

Thirtieth Anniversary Note from the Editors in Chief

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Urban mathematical legend holds that thirty is the best age for a mathematician. Our journal, *Discrete & Computational Geometry*, has just reached this magical age, and in a way, so has also the field that has become known under the same name.

At the time the journal was conceived, the explosive proliferation of computers, accompanied by spectacular progress in computer science, prompted a revolution in several areas of mathematics. This was particularly striking in geometry: many geometric optimization problems, traditionally studied by calculus of variations, differential equations, and other continuous techniques, suddenly become accessible to discrete methods. For example, elegant algorithms were discovered for constructing the convex hull and the Voronoi diagram of a point set, and for solving various visibility and motion planning problems. The analysis of several of these algorithms required the use of classic extremal results in discrete geometry, such as the Erdős–Szekeres convex n -gon theorem; the theorem of Szemerédi and Trotter on the maximum number of incidences between points and lines; Lovász’s bound on the number of halving lines of a point set; the upper bound theorem and the lower bound theorem from polytope theory; or new ones, still to be developed. Exciting new questions were asked about arrangements of geometric objects, that demanded new ideas. Glancing through the first couple of issues of *DCG*, one can get a taste of those momentous times. The marriage of the classic subject of discrete geometry, initiated by Newton, Minkowski, Hilbert, Steinitz, Coxeter, Erdős, Fejes Tóth, and others, and the brand new field of computational geometry has turned out to be long lasting and fruitful: a new discipline was born, called *Discrete and Computational Geometry*.

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The godfathers of the new field were *Jacob E. Goodman* and *Richard Pollack*, known as Eli and Ricky, the founding editors-in-chief of *DCG*. They kept permanent contact with a large number of enthusiastic researchers working in this area, among them the established experts, but also a new generation of students and postdocs who would soon leave their marks on the field. Ricky and Eli spread the news about exciting developments, established contacts between people studying similar problems, and asked fellow researchers to submit their best results to *DCG*—sometimes even before those results had been written up. In 1986 they organized the first significant meeting dedicated to Discrete and Computational Geometry in Santa Cruz, California. The tenth anniversary meeting took place at Mount Holyoke, Massachusetts (1996), the twentieth anniversary conference at Snowbird, Utah (2006), and the thirtieth anniversary at Monte Verità, Switzerland (2016). *DCG* had been launched at about the same time as the series of *Annual Symposia on Computational Geometry*, known under their acronym *SoCG* (and pronounced like “sausage”). From the very beginning, every single year *DCG* devoted a special issue to the best papers presented at *SoCG*. This tradition lives on.

Of course we are biased, but it appears to us that 30 is a great age not just for a mathematician, but also for a discipline and for a journal. By now, discrete and computational geometry has acquired many powerful new techniques and tools to successfully deal with fundamental problems associated with classical structures such as convex polytopes, linear programs, tilings, packings and coverings, lattices, point configurations and hyperplane arrangements, both in the plane and in higher dimensions. Structural problems have been posed and solved in order to satisfy the algorithmic needs of geometric computing. For example, variants of the random sampling method, discovered and mastered by Paul Erdős in the 1960s and applied in the theory of computation ten years later, have also played a crucial role in almost all subareas of discrete and computational geometry. Methods of symbolic perturbation can be performed in discrete-geometric settings; they are reflected in judicious treatments of floating-point arithmetic that lead to surprisingly robust geometric calculations.

The richness and liveliness of geometric computation is apparent from the early years, and continues: in any given issue, someone might be guarding, covering, interpolating, peeling, partitioning, translating, counting, enumerating, locating, moving, triangulating, separating, searching, traversing, cutting, spanning, netting, projecting, flipping, or constructing; might be computing the width, diameter, radius, center, hull, Voronoi diagram, or upper envelope; might work deterministically, randomly, dynamically, in parallel, output-sensitively, in floating point, or incrementally; might be working with points (in the plane, in general position, amen), polytopes, lines, line segments, circles, squares, quad-trees, rectangles, spheres, simple polygons, rectilinear polygons (with holes), zones, cells, nets, zonotopes, planar graphs, Reeb graphs, contour trees, Pareto frontiers, linkages, homology groups, metric spaces, or Jordan arcs.

Throughout these thirty years, discrete and computational geometry has maintained and enabled and fostered vigorous connections to many other fields of mathematics and computer science. Algebraic and topological methods have proven to be amazingly powerful on a great range of geometrical problems. Discrete geometry has seen the birth of tropical geometry, motivated by and intimately connected to diverse aspects of

complex algebraic geometry. Algorithms for metric spaces and for topological analysis have made great strides.

Apart from papers introducing groundbreaking techniques, the solutions of many longstanding open problems also appeared in *DCG*. We will resist the temptation to start a very long list of our personal favorite *DCG* papers and results here—but instead we invite you to browse 30 years and 55 volumes of our journal and to make your own choice (and perhaps discover further highlights you were not aware of).

At the same time, the field of discrete and computational geometry is as lively and vigorous as ever, with fundamental problems and questions ahead of us, waiting to be solved. Again, we refrain from naming our favorites, but rather invite you to choose your own, solve them, and submit the solutions to *DCG*.

We are grateful to an army of friends, colleagues, and other professionals who have contributed to the success of *Discrete & Computational Geometry* during the past three decades: to our editors, to the reviewers for their relatively thankless but crucially important contributions, to the Springer editorial and production staff, and—above all—to our ever growing number of authors and readers, who make this whole enterprise meaningful. Many happy returns!