structure of their super moduli spaces. The super Riemann surfaces provide the natural setting for superconformal field theory. They are the world surfaces of fermionic strings. The basic tools for superconformal analysis and algebra on super Riemann surfaces were developed: super power series expansions, super line integrals and contour integrals, the super Cauchy theorem and the superconformal tensor calculus.

Our graduate student, *J. Cohn*,[74] extended this work to describe the $N = 2$ super Riemann surfaces which provide the setting for superstring theory, fermionic strings in spacetime supersymmetric backgrounds (see sections 8.6, 8.4 and 8.5 below). Super Riemann surfaces have provided the mathematical setting for extending the covariant quantization of fermionic string[75] to higher loops[76].

Some aspects of the theory of super Riemann surfaces seem to have been independently described by and by Baranov and Schwarz,[77] in quite different language. Some aspects of supermoduli space and its role in fermionic string theory were earlier discussed by Moore and Nelson[78].

8.4 $N = 2$ superconformal unitarity and superstring compactification

In the winter of 1985-86, Boucher, *Friedan* and *Kent*[79] obtained determinant formulae for the $N = 2$ superconformal algebra and found the constraints on its representations due to unitarity. The results are the first step in classifying the $N = 2$ supersymmetric critical phenomena. They are also the first step in the abstract classification and study of supersymmetric string ground states as $N = 2$ superconformal field theories.

In the spring of 1985 *Qiu* and *Shenker* had obtained some preliminary results on the $N = 2$ algebra, and at the Santa-Barbara workshop Di Vecchia and collaborators[80] reported similar results. At this time *Friedan* was contemplating the idea of constraining or even classifying string ground states by the representation theory of algebras of conformal fields. The $N = 2$ algebra seemed