

MATHEMATISCHES FORSCHUNGSINSTITUT OBERWOLFACH

Report No. 16/2007

## Graph Theory

Organised by  
Reinhard Diestel (Hamburg)  
Alexander Schrijver (Amsterdam)  
Paul D. Seymour (Princeton)

March 25th – March 31st, 2007

ABSTRACT. This week broadly targeted both finite and infinite graph theory, as well as matroids, including their interaction with other areas of pure mathematics. The talks were complemented by informal workshops focussing on specific problems or particularly active areas.

*Mathematics Subject Classification (2000):* 05Cxx.

### Introduction by the Organisers

This conference was one of a series of Oberwolfach conferences on the same topic, held every two years. There were 55 participants, including about twenty graduate students and postdocs.

Since graph theory is a broad and many-faceted field, we need to focus the workshop on a specific domain within the field (as we did in previous years). A dominant area within graph theory today is extremal graph theory: the study of the asymptotic and probabilistic behaviour of various graph parameters. While this is an exciting area, it is of a different character from much of the remainder of graph theory, and its inclusion would lead to an undesired division of the participants. Since extremal graph theory is adequately covered by the Oberwolfach combinatorics conference, we decided to minimize the extremal content and to focus the conference on other fundamental areas in graph theory, their interaction, and their interaction with mathematics outside combinatorics. In particular, we focus on structural aspects of graphs like decomposability, embeddability, duality, and noncontainment of substructures and its relations to basic questions like colourability and connectivity, and on the applicability of methods from algebra, geometry, and topology to these areas.

The conference was organized along lines similar to the earlier Oberwolfach Graph Theory conferences of 2003 and 2005. There is a reduced number of formal talks, to give space for informal workshops on various topics in the area. As before, on the first day, we asked everyone to make a five-minute presentation of their current interests. This was designed also to promote contact between participants early in the meeting, and turns out to work very well.

As for the talks intended for all the participants, there were six 50-minute and twenty-one 25-minute talks. We selected these from the abstracts submitted before the meeting, and we chose them to be of scientific relevance and general interest, as best we could. Also, we deliberately chose younger speakers, and tried for a wide range of topics. Among the highlights of the week were the presentation of a proof of Berge's strong path partition conjecture for  $k=2$ , a new method to apply chip-firing games in graphs to derive a Riemann-Roch theorem in tropical geometry, and constructions of limits of graphs forming a topological space that encompass Szemerédi's regularity lemma.

The workshops are intended to be informal — no formal speakers or time slots, with a 'convenor' to manage the workshop — and are focused on areas with specific recent results, conjectures and problems. It is our experience that such workshops can be the best part of a conference. We wanted these to be really informal, so that anyone in the group who wanted to contribute could spontaneously get up and say his or her piece. Before the meeting, we selected a few topics that seemed appropriate for workshops, some of which were suggested by participants. This time there were workshops on graph width, matroids, graph limits, flows and cycles in infinite graphs, and paths and minors. Sometimes, the workshops were scheduled in parallel, and some were extended in evenings later in the week.

We were very satisfied with the way the conference worked out. Although the participants had varied interests, they were not so far apart that they polarized into separate camps. Most of the talks were of interest to almost all of the participants, and the workshop format satisfied the desire of some for more focus.

Again, we regard this as a very successful conference. If we organize another Graph Theory meeting at Oberwolfach, we would run it on the same lines. We are very thankful to the Oberwolfach management and staff for the opportunity to organize this meeting and for their smooth running and support of the meeting.

Reinhard Diestel,  
Alexander Schrijver,  
Paul Seymour.