). *Commun. Contemp. Math.* **10** (2008) 843–847.

64. Generalized quandle polynomials. *Can. Bull. Math.* **54** (2011) 147–158.

65. Virtual Yang-Baxter 2-cocycle invariants (with Jose Ceniceros[†]). *Trans. Amer. Math. Soc.* **361** (2009) 5263–5283.

66. On bilinear biquandles (with Jacquelyn Rische[†]). *Colloq. Math.* **112** (2008) 279–289.

67. On symplectic quandles (with Esteban Adam Navas[†]). *Osaka J. Math.* **45** (2008) 973–985.

68. A polynomial invariant of finite quandles. *J. Alg. Appl.* **7** (2008) 263–273.

69. Symbolic computation with finite biquandles (with Conrad Creel[†]). *J. Symbolic Comput.* **42** (2007) 992–1000.

70. An isomorphism theorem for Alexander biquandles (with Daisy Lam[†]). *Intl. J. Math.* **20** (2009) 97 – 107.

71. Quandles and Linking Number (with Natasha Harrell[†]). *J. Knot Theory Ramifications* **16** (2007) 1283–1293.

72. Matrices and finite biquandles (with John Vo[†]). *Homology Homotopy Appl.* **8** (2006) 51–73.

73. Non-classicality and quandle difference invariants (with Natasha Harrell[†]). *Topology Proc.* **30** (2006) 251–263.

74. Matrices and finite Alexander quandles (with Gabriel Murillo[†] and Anthony Thompson[†]). *J. Knot Theory Ramifications* **16** (2007) 769–778.

75. Symbolic computation with finite quandles (with Richard Henderson (Red Hat) and Todd Macedo[†]). *J. Symbolic Comput.* **41** (2006) 811–817.

76. On the orbit decomposition of finite quandles (with Chau-Yim Wong[‡]). *J. Knot Theory Ramifications* **15** (2006) 761–772.

77. Matrices and finite quandles (with Benita Ho[†]). *Homology Homotopy Appl.* **7** (2005) 197–208.

78. On Generalized Knot Groups (with Xiao-Song Lin (UCR)). *J. Knot Theory Ramifications* **17** (2008) 263–272.

79. Alexander quandles of order 16 (with Gabriel Murillo[†]). *J. Knot Theory Ramifications* **17** (2008) 273–278.

80. Signed ordered knotlike quandle presentations. *Algebr. Geom. Topol.* **5** (2005) 443–462.

81. Virtual crossing realization. *J. Knot Theory Ramifications* **14** (2005) 931–951.

82. Classification of finite Alexander quandles. *Topology Proc.* **27** (2003) 245–258.

83. The Betti numbers of some finite racks (with R. A. Litherland (LSU)). *J. Pure Appl. Alg.* **178** (2003) 187–202.

84. Unknotting virtual knots via Gauss diagram forbidden moves. *J. Knot Theory Ramifications* **10** (2001) 931–935.

Papers in Peer Review

1. Psyquandle Coloring Quivers (with Jose Ceniceros (Hamilton College) and Anthony Christiana[†] (Hamilton College)), arXiv:2107.05668.

2. Biracks and Switch Braid Quivers (with Max Chao-Haft[†] (HMC)), arXiv:2110.10787.

3. Biquandle Bracket Quivers (with Pia Cosma Falkenburg^{dagger} (Jacobs University)), arXiv:2109.05365.

4. Skew Brace Enhancements (with Melody Chang[†]), arXiv:2107.05696.

5. Psybrackets, Pseudoknots and Singular Knots (with Jieon Kim (PSU) and Suhyeon Joung (PSU)), arXiv:2006.02276.

6. Twisted Virtual Bikeigebras and Twisted Virtual Handlebody-Knots (with Yuqi Zhao[†]), arXiv:1711.04362.

Books

1. Quandles: An Introduction to the Algebra of Knots (with Mohamed Elhamdadi (U. South Florida)). Student Mathematical Library **74**. American Mathematical Society, Providence, RI. (2015) 245 pp.

Book Chapters

1. *Racks, Biquandles and Biracks*, section in Concise Encyclopedia of Knot Theory
2. *Forbidden Moves*, section in Concise Encyclopedia of Knot Theory

Conference Talks

1. *Biquandle Bracket Quivers*, Knots in Washington 49.5 (George Washinton University, DC, via zoom), Fall 2021.
2. *Biquandle Bracket Quivers*, Second Russia-Korea Conference on Knots and Related Topics (via zoom), Fall 2021.
3. *Region Coloring Invariants of Knots*, TAPU-KOOK Seminar in Daegu, South Korea (via zoom), July 2021.
4. *Quiver Enhancments of Counting Invariants*, Winter TAPU seminar in Daegu, South Korea (via zoom) January 2021.
5. *Quiver Enhancements of Quandle Counting Invariants*, AMS Fall Sectional Meeting, Zoom, Fall 2020.
6. *Biquandle Brackets*, AMS Fall Sectional Meeting, University of California at Riverside, Fall 2019.
7. *Quandle Cocycle Quivers*, KOOK-TAPU 2019 workshop at Osaka City University, Osaka, Japan, Summer 2019.
8. *Quandle Cocycle Quivers*, Knots in Washington XLVII Conference, Washington DC, January 2019.
9. *Quandle Coloring Quivers*, AMS Fall Sectional meeting, Fayetteville AS, Fall 2018.
10. *Virtual Tribrackets and Niebrzydowski Algebras*, KOOK-TAPU 2018 workshop in Pusan, South Korea, Summer 2018.
11. *Quandles and Knots*, Hostefest (Retirement Conference in honor of Jim Hoste), Claremont, Spring 2018.
12. *Trace Diagrams and Biquandle Brackets*, Knots in Washington XLVI conference, George Washington University, Washington DC, Spring 2018.
13. *Psyquandles, Singular Knots and Pseudoknots* Knots in Washington XLV conference, George Washington University, Washington DC, Fall 2017.
14. *Algebraic invariants of twisted virtual handlebody-links* Handlebody-knots and Related Topics 10, Hurwitz action 7, University of Tsukuba, Japan.
15. *Biquandle Brackets and Biquandle Cohmology*, Self-distributive system and quandle (co)homology theory in algebra and low-dimensional topology, KIAS Research Station Busan, Korea, 2017.
16. *Biquandle Virtual Brackets*, Knots in Washington XLIII conference, George Washington University, Washington DC, Fall 2016.

17. *Biquasiles and Dual Graph Diagrams*, AMS Fall Southeastern Sectional Meeting, NSCU, Raleigh, Fall 2106.

18. *Biquasiles, Triquasiles and Spatial Graphs*, International Workshop on Spatial Graphs 2016, Waseda University, Shinjuku, Toky o, Japan, Summer 2016.

19. *Biquandle Brackets*, 8th KOOK-TAPU Joint Seminar on Knots and Related Topics, Pusan National University, South Korea, Summer 2016.

20. *Biquandle Brackets*, Knots in Hellas 2016 conference, International Olympic Academy, Ancient Olympia, Greece, Summer 2016.

21. *Bikei Homology*, Knots in The Triangle conference, North Carolina State University, Raleigh, Spring 2016.

22. *Biquandle Brackets*, Knots in Washington XLI conference, George Washington University, Washington DC, Fall 2015.

23. *Biquandle Brackets*, AMS Fall Sectional Meeting, Loyola University, Chicago, Fall 2015.

24. *Enhancements of Counting Invariants*, MAA Centennial MathFest, Washington DC, Summer 2015.

25. *Ribbon Biquandles and Virtual Knotted Surfaces*, Conference on Knot Theory and Its Applications to Physics and Quantum Computing; 60th birthday of Jozef H. Przytycki, University of Texas at Dallas, Spring 2015.

26. *Finite Type Enhancements*, AMS Fall Sectional Meeting, University of North Carolina at Greensboro, Fall 2014.

27. *Augmented Birack Homology*, Lloyd Roeling UL Lafayette Mathematics Conference, Fall 2013.

28. *Augmented Birack Homology*, AMS sectional meeting, Washington University of St. Louis, Fall 2013.

29. *Biracks and their Knot Invariants*, 2013 TAPU Workshop on Knot Theory and Related Topics, NIMS, Daejeon, Korea, Summer 2013.

30. *Quandles and their Knot Invariants*, 2013 TAPU Workshop on Knot Theory and Related Topics, NIMS, Daejeon, Korea, Summer 2013.

31. *Quantum enhancements*, Knots in Washington XXXV conference, The George Washington University, Fall 2012.

32. *Counting invariants of knots and links*, UnKnot, the Undergraduate Knot Theory conference, Dennison University, Summer 2012.

33. *Three new enhancements of counting invariants*, AMS sectional meeting, University of Kansas, Spring 2012.

34. *Polynomial birack module invariants*, AMS sectional meeting, University of South Florida, Spring 2012.

35. *Virtual Shadow Modules and their Link Invariants*, Knots in Washington XXXIII conference, George Washington University, Fall 2011.

36. *Twisted virtual biracks*, AMS sectional meeting, University of Nebraska at Lincoln, Fall 2011.

37. *Link Invariants from the Alexander virtual biquandle*, AMS sectional meeting, University of Nebraska at Lincoln, Fall 2011.

38. *Bikei and unoriented link invariants*, Knots in Washington conference, George Washington University, Spring 2011.

39. *Birack algebras, shadow algebras and link invariants*, Seventh East Asian School of Knots and Related Topics, Higashi-Hiroshima, Japan, January 2011.

40. *Rack modules and generalizations*, Knots in Washington conference, George Washington University, Fall 2010.

41. *Rack module enhancements of counting invariants and (t, s)-racks*, AMS Fall sectional meeting, University of California, Los Angeles, Fall 2010.

42. *Rack module enhancements of counting invariants*, Knots in Chicago conference, University of Illinois at Chicago, Fall 2010.

43. *Blackboard Biracks and their link invariants*, Knots in Washington conference, George Washington University, Spring 2010.

44. *Rack Shadows and their invariants*, Knots in Washington conference, George Washington University, Fall 2009.

45. *Column group enhancements*, AMS sectional meeting, Florida Atlantic University, Fall 2009.

46. *Counting invariants of knots/links*, invited address, UnKnot (undergraduate knot theory) conference, Dennison University, Summer 2009.

47. *Knot invariants from finite racks*, Knots in Washington conference, George Washington University, Spring 2009.

48. *Enhancements of counting invariants*, Knots in Washington conference, George Washington University, Spring 2008.

49. *Virtual cocycle invariants*, AMS sectional meeting, Louisiana State University, Spring 2008.

50. *Generalized quandle polynomials*, AMS/MAA joint meetings, San Diego, Winter 2008.

51. *Quandles and linking number*, Knotting Mathematics and Art conference, University of South Florida, Fall 2007.

52. *Quandles and linking number*, AMS sectional meeting, University of New Mexico, Fall 2007.

53. *A polynomial invariant of finite quandles*, Knots in Washington conference, Spring 2007.

54. *Quandle difference invariants*, Spring Topology and Dynamics Conference, University of North Carolina, Greensboro, Spring 2006.

55. *Quandle difference invariants*, Knots in Washington conference, George Washington University, Spring 2006.

56. *Virtual Crossing Realization*, Spring Topology and Dynamics Conference, Texas Tech University, Spring 2003.

57. *Virtual Crossing Realization*, AMS sectional meeting, Louisiana State University, Spring 2003.

58. *Classification of Finite Alexander Quandles*, AMS sectional meeting, University of Central Florida, Fall 2002.

59. *Classification of Finite Alexander Quandles*, Spring Topology and Dynamics Conference, University of Texas at Austin, Spring 2002.

Selected Colloquia, Seminars and other Talks

1. *Biquandle Bracket Quivers*, Knot and Representation Seminar (Moscow, via zoom), Fall 2021.

2. *Biquandle Bracket Quivers*, Claremont Topology Seminar, Fall 2021.

3. *Biquandle Bracket Quivers*, Izmir Yuksek Teknoloji Enstitusu Matematik Semineri (Izmir Institute of Technology Math Seminar, via zoom), Fall 2021.
4. *Region Coloring Invariants of Knots*, Claremont Topology Seminar, Fall 2021.
5. *Region Coloring Invariants of Knots*, Claremont ANTC Seminar, Fall 2021.
6. *Region Coloring Invariants of Knots*, CKVK* Seminar (online, hosted at The Ohio State University), Spring 2021.
7. *Experimental Knot Music*, CCMS Colloquium talk, Fall 2020.
8. *Biquandle Brackets*, Claremont Algebra, Number Theory and Combinatorics Seminar, Fall 2019.
9. *Biquandle Brackets*, Pure Mathematics Seminar, University of South Alabama, Mobila, AL, Fall 2019.
10. *Knotoids and Biquandle Brackets*, Claremont Topology Seminar, Fall 2019.
11. *Quandle Cocycle Quivers*, Knotting Nagoya Seminar, Nagoya City University, Japan, Summer 2019.
12. *Quandles and Knots*, Mathematics Colloquium, Nara Woman's University, Nara, Japan, Summer 2019.
13. *Quandles and Knots*, Mathematics Colloquium, Kyungpook National University, Daegu, Korea, Summer 2019.
14. *Quandles and Knots*, Mathematics Colloquium, Pusan National University, Pusan, Korea, Summer 2019.
15. *Quandle Coloring Quivers*, Claremont Topology Seminar, Fall 2018.
16. *Quandle Coloring Quivers*, Seminar on Knots, Bauman Moscow State Technical University, Moscow, Russia (via Skype), Fall 2018.
17. *Quandle Coloring Quivers*, Claremont Algebra, Number Theory and Combinatorics Seminar, Fall 2018.
18. *Knots and How to Tell Them Apart*, National Institute of Technology Gunma College International Seminar, Gunma, Japan, Summer 2018.
19. *Virtual Tribrackets and Niebrzydowski Algebras*, Waseda University Topology Seminar, Tokyo, Japan Summer 2018.
20. *Twisted Virtual Bikeigebras*, Claremont Algebra, Number Theory and Combinatorics Seminar, Spring 2018.
21. *Twisted Virtual Bikeigebras*, Claremont Topology Seminar, Spring 2018.
22. *Biquandle Brackets and Trace Diagrams*, Seminario Tomea Math, National Technical University of Athens, Greece, Fall 2017.
23. *Psyquandles, Singular Knots and Pseudoknots*, Claremont Topology Seminar, Fall 2017.
24. *Psyquandles, Singular Knots and Pseudoknots*, Claremont Algebra, Number Theory and Combinatorics Seminar, Fall 2017.
25. *Biquandle Brackets*, Osaka City U. Friday Seminar on Knot Theory, Spring 2017.
26. *Biquasiles and Dual Graph Diagrams*, Knotting Nagoya Seminar, Nagoya Institute of Technology, Spring 2017.

27. *A Categorical Imperative*, Claremont Algebra, Number Theory and Combinatorics Seminar, Spring 2017.

28. *Biquandle virtual brackets*, Claremont Algebra, Number Theory and Combinatorics Seminar, Spring 2017.

29. *Biquasiles and Dual Graph Diagrams*, LSU Topology Seminar, Spring 2017.

30. *Biquasiles and Dual Graph Diagrams*, U. South Florida Math Colloquium, Spring 2017.

31. *Biquandle Brackets*, Seminar on Knots, Bauman Moscow State Technical University, Moscow, Russia (via Skype), Fall 2016.

32. *Biquasiles and Dual Graph Diagrams*, Claremont Topology Seminar, Fall 2016.

33. *Biquasiles and Dual Graph Diagrams*, Claremont Algebra, Number Theory and Combinatorics Seminar, Fall 2016.

34. *Parity biquandle cocycle invariants*, Claremont Algebra, Number Theory and Combinatorics Seminar, Spring 2016.

35. *Biquandle Brackets*, Claremont Mathematics Colloquium, Fall 2015.

36. *Biquandle Brackets*, Claremont Topology Seminar, Fall 2015.

37. *Biquandle Brackets*, Claremont Algebra, Number Theory and Combinatorics Seminar, Fall 2015.

38. *Quantum Enhancements of Biquandle Invariants*, Instituto Superior Técnico, University of Lisbon, Summer 2015.

39. *Pure Mathematics for the Impatient*, Gunma National College of Technology, Japan, Summer 2015.

40. *Finite Type Enhancements*, U. South Florida Math Colloquium, Spring 2015.

41. *Quandles and Knot Invariants*, Cal Poly Pomona Math Colloquium, Spring 2015.

42. *Ribbon biquandles and knotted surfaces*, Claremont Algebra, Number Theory and Combinatorics Seminar, Spring 2015.

43. *Quadratic Forms in Knot Theory*, Claremont Topology Seminar, Spring 2015

44. *Quandles and Knot Invariants*, Seattle U. Math Colloquium, Spring 2015.

45. *Ribbon Biquandles and Virtual Knotted Surfaces*, NCSU Algebra and Combinatorics Seminar, Fall 2015

46. *Finite type enhancements of biquandle counting invariants*, Claremont Algebra, Number Theory and Combinatorics Seminar, Fall 2014..

47. *Finite type enhancements of biquandle counting invariants*, Claremont Topology Seminar, Fall 2014.

48. *Knot Theory* (with Allison Henrich), Canada/USA Mathcamp minicourse, Summer 2014.

49. *Quandles and their Knot Invariants*, Vassar College Math Colloquium, Spring 2014.

50. *Augmented Birack Homology*, CSU Long Beach Colloquium, Fall 2013.

51. *Knot Theory*, CSU Fullerton Analysis Seminar, Fall 2013.

52. *Augmented Birack Homology*, Claremont Topology Seminar, Fall 2013.

53. *Enhancements of Counting Invariants*, Louisiana State University Mathematics Colloquium, Spring 2013.

54. *Rack and Birack Module Invariants*, Louisiana State University Topology Seminar, Spring 2013.

55. *Enhancements of Counting Invariants*, University of Louisiana Lafayette Mathematics Colloquium, Spring 2013.

56. *Enhancements of Counting Invariants*, University of South Florida Math Colloquium Spring 2013.

57. *Quantum enhancements of birack counting invariants*, Claremont Topology Seminar, Fall 2012.

58. *Toward the Kontsevich integral: integrals and link invariants*, Claremont Analysis Seminar, Spring 2012.

59. *Polynomial birack modules.* Claremont Topology Seminar, Spring 2012.

60. *Birack projection invariants*, Claremont Algebra/Number Theory/Combinatorics Seminar, Spring 2012.

61. *Enhancements of counting invariants.* UCR Topology Seminar, Spring 2012.

62. *Link invariants from the Alexander virtual biquandle*, Claremont Algebra Seminar, Fall 2011.

63. *BiKei and unoriented link invariants*, Claremont Topology Seminar, Spring 2011.

64. *The Rack Algebra* Claremont Algebra seminar, Pomona College, Spring 2011.

65. *Birack Modules, Kei modules and Shadow Modules* Claremont Algebra seminar, Pomona College, Spring 2011.

66. *Rack module enhancements of counting invariants*, Claremont Topology Seminar, Fall 2010.

67. *The Algebra of Knots*, Mathematics Colloquium, Fullerton College, Fall 2010.

68. *Blackboard Biracks and their link invariants*, Claremont Algebra seminar, Pomona College, Spring 2010.

69. *Quandles, Racks and the Fundamental Group*, Claremont Topology seminar, Pomona College, Spring 2010.

70. *Rack Shadows and their invariants*, Mathematics Colloquium, University of South Florida, Fall 2009.

71. *The Combinatorial Revolution in Knot Theory*, Mathematics Colloquium, California State University Fresno, Fall 2009.

72. *The Combinatorial Revolution in Knot Theory*, Claremont Mathematics (CCMS) Colloquium, Fall 2009.

73. *Algebraic structures in knot theory*, Mathematics Colloquium, California State University Dominguez Hills, Spring 2009.

74. *Applications of knot theory*, Atul Vyas Memorial lecture, Claremont McKenna College, Fall 2008.

75. *Algebraic structures in knot theory*, Claremont algebra seminar, Pomona College, Fall 2008.

76. *Semiquandles and flat virtual knots*, Claremont topology seminar, Pomona College, Fall 2008.

77. *Rack counting invariants*, Claremont topology seminar, Pomona College, Spring 2008.

78. *Algebraic structures from knots*, Claremont algebra seminar, Pomona College, Fall 2007.

79. *Virtual knots and finite biquandles*, USC topology seminar, University of Southern California, Spring 2006.

80. *Virtual knot theory*, featured talk at annual Math Week, University of Wyoming, Spring 2005

81. *Quandles and generalized knot groups*, Claremont topology seminar, Pomona College, Fall 2004.

82. *Quandle cocycle invariants*, UCR Topology seminar, University of California, Riverside, Winter 2004.

III. Teaching

Courses Taught

Claremont McKenna College (2008–Present)

1. *Algebraic Topology* Homology and cohomology theory with applications to category theory and knot theory.

2. *Calculus I* Limits, derivatives, optimization, antiderivatives.

3. *Calculus II and IIa* Integration, sequences and series.

4. *Calculus III, Honors Calculus III* Multivariable differential and integral calculus.

5. *Discrete Mathematics* Graph theory, binomial coefficients, recurrence relations, discrete probability, propositional logic.

6. *Knot Theory* Knots and links, skein invariants, quandles, virtual knots, surface-links, spatial graphs.

7. *Intro to/Foundations of Pure Mathematics* A liberal arts math course covering selected topics from abstract algebra, real and complex analysis, and topology.

8. *Linear Algebra* Vector spaces, linear transformations, matrix algebra, determinants, eigenvalues, canonical forms.

9. *Modern Geometry* Axiomatic systems, discrete geometry, hyperbolic, elliptic, affine and projective geometry, fractals.

Pitzer College (Summer 2009)

1. *Mathematics of Gambling* A summer course on discrete probability with applications to popular games of chance.

Pomona College (2007-2008)

1. *Calculus I* Limits, continuity, derivatives and integration.

2. *Linear Algebra* Vector spaces, linear transformations, matrix algebra, Gaussian elimination, determinants, eigenvalues, canonical forms.

3. *Topology* Open and closed sets, continuous maps, compactness, separation axioms, product and quotient topologies, homotopy, fundamental group, covering spaces.

University of California, Riverside (2003-2006; Summer 2008)

1. *Calculus I* Limits, continuity, derivatives and integration.

2. *Calculus II* Techniques and applications of integration.

3. *Calculus III* Sequences and series.

4. *Discrete Structures II.* Graph theory, binomial coefficients, recurrence relations, discrete probability, propositional logic.

5. *Linear Algebra.* Vector spaces, linear transformations, matrix algebra, Gaussian elimination, determinants, eigenvalues, canonical forms. 3 sections.

6. *Matrix Algebra for Business* Gaussian elimination, determinants, eigenvalues and eigenvectors, applications.

7. *Topology II* Product and quotient topologies, homotopy, fundamental group, covering spaces.

8. *Vector Calculus I* Partial derivatives, gradients, vector fields, Jacobian matrices, Lagrange multipliers, Implicit function theorem.

9. *Vector Calculus II* Iterated integrals, line integrals, surface integrals, Green's Theorem, Stokes' Theorem.

Whittier College (2002-2003; 2006-2007)

1. *Business Mathematics.* Techniques of optimization, linear programming, Gaussian elimination.

2. *Calculus II* Integration, sequences and series.

3. *College Algebra* Polynomial and rational equations, factoring, curve sketching.

4. *Differential Equations II* First order linear ODEs, integrating factors, Laplace transforms.

5. *Discrete Mathematics* Graph theory, binomial coefficients, recurrence relations, discrete probability, propositional logic.

6. *Modern Algebra II.* Rings, ideals, fields, quotients, extensions, Galois groups, solvable groups.

7. *Quantitative Reasoning* Liberal arts math course focusing on basic computational skills.

Louisiana State University (2000-2002)

1. *Remedial Algebra* Basic arithmetic and beginning algebra.

2. *College Algebra* Polynomial and rational equations, factoring, curve sketching.

3. *Business Calculus I* Differential and integral calculus without trig functions, with applications to business.

4. *Calculus I* Limits, continuity, derivatives and integration.

New Courses Developed

1. CMC Math 35, *Foundations of Pure Mathematics.* A liberal arts math course covering selected topics from abstract algebra, real and complex analysis, and topology.

2. CMC CS 55, *Discrete Structures*, Discrete mathematics for CS students.

3. CMC Math 103, *Combinatorics*, A survey of topic in combinatorics.

4. CMC Math 140, *Modern Geometry.* A survey course on modern concepts in geometry including axiomatic systems, discrete geometry, hyperbolic, elliptic, affine and projective geometry, and fractals.

5. CMC Math 148, *Knot Theory.* Knots and links in 3-space, skein invariants, knot groups, quandles, virtual knots.

6. CMC Math 149a/144, *Algebraic Topology*. Chain complexes, homology and cohomology with applications to topology.
7. CMC Math 190/191, Math Majors Seminar and Senior Seminar.

Senior Theses Supervised

1. *Biquandle Bracket Quivers*, Pia Cosma Falkenberg, Jacobs University (Bremmen, Germany) 2021-22.
2. *G-Family Polynomials*, Madeline Brown, Scripps College 2021.
3. *Quandle Module Quivers*, Karma Istanbouli, Scripps College 2020.
4. *Quandle Cocycle Quivers*, Karina Cho, Harvey Mudd College 2019.
5. *Multi-tribrackets*, Evan Paultich, CMC 2019.
6. *An Overview of Computational Mathematical Physics: A Deep Dive on Gauge Theories*, André Simoneau, CMC 2019.
7. *Virtual Tribrackets*, Shane Pico, CMC 2018.
8. *Twisted Virtual Handlebody-links and Twisited Virtual Bikeigebras*, Yuqi Zhang, CMC 2017.
9. *Virtual Links with Finite Medial Bikei*, Julien Chien, CMC 2017.
10. *Boltzmann Enhancements of Biquasile Counting Invariants*, WonHyuk Choi, Pomona College 2017
11. *Bikei Homology*, Jake Rosenfield, Claremont McKenna College 2016.
12. *At the Intersection of Math and Art: An Exploration of the Fourth Dimension, Non-Euclidean Geometry, and Chaos*, Kathryn Knapp, Scripps College, 2015.
13. *Science, Technology, Engineering, and Men? Do Conservative Gender Role Attitudes in Adolescence Affect the Likelihood of Working in a STEM Career?*, Alexandra Arnett, Claremont McKenna College 2015.
14. *Symmetric Enhancements of Counting Invariants*, Melinda Ho, Scripps College 2014.
15. *Lie Ideal Enhancements*, Gillian Grindstaff, Pomona College 2014.
16. *Quotient Quandles and the Fundamental Latin Alexander Quandle*, Sherilyn Tamagawa, Scripps College, 2014.
17. *The Mathematics of Invisibility*, Austin Gomez, Claremont McKenna College 2013.
18. *Birack dynamical cocycles and their link invariants*, Emily Watterberg, Scripps College 2012.
19. *Polynomial birack modules*, Evan Cody, Pomona College 2012.
20. *Shadow modules and their link invariants*, Katie Pelland, Pomona College, 2011.
21. *Birack modules and their link invariants*, Gina Bauernschmidt, Pomona College, 2011.
22. *Kei Module Invariants of Knots and Links*, Michael Grier, Pomona College, 2011.
23. *Twisted virtual biracks*, Jessica Ceniceros, Claremont McKenna College, 2011.
24. *Normalizing the symplectic quandle polynomial invariant*, Lisa Pearis, Scripps College, 2010.
25. *Enhancements of counting invariants: the column group*, Johanna Hennig, Scripps College, 2009.

26. *The Surface Biquandle*, Tim Carrell, Pomona College, 2009.
27. *Homogeneous quandle structures on S_3*, Charles Medford, Pomona College, 2008.
28. *Virtual Yang-Baxter cocycle invariants*, Jose Ceniceros, Whittier College, 2008.

IV. Service

Chairmanships

1. Chair, Department of Mathematical Sciences, Claremont McKenna College, 2019-2022.
2. Chair, Mathematical Association of America (MAA) SoCal-Nevada Section Officer Recruitment Committee, 2018-2019.
3. Past Chair, Mathematical Association of America (MAA) SoCal-Nevada Section, 2018-2019.
4. Chair, Mathematical Association of America (MAA) SoCal-Nevada Section, 2017-2018.
5. Vice Chair, Mathematical Association of America (MAA) SoCal-Nevada Section, 2016-2017.
6. Chair, Mathematical Association of America (MAA) SoCal-Nevada Section Teaching Award Committee, 2016-2017.
7. Co-Chair American Mathematical Society (AMS) Library Committee, 2015–2016
8. Co-Chair CMC Personal and Social Responsibility Subcommittee on Diversity, Identity and Speech, 2014–2015.
9. Co-Chair Claremont Mathematics Colloquium, 2010–2011.

Other Committee Service

1. CMC Science Building Committee, 2019–2020.
2. CMC Curriculum Committee, 2019– 2022.
3. CMC Council of Chairs, 2019 – 2022.
4. CMC Math Dept. Hiring Committee for Stats VAP, 2019-2020.
5. CMC Math Dept. Hiring Committee for Applied Math & Stats position, 2018-2019.
6. CMC Math Dept. Hiring Committee for Computer Science position, 2018–2019.
7. CMC Appointments, Promotion and Tenure Committee, 2018 – Present.
8. CMC Writing Committee, 2017–2019.
9. CMC Faculty Research Committee, 2017–Present.
10. CMC Field Investigative Subcommittee for Alison Harris, 2018.
11. CMC Math Dept. Hiring Committee for Computer Science/Data Science Position, 2017–2018.
12. CMC Field Investigative Subcommittee for Heather Ferguson, 2017.
13. CMC Lateral Tenure Committee for Helen Wong, 2017.
14. CMC Math Dept. Hiring Committee for Pure Math position, 2016–2017.

15. CMC Board of Trustees Committee on Academic Affairs, 2016-2017.
16. CMC Personal and Social Responsibility Subcommittee on Sexual Assault, 2016-2017.
17. CMC Appointments, Promotion and Tenure Committee, Executive Committee 2015–2016.
18. CMC Personal and Social Responsibility Subcommittee on Diversity, Identity and Speech, 2014–2016.
19. CMC Field Investigative Subcommittee for George Thomas, 2015.
20. CMC Student Recruitment Committee, 2014-2015.
21. CMC Appointments, Promotion and Tenure Committee, 2013–2016.
22. CMC Field Investigative Subcommittee for Cameron Shelton, 2013
23. American Mathematical Society (AMS) Library Committee, 2013–2016.
24. CMC Civil Rights Board, 2012–Present.
25. CMC Committee on Academic Computing, 2011–2014.
26. CMC Institutional Review Board, 2010–2011.
27. CMC Math Dept. Hiring Committee for Stats position, 2010–2011.
28. CMC Math Dept. Committee on data collection for WASC Assessment, 2010–2011.

Conference Sessions Organized

1. *Algebraic and combinatorial structures in knot theory* (with Carmen Caprau (CSUF)), AMS sectional meeting, California State University at Fresno, May 2020.
2. *Algebraic and combinatorial structures in knot theory* (with Jieon Kim (Pusan National U.)), AMS sectional meeting, University of California at Riverside, November 2019.
3. *Algebraic and combinatorial structures in knot theory* (with Kanako Oshiro (Sophia U.) and Natsumi Oyamaguchi (Shumei U.)), AMS sectional meeting, Honolulu, HI, May 2019.
4. *Algebraic and combinatorial structures in knot theory* (with Allison Henrich (Seattle U.) and Inga Johnson (Willamette University)), AMS sectional meeting, Portland, OR, April 2018.
5. *Quandle Questions* (with Alissa Crans (LMU)), AMS-MAA Joint Mathematics Meetings, San Diego, January 2018.
6. *Algebraic and combinatorial structures in knot theory* (with Patricia Cahn (Smith College)), AMS sectional meeting, University of California at Riverside, Fall 2017.
7. *Algebraic and combinatorial structures in knot theory* (with Allison Henrich (Seattle U.)), AMS sectional meeting, Washington State University, Pullman, WA, Spring 2017.
8. *Algebraic structures in knot theory* (with Mohamed Elhamdadi (USF)) AMS sectional meeting, University of Georgia, Athens, Spring 2016.
9. *Knots in Washington (State)* (with Allison Henrich (Seattle U.), Jozef Przytycki (George Washington U.) and Radmila Sazdanovic (NCSU)) AMS-MAA Joint Mathematics Meetings, Seattle, January 2016.
10. *Algebraic and Combinatorial structures in knot theory* (with Allison Henrich (Seattle U.), Aaron Kaestner (Northpark U.) and Matt Rathbun (CSUF)) AMS sectional meeting, California State University, Fullerton, Fall 2015.

11. *Algebraic structures in knot theory* (with Radmila Sazdanovic (NCSU)) AMS sectional meeting, University of Nevada, Las Vegas, Spring 2015.
12. *Algebraic structures in knot theory* (with Allison Henrich (Seattle U.)) AMS sectional meeting, University of California, Riverside, Fall 2013.
13. *Algebraic structures in knot theory* (with Carmen Caprau (CSUF)) AMS sectional meeting, University of California, Los Angeles, Fall 2010.
14. *Algebraic structures in knot theory* (with Alissa Crans (LMU)) AMS sectional meeting, University of California, Riverside, Fall 2009.
15. *Algebraic structures in knot theory* (with Alissa Crans (LMU)) AMS/MAA joint meetings, Washington DC, Winter 2009.
16. *Knot Theory and the Topology of 3-manifolds* (with Jim Hoste (Pitzer), Erica Flapan (Pomona), and David Bachman (Pitzer)), AMS sectional meeting, Claremont McKenna College, Spring 2008.
17. *Recent Advances in Knot Theory: Quandle Theory and Categorified Knot Invariants* (with Alissa Crans (LMU)), AMS sectional meeting, Louisiana State University, Spring 2008.

Other Service to Academic Community

1. Reviewer for Zentralblatt MATH.
2. Reviewer for American Mathematical Society Mathscinet Math Reviews.
3. Referee for journals and conference proceedings.
4. Recommendation letters for students, colleagues and TAs.
5. Software code and algorithms for research made freely available online.

Professional Society Memberships

1. American Mathematical Society (AMS), Member since 1996
2. Mathematical Association of America (MAA), Member since 2002
3. Mathematical Society of Japan, Member since 2018