Contents of CV

Bernd S. W. Schröder

RESEARCH

Ordered Sets, Graph Theory,
Probability Theory, Harmonic Analysis (p. 30),
Integrated Engineering and Science Curricula (p. 34).
43 refereed papers (p. 5).
5 survey/invited papers (p. 11).
51 talks at conferences (p. 14).
9 principal/invited talks (p. 21).
9 funded grants (p. 28).

TEACHING

Variety of undergraduate/graduate classes (p. 27).
Created 7 on-line courses (p. 26).
Supervised 3 MS theses (p. 24).
Experience in using technology in the classroom (p. 37).
Experience in the design of integrated curricula (p. 34).
Wrote 6 undergraduate textbooks (p. 12).
Mentored 10 undergraduate research projects (p. 25).

SERVICE (DISCIPLINE)

Regularly refereeing papers for *Order*, *Discrete Mathematics* and other research and educational journals.
Reviewer for *Mathematical Reviews* and *Zentralblatt der Mathematik*.
NCTM CAEP Standards 2012 Program Reviewer.
ICFCA program committee (p. 22).
Organized special sessions at AMS/MAA meetings (p. 22).

SERVICE (USM)

Council of Chairs (2015-current)
Eagle SPUR reviewer 2016
Goldwater review committee 2015

SERVICE (LA Tech)

Mentor for junior faculty at Louisiana Tech.
Advisor for all mathematics majors.
University's Enrollment Management Council 2008-2014.
University's Instructional and Planning Council 2005-2008.
College-wide Tenure and Promotion Committee 2003-2006, served as committee chair in 2006.
Dean Search Committee 2004.
University Senate 2002-2005, Executive Committee 03-05.
Associate member of the College Leadership Team, Fall and Winter 2000-2001.
Planned and supervised computer lab construction in 2000.
Integrated curriculum teams, Louisiana Tech.

EXPERIENCE

2014–present THE UNIVERSITY OF SOUTHERN MISSISSIPPI
Department Chair (since 2014)
Professor (since 2014)

1997–2014 LOUISIANA TECH UNIVERSITY
Academic Director (2008-2014)
Edmondson/Crump Professor (2004-2014)
Professor and Program Chair (2003-2014)
Associate Professor (1997-2003)

1992–1997 HAMPTON UNIVERSITY
Assistant Professor (1993-1997)
Research Associate (1992-1993)

1988-1992 KANSAS STATE UNIVERSITY
Graduate Teaching and Graduate Research Assistant

EDUCATION

1988–1992 KANSAS STATE UNIVERSITY, Manhattan, KS
Ph. D. in Mathematics: July 1992
Advisors: Prof. Andrew G. Bennett (research)
Prof. George E. Strecker (teaching)
Dissertation: *On Generalized Maximal Functions and Distorted Local Times of Continuous (Semi-) Martingales*
M.S. in Mathematics: July 1989

1985–1988 TECHNISCHE UNIVERSITÄT BERLIN
Vordiplom (equivalent to B.S.) in
Mathematics and in Physics

LANGUAGES

German, English, French.

CITIZENSHIP

American

PROGRAMMING LANGUAGES

C, C++, R, (it is unclear what happened to D-Q)
BASIC, PASCAL, FORTRAN, Assembly Language.

PROFESSIONAL ORGANIZATIONS

American Mathematical Society,
Mathematical Association of America.

ADDRESS

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The University of Southern Mississippi
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Hattiesburg, MS 39406
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bernd.schroeder@usm.edu
http://www.math.usm.edu/schroeder

RECOGNITIONS AND HONORS

- Distinguished Teaching Award, Mathematical Association of America, Louisiana/Mississippi Section, 2014
- Named as a Board of Regents Endowed Professor in the College of Engineering and Science at Louisiana Tech University, holding the title of Edmondson/Crump Professor, 2004.
- Award for Outstanding Achievement in Teaching, Research and Service, Louisiana Tech University, College of Engineering and Science, 1999.
- T.L. James Award for Outstanding Achievement in Teaching, Louisiana Tech University, College of Engineering and Science, 1998 (Co-recipient, award was to the Freshman Team).
- Best male mathematics teacher (“Mr. Mathematics Professor”), vote by the senior mathematics students at Hampton University, 1997.
- Outstanding Graduate Student in Academics Award, KSU, Department of Mathematics, 1991.
- Member PHI KAPPA PHI honor society, KSU 1989.
- Outstanding Graduate Student in Academics Award, KSU, Department of Mathematics, 1989.
- Sponsored by the *Studienstiftung des deutschen Volkes* (*German National Scholarship Foundation*), 1986-1990.

Refereed Publications

1. *The Fixed Point Property for Ordered Sets of Interval Dimension* 2
   to appear in Order, available at http://link.springer.com/article/10.1007/s11083-016-9401-4

2. *The Fixed Vertex Property for Graphs*
   Order 32 (2015), 363-377

3. *A Cacciopoli-Type Inequality to Prove Coercivity of a Bilinear Form Associated with Spatial Hysteresis Internal Damping for an Euler-Bernoulli Beam* (with J. Walters and K. Evans)
   Journal of Mathematical Analysis and Applications 425 (2015), 520–535

   Mathematical review MR3299677

4. *The Copnumber for Lexicographic Products and Sums of Graphs*,
   Contributions to Discrete Mathematics 9 (2014), no. 2, 45–49

   Mathematical review MR3320447

5. *Ordered Sets that are Reconstructible from Two Cards and the Number of Comparabilities*,
   Order 31 (2014), 365–371

   Mathematical review MR3265975

6. *A* 2*-Antichain that is not Contained in any Finite Retract* (with M. Kukieła),
   Algebra Universalis 67 (2012), 59–62

   Mathematical review MR2885513

7. *Pseudo-Similar Points in Ordered Sets*,
   Discrete Mathematics 310 (2010), 2815–2823

   Mathematical review MR2677639

8. *Examples of Powers of Ordered Sets with the Fixed Point Property*
   Order 23 (2006), 211–219

   Mathematical review MR2308907

9. *The Automorphism Conjecture for Small Sets and Series Parallel Sets*,
   Order 22 (2005), 371–387

   Mathematical review MR2220346

10. *Rearranging the Calculus Sequence to Better Serve its Partner Disciplines,* American Mathematical Monthly 113 (2006), 628–636

11. *Isotone Relations Revisited* (with M. S. Roddy), Discrete Mathematics 290 (2005), 229–248

    Mathematical review MR2123392

12. *A fixed point theorem with applications to truncated lattices* (with A. Rutkowski), Algebra Universalis 53 (2005), 175–187

    Mathematical review MR2148293

13. *More Examples on Ordered Set Reconstruction*, Discrete Mathematics 280 (2004), 149–163

    Mathematical review MR2043805

14. *On Ordered Sets with Isomorphic Marked Maximal Cards*, Order 20 (2003), 299–327

    Mathematical review MR2079147

15. *Examples on Ordered Set Reconstruction*, Order 19 (2002), 283–294

    Mathematical review MR1942188

16. *Reconstruction of finite truncated semi-modular lattices* (with J.-X. Rampon), Journal of Combinatorial Theory, Series B 86 (2002), 254–272

    Mathematical review MR1933462

17. *Determining if (FC-) (Conflict-Directed) Backjumping Visits a Given Node is NP-hard*, Artificial Intelligence 132 (2001), 105–117

    Mathematical review MR1858426

18. *Establishing an Integrated Mathematics, Engineering, and Science Curriculum: Lessons Learned* (with J. Nelson), Proceedings of the 2001 Annual ASEE conference, paper nr. 1299

- A shorter version of this paper appears under the title "*Implementing an integrated engineering curriculum*" in the Proceedings of the workshop on Implementing Curricular Change in Engineering Education, Union College, Schenectady, NY, October 2001

19. *Strictly order-preserving maps into $\mathbb{Z}$, II: A 1979 problem of Erné* (with Jonathan Farley)
Order 18 (2001), 381–385

    Mathematical review MR1884429

20. *Reconstruction of N-free ordered sets*,
Order 18 (2001), 61–68

    Mathematical review MR1844517

21. *The Copnumber of a Graph is Bounded by* $\left\lfloor \frac{3}{2}\text{genus}(G) \right\rfloor + 3$,

    Trends in Mathematics (2001), "Categorical Perspectives," Proceedings of the Conference in Honor of George Strecker's 60th Birthday (Kent, OH 1998), Birkhäuser, pp. 243–263

    Mathematical review MR1827672

22. *Reconstruction of the neighborhood deck of an ordered set*,
Order 17 (2000), 255–269

    Mathematical review MR1809725

23. *Uniqueness of the core for chain-complete ordered sets*,
Order 17 (2000), 207–214

    Mathematical review MR1809321

24. *Team Teaching Merged Sections as a Way of Mentoring Faculty*
(with J. Carpenter, D. Meng and N. Ponder)
Proceedings of the Frontiers in Education 2000 conference

25. *Performance guarantees and applications for Xia's algorithm*
(with M. Donalies) Discrete Mathematics 213 (2000), Proceedings of the Banach Center Minisemester in Discrete Mathematics, week on ordered sets, 67–86

    Mathematical review MR1755412

26. *On three notions of orthosummability in orthoalgebras*,
International Journal of Theoretical Physics 38 (1999), 3305–3313

    Mathematical review MR1764466

27. *Mathematical support for an integrated engineering curriculum*
(with J. Carpenter), Proceedings of the 1999 ASEE summer conference

28. *A connection between fixed-point theorems and tiling problems*
(with J. Jachymski and J. Stein),
Journal of Combinatorial Theory – Series A 87 (1999), 273–286

    Mathematical review MR1704262

29. *Fixed Cliques and Generalizations of Dismantlability*,
in: Combinatorics, Graph Theory and Algorithms (edited by Y. Alavi, D. R. Lick and A. Schwenk), Proceedings of the Eighth Quadrennial International Conference on Graph Theory, Combinatorics, Algorithms and Applications at Western Michigan University (1999), pp. 747–756

    Mathematical review MR1985106

30. *Recursive condition for positivity of the angle for multivariate stationary processes* (with A. Makagon and A. G. Miamee),
Proceedings of the American Mathematical Society 126 (1998), 1821–1825

    Mathematical review MR1443841

31. *On cc-comparability invariance of the fixed point property*,
Discrete Mathematics 179 (1998), 167–183

    Mathematical review MR1489081

32. *Problems related to fixed cliques in graphs*,
Graph Theory Notes of New York XXX (1996), 42–46

    Mathematical review MR1661924

33. *Fixed point theorems for ordered sets P for which $P \setminus \{a, c\}$ is a retract*,
Order 13 (1996), 135–146

    Mathematical review MR1404458

34. *On pasting A_p-weights*,
Proceedings of the American Mathematical Society 124 (1996), 3339–3344
Mathematical review MR1328376

35. *On completeness of the spectral domain of harmonizable processes* (with A. G. Miamee),
Probability Theory and Related Fields 101 (1995), 303–309
Mathematical review MR1324087

36. *On retractable sets and the fixed point property*,
Algebra Universalis 33 (1995), 149–158
Mathematical review MR1318979

37. *Retractability and the fixed point property for products* (with A. Rutkowski), Order 11 (1994), 353–359
Mathematical review MR1321753

38. *Lagois connections – a counterpart to Galois connections* (with A. C. Melton and G. E. Strecker),
Theoretical Computer Science 136 (1994), 79–107
Mathematical review MR1311053

39. *Fixed point property for 11-element sets*,
Order 10 (1993), 329–347
Mathematical review MR1269270

40. *On generalized maximal functions*,
Proceedings of the American Mathematical Society 118 (1993), 619–625
Mathematical review MR1158009

41. *The strong fixed point property for lexicographic sums*,
Order 9 (1992), 311–319
Mathematical review MR1233343

42. *On the number of nondismantlable posets with the fixed point property*,
Order 8 (1992), 325–329
Mathematical review MR1173138

43. *Connections* (with A. C. Melton and G. E. Strecker),
Proceedings of the Mathematical Foundations of Programming Semantics, Lecture Notes in Computer Science 598 (1992), 492–506

    Mathematical review MR1251331

Currently in review:

44. *A Finite Ordered Set that Contains No Crowns with* 6 *or More Elements is D2-Collapsible*, submitted to Discrete Mathematics

Currently in preparation:

45. *Generalizing a Caccioppoli-Type Inequality* (with V. Komornik and J. Ding)
46. *Reconstruction of the Non-Extremal Card-Neighborhood Deck of an Ordered Set*
47. *Reconstruction of Ordered Sets with a Minmax Pair of Pseudo-Similar Points*

Invited and Invited Survey Papers

1. *The Use of Retractions in the Fixed Point Theory for Ordered Sets* (survey), In: Monther Alfuraidan and Qamrul Hasan Ansari (2016), Fixed Point Theory and Graph Theory – Foundations and Integrative Approaches, ElSevier, 365–417

   Proceedings of the workshop on Fixed Point Theory and Applications, King Fahd University of Petroleum and Minerals, December 2014, Dhahran, Saudi Arabia

2. *The Fixed Point Property for Ordered Sets* (survey),
   Arabian Journal of Mathematics 1 (2012), 529–547

   Mathematical review MR3041063

3. *An Enumeration Problem in Ordered Sets Leads to Possible Benchmarks for Run-Time Prediction Algorithms* (with T. Kulkarni),
   invited lecture, in: Rokia Missaoui, Jürg Schmidt (ed.), Formal Concept Analysis: 4th International Conference, ICFCA 2006, Dresden, Germany, February 13-17, 2006, Proceedings, Lecture Notes in Computer Science 3874 (2006), Springer, 30–44

4. *Algorithms for the fixed point property* (survey),
   Theoretical Computer Science 217 (1999), 301–358, Proceedings of the ORDAL 96, also available at

   `http://www.csi.uottawa.ca/ordal/papers/schroder/FINSURVE.html`

   Mathematical review MR1688618

5. *Fixed point property for ordered sets (posets)*,
   survey contribution to the Encyclopedia of Mathematics, also available at

   `http://eom.springer.de/F/f110100.htm`

Books

1. *Ordered Sets – An Introduction with Connections from Combinatorics to Topology* ,
   Birkhäuser, Boston – Basel – Berlin, 2016 (second edition, first edition: 2003), a text for advanced undergraduate/beginning graduate students

   available at http://www.springer.com/us/book/9783319297866

   Library of Congress #QA171.48.S47 2002, ISBN #978-3-319-29788-0 (second edition, e-book), ISBN #978-3-319-29786-6 (second edition, hardcover), ISBN #0-8176-4128-9 (first edition)

   Mathematical review MR1944415

2. *Single Variable Calculus with Precalculus* (third edition),
   Fountainhead Press, Southlake, TX, 2012, a modular text that integrates precalculus and single variable calculus with connections to other fields in science and engineering; also includes calculus based statistics up to and including the Central Limit Theorem; combined electronic edition that includes the revised version of the text 6 is available

   ISBN#978-1-59871-615-3

3. *Fundamentals of Mathematics – An Introduction to Proofs, Logic, Sets and Numbers*,
   John Wiley & Sons, Inc., Hoboken, NJ, 2010, a text for a first proof class

   Library of Congress #QA248.S358 2010, ISBN #978-0-470-55138-7

4. *A Workbook for Differential Equations*,
   John Wiley & Sons, Inc., Hoboken, NJ, 2010, a text for a sophomore level differential equations course

   Library of Congress #QA371.S384 2010, ISBN #978-0-470-44751-2

5. *Mathematical Analysis – A Concise Introduction*,
   John Wiley & Sons, Inc., Hoboken, NJ, 2007, a text for advanced undergraduate and beginning graduate students

   Library of Congress #QA300.S376 2007, ISBN #978-0-470-10796-6

   Licensed to the Scientific American Book Club, introduced as an alternate selection, June 2008.

   Mathematical review MR2354744

6. *Multivariable Calculus*,
   Fountainhead Press, Southlake, TX, 2005, a modular text that integrates multivariable calculus with connections to other fields in science and engineering

   ISBN #1-932274-77-4

Talks, Abstracts

1. *A polynomial algorithm to check the fixed point property for ordered sets of dimension 2*
   3rd annual Mississippi Discrete Mathematics Workshop at the University of Mississippi, Oxford, MS, Nov 14-15, 2015

2. *Is there a Polynomial Algorithm that Certifies the Fixed Point Property for an Ordered Set with a Collapsible Chain Complex?*
   American Mathematical Society sectional meeting in Memphis, TN, special session on Topological Combinatorics, talk nr. 1113-06-56

3. *Using Algebraic Topology to Prove Performance Guarantees for a Constraint Satisfaction Algorithm?*
   3rd annual Mississippi Discrete Mathematics Workshop at Mississippi State University in Starkville, November 15-16, 2014.

   Note. This talk was a shorter version of my invited talk 2 at KFUPM.

4. *Flipping the Calculus Sequence*
   Mathematical Association of America Louisiana-Mississippi sectional meeting, March 2013, Hattiesburg, MS

5. *Teaching Class Upside Down Without Getting a Head Rush*
   Contribution to a Section NeXT panel discussion at the Mathematical Association of America's Louisiana Mississippi sectional meeting in March 2012, Natchitoches, LA

6. *Starting the Endgame for the Reconstruction Problem for Ordered Sets?*
   OAL2.0: Second International Conference on Order, Algebra and Logics: honoring Ralph McKenzie, Hiroakira Ono and Andrzej Wronski, June 2011, Krakow, Poland

7. *(How) Can We Teach Proofs? A Classical Approach.*
   American Mathematical Society-Mathematical Association of America-Society for Industrial and Applied Mathematics Joint Mathematics Meetings, New Orleans, LA, January 2011, talk nr. MCP GET G1, Mathematical Association of America Session on Getting Students Involved in Writing Proofs

8. *On-Line Delivery of Differential Equations: (How) Does It Work?*
American Mathematical Society-Mathematical Association of America-Society for Industrial and Applied Mathematics Joint Mathematics Meetings, San Francisco, CA, January 2010, talk nr. 1056-BD-248, Mathematical Association of America Invited Paper Session on Online Delivery of Mathematics

9. *Some Approaches to Improve Student Performance in Early Mathematics Classes*
panelist on the panel discussion "Course Redesign in Freshmen Level Mathematics: What is working, what is not at your institution!" at the Mathematical Association of America sectional meeting in Lake Charles, LA, February 29, 2008

10. *Can We Change the Paradigm for Reconstruction?*
American Mathematical Society-Mathematical Association of America-Society for Industrial and Applied Mathematics Joint Mathematics Meetings, New Orleans, LA, January 2007, talk nr. 1023-06-221, special session on Universal Algebra and Order

11. *Integrating Math with Other Disciplines*
American Mathematical Society-Mathematical Association of America-Society for Industrial and Applied Mathematics Joint Mathematics Meetings, San Antonio, TX, January 2006 (panelist on a panel session)

12. *Infinite Products of Ordered Sets with the Fixed Point Property*
American Mathematical Society-Mathematical Association of America-Society for Industrial and Applied Mathematics Joint Mathematics Meetings, San Antonio, TX, January 2006, talk nr. 1014-06-60, special session on The Many Lives of Lattice Theory and Ordered Sets

13. *Integrating Math & Science for Science Majors*
(with J. Carpenter and delivered by her)
Mathfest 2005, Albuquerque, NM August 4-6, 2005

14. *Using MERLOT in Teaching Mathematics, Physics and Engineering*
panelist at the MERLOT (Multimedia Educational Resource for Learning and On-Line Teaching) International Conference, Nashville, TN, July 2005

15. *Integrating Mathematics, Engineering and the Sciences in Multivariable Calculus*
    2005 conference of the Louisiana Academy of Science, March 18, 2005

16. *Using MERLOT to turn research into research that has impact* (with A. Bedard Voorhees and J. Rutledge),
    American Mathematical Society-Mathematical Association of America-Society for Industrial and Applied Mathematics Joint Mathematics Meetings, Atlanta, GA, January 2005, talk nr. 1003-V1-759

17. *Competitive Textbooks Developed with Public Domain Authoring Tools*
    MERLOT (Multimedia Educational Resource for Learning and On-Line Teaching) International Conference, Costa Mesa, CA, Aug. 2004

    at the same conference I presented my textbooks as part of the Learning Objects Fair under *"Holistic Presentation of College Mathematics via Public Domain Authoring Tools"*

    I also participated in the panel presentation *"Using MERLOT to Engage Students in the Teaching/learning Process: A Panel Presentation"*

18. *MERLOT As A Tool To Support Mathematics Instruction As Well As Development of New Innovative Strategies*
    workshop session at the Louisiana MERLOT (Multimedia Educational Resource for Learning and On-Line Teaching) conference, Baton Rouge, LA, April 2003 (also served as co-organizer for the conference)

19. *Perceived Needs of Secondary Schools and Suggestions How to Meet Them*
    American Mathematical Society meeting in Baton Rouge, LA, March 2003, talk nr. 984-97-50

20. *Results and Partial Counterexamples on Order Reconstruction*
    American Mathematical Society-Mathematical Association of America-Society for Industrial and Applied Mathematics Joint Mathematics Meetings, Baltimore, MD, January 2003, talk nr. 983-06-661

21. *Integrated Precalculus and Calculus that Connects with Engineering and Science and Does Some Proofs*
    American Mathematical Society-Mathematical Association of America-Society for Industrial and Applied Mathematics Joint Mathematics Meetings, Baltimore, MD, January 2003, talk nr. 983-W1-662

22. *Using MERLOT to Support Change in a Homogeneous Market?*
    Second International MERLOT (Multimedia Educational Resource for Learning and On-Line Teaching) conference, Atlanta, GA, September 2002

23. *Mathematics in a Freshman and Sophomore Integrated Engineering Curriculum*
    Third Richard A. Harvill Conference on Higher Education ("Developing a Sense of Place for Distance Education"), Tucson, AZ, January 2002

24. *Connecting Differential Equations to a Freshman and Sophomore Integrated Engineering Curriculum*
    American Mathematical Society-Mathematical Association of America-Society for Industrial and Applied Mathematics Joint Mathematics Meetings, San Diego, CA, January 2002, talk nr. 973-C1-97

25. *The automorphism problem for ordered sets*
    American Mathematical Society-Mathematical Association of America-Society for Industrial and Applied Mathematics Joint Mathematics Meetings, San Diego, CA, January 2002, talk nr. 973-06-28

26. *Implementing an Integrated Engineering Curriculum* (with J. Nelson), workshop on Implementing Curricular Change in Engineering Education, Union College, Schenectady, NY, October 2001

27. *Remember books ... ?*
    Contribution to the panel "A state system approach to MERLOT" (organized by G. Harvey), First International MERLOT (Multimedia Educational Resource for Learning and On-Line Teaching) conference, University of South Florida, Tampa, FL, August 2001

    At the same conference, I also organized the panel *Challenges and successes in reviewing mathematics* for the MERLOT mathematics discipline team

28. *Establishing an Integrated Mathematics, Engineering, and Science Curriculum: Lessons Learned* (with J. Nelson),
    2001 Annual American Society for Engineering Education conference, July 2001

29. *N-free ordered sets are reconstructible*
    16$^{\text{th}}$ Shanks Lecture Series and Horizons in Combinatorics Conference, Vanderbilt University, May 2001

30. *Using item analysis to adjust testing and topical coverage in individual courses*,
    Best Assessment Processes IV conference, Rose-Hulman Institute of Technology, April 2000

31. *Recurrent concepts in the (engineering) mathematics sequence: error estimates* (preliminary report),
    American Mathematical Society-Mathematical Association of America-Society for Industrial and Applied Mathematics Joint Mathematics Meetings, New Orleans, January 2001, nr. 962-97-67

32. *Integrating mathematics with the undergraduate engineering curriculum: using just-in-time delivery* (with J. Carpenter and delivered by her),
    American Mathematical Society-Mathematical Association of America-Society for Industrial and Applied Mathematics Joint Mathematics Meetings, New Orleans, January 2001, nr. 962-G1-579

33. *Team Teaching Merged Sections as a Way of Mentoring Faculty* (with J. Carpenter, D. Meng and N. Ponder),
    Frontiers in Education 2000 conference,

34. *Mathematical support for an integrated engineering curriculum*, (with J. Carpenter and delivered by her),
    1999 American Society for Engineering Education summer conference, Charlotte, NC, June 1999

35. *The integrated engineering curriculum at Louisiana Tech University* (with J. Carpenter),
    American Mathematical Society meeting 939, San Antonio, TX, January 1999, ref. nr. 939-M1-454

36. *Projectivity in infinite products of ordered sets*,
    conference in honor of G. Strecker's 60th birthday, Kent State University, August 1998

37. *Mentoring students at Louisiana Tech University*
(with J. Carpenter and delivered by her),
Toronto Mathfest, July 1998

38. *Embedding orthomodular lattices and orthomodular posets into atomic orthomodular lattices resp. orthomodular posets*,
1997 meeting of the International Quantum Structures Association in Atlanta, GA

39. *Using an Algorithm by Xia to Tackle Decision and Enumeration Problems*
(with M. Donalies),
American Mathematical Society meeting nr. 918, San Diego, CA, 1997, ref. nr. 918-06-111

40. *The fixed clique property*,
Eighth Quadrennial Conference on Graph Theory, Combinatorics, Algorithms and Applications, Kalamazoo, MI, June 1996

41. *The fixed simplex and the fixed clique property and their relation to the fixed point property for truncated lattices*,
International Conference on Modern Algebra and Its Applications, Vanderbilt University, Nashville, TN, May 1996

42. *The fixed clique property for graphs*,
Southeastern International Conference on Combinatorics and Graph Theory, Baton Rouge, LA, February 1996

43. *Problems related to the fixed point property for Products of Ordered Sets*,
American Mathematical Society meeting nr. 906, Greensboro, NC, 1995 (special session on the theory of ordered sets), ref. nr. 906-06-93

44. *Problems related to fixed cliques in graphs*,
presentation in the problem session of Graph Theory Day XXX, Drew University, 1995

45. *The connection between graph theory and the product property for ordered sets*,
American Mathematical Society meeting nr. 899, Orlando, FL, 1995 (special session on combinatorics and graph theory), ref. nr. 899-06-31

46. *On the angle between past and future for bivariate stationary processes* (with A. G. Miamee),
American Mathematical Society meeting nr. 891, Manhattan, KS, 1994 (special session on probability theory and harmonic analysis), ref. nr. 891-42-06

47. *On the completeness of the spectral domain for harmonizable processes* (with A. G. Miamee),
American Mathematical Society meeting nr. 882, DeKalb, IL, 1993 (special session on probability theory and stochastic processes), ref. nr. 882-28-69

48. *On generalized d-functionals*,
American Mathematical Society meeting nr. 878, San Antonio, TX, 1993 (session on analysis), ref. nr. 878-42-194

49. *Retractable points and the fixed point property*,
American Mathematical Society meeting nr. 876, Dayton OH, 1992 (special session on combinatorics), ref. nr. 876-06-05

50. *On generalized maximal functions*,
American Mathematical Society meeting nr. 871, Baltimore MD, 1992 (session on probability theory), ref. nr. 871-60-126

51. *New completeness criteria for posets and applications*,
Conference in honor of G. Birkhoff's 80th birthday, general session, Darmstadt, 1991

Colloquium talks and research visits at:
Brandon University, Cornell University, Dalhousie University, Emory University, Hampton University, Kansas State University, King Fahd University of Petroleum and Minerals, Oxford University, Southwest Jiaotong University, Université de Nantes, University of Louisiana at Lafayette, University of Texas at El Paso, Vanderbilt University, Warsaw Technical University

Recruitment talks at:
Lyons College, Sam Houston State University, Southeastern Louisiana University, University of Monticello.
Airline High School, Shreveport, LA; Louisiana School for Mathematics, Science and the Arts, Natchitoches, LA; Mississippi School for Mathematics and Science, Columbus, MS.

Principal/Invited Talks

1. *Why being just a teacher is not "just" being a teacher*
   Outstanding Teacher Address at the 2015 Louisiana/Mississippi section meeting of the Mathematical Association of America, February 28, 2015, Long Beach, MS

   Versions of this talk were also given as an hour long talk at the 2015 Annual Meeting of the Mississippi Collegiate Mathematical Association (MCMA), Friday, April 10, 2015, Holmes Community College – Ridgeland Campus and as a keynote address at the Louisiana/Mississippi Mathematical Association of Two-Year Colleges (LaMsMATYC) conference at Pearl River Community College, Forrest County Center, Saturday, September 29, 2015.

2. *Using Algebraic Topology to Prove Performance Guarantees for a Constraint Satisfaction Algorithm?*
   King Fahd University of Petroleum and Minerals, workshop on Fixed Point Theory and Applications, December 2014, Dhahran, Saudi Arabia

   Note. A shorter version of this talk was given at Mississippi State University, see talk nr. 3.

3. *Proving Polynomial Solvability Using Local Consistency Enforcement*
   King Fahd University of Petroleum and Minerals, workshop on Computational and Algebraic Graph Theory, December 2013, Dhahran, Saudi Arabia

4. *The Fixed Point Property for Ordered Sets*
   King Fahd University of Petroleum and Minerals, workshop on Nonlinear Analysis and Fixed Point Theory, December 2012, Dhahran, Saudi Arabia

5. *An Enumeration Problem in Ordered Sets Leads to Possible Benchmarks for Run-Time Prediction Algorithms,*
   Fourth International Conference on Formal Concept Analysis, Dresden, Germany, February 2006

6. *Order from* 0 *to* $\omega + 1$,
   26^{th} Annual Western Kentucky University Undergraduate Symposium, November 2003

7. *The fixed point property for ordered sets*,
   Banach Center symposium and summer school on ordered sets, Warsaw, Poland, July 1999

8. *The fixed point property for ordered sets and its connections to algorithms, graph theory, algebraic topology and analysis*,
   Week on Partially Ordered Sets in the Minisemester on Discrete Mathematics at the Stefan Banach International Center for Mathematics, Warsaw, Poland, September 1996

9. *Algorithms for the fixed point property*,
   ORDAL 96, Ottawa, Canada, August 1996

Organization of Events/Special Issues

1. Co-editor (with Mohamed A. Khamsi and Hichem Ben-El-Mechaiekh) for the Special Issue "Recent Contributions to Fixed Point Theory and Its Applications" of the journal *Abstract and Applied Analysis*. The editorial article of the same title appears in Abstract and Applied Analysis Volume 2014 (2014), Article ID 329815, 1 page at `http://dx.doi.org/10.1155/2014/329815`

   Note. The bulk of the work was handled by my two co-editors.

2. Organized the Mathematical Association of America Invited Paper Session "Online delivery of mathematics" at the Joint Mathematics Meetings in San Francisco, January 13-16, 2010

3. Organized and taught the NSF-Chautauqua workshop "Connecting Mathematics with Engineering and the Sciences" in Ruston, LA, July 20-22, 2006

4. Member of the program committee of the Fourth International Conference on Formal Concept Analysis (ICFCA 06), Dresden, Germany, February 13-17, 2006

5. Member of the program committee of the Third International Conference on Formal Concept Analysis (ICFCA'05 - LENS), Lens, France, February 14-18, 2005.

6. Organized the American Mathematical Society special session "The theory of ordered sets" at American Mathematical Society meeting nr. 906 in Greensboro, NC, November 17-18, 1995

Educational Consulting

1. Evaluated Yamie Chess for Yamie Chess Ltd. in 2013.

   https://www.yamiechess.com/latech

2. Software review: TEXCAD for Windows, TUGboat 29 (2008), 333-334

3. External Materials Evaluator in D. Kirschner and B. Chance's evaluation study "The laboratory component of Calculus II at Washington University," final report in August 2005. Evaluated the connection between lab and lecture content, including detailed review of the lab manual.

4. Evaluated an on-line homework system for ITP in 2003.

5. Reviewer for calculus texts: 4 chapters of Smith/Minton's calculus text in 2003, second edition of Stewart's "Concepts and Contexts" text in 2003.

6. McGraw-Hill Calculus workshop in Charleston, SC, 2002.

Master's Theses advised

1. *The Computation and Comparison of Decks of Small Ordered Sets*,
   J. Hughes, Louisiana Tech University, spring 2004

2. *Experimental evaluation of selected algorithms for estimating the cost of solving a constraint satisfaction problem*,
   T. Kulkarni, Louisiana Tech University, summer 2001
   Although the committee chairman is Dr. Choi of the Louisiana Tech Computer Science Program (the thesis is in Computer Science), Mr. Kulkarni's research work was directed by me.

3. *Implementation and analysis of Xia's algorithm*,
   M. Donalies, Hampton University, summer 1997
   presented at the Mathematical Association of America spring meeting in Williamsburg, VA, April 1997

Undergraduate Research Projects

1. *Simultaneous Tangent Lines to a Pair of Parabolas*
   N. Collins, Louisiana Tech University, Winter quarter 2012-13

   This project was entirely student-driven. I gave suggestions on the paper and helped assure that a case distinction was clean. The student's paper earned the 3rd *place in the student paper competition at the Mathematical Association of America Louisiana/Mississippi sectional meeting in March 2013 in Hattiesburg, MS.*

2. *Constraint Satisfaction Problems*
   D. Welch, Louisiana Tech University, Winter quarter 2012-13

3. *From DC to AC*,
   A. Hector, University of the Virgin Islands, St. Croix, Summer 2007

4. *Hamiltonian cycles in chess: knight's tours*,
   N. Thompson, Hampton University, Ac. Yr. 1996-1997
   Presented at Beta Kappa Chi National Institute of Science, April 1997, chosen best Mathematics and Computer Science presentation.
   Presented at the Mathematical Association of America spring meeting in Williamsburg, VA, April 1997,
   tied for 3rd place among the undergraduate presentations

5. *Complete subgraphs of (r-partite) graphs*,
   D. Shirley and N. Thompson, Hampton University, Ac. Yr. 1995-1996

6. *Fermat's little theorem*,
   N. Thompson, Hampton University, Ac. Yr. 1994-1995

7. *Constructing* $\mathbb{Q}$ *from* $\mathbb{N}$,
   D. Shirley, Hampton University, Ac. Yr. 1994-1995

8. *Absolute vs. unconditional convergence*,
   E. Young, Hampton University, Spring 1994

9. *Efficient representation of ordered sets using Hasse diagrams*,
   D. Shirley, Hampton University, Ac. Yr. 1993-1994

10. *"Do japanese children play fair?" (an analysis of a japanese children's game)*, E. Young, Hampton University, Spring 1993

Electronic Materials Developed

1. On-line single variable calculus modules, available on YouTube under "Concise Modular Calculus."

   26 hours, 59 minutes and 6 seconds of video. Completed in February 2013.

2. On-line multivariable calculus modules, available on YouTube under "Concise Modular Calculus."

   26 hours, 49 minutes and 12 seconds of video. Completed in December 2012.

3. On-line introductory number theory course,

   13 hours, 11 minutes and 55 seconds of video. Completed in August 2012.

4. On-line introductory complex analysis course,

   16 hours, 4 minutes and 2 seconds of video. Completed in October 2010.

5. On-line introductory statistics course,

   16 hours, 10 minutes and 22 seconds of video. Completed in June 2010.

6. On-line course introducing the student to proofs,

   23 hours, 5 minutes and 31 seconds of video. Completed in July 2009.

7. On line differential equations course,

   15 hours, 7 minutes and 59 seconds of video. Completed in November 2008.

8. Animations that explain a variety of calculus topics, available at

   http://www.math.usm.edu/schroeder/animations.htm

9. EXCEL tool to teach elementary statistics, available at

   http://www.math.usm.edu/schroeder/sprsh.html

Classes Taught

1. At Louisiana Tech University: College Algebra, Precalculus Algebra (technology supported and in the integrated engineering curriculum), Precalculus Trigonometry (technology supported), Calculus I (technology supported), Calculus I-IV (integrated engineering or integrated science curriculum, traditional as well as “flipped”), Differential Equations (integrated engineering curriculum and on-line), Fundamentals of Mathematics, Number Theory, Statistical Methods (face-to-face and on-line), Theory of Functions of Complex Variables (on-line), Introduction to Real Analysis, Introductory Analysis, Functional Analysis

2. At the University of the Virgin Islands (St. Croix campus): Discrete Dynamical Systems (in the Master’s Degree in Mathematics for Teachers Program)

3. At Hampton University: College Algebra (technology supported), Trigonometry, Business Calculus (technology supported), Foundations of Mathematics, Discrete Structures, Modern Algebra, Foundations of Analysis, Number Theory, Linear Algebra (graduate class)

4. At Kansas State University (TA): College Algebra, Calculus I, Calculus II, Differential Equations (technology supported)

Internships

1998 LaCEPT internship with LaSIP in-service teacher professional development project, 3 weeks working with high school teachers on instructional technology, alternative assessment, cooperative learning

1986 Berliner Verkehrs Betriebe (BVG) Ausbildungswerkstatt, 13 weeks basic instruction in working metal; filing, drilling, milling, turning, welding, blacksmithing

Funding History

Principal Investigator

1. Louisiana Board of Regents, "Consulting for the MERLOT (Multimedia Educational Resource for Learning and On-Line Teaching) project," \$20,000 for AY 2000-01 through 2005-06

2. Louisiana Tech University, Center for Entrepreneurship and Information Technology, equipment proposal (desktop computer), \$2,400 in AY 2001-02

3. (co-PI with Dr. Hisham Hegab, David Hall and David Cowling), Louisiana Board of Regents enhancement grant, "Hands-on learning in undergraduate fluid mechanics," \$75,600 for AY 2000-01

4. (co-PI with Dr. James D. Nelson) National Science Foundation, Action Agenda program, "Institutionalization of an integrated engineering curriculum at Louisiana Tech University," ≈\$650,000 for AY 1999-2000 through 2001-02

5. Louisiana Board of Regents, Research Competitiveness Subprogram, "A unified treatment of constraint satisfaction problems leads to new insights and tools," ≈\$75,000 for AY 1999-2000 through 2001-02

6. Louisiana Systemic Initiatives Program, "Benefiting Intellectual Growth with Technology," ≈\$110,000 for AY 1999-2000,

7. Louisiana Board of Regents, Fellow of Excellence in Education (Faculty Incentives and Rewards - Undergraduate Program), "Mathematical Support for an Integrated Engineering Curriculum, ≈\$27,000 for AY 1998-99 and 1999-2000

8. LaCEPT internship, \$3,250 for June 1998

9. Office of Naval Research grant nr. N 00014-95-1-0660, "Structural Results for Ordered Sets and Graphs via the Fixed Point Property," ≈\$180,000 for AY 1995-96 and 1996-97,

Mentor for grants. For the following grants I provided significant assistance to the P.I.s in obtaining the funding. Since then, I have routinely proofread junior faculty's proposals and offered suggestions to strengthen them.

1. Dr. K. Al-Agha and Dr. N. Ponder, Louisiana Systemic Initiatives Program, "Mathematical Technology and Educational Methods," ≈\$110,000 for AY 2000-01

2. Dr. N. Ponder, LaCEPT internship, ≈\$4,000 for June 1999

Senior faculty and collaborator on the proposal. For the following grant I was senior faculty and provided significant aid in the preparation of the proposal as indicated.

- J. Carpenter et. al., NSF-CCLI A& I, "Integrating the Sciences and Secondary Science Education in the Early College Curriculum," ≈123,000 for AY 2003-04 through 2005-06

  I wrote most of the narrative, Dr. Carpenter finalized it.

Visiting Appointments

1. University of the Virgin Islands, St. Croix campus, Department of Mathematics, summer 2007. Visiting professor. Taught a class on discrete dynamical systems in the Master's Degree in Mathematics for Teachers program.

2. University of Nantes, Department of Computer Science, summer 2000. Maître de Conférence invité 1$^{\text{ère}}$ classe 4$^{\text{ème}}$ échelon. Performed research on the reconstruction problem for ordered sets with J.-X. Rampon.

Research Interests

My primary research area is the theory of **ordered sets**. My text on ordered sets (see nr. 1, p. 12) takes a thematic view of the theory, using major open problems to motivate the investigation of certain order-theoretical structures. Among these open problems are the problems that are most interesting to me.

1. **The fixed point property.** An ordered set P has the **fixed point property** iff each order-preserving map $f : P \to P$ has a fixed point $p = f(p)$.

   This is, strictly speaking, not a problem, but a property. Its investigation has shaped much of my early work. Indeed, the papers 23, 25, 29, 31, 33, 36, 37, 39, 42, the surveys 2, 4 and 5 (p. 11), the principal talks 3, 4, 7, 8, 9 (p. 22) and the grants 5 and 9 (p. 28) all are tied to the fixed point property. This work has now evolved towards questions related to the fixed point property (see the papers 6 and 2) and towards work on constraint satisfaction problems, described below.

   Two major results have settled the possibly most pressing questions regarding the fixed point property. In the 1994 paper *"Fixed points and products"* (Order 11, pp. 11-14), M. S. Roddy shows that, if P and Q are finite ordered sets with the fixed point property, then the product $P \times Q$ also has the fixed point property. In 1996, D. Duffus and T. Goddard showed in *"The complexity of the fixed point property"* (Order 13, pp. 209-218) that the decision problem "Does a given finite ordered set have a fixed point free order-preserving self map?" is NP-complete.

   Despite these results, which settle the greatest open problems related to the fixed point property, interesting questions remain. For example, the question if the fixed point property is "productive" is (in full generality) still open. It has lately attracted new attention and inspired new approaches as for example in the paper 11. An interesting variation on this theme is the same question for products with infinitely many factors. M. S. Roddy has shown in "On an example of Rutkowski and Schröder" (Order 19, 365–366) that there is a connected infinite product of dismantlable ordered sets that does not have the fixed point property. This surprising result relies on the existence of free ultrafilters, which hints at considerable depths. The paper 8 provides the first examples of nondismantlable ordered sets whose infinite powers do have the fixed point property.

   My work on the fixed point property has given me an interest in the algorithmic treatment of NP-complete problems (see papers 17 and 25, the invited paper 3, the theses 2 and 3, and the grant 5). This research is currently experiencing a revival that I am exploring with colleagues at King Fahd University of Petroleum and Minerals. I conjecture that the ideas that underly polynomial reduction algorithms for constraint satisfaction problems can be used to prove that certain special cases of NP-complete problems have polynomial solutions. The paper 1, which is currently under review, proves that, for ordered sets of order dimension 2, there is a polynomial time algorithm that determines if the ordered set has the fixed point property. On the computational side, it appears that there may be a niche in which general reduction procedures for constraint satisfaction problems outperform dedicated algorithms that find Hamiltonian cycles. I am currently exploring the size of this niche.

My background on computational approaches has also been useful in analyzing the automorphism problem.

2. **The Automorphism Problem.** Is it true that $\lim_{|P|\to\infty} \frac{|\mathrm{Aut}(P)|}{|\mathrm{End}(P)|} = 0$, where the limit is taken over all ordered sets?

   This problem was first posed by Rival and Rutkowski in the paper *"Does almost every isotone self-map have a fixed point?"* (in: Extremal Problems for Finite Sets, Bolyai Soc. Math. Studies 3, Viségrad, Hungary, pp. 413-422). It can also be seen as motivated by Prömel's 1987 result that almost every ordered set is rigid (*Counting unlabeled structures*, J. Comb. Theory Ser. A 44, 83-93). W.-P. Liu and H. Wan proved in 1993 that the answer is positive for lattices and for sets with sufficiently many irreducible points (*Automorphisms and isotone self-maps of ordered sets with Top and Bottom*, Order 10, pp. 105-110).

   In my textbook 1, it is mentioned that it can be proved (as an easy modification of Liu and Wan's result) that the answer is positive for interval orders and (in a simple direct argument) for ordered sets of width 3. There should be a reasonably easy proof that the automorphism conjecture holds in any class of ordered sets of bounded width. This is because automorphisms are equal iff they are equal on all non-singleton sets of points with the same lower covers.

   The paper 9 presents ordered sets with the largest automorphism to endomorphism ratios known to date and it is also proved there that the automorphism conjecture holds (with exponential decay) for series-parallel ordered sets. Some of the sets with large ratios have been found using computer enumeration schemes.

3. **The Reconstruction Problem.** Let $\mathcal{C}$ be the class of all isomorphism classes $[C]$ of finite ordered sets. For a finite ordered set P, let $\mathcal{D}_P([C])$ be the number of points $x \in P$ such that $P \setminus \{x\}$ is isomorphic to C. Is it possible to reconstruct any ordered set P with at least four elements from the function $\mathcal{D}_P : \mathcal{C} \to \mathbb{N}$? That is, if, for two ordered sets P and Q, we have $\mathcal{D}_P = \mathcal{D}_Q$, does it follow that P is isomorphic to Q?

   This problem started gaining attention in order theory with Kratsch and Rampon's 1994 article *"Towards the reconstruction of ordered sets"* in Order 11, pp. 317-341. In this paper, Kratsch and Rampon produce a multitude of tools for reconstruction and they also show that interval orders are reconstructible and that N-free ordered sets are recognizable.

   In the paper *"Reconstruction of the neighborhood deck of an ordered set"* (see nr. 22, p. 7), I reconstruct the isomorphism types (with multiplicity) of the neighborhoods of the points of P from $\mathcal{D}_P$. This "neighborhood deck" unifies many of the results of Kratsch and Rampon's paper and it allows for fast proofs of the reconstructibility of interval orders and orders of width 2 (another result due to Kratsch and Rampon). In the paper *"Reconstruction of N-free ordered sets"* (see nr. 20, p. 7), I was able to reconstruct N-free ordered sets, which completes the reconstruction of N-free ordered sets started by Kratsch and Rampon in 1994. The paper *"Reconstruction of truncated semi-modular lattices"* (nr. 16, p. 6) is a cooperation with Jean-Xavier Rampon during a research visit to the University of Nantes (nr. 2, p. 29).

   The papers 13 and 15 (see p. 6) present counterexamples to some conjectures on reconstruction from sub-decks. They culminate in the construction of pairs of sets that have the same maximal decks, the same minimal decks and a rank k such that the decks obtained by erasing the elements of rank k also are equal. These negative results in 13 and 15 are accompanied by positive results on reconstruction in 14. Recent work in 5 shows that this is not a coincidence: All (partial) counterexamples known to date violate the same part of a sufficient condition for reconstructibility presented in 5. Moreover, when this condition is violated, there is a structured way to construct pairs of nonisomorphic ordered sets with two isomorphic cards. Conversely, it can be shown that, if an ordered set P is not in one of four rather special classes of ordered sets, then P is reconstructible.

There are commonalities in the approaches to these problems which indicate to me that progress on one problem could be translatable to progress on another.

My interest in **Integrated Engineering Curricula** has produced the papers 10, 18, 24 and 27, the grants 3, 4, 7 and my texts 2, 4 and 6 that cover undergraduate mathematics from precalculus through differential equations from an integrated point-of-view. The main consequence of this work is the creation of the mathematics sequence of the integrated engineering and science curricula at Louisiana Tech University. The insights gained in curricular structure and design appear to be widely applicable in other areas (see my statement on curriculum development).

My original training is in **Probability Theory and Harmonic Analysis.** The papers 30, 34, 35, 40 and my dissertation are the contributions derived from this work. I am currently not active in research in analysis. However, the paper 28 shows that my analytical training helps when connections between combinatorics and analysis are necessary, and the recent submission 3 shows that my abilities are still available. Moreover, my analysis textbook 5 takes the reader from the axioms of the real numbers through all the necessary theory to understand the analytical constructions that make the finite element method work. I am working on a potential second volume of the analysis text. The explicit goal of this volume is to build the necessary mathematical tools to understand the major areas of physics: Classical Mechanics, Electrodynamics, Quantum Mechanics and Relativity (special and general). Consequently, the text will include, but not be limited to, Functional Analysis, Differential Geometry, Probability Theory, and Calculus of Variations.

Curriculum Development

How can we prepare students for a technological society in which processes have become much more complex than people would have been able to anticipate even as recently as 20 years ago? Interdisciplinary connections provide for significant advances in all fields of science. There is a strong need for people who can make connections between different subjects and exploit these connections to improve models, processes, products, etc.

Yet the basic tool – the human brain – remains the same, because evolution works on a scale of millions of years. There will be no substitute, and actually an increasing need, for a solid background in mathematics and the sciences, especially in professions that do *not* require a doctoral degree in mathematics. The question is how to gain the requisite background in a way that makes it useful in practice. There is experimental evidence [J. Bransford, R. Sherwood, N. Vye and J. Rieser (1986), *Teaching thinking and problem solving*, American Psychologist, October issue] which suggests that teaching topics in isolation does not necessarily enable people to automatically make connections between different fields.

In my own career as a student I was bothered by the fact that mathematics and science classes often were “out of synch.” The worst extreme was having to solve multiple integrals using the Divergence Theorem and Stokes’ Theorem in electrodynamics, while, in analysis, we just had proved that the real number field *exists*. Disciplines such as mathematics, the sciences and engineering are mutually supportive. Hence there should be ways to coordinate course sequences so that content taught in one class is applied, or used as motivation, in a class in another discipline in the near future. “Near future” has to mean within a week or at least during the same term. Prerequisites taught in isolation which remain unused for extended periods of time are likely to get lost. Trigonometric identities in precalculus are a good example. They are only used a year later in trigonometric substitution, and student memory can often be hazy.

We cannot expect total integration of every piece of information all the time. However, there should be a better way than ignoring what is done in other disciplines.

Such was my thinking as I joined the integrated engineering curriculum team at Louisiana Tech University in 1997. Since then, we have reformed the full first two years of engineering and science study at Louisiana Tech University. This was done keeping in mind the philosophy of active, cooperative, technology supported learning and the desire to make as many connections between disciplines as possible. My own contributions are the design of the Mathematics for Engineering and Science III-VI courses, contributions to the design of courses I and II in the sequence, and the writing of the implementation grant 4 *"Institutionalization of an integrated engineering curriculum at Louisiana Tech University."*

Key shifts in the presentation of topics, intended to facilitate better integration between courses are described in the papers 10 *"Rearranging the Calculus Sequence to Better Serve its Partner Disciplines"* and 27 *"Mathematical support for an integrated engineering curriculum,"* with 10 providing a detailed analysis of the topical dependencies within the precalculus-calculus-differential equations sequence. The issue of ramping up from a pilot program to full implementation under stringent budgetary limitations is addressed in the paper 24. *"Team Teaching Merged Sections as a Way of Mentoring Faculty"* and more completely in 18 *"Establishing an Integrated Mathematics, Engineering, and Science Curriculum: Lessons Learned"* and its companion *"Implementing an integrated engineering curriculum."* All papers include tables that indicate the setup of the integrated engineering curriculum as it stood at the time.

The success we had with the integrated engineering curriculum prompted the development of an integrated science curriculum in Fall 2002. This curriculum uses the same ideas of interdisciplinary integration and active, cooperative, technology supported learning to address the needs of Mathematics, Physics, Chemistry, Biology, Computer Science, Geoscience, Environmental Science and Middle School and Secondary Mathematics and Science Education. Continuous self-evaluation for both integrated curricula will allow adjustments to new insights in education and the emergence of new tools as appropriate.

My curriculum development activities were primarily supported by the grants 4 *"Institutionalization of an integrated engineering curriculum at Louisiana Tech University"* and 7 *"Mathematical support for an integrated engineering curriculum."*

At the upper undergraduate and beginning graduate level, I have developed an analysis course that allows students to progress faster towards the frontier of research than any other course I know of. Because of the depth of mathematics, the time needed to reach this frontier is acknowledged to be quite long (see `http://www.ams.org/meetings/CultureStatement12.pdf`). My primary tool (or product) is the text 5, which makes Lebesgue integration and L^p-spaces natural building blocks of a first year analysis course. This course should leave students prepared to study the elements of Functional Analysis that are useful for deep applied mathematics or theoretical physics.

Aside from a sound logical structure, it is important that a curriculum has a delivery mechanism that actually transmits the requisite skills. Because individuals differ, there is no one such mechanism that fits all students. Hence it is useful to have more than one delivery mechanism available. In the Academic Years 2011-12 and 2012-13, I have taught the whole calculus sequence in the "flipped" format, using my electronic materials 1 and 2 (p. 26).

The experience was very positive and showed that *as an option*, for students who are ready to rigorously prepare for each class period on their own or with friends, the flipped format is highly viable. Classroom discussions were usually deeper than in a regular class, because there was more time to address deeper questions. Even at times when "only" nuts and bolts were discussed, there was a lot of time to answer, sometimes surprising, student questions, which contributed to students being more satisfied, and probably also more successful, than otherwise.

At the same time, there were students who were successful in the flipped class and who signed up for a regular section in the next term. They told me that their motivation to prepare for each individual class by essentially treating a video as a "class before class" was flagging. Hence a regular class was the safer option for them. Because the objective of teaching is learning, not teaching, I was not offended by their choice and was glad to see them do well in parallel classes. This leads us to my teaching philosophy.

Teaching Philosophy

My teaching philosophy can be summed up in two sentences. *"The objective of teaching is learning, not teaching,"* (source unknown to me) and *"The laws of nature are not negotiable."*

As with many wonderful quotes and sound bites, an explanation is necessary. I believe classroom instruction needs to be student centered inasmuch as that is possible. If I give a brilliant lecture and nobody understands, then we have wasted valuable instructional time. If, however, I create a wonderful active learning activity, that involves all students, and nobody understands, then ... we have wasted time, too. Because the objective is learning, not teaching, effective instruction must not depend on the subscription to one and only one method. Instead, it needs to be adapted to the needs of the topic, the audience as well as the instructor. If any one of these three components is out of synch, instruction becomes less effective than it could be.

Effective instruction is also not measurable by class grades and evaluations alone. Effective instruction starts out with the realization that the laws of nature and mathematics are not negotiable. Instructional objectives will be set in relation to these ultimate measures of achievement. Skills that a student is supposed to have at the end of a class can be identified in advance. Similarly, ways to measure these skills can be identified. Success is not to reinterpret achievement of these skills until many students fit the bill, but to adjust instruction until the original measure shows higher student success. Even absolute numbers must be treated with care, because factors such as the students' level of preparation at the start of the class and their willingness to do homework have direct impact on the overall outcome. Longitudinal tracking of student performance in follow-up classes appears to be the best measure of a course's impact upon students. Assuming a minimum level of consistency in the follow-up courses, this is a reliable indicator and it is still relatively easy to gather the requisite data. Similar to my philosophy that approaches to teaching should fit all constituents as much as possible, I only believe in performance indicators for which data can actually be gathered and evaluated in reasonable time.

Coming back to the classroom level, to me, the key to effective classroom instruction is to keep the learner's minds active throughout the instructional period. In a traditional face-to-face class, this can be achieved, for example, through a mixing of instructional techniques, such as short lectures, questions to the audience, active learning techniques such as think-pair-share or thinking-aloud-paired-problem-solving, discovery activities to lay the groundwork for a new concept, etc. In a flipped class, the format is a bit more open-ended: Students have already spent some "lecture time" preparing for the class. Hence, by design, class only lasts until the key ideas and examples were discussed, often with techniques that I also use in a regular face-to-face class. This leaves time for student driven discussions, which are one of the strengths of the flipped format. Discussions can range from questions about classes that are a year in the students' future to a review of integration techniques.

Will there ever be a time when an instructor has the right mix for all students in the room? Not unless all students in the room were identical. However, by changing instructional techniques as necessary, different learning styles can be addressed. In this fashion it is likely that all students will be taught in their style some of the time, while their thinking is stretched in a less comfortable dimension at other times. Moreover, a change of pace gives students who have arrived at the end of their attention span a chance to re-start. None of these remarks should be seen as disrespecting the time-honored tradition of a good lecture. In fact, some of my most successful classes were and are straight lectures. However, in these cases, the audience was ready to receive the lectures and to significantly improve their concentration and listening skills by following the lectures.

When trying to add more instructional techniques to my repertoire, the first gatekeeper is if I am comfortable with the technique or not. I shall not dismiss a technique right after I have seen it. If, however, after giving it a serious try, it does not work, I will need to adjust or discard it. The key is to keep an open mind and to not try too much at once.

One important exception to the idea that the instructor should choose methods he/she is comfortable and effective with is technology.[1] The question can no longer be *if* we use technology but only *how* (Gene Callens). Having done research that involved heavy programming as well as pure mathematical research, I can say that my brain works in different ways when I use technology than when I do not. Of course sometimes this leads to problems. It can happen that I tried something with paper and pencil that could have been done more efficiently with technology, or, it can also happen that I wrote a program for something that could have been dismissed with an easy theoretical argument. Either half of the above sentence is sometimes used by well-meaning, if overzealous, colleagues who wish to either completely embrace technology or to condemn its use. Technology must enhance our abilities, not replace them. To reach this point, students must have a

[1] A semantic way out of any quandaries here would be to declare technology part of what we want to learn, rather than an instructional tool. To a certain degree, I subscribe to this idea.

solid grasp of fundamental concepts and skills so that they can confront problems in which hand-computation is extremely tedious. Only after this foundation is laid do we start using technology.

Where the line is to be drawn above is of course subject to discussion. Again there are probably as many answers as there are people. To illustrate my own point-of-view, consider integration in calculus.

First, the indefinite integral. It is not unreasonable to expect students to solve integrals using substitution, integration by parts and partial fractions. Aside from computing a useful quantity for science and engineering, solving integrals trains many valuable abilities associated with STEM occupations, such as problem sensitivity (ability to tell something is wrong or likely to go wrong), deductive and mathematical reasoning, number facility and perceptual speed. However, integration techniques can be pushed too far. For example, I do not believe it is reasonable to memorize reduction formulas for integrals of powers of sine and cosine. These integrals can easily be solved using computer algebra systems. Prior to the emergence of these systems, practitioners used integral tables. Hence we are not losing fundamental skills, especially if students remain able to also use tables, which can still be more effective than computer algebra systems.

Second, the definite integral. Of course, just about any definite integral a student may need to solve can be solved numerically. As stated above, that does not mean we do it all the time, because we would lose the training of valuable mental skills. Moreover, a quick mental calculation during a presentation in science or engineering or while reading an advanced text is usually more effective than trying to start up a computer or to remember to check later. In a way, integration is a reading skill for advanced material in science. However, computers allow us to get away from toy problems in numerics. Don't use Simpson's rule with 10 partitions to work out an integral. Program it and use 10,000. Or, even better, determine how many partitions are needed to achieve a certain accuracy and then use exactly this number.

Connecting back to curriculum development, it can be seen from the above example, that what we teach changes. Skills can become less relevant in everyday science (such as exotic integration tricks), while others (error estimates in numerics) gain in importance. Seeing the shifts, adjusting accordingly and with due deliberation (do not follow every fad) will remain very important for an effective instructor. My commitment to the appropriate use of technology is also evidenced in the electronic course materials and the on-line courses that I have developed (p. 26) as well as in my texts. The use of computer algebra systems for complicated problems is encouraged and many projects require students to write small programs that solve standard problems such as, for example, numerical integration to a given precision, or constant coefficient differential equations with Laplace transforms.

Finally it has to be said that I do not consider my work as teaching *students*. I teach *future professionals*. (This became clear to me when I overheard my doctoral advisor talk about the students' need for professional behavior.) Hence the goal of making students self-reliant individuals who can make adequate decisions which tools to use, when and how to ask for help, etc. underlies my teaching, as well as my course and curriculum designs.

Administrative Philosophy

People do not work for administrators. Administrators work for people.

This is how my wife approaches administrative tasks. I could not agree more, and when I started writing up my philosophy, it automatically condensed into the above. If we keep it this simple, administration becomes easier to do and easier to deal with. Consider what is important in the academic setting. It is important that the scientist who is working on a new drug delivery system will have the time and the resources needed to pursue this research. It is important that the faculty who teach classes can do so unencumbered by worries about the budget in general and costs of supplies, copies, etc. in particular. It is important that the diverse goals of individual faculty are not at odds with each other, as this can create an inefficient work environment. Administrative activities are simply the things we do so that the important goals can be achieved.

Therefore, to keep things in perspective, an administrator must be enthusiastic about his or her discipline. Said discipline should not be too narrow, such as, say, the reconstruction problem for ordered sets. It should be broad enough to include everyone on the faculty. The teaching and research of mathematics as it relates to science and engineering works nicely as my "discipline." Details can be worked out later, and while it can be healthy for an administrator to retain a research program in a highly focused area, the administrator should be broadly trained and willing to learn more. This attitude and background make it possible to competently interact with all faculty.

Competent and useful interaction with faculty will create the faculty buy-in that is needed to lead a program in new directions. Once it is established that an administrator's assessments are usually correct and fair, it will be easier for faculty to listen to new ideas. Most interactions between faculty and administrators have the administrator in a service capacity. The proofreading and routing of a grant, the assignment of teaching duties, the evaluation of faculty and the settlement of grievances may not be perceived in this way, but that is what they are. A proofread grant proposal on which errors in language, as well as sometimes content, have been eliminated, and on which the presentation has been adjusted based on someone's impression how it reads, has a better chance of being funded. That is a service. Assigning teaching duties based on the program's needs and on the desires of individual faculty helps the smooth functioning of a program. On one hand, classes get staffed, on the other hand, faculty with a teaching schedule that fits who they are will be more satisfied and more effective. Hence, going through the slightly tedious task of making the assignments is another service to all constituents. As long as faculty understand that not everyone can have all great assignments all the time, scheduling can actually be perceived as such. Yearly evaluations are only fun when the evaluations are good. However, by identifying areas in which improvement is possible, paired with suggestions how to achieve the improvement, a service is provided. Although some facts can be hard to accept, it is better to know what needs to be done than to get noncommittal verbiage every year, ultimately leading to a lesser career or the non-achievement of career goals. Finally, the settlement of grievances takes the burden of handling the rare cases in which faculty and a student cannot agree off the faculty member's shoulders. As an administrator, the first obligation is to fairness here. Independent of whom the final decision "favors" (it's not about "winning"), it must be clear to all parties involved that the decision was based on fair and equitable criteria. Of course, the list of services provided by administrators could be made to go on, but the above examples should show that central to all decisions and suggestions is the goal of having a better functioning faculty, program and university.

Confrontation can still be unavoidable at times and needs to be handled carefully. Some individuals need a softer, some a more blunt statement of the facts, and it is important to realize what approach to use when. No individual gets the approach right every time, and decades of political convenience may have made it hard for some individuals (maybe society at large) to realize that facts are facts (see ENRON, subprime mortgages, etc.). However, by learning how the people with whom we interact function, it is possible to achieve goals by adjusting the behavior to the situation, which is an art form acquired by experience. Once more, the goal is not to win, but to make sure the right thing happens.

Just as there is surprisingly little physics in texts on theoretical physics (typically the physics is outweighed by the presentation of mathematical tools and computations that show that the physics actually predicts reality), there is surprisingly little leadership in administrative activities. Nonetheless, leadership must be taken seriously. The case can be made that a lot of leadership falls under the service described above. What remains are the "big decisions" (new programs, targeting new funding sources, new buildings). These need to be made after due deliberation and while remembering the purpose of the institution, which includes the goals of the scientist and the teachers from the first paragraph. Once the decisions are made and buy in is achieved, we are back to service as we work towards the newly agreed upon goal.

Administrative Results

Interests and philosophies are what define and drive us. However, from an institutional point-of-view, faculty and administrators must produce positive results. To measure these results on an individual faculty level, we use measures such as teaching load, teaching evaluations, creativity in the classroom, student performance in later classes, research productivity in terms of papers written, in terms of grants obtained, in terms of talks given, service activities etc. For each of these measures, a debate can be fielded whether the measure is appropriate and useful. This vita showcases some of the above aspects for myself and I can provide more information as needed. Given that evaluating faculty is not always simple, measuring how an administrator produces results is even more challenging.

As a counterpoint and potential validation of my administrative philosophy, let me briefly mention some results produced in my time as administrator in charge of the Program of Mathematics and Statistics at Louisiana Tech University.

- Because of the economic downturn, the faculty shrank from 23 (8 instructors, 3 lecturers, 12 tenured or tenure track positions) in AY 08-09 to 18 permanent (6 instructors, 3 lecturers, 9 tenured or tenure track faculty) plus one visiting lecturer in AY 13-14. This contraction, which was unavoidable and beyond my control, was managed without terminations. Classes remained staffed at reasonable sizes with competent, dedicated teachers whose average evaluations exceeded the college and university averages. It should also be noted that a high level of morale has been sustained despite six consecutive years without raises.

- Six of the tenured and tenure track faculty members were tenured with me as the administrator in charge of the Program of Mathematics and Statistics. All these faculty members were involved in disciplinary or interdisciplinary grants. Three colleagues have had NSF research grants in this time, where it is notable that one colleague had two active NSF research grants at the same time. One more colleague had an NSF education grant. This funding success came after an at least 20 year gap in NSF funding for mathematical research at Louisiana Tech University and after a long period of only a minority of research faculty receiving any funding at all.

Naturally, the achievements of my colleagues are not my achievements. Notably, the case can be made that the success of the faculty is due to having the right people. Maybe that means I know how to hire the right people, as, for the six colleagues who earned tenure under my leadership, I also was the chair of the hiring committee. For the instructors and lecturers, I was involved in some of the searches. My contribution in terms of leadership can be seen as providing an atmosphere that got people to do well in their chosen focus areas, be it teaching, research, curricular innovation or, in some cases, all three, and, in my ability to explain the expected levels of productivity for mathematicians in an environment that is heavily influenced by engineering, which has much larger funding levels. Dedication to student success has always been high in the Program of Mathematics and Statistics at Louisiana Tech University and I am glad that I contributed to the maintenance of this dedication.

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