Mathematical Institute

Leiden University

Annual Report 2007

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Research

Cluster 1. Number Theory, Algebra and Geometry

Research Programme 1.1: Number Theory and Algebra
Programme leader: H.W. Lenstra

Description of the project

The main focus of the research programme is number theory. Number theory studies the properties of integers, with a historically strong emphasis on the study of diophantine equations, that is, systems of equations that are to be solved in integers. The methods of number theory are taken from several other branches of mathematics. Traditionally, these include algebra and analysis, and in recent times algebraic geometry has become increasingly important. Another recent development is the discovery that number theory has significant implications in more applied areas, such as cryptography, theoretical computer science, the theory of dynamical systems, and numerical mathematics. This discovery led to the rise of algorithmic and computational number theory, which occupies itself with the design, analysis, and efficient implementation of arithmetical algorithms. The overall result has been a unification rather than a diversification of number theory. For example, the applications in cryptography depend heavily on algebraic geometry, and algebraic number theory, which used to stand on itself, is now pervading virtually all of number theory. Themes of the programme reflect the research areas mentioned. They include finding points on algebraic curves, applications of group theory and algebraic number theory, the theory of finite fields, diophantine approximation, words and sequences, discrete tomography, primality tests and factorization methods, and the development of efficient computer algorithms.

The algebra portion of the programme is strongly oriented towards the applications of algebra in number theory and arithmetic geometry and towards algorithmic aspects. Themes include Galois theory and various aspects of group theory and ring theory.

The research programme also includes cryptology and the history of mathematics. Main themes in cryptology are the applications of number theory and algebra to the design of cryptographic schemes, and foundational issues are considered as well. In the history of mathematics, the emphasis is on the edition and translation of early Islamic mathematical and astronomical texts.

Research results in 2007

Evertse and Bugeaud finished a paper on the approximation of complex algebraic numbers by algebraic numbers of bounded degree. They further investigated the structure of the expansion of an algebraic number with respect to a given base b. Evertse and Ferretti worked out an improvement of the quantitative Subspace Theorem. Bérczes, Evertse and Győry obtained new effective results on equations ax+by=1 with unknowns x,y from a multiplicative group of finite rank. The new feature of this result is that the unknowns x,y are taken from a group which is not contained in a prescribed algebraic number field. Evertse and Győry are writing a book on unit equations and discriminant equations. This is work in progress.

Tijdeman obtained with Hancl results on the irrationality of values of polynomial Cantor series. Saradha and Tijdeman studied arithmetic progressions with common difference divisible by a small prime. Hajdu, Tengely and Tijdeman proved that cubes cannot occur as products of the terms in arithmetic progressions of certain lengths. Tijdeman and Zamboni deduced new results on words with any periods.

Van Dalen started a Ph.D.-project on discrete tomography, Ekkelkamp continued her study of estimates of the expected run time of factorization algorithms, Rosema obtained new results on the connection of substitutions and number systems, and Smeets transformed the LLL-algorithm into a multi-dimensional continued fraction algorithm with similar properties, and with Kraaikamp corrected and sharpened a result on symmetric and asymmetric Diophantine approximation by Tong.

Dassen continued his research in the theory and structure of layered lattices. He completed the embedding theorem and gave a description of the subgroups of a layered Euclidean space which are layered lattices. Streng continued his research on the construction of curves of

genus 2 via CM methods.
Daems continued her research on the history of mathematical crystallography, in particular the several classifications of crystal structures in the 19th century.
The connections between secure computation and algebraic function fields with many rational places that were found by Chen and Cramer in 2006 were extended by Chen (Shanghai), Cramer, Goldwasser (MIT), de Haan (CWI) and Vaikuntanathan (MIT) in their work on ramp schemes and secure computation from random error correcting codes. Cramer also concluded his work with Damgaard (Aarhus) and de Haan (CWI) on low communication secure multiplication, and his work with Kiltz, Padró, on secure linear algebra based on new results concerning Moore-Pernrose pseudoinverses. Cramer also studied blackbox construction of chosen ciphertext secure encryption with Hofheinz (CWI), Kiltz (CWI), Pass (Cornell), Shelat (U Virginia) and Vaikuntanathan (MIT).
Brakenhoff has continued his research on subrings of maximal orders and started research on the class numbers of general orders. Palenstijn continued his research on radical field extensions, extending certain results to division points of rank one tori over number fields together with de Smit
The distributed computation project abcathome.com which is run by Lenstra, Palenstijn and de Smit, made substantial progress collecting data related to the ABC conjecture.
De Smit collaborated with Thomas and Florence of the EPFL Lausanne on a valuative criterion for normal basis generators in a wildly ramified extension of local fields. Together with Sutton (Dartmouth) and Gornet (U. Texas, Arlington) he analyzed the behavior of the covering spectrum of isospectral Riemannian manifolds. He supervised the Master's Thesis of M. Perone (Padova) on a duality theory of commutative monoids and applications to units in group rings. De Smit continued his collaboration with Hanzon (Cork) which aims to apply Galois theory to mathematical finance.
Lenstra worked on several subjects in algebra and number theory, in many cases as part of a collaboration with others or a supervision of a PhD student. These subjects include numerical aspects of the abc conjectures (with de Smit and Palenstijn), algorithms for norm residue symbols (with Bouw), layered lattices (with Dassen), Mersenne primes and class field theory (with Jansen and de Smit), primality testing in polynomial time (with C. Pomerance), the history of the LLL algorithm (with A. Lenstra, L. Lovász and P. van Emde Boas), an apparent error in the Cohen-Lenstra heuristics (with G. Malle), certain aspects of crystallographic groups (with Daems), odd perfect numbers (with M. Roelands) and algorithms for ordered fields.
Stevenhagen and Bröker improved their construction of elliptic curves with point groups of prime order. Stevenhagen, Streng and Freeman (UC Berkeley) created an algorithm for finding pairing friendly abelian varieties in low dimension. With Howe (CCR San Diego) and Lauter (Microsoft), Stevenhagen investigated the construction of cryptographic abelian surfaces over finite fields by CM-methods. He also completed his survey paper on the arithmetic of general number rings.

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Research Programme 1.2: Arithmetic Geometry
Programme leader: S.J. Edixhoven

Description of the project
Geometers study geometric properties of sets of solutions of systems of equations. According to the possible kinds of equations (continuous, differentiable, analytic, polynomial), and of the structures that one studies, one distinguishes kinds of geometry (topology, differential topology and differential geometry, analytic geometry, algebraic geometry, arithmetic

geometry).
In algebraic geometry the equations are given by polynomials. Classically, the coefficients and solutions were complex numbers. Number theorists consider integer or rational coefficients and solutions. The goal of arithmetic geometry is to understand the relations between algebraic geometry and number theory.
Three important notions in arithmetic geometry are “algebraic variety” (abstraction of system of polynomial equations), “zeta function” and “cohomology”. Zeta functions associated to algebraic varieties are generating functions defined using the numbers of solutions in finite fields. Cohomology associates vector spaces equipped with certain structures to algebraic varieties. One important aim of arithmetic geometry is to understand the relations between the values of zeta functions at integers and properties of the set of rational solutions. Cohomology plays an important role here. Cohomology also provides representations of Galois groups, which is essential for Langlands's program (relations between such representations and “automorphic” representations of matrix groups). The most striking results obtained in this field are the proof of Weil's conjectures (Dwork, Grothendieck, Deligne), Faltings's proof of Mordell's conjecture, Fontaine's theory (comparison between certain cohomologies), Wiles's proof of Fermat's Last Theorem, and Lafforgue's result on Langlands's conjectures.
Apart from its numerous applications within mathematics, algebraic geometry over finite fields provides error correcting codes and crypto systems, both used in everyday life.

Research results in 2007
Bosman computed polynomials attached to projectivised residual Galois representations associated to several modular forms. Using proven instances of Serre's conjectures I could prove the correctness of these polynomials. One of the consequences is a verification of Lehmer's conjecture of the non-vanishing of tau(n) up to a bound about 1000 times higher than what was done before.
is working on height bounds for torsion points on Jacobians of modular curves. Bounding Green functions is an important ingredient here. The application envisaged is to get information on the complexity of the algorithm by Edixhoven et al. for computing Galois representations associated to modular forms.
De Jong made a start with his NWO VENI-project “The Shafarevich conjecture made effective”. In this project he tries to get effective bounds on Faltings heights of curves with an explicit description, as for exampe hyperelliptic curves. A collaboration with Gael Remond is taking place.
Edixhoven has generalised the results (joint with Couveignes, R. de Jong, and Merkl) concerning the fast computation of $\tau(p)$ to forms of level one and arbitrary weight. More precisely, it is show that there is an algorithm that computes, on input a prime p and an integer k, the element T_p of the Hecke algebra of modular forms of level 1 and weight k, in time polynomial in k and log p. This is conditional under GRH. It has an interesting application to lattices, via theta functions: fast computation of the number of elements of given length.
Karpenkov studies the problem of description of conjugacy classes in the group SL(n,Z). He introduces a new approach to this problem based on reduction to reduced Hessenberg matrices and theory of Klein-Voronoi continued fractions. There exists a form, unique up to multiplication by a constant (it is called Mobius form), of the highest degree on the manifold of n-dimensional continued fractions in the sense of Klein, that is invariant under the natural action of the group of projective transformations PGL(n+1). Karpenkov deduces an explicit formulae to calculate Mobius form in special coordinates. Finally, Karpenkov studies properties of lattice trigonometric functions of lattice angles in lattice geometry. He introduces the definition of sums of continued fractions and establishes a necessary and

sufficient condition for three angles to be the angles of some lattice triangle in terms of lattice tangents.
Schepers obtained a description of class of isolated singularities of which the stringy Hodge numbers satisfy a "Hard Lefschetz" property. He found a simple method to calculate the contribution of a Brieskorn singularity to the stringy E-function, and he generalised this to a class of non-degenerate singularities. In particular, the stringy Hodge numbers of varieties with such singularities are non-negative. Actual research themes are: tensegrity frameworks (with Karpenkov and Doray), a combinatorial version of the stringy E-function, defined by Batyrev and Hill.
Taelman has been investigating special values of L-functions of t-motives. He found that not only the existing results on such special values fit nicely in a kind of function field analogue to the
Bloch-Beilinson-Deligne-Conjecture, but through numerical experiments observed that such an analog should hold in much greater generality.
In a research seminar, Bosman, Bruin, de Jong, Edixhoven, Murre, Schepers and Stolk have obtained a bound on the Faltings height of covers of a curve over a function field over the complex numbers, unramified outside a fixed divisor and a fixed set of places of the function field, polynomial in the degree of the cover. They try to transpose this to the arithmetic case.

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Cluster 2. Analysis and Stochastics

Research Programme 2.1: Analysis and Dynamical Systems
Programme leader: S.M. Verduyn Lunel

Description of the project
This programme focuses on operator-theoretical methods to analyze problems arising from concrete classes of integral, differential and difference equations. Both linear and non-linear equations are studied, and the problems may have a finite-dimensional or infinite-dimensional character. Typical for this programme is a strong interaction with dynamical systems, functional analysis, numerical analysis, partial differential equations, probability theory and complex function theory.
There is a special focus on the analysis of infinite dimensional dynamical systems and applications. Computing the long-term behavior of dynamical systems by solving the initial data problem can be a time consuming and difficult task. It is often essential to combine numerical methods with methods from dynamical systems theory. Rather than solving the equations for fixed values of the physical parameters, we often study solutions as a function of the physical parameters. Specific examples that are investigated include dynamical systems with time delays in the feedback loop (such models arise in engineering, life sciences and semi-conductor lasers), differential equations modeled on a lattice (such as the Ising model and Cellular neural networks (CNN)), and partial differential equations with applications to life sciences and chemical engineering.
The current research interests of the group include: Algebras associated with dynamical systems, Ginzburg-Landau equation and semi conductor lasers,Differential-difference equations of mixed type, invariant measures for stochastic delay equations, patterns in nonlinear ordinary and partial differential equations and applications to life sciences and chemical engineering.

Algebras associated with dynamical systems

When a group G acts on a Banach algebra A there are several algebras of crossed product type naturally associated with these data. It is the aim of this project to understand the relationship between the associated algebra and the initial dynamical system. Of special interest, and well rooted in C*-theory, is the case where A is the algebra of continuous functions on a compact Hausdorff space X and the group G is the integers, in which case one wants to understand the structure of the associated algebra in terms of the ambient dynamical system on X. Another main line of investigation consists of constructing the appropriate Banach algebra crossed product for a given set of covariant representations of a Banach algebra dynamical system. This is a natural generalization of C*-crossed products and is analogously expected to be the main tool when studying group representations in (ordered) Banach spaces and induction procedures in these spaces.

Calculating Hausdorff dimensions of invariant sets using spectral theory.
In this ongoing project together with Roger Nussbaum, we present a new approach to compute the Hausdorff dimension of conformally self-similar invariant sets. The approach is based on a direct spectral analysis of the transfer operator associated with the dynamical system. In the case that the maps defining the dynamical system are analytic, our method yields a sequence of successive approximations that converge to the Hausdorff dimension of the invariant set at a super-exponential rate. This allows us to estimate the dimension very precisely. The results
can be illustrated with examples from dynamical systems and from number theory via Diophantine approximations. A number of publications are in progress.

Ginzburg-Landau equation and semi conductor lasers.
Lasers are highly nonlinear devices and the competition between nonlinear and dispersive effects can lead to exciting pattern formation, quasi-periodic, chaotic, and blow-up structures. Semi-conductor lasers subject to delayed optical feedback can be described by the so-called Lang-Kobayashi equations, that form a three dimensional delay differential system. In work of Rottschäfer, the regions of existence and stability of certain types of solutions for these equations in 3-dimensional parameter-space, thereby laying out the `ECM-backbone' of the LK-equations. Furthermore, using asymptotic analysis combined with numerical simulations, Rottschäfer constructed multi-bump, blow-up structures for the Ginzburg-Landau equation considered as a small perturbation of the nonlinear Schrödinger equation. This research is part of the VIDI project of Rottschäfer.

Differential-difference equations of mixed type.
Lattice differential equations are continuous-time infinite dimensional dynamical systems, which possess a discrete spatial structure modeled on a lattice. Such equations play an important role in modeling a variety of applications with spatial structure and can be found in chemical reaction theory, image processing and pattern recognition, material science and biology. Travelling waves in lattice differential equations naturally lead to systems of functional differential equations of mixed type, both autonomous and (asymptotically hyperbolic) nonautonomous.

Invariant measures for stochastic delay equations.
This project is devoted to a detailed study of the asymptotic behavior of the solutions of stochastic evolution equations. Such equations are of great importance in the applied sciences, since they are used to model processes with stochastic components, such as white noise. In order to apply methods from ergodic theory to study the limit behavior of the distribution of solutions, it is necessary to have the existence of an invariant measure (or stationary distribution). Existing abstract results regarding the existence of an invariant measure for stochastic evolutionary systems do either require strong smoothness assumptions

or a dissipativity condition on the underlying deterministic flow. However, for stochastic delay equations, these conditions fail dramatically and the existence of an invariant measure is not yet known. Our main result avoids smoothness or dissipativity and is based on exponential dichotomies and appeared in 2004. This result has been extended to noise generated by Levy processes with finite second moments. In order to relax the dichotomy condition, an investigation of a discrete time analog has been started. This project is part of the NWO VIDI project by van Gaans.

Numerical analysis and step-by-step methods.
Step-by-step methods are indispensable tools in computing numerical approximations to the solution of an initial value problems for ordinary and partial differential equations. The research concentrates on the theoretical analysis of step-by-step methods. The emphasis lies on the convergence and stability properties of the numerical methods. There are important open questions and conjectures about these properties. The research has in view to contribute to the settlement of these questions.

Applications to Chemical Engineering.
In reaction engineering it is increasingly important to replace steady state processes by periodic processes. In such processes periodic operation may for instance consist of cyclic reaction-regeneration steps. Depending on the convergence properties of the system at hand, the number of cycles that needs to be computed up to a cyclic steady state is reached, can be large. Hence, direct iterative methods are essential. However, to overcome severe memory constraints many authors have reverted to pseudo-homogeneous one-dimensional models and to coarse grid discretization, which renders such models inadequate or inaccurate. In joint work van der Rotten and Verduyn Lunel proposed a limited memory iterative method, called the Broyden Rank Reduction method, to simulate a full two-dimensional model with radial gradients taken into account. A number of publications further elaborating these new ideas are in progress.

Applications to Life Sciences.
This research project concerns the modelling, analysis and simulation of long-term behaviour of discrete and continuous dynamical systems that occur in the Life Sciences, in particular concerning the topic of self-organisation and chemotaxis. It has three main lines of research:
(1) a functional analytic understanding of approximation of dynamical systems, e.g. discrete systems by continuum models, limits related to singular perturbation like diffusion and hydrodynamic limits; (2) analysis and simulation of the dynamics of large, multiscale models of mixed type and simulation of such systems, and (3) data oriented system's analysis, in which system properties (e.g. attractors) are numerically approximated based on experimental data, without explicit modelling of the underlying 'complex' system. The project takes the self-organising and individual movement behaviour of the amoeba Dictyostelium discoideum as prototype biological system.

Research results in 2007
The investigation of the algebraic crossed product of Banach algebras has been continued within the framework of the long-term cooperation between Svensson and De Jeu in Leiden, Silvestrov in Lund and also with Tomiyama in Tokio. Earlier results already indicated that various known results about C*-algebra crossed products with the integers might well be special cases of more general theorems in the context of Banach algebras, and the results obtained in recent years about algebraic Banach algebra crossed products continue to point in this direction. As a next step, completed Banach algebra crossed products have been taken into consideration. Although this is technically more demanding, the indications are that here also the analogy holds to a large extent. A second PhD-student has started in this project,

who will be working on crossed products associated with Banach algebra dynamical systems for arbitrary groups.
De Jeu also continued his work to generalize a classical result of Burchnall and Chaundy which states that any two commuting ordinary differential operators of positive degree with polynomial coefficients are algebraically dependent over the complex numbers, to the q-Heisenberg algebra setting. Two papersare finalized.
Van Dijk continued his study of Generalized Gelfand Pairs, a rather hot topic because of recent progress made by Schiffmann, Rallis, Aizenbud and Gourevitch. Another of publications are in progress.
Peletier worked on a qualitative and asymptotic analysis of a class of feedback systems frequently used in pharmacodynamics, as well as the development of a series of generalized feedback systems designed to model triggering phenomena and delay observed in drug development. He also finalized a systematic analysis of protein binding on the efficacy of drugs.
Spijker derived a new stepsize condition for boundedness of a generic numerical process. This condition is best possible in a natural sense, and it is relevant to Butcher's important class of General Linear Methods. Furthermore, classes of singly-diagonally-implicit Runge-Kutta methods were determined that are optimal in the sense of their stepsize coefficient for strong stability.
Rottschäfer presented new existence results for solutions of the Ginzburg-Landau equation. These results are a major extension of existing results - based on NLS -that only hold close to the critical dimension. The newly constructed solutions have a minimum at y=0 with a total of k maxima (k even) on the real line. These solutions with a minimum at y=0 had so far not been constructed for the NLS and this proof is in that sense completely new.
Hille continued his research on the long-term behaviour of discrete and continuous dynamical systems that occur in the Life Sciences. Together with the Ph.D. student Worm new results were obtained regarding positivity of mild solutions of quite general dynamical systems of mixed type and regarding the global existence of positive solutions of these systems under practical and suffienciently general conditions on the perturbation by exploiting positivity. New global existence results for a family of kinetic chemotaxis equations were obtained extending the work of (among others) Stevens and Perthame. Two papers are submitted.
In joint work Hupkes and Verduyn Lunel study of the qualitative behaviour of solutions of infinite dimensional dynamical systems in the neighbourhood of an equilibrium and have developed a local center manifold theory for nonlinear autonomous functional differential equations of mixed type. The center manifold theory allows us to study effectively the bifurcation of periodic solutions. New applications towards models from economics have been established.
Riedle and van Gaans have proved a Levy-Ito decomposition for Banach space valued Levy processes. There are no conditions on the geometry of the space nor conditions on the Levy process. The decomposition uses their Banach space valued stochastic integral. Moreover, the stochastic integral has been applied to establish necessary and sufficient conditions for existence and uniqueness of solutions of abstract Cauchy problems perturbed by additive Levy noise.
Stojkovic and van Gaans have extended a result on existence of stationary solutions for stochastic delay differential equations driven by Levy processes. Instead of a global Lipschitz condition on the bounded diffusion coefficient only a locally Lipschitz condition is needed. The proof includes a variation-of-constants formula for the locally Lipschitz case.

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Research Programme 2.2: Probability Theory

Programme leader: F. den Hollander

Description of the project

The research in Probability Theory is concentrated on interacting stochastic systems (percolation, random polymers, metastability, catalytic branching, sandpile dynamics), ergodic properties of random processes (Gibbs versus non-Gibbs, frequency of local patterns), and topics from mathematical biology (population dynamics, T-cells, sequence alignment). Key tools are large deviation theory and stochastic analysis.

Interacting stochastic systems consist of a large number of interacting random components. These components interact with each other and with their environment. Even when the interaction is local, such systems typically exhibit a complex global behavior, with a long-range dependence resulting in anomalous fluctuations and phase transitions.

To mathematically understand these systems requires the use of powerful probabilistic ideas and techniques. The challenge is to introduce simple models, which serve as paradigms, and to unravel the complex random spatial structures arising in these models. Statistical physics and ergodic theory provide the conceptual ideas, while probability theory provides the mathematical language and framework. The important challenge is to give a precise mathematical treatment of the physics that arises from the underlying complexity.

Much of the knowledge that has been built up in mathematical statistical physics over the past decades is currently making its way into biology. One of the tasks is to help facilitate this cross-fertilization and to address concrete biological questions at the interface. Examples are coming from population genetics, immune system biology, and artificial life.

The research in Operations Research is concentrated on Markov chains, Markov decision processes and Markov games with applications to problems in stochastic networks. One of the main issues concerns stability.

How can one check stability? If stable, how quick does the network "become stable"? It is possible for the network to seemingly have "settled down" to the stationary distribution, while it actually has not. This seemingly stationary distribution is called a quasi-stationary distribution. When can such a situation occur? On the other hand, if one wants to compute certain characteristics of stochastic models, such as stationary distributions and fundamental matrices related to the overall deviation from stationarity, then efficient algorithms are needed. These issues can be studied within the framework of Markov chain theory.

One may also wish to determine controls of a network that optimise a certain criterion, for instance, the probability that a mobile network is overloaded. This is typically a problem to be dealt with by Markov decision processes theory. Much research has involved theoretical issues, such as existence of optimal controls and results on the structure of optimal controls ("are they amenable to practical implementation?"). Current research mainly focuses on developing algorithms for computing optimal controls.

Often the situation arises that there are conflicting interests, say, one wants to maximise server efficiency while minimising customer dissatisfaction. This may be studied through Markov game models.

Research results in 2007

Together with Gaudillière, Nardi, Olivieri and Scoppola (Rome), den Hollander continued research on the formation of critical droplets for nucleation in supersaturated lattice gases under Kawasaki dynamics. Here, particles move randomly on a lattice subject to an on-site repulsion and a nearest-neighbor attraction. The goal is to estimate the time that elapses before the system manages to form a "critical droplet" that triggers the nucleation. The problem is challenging because of the presence of a conservation law: particles are conserved

under the dynamics. Various metastable regimes are of interest. The current focus is on low temperatures and large volumes. The main techniques come from large deviation theory.
Together with Bovier (Berlin), den Hollander and Spitoni looked at the nucleation problem from the perspective of potential theory. By viewing the Markovian dynamics as an electric network, estimates can be derived for the average nucleation time, which seem to be more flexible than those obtained via large deviation techniques. The general theory is still under construction, but for Glauber spin-flip dynamics and Kawasaki hopping dynamics very sharp estimates have been derived for low temperature and large volumes.
Gärtner (Berlin), den Hollander and Maillard (Lausanne) studied the growth rate of populations of particles of one type (say, reactant) subject to migration and branching at a rate that depends on the number of particles of another type (say, catalyst) present at the same location at the same time. The catalyst moves autonomously. The growth rate of the reactant was computed when the catalyst performs a symmetric exclusion process. It turns out that these growth rates behave differently in different dimensions, with dimension three being critical. The main techniques come from large deviation theory, spectral theory and variational calculus. Currently the case is investigated where the catalyst acts like a voter model. Due to non-reversibility of the voter model, this is a very challenging task.
Blachère (EURANDOM), den Hollander and Steif (Gothenburg) continued their investigation at random sequences of colors ("the color record") encountered by a random walk running on a randomly colored lattice. The goal is to show that, in some instances, this random sequence has remarkable ergodic properties. An example is being studied where the set of discontinuity points of the conditional probability to see a certain pattern of colors inside a finite time interval, conditioned on seeing a fixed pattern outside this time interval, changes from being "nothing" to being "all" as the drift of the random walk crosses a certain critical value. Both upper and lower bounds have been derived for the critical value of the drift. Techniques come from combinatorics.
Den Hollander and Pétrélis focused on polymers consisting of hydrophobic and hydrophilic monomers (arranged in a random order) in the vicinity of an oil-water interface. A model was considered where the oil occurs as random droplets in a sea of water, creating a random interface. It is shown that there is a phase transition between a phase where the polymer spends most of its time away from the interface to a phase where it spends part of its time near the interface. The full phase diagram has been determined. The phase diagram is remarkably rich, particularly when the oil droplets do not percolate.
Birkner (Berlin), Greven (Erlangen) and den Hollander continued working on a quenched large deviation principle for the empirical process of words cut out from a letter sequence via a renewal process with algebraic tails. The rate function turns out to be the sum of two terms, the first being the annealed rate function, the second being a specific relative entropy associated with contatenation and randomization of the words. The results are applied to show the presence of intermediate phases for branching processes with self-interaction, interacting diffusions, and directed polymers in random environment.
With Bolthausen (Zurich), den Hollander applied to quenched large deviation principle to derive strict bounds for the critical curve in a model of a copolymer near a linear interface, which had been open for almost ten years. With Cheliotis (EURANDOM), den Hollander worked on extending these bounds to random pinning models.
Spitoni worked with Cirillo (Rome) and Nardi (Eindhoven) on metastability for a cellular automaton. Due to the parallel nature of the dynamics, the estimation of nucleation times is difficult, and new notions of communication height and saddle points have to be introduced. The theory has a strong geometric flavor.
Avena worked with den Hollander on a random walk in a dynamic random environment. The environment is autonomous and evolves according to the one-dimensional simple symmetric exclusion process. The random walk has a drift to the right on particles and a drift to the left on vacancies. The goal is to find necessary and sufficient conditions under which the process

is recurrent, transient with zero speed or transient with positive speed. Large deviation properties are targeted as well.
Fey (EURANDOM), Jarai (Ottawa), Maes (Leuven), Redig and Saada (Rouen) worked on sandpile dynamics. In the physics literature, the sandpile model serves as a paradigm for the phenomenon of self-organized criticality. The dynamics is characterized by intermittent periods of large activity - so-called avalanches - and this naturally leads to power law decay of stationary correlation functions. Only recently the sandpile model has been studied mathematically, both in the probability and in the combinatorics community. From the probabilistic point of view, this leads to a challenging new class of interacting particle systems with non-local dynamics exhibiting several interesting new phenomena.
Jarai, Redig and Saada worked on a dissipative sandpile model with continuous heights, in which the dissipation can be taken arbitrary small. They obtained existence of the infinite volume limit, for the stationary measures as well as for the stationary processes, and proved that the critical model is recovered in the zero dissipation limit.
Fey, Meester and Redig worked on sandpile percolation, a model that makes a link between ordinary criticality and self-organized criticality. They proved the existence of a subcritical phase with exponential tails for the cluster size. Furthermore, they proved that in d=1, the transition between the stabilizable and the non-stabilizable phase is of first order.
Fey and Redig worked on shape theorems in the context of the sandpile model. They proved that the shape of the toppled region upon n additions at the origin in an initial homogeneous background of height is a hypercube for h=2d-2, and a sphere in the limit to minus infinity.
Chazottes, Collet (Paris), and Redig worked on concentration inequalities. They obtained a variance inequality for Lipschitz functions of the trajectory of interval maps with an indifferent fixed point such as the Manneville-Pomeau map. Such maps are important in studying intermittency and are used in the mathematical analysis of turbulence. In collaboration with E. Verbitsky (Philips, Eindhoven) they develop a coupling method which enables to derive higher moment inequalities for Lipschitz functions in a more general context of dynamical systems with intermittency.
Chazottes, Collet (Paris), and Redig worked on the relation between relaxation to equilibrium and concentration inequalities in the context of interacting particle systems. Applications to the asymmetric exclusion process gives new bounds on the speed of relaxtion in L^p-spaces. They further proved the Poincare inequality for Gibbs measures with polynomially decaying interactions in dimension 1.
Collet, Giardina and Redig worked on matching with shift for Gibbsian sequences. They prove that the maximal alignment behaves as the logarithm of the length of the matching sequences, with a constant that can be explicitly identified in terms of the potential of the Gibbs measure.
Giardina, Kurchan (Paris) and Redig worked on a microscopic model of heat conduction. They obtained a general framework in which duality can be obtained if the generator of the process can be written in terms of generators of the SU(1,1) algebra. This leads to results on Fourier law and microscopic correlations in non-equilibrium for an extended class of model.
Metz (biology, Leiden) and Redig worked on a population model in which fitness is microscopically defined in terms of reproduction rate. With the help of ideas of Freidlin-Wentzel theory they recover diffusions of Wright-Fisher type in the limit of large populations on the timescale of the population size.
Giardina, with Kurchan and Pelliti (Paris), studied large deviations in interacting particle systems. They introduced a numerical procedure to evaluate the probabilities of large deviations of physical quantities, such as current or density, that are local in time. The large-deviation functions are given in terms of the typical properties of a modified dynamics, and since they no longer involve rare events, can be evaluated efficiently and over a wide range of values. The method was illustrated with the current fluctuations of the Totally Asymmetric Exclusion Process and with the entropy production distribution of a driven Lorentz gas.

Giardina and Starr (Los Angeles) studied spin glasses, in particular, they computed the pressure of the random energy model (REM) and the generalized random energy model (GREM) by establishing variational upper and lower bounds. This generalizes Guerra's "broken replica symmetry bounds", and identifies the random probability cascade as the appropriate random overlap structure for the model. The lower bound is obtained with the help of Talagrand's concentration of measure inequality.
Contucci (Bologna) and Giardina proved that if the variance of a Gaussian spin glass model grows like the volume, then the system satisfies the Ghirlanda-Guerra factorization rules in terms of the model-covariance.
Kallenberg, besides his activities as Scientific Director of the LNMB, continued the study of stochastic dynamic programming. He also cooperated with Dekker and Nicolai (Erasmus University Rotterdam) on Maintenance and Markov decision models. This has resulted in a paper in Encyclopedia of Statistics in Quality and Reliability.
Spieksma has published work with Filar and Ejov. She has also continued earlier work on Markov Decision Processes but otherwise she been absent the whole year due to a serious illness.

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Research Programme 2.3: Mathematical Statistics
Programme leader: R.D. Gill

Description of the project
Statistics is concerned with learning from data and decision making under uncertainty. In mathematical statistics we study the mathematical structure of such problems with an emphasis on stochastic modelling, optimality of statistical inference procedures, and approximation (usually in some sense asymptotic). Approximate procedures and approximate optimality, with a wider range of application, are more useful and more reliable than exact solutions to rather narrowly defined problems. Worldwide, research in mathematical statistics is presently largely driven by new application fields. New scientific challenges tend to pose also new statistical challenges, and tend to attract the most creative and ambitious researchers. Our group's research is currently mainly inspired by the two extra-mathematical fields of quantum statistics, and of statistics for molecular biology and genetics. The rôle of statistics in molecular biology and modern genetics is self evident. On the other hand, the phrase "quantum statistics" needs further explanation. We refer here to statistical inference for data from measurements on quantum systems. This field is making a rapid transition from a theoretical academic exercise to the laboratory and beyond, to technology, fueled by the rise of the *quantum information* and *quantum communication*.

Research results in 2007
Gill put a large effort into the case of Lucia de B., the nurse convicted for serial murder on the basis – in part – on the statistics of occurrences of deaths and reanimations during her shifts. A publication appeared in *Law, Probability and Risk*, and a futher publication in *Annals of Applied Statistics* is in preparation. This interest led to a further reorientiation of his research in the direction of forensic statistics, in particular in DNA matching. With Ph.D. student Cox an inventory has been made of problems in this field.
Meulman collaborated with system biologists in a "double blind" exploratory data-analysis of multivariate biophysical time series data on a sample of twins. She was able to recover a statistically significant number of correct pairings in the data, thereby supporting the hypothesis of a "genetic fingerprint" in physiological and biochemical life processes (presumably in the *relations between* different processes, rather than in any one in particular).

She worked with Friedman (Stanford) on clustering, nonlinear regression and dimension reduction.
Together with Sjerps at the Dutch forensics institute NFI, E. van Zwet supervised the master's project of Veldman. Veldman studied the identification through Y-chromosome matching. Since the Y-chromosome is passed only by males to males, cross-overs do not occur and genetic variation comes only from mutation. This means that the information in DNA markers is highly dependent over different loci, making Y chromosome matching very different from ordinary DNA matching. In September 2007, the work resulted in Veldman's thesis "Evidential strength of Y-STR haplotype matches in forensic DNA casework". The line of research will continue with the arrival of PhD student Zohren.
Van Werkhoven started a master's project at the dutch Central Bureau of Statistics CBS under the supervision of Pannekoek and E. van Zwet. The project concerns the imputation of missing information in economic surveys under non-negativity constraints and linear equality constraints.
Walenkamp started a master's project with the Investment Strategy team of Aegon Asset Management. The project concerns the prediction of stock volatility. She will review existing methods, and attempt to improve on them using modern regression techniques such as boosting.

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Project Mathematics, Computer Science and Society
Project leader: F.A.J. Birrer

Description of the project
Research area:
Mathematics & Society, Computer Science/Chemistry/Science & Society.
Mission/themes:
Understanding and supporting argumentative, procedural and ethical quality in societal debate, deliberation and decision making that relate to (or draw upon) science and technology, particularly information technology, mathematical models and statistics, environmental issues and biotechnology

Research results in 2007
An argumentation analysis of the recent US debate on data mining was finished for publication. A start was made with what will be a major activity for the coming period: a fundamental project in epistemology, to develop a theory of knowledge. Though aimed as a contribution to epistemology in general, the more specific purpose is to provide a basis for the study of (the social role of) science and scientific expertise.

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Kloostermanprofessor 2007

In 1986 the Mathematical Institute established a visiting professorship in Mathematics, for two months a year, called the Kloosterman Chair. Hendrik Douwe Kloosterman was born on April 9, 1900. After studying in Leiden, Copenhagen, Oxford, Göttingen and Hamburg, he was appointed "lector" in Leiden in 1930 and full professor in 1947. He died on May 6, 1968. He is mostly known for his work in analytic number theory on what we now call "Kloosterman sums".

In the months April and May Mike Bennett (University of British Columbia in Vancouver, Canada) was in Leiden as the Kloosterman Professor 2007, with host Rob Tijdeman. Bennett is a leading number theorist who is an expert in the application of Diophantine approximation methods and the modular method to Diophantine equations. He has, partly in collaboration with others, obtained some spectacular generalizations of Wiles' celebrated proof of Fermat's last Theorem.
Highlights of his stay were his lecture during the NMC in Leiden, his lectures during the Instructional Conference and adjacent workshop on Solving Diophantine Equations, and the Kloosterman Lecture.

On April 12 Mike Bennett presented the plenary opening lecture at the two-day Nederlands Mathematisch Congres which was held in Leiden. In his lecture entitled “Why on earth should anybody care about Diophantine equations” he presented in an accessible and humoristic way some progress achieved in the past years and some open problems.
Mike Bennett was co-organizer and one of the four speakers at the Instructional Conference on Solving Diophantine Equations at the Lorentz Center from May 7-11. This conference which was attended by about 50 international young participants was a big success and will be imitated in Banff, Canada.
In the next week a three-day workshop was held on the same subject, again with Mike Bennett as co-organizer. About 20 participants of the Instructional Conference joined some 15 new senior international participants to present recent results and to work together on solving mathematical problems.
The Kloosterman lecture was held on May 24. Bennett gave a lecture on "Open Diophantine Problems". He indicated where the questions arise, why they turn out to be so difficult, and whether modern methods can provide, if not their complete solution, at least some insight.

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International and National Programmes

European Programmes:

Dutch-Russian Research Cooperation (NWO-RBFR): Geometric aspects of quantum theory and integrable systems.
2005-2008.
Cooperation with Moscow, St. Petersburg, Tambov, Twente, Utrecht, Amsterdam.
Project leader: G. van Dijk.

RTN: Arithmetic Algebraic Geometry.
2004-2008.
Cooperation with Barcelona (Spain), Bonn (Germany), Cambridge (England), Durham (England), Jerusalem (Israel), Milano (Italy), Münster (Germany), Padova (Italy), Paris 11 (France), Paris 13 (France), Regensburg (Germany), Rennes (France), Strasbourg (France), Tokyo (Japan).
Coordinator: S.J. Edixhoven.

Erasmus Mundus Master program Algebra, Geometry And Number Theory.
2005-2010.
Cooperation with Bordeaux and Padova and Orsay.
See: www.math.u-bordeaux1.fr/ALGANT/.
Coordinators: P. Stevenhagen, S.J. Edixhoven.

ESF Scientific Programme Random Dynamics in Spatially Extended Systems, involving 13 European countries.
2002-2007.
Project leader: F. den Hollander.

Dutch-German Bilateral Research Group (NWO-DFG): Mathematics of Random Spatial Models from Physics and Biology.
2003-2009.
Cooperation with E. Baake (Bielefeld), A. Bovier (Berlin), F. Götze (Bielefeld), A. Greven (Erlangen) and A. Wakolbinger (Frankfurt).
Project leader: F. den Hollander.

Long term collaboration with Lund University in the project Algebras associated with dynamical systems. The collaboration is supported by an NWO visitor's grant (8 months) for Dr. S. Silvestrov (Lund University).
Coordinator: M.F.E. de Jeu.

FP6 Research and Training Network: Galois Theory and Explicit Methods.
October 2006 - October 2010.
Cooperation with: Barcelona, Bordeaux, Essen, Heidelberg, Lausanne, Leuven, Lille, Nottingham, Paris, Rome, Tel Aviv.
Project leader: B. de Smit.

Socrates program: Number Theory.
2006-2008.
Cooperation with Debrecen (Hungary).
Project leader: R. Tijdeman.

Socrates program: Number Theory.
2001-2008.
Cooperation with Ostrava (Czech Republic).
Project leader: R. Tijdeman.

National Programmes:

NWO SPINOZA-premie.
1999 – 2008.
Project leader: H.W. Lenstra.

NWO cluster: Discrete, interactive & algorithmic mathematics, algebra and number theory. (DIAMANT).
1/9/2005 - 1/1/2010.
Coordinators: H.W. Lenstra, S.J. Edixhoven.

NWO VICI-premie: Arithmetic geometry, motives: computational aspects.
1/1/2005 - 1/1/2010.
Project leader: S.J. Edixhoven.

NWO VICI-premie: The Mathematics of Secure Computation.
1/1/2006 - 1/1/2011.
Projectleader: R. Cramer.

NWO program: Number Field Sieve.
2004-2008.
Cooperation with CWI.
Coordinator: R. Tijdeman.

NWO cluster: Nonlinear Dynamics of Natural Systems (NDNS).
1/1/2006 - 1/1/2010.
Coordinator: S.M. Verduyn Lunel.

NWO VIDI-premie Stationary dynamics in infinite dimensions.
1/1/2006 - 1/1/2011.
Project leader: O.W. van Gaans.

NWO VIDI-premie: Formation of singularities in natural systems.
1/1/ 2007 – 1/1/ 2012.
Project leader: V. Rottschäfer.

The Plant BioDynamics Laboratory (PBDL).
Cooperation with the Institute for Biology Leiden (IBL).
Project leader: L.A. Peletier.

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Master Theses

Mr. M. Hendriks
title: Surface automorphisms and the Nielsen realization problem
advisor: dr. M. Lübke, prof.dr. H. Geiges
date: 15-01-2007

Mrs. C. den Butter
title: Het Financieel Toetsingskader
advisor: prof.dr. L.C.M. Kallenberg
date: 26-01-2007

Mrs. A.B. Aaten
title: Ik begreep er niets van – het leek wel algebra
advisor: drs. P.M.G.M. Kop, dr. C.G. Zaal
date: 06-06-2007

Mr. D. Mikdad
title: Integral models of tori
advisor: prof.dr. H.W. Lenstra
date: 22-06-2007

Mrs. B.E. van Dalen
title: Dependencies between line sums
advisor: prof.dr. R. Tijdeman
date: 06-07-2007

Mr. A.C. Veldman
title: Evidential strength of Y-STR haplotype matches in forensic DNA casework
advisor: dr. E.W. van Zwet
date: 28-09-2007

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ALGANT MasterTheses

The ALGANT MASTER is a two-year master programme in pure mathematics, with a strong emphasis on Algebra, Geometry and Number Theory. It has been offered since September 2005, and it involves the partner universities of Bordeaux (France), Leiden (Holland), Padova (Italy) and Paris-Sud (France). It is a European Erasmus Mundus Master and provides European Community grants to students from non-EC-countries.

Every student participating in the Algant Master studies one year each in TWO of the four partner universities. At the end of the second year, the student defends a master thesis and is awarded the Algant master diploma in an Algant Graduation Ceremony.

Mr. N.V.A.Aryasomayajula
title: Average height of isogenous abelian varieties
advisor: dr. R.S. de Jong
date: 27-06-2007

Mr. A. Barry
title: The abc-conjecture and k-free numbers
advisor: dr. J.H. Evertse
date: 27-06-2007

Mr. P. Joubert
title: The topology of isolated singularities on complex hypersurfaces
advisor: dr. J.A.W. Schepers
date: 27-06-2007

Mrs. Zh. Ljujic:
title: Prime densities for generalized Lucas sequences
advisor: prof.dr. P. Stevenhagen
date: 27-06-2007

Mr. M. Perone:
title: Finite monoids and actions on group ring units
advisor: dr. B. de Smit
date: 27-06-2007

Mr. C. Sanabria:
title: Third order linear differential equations over C(z,d/dz)
advisor: prof.dr. J. Top (RUG)
date: 27-06-2007

Mrs. A. Stavrova:
title: Motivic decomposition of projective homogeneous varieties

advisor: dr. F.R.A. Doray
date: 27-06-2007

Mr. A. Trevisan:
title: Lattice polytopes and toric varieties
advisor: dr. O. Karpenkov
date: 27-06-2007

Mr. H. Zhao:
title: The extension of an elliptic curve by the multiplicative group over F_q
advisor: prof.dr. S.J. Edixhoven
date: 27-06-2007

Mr. R. K. Singh:
title: Anticyclotomic *p*-adic *L*-functions attached to elliptic curves over imaginary quadratic fields
advisor: prof.dr. S.J. Edixhoven
date: 15-08-2007

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PhD Theses

A.J. Van der Kooij June 27, 2007	Prediction Accuracy and Stability of Regression with Optimal Scaling Transformations. Thesis advisor: prof.dr. J.J. Meulman Leiden University
M. Linting October 16, 2007	Nonparametric Inference in Nonlinear Principal Components Analysis: Exploration and Beyond. Thesis advisor: prof.dr. J.J. Meulman Leiden University

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Publications

1. Number theory, Algebra and Geometry

1.1 Number Theory and Algebra

Papers in Journals and Proceedings
Alpers, A., Tijdeman, R., The two-dimensional Prouhet-Tarry-Escott problem, *J. Number Th. 123 (2007), 403-412*.
Ash, A., Brakenhoff, J., Zarrabi, Th., Equality of polynomial and field discriminants,

Experimental mathematics, vol. 16 (2007), 3, 367-374.
Bérczes, A., Evertse, J.-H., Győry,K., On the number of pairs of binary forms with given degree and given resultant, *Acta Arith. 128 (2007), 19-54*.
Bérczes, A., Evertse, J.-H., Győry, K., Diophantine problems related to discriminants and resultants of binary forms, *In: Diophantine Geometry, Proceedings of a trimester held in 2005 at SNS Pisa, U. Zannier, ed., Scuola Normale Superiore Pisa, (2007), 45-63.*
Bröker, R., Stevenhagen, P., Efficient CM-constructions of elliptic curves over finite fields, *Math. Comp. 76(2007), 260, 2161-2179.*
Chen, H., Cramer, R., Goldwasser, S., Haan, R. de, Vaikuntanathan, V., Secure Computation from Random Error Correcting Codes. *In: Proceedings of 26th Annual IACR EUROCRYPT, Barcelona, Spain, Springer Verlag LNCS, vol. 4515 (2007), 329-346.*
Cramer, R., Kiltz, E., Padró, C., A Note on Secure Computation of the Moore-Penrose Pseudo-Inverse and its Application to Secure Linear Algebra. *In: Proceedings of 27th Annual IACR CRYPTO, Santa Barbara, Ca., USA, Springer Verlag LNCS, vol. 4622 (2007) , 613-630.*
Cramer, R., Damgaard, I., Haan, R. de, Atomic Secure Multiplication with Low Communication. *In: Proceedings of 26th Annual IACR EUROCRYPT, Barcelona, Spain, Springer Verlag LNCS, vol. 4515 (2007), 291-310.*
Cramer, R., Hofheinz, D., Kiltz, E., Pass, R., Shelat, A., Vaikuntanathan, V., Bounded CCA2-Secure Encryption. *In: Proceedings of 13th Annual IACR ASIACRYPT, Malaysia, Springer Verlag LNCS, vol. 4833 (2007), 502-518.*
Ekkelkamp, W., The role of semismooth numbers in factoring large numbers (extended abstract), Proceedings of Conference on Algorithmic Number Theory 2007, ed. by A. Ernvall-Hytönen and M. Jutila and J. Karhumäki and A. Lepistö, *TUCS General Publication 46 (2007), 40-44.*
Hajdu, A., Hajdu, L., Tijdeman, R., General neighborhood sequences in Z^n, *Discr. Appl. Math. 155 (2007), 2507-2522.*
Hajdu L., Tijdeman, R., Algebraic discrete tomography, Ch. 4 of Advances in Discrete Tomography and its Applications, ed. by G.T. Herman and A. Kuba, Birkhäuser, Boston etc., (2007), *55-81*.
Hirata-Kohno, N., Laishram S.,Shorey, T.N., Tijdeman, R., An extension of a theorem of Euler, *Acta Arith. 129 (2007), 71-102*.
Hogendijk, J., A new look at the Barber's Astrolabe, *In: A. Vrolijk, Jan P. Hogendijk, ed., O ye Gentlemen: Arabic Studies on Science and Literary Culture in Honour of Remke Kruk, Leiden, Brill 2007,. 65-76.*
Hogendijk, J., Similar mathematics in different cultures: Jamshid al-Kashi and Ludolph van Ceulen on the determination of pi; *In: Mélanges offerts à Hossam Elkhadem par ses amis et élèves, ed. Frank Daelemans, Jean-Marie Duvosquel, Robert Halleux and David Juste, Brussels, Archives et Bibliothèques de Belgique, Numéro Spécial 83 / Archief- en Bibliotheekwezen in België, 83 Extranummer, (2007), 189-203, [ISSN: 0775-0722].*
Kraaikamp, C., Schmidt, Th. A., Smeets, I., Tong's spectrum for Rosen continued fractions, *J. Théor. Nombres Bordeaux, 19 (2007), 641-661.*
Lenstra, H.W., Commentary on H: Divisibility and congruences, *In: Andrzej Schinzel, Selected papers vol. II (2007), European Mathematical Society, Zürich, 901-902.*
Lenstra, H.W., Bernstein, D.J., Pila, J., Detecting perfect powers by factoring into coprimes, *Math. Comp. 76 (2007), 385-388.*
Rosema, S.W., Substitutions on two letters, cutting segments and their projections, *J. Théor. Nombres Bordeaux 19 (2007), 523-545.*
Shorey, T.N., Tijdeman, R., Prime factors of arithmetic progressions and binomial coefficients, *In: Diophantine Geometry, Proceedings of a trimester held in 2005 at the SNS Pisa, U. Zannier, ed., Scuola Normale Superiore Pisa, (2007), 283-296.*
Smit, B. de, Thomas, L., Local Galois module structure in positive characteristic and

continued fractions, *Archiv der Mathematik 88 (2007), 3, 207-219*

Other publications
Lenstra, H.W., Het hoofd en de boekenkast, published in a collection of essays dedicated to Jan Karel Lenstra on the occasion of his sixtieth birthday, edited by Gerard Kindervater, (2007), 1-3.
Smit, B. de, Geuze, G., Reken mee met ABC, *Nieuw Archief voor Wiskunde (5th series) 8 (2007), 26-30.*

1.2 Arithmetic Geometry

Papers in Journals and Proceedings
Bosman, J., A polynomial with Galois group SL2(F16), *LMS J. Comput. Math. 10 (2007) 378-388.*
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Karpenkov, O., Integer conjugacy classes of SL(3,Z) and Hessenberg matrices, http://arxiv.org/abs/0711.0830.
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2. Analysis and Stochastics

2.1 Analysis and Dynamical Systems

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Dijk, G. van, Pevzner, M., Ring structures for holomorphic discrete series and Rankin-Cohen brackets. *J. Lie Theory 17 (2007), 283-306.*

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Lemmens, B., Randrianantoanina, B. Gaans, O. van, Second derivatives of norms and contractive complementation in vector-valued spaces, *Studia Math. 179 (2007), 149--166.*

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Reiss, M., Riedle, M. Gaans, O. van, On Emery's inequality and a variation-of-constants formula, *Stoch. Anal. Appl. 25 (2007), 353-379.*

Rottschäfer, V. Krauskopf, B., The ECM-backbone of the Lang-Kobayashi equations: a geometric view, *J. of Bif. and Chaos, Vol. 17 (2007), 1-14.*

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Svensson, P.C., Silvestrov, S., Jeu, M.F. de, Dynamical systems and commutants in crossed products, *Internat. J. Math. 18 (2007), 455-471.*

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2.2 Probability Theory

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Chazottes, J.R., Collet, P., Kuelske, C., Redig, F., Deviation inequalities for random fields via coupling, *Probability Theory and Related Fields 137 (2007) 201-225.*

Dekker, R., Kallenberg, L.C.M., Nicolai, R.P., Maintenance and Markov Decision Models, *In: Encyclopedia of Statistics in Quality and Reliability, Ruggeri, F., Kenett, R. and Faltin, F.W. (eds), John Wiley & Sons Ltd, Chichester, UK, (2007), 993-1000.*

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Heidergott, B., Hordijk, A., Uitert, M. van, Series expansions for finite-state Markov chains, *Probability in Engineering and Informational Sciences, vol. 21 (2007), 381-400.*
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2.3 Mathematical and Applied Statistics

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Gill, R. D. (2007), Better Bell inequalities (passion at a distance), in: *Asymptotics: Particles, Processes and Inverse Problems: Festschrift for Piet Groeneboom* (E. A. Cator, G. Jongbloed, C.
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3. Mathematics, Computer Science and Society

Papers in Journals and Proceedings

Birrer, F.A.J., Hidden obstructions in discussions involving conductive argumentation: core and surface in the U.S. debate on the use of data mining techniques in the fight against terrorism, in F.H. van Eemeren, J.A.Blair, Ch.A. Willard, B. Garssen (eds.): *Proceedings of the Sixth Conference of the International Society for the Study of Argumentation, 2007, SicSat, Amsterdam, pp. 137-143*.

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Mathematical Institute Reports

MI 2007-01
Hupkes, H.J., Augeraud-Véron
Center projections for smooth difference equations of mixed type

MI 2007-02
M.F.E. de Jeu, S. Silvestrov, P.C. Svensson
Connections between dynamical systems and crossed products of Banach algebras Z

MI 2007-03
B.A. van de Rotten, S.M. Verduyn Lunel
A memory efficient Broyden method to simulate periodically forced processe.

MI 2007-04
F. den Hollander, N Pétrélis
A mathematical model for a copolymer in an emulsion

MI 2007-05
J. Gärtner, F. den Hollander, G. Maillard
Intermittency on catalysts

MI 2007-06
A. Es-Sarhir
Existence and uniqueness of invariant measures for a class of transition semigroups on Hilbert spaces

MI 2007-07
M. Streng
Divisibility Sequences for Elliptic Curves with Complex Multiplication

MI 2007-08
H.J. Hupkes and S.M. Verduyn Lunel
Center Manifolds for Periodic Functional Differential Equations of Mixed Type

MI 2007-09
A.Gaudillière, F. den Hollander, F.R. Nardi, E. Olivieri, E. Scoppola.
Ideal gas approximation for a two-dimensional rarefied gas under Kawasaki dynamics

MI 2007-10
F. den Hollander
Three lectures on metastability under stochastic dynamics

MI 2007-11
L. Ferracina and M.N. Spijker
Strong Stability of Singly-Diagonally-Implicit Runge-Kutta Methods

MI 2007-12
J. Gabrielsson and L.A. Peletier
A flexible nonlinear feedback system that captures diverse patterns of adaptation and rebound

MI 2007-13
F. den Hollander, N. Pétrélis
On the localized phase of a copolymer in an emulsion: supercritical percolation regime

MI 2007-14
H. Cohen, P. Stevenhagen
Computational class field theory

MI 2007-15
J.-R. Chazottes, P. Collet, F. Redig
Rate of convergence to equilibrium for interacting particle systems via coupling and concentration

MI 2007-16
A. Fey-den Boer, R. Meester, C. Quant, F. Redig
A probabilistic approach to Zhang's sandpile model

MI 2007-17
P. Collet, C. Giardinà, F. Redig
Alignment of one dimensional Gibbs measures

MI 2007-18
C. Giardinà, J. Kurchan, F. Redig
Duality and exact correlations for a model of heat conduction

MI 2007-19
A. Fey-den Boer, R. Meester, F. Redig
Stabilizability and percolation in the infinite volume sandpile model

MI 2007-20
A. Fey-den Boer, F. Redig
Limiting shapes for deterministic centrally seeded growth models

MI 2007-21
M. F.E. de Jeu, P.C. Svensson, S. Silvestrov
Algebraic curves for commuting elements in the q-deformed Heisenberg algebra

MI 2007-22
B. de Smit, L. Thomas
Local Galois module structure in positive characteristic and continued fractions

MI 2007-23
J. Borger, B. de Smit

Galois theory and integral models of Λ-rings

MI 2007-24
J. Hančl, R. Tijdeman
On the irrationality of polynomial Cantor series

MI 2007-25
L. Hajdu, R. Tijdeman
A criterion for polynomials to divide infinitely many k-nomials

MI 2007-26
N. Saradha, R. Tijdeman
Arithmetic progressions with common difference divisible by small primes

MI 2007-27
R. Tijdeman, L. Zamboni
Fine and Wilf words for any periods II

MI 2007-28
S. Silvestrov, P.C. Svensson, M.F.E. de Jeu
Algebraic dependence of commuting elements in algebras

MI 2007-29
R.S. de Jong
Gauss map on the theta divisor and Green's functions

MI 2007-30
M.F.E. de Jeu, S. Silvestrov, P.C. Svensson
Dynamical systems associated with crossed products

MI 2007-31
H.W. Lenstra
Entangled radicals

MI 2007-32
H.W. Lenstra
Lattices

MI 2007-33
S.J. Edixhoven
Point counting after Kedlaya

MI 2007-34
J.G. Bosman, J.M. Couveignes, S.J. Edixhoven, R.S. de Jong
On the computation of coefficients of a modular form

MI 2007-35
C. Kraaikamp, T.A. Schmidt, I. Smeets
Tong's spectrum for Rosen continued fractions

MI 2007-36
J. Schepers, W. Veys

Stringy E-functions of hypersurfaces and of Brieskorn singularities

MI 2007-37
J. Schepers
On the Hard Lefschetz property of stringy Hodge numbers

MI 2007-38
R.S. de Jong
Local invariants attached to Weierstrass points

MI 2007-39
R. Dekker, R.P. Nicolai, L.C.M. Kallenberg
Maintenance and Markov decision models

MI 2007-40
D. Freeman, P. Stevenhagen, M. Streng
Abelian varieties with prescribed embedding degree

MI 2007-41
G. van Dijk
(U(p,q), U(p-1,q)) is a generalized Gelfand pair

MI 2007-42
V. Rottschäfer
Multi-bump, selfsimilar, blowup solutions of the Ginzburg Landau equation

MI 2007-43
A. Bérczes, J.-H. Evertse, K. Győry
On the number of pairs of binary forms of given degree and given resultant

MI 2007-44
A.Bérczes, J.-H. Evertse, K. Győry
Diophantine problems related to discriminants and resultants of binary forms

MI 2007-45
Y. Bugeaud, J.-H. Evertse
Approximation of complex algebraic numbers by algebraic numbers of bounded degree

MI 2007-46
Y. Bugeaud, J.-H. Evertse
On two notions of complexicyt of algebraic numbers

MI 2007-47
S.C. Hille, D.T.H. Worm
Global existence of positive mild solutions for a class of kinetic chemotaxis models

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Workshops, Seminars a.o.

This chapter summarizes the workshops, seminars and others (co-) organised by (researchers

of) the Mathematical Institute. The following data are given:
- *Title*
- *City and date*
- *(Co-) organisers*

Mathematics of Operations Research,
Lunteren, January 16-17.
L.C.M. Kallenberg

Seminar Operations Research and Public Transportation,
Lunteren, January 18
L.C.M. Kallenberg

Probability and Statistics in Population Genetics
Leiden, January 22-26
S.M. Verduyn Lunel

Mathematical Modeling and Analysis of Biological Networks
Leiden, January 29 - February 2
S.M. Verduyn Lunel

4th IACR Theory of Cryptography Conference
Amsterdam, February 2007
R. Cramer

Bruno Ernst Symposium
Leiden, March 30, 2007
M.F.E. de Jeu

43rd Dutch Mathematical Congress
Leiden, April 12-13
F. Bakker, T.A. Dijks, J.-H. Evertse, W.Th.F. den Hollander, R. van der Hout, M.F.E. de Jeu, L.C.M. Kallenberg (voorzitter), H.W. Lenstra, M. Lübke, F. Redig, V. Rottschäfer, J.B. Weimar

Ostrowski Prize Ceremony
Leiden, April 12
R. Tijdeman

Seminar on Néron models
Leiden, Spring 2007.
P. Bruin

Instructional conference Solvability of Diophantine equations
Leiden, May 7-11
J.-H. Evertse, R. Tijdeman

Workshop Solvability of Diophantine equations
Leiden, May14-16
J.-H. Evertse, R. Tijdeman.

3rd Mathematics of Cryptology Event

Barcelona, Spain, May 2007
R. Cramer

Workshop on Random Polymers,
Eindhoven, June 18-22
F. den Hollander

Explicit methods in number theory,
Oberwolfach, Germany, July 15-20
H.W. Lenstra

Workshop on Sandpile Models and Related Fields,
Eindhoven, September 10-13
F. Redig

Galois Theory and Explicit Methods,
Leiden, September 17-21
B. de Smit

Dagstuhl-meeting on Cryptology
Schloss Dagstuhl, Germany, September 2007
R. Cramer

Workshop Applied Quantum Measurement,
Leiden, November 5-9
R.D. Gill

Meeting of Stochastics,
Lunteren, November 12-14
R.D. Gill

The 2007 Twente Conference on Lie Groups
Enschede, December 12-14
G. van Dijk

Seminar on moduli spaces and modular forms
Leiden, Fall 2007
M. Streng, P. Bruin

General Mathematics Colloquium, monthly,
Leiden
J.-H. Evertse and F. Redig

DIAMANT Intercity number theory seminar
Varying locations, bi-weekly
B. de Smit

Research seminar on Faltings heights of covers
Leiden, weekly
S.J. Edixhoven

RISC (Research in Information Security and Cryptology) Seminar

Leiden and Amsterdam, monthly
R. Cramer

Cryptography seminar
Rennes, France
S.J. Edixhoven

Geometry Seminar
Leiden
S.J. Edixhoven

BioScience Colloquium
Leiden, monthly
L.A. Peletier

Joint Leiden/Delft seminar on Banach space theory
Leiden, biweekly.
M.F.E. de Jeu

NDNS+-bioseminar 'Evolutionary theory'
Leiden, biweekly
S.C. Hille and S.M. Verduyn Lunel

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Invited lectures

1.1 Number theory and Algebra

J. Brakenhoff
- Counting subrings of maximal orders, Oberwolfach, Germany, July 18.

R. Cramer
- Secure Computation and Coding Theory, Zürich, Switzerland, March 15.
- Algebraic Manipulation Detection Codes, Zürich, Switzerland, March16.
- Algebraic Geometric Aspects of Secure Computation, Oviedo, Spain, April 27.
- Introduction to Algebraic and Combinatorial aspects of Secure Computation Complutense, Barcelona, Spain, May 1- May 11.
- Reductionist security in cryptography, Barcelona, Spain, May 14.
- Interplays between secure computation, algebra, geometry and coding theory, Barcelona, Spain, May 18.
- Secure Computation from Random Error Correcting Codes,Barcelona, Spain, May 23..
- Algebraic Manipulation Detection Codes, Dagstuhl, Germany, September 21.

J. L.A.H. Daems
- Betegel een veelhoek met driehoekjes, Noordwijkerhout, The Netherlands, February 2 (with A. Aaten).
- History of mathematical crystallography, Nijmegen,The Netherlands, February 23.
- Betegelingen en behanggroepen, Leiden, The Netherlands, March 30.

- Betegel een veelhoek met driehoekjes, Lunteren, The Netherlands, August 2.
- De verdeling van het vlak in regelmatige patronen, Nijmegen, The Netherlands, October 6 (with B. Souvignier).

B. van Dalen
- Dependencies between line sums, Leiden, The Netherlands, November 23.

W. Ekkelkamp
- The role of semismooth numbers in factoring large numbers, Algorithmic Number Theory, Turku, Finland, May 9.

J.-H. Evertse
- On the quantitative Subspace Theorem, Diophantische Approximationen, Oberwolfach, Germany, April 16.
- On the approximation of complex algebraic numbers by algebraic numbers of bounded degree, Rome, Italy, June 8.
- On the quantitative Subspace Theorem, Debrecen, Hungary, August 3.

H.W. Lenstra
- Ordering fields, Leiden, The Netherlands, January 8.
- 43, Princeton, USA, April 3.
- Escher and the Droste Effect, Princeton, USA, April 3.
- Layered lattices, Princeton, USA, April 5.
- Wat het getal 43 zo bijzonder maakt, Delft, The Netherlands, April 24.
- The Early History of LLL, Caen, France, June 29.
- Escher en het Droste-effect, Biddinghuizen, The Netherlands, August 18.
- Layered lattices, Amsterdam, The Netherlands, September 7.
- Heuristics for class groups, Leiden, The Netherlands, September 20.
- Escher and the Droste effect, Ankara, Turkey, September 25.
- Algorithms for ordered fields, Ankara, Turkey, September 26.
- Algorithms for ordered fields (4 lectures), Philadelphia, USA, October/November

W.J. Palenstijn
- Computing primitive root densities of rank one tori, Oberwolfach, Germany, July 19.

S. Rosema
- Sturmian substitutions, cutting paths and their projections, Graz, Austria, April 16.
- Sturmian substitutions, cutting paths, and their projections, Leiden, The Netherlands, March 30.
- Beta-substitutions, cutting paths and their projections, Leiden, The Netherlands, November 23.

B. de Smit
- Escher and the Droste Effect, Leiden, The Netherlands, January 11.
- Escher and the Droste Effect, Ede, The Netherlands, March 8.
- Escher and the Droste Effect, Minneapolis, USA, October 9.
- Escher and the Droste Effect, Northfield, USA, October 10.
- Escher and the Droste Effect, Bowling Green, USA, October 12.
- Escher and the Droste Effect, Delft, The Netherlands, October 24.
- Escher and the Droste Effect, Genua, Italy, October 31.
- Ervaringen van een Marie Curie network coordinator, Maarssen, The Netherlands, December 13

R. Tijdeman
- Linear forms, diophantine equations, and arithmetic progressions, Moscow, Russia, January 29.
- On words with many periods, Graz, Austria, October 18.
- Fine and Wilf words for any periods, Debrecen, Hungary, October 24.
- Words with any periods, Leiden, The Netherlands, November 23.

1.2 Arithmetic Geometry

S.J. Edixhoven
- On the computation of the coefficients of modular forms, Aachen, Germany, January 17.
- Computing coefficients of modular forms, Stellenbosch, South Africa, January 29.
- Computation of etale cohomology and some applications, Eindhoven, The Netherlands, February 28.
- Height bounds for covers of a given curve in the function field case, Groningen, The Netherlands, April 18.
- Computational aspects of Galois representations associated to modular forms, St. Petersburg, Russia, June 16.
- Modular curves. A series of 4 one hour lectures in the "Summer School and Conference on Automorphic Forms and Shimura Varieties", Trieste, Italy, July 13, 16-18.
- General Introduction. Intercity Seminar Algebraic Geometry on "Derived categories and stability conditions", Utrecht, The Netherlands, September 28.
- How to count vectors with integral coordinates and given length in $\boldsymbol{R^n}$?, Leiden, The Netherlands, November 1.
- Computational aspects of coefficients of modular forms, New York, USA, December 13.

R. S. de Jong
- Gauss map on the theta divisor and moduli of abelian varieties, Stockholm, Sweden, April 26.
- On an isomorphism connected with Arakelov's proof of rigidity, Aber W'rach, France, September 11.

O. Karpenkov.
- Energies of knots and graphs, The Algebra and Geometry around Knots and Braids, St.Petersburg, Russia, September 12.
- Invariant Mobius measure and Gauss-Kuzmin face distribution, Moscow, Russia, August 22.

J.P. Murre
- H.D. Kloosterman, Als Wiskundige en als Leermeester, Leiden, The Netherlands, April 13.
- An introduction to motives, Caltech, Pasadena, U.S.A., May 25.
- Finite coverings of surfaces Torino, Italy, June 12.
- The Picard Motive revisited, Genova, Italy, October 10-16.
- The Picard Motive revisited, Torino, Italy, October 23.

J.W. Schepers
- Stringy E-functions of Brieskorn singularities, Sedano, Spain, March 21.
- Quotient singularities are rational, Leiden, The Netherlands, March 14.
- Stringy Hodge numbers for a class of isolated singularities and for threefolds, Paris, France, September 24.

- Stringy Hodge numbers for a class of isolated singularities and for threefolds, Lille, France, October 17.

L. Taelman
- Number Fields and Function Fields: Special Values of L-functions, Zürich, Switzerland, October 5.

2.1 Analysis and Dynamical Systems

Ph. Clément
- Some remarks on infinite dimensional nonlinear elliptic problems, Toulouse, France, January 19.
- An elementary proof of the triangle inequality for the Wasserstein metric, Toulouse, France, June 22.
- Maximal L^p- regularity and R-boundednes, Lausanne, Switzerland, September 6.

G. van Dijk
- Multiplicity free decomposition of the oscillator representation, Tambov, Russia, September 26.

O.W. van Gaans
- Invariant measures for stochastic delay equations, Darmstadt, Germany, January 30
- Oneindig in de wiskunde, Delft, The Netherlands, December 19.

M.F.E. de Jeu
- Dilation theorems, Seminar "Completely Bounded Maps and Operator Algebras", Delft, The Netherlands, February 9 and 23.
- Hoeveel is oneindig?, Bruno Ernst Symposium, Leiden, The Netherlands, March 30.
- Local spectral radii of constant coefficient differential operators, Clausthal, Germany, October 31.

L.A. Peletier
- Modeling Polar Auxin Transport, Leiden, The Netherlands, February 1.
- Modeling Polar Auxin Transport, Boston, USA, February 20.
- Nonclassical solutions of the Buckley-Leverett equation in the context of two phase flow, Madrid, Spain, June 26.
- Nonclassical solutions of the Buckley-Leverett equation in the context of two phase flow, Worcester, USA, October 26.
- Dynamical Systems in Pharmaceutical Science, New Jersey, USA, November 12-13.
- Modeling Polar Auxin Transport, Ohio, USA, November 16.

V. Rottschäfer
- Multi-resolution and High Oscillation for Evolutionary Problems: Blow-up and Hamiltonian Systems, Bath, Great Britain, June11-12.
- Multi-resolution and High Oscillation for Evolutionary Problems: Blow-up and Hamiltonian Systems, Snowbird, Utah, USA, May 28-June 1.

S.M. Verduyn Lunel
- New completeness and noncompleteness theorems for compact operators with applications, Potchefstroom, South Africa, July 2-6.

2.2 Probability Theory

F. den Hollander
- Invasiepercolatie, Amsterdam, The Netherlands, January 29.
- Copolymers in emulsions, Oberwolfach, Germany, March 21-25.
- Intermittency on catalysts, Kaiserslautern, Germany, April 3.
- Copolymers in emulsions, Toronto, Canada, May 31–June 2.
- Intermittency on catalysts, Paris, France, June 13-15.
- Random Polymers, 6 lectures, Saint-Flour, France, July 8-21.
- Random walk in random scenery, Amsterdam,The Netherlands, October 3.
- A quenched large deviation principle for words in a sequence of letters, Rome, Italy, November 9.
- A quenched large deviation principle for words in a sequence of letters, Vancouver, Canada, November 21.
- Metastability under stochastic dynamics, Vancouver, Canada, November 23.
- Entropy: a core concept, Melbourne, Australia, November 26.
- A quenched large deviation principle for words in a sequence of letters, Melbourne, Australia, November 29.

F. Redig
- Coupling, concentration and stochastic dynamics, Ottawa, Canada, April 26.
- Coupling, concentration and stochastic dynamics, Utrecht, The Netherlands, May 11.
- Coupling, concentration and stochastic dynamics, Groningen, The Netherlands, May 15.
- Coupling, concentration and stochastic dynamics, Berlin, Germany, June 15.
- Duality and exact correlations in a model of heat conduction, Eindhoven, The Netherlands, July 9.
- Coupling, concentration and stochastic dynamics, Delft, The Netherlands, December 5.
- Introduction to the sandpile model, Oberwolfach, Germany, December 18.

2.3 Mathematical and Applied Statistics

R.D. Gill
- Science versus justice (the case of Lucia de B.), Zürich, Switzerland, January 12.
- Better Bell inequalities, Workshop on quantum information, Tokyo, Japan, March 20.
- Passion at a Distance, Rome I, Italy, April 25.
- Better Bell inequalities, Barcelona, Spain, March 27.

J.J. Meulman
- Clustering subjects with smoothing parameters on the attribute weights in systems biology, Zurich, Switzerland, November 8.

3. Mathematics, Computer Science and Society

F.A.J. Birrer
- Acceptance as a notion for understanding the practice of science, Enschede, The Netherlands, August 23.

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Memberships of editorial boards

R. Cramer
- IACR Journal of Cryptology
- Information Security and Cryptology Book Series: advisory board
- Journal of Mathematical Cryptology
- IEE Journal of Information Security

Ph. Clément
- Journal of Evolution Equations
- PanAmerican Mathematical Journal

S.J. Edixhoven
- Compositio Mathematica (managing editor)
- Journal of Number Theory
- Expositiones Mathematicae

J.H. Evertse
- Compositio Mathematica

R.D. Gill
- International Statistical Review
- Annals of Statistics
- Methods of Mathematical Statistics
- Probability and Mathematical Statistics
- Electronic Journal of Statistics

J. P. Hogendijk
- Ganita-Bharati
- Istoriko-Matematicheskie Issledovaniya
- Suhayl
- Centaurus
- Zeitschrift für Geschichte der arabisch-islamischen Wissenschaften
- Historia Mathematica
- Ta'rikh-e Elm
- Journal for the History of Arabic Science
- Early Science and Medicine

F. den Hollander
- Annals of Probability
- Annales Henri Poincaré
- Electronic Communications in Probability
- Electronic Journal of Probability
- Markov Processes and Related Fields
- Indagationes Mathematicae
- Stochastic Processes and Applications

H.W. Lenstra
- Indagationes Mathematicae
- Ergebnisse der Mathematik und ihrer Grenzgebiete
- Experimental Mathematics
- Arab Journal of Mathematical Sciences
- Foundations of Computational Mathematics
- Journal of the European Mathematical Society

M.F.E. de Jeu
- Symmetry, Integrability and Geometry: Methods and Applications
  (guest editor for the "Special Issue on Dunkl Operators and Related Topics")

J.J. Meulman
- Journal of Classification
- Publication Series Studies in classification, data analysis, and knowledge organization, Springer-Verlag
- British Journal of Mathematical and Statistical Psychology

J.P. Murre
- Indagationes Mathematicae

L.A. Peletier
- Advances in Differential Equations
- Differential and Integral Equations
- Applied Mathematics Letters
- Journal of the European Mathematical Society
- Progress in Nonlinear Differential Equations and their Applications

M.N. Spijker
- Journal of Computational and Applied Mathematics
- International Journal of Engineering
- Applicationes Mathematicae
- CWI-Publications

P. Stevenhagen
- Contributions to Discrete Mathematics
- Japan journal of industrial and Applied Mathematics
  (guest associate editor for the special issue on Algorithmic Number Theory, Vol. 24, No. 3)

R. Tijdeman
- Acta Arithmetica
- Indagationes Mathematica

S.M. Verduyn Lunel
- Archiv der Mathematik
- Functional Differential Equations
- Integral Equations and Operator Theory (managing editor)
- Operator Theory Advances and Applications (series of monographs, Birkhäuser)

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Honors

J. Bosman
- Philips Prize for PhD students in Mathematics, Nederlands Mathematisch Congres, April 2007

R. Cramer
- Invited professor, Department of Mathematics, Complutense, Madrid, Spain, (10 lectures on Foundation of Secure Computation), May/June 2007

R.D. Gill
- Elected president of the Dutch Society for Statistics and OR (VVS-OR)

F. den Hollander
- Saint-Flour Probability Lectures 2007

H.W. Lenstra
- Akademiehoogleraar (KNAW)
- Chairman of Program Committee of ICM 2010

J.J. Meulman
- Elected to the General Board of The Royal Netherlands Academy of Arts and Sciences

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Foreign visitors

The following data are given:
name, place and country of the visitor
name(s) of the host(s)

1. Number theory, Algebra and Geometry

1.1. Number theory and Algebra
- A. Bérczes, Debrecen, Hungary, J.H. Evertse.
- N. Bruin, Vancouver, Canada, J.-H. Evertse, R. Tijdeman.
- Y. Bugeaud, Strasbourg, France, J.-H. Evertse, R. Tijdeman.
- I. Damgaard, Aarhus, Denmark, R. Cramer.
- D. Geyer, Erlangen-Nürnberg, Germany, B. de Smit.
- B. Green, Cambridge, United Kingdom, R. Tijdeman.
- Y. Ishai, Los Angeles, USA, R. Cramer.
- A. Shamir, Rehovot, Israel, R. Cramer.
- A. Surroca Ortiz, Zürich, Switzerland, B. de Smit.
- E. Weinreb, Haifa, Israel, H.W. Lenstra.
- G. Wiese, Duisburg-Essen, Germany, B. de Smit.
- C. Wuthrich, Lausanne, Switzerland, B. de Smit.

1.2. Arithmetic Geometry

- S. Kimura, Hiroshima Univ., Japan, J.P. Murre.
- R. Noot, Strasbourg, France, S.J. Edixhoven.
- M. Saito, RIMS, Kyoto, Japan, J.P. Murre.

2. Analysis and Stochastics

2.1. Analysis and Dynamical Systems

- N. Benson, Sandwich, United Kingdom, L.A. Peletier.
- G. Buskes, Oxford, Mississippi, USA, O. van Gaans.
- J. Gabrielsson, Molndahl, Sweden, L.A. Peletier.
- P.H. van der Graaf, Sandwich, United Kingdom, L.A. Peletier.
- K.J. in 't Hout, Antwerpen, België, M. Spijker.
- A. Kalauch, Dresden, Germany, O. van Gaans.
- V.F. Molchanov, Tambov, Russia, G. van Dijk.
- S. Silvestrov, Lund Universitet, M. de Jeu.
- J. Tomiyama, Japan Women's University, Tokyo, M. de Jeu.

2.2. Probability Theory

- E. Baake, Bielefeld University, Germany, F. den Hollander.
- M. Birkner, Weierstrass Institute, Berlin, Germany, F. den Hollander.
- E. Bolthausen, University of Zürich, Switzerland, F. den Hollander.
- A. Bovier, Weierstrass Institute, Berlin, Germany, F. den Hollander.
- J.R. Chazottes, Ecole Polytechnique, Paris, France, F. Redig.
- R. Fernández,Rouen University, France, F. den Hollander and F. Redig.
- J. Gärtner, Technical University Berlin, Germany, F. den Hollander.
- A. Gaudilliere, University of Rome 2 and 3, Italy, F. den Hollander.
- A. Greven, University of Erlangen- Nürnberg, Germany, F. den Hollander.
- J. Kurchan, Ecole Normale Supérieure, Paris, France, F. Redig.
- G. Maillard, EPFL Lausanne, Switzerland, F. den Hollander.
- E. Olivieri, University of Rome 2 and 3, Italy, F. den Hollander.
- E. Scoppola, University of Rome 2 and 3, Italy, F. den Hollander.
- G. Slade, University of British Columbia, Vancouver, Canada, F. den Hollander.
- N. Zint, University of Bielefeld, Germany, F. den Hollander.

2.3. Mathematical and Applied Statistics

- H. Thorissen, Reykyavik, Finland, R.D. Gill.

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Research Staff

1. Number theory, Algebra and Geometry

1.1 Number theory and Algebra

permanent staff:

prof.dr. R.J.F. Cramer

dr. J.-H. Evertse
prof.dr. J.P. Hogendijk
prof.dr. H.W. Lenstra
dr. B. de Smit
prof.dr. P. Stevenhagen
prof.dr. R. Tijdeman

PhD students:
drs. J. Bouw
drs. J.F. Brakenhoff
drs. J.L.A.H. Daems
B.E. van Dalen, MSc. (from September 1)
drs. W.H. Ekkelkamp (CWI)
drs. W.J. Palenstijn
drs. S.W. Rosema
ir. I. Smeets
drs. T.C. Streng
E.L. Toreao Dassen, MSc.

guest researchers:
drs. G. Geuze (LIO, till September 1)
drs. B. Zevenhek (LIO)

1.2 Arithmetic Geometry

permanent staff:
prof.dr. S.J. Edixhoven
dr. R.S. de Jong
dr. M. Lübke

emeriti:
prof.dr. J.P. Murre
prof.dr. A.J.H.M. van de Ven

postdocs:
dr. F.R.A. Doray
dr. O. Karpenkov
dr. J.A.W. Schepers
dr. L.D.J. Taelman (from September 1)

PhD students:
drs. J.G. Bosman
drs. P.J. Bruin
drs. A.P. Stolk

2. Analysis and Stochastics

2.1 Analysis and Dynamical Systems

permanent staff:
prof.dr. P.J.E. Clément
dr. O. van Gaans
prof.dr. R. van der Hout (till August 1)
dr. S.C. Hille
dr. M.F.E. de Jeu
dr. V. Rottschäfer
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prof.dr.ir. L.A. Peletier
prof.dr. M.N. Spijker

postdocs:
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dr. B.A. van de Rotten

PhD students:
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drs. H.J. Hupkes
M. Muskulus, Dipl.Math.
drs. M. van der Schans
I. Stojkovic, MSc (from February 1)
drs. P.C. Svensson
drs. D. Worm
M. Wortel, MSc (from December 1)

guest researchers:
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prof.dr. H. Metz

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prof.dr. L.C.M. Kallenberg
dr. F.H.J. Redig
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postdocs:
dr. C. Spitoni (UL/Eurandom)

PhD student:
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prof.dr. J.J. Meulman
dr. E.W. van Zwet

emeritus:
prof.dr. W.R. van Zwet

PhD student:
S.G. Cox, MSc (from March 1 till August 1)

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