NOTES de la SMC

In Memoriam: Daniel Ashlock (1961-2022)

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The Department of Mathematics and Statistics of the University of Guelph mourns the passing of our Chair, Daniel Ashlock, after a brief battle with cancer. Dan was an exemplary member of the department and an energetic presence in the university community. Dan completed his Ph.D. in 1990 at the California Institute of Technology under the direction of the combinatorialist Richard M. Wilson. He was a Professor of Mathematics at Iowa State University for fourteen years before joining the Department of Mathematics and Statistics at the University of Guelph in 2004. Dan's contributions to research, teaching, student supervision, outreach, and university administration have been extraordinary.

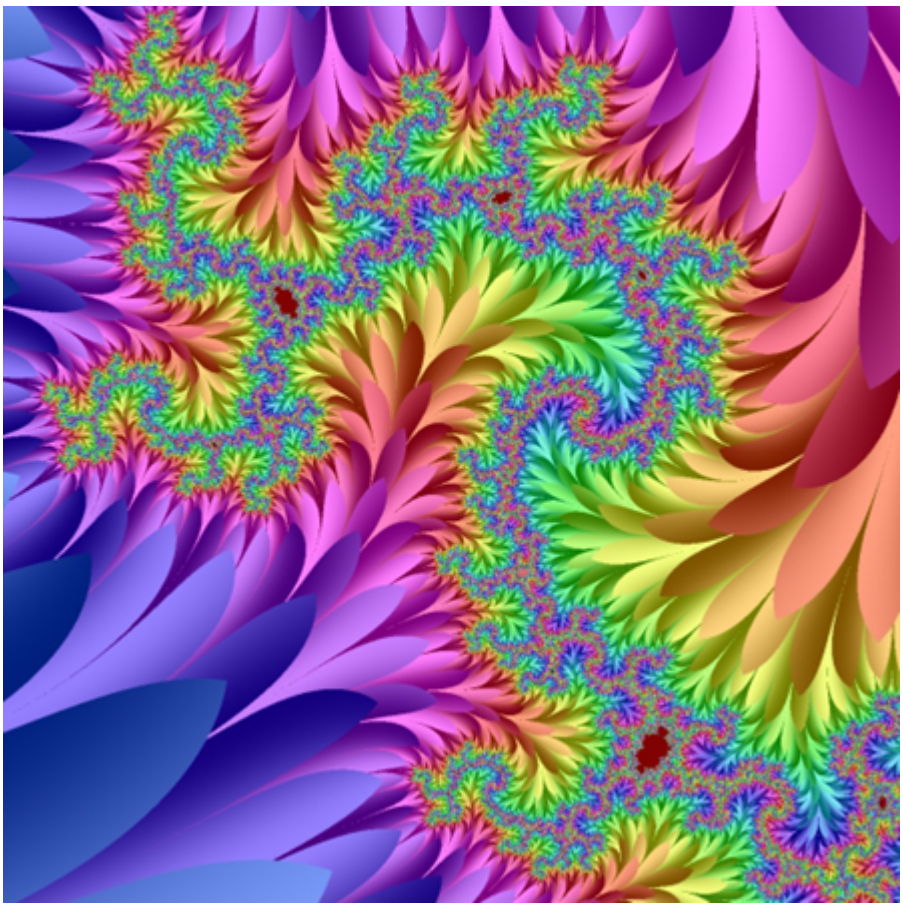
Dan was a prolific researcher in many fields, most notably Evolutionary Computation, Bioinformatics, Mathe- matical Biology, Games, and Graph Theory. From using evolutionary computation to optimize cooking stove design in Central America to using artificial intelligence to improve vaccine distribution, Dan was a master at using ad- vanced computational techniques to solve real-world problems. An author of more than 300 scholarly articles, Dan's writing and influence have been substantial. He is author or co-author of seven published textbooks including "Evo- lutionary Computation for Modeling and Optimization" (Springer, 2006), "A Course in Evolutionary Computation" (with Wendy Ashlock, independently published, 2021), and five introductory level texts: "Mathematical Problem Factories: Almost Endless Problem Generation" (with Andrew McEachern, Morgan-Claypool, 2021), "An Intro- duction to Proofs with Set Theory" (with Colin Lee, Morgan-Claypool, 2020), and three "Fast Start ... Calculus" texts (Morgan-Claypool, 2019). Dan was also the editor for a book series on computational intelligence in games for Morgan and Claypool for the past four years, and served as an associate editor for many years for the journals BioSys- tems, the IEEE Transactions on Evolutionary Computation, the IEEE Transactions on Games, and the IEEE/ACM Transactions on Computational Biology and Bioinformatics. In the area of evolutionary computation, one of Dan's seminal contributions was the idea that representation of the problem has a large, and often determining, effect on the success of an optimizing algorithm. Dan's research led to improved knowledge about fitness landscapes and issues surrounding coevolution.

Dan played a pivotal role in the interdisciplinary bioinformatics programs at both Iowa State and the University of Guelph, being a founding member of the program at Iowa State, and serving on the Bioinformatics Steering Committee at Guelph. Dan was instrumental in the launch and success of Guelph's Ph.D. program in this area. In Iowa, he was involved with the Research Experience for Undergraduates (REU) that attracted students from all over the U.S. to come to Iowa State for a summer of bioinformatics research. At Guelph, Dan taught courses in the program at various points over the years, and served as supervisor or advisory committee member for many graduate students. He developed a particularly close collaboration with Dr. Steffen Graether of the Department of Molecular & Cellular Biology, and their research has resulted in novel clustering methods that can be applied to DNA sequence and other data, and new approaches for studying the evolutionary history and classification of proteins.

Dan was highly involved in the IEEE, being a senior member since 2005. He was on the Chair of the Task Force on Industrial Relations (Games), 2017–2018, and Chair of the Games Technical Committee, IEEE Computational Intelligence Society, 2017–2018. He served on the IEEE Education Committee from 2018 until his death, and was particularly heavily involved for decades with the Bioinformatics and Bioengineering Technical Committee and its associated IEEE Computational Intelligence in Bioinformatics and Computational Biology (CIBCB) conferences, as well as the IEEE Conference on Games (COG). Dan was awarded the IEEE Lifetime Achievement Award in 2015–2016.

Dan was a passionate promoter of Mathematics Education and Outreach as evidenced by his blog Occupy Math, whose byline was "Math is the right of all free people." He posted articles covering a wide array of topics including math anxiety, needing more women in mathematics, using mathematics to know when politicians are lying to you, and enjoying the wonderful structure of mathematics through art. As service to the department, Dan was involved in outreach, high school liaison, and supporting the undergraduate Mathematics & Statistics Club. Dan developed a

relationship with a chemistry high school teacher at Centennial CVI in Guelph, who sent him bright students with whom Dan met regularly to mentor. Dan would frequently hold math challenge problem contests for undergraduate students, he designed many educational games, and he held a fractal art competition. Fractals were one of Dan's loves. He, along with his graduate students, would write evolutionary algorithms to find "interesting" portions of the Mandelbrot set, or other fractals. An example of one of his fractals is below; many others can be found on his Occupy Math blog.



One wall of the Mathematics & Statistics Club room at the University of Guelph is a mural of a fractal created by Dan. Dan felt that everyone should have the opportunity to learn mathematics, but he was not convinced that calculus is the best topic at the first year level for many students, especially those outside Physics and Engineering. He has a TEDx talk on this subject, which can be viewed here. Many other of his opinions about teaching and learning mathematics can be found on his Occupy Math blog.

Dan was also a driving force behind curricular renewal. The Physics department had often complained that the order in which topics were taught in our calculus courses did not suitably align with when these topics were needed in the Physics courses. Dan formed a committee to look into this, making sure that the committee had ample student representation. Following the recommendations of the committee, Dan helped design two combined introductory Physics and Calculus courses that would be team taught by both a Physics and a Mathematics instructor. Dan then co-taught that course for many years, often receiving standing ovations from students at the end of the semester. Dan was instrumental in re-designing the department's mathematics for business students course and most recently helped design our department's first Combinatorics and Graph Theory course. While at Iowa State, Dan developed a Math for Biologists course and an Introduction to Evolutionary Computation course.

Dan was mentor and advisor to many undergraduate and graduate students in the Mathematics and Bioinformat- ics programs at the University of Guelph and Iowa State. While at Iowa State, he supervised three Bioinformatics doctorates and two Mathematics doctorates, as well as 11 masters students. At Guelph he advised or co-advised nine doctoral and 15 masters students in Mathematics, one doctoral student in Statistics, one doctoral student in Computer Science, one masters student in Biophysics, six doctorates in Bioinformatics, two Masters of Science in Bioinformatics, and dozens of Masters of Bioinformatics projects, as well as serving on many advisory committees. Many of Dan's students have expressed thanks for his support, and for conveying his enthusiasm for mathematics to them. Dan cared deeply for others and was an advocate for the vulnerable.

Conversing with Dan on the research level was often a mental workout, not because what he said was obtuse, but simply because his thought processes were far faster than most. One often felt like Dan was at the summit surveying the problems on the other side while you were still trying to get your head around the obstacle half way up the hill. At a more general level, Dan always had something interesting to talk about, whether it be the most recent scientific gadget, the fascinating research of some colleague, the latest environmental news, or his own opinion on the woeful state of politics. And he was nearly always ready with a reference to some science fiction story that was directly applicable. An elevator ride with Dan was never a dull moment.

He will be greatly missed.

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