

# CURRICULUM VITAE

## EZRA A. BROWN

### Education

- Ph. D. Mathematics, Louisiana State University, August 1969
- M. S. Mathematics, Louisiana State University, August 1967
- B. A. Mathematics, Rice University, June 1965

### Professional Experience

- Alumni Distinguished Professor, Mathematics Department, Virginia Tech, 2005-2017; Professor, 1981-2005; Associate Professor, 1973-81; Assistant Professor, 1969-73
- Retired since June 1, 2017
- Project NExT (New Experiences in Teaching) Consultant, 1998, 2001, 2003 to present
- Consulting Mathematician, Washington DC, 1993-2018 (summers)
- Sabbatical Year, Washington DC, 1991-92
- Consulting Mathematician, Princeton NJ, 1989-90, 2009 (summers)
- Reader, Advanced Placement Examinations in Mathematics, 1981-86
- Sabbatical Year, Munich, Germany, 1978-79

### National/Regional Honors and Awards

- Mathematical Association of America (MAA) MD-DC-VA Section 2014 Sister Helen Christensen Service Award
- MAA 2013 Carl B. Allendoerfer Award for Excellence in Expository Writing for “Why Ellipses Are Not Elliptic Curves” (with Adrian Rice), Math Magazine 85 (June 2012), 163-174
- MAA 2010 Allendoerfer Award for “Kirkman’s Schoolgirls Wearing Hats and Walking through Fields of Numbers” (with Keith Mellinger), Math Magazine 82 (2009), 3-15
- MAA 2006 George Polya Award for Excellence in Expository Writing for “Phoebe Floats!,” College Math Journal 36 (2005), 114-122
- MAA 2003 Allendoerfer Award for “The Many Names of  $(7,3,1)$ ,” Math Magazine 75 (2002), 83-94
- MAA 2001 Polya Award for “Three Fermat Trails to Elliptic Curves,” College Math Journal 31(2000), 162-172
- MAA 2000 Polya Award for “Square Roots from 1; 24, 51, 10 to Dan Shanks,” College Math Journal 30 (1999), 82-95
- MAA MD-DC-VA Section 1999 John M. Smith Award for Outstanding College or University Teaching

### Virginia Tech Honors and Awards

- Alumni Distinguished Professorship, 2005; reappointed, 2015; emeritus since 2017
- Commencement Address, University Commencement Exercises, Fall 2003
- ODK G. Burke Johnston Award for Teaching Excellence, 2000
- Upsilon Pi Epsilon National Computer Science Honor Society, 1999
- Academy of Teaching Excellence, 1998
- William E. Wine Award for Excellence in Teaching, 1998
- MAA Student Chapter Outstanding Professor Award, 1998, 2000, 2002, 2016
- Edward S. Diggs Teaching Scholar Award, 1997
- College of Arts and Sciences Certificate of Teaching Excellence, 1991

### Ph. D Students

- Robert Johnson, Graphical sequences. Ph. D. in Mathematics, 1974.
- Bruce Landman, Generalized van der Waerden numbers. Ph. D. in Mathematics, 1983.

### Master of Science Students (all in Mathematics)

- Lawrence Gosnell, Quadratic forms over fields of characteristic 2. M. S., 1973.
- Kenneth Hawkes, Perfect numbers and other numbers defined by the sum of their divisors. M. S., 1975.
- Robert Ellis, Cubical complexes. M. S., 1996.
- Matthew Briggs, The General Number Field Sieve. M. S., 1998.
- Karen Potanka, Symmetry and automorphism groups of graphs. M. S., 1998.
- John McGee, Schoof's Algorithm for counting points on elliptic curves. M. S., 2006.
- Courtney Baber, List colorings of graphs. M. S., 2009.
- Maria Beane, The  $S(5,8,24)$  Steiner System. M. S., 2011.
- James Dickson, An introduction to Ramsey theory on graphs. M. S., 2011.
- Andrew Wills, The Inverse Galois Problem. M. S., 2011.
- Ryan Shifler, Computational Algebraic Geometry Applied to Invariant Theory. M. S., 2013.
- Sohail Farhangi, The 2-Large Is Large Conjecture. M. S., 2015.

### Publications in refereed journals

1. Representations of discriminantal divisors by binary quadratic forms, *J. Number Theory* **3** (1971), 213-225.
2. Theory of bivectors (with J. D. Zund), *Tensor (New Series)* **22** (1971), 179-185.
3. A theorem on biquadratic reciprocity, *Proceedings of the Amer. Math. Soc.* **30** (1971), 220-222.
4. The class number of  $Q(-p)$ , for  $p \equiv 1 \pmod{8}$  a prime, *Proceedings of the Amer. Math. Soc.* **31** (1972), 381-383.
5. Quadratic forms and biquadratic reciprocity, *J. reine und angewandte Mathematik* **253** (1972), 214-220.
6. Discriminantal divisors and binary quadratic forms, *Glasgow Math. J.* **13** (1972), 69-73.
7. A class of planar four-colorable graphs (with L. W. Johnson), *Israel J. Math.* **11** (1972), 53-56.
8. Doubly regular tournaments are equivalent to skew-Hadamard matrices (with K. B. Reid), *J. Combinatorial Theory (Series A)* **12** (1972), 332-338.
9. Binary quadratic forms of determinant  $-pq$ . *J. Number Theory* **4** (1972), 408-410.
10. Quasiperfect numbers (with H. L. Abbott, C. E. Aull, and D. Suryanarayana), *Acta Arithmetica* **22** (1973), 489-497.
11. Class numbers of imaginary quadratic fields having exactly three discriminantal divisors (with C. J. Parry), *J. reine und angew. Math.* **260** (1973), 31-34.
12. Biquadratic reciprocity laws, *Proc. Amer. Math. Soc.* **37** (1973), 374-376.
13. The power of 2 dividing the class number of a binary quadratic discriminant, *J. Number Theory* **5** (1973), 413-419.
14. Class numbers of complex quadratic fields, *J. Number Theory* **6** (1974), 185-191.
15. Class numbers of real quadratic number fields, *Transactions Amer. Math. Soc.* **190** (1974), 90-107.
16. A lemma of Stark, *J. reine und angew. Math.* **265** (1974), 201.
17. The imaginary bicyclic biquadratic fields of class number one (with C. J. Parry), *J. reine und angew. Math.* **266** (1974), 118-120.
18. Class numbers of quadratic fields, *Symposia Matematica* **15** (1975), 403-411.
19. Diophantine equations of the form  $x^2 + D = y^m$ , *J. reine und angew. Math.* **274/275** (1975), 385-389.
20. Representations of discriminantal divisors by binary quadratic forms II, *J. reine und angew. Math.* **276/277** (1976), 132-137.
21. The Diophantine equation  $x^2 + 3 = 7^m$ , *J. reine und angew. Math.* **288** (1977), 74-76.
22. Diophantine equations of the form  $ax^2 + Db^2 = y^p$ , *J. reine und angew. Math.* **291**(1977), 118-127.
23. The 2-class group of certain biquadratic number fields (with C. J. Parry), *J. reine und angew Math.* **295** (1978), 61-71.
24. The 2-class group of certain biquadratic fields II (with C. J. Parry), *Pacific Journal of Mathematics* **78** (1978), 11-26.
25. Circularity in graphs and continua: combinatorics (with H. Bell, R. F. Dickman and E. L. Green),

- Houston J. Math.* **6** (1980), 455-470.
26. The first proof of the quadratic reciprocity law revisited, *Amer. Math. Monthly* **88** (1981), 257-264.
  27. Circularity in graphs and continua: topology (with H. Bell, R. F. Dickman and E. L. Green), *Fundamenta Mathematica* **112** (1981), 103-110.
  28. Social relativity: the motion of groups and actors (with C. J. Dudley), *The Sociological Quarterly* **22** (1981), 313-326.
  29. The class number of  $\mathbb{Q}(-pq)$ , for  $p \equiv -q \equiv 1 \pmod{4}$  primes, *Houston J. Math.* **7** (1981), 497-505.
  30. The class number of  $\mathbb{Q}(-2q)$ , for  $p \equiv 1 \pmod{16}$  a prime, *J. Number Theory* **16** (1983), 95-99.
  31. Sets in which  $xy + k$  is always a square, *Math. Comp.* **45** (1985), 613-620.
  32. The euclidean (mod  $U$ ) property in quadratic number fields (with Daniel Shapiro and Raj Markanda), *Acta Arithmetica* **47** (1986), 143-152.
  33. Diophantine equations of the form  $x^4 + dx^2y^2 + y^4 = z^2$ : Some cases with only trivial solutions—and a solution Euler missed, *Glasgow Math. J.* **31** (1989), 297-307.
  34. Partitions of bi-partite numbers into at most  $j$  parts (with Bruce Landman and Frederick Portier), *Graphs and Combinatorics* **8** (1992), 65-73.
  35. Periodic seeded arrays and automorphisms of the shift. *Transactions of the Amer. Math. Soc.* **339** (1993), 141-162.
  36. Why not try a sabbatical at the National Security Agency? *Notices Amer. Math. Soc.* **41** (1994), 451-452.
  37. Directed graphs defined by arithmetic (mod  $n$ ), *Fibonacci Quarterly* **35** (1997), 346-351.
  38. Square roots from 1; 24, 51, 10 to Dan Shanks, *College Math. Journal (CMJ)* **30** (1999), 82-95.
  39. Three Fermat trails to elliptic curves, *CMJ* **31** (2000), 162-172.
  40. Magic squares, finite geometries and points of inflection on elliptic curves, *CMJ* **32** (2001), 260-268.
  41. Diophantine triplets and the Pell sequence (with M. N. Deshpande), *Fibonacci Quarterly* **39** (2001), 242-249.
  42. Cycles of directed graphs defined by arithmetic (mod  $n$ ) (with Theresa P. Vaughan), *Discrete Mathematics* **239** (2001), 109-120.
  43. The many names of  $(7,3,1)$ , *Mathematics Magazine (Math. Mag.)* **75** (2002), 83-94.
  44. Elliptic curves from Mordell to Diophantus and back (with Bruce Myers), *Amer. Math. Monthly* **109** (2002), 639-649.
  45. Three connections to continued fractions, *Pi Mu Epsilon Journal* **11** (2002), 241-250.
  46. The sliding ladder, *Math Horizons* **11** (September 2003), 31.
  47. The fabulous  $(11,5,2)$  biplane, *Math. Mag.* **77** (2004), 87-100.
  48. Configurations with subset restrictions (with Theresa P. Vaughan), *Journal of Combinatorial Mathematics and Combinatorial Computing* **48** (2004), 197-215.
  49. The ancient world's magical genius thinks big, *Math Horizons* **12** (November 2004), 5-8.
  50. A conversation with Leonardo Pisano, *Math Horizons* **12** (February 2005), 16-18.
  51. Phoebe Floats, *CMJ* **36** (2005), 114-122.
  52. Hyperelliptic curves with compact parameters (with Bruce Myers and Jerome Solinas), *Designs, Codes and Cryptography* **36** (2005), 245-261.
  53. A conversation with Lewis Carroll, *Math Horizons* **14** (November 2006), 9-11.
  54. Whodunit? *Math Horizons* **14** (April 2007), 25-26, 28-29.
  55. Fibonacci's forgotten number (with Jason C. Brunson), *CMJ* **39** (2008), 112-120.
  56. Kirkman's Schoolgirls Wearing Hats and Walking through Fields of Numbers (with Keith Mellinger), *Math Mag.* **82** (2009), 3-15.
  57. A dozen problems about hats (with James Tanton), *Math Horizons* **16** (April 2009), 22-25.
  58. Why Is  $\text{PSL}(2,7) \cong \text{GL}(3,2)$ ? (with Nicholas Loehr), *Amer. Math. Monthly* **116** (Oct 2009), 727-731.
  59. A conversation with Archimedes, *Math Horizons* **17** (April 2010), 22-24.
  60. Chocolate Key Cryptography (with Dale Bachman and Anderson Norton), *Mathematics Teacher* **104** (Sept 2010), 100-104.
  61. A mathematical journey to Princeton, *Math Intelligencer* **32** #3 (Fall 2010), 35-37.
  62. Trigonometry without triangles (with Adrian Rice), *Math Horizons* **19** (Nov 2011), 20-23.
  63. Why ellipses are not elliptic curves (with Adrian Rice), *Math Mag.* **85** (June 2012), 163-174.

64. Generalizing Gauss's Gem (with Marc Chamberland), *Amer. Math. Monthly* **119** (August-September 2012), 597-601.
65. A (7,3,1) puzzle, *MAA Focus* **34** (Aug-Sept 2014), p. 18.
66. Squareorama 4, *Math Horizons* **22** (November 2014), inside front cover.
67. Many more names of (7,3,1), *Math. Mag.* **88** (April 2015), 103-120.
68. Saints and scoundrels and two theorems that are really the same, *CMJ* **46** (Nov 2015), 326-334.
69. Commutativity and Collinearity: A historical case study of the interconnection of mathematical ideas. Part I (with Adrian Rice), *Bulletin of the British Society for the History of Mathematics* (BSHM) **31**, #1 (2016), 1-14.
70. Commutativity and Collinearity: A historical case study of the interconnection of mathematical ideas. Part II (with Adrian Rice), *Bulletin of the BSHM* **31**, #2 (2016), 90-103.
71. Five Families around a Well: a new look at an old problem (with Matthew Crawford), *CMJ* **49** (May 2018), 162-168.
72. You can't multiply triples: a proof Hamilton missed (with Adrian Rice), in preparation.

### Books

- *Regiomontanus: His Life and Work*, a translation of Ernst Zinner's *Leben und Werken des Johann Muller von Koenigsberg, genannt Regiomontanus*. North-Holland, Amsterdam-New York, 1990. x+402 pp.
- *Biscuits of Number Theory*, a collection of expository articles on number theory, co-editor with Arthur Benjamin. Dolciani Mathematical Expositions #34, Mathematical Association of America, Washington DC, 2009. xiii+311 pp.
- *The Unity of Combinatorics* (with Richard K. Guy), *MAA Carus Monograph Series*, to appear in March 2020.

### Book Chapters

- "What I Wish They'd Told Me: Notes from the Trenches of Academe", in *Teaching Excellence at a Research University* (E. Scott Geller and Philip K. Lehman, editors), Chapter 8 (pp.49-54), Pearson Custom Publishing, Boston, 2007.
- "Getting involved with the MAA: A Path Less Traveled," in *A Century of Advancing Mathematics* (Stephen Kennedy, ed.), MAA Press Washington DC, 2016

### Invited Talks

- Over 100 invited presentations and colloquia on research topics, including a Carriage House Distinguished Lecture, MAA Headquarters, Washington DC (2011); invited hour addresses to the MD-DC-VA (1999, 2007, 2011), Northeastern (2001, 2004 – the Christy Lecture, and 2007), EPaDel (2015) and Louisiana-Mississippi (2010 – the inaugural R. D. Anderson Lecture) Sections of the Mathematical Association of America; banquet keynote address at MathFest 2001; a two-hour workshop for Project NExT Fellows at MathFests 2007 and 2008; a one-hour version of that workshop at the Joint Math Meetings, 2008 and 2009; the Student Activities Lecture at MathFest 2008; the 46<sup>th</sup> SE International Conference on Combinatorics, Graph Theory and Computing (2015, two one-hour talks)
- Numerous lectures on number theory, cryptography and network security both at Virginia Tech and at other universities, colleges, high schools, and professional organizations; keynote speeches for the Virginia Computer Users Conference (1994), the All-School Colloquium on Mathematics at Woodberry Forest School (1996), and Math Awareness Month at Virginia Tech (1997, 2002) and at Worcester Polytechnic Institute (2002); the Norman W. Johnson Lecture at Wheaton (MA) College (2004); Appeared on "Math: No Problem," a segment of the Virginia Foundation for Humanities radio show *With Good Reason*, broadcast state-wide the week of January 26-30, 2004

### Presentations to Alumni and other University Groups

More than two dozen since 2005, including alumni chapters, class reunions, new faculty orientations, and the Old Guard.

### **Teacher Development**

- Workshop leader, NSF Workshop for High School Teachers on Mathematical Studies in Modeling, Mount St. Mary's College, 1993-96
- Presentation at Virginia Tech Faculty Development Initiative Workshop, 1995
- Mentor to sixteen graduate teaching assistants since 1992
- Mentor/Trainer of Student Helpers at the Math Emporium, 1999-2002
- Guest speaker at CEUT GTA Seminar, 1999-2005
- Dossier preparation workshop for the Academy of Teaching Excellence, 1997-2011
- GTA Training Workshop (with other Diggs Scholars), 1997-2012
- Program Development
- Developed (with Lorraine Holub) the Calculus Emerging Scholars Program (ESP), 1996-2001, with grants totaling \$339,540 (for pilot and full-scale projects) from Provost and Dean of Arts & Sciences
- ESP Project Director, 1996-2002
- Developed or revitalized four courses in Mathematics at the senior and graduate level: Graph Theory, History of Mathematics, Advanced Discrete Mathematics, and Cryptography I and II

### **Unusual Teaching Contributions**

- Taught Vector Geometry via email to a Freshman who was out of school for a semester due to illness, 1994
- Taught Number Theory via email to two high school students at Woodberry Forest School, 1996-97
- Taught 4 Freshman Honors Seminars (1971-73), 4 University Colloquia on Fantasy and Science Fiction (1974, 1975-76, 1978), 5 University Colloquia on Duke Ellington (1981-85), two University Colloquia on Problem Solving (2001, 2003)
- Teacher of Record, University Jazz Ensemble, 1973-74
- Rhodes/Marshall Mock Interviews, 1995-96, 1998
- Freshman Conversations (an honors program to orient Freshmen), 1996
- Mentor to Ashley White, University Honors Scholar, 2002; Marshall Scholar, 2005
- Mentor to David Gagnon, Horton Honors Scholar, 2004
- Mentor to Brad Shapiro, Class of 1954 University Honors Scholar, 2006

### **Student Research Projects**

- M.S. oral presentations (Catherine Stephens, Angela O'Kernick, Rita Cox, Stan Hartzler, Darrell Wells, Mike Rudacille, David Ferguson, Kurt Edmiston, Audrey Doughty, David Profili, Rose Feor, David Collins, Bastian Erdnuess, Jessica Kline, Lacey Ore, Felicia Freeman) since 1995
- Seventeen undergraduate research projects in mathematics and the honors program since 1990
- Mentor to more than fifty students in the Director's Summer Program and other summer research programs, Department of Defense, 1994 to present.

### **Mathematical Association of America Service (highlights)**

- Music Director and accompanist, "MAA: The Musical," MathFest 2011, Lexington KY, August 3, 2011; "MAA: The Musical<sub>2</sub>," MathFest 2012, Madison WI, August 1, 2012; "MAA: The Musical<sub>2.5</sub>," EPaDel Section Meeting, Lancaster PA, March 14, 2015; and "MAA: The Musical<sub>3</sub>," MathFest 2015 Meeting, Washington DC, August 8, 2015
- Associate Editor, American Mathematical Monthly, 1992 to present
- Editorial board, Math Horizons, 2004 to present
- MAA Council on Prizes and Awards, 2013 to present
- MAA Committee to Select Recipients of the Carl B. Allendoerfer Award, 2001-2002, 2005-2008; Chair, 2008 (given for articles of expository excellence in Mathematics Magazine)
- MAA Committee to Select Recipients of the Merten M. Hasse Award, 2009-2013; Chair, 2011-2013 (given for articles of expository excellence by a mathematician under 40)
- MAA Committee to Select Recipients of the Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member, 2010-2012
- MAA Committee on Invited Paper Sessions, 2010-2014

- MAA Search Committee for the Editor of Math Horizons (Chair), 2011-2012
- MAA Invited Addresses Committee for Joint Mathematics Meetings, 2014, 2011-2013
- MAA Task Force on the Daniel Solow Author's Award (Chair), 2015-2017
- MAA Task Force on Senior Members and Memberships (Chair), 2017-2018
- Consultant to MAA Project NExT (New Experiences in Teaching) Fellows, 1999 to present.
- MAA MD-DC-VA Section Teaching Award Committee, 1999-2005; Chair, 2000-2005
- Local Arrangements Coordinator, Fall 2001 Section Meeting
- Math Jeopardy Moderator, Spring Section meetings, 2007 to present.
- Section Program Chair, 2004-2006
- Section Governor (representative to the MAA Board of Governors), 2007-2010
- Project NExT Course "Starting and Maintaining Your Mathematical Research Program," given at MathFests 2007 and 2008 and JMM's 2008 and 2009

#### **Professional Organizations and Activities**

- Mathematical Association of America, 1975-present
- American Mathematical Society, 1969-1975
- Pi Mu Epsilon national mathematics honor society, 2006-present

#### **Community**

- Over forty performances with the Virginia Tech Jazz Ensemble, including a year as director
- Fifty-nine performances with the Blacksburg Master Chorale
- Six performances with Opera Roanoke