Ideas of projective geometry keep reappearing in seemingly unrelated fields of mathematics. The authors' main goal in this book is to emphasize connections between classical projective differential geometry and contemporary mathematics. They also give new results and new proofs of classic theorems. Exercises play a prominent role: historical and cultural comments relate the basic notions to a broader context.

The book starts with a detailed discussion of the simplest differential projective invariant – the Schwarzian derivative – and its connection to the Virasoro algebra, one of the most popular objects of study in mathematical physics today. About half of the book is devoted to one-dimensional projective differential geometry and related topics: differential operators, the cohomology of the group of diffeomorphisms of the circle, the classical four-vertex theorem, its numerous generalizations, and their significance to symplectic and contact topology. The classical projective differential geometry of projective hypersurfaces is surveyed and related to less traditional topics such as the complete integrability of the geodesic flow on the ellipsoid, Hilbert's fourth problem, and very recent results and conjectures in the projective differential topology of surfaces. A final chapter considers various versions of the multi-dimensional Schwarzian derivative, including the Lagrangian Schwarzian and multi-dimensional Sturm theory. The seven appendices cover diverse background material from proofs of the Sturm–Hurwitz theorem to symplectic and contact geometry, from the Godbillon–Vey class to infinite-dimensional Poisson geometry.

In sum, this book is a rapid route for graduate students and researchers to the frontiers of current research in this evergreen subject.