

# Application for an ESF short visit grant

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

Emanuel Huhnen-Venedey  
Technische Universität Berlin, Germany

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## **Aim of the visit and research project**

I plan to visit the Isaac Newton Institute for Mathematical Sciences at Cambridge, UK, from Sunday 22nd to Saturday 28th of March 2009. At these days there happens the conference “Quantum Discrete Integrable Systems” in which most of the specialists in discrete integrable systems will participate. This is an excellent occasion to meet people working in this subject and to broaden my respective knowledge. In particular I plan to collaborate with Professor Alexander Veselov from Loughborough University, UK, and Professor Rinat Kashaev from University of Geneva, Switzerland.

My field of research is discrete differential geometry. Discrete differential geometry is an active mathematical terrain where differential geometry and discrete geometry meet and interact. It aims at the development and application of discrete equivalents of the geometric notions and methods of differential geometry. The latter appears then as a limit of refinements of the discretization. Current progress in this field is to a large extent stimulated by its relevance for computer graphics and mathematical physics, thus discrete differential geometry is an essential ingredient of quantum discrete integrable systems.

Currently I’m dealing with the discretization of curvature line parametrized surfaces and orthogonal coordinate systems, which are described by integrable systems. My work on that started with my Diploma thesis (finished in 2008), in which I introduced cyclidic nets as a discretization of the mentioned systems based on Lie geometry of spheres. The idea was, to use surface patches of so-called Dupin cyclides in order to obtain piecewise smooth discretizations of curvature line parametrized surfaces and orthogo-

nal coordinate systems. This worked out very well, because there is a simple description of Dupin cyclides in the projective model of Lie geometry. Nevertheless one ends up with quadratic expressions, and our goal now is to linearize the theory by switching to a Clifford algebraic description of Lie geometry. Something similar was already done in the context of circular nets, where a Clifford algebraic description of Möbius geometry enabled Bobenko, Matthes and Suris in 2003 to prove important facts about the convergence of circular nets to orthogonal coordinate system. My current work can be seen as a continuation of this.

## Organizational details

**Duration of the visit:** 22nd to 28th of March 2009.

**Accomodation:** Accommodation and meals are provided at Wolfson Court, next to the Newton Institute. It is part of the Girton College:

Address: Girton College, Cambridge, UK, CB3 0JG

Telephone: +44 (0)1223 338999

Fax: +44 (0)1223 338896

E-mail: [info@girton.cam.ac.uk](mailto:info@girton.cam.ac.uk)

**Travel costs:** approximately €400.

# Curriculum Vitae

## Personal data

Address Emanuel Huhnen-Venedey  
Gneisenaustraße 87  
10961 Berlin, Germany

E-mail address [huhnen@math.tu-berlin.de](mailto:huhnen@math.tu-berlin.de)

Phone number +49-30-314-79253

Homepage [www.math.tu-berlin.de/~huhnen](http://www.math.tu-berlin.de/~huhnen)

Date of birth 14.07.1981 in Bensberg, Germany

Citizenship German

Family status unmarried

## Education

08/1987–05/2000 School, North Rhine-Westphalia, Germany

10/2001–09/2002 Mathematics (Diploma) at Bonn University, Germany

10/2002–02/2008 Mathematics (Diploma) at Technical University Berlin  
Topic: *Curvature line parametrized surfaces and orthogonal coordinate systems. Discretization with Dupin cyclides.*  
Advisor: Prof. A.I. Bobenko  
Obtained award for the 2nd best degree in Mathematics at TU Berlin in 2008

04/2008–ongoing Mathematics (Ph.D.) at Technical University Berlin

## Employment

09/2000–08/2001 Civilian service at "Johannes-Schule" for handicapped children in Bonn

03/2004–03/2005 Tutor for mathematics and physics at "Schülerhilfe" institute, Berlin

04/2005–02/2008 Student Assistant at TU Berlin,  
Research Unit "Polyhedral Surfaces"

04/2008–ongoing Research Assistant at TU Berlin

## **Teaching**

Summer 08 Discrete Differential Geometry (Exercises)  
Linear Algebra for engineers (Exercises)

Winter 08 Berlin Mathematical School basic course "Geometry"  
(Analytic and projective Geometry) (Exercises)

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Institut für Mathematik, MA 8-3  
Technische Universität Berlin  
Straße des 17. Juni 136  
10623 Berlin, GERMANY

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Emanuel Huhnen-Venedey is a research assistant at the institute of mathematics at TU Berlin, and a participant in the DFG Research Unit "Polyhedral Surfaces". He is working on discretization of curvature line parametrized surfaces and orthogonal coordinate systems, and has written an excellent Diploma thesis in this topic. The proposed visit would aid the current and future research of him.

Prof. Dr. A.I. Bobenko