

Mathematics of Computation meets Geometry

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Computational mathematics, and particularly, computational differential equations, has traditionally found its mathematical grounding chiefly in the area of analysis. An important trend, which flowered in the last couple of decades and is burgeoning now, is the development of structure-preserving, or compatible discretization methods for differential equations, for which the relevant numerical analysis is intimately connected to geometry. The payoff comes as numerical methods that improve on the stability and convergence properties of more general purpose methods by exactly preserving key underlying the equations under consideration. Such structures include, for ordinary differential equations, symplecticity, symmetry, invariants and constraints, and, for partial differential equations, de Rham and other cohomologies and associated Hodge theory. We will tour some of the high points in the development of structure-preserving discretizations and report on some recent developments.