

PRAGMATIC 2009

The following six papers arise from the research work done during, and immediately after, the Pragmatic School 2009. This was the eleventh edition of the Pragmatic School, since its starting in 1997, promoted by the Algebraic Geometry group in Catania.

We were glad to work in this School, who has become a traditional appointment in the education and training of many young researchers in mathematics. Its spirit, appreciated by us, is to do active mathematics through the solution of problems.

The School was held in Catania, from September 13th to October 3rd 2009, with the title “Vector bundles, from classical techniques to new perspectives”. The two teachers were Rosa Maria Miró-Roig (Universitat de Barcelona) and Giorgio Ottaviani (Università di Firenze), with the collaboration of Laura Costa (Universitat de Barcelona) and Daniele Faenzi (Université de Pau et de Pays de l’Adour). It is noteworthy that the two collaborators both participated, as students, to former editions of the school. This allowed to profit of their own experience, showing how the Pragmatic tradition of “making mathematics” remains alive. We wish to thank warmly Laura Costa and Daniele Faenzi for their scientific cooperation and their invaluable support to the school.

19 persons participated to the school, all graduate students or postdocs from all over Europe and from United States, with the addition of one researcher who could attend only the first week. The first week was very dense of lectures, aimed to introduce some topics and several tools intended for work on them.

In particular the following topics were covered, both by the teachers and by the collaborators:

- Vector bundles and their moduli spaces,
- Beilinson Theorem and cohomological characterization of vector bundles,
- Derived category and exceptional collections,
- Brill-Noether theory,

- Group actions, bundles on toric varieties, homogeneous bundles,
- Instanton bundles.

During the first week, all the participants gave a short presentation about their current research and their motivations to attend the school. On Thursday of the first week, we distributed a list with 10 open problems. For each problem, it was presented a short reference list and some suggestions on methods and techniques useful to attack it. On Friday of the first week, we formed eight groups, and each group received one of the problems.

The second and the third week were dedicated to the work around these problems. Each group had its own space of joint work, with discussions with the teachers and the collaborators. Two days were dedicated to thorough discussions about the status of work on each problem, with the choice of intermediate goals and even of more advanced aims. In several cases it became clear how an advanced topic can be reduced to “down to earth” computations with matrices, polynomials or discrete set of points, and this style reflects well the Pragmatic enthusiastic method of work.

At the end of the three weeks most of the groups had already significant results on each problem. A December 2009 deadline was put on the production of the first draft. Six groups answered to this call, and a couple of them essentially completed their papers. In January and February these six groups continued to work on the files, in order to transform them in cleaned mathematical research papers.

The last day of the school was dedicated to the presentation of the results of each group, and it was attended also by many colleagues in Catania that were not involved in the school.

We were impressed by the enthusiasm and the efforts of the participants and by the quality of the results achieved, that fit well in the international literature.

It is a pleasure to thank the wonderful organization of the Pragmatic school, and to acknowledge the extraordinary hospitality of the whole algebraic geometry community in Catania. The school has been for us a frenetic scientific activity, but also a lovely life experience. Among the many people in Catania whose efforts have contributed to the school, we would like to express our big gratitude to the Coordinator of Pragmatic Alfio Ragusa and to Salvino Giuffrida, Giuseppe Paxia and Giuseppe Zappalà.

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