Description of the Bielefeld group involved with the algebraic-combinatoric network

Principal researcher:

Prof. Dr. Andreas W.M. **Dress**, full professor of mathematics at Bielefeld University since 1969. Interests range from pure mathematics including e.g. representation and K-theory to very applied areas including e.g. crystallography, chemistry, and computational biology: surprisingly often, activities in any one of these diverse fields have led to developments which are closely related to questions studied in *algebraic combinatorics.*

Associated researchers (in alphabetical order):

Dipl.math. Jörn **Bornhöft**: in his diplom thesis, presented in 1994, he justified rigorously some computer-graphics procedures for drawing hyperbolic tilings, relying on the surprisingly close connection between these procedures and the word problem for discrete hyperbolic groups.

Dr. Gunnar **Brinkmann**: in his thesis, presented in 1991, he pioneered the first systematical approach towards a mathematical theory of local perturbations of periodic tilings, - a topic which simultaneously is very important in condensed matter physics and utterly neglected in mathematics. Since then, he has not only broadened his approach; in addition, he has established several world records through his computer programs for generating and enumerating all sorts of discrete structures (3-regular graphs, Fullerenes, hydrocarbon structures etc.).

Dr. Olaf **Delgado Friedrichs**: in his thesis, presented in 1994, he has worked out efficient algorithms concerning the construction and classification of periodic 3D-tilings, which have already been used successfully to solve systematically a number of problems in this field, which have not been attackable by any other known technique so far.

Dr. Daniel **Huson**: in his thesis, presented in 1990 and awarded with a university price, he has developed computer algebra tools to generate and enumerate periodic 2D-tilings. In the last five years, he worked out several refinements and generalizations which, in the meantime, won international acclaim. He is now - in cooperation with Olaf Delgado Friedrichs - extending his methods to the 3D-case, while simultaneously constructing efficient methods to compute Delone tilings for periodic discrete point systems (e.g. atoms in crystalls) and improving the scientific and artistic options available in his and O. Delgado Friedrich's 2D-computer graphics package `RepTiles`.

Dipl.Math. Lars **Lauer**: in his diplom thesis, he studied local irregularities in otherwise regular hexagonal tilings. He is now extending his approach to spherical structures (e.g. Fullerenes) and structures with a well defined boundary structure (e.g. PentHex Puzzles).

Dr. Vincent **Moulton**: In his thesis, presented in 1994 at Duke University, V. Moulton studied vector braids. He is now extending this study to encompass all sorts of subspace arrangements. In addition, he has started to work on the combinatorics of finite metric spaces, relevant in combinatorial group theory as well as in e.g. phylogenetic studies.

Dr. Christian **Siebeneicher**: Akademischer Rat at Bielefeld University since 1975. Since he studied λ-ring structures of Burnside rings in his thesis from 1972, he has - among other things - continuously worked on various aspects of Burnside-ring theory, including the fascinating connection with the Witt-vector construction.

Dipl.Inf. Jens **Stoye**: After finishing his diplom thesis in theoretical informatics, J. Stoye joined our biocomputing group to work on sequence alignment algorithms.

Dr. Sören **Perrey**: in his thesis, presented in 1994, he has developed deeper insights into the behavior of Chess programs and other computer programs playing two-person games. He now works in the biocomputing group, in particular on new algorithms for sequence comparison.

Dr. Werner **Terhalle**: in his thesis, presented in 1992 and awarded with a university price, he has studied an intriguing connection between valuated matroids and affine buildings. He is now using this approach to develop a deeper understanding of (**R-**) trees, and possible higher-dimensional generalizations of such trees.

Dipl.Math. Bernd **Volkmer**: he works on (strongly deterministic!) cellular automata which can be used to produce (pseudo)random numbers and, hence, to simulate efficiently diffusion processes,- an important aspect in many other simulation tasks.