Stellarator Coil Optimization[1] RONALD F. SCHMITT, ALLEN H. BOOZER, Department of Applied Physics and Applied Mathematics, Columbia University — Coil design is critical to the cost and viability of stellarator fusion reactors. Coil design is a complex inverse problem with many subtleties. The complexity and inefficiency of the coils increases exponentially with the number of magnetic features retained. The physics properties of a stellarator plasma are determined by the shape of the outermost surface. Only a limited set of shape parameters are essential to that design. The optimal coil set for a given plasma equilibrium controls only the essential shape parameters. The study of small perturbations about the essential shape parameters yields the magnetic features that the coils must produce. This study allows the design of a coil set that possesses minimal complexity and a minimal ratio of the magnetic field on the coil surface to that on the plasma surface. Coil set designs for several plasmas are presented.

Ronald Schmitt
Department of Applied Physics and Applied Mathematics, Columbia University