

RACHEL WELLS HALL

CURRICULUM VITAE

Academic Affiliation: Department of Mathematics, Saint Joseph's University, 5600 City Avenue, Philadelphia, PA 19131

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Education:

- Ph.D., Mathematics, The Pennsylvania State University, December 1999, Thesis "Hecke C^* -Algebras" directed by Nigel Higson
- B.A. *magna cum laude*, Ancient Greek at Bryn Mawr College, Haverford College, Haverford, PA, 1991
- Thomas J. Watson Fellowship, project entitled "Traditional Dance Music," Norway, Denmark, Shetland Islands, and Ireland, 1991-1992

Academic Position: Associate Professor, Department of Mathematics and Computer Science, Saint Joseph's University, 2006-present; Assistant Professor, SJU, 1999-2006

Research Interests: Applications of Mathematics to Music Theory, Ethnomathematics

Journal publications: (available at <http://www.sju.edu/~rhall/research.htm>)

- Rachel Wells Hall. [Linear contextual transformations](#). *Quaderni di matematica: Theory And Applications of Proximity, Nearness and Uniformity*, Somashekhar Naimpally and Giuseppe Di Maio, eds., **23** (2009) 101-130.
- Rachel Wells Hall. [Geometrical music theory](#). *Science* **320** (2008) 328-329.
- Rachel W. Hall. [Math for poets and drummers](#). *Math Horizons* **15** (2008) 10-11.
- Rachel W. Hall. [A course in multicultural mathematics](#). *PRIMUS* **17** (2007), no. 3, 209-227.
- Rachel W. Hall and Paul Klingsberg. [Asymmetric rhythms and tiling canons](#). *American Mathematical Monthly* **113** (2006), no. 10, 887-896.
- Rachel W. Hall and Krešimir Josić. [The mathematics of musical instruments](#). *American Mathematical Monthly* **108** (2001), no. 4, 347-357.
- Rachel W. Hall and Krešimir Josić. [Planetary motion and the duality of force laws](#). *SIAM Review* **42** (2000), no. 1, 115-124.

Reviews:

- Rachel Wells Hall. [Review of *Generalized Musical Intervals and Transformations and Musical Form and Transformation*](#), by David Lewin, Oxford University Press, 2007. *Journal of the American Musicological Society* **62** (2009), no. 1, 205-222.
- Rachel Wells Hall. [Report on the 2008 Bridges art exhibition](#). *Journal of Math and the Arts* **2** (2008), no. 4, 197-204.
- Rachel W. Hall, [review of *The Math behind the Music*](#), Leon Harkleroad, Cambridge University Press, 2006. In *Journal of Math and the Arts* **1** (2007), no. 2, 143-145.

Book chapter:

- Rachel Wells Hall. [Geometrical models for modulation in Arab music](#). To appear in *Mathematical and Computational Musicology*, Timour Kloche, ed., Springer, Berlin, 2011.

Publications in peer-reviewed conference proceedings:

- Chirashree Bhattacharya and Rachel W. Hall. Geometrical representations of North Indian *Thāts* and *Rāgs*. In *Bridges: Mathematical Connections in Art, Music, and Science*. G. Hart and R. Sarhangi, eds., Pécs, Hungary, 2010.
- Rachel W. Hall. Neo-Riemannian geometry. In *Bridges: Mathematical Connections in Art, Music, and Science*. R. Sarhangi and C. Séquin, eds., Leeuwarden, Holland, 2008.
- Rachel W. Hall. [Playing musical tiles](#). In *Bridges: Mathematical Connections in Art, Music, and Science*. R. Sarhangi and J. Sharp, eds., London, 2006.
- Joseph E. Flannick, Rachel W. Hall, and Robert Kelly. [Detecting meter in recorded music](#). In *Bridges: Mathematical Connections in Art, Music, and Science*. R. Sarhangi and C. Séquin, eds., Banff, Alberta, 2005.
- Rachel W. Hall and Paul Klingsberg. [Asymmetric rhythms, tiling canons, and Burnside's Lemma](#). In *Bridges: Mathematical Connections in Art, Music, and Science*. R. Sarhangi and C. Séquin, eds., Winfield, KS, 2004.

Works in progress:

- Rachel Wells Hall. [The Sound of Numbers: A Tour of Mathematical Music Theory](#). Book in preparation for Princeton University Press.
- Rachel W. Hall and Dmitri Tymoczko. [Submajorization and the geometry of multisets](#). Under review.

Teaching Experience:

- **Associate Professor**, Saint Joseph's University, 2006–present.
Assistant Professor, Saint Joseph's University, 1999–2006.
Taught twenty different mathematics courses: [Modern Algebra I](#); [The Mathematics of Music](#); [Complex Analysis](#); [Signal Processing](#); [Differential Equations](#); [Chaos, Fractals, and Dynamical Systems](#); Discrete Structures; Calculus I, II, and III and Applied Calculus I and II; Applied Statistics; [Introduction to Statistics](#); Topics in Mathematics; Excursions in Mathematics I and II; Business Mathematics I and II; and [Multicultural Mathematics](#). Created three new courses: [The Mathematics of Music](#), [Signal Processing](#) and [Multicultural Mathematics](#). Supervised four departmental honors research projects and six capstone research projects. Duties included planning curricula; choosing texts; lecturing; creating assignments, projects, worksheets, and computer labs; supervising student research; and assessment.
- **Graduate Assistant**, The Pennsylvania State University, 1993–1999. Taught eight different mathematics courses in nineteen sections, fifteen of which were taught independently.

Student Research Supervised:

- William Lyons. The melody and rhythm of surgery. Departmental Honors thesis, 2009.
- Jiaming Chen. Algebraic problems in music theory. Departmental Honors thesis, 2008.
- Joseph Flannick. [Rhythm detection in recorded music](#). Departmental Honors thesis, 2003.
- Robert Kelly. [The mathematics of musical rhythm](#). Departmental honors thesis, 2002. Winner of the MAA regional student paper competition.

Invited Addresses:

- “Asymmetric rhythms and tiling canons,” Mathematical Association of America (MAA) Indiana section meeting, October 2008.
- “Poverty and polyphony: a connection between music and economics,” Plenary talk, Bridges: Mathematical Connections in Art, Music, and Science, Donostia, Spain, July 2007
- “Asymmetric rhythms and tiling canons,” Mathematical Association of America (MAA) Eastern PA and Delaware section meeting, October 2006

Invited Workshops:

- “Teaching multicultural mathematics,” Workshop for math faculty, West Point, February 2008.
- “Teaching multicultural mathematics,” Workshop for math faculty, Dade College, February 2008.

Recent Presentations at International, National, and Regional Meetings:

- “A Mathematician’s Guide to Mathematical Music Theory,” AMS Southeastern Section Meeting, Richmond, VA, November 2010.
- “Upright Petrouchka, Proper Scales, and Sideways Neapolitans,” joint paper with Dmitri Tymoczko and Jason Yust, Society for Music Theory annual meeting, Indianapolis, Indiana, November 2010. (25% acceptance rate)
- “Two Geometrical Models for Modulation in Arab Music,” Society for Music Theory annual meeting, Montreal, Quebec, November 2009. (25% acceptance rate)
- “Hands-on Workshop in Geometrical Music Theory,” Second International Conference of the Society for Mathematics and Computation in Music, Yale University, New Haven, June 2009.
- “Neo-Riemannian Geometry,” Society for Music Theory annual meeting, Nashville, November 2008. (25% acceptance rate)
- “The Z-relation and Homometric Sets,” with Clifton Callender, Society for Music Theory national meeting, Nashville, November 2008. (25% acceptance rate)
- “Neo-Riemannian Geometry,” Bridges: Mathematical Connections in Art, Music, and Science, Leeuwarden, the Netherlands, July 2008.
- “Measuring voice leadings,” Society for Music Theory national meeting, Baltimore, November 2007. (25% acceptance rate)
- “On the measurement of music,” Fifth International Workshop on Computational

Music Theory, Barcelona, July 2007.

- “Voice leading, submajorization, and the distribution constraint,” American Mathematical Society (AMS) Special Session on Mathematical Techniques in Musical Analysis, Joint Mathematical Meetings, New Orleans, January 2007.
- “Asymmetric rhythms and tiling canons,” Fourth International Workshop on Computational Music Theory, Madrid, July 2006.
- “Playing Musical Tiles,” Bridges: Mathematical Connections in Art, Music, and Science, London, August 2006.
- “[Detecting Meter in Recorded Music](#),” Bridges: Mathematical Connections in Art, Music, and Science, Banff, Alberta, Canada, July 2005.

Recent Colloquium Talks:

- “Math for Poets and Drummers,” Wesleyan University ethnomusicology colloquium, November 2008.
- “Asymmetric Rhythms and Tiling Canons,” Wesleyan University math colloquium, November 2008.
- “Asymmetric Rhythms and Tiling Canons,” Randolph-Macon College, October 2008.
- “Poverty and Polyphony,” Dartmouth College, May 2008.
- “Poverty and Polyphony,” University of Pennsylvania, February 2008.
- “Math for poets and drummers,” Onondaga County Community College, November 2007.
- “Asymmetric rhythms and tiling canons,” Vassar College Colloquium, May 2007.
- “Asymmetric rhythms and tiling canons,” Villanova University Pi Mu Epsilon induction, May 2007.
- “Asymmetric rhythms and tiling canons,” Shippensburg University student research day, March 2007.
- “[Asymmetric Rhythms and Tiling Canons](#),” Math and Music Colloquium, Institut de Recherche et Coordination Acoustique/Musique, Paris, France, July 2005.
- “[Math for Poets and Drummers](#),” Arcadia University Colloquium Series, Philadelphia, February 2005.

Awards:

- Regional Fellow of the Penn Humanities Forum, University of Pennsylvania, 2009-2010.
- Saint Joseph’s University Faculty Merit Award for Research, 2007.

Professional Leadership and Service:

- Program committee, Music Theory Society of the Mid Atlantic annual meeting, 2011.
- Editorial board of *Music Theory Spectrum*, 2008-2010 (Society for Music Theory).
- Planning committee, 2015 Centennial of the Mathematical Association of America, 2007-2015.
- Executive committee member, Eastern Pennsylvania and Delaware chapter of the Mathematical Association of America, 2008-2010.

- Editorial board of *Journal of Mathematics and Music*, 2006-present (Taylor & Francis).
- Editorial board of *Journal of Mathematics the Arts*, 2006-present; Associate Editor for music, 2009-present (Taylor & Francis).
- Co-organizer of AMS Special Session on Mathematical Techniques in Musical Analysis (Joint Mathematical Meetings, New Orleans, January 2007).
- Member of founding board, Society for Mathematics and Computational Science in Music.
- Reviewer for *Science*, *Music Theory Spectrum*, *Journal of Mathematics and Music*, *Journal of Mathematics and the Arts*, and conference papers for Bridges and the International Computer Music Conference.

University Service: Executive Committee of the College Council of the College of Arts and Sciences, 2007-2009. Faculty Policies and Procedures committee (2002-2006, Assistant Chair 2005-2006).

Musical Experience:

- Member of the folk trio Simple Gifts, 1995–present.
- Taught music workshops for beginning adult musicians at Folk College, Clarion University and Juniata College, PA, May 2000–2010.
- Taught music workshops in rural Pennsylvania schools.
- Received grants from Pennsylvania Performing Artists on Tour and Meet the Composer.
- Released three albums: “Crossing Borders” (2005), “Time and Again” (1999), and “Other Places, Other Times” (1997).
- Instructor at Northeast Concertina Workshop (2007, 2010, 2011).
- Organizer of monthly Sacred Harp singing at Christ Church, Philadelphia; singer at Sacred Harp conventions in five states.