MATHEMATISCHES FORSCHUNGSINSTITUT OBERWOLFACH

Tagungsbericht 20/1984

Gruppen und Geometrien

29.4. bis 5.5.1984

Die Tagung fand unter Leitung von Herrn B. Fischer (Bielefeld) und Herrn D.G. Higman (Ann Arbor) statt. Neben Fragen zur internen Struktur und Darstellungstheorie endlicher einfacher Gruppen wurden hauptsächlich geometrische Problemstellungen behandelt. Dabei waren Themen aus dem Bereich der Blockpläne, Graphentheorie und der projektiven bzw. affinen Geometrie vertreten. Ferner wurden Ergebnisse der Kodierungstheorie vorgestellt. In mehreren Vorträgen spielten topologische Aspekte (Homologie) eine besondere Rolle.

Sehr fruchtbar waren auch die Diskussionen, die außerhalb des offiziellen Programms geführt wurden. So trafen sich abends kleinere Arbeitsgruppen, um spezielle Fragestellungen zu diskutieren.

Gefördert durch
DFG Deutsche Forschungsgemeinschaft

Vortragsauszüge

L.M. BATTEN:

Affinely and projectively extendable finite affine subplanes

Those Desarguesian projective planes containing primitive cube roots of unity and therefore affine subplanes of order 3, also contain, in an interesting way, dual affine subplanes of order 3. Motivated by this observation we show that under certain conditions, a projective plane which contains an affine subplane of order m also contains a dual affine subplane of order m or a projective plane of order $\frac{\sqrt{4m+1}-1}{2}$.

B. BAUMANN:

Linear groups generated by a pair of quadratic action subgroups

Some comments on the proof of the following theorem had been made, which is a joint result with Chat Ho.

Theorem. Let G be a finite group and V be a finite dimensional faithful F_pG-module, where p is a prime. Suppose Γ is a G-invariant set of elementary abelian p-subgroups of G satisfying $1 = [V,A,A]$ for all $A \in \Gamma$. Assume that any two members of Γ generate either a p-group or G. Then $G/O_p(G)$ is isomorphic to one of the following groups:

(a) 1,

(b) $SL(2,q)$, where q is a power of p,

(c) $Sz(q)$, where q is an odd power of p and $p = 2$,

(d) D_{2s}, where s is an odd prime and $p = 2$.

A.M. COHEN:

Two properties of Coxeter groups

Joint work with Andries Brouwer.

Let (W,R) be a Coxeter system, R finite, and $r \in R$. For $J \subseteq R - \{r\}$ and $k \in \mathbb{N}$ set

$$B(J,k) = \langle J\rangle(r\langle J\rangle)^k - \bigcup_{i=o}^{k-r} \langle J\rangle(r\langle J\rangle)^i ,$$

$$S_k = \{s \in J \mid rs \text{ has order } k\}.$$

The following two properties hold for $K \subseteq J \subseteq R - \{r\}$:

(1) $r\langle J\rangle r\langle J\rangle r \cap \langle J\rangle = \langle S_2\rangle S_3\langle S_2\rangle$,

(2) $B(J,k) \cap \langle K \cup \{r\}\rangle = B(K,k)$.

The first property generalizes a lemma of Cooperstein (concerning the spherical case). It can be used to show that (except for some well described instances, among which the projective spaces) singular lines of the collinearity graph of a Lie incidence system are in fact (ordinary) lines of the incidence system.
The second property can be used to show that the geodesics between two points γ,δ of a Lie incidence system are all contained in a subsystem determined by a Coxeter system $(\langle B\rangle,B)$ if γ,δ belong to that subsystem.

A. DELANDTSHEER:

Some geometric consequences of the classification of finite doubly transitive permutation groups

The finite linear spaces containing a proper linear subspace and admitting an automorphism group which is transitive on the ordered pairs of intersecting lines are the projective and affine spaces of dimension ≥ 3, unless all lines have size 2. Moreover, the finite planar spaces admitting an automorphism group transitive on the ordered pairs of intersecting lines and those admitting an automorphism group transitive on the pairs consisting of a plane and a line intersecting this plane are determined.

G. GLAUBERMAN:

Viewing $O_6^-(3)$ as a characteristic 2 group

Although $O_6^-(3)$ is not isomorphic to a group of Lie type of characteristic 2, it shares many properties of such groups. For example, Ronan and Smith observed that its maximal 2-local subgroups yield a geometry with a diagram of type o=o=o. Kantor has shown that this is a GAB (geometry that is almost a building). We show how $O_6^-(3)$ can be constructed as a natural, but sporadic, linear group of characteristic 2 contained in $U_6(2)$. We do this by extending to $GF(4)$ the natural 6-dimensional module for $G_2(2)$ over $GF(2)$.

J.I. HALL:

Characterizing certain 3-transposition groups and Fischer spaces

I will discuss recent work on the classification of all center-free groups G generated by a conjugacy class D of 3-transpositions and in addition satisfying one of:

(1) $|G|$ finite and G possesses a normal 2-subgroup

or

(2) G contains no subgroup $H = \langle H \cap D \rangle$ with $|H| = 18$ or 54.

Ch. HERING:

The factorizations of $E_6(q)$

Let $G = E_6(q)$, q a prime power. Let r_1 and r_2 be primes dividing $q^4 - q^2 + 1$ and $(q^6 + q^3 + 1)/(3,q-1)$ respectively. Using the classification of finite simple groups we find

Theorem 1. If U is a subgroup of G whose order is divisible by r_1 and r_2, then $U = G$.

Also, the subgroups of G whose order is divisible by r_1 or r_2 can be classified. This information leads to

Theorem 2. G does not admit any non-trivial factorization.
Many arguments used in the proof I owe to J.G. Thompson.

D.G. HIGMAN:

Configurations and incidence structures

Adjacency algebras of type $\begin{pmatrix} 2 & 2 \\ & 3 \end{pmatrix}$ and $\begin{pmatrix} 3 & 2 \\ & 3 \end{pmatrix}$ correspond to quasi-symmetric designs and strongly regular incidence structures respectively. Some applications, in particular to quasi-symmetric designs, were discussed.

Z. JANKO:

The unknown small block designs

The construction of the symmetric block designs with the parameters (70,24,8), (71,21,6) and (78,22,6) will be discussed. We use the method of tactical decompositions in these constructions. The main problem is to find the suitable collineation groups. The full collineation groups of the constructed designs have also been determined.

D. JUNGNICKEL:

Translation transversal designs

In group theoretic language, a translation transversal design (TD) corresponds to a partition $\mathcal{T} = \{T_o,\dots,T_s\}$ of a group G such that $G = T_oT_i$ for all

$i=1,\dots,s$. The TD then has parameters $s = |T_o|$ (= size of point classes) and $k = |T_i|$ (= block size). Such a partition is of one of the following types:

(i) G a p-group, $H_p(G) \leq T_o$;

(ii) G a Hughes-Thompson group, $T_o = H_p(G)$, $T_i \simeq \mathbb{Z}_p$ for $i > o$;

(iii) G a Frobenius group, $\mathcal{T}$ the Frobenius partition.

(iv) G a Frobenius group, $T_o \underset{\neq}{<} K$ (the kernel of G), $T_i = K_i H_i$ ($i \neq o$) for some complement H_i and $K = T_o K_i$ for $i \neq o$.

While types (i) to (iii) are not surprising, the existence of partitions as in (iv) was in doubt. Examples with K elementary abelian exist iff $s = p^a$, $k = p^r h$ $(1 \leq r < a)$, $h \mid (p^a-1, p^r-1)$. There are also examples with K a non-abelian p-group. Most of these results are due to R.H. Schulz, M. Biliotti and G. Micelli; the non-abelian examples make essential use of results of A. Herzer. (Arch. Math. 34 (1980), 385-392). Case (iii) was studied by the speaker. (J. Geom. 17 (1981), 140-154).

G.I. LEHRER:

Generic chain complexes

The action of a finite group of Lie type on a building may be linearized using homology. The resulting representation may be studied generically - i.e. by means of a chain complex of $\mathbb{C}[q,q^{-1}]$-modules, where q is an indeterminate. The specifications ("putting q equal to a prime power", e.g.) of this chain complex apply to specific geometric situations, which may be studied via the universal coefficient theorem. In this lecture, the background to groups acting on homology will be discussed, and a brief indication of its uses given, including the Deligne-Lusztig vanishing theorem.

M.W. LIEBECK:

On the orders of maximal subgroups of finite simple groups

1. We present some results of the following type: if T is a finite simple group of Lie type, $T \triangleleft G \leq \text{Aut } T$ and H is a maximal subgroup of G, then either (I) H is known, or (II) $|H|$ is small. All proofs assume the classification of finite simple groups (f.s.g.).

Theorem 1 (M.W.L.) Let T be a classical f.s.g. with natural module V of dimension n over $GF(q)$, let $T \triangleleft G \leq \text{Aut } T$ and let H max G.

Then either (I) H is known (with well-described action on V), or (II) $|H| < q^{2n+4}$.

For T nonclassical, J. Saxl and I have results for all types, e.g.:

Theorem 2 (M.W.L. and J. Saxl) If H max $E_8(q)$, either (I) H is known, or (II) $|H| < q^{118}$.

2. J. Saxl and I have recently obtained the following result:

Theorem 3 Let G be a primitive permutation group of odd degree on a set Ω.

(a) If G has simple socle, then G^{Ω} is known.

(b) In any case, either $G \leq AGL(d,p)$ (p an odd prime), or $G \leq G_o \text{ wr } S_m$ in the product action, with G_o as in (a).

W.M. Kantor has also recently proved this result, and has used it to determine all projective planes with a primitive automorphism group.

R.A. LIEBLER:

Tactical configurations and their generic ring

A construction of Tits is used to cast the argument of Solomon and Kilmoyer proving the Feit-Higman theorem in the context of tactical configurations. An analog of a result of Cvetkovic shows what additional combinatorial data is needed to determine the representations associated with a given configuration. A bound for the size of certain configurations for which the first nonzero bit of this data is sufficiently large is given.

V. MAZUROV:

On symmetric subgroups of finite groups

This talk concerns some results by my post-graduate student, Dmitrij Flaass. His article on these results is to appear in Algebra i Logika.

Hypothesis 1. G is a finite group generated by a class D of involutions; S is its subgroup isomorphic to the symmetric group S_n; $\Delta = S \cap D$ is the class of transpositions in S and S acts transitively on $D-\Delta$.

This situation arises in many groups generated by 3-transpositions. One may conjecture that the class D is almost always a class of 3-transpositions.

Theorem 1. Let Hypothesis 1 hold and suppose that $C_\Delta(d_1) \neq C_\Delta(d_2)$ for any two different elements d_1, d_2 of $D-\Delta$. Then D is a class of 3-transpositions.

Theorem 2. Let Hypothesis 1 hold and suppose that $C_\Delta(d) = \emptyset$ for any $d \in D-\Delta$. Then either $n \leq 4$, or $G = O_\infty(G)S$, or $G = S_7$ and D is the class $(2)^3$.

The work was inspired by the notion of "width extension" introduced by B. Fischer in his paper "Groups generated by 3-transpositions" and by G. Enright's construction of F_{22} and F_{23} (J. Algebra, 46:2(1977)).

D.M. MESNER:

Some configurations in strongly regular graphs

Let H be the Hoffman-Singleton graph. It is shown that cycles C_n occur as induced subgraphs of H precisely for $5 \leq n \leq 10$ and $n = 12,13,16,18$. A computer search was used for $n \geq 7$. The longest induced paths in H have 21 vertices. The 25-vertex Petersen incidence graph, say Π, occurs as an induced subgraph of H in two ways. A C_n in a Petersen graph leads to an induced C_{2n} in Π and in H, accounting for some (but not all) of the orbits of C_{2n}'s in H.

The Higman-Sims graph contains H as an induced subgraph and hence at least the same induced subgraphs as H. A computer search shows that while it has more orbits of C_n's and Π's than H, no C_n's for new n are found except C_4's.

A. NEUMAIER:

Uniqueness of some distance regular graphs

A proof is given that all distance regular graphs with intersection array $b_i = \frac{1}{2}(d-i)(a-c_i)$, $c_i = i + c\binom{i}{2}$ are known. They are the graphs of Hamming and Johnson, the half cubes, the Gosset polyope 3_{21} (all distance transitive), and some further graphs with the same parameters discovered by Shrikhande, Chang, and Egawa.

The proof is based on the fact that to the eigenspace belonging to the eigenvalue $k-\lambda-2$ one can associate a root lattice such that each edge of the graph corresponds to a root. Results of Cameron et al. then imply that locally the graph is a line graph or represented by a set of roots of E_8 (cocktail party graphs cannot occur). The line graph case leads to the Hamming graphs, the Johnson graphs and the half cubes; the E_8-case leads to 3_{21} and the exceptions.

S. NORTON:

The Monster Algebra

The 196883-dimensional algebra invariant under the Fischer-Griess Monster can be extended by adjoining an identity (with use of the inner product) in a particularly interesting way. If $*$, $(\, , \,)$ denote the algebra and inner products, then $(a*c, b*d) - (a*d, b*c)$ is a bilinear form on the exterior square of the 196883-dimensional representation. Because this exterior square has norm 2, it is possible to choose the 196884-dimensional algebra so that this form vanishes in one component. If $a*b = 0$, then $a \wedge b$ will lie in this component, and the operations of multiplying by a and b commute. This was the main result proved.

D.K. RAY-CHAUDHURI:

Multiplier theorem for a difference list

Let G be an abelian group. A mapping $L : G \longrightarrow \mathbb{N}_0$ (non-negative integers) is called a λ^*-difference list if $\forall\, 1 \neq h \in G$, $\sum_{a,b \in G} L(a)L(b)\,\delta_{ab^{-1}}(h) = \lambda^*$ where $\delta_g(h) = 1$ if $h = g$ and 0 otherwise. Difference list is a generalization of the concept of difference set.

Theorem 1. Let L be a λ^*-difference list $(\lambda^* > 0)$ on G of order v and exponent v^*. Let t and n_1 be integers such that $(n_1, v) = 1$, $n_1 | n^*$ $(n^* = \Sigma L^2(g) - \lambda^*)$, for every prime divisor p of n_1, there exists an integer f satisfying $t \equiv p^f \bmod v^*$. If $n_1 > \lambda^*$ or if $\left(v, M'\left(\frac{n^*}{n_1}\right)\right) = 1$ (here M' denotes Mcpharland's function), t is a multiplier of L.

Multiplier of L is the obvious generalization of the notion of multiplier of a difference set.

Theorem 2. Let k and λ be odd, v be such that $\lambda(v-1) = k(k-1)$, p prime, $p | k-\lambda$ $p > \lambda$, $(p,v) = 1$, $b | v$ and $\exists\, c$ such that $p^c \equiv -1 \bmod b$ and $8 \nmid (b-1)(k-\lambda)$. Then a (v,k,λ)-difference set does not exist.

Theorem 2 proves nonexistence of several infinite families of (v,k,λ)-difference sets which are not excluded by Bruck-Ryser-Chowler Theorem. The above theorems are proved jointly by K.T. Arasu and D.K. Ray-Chaudhuri.

Gefördert durch DFG Deutsche Forschungsgemeinschaft

M.A. RONAN:

Duality for sheaves on group geometries

Given a flag-geometry (or more generally a chamber system) defined by a group G - chamber stabilizer B, panel stabilizers $P_o,\ldots,P_n$, one can define a universal sheaf $\mathcal{U}$ by taking modules for B and the P_i. Under resonably mild conditions one can define a "dual" sheaf $\mathcal{U}^*$. This has the property that $H_o(\mathcal{U}) \simeq H^n(\mathcal{U}^*)$. The proof of this theorem was discussed, and applications of sheaf homology to embeddings of geometries in projective space were also discussed.

H. SALZMANN:

Groups on the octonion plane

A topological projective plane with a locally compact point set of positive dimension $d < \infty$ having an automorphism group Σ such that in the compact-open topology $\dim \Sigma > 40$ is isomorphic to the classical Moufang plane over the real octonions.

J. SAXL:

On distance transitive graphs

We report on recent work towards the classification of finite distance transitive graphs. We assume that the automorphism group is primitive on vertices. A theorem of Praeger and myself shows that if the graph is not a Hamming graph, its automorphism group G is either affine or almost simple. If the group is affine, that is if it contains an elementary abelian regular normal subgroup of order p^m, then the diameter d is at most m. The work on the affine rank 3 (that is $d = 2$) case is almost complete (M.W. Liebeck) and we hope to extend his techniques to deal with all the affine graphs. In the case where G is almost simple (so $T \triangleleft G \leq \mathrm{Aut}\, T$ for some simple T), we restrict our attention to groups of Lie type. Then the stabilizer of a point is large $(|G_\alpha| > |G:B|/|W|)$ and the bounds discussed by Liebeck in his lecture apply. This will leave a finite number of possible families to be investigated. Inglis is at present dealing with the cases where G is a classical group.

R. SCHARLAU:

Tits buildings as metric spaces

A subset A of a metric space $(C,\ d: C \times C \longrightarrow \mathbb{R}_{\geq 0})$ is called gated (inside C) if, given $C \in C$, there exists $D \in A$ such that $d(C,E) = d(C,D) + d(D,E)$ for all $E \in A$. Let C be the set of chambers (maximal simplices) of a building, with the usual distance function defined by galleries. It is a standard fact that every star in C (set of chambers containing a fixed simplex) is gated. Using the first criterion of Tits' paper "A local approach to buildings", one shows that this property even characterizes the buildings among all (numbered) complexes belonging to a Coxeter diagram. One only needs to assume the gate property for the "small" stars of rank 1 and 2.

J.J. SEIDEL:

Harmonics and combinatorics

Die Geometrie der Sphäre in $\mathbb{R}^d$, die ein Modell bietet für gewisse kombinatorische Konfigurationen, wird beherrscht von sphärischen Harmonischen. Grenzen für die Kardinalität von solchen Konfigurationen werden hergeleitet mit Hilfe einer Methode der linearen Programmierung. Dies hat Anwendungen für Systeme von gleichwinkligen Geraden, für Wurzelsysteme und für Newtonsche Zahlen. Die Methoden gestatten Verallgemeinerungen im hyperbolischen Fall und auch im diskreten Fall.

S.D. SMITH:

Some coombinatorial and topological aspects of sporadic-group geometries

As interest increased in the area of diagram geometries (pioneered by Buekenhout), Tits and Ronan cast a new light by means of study of topological properties of geometries. A strong motivation for such study is the analogy of buildings with sporadic-group geometries (especially, the failure of the analogy). The talk will consider details of a number of examples, examining:

apartment-like structure,
homology groups and the representations they provide,
geometric structures found in homology.

These considerations connect naturally with ideas of shellability now studied by combinatorialists (Stanley, Björner); sporadic geometries provide naturally-occurring examples in this context.

J.A. THAS:

Characterizations of generalized quadrangles by generalized homologies

Let $S = (P,B,I)$ be a generalized quadrangle (GQ) of order (s,t). For $x,y \in P$, $x \not\sim y$, let $\mathcal{H}(x,y)$ be the group of all collineations of S fixing x and y linewise. If $z \in \{x,y\}^{\perp}$, then the set of all points incident with the line xz (resp. yz) is denoted by $\widetilde{xz}$ (resp. $\widetilde{yz}$). The GQ $S = (P,B,I)$ is said to be (x,y)-transitive, $x \not\sim y$, if $\mathcal{H}(x,y)$ is transitive on each set $\widetilde{xz} - \{x,z\}$ and $\widetilde{yz} - \{y,z\}$, $z \in \{x,y\}^{\perp}$. If $S = (P,B,I)$ is a GQ of order $(s,t), s > 1$ and $t > 1$, which is (x,y)-transitive for all $x,y \in P$ with $x \not\sim y$, then we have one of the following:

(i) $S \simeq W(s)$, the GQ arising from a symplectic polarity of $PG(3,s)$;
(ii) $S \simeq Q(4,s)$, the GQ arising from a non-singular quadric in $PG(4,s)$;
(iii) $S \simeq H(4,s)$, the GQ arising from a non-singular hermitian variety in $PG(4,s)$;
(iv) $S \simeq Q(5,s)$, the GQ arising from an elliptic quadric in $PG(5,s)$;
(v) $S \simeq H(3,s)$, the GQ arising from a non-singular hermitian variety in $PG(3,s)$;

i.e. S is a classical GQ.

J.G. THOMPSON:

The Frobenius-Schur index and modular representation

Let p be an odd prime, G a finite group, and k a splitting field for G with char $k = p$. Let M be an irreducible kG-module. Assume that M is self-dual. Then there is a non-zero G-invariant form M which is either symmetric or a skew symmetric. Set $\varepsilon(M) = +1$ or -1 according to the two possibilities. There is an ordinary irreducible character χ which is real valued, and such that χ contains the Brauer character of M with odd multiplicity. For any such χ

$$\varepsilon(M) = \varepsilon(\chi) = \text{Frobenius-Schur index of } \chi = \frac{1}{|G|} \sum_{g \in G} \chi(g^2) .$$

F. TIMMESFELD:

Amalgams with rank 2 groups of Lie-type

Applications and the proof of the following theorem were discussed:
Let $G = \langle G_1, G_2 \rangle$ satisfying

(1) $\bar{G}_i = O^{2'}(G_i/O_2(G_i))$ are 'nearly' quasi simple, finite rank 2 groups of Lie-type in characteristic two. (Allowing all types of degeneracies!)

(2) $G_1 \cap G_2$ is a max. parabolic of both.

(3) There exists no $N \triangleleft G$, $N \leq G_1 \cap G_2$.

(4) Let $S \in Syl_2(G_1 \cap G_2)$. Then $|S| < \infty$ and $Z = \Omega_1(Z(S)) \ntrianglelefteq G_i$ for $i = 1$ and 2.

Then one obtains a complete list of possibilities for G_1 and G_2.

P. VANDEN CRUYCE:

Geometries related to PSL(2,19)

We construct geometries related to PSL(2,19). They arise from the Perkel graph, which is a graph of degree 6 associated to $PSL(2,19)/A_5^{(1)}$ ($A_5^{(1)}$ denotes one of the two conjugacy classes of subgroups A_5 in PSL(2,19)). We get in particular another view on two interesting rank 4 geometries obtained recently by H.M.S. Coxeter and A.I. Weiss.

J.H. VAN LINT:

Codes from algebraic geometry

We present a simple version of a construction of a sequence of codes exceeding the Gilbert bound. The method is due to Goppa, Tsfasman, Vladut, and Zink. Let X be a smooth projective curve in the projective plane over the algebraic closure of $\mathbb{F}_q$. If $P_1, P_2, \ldots, P_n, Q$ are the rational points on X we consider the space of rational functions $L(\Sigma P_i - \alpha Q)$ and map a function f on $(Res_{P_1} f, Res_{P_2} f, \ldots, Res_{P_n} f)$. The dimension of this code follows from Riemann's theorem and clearly the distance d is at least α. The choice of X depends on the following result:
If $q = p^{2n}$ then there is an infinite sequence of curves X over $\mathbb{F}_q$ with increasing genus g such that g/n tends to $(q^{1/2}-1)^{-1}$. Taking the optimal choice of α (followed by some simple calculus) shows that we exceed the Gilbert bound $q > 49$.

J.H. VAN LINT:

Subsets of the affine plane with square differences

Let AG(2,q) be a model for $\mathbb{F}_{q^2}$. Let X be a subset of the planes with the properties:

(i) $|X| = q$, (ii) $o \in X$, (iii) $\forall_{x \in X} \forall_{y \in X}$ [x-y is a square in $\mathbb{F}_{q^2}$].

Clearly half of the lines through o have this property.

Theorem. X is a line through o.

Several proofs were known, all of which work only if q is a prime. We present a proof by A. Blokhuis (found in April'84) of the theorem for any prime power q.

Berichterstatter: Thomas Westerhoff

Tagungsteilnehmer

Prof. Dr. L.M. Batten
Department of Mathematics
University of Winnipeg
515 Portage Ave,
Winnipeg, Manitoba,
Canada R3B 2E9

Dr. Alberto L. Delgado
Fakultät für Mathematik
Universität Bielefeld
Universitätsstraße

4800 Bielefeld 1

Prof. Dr. Bernd Baumann
Mathematisches Institut
der Universität
Arndtstr. 2

6300 Gießen

Prof. Dr. Ulrich Dempwolff
Fachbereich Mathematik
Universität
Postfach 3049

6750 Kaiserlautern

Prof. Dr. F. Buekenhout
C.P. 216
Départment de Mathématique
Université Libre de Bruxelles
1050 Bruxelles

Belgien

Prof. Dr. Jean Doyen
Dépt. de Mathématiques
Campus Plaine C.P. 216,
Université de Bruxelles
B-1050 Bruxelles

Belgien

Prof. Dr. Andrew Chermak
Department of Mathematics
Kansas State University
Manhattan, Kansas 66506

USA

Dr. Paul S. Fan
Department of Mathematics
U.C. Bereley
Berkeley, CA 94720

USA

Prof. Dr. Arjeh M. Cohen
Math. Centre
Kruislaan 413
10 98 SJ Ansterdam

Niederlande

Prof. Dr. B. Fischer
Fakultät für Mathematik
Universität Bielefeld
Universitätsstraße

4800 Bielefeld 1

Patricia Vanden Cruyce
Université Libre de Bruxelles
Département de Mathématique
C.P.215 - Boulvard du Triomphe
1050 Bruxelles

Belgien

Prof. Dr. George Glauberman
Dept. of Mathematics
University of Chicago
Chicago, 5734 University Avenue
Illinois 60637

USA

Dr. Anne Delandtsheer
Université Libre de Bruxelles
C.P. 210
Boulvard du Triomphe
1050 Bruxelles

Belgien

Dr. Jonathan I. Hall
Department of Mathematics
Michigan State University
East Lansing, MI 48824

USA

Prof. Dr. Ch. Hering
Mathematisches Institut
Auf der Morgenstelle 10

7400 Tübingen

Prof. Dr. D.G. Higman
Ann Arbor
Dept. of Mathematics
University of Michigan
Ann Arbor, MI 48104

USA

Prof. Dr. D.R. Hughes
Department of Mathematics
Westfield College
London NW3 7ST

England

Prof. Dr. Z. Janko
Mathematisches Institut
Universität Heidelberg
Im Neuenheimer Feld 288

6900 Heidelberg 1

Prof. Dr. D. Jungnickel
Mathematisches Institut
Justus-Liebig-Universität
Arndtstr. 2

6300 Gießen

Prof. Dr. G. Lehrer
Dept. of Pure Mathematics
University of Sydney
Sydney, N.S.W.

Australien

Dr. M.-W. Liebeck
Department of Mathematics
Downing College
Cambridge

England

Prof. Dr. Robert A. Liebler
Dept. of Mathematics
Ohio State University
190 North Oval Drive
Columbus, Ohio 43210

USA

Prof. Dr. J.H. van Lint
Technical University Eindhoven
P.O. Box 513
5600 MB Eindhoven

Niederlande

Prof. Dr. Victor D. Mazurov
Institut Matematiki
Novosibirsk, 630090

UdSSR

Prof. Dr. D.M. Mesner
Dept. of Mathematics and
Computer Science,
University of Technology
5600 MB Eindhoven

Niederlande

Prof. Dr. Arnold Neumaier
Inst. f. Angew. Mathematik
Universität Freiburg

7800 Freiburg

Prof. Dr. S. Norton,
DPMMS
16 Mill Lane
Cambridge CB2 1SB

England

Jerome John Povse
Fakultät für Mathematik
Universität Bielefeld
Universitätsstraße

4800 Bielefeld 1

Prof. Dr. D.K. Ray-Chaudhuri
Department of Mathematics
Ohio State University
231 W 18th Avenue
Columbus, Ohio 43210
USA

Prof. Dr. J.J. Seidel
Technical University Eindhoven
Postbus 513
5600 MB Eindhoven
Niederlande

Dr. Sarah Rees
Département de Mathématique
Université Libre de Bruxelles
Boulevard du Triomphe
B-1050 Bruxelles
Belgien

Prof. Dr. Stephen D. Smith
Department of Mathematics
University of Illinois at Chicago
Chicago, ILL 60680
USA

Prof. Dr. M.A. Ronan
Mathematics Dept.
University of Illinois
Box 4348
Chicago, ILL 60680
USA

Dr. B. Stellmacher
Fakultät für Mathematik
Universität Bielefeld
Postfach 8640
4800 Bielefeld 1

Prof. Dr. Peter Rowley
Department of Mathematics
University of Manchester
Institute of Science & Techn.
P.O. Box 88
Manchester M60 1QD
England

Prof. Dr. J.A. Thas
Seminar of Geometry & Combinatorie
University of Ghent
Krijgslaan 281
B-9000 Gent
Belgien

Prof. Dr. H. Salzmann
Universität Tübingen
Mathematisches Institut
Auf der Morgenstelle 10
7400 Tübingen 1

Prof. Dr. J.G. Thompson
16 Mill Lane, DPMMS
Cambridge CB2 1SB
England

Prof. Dr. Jan Saxl
Department of Mathematics
University of Cambridge
16 Mille Lane
Cambridge CB2 1SB
England

Prof. Dr. F.G. Timmesfeld,
Mathematisches Institut
Justus-Liebig-Universität
Arndtstr. 2
6300 Gießen

Dr. Rudolf Scharlau
Universität Bielefeld
Fakultät für Mathematik
Postfach 8640
4800 Bielefeld 1

Thomas Westerhoff
Universität Bielefeld
Fakultät für Mathematik
Postfach 8640
4800 Bielefeld 1