Catherine Cole McGeoch

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Research Interests

Simulation and experimental methods for algorithm analysis; generation of random combinatorial objects; heuristics for NP-hard problems; algorithm design and analysis.

Education

PhD 1986 Carnegie Mellon University. Dissertation Title: *Experimental Analysis of Algorithms.* Dissertation Adviser: J. L. Bentley.
MS 1983 Carnegie Mellon University.
BS 1981 Butler University, Indianapolis, IN. Graduated *summa cum laude* and with highest departmental honors.

Current Position

Since 2010, Beitzel Professor of Technology and Society, Amherst College. Since 2001, Professor of Computer Science. 1995-2001, Associate Professor of Computer Science. 1987-1995, Assistant Professor of Computer Science. Past department chair.

Editorial Activities

2009–present. Member of the ACM Publications Board.
2009. Guest Editor for a Special Section on papers from WEA 2009, *The Journal of Experimental Algorithmics.*
2003–2008. Editor in Chief, *The Journal of Experimental Algorithmics*, published by ACM.
1997–present. Associate Editor, DIMACS Undergraduate Module Series.
1995–2000. Editorial board, *Theory of Computing Systems,* formerly *Mathematical Systems Theory*
1994–2011. Associate Editor, *The Journal of Experimental Algorithmics.*
1993–1995. Editor and author of a bimonthly column "The Computer Science Sampler," in *The American Mathematical Monthly.*
1991–1998. Associate Editor, *The American Mathematical Monthly.*
1990–1994. Associate Editor, *Journal of Computational and Graphical Statistics.*

Recent and Selected Professional Activities

September 2010. Invited panelist, "Teaching Computer Science at Liberal Arts Colleges," Grace Hopper Celebration of Women in Computer Science, Atlanta, GA.

June 2010. Speaker, Dagstuhl Seminar 10261, "Algorithm Engineering," Schloss Dagstuhl Leibniz-Zentrum für Informatik, Wadern, Germany.

June 2010. Invited lecturer, Master Class on Experimental Study of Algorithms and Benchmarking, at the 7th International Conference on Constraint Programming, Artificial Intelligence, and Operations Research (CPAIOR), Bologna, Italy.

December 2009. External review of the Computer Science Department, Swarthmore College, Philadelphia, PA.

April 2009. Program Committee for SLS 2009: Engineering Stochastic Local Search Algorithms, Brussels, Belgium.

October 2008. Keynote Speaker, 24th Annual Eastern Conference, the Consortium for Computing Sciences in Colleges, Hood College, Frederick, MD.

July 2008. Invited lecturer, University of Catania 20th International Lipari Summer School on "Algorithms: Science and Engineering," Lipari Island, Italy.

May/June 2008. General and Program Chair for WEA'08, the Workshop on Efficient and Experimental Algorithms, Provincetown, MA.

October 2007. Program committee for ALENEX'08, the Workshop on Algorithm Engineering and Experimentation, San Francisco, CA.

October 2007. Invited Speaker and program committee member for the Workshop on Hybrid Meta-Heuristics, Dortmund University, Germany.

June 2007. Invited speaker, Experimental CS 2007: Workshop on Experimental Computer Science, San Diego, CA.

April 2007. Program committee for SLS 2007: Engineering Stochastic Local Search, Brussels.

Books

Network Flows and Matching: Proceedings of the First DIMACS Implementation Challenge, DIMACS Series in Discrete Mathematics and Theoretical Computer Science, Volume 12. American Mathematical Society, 1993. Editor, with D. S. Johnson. Also published as *DIMACS Implementation Challenge Workshop: Algorithms for Network Flows and Matching,* DIMACS Technical Report 92-4, January 1992.

Proceedings of the Workshop on Algorithm Engineering and Experimentation (ALENEX99), Springer Verlag Lecture Notes in Computer Science, No. 1619, 1999. Editor, with M. T. Goodrich.

Data Structures, Near Neighbor Searches, and Methodology: Proceedings of the Fifth and Sixth DIMACS Implementation Challenges, Volume 59, DIMACS Series in Discrete Mathematics and Theoretical Computer Science, Mathematical Association of America, 2002. Editor, with M. H. Goldwasser and D. S. Johnson.

Experimental Algorithms, Proceedings of the 7th International Workshop, WEA 2008. Springer Lecture Notes in Computer Science LNCS 5068, 2008. Editor.

A Guide to Experimental Algorithmics, Cambridge University Press, 2012. A companion website is available at `www.cs.amherst/alglab`.

Articles

"An experimental study of bin packing," *Proceedings of the* 21^{st} *Annual Allerton Conference on Computing, Control, and Communication* (1983). With J. L. Bentley, D. S. Johnson, and F. T. Leighton.

"Some unexpected expected behavior results for bin packing," *Proceedings of the* 16^{th} *Annual ACM Symposium on Theory of Computing (STOC)* (1984). With J. L. Bentley, D. S. Johnson, F. T. Leighton, and L. A. McGeoch.

"Amortized analysis of self-organizing sequential search heuristics," *Communications of the ACM* Vol. 28 (April 1985), with J. L. Bentley. An early version appears as "Worst case analysis of self-organizing sequential search heuristics," *Proceedings of the* 20^{th} *Annual Allerton Conference on Computing, Control, and Communication* (1982).

Experimental Analysis of Algorithms. PhD dissertation, Department of Computer Science, Carnegie-Mellon University (August 1986). Available as Technical Report CMU-CS-87-124.

"An experimental study of median-selection in Quicksort," *Proceedings of the* 24^{th} *Annual Allerton Conference on Computing, Control, and Communication* (1986).

When are Best Fit and First Fit Optimal? Technical Report CMU-CS-87-168, Department of Computer Science, Carnegie-Mellon University, Pittsburgh, PA (October 1987). With J. D. Tygar.

"Analyzing algorithms by simulation: variance reduction techniques and simulation speedups," *Computing Surveys*, June 1992. Also published (in Japanese translation) in *bit*, Kyoritsu Shuppan Pub. Co. Ltd., Tokyo, 1994.

"The Computer Science Sampler," column appearing in *The American Mathematical Monthly.* Data Compression, May 1993; Zero-Knowledge Proofs, August-September 1993; Parallel Addition, November 1993; Does Anybody Really Know What Time It Is? May 1994; Veni, Divisi, Vici, May 1995.

"All-pairs shortest paths and the essential subgraph," *Algorithmica*, May 1995. An earlier version appeared as "Using the Short-Path Subgraph to Find Shortest Paths," DIMACS Technical Report TR 91-30.

"Optimal sampling strategies for Quicksort," *Random Structures and Algorithms*, Vol. 7, No. 4, 1995. An earlier version appeared in *Proceedings of the* 28*th Annual Allerton Conference on Computing, Control, and Communication*, 1990. With J. D. Tygar.

"Toward an experimental method for algorithm simulation" (feature article), *INFORMS Journal on Computing*, Vol. 8 No. 1, Winter 1995.

"Challenges in algorithm simulation" (rejoinder), *INFORMS Journal on computing*, Vol. 8, No. 1, Winter 1995.

"Research in the curriculum, and the Web" (position paper), *CSURVES: Computing Surveys Electronic Section,* Vol. 28, 1996.

"Emerging opportunities for theoretical computer science," *SIGACT News,* Vol. 28, 1997. Committee report, with A. Aho, D. S. Johnson, R. Karp, S. R. Kosaraju, D. Papadimitriou, and P. Pevzner.

"How to present a paper on experimental work with algorithms," *SIGACT News*, Vol. 30, No. 4, December 1999. With Bernard M.E. Moret.

"Experimental analysis of algorithms" (invited article), *Notices of the American Mathematical Society*, pp 304-311, March 2001.

"Experimental analysis of optimization algorithms," a chapter in the *Handbook of Applied Optimization*, Oxford University Press, 2002. Panos M. Pardalos and Mauricio G. C. Resende, editors.

"Using finite experiments to study asymptotic performance," in *Experimental Algorithmics: From Algorithm Design to Robust and Efficient Software*, Lecture Notes in Computer Science No. 2547, Springer-Verlag Publishers, 2001, R. Fleischer, B. Moret, and E. M. Schmidt, Editors. With P. Sanders, R. Fleischer, P. Cohen, and D. Precup.

"How to find big-oh in your data set (and how not to)," presented at the Second International Symposium on Intelligent Data Analysis (IDA-97), LNCS, Birkbeck College, London, August 1997, with P. Cohen and D. Precup.

"Experimental analysis of algorithms," a chapter in the *Handbook of Global Optimization, Volume 2: Heuristic Approaches*, Kluwer Academic Publishers, 2002. Panos Pardalos and H. Edwin Romeijn, editors.

"A bibliography of algorithm experimentation," in *Data Structures, Near Neighbor Searches, and Methodology: Proceedings of the Fifth and Sixth DIMACS Implementation Challenges,* Volume 59, DIMACS Series in Discrete Mathematics and Theoretical Computer Science, MAA, 2002.

"Experimental algorithmics," *Communications of the ACM*, Special issue on experimental computer science, 50 (11), November 2007.

"Experimental methods for algorithm analysis," article in *The Encyclopedia of Algorithms,* Ming-Yang Kao, Ed, Springer Verlag, 2008.

Other Publications

"On experimenal algorithmics: An interview with Catherine McGeoch and Bernard Moret," interview by Richard T. Snodgrass, *ACM Ubiquity*, August 2011, pp 1-14.

Books In Progress

The Internet and the Foundations of Computer Science, an introductory textbook.
Awesome Programming Projects, a project idea book for beginning programmers.