GREGORY T. BYRD
Professor, Electrical and Computer Engineering
NC State University

Education

PhD, Electrical Engineering, August 1998, Stanford University, CA
    Advisor: Michael J. Flynn, Thesis: *Communication Mechanisms in Shared Memory Multiprocessors*
MS, Electrical Engineering, June 1985, Stanford University, CA
BS, Computer Engineering, May 1984, Clemson University, SC

Professional experience

Associate Department Head, July 2013 - present, NC State University, Dept. of Electrical and Computer Engineering
Professor, Aug 2012 – present, NC State University, Dept. of Electrical and Computer Engineering
Associate Professor, July 2004-July 2012, NC State University, Dept. of Electrical and Computer Engineering
Assistant Professor, July 1999-June 2004, NC State University, Dept. of Electrical and Computer Engineering
Adjunct Asst. Professor, Jan 1999-June 1999, NC State University, Dept. of Elec. and Computer Engineering
Principal Scientist, Feb 1998-June 1999, Celotek Corporation, NC
Member of Technical Staff, Oct 1993-Oct 1996, MCNC, HPCC Research Group, NC
Systems/Scientific Support Analyst, Apr 1991-Oct 1993, MCNC, NC Supercomputing Center, NC
Senior Engineer, Apr 1990-Mar 1991, Digital Equipment Corporation, NC

Publications

Book

1. D. D. Stancil and G. T. Byrd. *Principles of Superconducting Quantum Computers*. Wiley, 2022.

Journal Articles

2. M. M. Ibrahim, H. Mohammadbagherpoor, C. Rios, N. T. Bronn, and G. T. Byrd. "Evaluation of Parameterized Quantum Circuits with Cross-Resonance Pulse-Driven Entanglers." *IEEE Transactions on Quantum Engineering*, to appear.
3. H. Zhou and G. T. Byrd. "Quantum Circuits for Dynamic Runtime Assertions in Quantum Computation." *IEEE Computer Architecture Letters*, 18(2): 111-114, July-Dec 2019.
4. C. Kumar, S. Singh, and G. T. Byrd. "Hybrid Remote Access Protocol." *IEEE Computer Architecture Letters*, 18(1): 30-33, Jan-Jun 2019.
5. S. Reza and G. Byrd. "Reducing Migration-Induced Misses in an Over-Subscribed Multiprocessor System." *Parallel Processing Letters*, Vol. 23, Article 1350006, March 2013.
6. M. Chiang and G. Byrd. "Adaptive Aggregation Tree Transformation for Energy-Efficient Query Processing in Sensor Networks." Intl. Journal of Sensor Networks, 6(1):51-64, 2009.
7. M. Altunay, D. E. Brown, G. T. Byrd, R. A. Dean. "Collaboration Policies: Access Control Management in Decentralized Heterogeneous Workflows." Journal of Software, 1(1):11-22, July 2006.
8. M. Chiang, G. T. Byrd. "Zone Repartitioning – A Load-Balancing Method for Data-Centric Storage Systems." Intl. Journal of Pervasive Computing and Communications, 2(4):312-320, 2006.
9. Y. Lai and G. T. Byrd. "AES Packet Encryption on a SIMD Stream Architecture." International Journal of Computer Research, Special Issue on Cryptographic Hardware and Embedded Systems, 2004.
10. R. Wang, F. Wang, and G. T. Byrd. "Design and Implementation of Acceptance Monitor for Building Scalable Intrusion Tolerance System." Software: Practice and Experience, 33(14):1399-1417, November 2003.
11. G. T. Byrd and M. J. Flynn. "Producer-Consumer Communication in Distributed Shared Memory Multiprocessors." Proceedings of the IEEE, 87(3):456-466, March 1999.
12. G. T. Byrd and M. A. Holliday. "Multithreaded Processor Architectures." IEEE Spectrum, 32(8):38-46, August 1995.
13. D. Stevenson, N. Hillery, and G. Byrd. "Secure Communications in ATM Networks." Communications of the ACM, 38(2):45-52, February 1995.

Book Chapters

14. J. Rai, Y. Lai, and G. T. Byrd. "Packet Processing on a SIMD Stream Processor." In P. Crowley, M. A. Franklin, H. Hadimioglu, and P. Z. Onufryk, editors, Network Processor Design: Issues and Practices, Volume 3, Chapter 7, 119-144, Morgan Kaufmann, 2004.

15. Y. Lai and G. T. Byrd. "AES Packet Encryption on a SIMD Stream Architecture." In N. Nedjah and L. Mourelle, editors, Embedded Cryptographic Hardware: Methodologies & Architectures, Chapter IV, 57-76, Nova Science Publishers, 2004.

16. D. Suryanarayanan, J. Marshall, and G. T. Byrd. "A Methodology and Simulator for the Study of Network Processors." In P. Crowley, M. A. Franklin, H. Hadimioglu, and P. Z. Onufryk, editors, Network Processor Design: Issues and Practices, Volume 1, Chapter 3, pp. 27-54, Morgan Kaufmann, 2003.

Peer-Reviewed Conference Papers

17. A. T. Mughrabi and G. T. Byrd. "CAPI-Precis: Towards a Compute-Centric Interface for Coherent Shared Memory Accelerators." Intl. Conf. on Field-Programmable Technology (ICFPT), Dec. 2022.

18. A. T. Mughrabi, M. Ibrahim and G. T. Byrd, "QPR: Quantizing PageRank with Coherent Shared Memory Accelerators." IEEE Intl. Parallel and Distributed Processing Symposium (IPDPS), 2021, pp. 962-972, May 2021.

19. J. Liu, G. Byrd, H. Zhou. "Quantum Circuits for Dynamic Runtime Assertions in Quantum Computation." IEEE Symp. on Architectural Support for Programming Languages and Operating Systems (ASPLOS), Mar 2020.

20. H. Elnawawy, R. Chowdhury, A. Asad, and G. T. Byrd. "Diligent TLBs: a mechanism for exploiting heterogeneity in TLB miss behavior." ACM Intl. Conf. on Supercomputing, pp. 195-205, June 2019.

21. S. Grover, A. Dhanotia, and G. T. Byrd. "A Canonical Multicore Architecture for Network Routers." ACM/IEEE Symp. on Architectures for Networking and Communications Systems (ANCS), Oct 2011.

22. A. Dhanotia, S. Grover, and G. Byrd. "Analyzing and Scaling Parallelism for Network Routing Protocols." IEEE Intl. Symp. on Workload Characterization, pp. 1-10, Dec. 2010.

23. S. Pant and G. T. Byrd. "Limited Early Value Communication to Improve Performance of Transactional Memory." ACM Intl. Conf. on Supercomputing, pp. 421-429, June 2009.

24. S. Pant and G. T. Byrd. "Extending Concurrency of Transactional Memory Programs by Using Value Prediction." ACM Intl. Conf. on Computing Frontiers, pp. 11-20, May 2009.

25. C. Lim and G. T. Byrd. "Exploiting Producer Patterns and L2 Cache for Timely Dependence-Based Prefetching." IEEE Intl. Conf. on Computer Design, pp. 685-692, Oct. 2008.

26. M. Chiang and G. T. Byrd. "Neighborhood-Aware Density Control in Wireless Sensor Networks." IEEE Conf. on Sensor Networks, Ubiquitous, and Trusted Computing (SUTC), pp. 122-129, June 2008.

27. M. Altunay, G. Byrd, D. Brown, and R. Dean. "An Interaction-Based Access Control Model (IBAC) for Collaborative Services." IEEE Intl. Symp. on Collaborative Technologies and Systems, pp. 547-554, May 2008.

28. Y. Lai and G. T. Byrd. "High-Throughput Sketch Update on a Low-Power Stream Processor." ACM/IEEE Symp. on Architectures for Networking and Communications Systems (ANCS), pp. 123-132, Dec. 2006.

29. Y. Lai and G. T. Byrd. "Stream-Based Implementation of Hash Functions for Multi-Gigabit Message Authentication Codes." IEEE Intl. Conf. on Parallel and Distributed Computing, Applications and Technologies (PDCAT), pp. 150-155, Dec. 2006.

30. M. Altunay, D. Brown, G. Byrd, and R. A. Dean. "Trust-Based Secure Workflow Construction." Intl. Conf. on Service-Oriented Computing (ICSOC), pp. 382-395, Dec. 2005.

31. M. Altunay, D. Brown, G. Byrd, and R. A. Dean. "Evaluation of Mutual Trust during Matchmaking." IEEE Intl. Conf. on Peer-to-Peer Computing (P2P), pp. 133-140, Sept. 2005.

32. K. Z. Ibrahim and G. T. Byrd. "Extending OpenMP to Support Slipstream Execution Mode." 17th IEEE/ACM Intl. Parallel and Distributed Processing Symposium (IPDPS), pp. 36-45, April 2003.

33. T. J. Smith, G. T. Byrd, X. Wu, H. Xin, K. Thangavelu, R. Wang, and A. Shah. "Dynamic PKI and Secure Tuplespaces for Dynamic Coalitions." 3rd DARPA Information Survivability Conference and Exposition (DISCEX III), Vol. 1, pp. 189-200, April 2003.

34. T. J. Smith, G. T. Byrd. "Yalta: A Dynamic PKI and Secure Tuplespaces for Secure Coalitions." 3rd DARPA Information Survivability Conference and Exposition (DISCEX III), Vol. 2, pp. 52-54, April 2003.

35. K. Z. Ibrahim, G. T. Byrd and E. Rotenberg. "Slipstream Execution Mode for CMP-Based Multiprocessors." 9th IEEE Intl. Symp. on High Performance Computer Architecture (HPCA-9), pp. 179-190, February 2003.

36. R. Wang, F. Wang, and G. T. Byrd. "Design and Implementation of Acceptance Monitor for Building Scalable Intrusion Tolerant Systems." 10th IEEE Intl. Conference on Computer Communications and Networks, pp. 200-205, October 2001.

37. K. Z. Ibrahim and G. T. Byrd. "On the Exploitation of Value Prediction and Producer Identification to Reduce Barrier Synchronization Time." 15th IEEE/ACM Intl. Parallel and Distributed Processing Symposium, 10 pp., April 2001.

38. G. T. Byrd, N. Hillery, and J. Symon. "Practical Experiences with ATM Encryption." Network and Distributed System Security Symposium, pp. 23-32, February 2001.

39. G. T. Byrd, M. J. Flynn. "Effectiveness of Producer-Initiated Communication." Hawaii Intl. Conf. on System Sciences, Vol. 7, pp. 770-771, January 1998.

40. D. Stevenson, N. Hillery, G. Byrd, F. Gong, and D. Winkelstein. "Design of a Key Agile Cryptographic System for OC-12c Rate ATM." Network and Distributed System Security Symposium, pp. 17-30, February 1995.

41. G. T. Byrd and B. A. Delagi. "StreamLine: Cache-Based Message Passing in Scalable Multiprocessors." 20th International Conference on Parallel Processing, Volume I, pp. 251-254, August 1991.

42. G. T. Byrd, N. Saraiya, and B. A. Delagi. "Multicast Communication in Multiprocessor Systems." 18th International Conference on Parallel Processing, Volume I, pp. 196-200, August 1989.

43. G. T. Byrd and B. A. Delagi. "A Performance Comparison of Shared Variable vs. Message Passing." Third International Conference on Supercomputing (ICS88), Boston, MA, May 1988. Also available as Technical Report KSL-88-10, Knowledge Systems Laboratory, Stanford University, Stanford, CA. May 1988.

44. B. A. Delagi, N. P. Saraiya, and G. T. Byrd. "LAMINA: CARE Applications Interface." Third International Conference on Supercomputing (ICS88), Boston, MA, May 1988.

45. B. A. Delagi, N. Saraiya, S. Nishimura, and G. Byrd. "Instrumented Architectural Simulation." Third International Conference on Supercomputing (ICSS88), Boston, MA, May 1988.

46. B. A. Delagi, N. Saraiya, S. Nishimura, and G. Byrd. "An Instrumented Architectural Simulation System." SCS Multiconference on Artificial Intelligence and Simulation, San Diego, CA, pp. 111-120, Feb. 1988.

Peer-Reviewed Workshop Papers

47. S. Reza, and G.T. Byrd. "Reducing Migration-induced Cache Misses." Workshop on Large Scale Parallel Processing (LSPP), May 2012.

48. S. Pant and G. Byrd. "A Case for Using Value Prediction to Improve Performance of Transactional Memory." 4th ACM SIGPLAN Workshop on Transactional Computing, Feb. 2009.

49. S. B. Selvadurai, D. E. Brown, G. T. Byrd. "Lightweight Web-Service Wrapper for Command-Line Programs (extended abstract)." Intl. Conf. on the Virtual Computing Initiative, May 2007.

50. Y. Lai and G. T. Byrd. "Stream Architecture for High-Speed Packet Inspection." Advanced Networking and Communications Hardware Workshop (ANCHOR), June 2005.

51. J. Rai, Y. Lai, and G. T. Byrd. "Packet Processing on a SIMD Stream Processor." Third Workshop on Network Processors and Applications (NP-3), in conjunction with 10th IEEE Intl. Symp. on High Performance Computer Architecture (HPCA-10), Feb. 2004.

52. D. Suryanarayanan, G. T. Byrd, and J. Marshall. "A Methodology and Simulator for the Study of Network Processors." Workshop on Network Processors (NP-1), in conjunction with 8th IEEE Intl. Symp. on High Performance Computer Architecture (HPCA-8), Feb 2002.

53. G. T. Byrd, F. Gong, C. Sargor, and T. J. Smith. "Yalta: A Collaborative Space for Secure Dynamic Coalitions." IEEE Systems, Man, and Cybernetics Information Assurance Workshop, June 2001.

54. G. T. Byrd and M. J. Flynn. "Evaluation of Communication Mechanisms in Invalidate-Based Shared Memory Multiprocessors." Parallel Computer Routing and Communication Workshop (PCRCW'97), Lecture Notes in Computer Science, Vol. 1417, pp. 159-170, Springer, June 1997.

55. G. T. Byrd, B. A. Delagi, and M. J. Flynn. "Communication Mechanisms in Shared Memory Multiprocessors." International Workshop on Support for Large-Scale Shared Memory Architectures, April 1994.

56. G. Byrd and B. Delagi. "Considerations for Multiprocessor Topologies." DARPA Knowledge-Based Systems Workshop, April 1987. Also available as Technical Report KSL-87-07 (STAN-CS-87-1144), Knowledge Systems Laboratory, Stanford University, Stanford, CA.

Non-Reviewed Articles

57. S. Willis, G. Byrd, and B.D. Johnson. "Challenge-based Learning." Guest editors' introduction, *IEEE Computer*, 50(7), pp. 13-16, July 2017.

58. T. Snyder and G. Byrd. "The Internet of Everything," *IEEE Computer*, 50(6), pp. 8-9, June 2017.

59. G. Byrd. "Tactile Digital Braille Display." Student Design Showcase, *IEEE Computer*, 49(3), pp. 88-90, Nov. 2016.

60. G. Byrd. "Seeing is Understanding." Student Design Showcase, *IEEE Computer*, 49(9), pp. 94-97, Sep. 2016.

61. G. Byrd. "Let the Sun Shine." Student Design Showcase, *IEEE Computer*, 49(7), pp. 94-97, July 2016.

62. G. Byrd. "Home Sweet Mind-Controlled Home." Student Design Showcase, *IEEE Computer*, 49(5), pp. 98-101, May 2016.

63. A. Weaver, G. Byrd, and R. Bryce. "Computing Tools and Techniques for Emergency Response." Guest editors' introduction, *IEEE Computer*, 49(5), pp. 16-18, May 2016.

64. G. Byrd. "Immortal Bits: Managing our Digital Legacy." Student Design Showcase, *IEEE Computer*, 49(3), pp. 100-103, Mar. 2016.

65. G. Byrd. "IEEE/IBM Watson Showcase." Student Design Showcase, *IEEE Computer*, 49(1), pp. 102-104, Jan. 2016.

66. G. Byrd. "21st Century Pong." Student Design Showcase, *IEEE Computer*, 48(10), pp. 80-84, Oct. 2015.

67. G. Byrd. "Cycling through Cyberspace." Student Design Showcase, *IEEE Computer*, 48(8), pp. 72-75, Aug. 2015.

68. G. Byrd. "Tracking Cows Wirelessly." Student Design Showcase, *IEEE Computer*, 48(6), pp. 60-63, June 2015.

69. G. Byrd. "A Little Ingenuity Solves an Elephant-Sized Problem." Student Design Showcase, *IEEE Computer*, 48(4), pp. 74-77, Apr. 2015.

70. G. Byrd. "Spotlighting Student Innovation." Student Design Showcase, *IEEE Computer*, 48(2), pp. 75-76, Feb. 2015.

Graduate Students

PhD Dissertations Supervised

- Mohannad Ibrahim, Dec 2022, *Application-Centric Quantum Computing Architectures and Software/Hardware Co-Designs*

- Abdullah Mughrabi, Dec 2021, *Fast and Efficient End-to-End Graph Processing with Shared Memory Accelerators*

- Hussein Elnawawy, May 2020, *Analyzing and Mitigating the Cost of Persistence in High-Performance Computing Systems*

- Sabina Grover, May 2013, *Using Multicore to Accelerate Network Routing Protocols*

- Mohammed Sajjid Reza, Dec 2012, *Reducing Migration-Induced Misses in an Over-Subscribed Multiprocessor System*

- Salil Pant, May 2010, *Value Communication Techniques to Improve Performance of Transactional Memory Systems*

- Chungsoo Lim, Dec 2008, *Enhancing Dependence-Based Prefetching for Better Timeliness, Coverage, and Practicality*

- Mu-Huan Chiang, Dec 2007, *Energy Optimization in Sensor Networks*

- Mine Altunay, May 2007, *Collaboration Policies: Access Control Management in SOA-Based Dynamic Coalitions*

- Yu-Kuen Lai, Aug 2006, *Packet Processing on Stream Architecture*

- Khaled Ibrahim, May 2003, *Slipstream Execution Mode for CMP-Based Shared Memory Systems*

MS Theses Supervised.

- Monam Agarwal, May 2016, Infrastructure and Methods for High level Architectural Exploration for Graphics

- Abhishek Dhanotia, Aug 2010, Scalable Software and Architecture for Network Routing Protocols

- Poulomi Pal, Aug 2009, Scheduling to Consolidate Idle Periods for Energy-Efficiency in Multicore Systems

- Santthosh Selvadurai, Dec 2007, Implementing a Metasearch Framework with Content-Directed Result Merging

- Robert Kuebel, Aug 2005, The Performance of Token Coherence on Scientific Workloads

- Robert Christner, May 2004, Static Determination of Synchronization Method for Slipstream Multiprocessors

- Salil Pant, May 2004, Slipstream-mode Prefetching in CMP's: Performance Comparison and Evaluation

- Praveen Cheruvu, Dec 2003, Tuple Space Computing on the Grid

- Gautam Gopinadhan, Dec 2003, Architecture for Using Java Bytecode for Processing Digital Items

- Jathin Rai, Aug 2003, A Feasibility Study on the Application of Stream Architectures for Packet Processing Applications

- Ravi Rajagopalan, May 2003, An Application Scheduler for Bioinformatics Applications

- Anu Vaidyanathan, Aug 2002, Poseidon: Hardware Support for Buffer Overflow Attacks

- Anuja Sonalker, May 2002, Asymmetric Key Distribution

- Milind Nemlekar, Dec 2001, Scalable Distributed Tuplespaces

- Manoj Srivastava, Dec 2001, Secure Overlay for RMI

- Deepak Suryanarayanan, Aug 2001, A Methodology for the Study of Network Processing Architectures

- Rong Wang, May 2001, Intrusion Tolerant Systems Characterization and Acceptance Monitor Design

External Research Funding

Total funding: $3.045M
Share of funding: $1.089M
Funding sources: NSF, DARPA, IBM, Cisco, Qualcomm

Teaching

Courses taught at NC State
- ECE 109: Introduction to Computer Systems
- ECE 209: Computer Systems Programming
- ECE 309: C++ and Data Structures for ECE
- ECE 492: Special Topics -- Enterprise Computing Systems
- ECE 492 / CSC 495: Special Topics -- Quantum Programming
- ECE 592 / CSC 591: Special Topics -- Quantum Computing (co-instructor)
- ECE 706: Advanced Parallel Computer Architecture

2011-12 ECE Department William F. Lane Outstanding Teacher Award

2012 College of Engineering Outstanding Teacher Award

Professional Service

<u>Conference Chair</u>

General Chair, IEEE Intl. Conf. on Quantum Computing and Engineering, 2022
Program Chair, IEEE Intl. Conf. on Quantum Computing and Engineering, 2020, 2021
General Chair, IEEE Intl. Conf. on Computer Design, 2013
General Co-Chair, IEEE Intl. Conf. on Computer Design, 2012
Technical Program Co-Chair, IEEE Intl. Conf. on Computer Design, 2011
Co-Chair, Computer Systems Design and Applications Track, IEEE Intl. Conf. on Computer Design, 2006, 2009, 2010, 2021

<u>Program Committees</u>

IEEE/ACM Symp. on Architectures for Networking and Communications Systems, 2006, 2007, 2008, 2011, 2014, 2015, 2017
ACM Intl. Conf. on Supercomputing, 2009, 2010, 2011
ACM Intl. Conf. on Computing Frontiers, 2009
Computer Systems Design and Applications Track, IEEE Intl. Conf. on Computer Design, 2007, 2008
Intl. Conference on Parallel Processing, 2005
IEEE Intl. Symp. on High-Performance Computer Architecture, 2004
Intl. Conf. on Massively Parallel Computing Systems, 2002
IFIP Intl. Conf. on Network and Parallel Computing, 2014

<u>Other Conference Service</u>

Tutorials and Workshops Chair, IEEE Intl. Symp. on High-Performance Computer Architecture, 2009
Publications Co-Chair, IEEE Intl. Conf. on Computer Design, 2008
Special Sessions Chair, IEEE Intl. Conf. on Computer Design, 2007
Publications Chair, IEEE Intl. Symp. on High-Performance Computer Architecture, 2007.
Publicity and Publications Chair, Symposium on Architecture for Networking and Communications Systems, 2005
Research Session Chair, Network Systems Design Conference, 2004
Research Session Chair, Network Processors Conference West, 2002
Organized and led the Birds-of-a-Feather session on "ATM Encryption" at Networld+Interop/Atlanta 1999

<u>Editorial Boards</u>

- IEEE Thesaurus Editorial Board, 2019 - present
- Guest Editor, Special issue on Challenge-based Learning, IEEE Computer, July 2017
- *IEEE Computer*, Column Editor, Student Design Showcase, 2015 - 2016
- Guest Editor, Special issue on Emergency Response, *IEEE Computer*, May 2016
- *IEEE Computer*, Assoc. Editor, 2012-2014
- *ACM Transactions on Architecture and Code Optimization*, Distinguished Reviewer, 2014 - 2021
- *ACM Transactions on Embedded Computing Systems*, Assoc. Editor, 2006 - 2011

<u>Other External Service</u>

- IEEE Computer Society 1st Vice President (Publications), 2018
- IEEE Computer Society 2nd Vice President (Publications), 2017
- IEEE Computer Society Board of Governors, 2015-2016, 2019
- IEEE Computer Society Secretary, 2016
- IEEE Computer Society Publications Board, Member-at-Large, 2014-2016, 2022
- IEEE Computer Society Constitution and By-Laws Committee, 2014-2021

- IEEE Computer Society Publications Board, Plagiarism Chair, 2012-2013

- IEEE TAB/PSPB Products and Services Committee, 2019
- IEEE Publications Services and Products Board (PSPB), 2017-2018
- IEEE Technical Activities Board (TAB) Periodicals Committee, 2017-2018

- Computing Research Association (CRA) Board, IEEE-CS Representative, 2018-2019