

# Scientific report concerning the ESF short visit grant 2842

*“Discretization of curvature line parametrized surfaces and  
orthogonal coordinate systems in terms of Clifford algebras”*

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I recently visited the Isaac Newton Institute for Mathematical Sciences at Cambridge, UK, from Sunday 22nd to Saturday 28th of March 2009. The main purpose of this stay was to build up a solid basis for my further work on discretization of orthogonal nets, using Dupin cyclides.

Up to now my work focussed on the geometric aspects of the discretization of orthogonal nets as *cyclidic nets*. These cyclidic nets are composed of patches of Dupin cyclides and the formalism essentially relies on the description of Dupin cyclides in the projective model of Lie geometry. The next step is to establish other algebraic descriptions of cyclidic nets, which in particular is related to the Clifford algebraic description of Dupin cyclides. The first goal to be achieved here is a linearization of the theory, which hopefully then also leads to new approximation and convergence results.

Therefore I spent much time dealing with Clifford algebras in general as a preparatory step. I also dealt with the classical “line-sphere correspondence” between spheres in  $\widehat{\mathbb{R}}^3$  and lines in  $\mathbb{R}P^3$ , which can be well observed in the projective models for both geometries. The aim of this examination is to uncover relations between the exterior algebra model of Plücker geometry and a Clifford algebra model of Lie geometry, in particular the representation of contact elements is of important interest.

As intended, I also benefited from some talks of the conference “Quantum Discrete Integrable Systems”, which took place at the same time, in order to broaden my knowledge concerning integrable systems, as well as to gain ground in this community by personal contact to active researchers.

Summarizing I can say that a good foundation for further research has been established.