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Arrangements, Local Systems and Singularities

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Preface

This volume comprises a set of lecture notes from the CIMPA Summer School, *Arrangements and Local systems and Singularities*, held at Galatasaray University, Istanbul, during June 11-22, 2007. The school was attended by 68 mathematicians, 35 of them from 19 countries outside Turkey. The Summer School was made up of eleven short courses and five seminars presented by an outstanding group of lecturers who covered a wide range of topics related to the concepts of arrangements, local systems and singularities. The list of lectures of the workshop appears below. Most members of the audience were graduate students or young researchers and the primary purpose of the school was to introduce them, in particular those from developing countries, to the many advances and opportunities in this widely applicable field.

Historically, research on arrangements of hyperplanes, starting with the work of V.I. Arnold and E. Brieskorn and later Peter Orlik, was presented at meetings devoted mainly to discussions of singularities. Some of the articles in this volume demonstrate that the interaction between these two subjects is ongoing and particularly productive. Beyond this, the volume is intended for a large audience in pure mathematics, including researchers and graduate students working in algebraic geometry, singularity theory, topology and related fields. The reader will find in the Problem Section at the end of the volume a variety of open problems proposed by the lecturers at the end of the School's sessions as directions ripe for further study and development.

We would like to thank the *Centre des Mathématiques Pures et Appliquées (CIMPA)* for sponsoring the School and Professor Richard Grin for organizational help. We would also like to thank the *Scientific and Technological Research Council of Turkey (TUBITAK)* for their financial help which made it possible to invite 16 young mathematicians from Turkey as well as some lecturers from abroad. We were able to support participants from across the region, thanks to the generous financial help provided by the *International Center for Theoretical Physics (ICTP)* and the *International Mathematical Union (IMU)*.

During the long preparatory process and also during the school, Gülay Kaya, Ayşe Altıntaş and Celal Cem Sarioğlu contributed at various levels to the organization. We are grateful to them.

F. El Zein, A. Suci, M. Tosun, A.M. Uludağ and S. Yuzvinsky

The fourth named editor was supported by Tübitak/Kariyer 103T136 and Tuba/Gebip during the summer school and during the preparation of this volume. The third and fourth named authors were supported by the Galatasaray University Research Fund during the preparation of this volume.

List of Lectures of the School

T. Abe

Addition-deletion theorems for multiarrangements and graphic deformation of braids.

D. Cohen

Fundamental groups of complements of hyperplane arrangements.

G. Denham

Homological algebra of hyperplane arrangements.

F. El Zein

Local systems, constructible sheaves and Geometry.

M. Falk *Geometry and combinatorics of resonance weights.*

G. Kaya

Moduli of surfaces admitting non-smooth genus two fibrations over elliptic curves.

A.U.O. Kisisel

Toric varieties and the diagonal properties.

Lê D.T.

Simple singularities and simple Lie algebras.

D. Matei

Artin groups, Bestvina-Brady groups and arrangements of hypersurfaces.

D. Mond

(1) *Introduction to singularities of mappings*

(2) *Conservation of multiplicity. Cohen-Macaulay rings. Free divisors (from groups).*

M. Oka

Introduction to plane curve singularities.

H. Terao

(1) *The characteristic polynomial of a multiarrangement*

(2) *Periodicity of arrangements with integral coefficients modulo positive integers.*

M. Yoshida

Hyperbolic Schwarz map for the hypergeometric differential equation.

M. Yoshinaga

Minimal CW decomposition of the complement of hyperplane arrangements.

S. Yuzvinsky

Orlik-Solomon algebras of hyperplane arrangements.

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