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## Nota di contenuto

Introduction -- Potential Flow Through Cascades of Thin, Impermeable Aerofoils -- Scattering by Cascades of Aerofoils with Realistic Geometry -- Potential Flow Through Cascades of Thin, Porous Aerofoils -- Scattering by Cascades of Aerofoils with Complex Boundary Conditions -- Potential Flow Through Cascades with Multiple Aerofoils per Period -- The Quasi-Periodic Compact Green's Function -- Conclusion.

## Sommario/riassunto

This thesis is concerned with flows through cascades, i.e. periodic arrays of obstacles. Such geometries are relevant to a range of physical scenarios, chiefly the aerodynamics and aeroacoustics of turbomachinery flows. Despite the fact that turbomachinery is of paramount importance to a number of industries, many of the underlying mechanisms in cascade flows remain opaque. In order to clarify the function of different physical parameters, the author considers six separate problems. For example, he explores the significance of realistic blade geometries in predicting turbomachinery performance, and the possibility that porous blades can achieve noise reductions. In order to solve these challenging problems, the author deploys and indeed develops techniques from across the spectrum of complex analysis: the Wiener–Hopf method, Riemann–Hilbert problems, and the Schottky–Klein prime function all feature prominently. These sophisticated tools are then used to elucidate the underlying mathematical and physical structures present in cascade flows. The ensuing solutions greatly extend previous works and offer new avenues for future research. The results are not of simply academic value but are also useful for aircraft designers seeking to balance aeroacoustic and aerodynamic effects.