

# ESF RESEARCH CONFERENCES

## Rapporteur Report

Partnership:	ESF-EMS-CRM-Pi
Conference Title:	Knots and Links: From Form to Function
Dates:	2-8 July 2011
Chair:	Professor Renzo Ricca
Rapporteur:	Professor H. K. Moffatt

### General Comments

Any general comments you might have concerning the conference, your role, the scientific area covered by this conference, etc.

This conference gathered together an interesting combination of mathematicians working on the topology of knots and links, and applied mathematicians involved in the application of knot theory to problems in the physical and biological sciences. The interaction was of mutual benefit, because problems that arise naturally in the physical and biological contexts (e.g. problems related to 'knot energy') raise new problems of a fundamental nature for 'pure' mathematicians. As regards my own role, this is an area in which I have been involved since the mid 1980's, when the importance of topological structure in fluid mechanics and magnetohydrodynamics began to be recognised. Applications to molecular biology emerged during the 1990s, stimulated by the work of Andrzej Stasiak, De Witt Sumners, and others. Exciting applications in fundamental particle physics, quantum hydrodynamics, polymer physics and optics have emerged during the last decade. Experts from all of these fields were present at this Conference, and the level of interdisciplinarity was remarkable. Quality of Scientific Programme, Presentations and Discussion Comments on the balance and scope of the scientific programme, the scientific quality of the presentations and discussions.

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The programme was arranged in morning and afternoon sessions, starting on the Sunday morning, 2 July, and ending with a special session in the beautiful 'Aula degli Stemma' of the Scuola Normale Superiore on the Thursday evening, 7 July. A poster session was also included, with 5 minute introductions to each poster on the Tuesday morning, and the posters being on view for an hour that evening before the Conference dinner at the Hotel Fossabanda.

The scope of the scientific programme extended to all the fields of application mentioned above, with an excellent balance between presentations from the pure and applied perspectives. These presentations were in general of very high quality, and the discussions that followed were extremely lively.

### Informal Networking and Exchange; Atmosphere

Was the schedule and the atmosphere conducive to an easy exchange of information? Was there time and space for an informal discussion? Were younger researchers integrated?

The practical arrangements were excellent, and gave every opportunity for easy exchange of information. The coffee breaks morning and afternoon were important in this respect, and the fact that an excellent lunch was provided in the nearby cafeteria of the Scuola Normale Superiore allowed for continuing discussion and lively interchange among all participants. The younger researchers had full opportunity during these informal breaks to interact with the more senior participants.

The excursion to San Miniato and the wine tasting at the San Quintino farmhouse on the Wednesday afternoon gave a further important opportunity for social and scientific interaction. This was brilliantly conceived and greatly appreciated by all participants.

### **Balance of Participants**

Was there an appropriate balance between young and senior participants? Was a balance of national groups and researchers from different (sub)fields achieved?

Yes, and yes!

### **Outlook and Future Developments**

Will new collaborations emerge from this conference? (How) could the conference outcomes be utilized further? Are there suitable (ESF) programmes or instruments to further the work of the conference?

The theme of the conference has significant overlap with two important international programmes that will take place in 2012: a one-month programme on “Knotted Fields” to be held in June/July at KITP, Santa Barbara; and a 6-month programme on “Topological Dynamics in the Physical and Biological Sciences” to be held at the Isaac Newton Institute for Mathematical Sciences, Cambridge, UK, July/December. These upcoming programmes testify to the current vitality of the field, which has received considerable fresh impetus from this ESF Pisa Conference, which may be seen as an important precursor for these more extended programmes.

### **Follow-up**

What immediate and long term follow-up would benefit collaborations and dialogues that may have begun at the conference?

Organisers of both the programmes mentioned above have been participants at the Pisa conference, and the planning of these programmes will certainly be influenced by the discussions that have taken place there. Many of the scientific problems raised in Pisa will no doubt be investigated in depth at these programmes in 2012, and it is therefore to be expected that the momentum generated by the Pisa meeting will be maintained and intensified over the next two years.

### **Organisation and Infrastructure**

Were venue, catering and accommodation appropriate for this conference? Were participants satisfied with the on-site administration and support?

All excellent; the only minor problem was that the air-conditioning of the ‘Aula Dini’ was not functioning on the first day of the conference (this being a Sunday), and the room became uncomfortably hot during the afternoon. Apart from that, the arrangements were uniformly excellent, and both Anne Guehl (of ESF) and Caterina D’Elia of the Centro di Ricerca Matematica (CRM) of the Scuola Normale Superiore are to be congratulated on the efficiency of the organisation, and thanked for their efforts in making the conference such an agreeable experience for the participants.

### **Summary & Overall Assessment**

Was the conference successful; were its aims achieved?

Emphatically yes, to both questions! Professor Renzo Ricca is to be congratulated on having brought together an exceptionally interesting and varied group of participants, and for having constructed a programme of outstanding interest and contemporary relevance.

## About ESF Research Conferences

### **The Scheme**

This conference is part of the European Science Foundation's (ESF) Research Conferences Scheme. The Scheme aims to promote scientific excellence and frontier level research throughout Europe and the rest of the world. Conferences aim to provide leading scientists and other participants, including young researchers, with a platform to present their work, to discuss the most recent developments in their fields of research and to network.

### **Conference Format**

The core activities should be based on lectures by invited speakers, who are leaders in their respective fields, followed by extensive discussion periods. An informal exchange of ideas, both inside and outside the lecture room, should be encouraged, and the number of sessions in the daily timetable should be limited in order to allow sufficient time for interaction between the participants. Time should be reserved for a 'Forward Look Plenary Discussion' about future developments in the field.

Participants can take all their meals together to encourage further contact and networking, which can be particularly beneficial to younger researchers who may be less outspoken in the formal lecture room setting. In order to gain optimum benefit from the conference, both the speakers and the participants are asked to stay for the whole duration.

### **Division of Tasks**

The Conference Chair is responsible for ensuring the quality of the scientific programme through the selection and invitation of speakers, and through the selection of participants.

The ESF Conferences Unit is responsible for managing all the logistical aspects of the conference organisation, including the provision of an on-site secretariat.

Further information: [www.esf.org/conferences](http://www.esf.org/conferences)