This project is planned as a continuation of the project `P14195-MAT` and will be located at the Erwin Schrödinger Institute and the Institute of Mathematics of the University of Vienna jointly. The research will follow several lines:

1) In previous papers we studied the problem of choosing the roots of one parameter families of polynomials as differentiable as possible. This problem generalizes to an invariant theoretic question about orthogonal representations of Lie groups. We plan to continue our investigation of this problem. Also we would like to consider polynomials which depend on more than one parameter, and study the relation to entanglement in quantum mechanics.

2) We plan to pursue our study of generalized Cayley transforms from Lie groups to their Lie algebras. Particular attention will be paid to fields with non-zero characteristic.

3) We consider the space of unparameterized simple close curves in the plane. This can be thought of as the space of two dimensional shapes. We started to study a class of (weak) Riemannian metrics on this space, its geodesic equation, curvature and the induced geodesic distance. We plan to compare this metric to the Weil–Peterssen metric which is used in Teichmüller theory and string theory.

4) The project is to continue the investigation of the geometry of orbit spaces of isometric Lie group actions. There are relations to interesting dynamical systems generalizing the Calogero–Moser system.

5) We want to continue our study of extending an infinitesimal group action to a group action on an enlarged manifold. We also plan to study flow completions of positive semigroups. As an application this should give a method to investigate viscosity solutions of Burgers' equation.

6) The cohomology of a Poisson manifold inherits a rich structure. Particularly a filtration which generalizes Brylinsky's space of Poisson harmonic forms. Every Poisson mapping has to preserve this structure. This should yield restrictions on the homotopy type of Poisson mappings. So we would like to compute this structure for nice Poisson manifolds such as Hamiltonian fibrations. It looks as this method also can be used to get information about the singularities of a Poisson manifold.

7) There is a close connection between spectral geometry and dynamics. For example the incidence numbers in the Morse–Novikov complex and the number of closed trajectories of a closed one form can be recovered from spectral geometry. We plan to extend this to Morse–Bott–Novikov situation.

8) The vortex filament equation for circles in three dimensional space generalizes to a Hamiltonian equation on the space of codimension two submanifolds in a Riemannian manifold. This is a non-linear evolution equation. As a first step in the study of this equation we plan to establish short time existence and uniqueness of solutions.