XXXII^es Journées Arithmétiques

Nancy — 3-7 juillet 2023

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The Organising Committee would like to thank all the people who helped us organise this conference, including

- Michel Waldschmidt, for being a driving force of the *Journées Arithmétiques* and for allowing an organisation in Nancy;
- the members of the Scientific Committee;
- the technical and administrative staff at the University of Lorraine, namely:
  - *service informatique, service technique et bureaux régulateurs, Faculté des Sciences et Technologies*;
  - *service de communication, administratif et financier, Institut Élie Cartan*, with special thanks to Paola Schneider for her enormous help;
- the CROUS (*Centre régional des œuvres universitaires et scolaires*) of Nancy-Metz;
- Jacques Martinet for updating and allowing us to distribute his historical account of the *Journées Arithmétiques*;
- all the volunteers (in particular the Ph.D. students) for their help during the conference;
- and our sponsors, namely:
  - GDR JC2A (*Groupement de recherche Jeunes chercheuses et jeunes chercheurs en artihmétique*);
  - CNRS (*Centre National de la Recherche Scientifique*);
  - Fondation Compositio;
  - Lorraine University, Faculty of Sciences and Technology;
  - the Number Theory Fondation;
  - the ANR-FWF Project Arithrand;
  - Région Grand-Est;
  - the ANR Project JINVARIANT;
  - Journal de Théorie des Nombres de Bordeaux;
  - Journal of Number Theory;
  - the doctoral school IAEM (*Informatique, Automatique, Electronique-Electrotechnique, Mathématiques et Sciences de lArchitecture*);
  - Institut Élie Cartan;
  - the city of Nancy;
  - International Journal of Number Theory; and
  - the SMF (*Société Mathématique de France*).

Finally, we thank Antonella Perucca and Gabor Wiese for having accepted to organise the next edition of the *Journées Arithmétiques* in Luxembourg, in 2025.

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Informations générales / General information

Faculté des Sciences et Technologies / Faculty of Sciences and Technologies

- The Faculty of Sciences and Technologies (FST) is located in the southern suburbs of Nancy, in the townships of Villers-lès-Nancy and Vandoeuvre-lès-Nancy. Within the Université de Lorraine, this Training and Research Unit (UFR) is forming with the UFR SciFA and MIM in Metz, the Collegium of Sciences and Technologies.
- Many bilateral agreements with other European universities enable students to study a semester or a year abroad. Several courses are international such as the Physics integrated curriculum, which is built in partnership with Saarland University, and the Erasmus Mundus Masters built with consortia of several partner universities.
- On campus, students have access to excellent ressources: computer rooms, language laboratories, experimental platforms... With the experience and knowledge of 360 Professors, assistant Professors or lecturers and the proximity of excellent research laboratories housed on campus in which they can do internships, our students are trained at the forefront of technology and innovation.
- The campus also houses the University Library of Sciences and Technologies. The Botanical Garden of Montet nearby is an extra teaching tool for students in plant biology while the Aquarium Museum of Nancy, accessible by tram No. 1 which serves the campus, can be used by students in animal biology. The educational resource centre AIP-PRIMECA Lorraine located on campus is used as an experimental support for some of our training courses in engineering. It promotes the implementation of manipulations of an industrial nature. The close proximity of the University restaurant of the Vélodrome and student residences are additional assets. Lastly, the campus hosts a large number of students associations which contribute to the animation of the site and allow a rapid integration of newcomers.

Se déplacer dans Nancy / Getting around in Nancy The public transport network in Nancy is called "Stan" (`www.reseau-stan.com`). Tickets can be bought at the train station. You can buy single tickets "Pass 1" for 1.40, day tickets "Pass 24h" for 3.90 or ten ticket passes "Pass 10" for 11.00. These tickets also exist in a "MixCités" version, however, these are for suburban lines and are not needed for the conference. Also note that on the weekends (Saturnday and Sunday) public transport in Nancy is free of charge – you do not need a ticket.

You are arriving to Nancy during a period of construction works. Indeed, the tramway line was closed in March 2023, and will be replaced by a trolleybus in September 2024. In the meantime the old line "Tempo 1" or "T1" is replaced by two lines A and B, which are not on the campus map. Therefore you have two possibilities to get from the city center to the conference site:

- The first one is by Bus A. It runs every 7-10 minutes and reaches the stop "Velodrome" which is in the bottom right corner, close to the R.U. (the mensa). However, this bus makes a round trip in the city center and it takes quite some time to get to the conference.

- The second one is the Bus "Tempo 3" or "T3". It runs every 10 minutes and serves the stops "Joseph Laurent" and "UFR Staps" in the upper right corner, which are closer to the conference site.

Accueil / Hospitality Welcome to the *Journées Arithmétiques*!
Please check the maps to find your way to the locations stated below.

- The registration desk, open during the mornings, is located in front of Amphitheater VG8 on the second floor of the building Victor Grignard — which is where the plenary talks will take place.

- A so-called organisation desk, open during the afternoons, is located in the corridor in front of Amphitheaters 11 to 16, on the second floor of the building Henri Poincaré.

- Plenary talks take place in Amphitheater VG8, located on the second & third floors of the building Victor Grignard.

- Short talks take place in Amphitheaters 11 to 16, located on the second floor of the building Henri Poincaré.

- Additional rooms are available for work from 08h00 till 18h00: rooms E21, E22, E24 to E27 and E30 to E37, all located on the second floor of the building Henri Poincaré, the same floor as the main entrance of the amphitheaters.

Restauration & café / Lunch & coffee

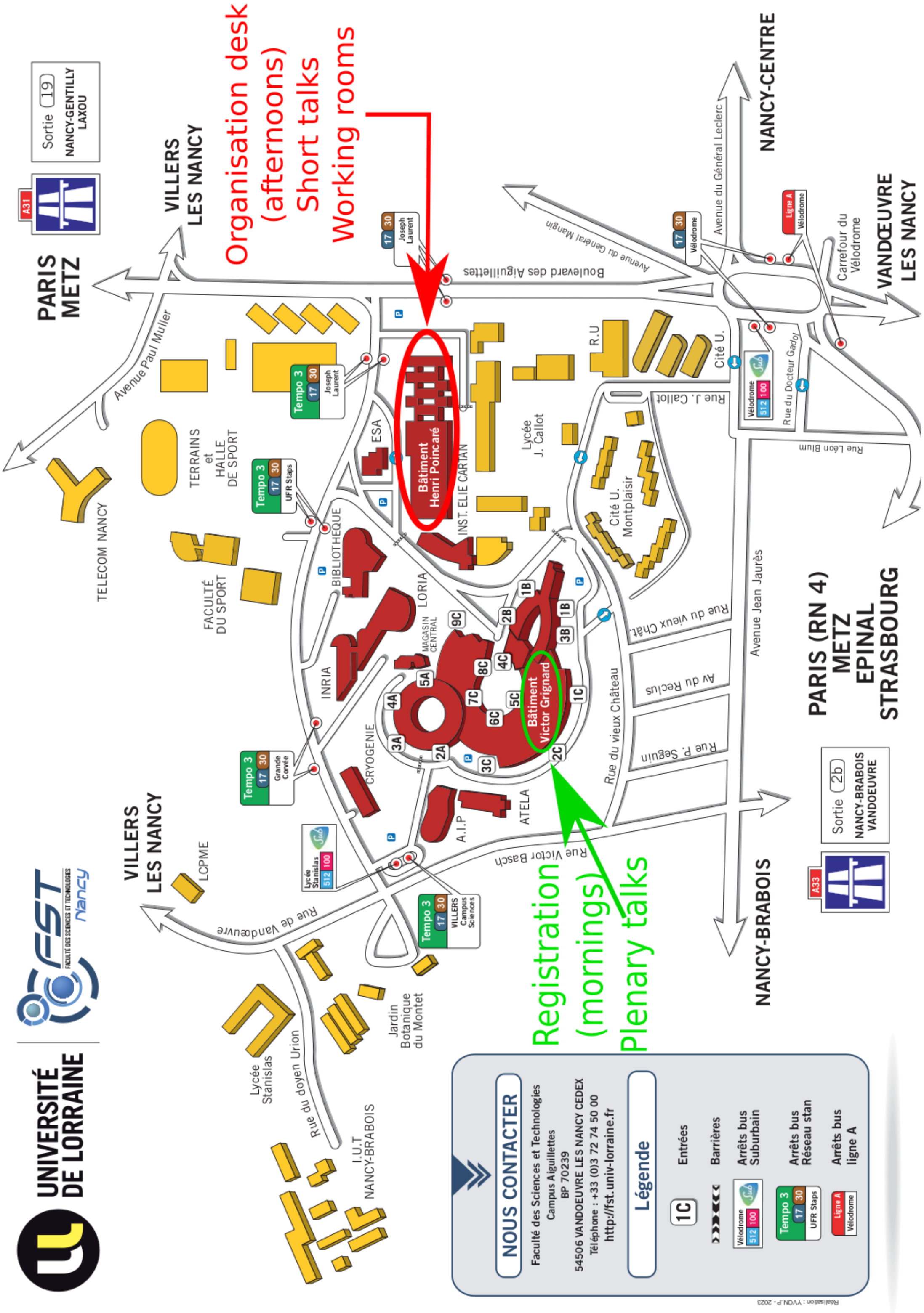
- The coffee breaks take place in the mornings in the building Victor Grignard on the floor near the Amphitheater 8 and during the afternoons in the corridor next to the Amphitheaters 11 to 16, in the second floor of the building Henri Poincaré.

- Lunches organised by the conference will be held at the CROUS near the conference place. It is a self-service restaurant. You will need to give a lunch ticket to the cashier. You will get these tickets when you register.

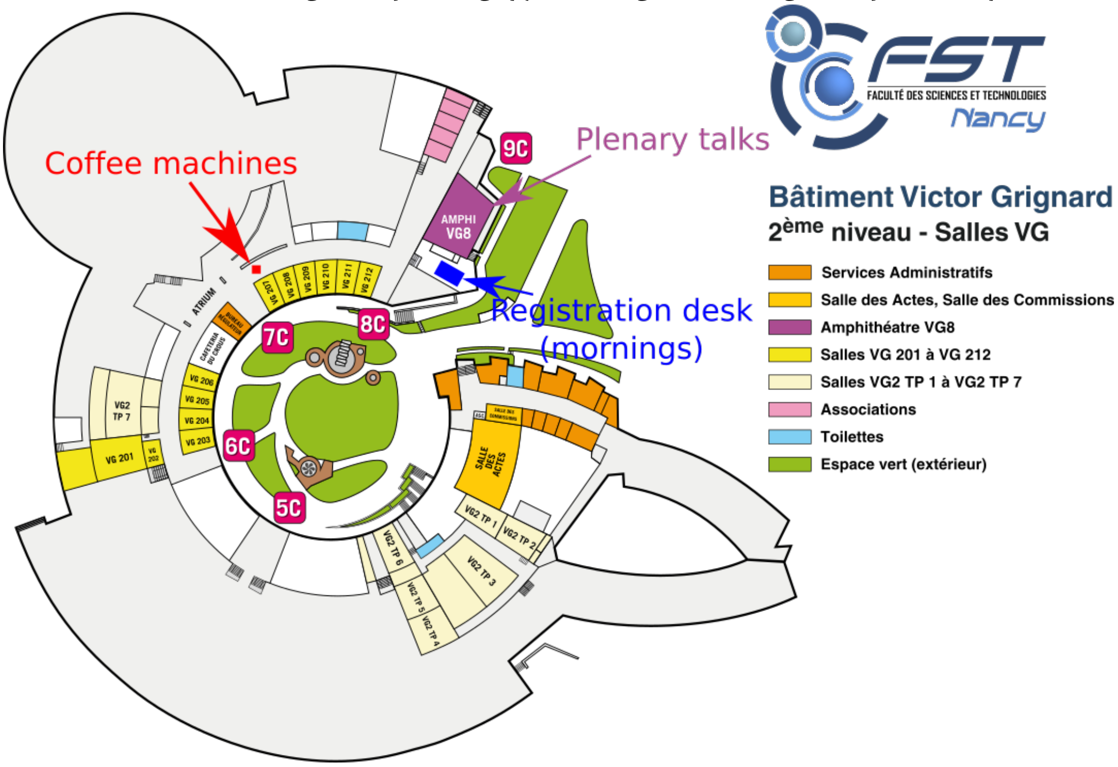
Activités / Social events

- A welcome cocktail (free of charge) will take place on Monday, July 3rd at 19h00 in the Hôtel de Ville de Nancy, located at “Place Stanislas” in Nancy.
- The conference banquet (for attendees who have registered) will take place on Thursday, 6th at 19h00 in the Brasserie Excelsior, 50 rue Henri Poincaré in Nancy.
- Six different social activities will be organised during the afternoon of Wednesday, July 5th. Details have been provided by email.
  - Visit of the Historical Centre of Nancy;
  - Art Nouveau in the business centre of Nancy;
  - Art Nouveau, Art Déco at Saurupt park in Nancy;
  - Maison de la mirabelle (cherry plum) — distillery in Rozelieures;
  - Visit of the botanical garden Jean-Marie Pelt;
  - Hike in Nancys hills.

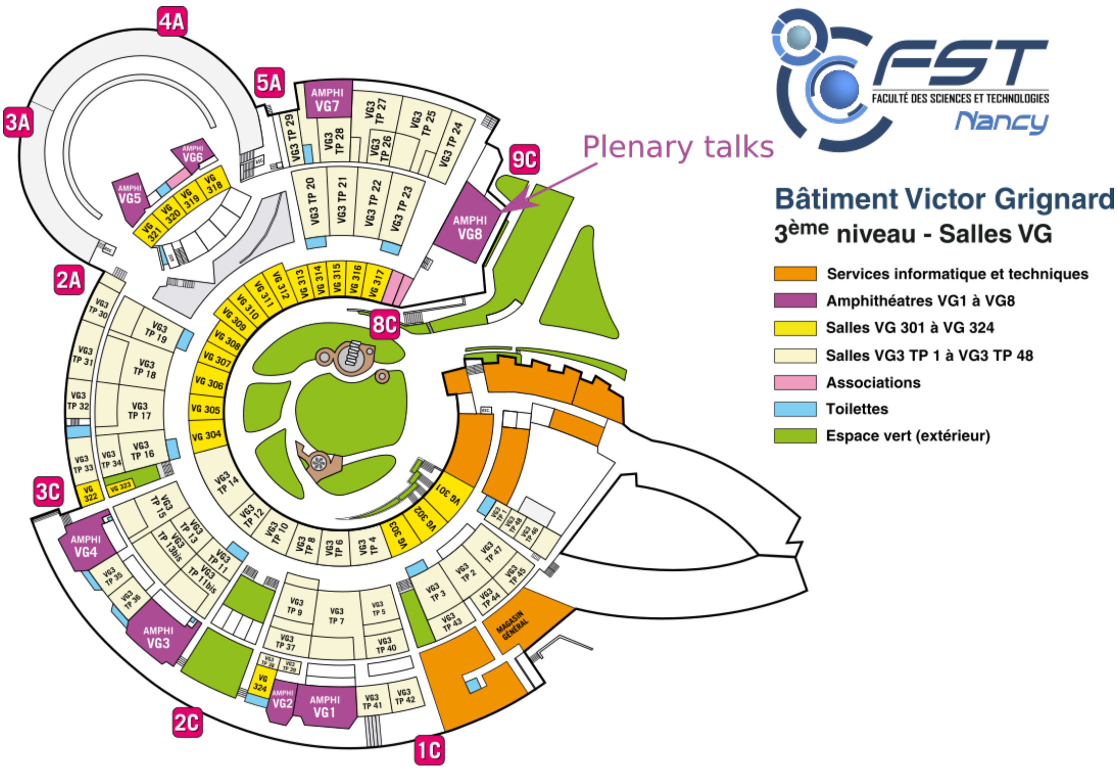
Plan du campus / Campus map



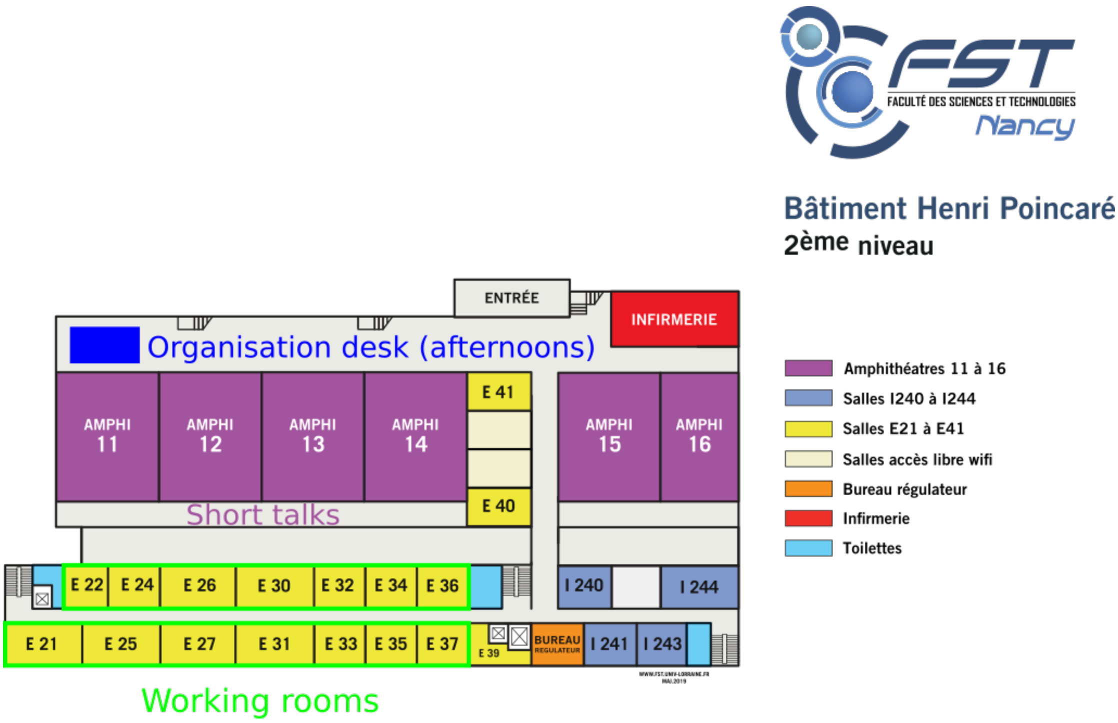
Bâtiment Victor Grignard (2e étage) / *Building Victor Grignard (2nd floor)*



Bâtiment Victor Grignard (3e étage) / *Building Victor Grignard (3rd floor)*



Bâtiment Henri Poincaré (2^{e} étage) / *Building Henri Poincaré (2nd floor)*



Programme général / General schedule

The detailed schedule for the afternoon sessions is to be found at
`https://iecl.univ-lorraine.fr/ad2023/#program`

Lundi 3	Mardi 4	Mercredi 5	Jeudi 6	Vendredi 7
8:40 Opening				
9:00–10:00: Xinwen Zhu *The unipotent categorical local Langlands correspondence*	09:00–10:00: Daniel Litt *Local systems of geometric origin*	9:00–10:00: Hector Pasten *Rational curves, p-adic curves, and sparsity of rational points*	9:00–10:00: Sarah Zerbes *Euler systems and their applications*	9:00–10:00: Vincent Pilloni *Higher Hida theory for the moduli space of abelian varieties*
10:00-10:45 Coffee & Tea	10:00-10:45 Coffee & Tea	10:00-10:45 Coffee & Tea	10:00-10:45 Coffee & Tea	10:00-10:45 Coffee & Tea
10:45–11:45: Simon L. Rydin Myerson *A two dimensional version of the delta method and applications to quadratic forms*	10:00–11:45: Dimitris Koukoulopoulos *The Erdős–Hooley Delta function*	10:00–11:45: Adam Harper *The typical size of character sums*	10:00–11:45: Gal Binyamini *New point-counting results and applications*	10:00–11:45: Yunqing Tang *The arithmetic of power series*
11:45–13:30: Lunch	11:45: Photo 12:00–13:45: Lunch	11:45: Presentation JA2025 11:50–13:30: Lunch	11:45–13:30: Lunch	11:45–13:30: Lunch
13:30–15:20: Short Talks	13:45–15:35: Short Talks	Social Activities	13:30–15:20: Short Talks	13:30–15:20: Short Talks
15:20–16:00: Coffee & Tea	15:35–16:15: Coffee & Tea		15:20–16:00: Coffee & Tea	15:20–16:00: Coffee & Tea
16:00–17:30: Short Talks	16:15–18:15: Short Talks		16:00–17:30: Short Talks	16:00–17:00: Open problem session Chair: M. Waldschmidt
Reception			Banquet	

Charter for the 32nd Journées Arithmétiques

All participants of the 32nd *Journées Arithmétiques* agree to be familiar with this charter:

1. The *Journées Arithmétiques* proudly welcome scientists from all over the world and of all origins at Nancy. This conference promotes international cooperation through intellectual openness and fosters an intercultural approach of solidarity and inclusion. Scientific exchange requires the ability to open up to an international and intercultural dialogue with tolerance and benevolence.

2. The organisers of the *Journées Arithmétiques* are actively committed to prevent all forms of discrimination, whether based on ethnic, national or social origin, physical characteristics, gender, sexual orientation, religion, disability or age, etc. Discriminatory attitudes, harassment, abuse of dominant positions and acts of repression are prohibited in accordance with the Management of our institution. The following behavior is inadmissible:

   - Discriminatory Jokes;
   - Personal insults, especially of a discriminatory nature;
   - Physical threat or aggressive behaviour;
   - Psychological pressure;
   - Unconsented solicitations of emotional or physical intimacy;
   - Undesired physical contact.

   Hierarchies (manifest or presupposed) in the research community can often lead to difficulties in expressing discomfort. If you have doubts about a concrete situation, please find advice here:

   `https://clasches.fr`

   `http://clasches.fr/wp-content/uploads/2022/08/Brochure-Web-english-2022_compressed.pdf`

3. If you have been a victim or a witness of a situation of discrimination or harassment, you can get in touch with the referent of your choice: Cécile Dartyge, Youness Lamzouri, Anne de Roton or Thomas Stoll. In case you can't reach any of these referents, do not hesitate to send a message to cecile.dartyge@univ-lorraine.fr, youness.lamzouri@univ-lorraine.fr, anne.de-roton@univ-lorraine.fr or thomas.stoll@univ-lorraine.fr. You do not need to specify the exact nature of your request. A first appointment will be offered rapidly. Our referents provide attention and assistance to each case and advice on possible next steps.

4. Sexual and moral harassment are offenses under French law. The organisers of the Journées Arithmétiques are committed to respond firmly to inappropriate behavior and to report all cases to their institution, who will decide on possible legal actions / suits. Get more information on this subject:

   `https://www.irif.fr/informations/charte`

   `https://www.cped-egalite.fr/wp-content/uploads/2019/03/VademecumHS-web.pdf`

   `https://www.youtube.com/watch?v=Wzkb5N_h0kY`

Un historique des Journées Arithmétiques

par Jacques Martinet

La fondation. Les Journées Arithmétiques ont eu lieu pour la première fois à Grenoble en 1960[1], à l'initiative de Claude Chabauty, désireux de structurer quelque peu la théorie des nombres française et de la faire connaître dans le milieu des mathématiciens français. À cet effet, il a organisé, avec le soutien de la Société Mathématique de France, cinq exposés pendant l'avant-dernier week-end du mois de mai, et édité et fait distribuer aux participants une brochure polycopiée contenant de courts résumés des conférences. Ces conférences, destinées à vulgariser chacune un thème de théorie des nombres, ont été prononcées par CLAUDE CHABAUTY (*Grenoble*), FRANÇOIS CHÂTELET (*Besançon*), ROGER DESCOMBES (*Paris*) , CHARLES PISOT (*Paris) et* GEORGES POITOU *(Lille). Elles ont été par la suite rédigées et publiées dans L'Enseignement Mathématique, revue suisse dont F. Châtelet était l'un des rédacteurs. En voici les titres :*

C. Chabauty : *Introduction à la géométrie des nombres*

F. Châtelet : *Introduction à l'analyse diophantienne*

R. Descombes : *Problèmes d'approximation diophantiennes*

C. Pisot : *Introduction à la théorie des nombres algébriques*

G. Poitou : *Le théorème de Thue–Siegel–Roth*

Les référence précises sont les suivantes :
8 (1962), 41–53 ; **6** (1960), 3–17 ; **6** (1960), 18–26 ; **8** (1962), 238–251 ; **7** (1961), 281–285.

Par la suite, ces textes, complétés par une *Bibliographie de l'arithmétique* écrite par F. Châtelet, ont été regroupés dans le *numéro 6* des « Monographies de l'Enseignement Mathématique » (numéro épuisé), dont ils occupent les 80 premières pages. [Les pages 81 à 127 sont consacrées à un article de Paul Erdős intitulé *Quelques problèmes de la théorie des nombres.*]

Étant alors étudiant en licence de mathématiques à Grenoble, et déjà pourvu d'un goût prononcé pour l'arithmétique, j'ai écouté les exposés, et, dès la fin de mes études, me suis tourné vers les aspects algébriques de la théorie des nombres, influencé par l'exposé de Châtelet, consacré aux courbes elliptiques, introduites via le théorème de Fermat pour l'exposant 4 en liaison avec la courbe $y^2 = x(x^2+1)$, et par celui de Pisot, montrant la riche extension de l'arithmétique que permet la notion d'entier algébrique. Je ne savais pas à l'époque que l'exposé de Chabauty, montrant sur l'exemple des minima des formes quadratiques réelles à deux variables que la théorie des nombres peut faire bon ménage avec les nombres réels, aurait bien plus tard une influence sur le choix de mes recherches, et je dois dire que j'ai toujours suivi avec intérêt ce qui se passe dans le domaine des approximations diophantiennes, même si les exposés de Descombes et de Poitou ne m'ont pas conduit à effectuer moi-même des recherches dans ce domaine.

Les Journées Arithmétiques étaient loin de ressembler à ce que nous connaissons maintenant, où l'on fait un large tour d'horizon des progrès récents de la théorie des nombres. Il s'agissait plutôt d'une opération de vulgarisation et de propagande, et la salle de conférences de l'ancien Institut Fourier de Grenoble, certes de taille modeste, fut bien garnie, grâce en particulier à la participation de nombreux professeurs de l'enseignement secondaire. De ce point de vue, ces premières Journées furent une réussite.

Il fut aussi décidé par les conférenciers que l'ex-

[1] et non en 1961, comme je l'ai fait écrire par erreur dans les actes des Journées de 1983

périence devrait être répétée. Ce fut fait grâce aux deux autres conférenciers provinciaux, qui organisèrent les deuxièmes et troisièmes Journées Arithmétiques à Lille en 1963 et à Besançon en 1965.

C'est de cette époque lointaine que date la tradition discutable de ne pas organiser les Journées Arithmétiques à Paris.

L'année 1963 marque une évolution radicale de l'université française, sensible dans tous les domaines de la science, et particulièrement en mathématiques : un important recrutement d'assistants eut lieu en France au début des années soixante. Les Journées de Lille furent l'occasion pour Georges Poitou de mettre dans le bain les assistants Lillois avec l'exceptionnel dynamisme qui ne l'abandonna jamais. L'auditoire fut constitué essentiellement de chercheurs professionnels, les exposés restant encore pour l'essentiel le fait de professeurs de la génération précédente.

L'évolution de la structure du corps enseignant des universités a entraîné l'apparition aux Journées de Besançon organisées en 1965 par François Châtelet des premiers exposés rendant compte de travaux originaux de jeunes chercheurs ; Georges Poitou fit en sorte qu'il y eut encore une solide implication des Lillois, en faisant faire par les plus jeunes des exposés sur des articles qu'il avait choisis.

C'est en 1967, avec les Journées Arithmétiques de Grenoble, que la vague de recrutements du début des années 1960 fit pleinement sentir ses effets. Les organisateurs décidèrent de consacrer l'essentiel du temps de parole à l'exposé de thèses fraichement soutenues ou sur le point de l'être. Ces Journées virent aussi pour la première fois la participation de quelques mathématiciens étrangers de passage en France.

L'ouverture. Il fut décidé à Grenoble que les Journées Arithmétiques prochaines seraient organisées à Marseille, au mois de mai de l'année suivante, à l'Université Saint-Charles, au centre de la ville. La situation politique française en décida autrement : la France fut paralysée pendant près d'un mois par les « événements de mai ». Les organisateurs durent *in extremis* annuler les Journées quelques jours avant la date prévue de leur ouverture.

Les collègues marseillais, encore sous le choc, préférèrent laisser passer leur tour. Jean Fresnel saisit alors la balle au bond, et proposa l'organisation à Bordeaux des 5^{es} Journées Arithmétiques à l'automne 1969. Un groupe important d'arithméticiens d'une trentaine d'années venait de s'installer à Bordeaux, en particulier sous l'influence de Pisot, qui y avait été lui même professeur quelques années auparavant. C'était l'occasion de faire connaître notre université, et nous prîmes l'initiative d'inviter plusieurs collègues étrangers, accompagnés s'ils le souhaitaient par l'un de leurs doctorants. L'internationalisation, déjà quelque peu programmée pour l'année précédente, était en marche.

La tradition d'éditer les actes dans une publication officielle fut reprise, et j'en assurai l'édition, grâce au soutien de la S.M.F. qui mit un volume de ses *Mémoires* à notre disposition.

Les Journées Arithmétiques suivantes eurent lieu en 1971, à Marseille comme il se doit. Pour des raisons techniques, l'université de Saint-Jérôme remplaça l'université de Saint-Charles prévue en 1968. Il y eut quelques soubressauts post-1968 au cours d'une séance présidée par Bateman. Celui-ci sut trouver les mots justes à dire aux étudiants, avec la sagesse et le doigté que confèrent l'âge et une longue expérience des campus américains.

Les Journées Arithmétiques suivantes, organisées en 1973, furent les troisièmes Journées grenobloises. Les organisateurs innovèrent, transgressant l'usage de les organiser avant les examens de juin ou au mois de septembre, en les faisant se tenir au mois de février. Les participants eurent la chance de pouvoir découvrir le ski de fond, que les Jeux Olympiques d'hiver avaient fait connaître aux grenoblois cinq ans auparavant. L'idée de 1967, consistant à privilégier les exposés des jeunes au voisinage de la thèse, fut maintenue. De ce fait, les conférenciers de 1967 furent assez souvent remplacés par leurs élèves.

Les Journées retrouvèrent une date canonique, au printemps de 1974, avec leur seconde édition bordelaise, organisée par Pierre Damey. L'exposé par Heini Halberstam mit en lumière les travaux de Chen sur la conjecture de Goldbach ($2n = p_1 + p_2$ ou $p_1 + p_2p_3$), qui, publiés dans une obscure revue chinoise, n'avaient pas connus la diffusion qu'ils méritaient. En même temps que la date canonique, les Journées retrouvèrent l'édition d'un volume d'actes, comme ce fut le cas déjà à Bordeaux en 1969, et encore une fois avec la complicité de la S.M.F., qui mit à la disposition des organisateurs un volume double d'*Astérisque*, une publication créée peu de temps auparavant. Depuis, les actes des Journées ont été systématiquement publiés.

Les Journées Arithmétiques suivantes furent organisées à Caen au printemps de 1976, par un temps plus estival que printanier, sous la responsabilité de Roger Apéry. Deux nouveautés, imposées par le succès croissant de l'institution, et dont l'usage s'est maintenu jusqu'à présent, furent introduites à la suite de discussions tenues à Bordeaux : d'une part, on décida de consacrer les matinées à des conférences d'exposition, permettant de faire le tour d'un sujet; d'autre part, on fractionna les après-midis en plusieurs thèmes faisant l'objet d'exposés plus courts ayant lieu en parallèle. Les Journées Arithmétiques ont depuis fonctionné ainsi. Malgré tout, le temps faisant défaut, on travailla jusqu'au samedi à midi, où deux conférences eurent lieu devant un amphithéâtre comble. Qui oserait de nos jours se risquer à dépasser les cinq jours traditionnels?

Peu avant les Journées, Roland Gillard fut amené à changer le titre initialement prévu de son exposé pour adopter la formulation « $\mu = 0$ », Ferrero et Washington ayant résolu quelques mois auparavant la conjecture célèbre de la théorie d'Iwasawa sur les $\mathbb{Z}_p$-extensions cyclotomiques.

Après Caen, les Journées Arithmétiques eurent lieu une seconde fois à Marseille, en 1978, cette fois à l'université nouvelle de Luminy, sous la responsabilité de Gérard Rauzy. Il y eut un événement pendant ces Journées : la conférence d'Apéry au cours de laquelle fut annoncée la preuve de l'irrationalité de $\zeta(3)$. Certes, les avis étaient partagés à l'issue de l'exposé quant à la fiabilité de la démonstration. L'avenir a prouvé que les idées étaient bonnes, et même exploitables de façon relativement directe.

Les Journées Arithmétiques deviennent européennes. Lors des Journées de Marseille, un « collectif » de collègues anglais fit la proposition, « afin de remercier les arithméticiens français pour leurs nombreuses invitations », de tenir en Angleterre les Journées suivantes. Cette proposition fut acceptée avec enthousiasme, et les Journées Arithmétiques de 1980 furent organisées pendant la période de Pâques dans la charmante ville d'Exeter, au sud de l'Angleterre, dont l'université est bien adaptée à l'accueil de congressistes. À la demande de Poitou, il fut souhaité que les Journées aient lieu néanmoins une fois sur deux dans leur pays d'origine. Cette alternance a été respectée jusqu'à présent.

Le *scoop* fut cette fois l'annonce pendant le congrès de la démonstration par Mazur et Wiles de la « conjecture principale de la théorie d'Iwasawa », ce qui résolvait du même coup la conjecture proposée par Georges Gras lors du dernier exposé des Journées de Caen. Les organisateurs avaient eu la sagesse de laisser un peu de place dans la liste des exposés principaux. Il fut ainsi possible à John Coates de faire deux conférences sur ce résultat.

Malgré le souhait souvent exprimé dans le passé de fixer à deux ans la périodicité de Journées Arithmétiques, les suivantes (pour des raisons techniques) furent organisées par Georges Rhin dès l'année 1981, à Metz, un site privilégié pour l'ouverture vers l'Europe. De fait, les mathématiciens allemands fournirent pour la première fois un grand nombre de congressistes, un fait important pour l'avenir de Journées.

Depuis les Journées de Metz, la périodicité de deux ans a été la règle, et l'alternance nous conduisit en 1983 aux Pays-Bas, où Hendrik Lenstra et Robert Tijdeman organisèrent les Journées Arithmétiques au début de l'été dans le centre de congrès de Noordwijkerhout, à mi-chemin entre leurs universités respectives d'Amsterdam et de Leyde (=Leiden).

L'événement fut cette fois l'annonce faite quelques semaines auparavant de la démonstration, après quelque soixante ans de résistance, de la conjecture de Mordell. Les organisateurs mirent sur pied rapidement une conférence de Gerd Faltings, qui mobilisa l'essentiel des congressistes en une fin d'après-midi.

Le retour en France nous conduisit pour la deuxième fois à Besançon, où Jean Cougnard organisa en 1985 les 14es Journées Arithmétiques, exactement 20 ans après celles de François Châtelet. Tout le monde apprécia leur excellente organisation, au sein d'une ville à taille humaine.

Il fut décidé à Besançon que les Journées Arithmétiques suivantes auraient lieu à Ulm en 1987, ville elle aussi à taille humaine. Je me souviens que quelques sourires accueillirent l'annonce que l'adresse précise serait Eselsberg. Leur organisation par Wirsing, un ancien des Journées, puisqu'il était présent à Bordeaux en 1969, fut un succès.

En 1989, Marseille accueillit les Journées Arithmétiques pour la troisième fois, sur le campus de Luminy comme en 1978. Entre temps, un événement important pour les mathématiciens français avait eu lieu : l'aménagement en centre de congrès (le *C.I.R.M.*) sur le site de Luminy d'une ancienne demeure provençale. Grâce à la ténacité de quelques uns, dont Georges Poitou, décédé peu après ces Journées, auxquelles sa santé ne lui avait pas permis de participer, la communauté mathématique française avait enfin son « Oberwolfach ». Gilles Lachaud, le premier directeur du C.I.R.M., organisa à Luminy, autour du C.I.R.M., ces 16es Journées Arithmétiques. La taille des actes, qui occupent un volume triple d'*Astérisque*, a atteint à cette occasion un maximum.

À Marseille, ce fut la Section de Mathématiques de l'Université de Genève, en les personnes de Daniel Coray et Yves-François Pétermann, qui fut désignée pour organiser l'édition suivante. Vu l'exiguïté des locaux propres de la Section, les conférences eurent lieu à l'Université de Genève, sur les bords de l'Arve, tout près du centre de la ville.

Pour la 18^{e} édition des Journées Arithmétiques, prévue en France, la candidature de Bordeaux, par la taille de son équipe de théorie des nombres, s'imposait, après presque 20 ans d'interruption. J'eus le redoutable honneur d'être chargé de l'organisation pour 1993, tâche dont je m'acquittai avec la collaboration de Francine Delmer.

L'annonce avant les vacances d'été de la démonstration par Wiles de la conjecture de Fermat, sans aucun doute le plus célèbre des problèmes qui aient atteint le grand public, nous obligea à changer nos plans. La présence de Jean-Pierre Serre et l'invitation *in extremis* de Richard Taylor nous permirent de consacrer une matinée à l'exposé d'un schéma de démonstration, dont les zones d'ombre ne furent pas cachées. Comme on le sait maintenant, il restait à cette époque une sérieuse lacune, et je dois dire que Serre nous mit en garde. À l'heure où j'écris ces lignes, cette lacune est comblée, et tout le monde gardera de ces Journées le souvenir de « Fermat » plutôt que celui du temps épouvantable qui avait régné au cours de cette semaine de Septembre.

À Bordeaux, Pilar Bayer s'est proposée pour organiser à Barcelone les 19es Journées Arithmétiques. Cet aperçu historique prend fin avec ce rendez-vous pour juillet 1995 dans la métropole catalane.

Talence, le 1er mai 1995

Rectificatif *(le 23 octobre 1998.)* J'aimerais corriger deux points du texte ci-dessus :

- J'ai oublié (remarque de J. Cougnard) de mentionner les actes des Journées de 1973. L'oubli est réparé page suivante, où j'ai de façon plus générale mis à jour la bibliographie.
- Il faut ajouter le nom de Michel Mendès France à celui de Jean Fresnel comme organisateurs des Journées Arithmétiques de Bordeaux de 1969.

Après 1993. La périodicité de deux ans, avec alternance France–Europe, se maintient depuis les Journées de Metz de 1981.

Les Journées de 1995 ont eu lieu comme prévu au mois de juillet à Barcelone sous la responsabilité de Pilar Bayer. Elles ont été suivies par celles de Limoges organisées par Jean-Pierre Borel en 1997, au mois de septembre ; les journées suivantes ont toutes été organisées en début d'été : en 1999, à Rome, par René Schoof ; en 2001, à Lille, par un collectif Lillois (Pierre Dèbes, Michel Emsalem,...) ; en 2003, à Graz (Autriche), par Franz Halter-Koch and Robert Tichy ; en 2005, à Marseille, par Pierre Liardet ; en 2007, à Édimbourg par Chris Smyth ; celles de 2009 ont eu lieu à Saint-Étienne du 6 au 10 juillet ; celles de 2011 à Vilnius (Lituanie), du

27 juin au 1er juillet ; celles de 2013 à Grenoble, du 1er au 5 juillet ; celles de 2015 à Debrecen, 6 au 10 juillet ; celles de 2017 à Caen, du 3 au 7 juillet ; celles de 2019 à Istamboul, du 1er au 5 juillet.

Les prochaines Journées Arithmétiques (les 32es) seront organisées à Nancy du 3 au 7 juillet 2023, après une interruption due à la pandémie de CCOVID-19.

Publications. Les actes de certaines Journées ont fait l'objet d'une publication « officielle ». Les références (qui ne tiennent pas compte de divers recueils de textes polycopiés à l'initiative des universités organisatrices) figurent page suivante avec la liste complète de toutes les Journées Arithmétiques. Depuis 1997, les actes au sens traditionnel ont été remplacés par l'édition d'un numéro spécial du *Journal de Théorie des Nombres de Bordeaux*, les textes étant expertisés selon les règles usuelles de fonctionnement du journal. (Autrement dit, ce ne sont pas simplement des actes, mais des articles expertisés avec intervention d'un *referee*.) À la date du 30 août 2022, la dernière publication de ce type est celle des Journées de 2015.

…/…

Liste des Journées Arithmétiques. Les revues qui ont accueilli des publications sont :

Ast	Astérisque, publication de la Société Mathématique de France.
BSMF	Bulletin de la Société Mathématique de France (Mémoires).
CM	Collectanea Mathematica (Universitat de Barcelona).
JTNB	Journal de Théorie des Nombres de Bordeaux.
LMS	London Mathematical Society, Lecture Notes Series.
MoEM	Monographies de l'Enseignement Mathématique.
SLN	Springer Lecture Notes in Mathematics (Springer-Verlag).

1960	Grenoble	MoEM	*n*° 6 (1962), 1–80
1963	Lille		
1965	Besançon		
1967	Grenoble		
1969	Bordeaux	BSMF	Mém. *n*° 25 (1971), 188 pp.
1971	Marseille		
1973	Grenoble	BSMF	Mém. *n*° 37 (1974), 192 pp.
1974	Bordeaux	Ast	*n*° 24–25 (1975), 336 pp.
1976	Caen	Ast	*n*° 41–42 (1977), 282 pp.
1978	Luminy (Marseille)	Ast	*n*° 61 (1978), 249 pp.
1980	Exeter	LMS	*n*° 56 (1982), 392 pp.
1981	Metz	Ast	*n*° 94 (1982), 196 pp.
1983	Noordwijkerhout	SLN	*n*° 1068 (1984), 296 pp.
1985	Besançon	Ast	*n*° 147–148 (1987), 346 pp.
1987	Ulm	SLN	*n*° 1380 (1989), 266 pp.
1989	Luminy (Marseille)	Ast	*n*° 198–199–200 (1991), 403 pp.
1991	Genève	Ast	*n*° 209 (1992), 319 pp.
1993	Bordeaux		
1995	Barcelone	CM	*n*° 48 (1997), 234 pp.
1997	Limoges	JTNB	*n*° 11, 1 (1999), 268 pp.
1999	Rome	JTNB	*n*° 13,1 (2001), 337 pp.
2001	Lille	JTNB	*n*° 15, 1 (2003), 410 pp.
2003	Graz	JTNB	*n*° 17, 1 (2005), 435 pp.
2005	Marseille	JTNB	*n*° 19, 1 (2007), 322 pp.
2007	Édimbourg	JTNB	*n*° 21, 1 & 2 (2009), 502 pp.
2009	Saint-Étienne	JTNB	*n*° 23, 1 (2011), 308 pp.
2011	Vilnius	JTNB	*n*° 25, 2 (2013) (avec les « journées » espagnoles).
2013	Grenoble	JTNB	*n*° 27, 3 (2015)
2015	Debrecen		
2017	Caen		
2019	Istamboul		
2023	Nancy		

Résumé des exposés / Abstracts

Exposés pléniers / Plenary talks

1 *New point-counting results and applications*

Binyamini, Gal (Weizmann Institute of Science, Israël)

In 2006 Pila and Wilkie proved an asymptotic bound for the number of rational points in sets definable in o-minimal structures as a function of height. This theorem has led to many developments around functional transcendence and unlikely intersection problems such as the Andre-Oort conjecture. It has been conjectured by Wilkie that the Pila-Wilkie bound can be significantly improved, from sub-polynomial to polylogarithmic, in the o-minimal structure $\mathbb{R}_{\exp}$. I will discuss a new class of o-minimal structures called "sharply o-minimal structures", and our recent proof (with Novikov and Zack) of Wilkie's conjecture using this framework. I'll also discuss some partial results toward the conjecture that period maps of algebraic families live in a sharply o-minimal structure. Finally Ill explain the role that these results play in the recent resolution of the Andre-Oort conjecture.

2 *The typical size of character sums*

Harper, Adam (University of Warwick, United Kingdom)

Sums of Dirichlet characters $\sum_{n\leq x}\chi(n)$ (where χ is a character modulo some prime r, say) are one of the best studied objects in analytic number theory. Their size is the subject of numerous results and conjectures, such as the Pólya–Vinogradov inequality and the Burgess bound. More generally, one can consider sums $\sum_{n\leq x}h(n)\chi(n)$ where $h(n)$ is an interesting twist function, such as the Möbius function. One way to get information about this is to study the power moments $\frac{1}{r-1}\sum_{\chi \bmod r}|\sum_{n\leq x}h(n)\chi(n)|^{2q}$, which turns out to be quite a subtle question that connects with issues in probability and physics. In this talk I will describe an upper bound for these moments when $0\leq q\leq 1$. I will focus mainly on the number theoretic issues arising, and also describe some possible applications of such estimates.

3 *The Erdős–Hooley Delta function*

Koukoulopoulos, Dimitris (Université de Montréal, Canada)

The Erdős–Hooley Delta function is defined for $n\in\mathbb{N}$ as $\Delta(n)=\sup_{u\in\mathbb{R}}\#\{d|n: e^u<d\leq e^{u+1}\}$. In a seminal 1979 paper, Hooley proved that estimates of its partial sums can be exploited to count solutions to certain Diophantine equations. On the other hand, the Delta function is directly related to the distribution of divisors of integers. For these reasons, it has been studied extensively, with most of the work focusing on estimating its mean value and its "typical" value. I will present a historical account of work on these two questions, including some relatively recent developments (joint with Kevin Ford and Ben Green, and with Terence Tao).

4 *Local systems of geometric origin*

Litt, Daniel (University of Toronto, Canada)

I will discuss “non-abelian” analogues of the Hodge and Tate conjectures, due to Simpson, Gieseker, Fontaine-Mazur, and others, as well as some evidence for these conjectures obtained in joint work with Aaron Landesman and Yeuk Hay Joshua Lam. These conjectures are an attempt to characterize the local systems on an algebraic variety which “come from algebraic geometry” — I will explain some examples where one can explicitly write down all such local systems.

5 *Rational curves, p-adic curves, and sparsity of rational points*

Pasten, Hector (Pontificia Universidad Católica de Chile, Chili)

Let X be a variety over a number field k. Given an open set U in X, the rational points of U are said to be sparse if their number up to a bounded height grows slowly in a precise sense. We ask for a characterization of the largest open set U in X such that for every finite extension L of k, the L-rational points of U are sparse. Such a characterization will be (conjecturally) proposed using rational curves and using p-adic analytic maps, and we will discuss the relationship between these notions. We will also provide concrete examples where these conjectures can be proved. This is joint work with Natalia Garcia-Fritz.

6 *Higher Hida theory for the moduli space of abelian varieties*

Pilloni, Vincent (Université Paris-Saclay, France)

In the 70’s, Kempf used local cohomology and the Grothendieck-Cousin complex ăto understand the cohomology of flag varieties. We are able to use similar techniques to describe ăthe ordinary part of the cohomology of the moduli space of abelian varieties. We will try to present some of the ideas as well as some arithmetic applications.

7 *A two dimensional version of the delta method and applications to quadratic forms*

Rydin Myerson, Simon Leo (Warwick University, Royaume-Uni)

We develop a two dimensional version of the delta symbol method (Heath-Brown circle method) and apply it to establish a quantitative Hasse principle for a smooth pair of quadrics defined over $\mathbb{Q}$ in least 10 variables. This improves on work of Munshi which applies a modified one-dimensional delta method twice, and provokes the question: what is the delta-method, really? This is joint work with Pankaj Vishe (Durham) and Junxian Li (Bonn).

8 *The arithmetic of power series*

Tang, Yunqing (University of California Berkeley, USA)

In this talk, we will discuss various irrationality and linear independence problems including the irrationality of 2-adic zeta value at 5. The proofs use an arithmetic holonomicity theorem for power series with rational coefficients, the special case of which was used in the proof of the unbounded denominators conjecture in joint work with Calegari and Dimitrov; arithmetic holonomicity theorems have also been studied in recent work of Bost and Charles. This is joint work in progress with Frank Calegari and Vesselin Dimitrov.

9 *Euler systems and their applications*

Zerbes, Sarah (ETH Zürich, Switzerland)

Euler systems are one of the most powerful tools for proving cases of the BlochKato conjecture, and other related problems such as the Birch and Swinnerton-Dyer conjecture.
I will recall a series of recent works (joint with Loeffler et al.) giving rise to Euler systems in the cohomology of certain Shimura varieties, and explicit reciprocity laws relating the Euler systems to values of L-functions of automorphic forms. I will then discuss some arithmetic applications of these results, e.g. to the BirchSwinnerton-Dyer conjecture for modular abelian surfaces over $\mathbf{Q}$, and to the Iwasawa Main conjecture for the symmetric square of a rational elliptic curve.

10 *The unipotent categorical local Langlands correspondence*

Zhu, Xinwen (Stanford University, USA)

I will discuss a conjectural categorical form of the (arithmetic) local Langlands correspondence for p-adic groups and establish the unipotent part of such correspondence (for characteristic zero coefficient field). Joint work with Tamir Hemo.

Exposés courts / Short talks

1 *Examples of abelian varieties satisfying the standard conjecture of Hodge type*

Agugliaro, Thomas (Université de Strasbourg)

The standard conjecture of Hodge type is a conjecture about algebraic cycles in varieties of characteristic p. It predicts the sign of the *intersection number* of some algebraic cycles. Grothendieck formulated this conjecture in an article in 1969, with the goal of using it to prove Weil conjecture. However, Deligne's proof of Weil conjecture did not provide a proof of the standard conjecture of Hodge type. In this talk, I will explain how to use Ancona's general result in *Standard conjectures for abelian fourfolds* (2021) and Honda-Tate theory to find new examples of abelian varieties that satisfy the standard conjecture of Hodge type.

THEOREM. *For each even integer g, there exist infinitely many simple abelian varieties $A/\overline{\mathbb{F}}_p$ of dimension g that satisfy the standard conjecture of Hodge type and which are not neat.*

The standard conjecture of Hodge type is known for all neat abelian varieties. So the condition *not neat* in the above theorem is here to provide *new* examples.
The condition that g is *even* in the theorem can be removed if we allow for non simple abelian varieties.

2 *A quantitative Koukoulopoulos-Maynard theorem in Diophantine approximation*

Aistleitner, Christoph (TU Graz)

The Duffin-Schaeffer conjecture had been a central open problem in the metric theory of Diophantine approximation for almost 80 years, before finally being settled by Koukoulopoulos and Maynard in 2019. In this talk we present a quantitative version of the Koukoulopoulos-Maynard theorem, which provides an estimate for the typical order of the number of solutions of the Diophantine approximation problem. The proof relies on sieve theory and multiplicative number theory. Joint work with Bence Borda and Manuel Hauke.

3 *On bicomplex bivariate r-Fibonacci polynomials*

Ait-Amrane, N.Rosa (Yahia Fares University of Medea)

In this work [1], we introduce a new perspective on bicomplex numbers. We define the bicomplex r-Fibonacci polynomials as bicomplex numbers with r-Fibonacci polynomials as components, and the bicomplex r-Lucas polynomials are defined as bicomplex numbers with r-Lucas polynomials as components. We also aim to obtain some basic properties of these bicomplex numbers. It is an old and intresting purpuse to obtain a natural extension of complex numbers and many mathematicians have studied this by defining multicomplex numbers. Quaternions which have been described by S.W. Hamilton [2], and bicomplex numbers which have been described by C. Segre [3], are two exemples of these extensions. There are some difference between these two extensions. Namely quaternions are noncommutative algebra, while bicomplex numbers are commutative algebra. The set of bicomplex numbers is defined as

$$\mathbb{K} = \left\{a + bi + cj + dij, \qquad a, b, c, d \in \mathbb{R}\right\}, \tag{1}$$

where $i^2 = j^2 = -1, ij = ji, (ij)^2 = 1$.

Several properties are given and will be presented.

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4 On algebraic structures of linear recurrent sequences

Alecci, Gessica (Politecnicno di Torino)

Several operations can be defined on the set of linear recurrent sequences, such as the binomial convolution or the multinomial convolution (also known respectively as the Hurwitz product and as the Newton product). We demonstrate, using elementary techniques, that when equipped with the termwise sum and the aforementioned products, this set forms an $R-$algebra, for any commutative ring R with identity. Additionally, we explicitly provide the characteristic polynomial of both the Hurwitz and the Newton product of any two linear recurrent sequences. Finally, we explore whether these $R-$algebras are isomorphic, while also considering the $R-$algebras obtained using the Hadamard product and the convolution product. We conclude with a brief overview about linear divisibility sequences and a conjecture due to J. Silverman about a particular divisibility sequence arising from algebraic integers.

5 Local-global divisibility on algebraic tori

Alessandrì, Jessica (Università degli Studi dell'Aquila)

The following *local-global divisibility problem* was introduced by R. Dvornicich and U. Zannier in 2001.

Problem 1 (Dvornicich-Zannier, [1])**.** Let k be a number field and $\mathcal{G}$ be a commutative algebraic group. Let q be a fixed positive integer. Assume that a point $P \in \mathcal{G}(k)$ has the following property: for all but finitely many places v of k there exists $D_v \in \mathcal{G}(k_v)$, where k_v is the completion of k at v, such that $P = qD_v$. Can we conclude that there exists $D \in \mathcal{G}(k)$ such that $P = qD$?

In our work we give a complete answer to this problem in algebraic tori for every power of odd primes. Our result is a generalization to any algebraic torus of the Grunwald-Wang Theorem, which provides an answer to Problem 1 in the split case.
The study of the local-global divisibility problem on algebraic tori was started by Dvornicich and Zannier in the same paper [1], who proved that the local-global divisibility for $q = p$ a prime number holds for tori of dimension $r \leq \max(3, 2(p-1))$. Later Illengo in [2] improved the bound on the dimension to $r < 3(p-1)$ and also proved that this bound is sharp.
We prove that the local-global divisibility by any power p^n of an odd prime p holds for algebraic tori over k of dimension $r < p-1$. We also show that this bound on the dimension is best possible, by providing counterexamples in finite extensions of $\mathbb{Q}$ for every $r \geq p-1$. Finally, we prove that under certain hypotheses on the number field generated by the coordinates of the p^n–torsion points of T, the local-global divisibility still holds for tori of dimension less than $3(p-1)$.

This is a joint work with Rocco Chirivì and Laura Paladino.

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6 Unimodal sequences, Hecke-type double sums and false theta series

Allen, Kevin (University College Dublin)

The study of strongly unimodal sequences has recently attracted considerable interest with connections to knot theory and (mixed) mock modularity. In this talk, we discuss a two-parameter generalization of a Hecke-Appell type expansion for the generating function of unimodal sequences and its connection to Hecke-type double sums and false theta series. This is joint work in progress with Robert Osburn (UCD).

7 Quelques résultats concernant l'équation diophantienne exponentielle $(a^n-1)(b^n-1)=x^2$

Ameur, Zahra (Département d'Algèbre et de Théorie des Nombres, Université des Sciences et de la Technologie Houari Boumediene)

Depuis 2000, plusieurs études ont porté sur l'équation diophantienne exponentielle

$$\left(a^n-1\right)\left(b^n-1\right)=x^2 \tag{2}$$

Le premier à s'intéresser à cette dernière est **Szalay** [6], il a prouvé que l'équation (2) n'a pas de solutions en entiers strictement positifs n et x, pour $(a,b)=(2,3)$. Grâce à ce résultat, d'autres auteurs ont pu obtenir plusieurs résultats concernant la non-résolubilité de l'équation (2), sous différentes hypothèses sur a et b. Nous pouvons citer **Hajdu**[2], **Le** [4], **Lan** [3], **Noubissie** et **Togbé**[5]. Récemment avec **Garici** et **Boumahdi** [1], nous avons obtenu le résultat suivant :

THÉORÈME. *Si a est pair,* $b\equiv 3 \pmod 4$ *et b possède un facteur premier* $p\equiv \pm 3 \pmod 8$, *alors l'équation* (2) *n'a pas de solutions en entiers strictement positifs n et x.*

Ce résultat suivi de deux autres corollaires liés à l'indicatrice d'Euler et à la fonction somme des diviseurs sont les principaux points de ma présentation.

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8 *Some consequences of the Chebotarev-Sato-Tate distribution on Abelian surfaces*

Amri, Mohammed Amin (AGA Laboratory, Higher School of Education and Training, Ibn Tofail University, Kenitra, Morocco)

We shall discuss the matter of the independence of arithmetic distribution of Frobenius traces at finite and jnfinite places on Abelian surfaces from [1], throughout, we explore some consequences of this independence on the Lang-Trotter conjecture [2].

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9 3*-Principalization over* S_3*-fields*

Aouissi, Siham (Moulay Ismail University (UMI) of Meknes - Morocco, Ecole Normale Supérieure (ENS), Department of Sciences, Algebraic Theory and Applications Research Team (ATA-FSM))

Let $p \equiv 1 \pmod 9$ be a prime number and ζ_3 be a primitive cube root of unity. Then $k=\mathbb{Q}(\sqrt[3]{p},\zeta_3)$ is a pure metacyclic field with group $\mathrm{Gal}(k/\mathbb{Q}) \simeq S_3$. In the case that k possesses a 3-class group $C_{k,3}$ of type $(9,3)$, the capitulation of 3-ideal classes of k in its unramified cyclic cubic extensions is determined, and conclusions concerning the maximal unramified pro-3-extension $k_3^{(\infty)}$, that is the 3-class field tower of k, are drawn.

10 *New bounds for sets with restricted differences*

Arala, Nuno (University of Warwick)

We prove a new upper bound for the size of a set $A \subseteq \{1,\ldots,N\}$ which does not contain two different elements a,b for which $a-b \in h(\mathbb{N})$, where $h \in \mathbb{Z}[x]$ is a fixed polynomial. This answers a question of Bloom and Maynard.

11 *Effective norm-form equations and an application to approximation by algebraic numbers*

Bajpai, Prajeet (University of British Columbia)

While effective resolution of Thue equations has been well-understood since the work of Baker in the 1960s, the effective resolution of a general norm-form equation in more than two variables remains an open problem. We will discuss some methods that apply to norm-forms arising from totally complex fields; in particular we completely settle the case of norm-form equations over totally complex Galois sextic fields. A strengthening of these results (proven in joint work with Yann Bugeaud) also gives rise to the first effective improvements on the Liouville inequality for the question of approximating complex algebraic numbers by quadratic, cubic and quartic irrationals.

12 *Diophantine approximation and the weighted products of partial quotients in continued fractions*

Bakhtawar, Ayreena (Scuola Normale Superiore di Pisa)

Dirichlet's theorem (1842) is a fundamental result in Diophantine approximation that gives an optimal approximation rate of any irrational number. Recently, it has been shown that improvements to Dirichlet's theorem are concerned with the growth of the product of consecutive partial quotients in continued fractions. In this talk, I will describe metrical results for the sets associated with the product of an arbitrary block of consecutive partial quotients raised to different powers. This is a joint work with Mumtaz Hussain, Dmitry Kleinbock and Bao-Wei Wang.

13 *Avoiding problems*

Ballini, Francesco (University of Oxford)

In 2020 Masser and Zannier proved that "most" abelian varieties over the algebraic numbers are not isogenous to any jacobian; here "most" refers to an ordering by some height function. We discuss some analogous problems in powers of the modular curve $Y(1)$, for instance: given a curve $C \subseteq Y(1)^2$, how can we find a rational point $(p,q) \in Y(1)^2$ which is not isogenous to any point $(x,y) \in C$ (meaning that p and x - resp. q and y - represent isogenous elliptic curves)?

14 *Cycle identities in the affine grassmannian and applications to Breuil–Mézard for crystalline representations*

Bartlett, Robin (University of Münster)

The Breuil–Mézard conjecture is a combinatorial shadow of the currently hypothetical p-adic Langlands correspondence. It describes the geometry, at the level of cycles, of special fibres of moduli spaces of n-dimensional potentially crystalline in terms of the mod p representation theory of GL_n.

In this talk I will give an overview of results from my recent paper (arXiv:2305.06455) which establish new results towards this conjecture, as well as generalisations in which GL_n is replaced by a split reductive group G. This is done by relating the geometry of moduli of crystalline representations with sufficiently small Hodge–Tate weights to certain degenerations of products of flag varieties in the affine grassmannian for G, and then describing these degenerations in terms of the representation theory of the dual group $\widehat{G}$.

15 *The p-adic analogue of Roman factorial*

Belhadef, Rafik (University of Jijel)

The definition of the p-adic factorial of a positive integer was considered by Alain Robert in [2] such as "restricted factorial", by $0!_p = 1$ and for $n > 0$

$$n!_p = \prod_{\substack{j=1 \\ (p,j)=1}}^{n} j.$$

In the present paper, we firstly demonstrate some properties of p-adic factorial, such as: For $p \geq 3$ and $s \geq 1$, then

$$\frac{(n+p^s)!_p}{n!_p} \equiv -1 \left(mod\ p^s\right).$$

Secondly, inspired by the works of Roman [3], Loeb and Rota [1], we will establish a p-adic analogue of the Roman factorial, so-called "p-adic generalized factorial", otherwise "p-adic Roman factorial". We give a definition of this new concept for $n \in \mathbb{Z}$, as

$$\lfloor n \rceil !_p = \begin{cases} n!_p & \text{for} \quad n \geq 0, \\ \dfrac{(-1)^{-n-1}}{(-n-1)!_p} & \text{for} \quad n < 0. \end{cases}$$

Next, we demonstrate some combinatorial properties of this factorial, using the p-adic gamma function: If $p \geq 3$ and $s \geq 1$, we have

$$\begin{cases} \dfrac{\lfloor n+p^s \rceil !_p}{\lfloor n \rceil !_p} \equiv -1 \left(mod\ p^s\right) & \text{if} \quad n \geq 0, \\ \dfrac{\lfloor n \rceil !_p}{\lfloor n-p^s \rceil !_p} \equiv -1 \left(mod\ p^s\right) & \text{if} \quad n < 0. \end{cases}$$

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16 *Algebraic independence measure of some continued fractions*

Belhroukia, Kacem (Université Ibn Tofail, Kénitra, Morocco)

Abstract not available at the time of printing.

17 *Effective results for Diophantine equations over finitely generated domains*

Bérczes, Attila (University of Debrecen)

In the 1980's Győry developed an effective specialization method for proving effective finiteness results for Diophantine equations with solutions from an integral domain finitely generated over $\mathbb{Z}$ which may contain transcendental elements, too. In 2013 Evertse and Győry extended this method to work for arbitrary finitely generated domains of characteristic 0 over $\mathbb{Z}$. Using this method, Evertse, Győry, Koymans, and Bérczes in several papers established general finiteness theorems over finitely generated domains of characteristic 0 for various types of Diophantine equations. In this talk we present a short survey of the results obtained by the above mentioned specialization method.

18 *Supersingular abelian surfaces and orthogonal polynomials*

Bogo, Gabriele (TU Darmstadt)

I will consider a family of abelian surfaces arising from Teichmüller curves in genus 2 and its reduction modulo a prime p. I will show that the supersingular fibers of the reduced family are related to the zeros of certain orthogonal polynomials, similarly to the case of supersingular elliptic curves studied by Atkin and Kaneko-Zagier. The main tools are the theory of Hilbert modular forms mod p and modular embeddings. This is a joint work with Yingkun Li.

19 *Extreme values of Birkhoff sums and quantum modular forms*

Borda, Bence (Graz University of Technology)

The notion of a quantum modular form was introduced in a seminal paper of Zagier [3] in 2010 to describe the rich arithmetic structure of certain quantum knot invariants coming from algebraic topology. In this talk we demonstrate that quantum modular behavior also emerges in the ergodic theory of circle rotations. In particular, we consider the extreme values as well as exponential moments of the classical Birkhoff sum $\sum_{n=1}^{N}(\{nr\}-1/2)$, $0 \leq N < \mathrm{denom}(r)$ as functions of $r \in \mathbb{Q}$, and establish remarkable transformation properties with respect to the Gauss map that reveals an interesting self-similar structure. Transferring this framework to the irrational setting, as an application we find the limit distribution (after suitable centering and scaling) of $\max_{1\leq N\leq M}\sum_{n=1}^{N} f(n\alpha)$ and $\min_{1\leq N\leq M}\sum_{n=1}^{N} f(n\alpha)$ with $f(x)=\{x\}-1/2$ and a randomly chosen real $\alpha \in [0,1]$. The same limit law holds with f being the indicator of a rational interval extended with period 1. The talk is based on the papers [1, 2].

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20 *Some remarks on polynomials with values which are powers of integers*

Boumahdi, Rachid (National Higher School of Mathematics, Algiers, Algeria)

In 1913, Grosch proved that a polynomial $P(x) \in \mathbb{Z}[x]$ whose integer values are squares is itself the square of another polynomial. In 1959 , In turn, Shapiro proved that if P and Q are two polynomials with integer values of degrees p and q respectively, q divides p and $P(n) = Q(m)$ for an infinity blocks of integers of length $p/q+2$, then $P(x) = Q(R(x))$ for some polynomial R.

In 2018, we proved that the following result : Let $P(x)$ be a polynomial with integer coefficients of degree n and q a divisor of n. We suppose that there are M blocks of integers, with M sufficiently large, each containing $(n/q)+2$ consecutive integers such that for all x in one of these blocks we have $P(x) = y^q$ for some y dependent on x. Then there exist a polynomial $R(x)$ with integer coefficients such that $P(x) = (R(x))^q$.

In this talk we will discuss the previous result and some new questions.

21 *Zero-density estimates for Beurling generalized numbers*

Broucke, Frederik (Ghent University)

We discuss zero-density estimates for Beurling zeta functions $\zeta(s)$ associated to Beurling number systems $(\mathscr{P},\mathscr{N})$, where $\mathscr{P} = (p_1, p_2, \dots)$ is a sequence of Beurling generalized primes, and $\mathscr{N} = (n_0 = 1, n_1, n_2, \dots)$ is the corresponding sequences of generalized integers generated by these primes. Assuming that the integers are "well-behaved", i.e. that their counting function $N(x)$ satisfies $N(x) = Ax+O(x^{\theta})$ for some $A > 0$ and $\theta \in [0,1)$, the zeta function has analytic continuation to the half-plane $\Re s > \theta$.

In this talk, we present our recent result stating that the number of zeros of such zeta functions in rectangles $\alpha \le \Re s \le 1$, $|\Im s| \le T$ is bounded as

$$N(\alpha, T) \ll T^{\frac{c(1-\alpha)}{1-\theta}} \log^9 T,$$

for a constant c arbitrarily close to 4. We also investigate the consequences of the obtained zero-density estimates on the PNT in short intervals. Our proofs crucially rely on an extension of the classical mean-value theorem for Dirichlet polynomials to generalized Dirichlet polynomials. This talk is based on collaborative work with Gregory Debruyne (Ghent University).

22 *Continued fraction expansions of algebraic power series over a finite field*

Bugeaud, Yann (Université de Strasbourg)

Almost nothing is known on the continued fraction expansion of an algebraic real number of degree at least three. The situation is different over the field of power series $\mathbb{F}_p((x^{-1}))$, where p is a prime number. For instance, there are algebraic power series of degree at least three whose sequence of partial quotients have bounded degree. And there are as well algebraic power series of degree at least three which are very well approximable by rational fractions: the analogue of Liouville's theorem is best possible in $\mathbb{F}_p((x^{-1}))$. In a joint work with Han (built on a previous work by Han and Hu), we proved that, for any distinct nonconstant polynomials a, b in $\mathbb{F}_2[x]$, the power series

$$[a; b, b, a, b, a, a, b, \dots] = a + \cfrac{1}{b + \frac{1}{b+\cdots}},$$

whose sequence of partial quotients is given by the Thue–Morse sequence (which is a 2-automatic sequence), is algebraic of degree 4 over $\mathbb{F}_2(x)$. Very recently, this has been extended to several families of 2-automatic sequences in a remarkable paper by Hu. In this talk, we give a complete description of the continued fraction expansion of the algebraic power series $(1+x^{-1})^{j/d}$ in $\mathbb{F}_p((x^{-1}))$, where j,d are coprime integers with $d \geq 3$, $1 \leq j < d/2$, and $\gcd(p, jd) = 1$ (joint work with Guo-Niu Han).

23 *Almost sure upper bound for random multiplicative functions*

Caich, Rachid (Institut de Mathématiques de Jussieu-Paris Rive Gauche)

Let $\varepsilon > 0$. Let f be a Steinhaus or Rademacher random multiplicative function. We prove that we have almost surely, as $x \to +\infty$,

$$\sum_{n \leqslant x} f(n) \ll \sqrt{x}(\log_2 x)^{\frac{1}{4}+\varepsilon}.$$

Thanks to Harper's Lower bound, this gives a sharp upper bound of the largest fluctuation of the quantity $\sum_{n \leqslant x} f(n)$.

24 *An extension of the Euclid-Euler theorem to certain α-perfect numbers*

Cardoso, Gabriel (CIDMA, University of Aveiro)

In a posthumously published work, Euler proved that all even perfect numbers are of the form $2^{p-1}(2^p-1)$, where 2^p-1 is a prime number. In this talk, we extend Euler's method for certain α-perfect numbers for which Euler's result can be generalized. In particular, we use Euler's method to prove that if N is a 3-perfect number divisible by 6; then either $2 \parallel N$ or $3 \parallel N$. As well, we prove that if N is a $\frac{5}{2}$-perfect number divisible by 5, then $2^4 \parallel N$, $5^2 \parallel N$ and $31^2 \mid N$. Finally, for $p \in \{17, 257, 65537\}$, we prove that there are no $\frac{2p}{p-1}$-perfect numbers divisible by p. This is joint work with Paulo J. Almeida.

25 *On differences of perfect powers and prime powers*

Cazorla-García, Pedro José (University of Manchester)

In 2004, Mihăilescu proved that the only consecutive perfect powers are 8 and 9. Despite many attempts to generalise this conjecture to perfect powers with arbitrary difference D, not much more is known today.

Given a squarefree integer $1 \leq C_1 \leq 20$ and a prime $2 \leq q < 25$, we will present a methodology that allows us to resolve the following Diophantine equation

$$C_1 x^2 + q^\alpha = y^n,$$

therefore determining which integers with squarefree part C_1 are the difference of a perfect power and a q−power.

This methodology combines the modular method popularised after the proof of Fermat's Last Theorem with an improved Thue–Mahler solver and new estimates on lower bounds on linear forms in three logarithms.

26 Kummer theory for number fields

Chan, Clifford (Department of Mathematics, University of Luxembourg, Esch-sur-Alzette, Luxembourg)

Kummer theory is a classical theory about radical extensions of fields in the case where suitable roots of unity are present in the base field. Motivated by problems close to Artin's primitive root conjecture, we have investigated the group structure of cyclotomic-Kummer extensions of number fields. We present a paper that is joint work with Bryan Advocaat, Antigona Pajaziti, Flavio Perissinotto, and Antonella Perucca.

27 On arithmetic nature of the Euler's constant

Chatterjee, Tapas (IIT Ropar)

The arithmetic nature of the Euler's constant γ is one of the biggest unsolved problems in number theory from almost three centuries. In an attempt to give a partial answer to the arithmetic nature of γ, Murty and Saradha made a conjecture on linear independence of digamma values. In particular, they conjectured that for any positive integer $q > 1$ and a field K over which the q-th cyclotomic polynomial is irreducible, the digamma values namely $\psi(a/q)$ where $1 \leq a \leq q$ with $(a, q) = 1$ are linearly independent over K. Further, they established a connection between the arithmetic nature of the Euler's constant γ to the above conjecture. In this talk, we first prove that the conjecture is true with at most one exception. Later on we also make some remarks on the linear independence of these digamma values with the arithmetic nature of the Euler's constant γ.

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28 The density hypothesis for the L-functions associated to holomorphic cusp forms and zero-density estimate for the Riemann zeta function

Chen, Bin (Department of Mathematics, Ghent University, Belgium)

We study the range of validity of the density hypothesis for the zeros of the L-functions associated to holomorphic cusp form f and prove that $N_f(\sigma, T) \ll T^{2(1-\sigma)+\varepsilon}$, for $\sigma \geq 51/58$. It improves the previous result of Ivić, replacing $51/58$ by $53/60$. In addition, we study zero-density estimate of the Riemann zeta function and show that $N(\sigma, T) \ll T^{\frac{24(1-\sigma)}{30\sigma-11}+\varepsilon}$ for $279/314 \leq \sigma \leq 17/18$. This improves on Ivić's condition $155/174 \leq \sigma \leq 17/18$. Our results rely on an improvement of the large values estimates for Dirichlet polynomials based on mixed moments estimates for the Riemann zeta function.

29 On singular moduli for higher rank Drinfeld modules

Chen, Chien-Hua (National Center for Theoretical Sciences (NCTS), Taiwan)

As a function field analogue of singular moduli for elliptic curves estimated by Gross-Zagier, we estimate the valuation at certain places of singular moduli for prime rank Drinfeld modules. Our estimation can be viewed as a generalization of rank-2 case proved by Dorman. This talk consists of three parts:

Firstly, we compare the valuation of singular moduli with the number of isomorphisms between "Drinfeld module with CM by the ring of integer of an imaginary extension over $\mathbb{F}_q(T)$" and "a specific prime rank Drinfeld module with CM by a constant extension of the polynomial ring $\mathbb{F}_q[T]$". Due to the difference between the structure of moduli scheme for Drinfeld modules of rank > 2 and that for Drinfeld modules of rank 2 (which is similar to the elliptic curve case), this comparison can only result into an inequality relation.

Secondly, we reduce counting number of isomorphisms into counting number of certain endomorphism on a Drinfeld module whose reduced characteristic polynomial is of certain form. This reduction step makes the counting process more concrete and computable.

Lastly, we compute some examples on singular moduli estimation for rank-3 Drinfeld modules.

30 *Existence of primitive pairs with two prescribed traces over finite fields*

Choudhary, Aakash (Department of Mathematics, IIT Delhi)

Let $\mathbb{F}_p$ represent a field of finite order p, where p is a prime power. The multiplicative group of $\mathbb{F}_p$ is cyclic, and its generator is referred to as a primitive element in $\mathbb{F}_p$. For any rational function $f(x) \in \mathbb{F}_p(x)$ and $\epsilon \in \mathbb{F}_p$, we call the pair $(\epsilon, f(\epsilon))$, a primitive pair if both ϵ and $f(\epsilon)$ are primitive elements in $\mathbb{F}_p$. Let $\mathbb{F}_{p^t}$ be an extension of $\mathbb{F}_p$ of degree t, for $\epsilon \in \mathbb{F}_{p^t}$, the trace of ϵ over $\mathbb{F}_p$ denoted by $Tr_{\mathbb{F}_{p^t}/\mathbb{F}_p}(\epsilon)$, is defined as $Tr_{\mathbb{F}_{p^t}/\mathbb{F}_p}(\epsilon) = \epsilon + \epsilon^p + \epsilon^{p^2} + \cdots + \epsilon^{p^{t-1}}$.

In this talk, for the extension $F = \mathbb{F}_{p^t}$ with $t \geq 7$, and for $f = f_1/f_2$, a rational function in F such that f_1, f_2 are distinct irreducible polynomials with $deg(f_1) + deg(f_2) = n$ in $F[x]$, we will present a sufficient condition on (p, t) which guarantees primitive pairing $(\epsilon, f(\epsilon))$ exists in F such that $Tr_{\mathbb{F}_{p^t}/\mathbb{F}_p}(\epsilon) = a$ and $Tr_{\mathbb{F}_{p^t}/\mathbb{F}_p}(f(\epsilon)) = b$ for any prescribed $a, b \in \mathbb{F}_p$. Further, we demonstrate for any positive integer n, such a pair definitely exists for large t. For $n = 2$, we verified that such a pair exists for all (p, t) except for finitely many values of p. This is a joint work with Prof. R.K. Sharma.

31 *A Galois counting problem for number fields*

Chow, Sam (University of Warwick)

Recently Bhargava counted number fields with prescribed Galois group. We improve the bound in four specific cases.

32 *Exponential sums with applications in PDEs*

Chu, Rena (Duke University)

In 2016 Bourgain applied Gauss sums to construct a counterexample related to a decades-old question in PDEs. The story started in 1980 when Carleson asked about how "smooth" an initial data function must be to imply pointwise convergence for the solution of the linear Schrödinger equation. After progress by many authors, this was resolved by Bourgain, whose counterexample construction proved a necessary condition on the regularity, and Du and Zhang, who proved a sufficient condition. Bourgains methods were number-theoretic, and this raised a natural question: could number-theoretic properties of other exponential sums have implications for other dispersive PDEs? We develop a flexible new method to construct counterexamples for analogues of Carlesons question. In particular, this applies the Weil bound for exponential sums, a consequence of the truth of the Riemann Hypothesis over finite fields.

33 *Bounds for rational points on algebraic curves and dimension growth*

Cluckers, Raf (Univ. Lille, CNRS, KU Leuven)

I will present new work with Binyamini and Novikov on a question by Salberger, about (optimal) bounds for the number of rational points of bounded height on algebraic curves. In more detail, for height up to B on an integral curve of degree d, the upper bound is $d^2 B^{2/d}$ times a poly log B factor. In this bound, the d^2 factor is new and the bound is optimal (apart from the poly log B factor). This leads to corresponding improvements and simplifications to so-called dimension growth results. The dimension growth conjecture was coined by Browning but initially raized as a question by Heath-Brown and Serre, and almost all degrees are known by now, except most importantly the uniformity in degree 3. In work in progress with Dèbes, Hendel, Nguyen and Vermeulen we present a question on curves that would lead to further simplifications, strengthenings, and generalizations of the dimension growth results, in particular in degree 3. In this approach we generalize the affine situation (unconditionally), using a new effective, higher dimensional variant of Hilbert's irreducibility theorem.

34 *The m-step solvable Hom-form of birational anabelian geometry for number fields*

Corato, Alberto (University of Exeter)

In 1980, Uchida proved a **conditional** Hom-form of the Grothendieck birational anabelian conjecture for number fields. In a joint work with M. Saïdi, we prove an m-step solvable **conditional** version of the Grothendieck birational anabelian conjecture for number fields whereby our conditions are slightly weaker than the ones in Uchida's theorem. Furthermore, as in Uchida's work, we show that our result holds unconditionally when the number field relating to the domain of the given homomorphism is $\mathbb{Q}$.

35 *Generalised Jacobians of modular curves and their $\mathbb{Q}$-rational torsion.*

Curcó-Iranzo, Mar (Utrecht university)

The Jacobian $J_0(N)$ of the modular curve $X_0(N)$ has received much attention within arithmetic geometry for its relation with cusp forms and elliptic curves. In particular, the group of $\mathbb{Q}$-rational points on $X_0(N)$ controls the cyclic N-isogenies of elliptic curves. A conjecture of Ogg predicted that, for N prime, the torsion of this group comes all from the cusps. The statement was proved by Mazur and later generalised to arbitrary level N into what we call generalised Oggs conjecture. Consider now the generalised Jacobian $J_0(N)_{\mathbf{m}}$ with respect to a modulus $\mathbf{m}$. This algebraic group also seems to be related to the arithmetic of $X_0(N)$ through the theory of modular forms. In the talk we will present new results that compute the $\mathbb{Q}$-rational torsion of $J_0(N)_{\mathbf{m}}$ for N an odd integer with respect to a cuspidal modulus $\mathbf{m}$. These generalise previous results of Yamazaki, Yang and Wei. In doing so, we will also discuss how our results relate to generalised Oggs conjecture.

36 *Genus two curves with everywhere good reduction over quadratic fields*

Dabrowski Andrzej (University of Szczecin, Poland)

(i) We classify genus 2 curves defined over $\mathbb{Q}$ with at least two rational Weierstrass points and whose absolute discriminant is an odd prime (genus two analogues to Neumann-Setzer families of elliptic curves over the rationals).

(ii) We provide the first infinite sequence of pairs (K, C) where K is a real (complex) quadratic field and C is a genus 2 curve with everywhere good reduction over K. Moreover, we show that the Jacobian of C is an absolutely simple abelian variety. Joint work with Mohammad Sadek.

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37 Multiplicative functions in short intervals

Das, Mithun Kumar (National Institute of Science Education and Research)

In this talk, I will present recent joint work with Pranendu Darbar. We will discuss a general class of multiplicative functions by relating "short averages" to its "long average". More precisely, we estimate the variance of such a class of functions asymptotically in short intervals using Fourier analysis and counting rational points on certain binary forms. Our result is applicable to the interesting multiplicative functions

$$\mu_k(n), \frac{\phi(n)}{n}, \frac{n}{\phi(n)}, \mu^2(n)\frac{\phi(n)}{n}, \sigma_\alpha(n), (-1)^{\#\{p:p^k|n\}}$$

and many others that establish various new results and improvements in short intervals to the literature.

38 On further modular relations for the Rogers-Ramanujan functions

Dasappa, Ranganatha (Central University of Karnataka, Kalaburagi, India)

Abstract not available at the time of printing.

39 Extreme oscillation for Beurling integers

Debruyne, Gregory (Ghent University)

In the context of Beurling generalized numbers we will discuss some recent extremal oscillation results on the (Beurling) integer counting function if the (Beurling) prime counting function is very regular, that is $\pi(x) = \mathrm{Li}(x) + O(x\exp(-c\log^\alpha x))$ for some $c > 0$ and $0 < \alpha \leq 1$. The talk is based on joint research with Frederik Broucke and Jasson Vindas.

40 Quantum j invariant and real multiplication program

Demangos, Luca (Xi'an Jiaotong - Liverpool University)

In my joint work with T. M. Gendron (UNAM, Mexico) we provide a complete solution of Y. Manin's program on the Real Multiplication in the **global function field** context, developing the construction of a **quantum modular invariant** on the moduli space of **quantum tori**. This invariant turns out to be a **multi-valued** function, associating to each point of the moduli space a finite Galois orbit in the *absolute* Hilbert Class Field over the given real quadratic function field K. The norm of these values generates the *relative* Hilbert Class Field over K (the precise analog of the classical Hilbert Class Field in the number field context). We then proceed in constructing a **quantum Drinfeld module** associated to the quantum j, whose torsion points are shown to generate all ray class fields over the relative Hilbert Class Field.

This approach, based on **combining Class Field Theory with Diophantine Approximation** produces therefore encouraging results, which we are now currently working to extend to the number field case by the use of quasi-crystals.

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41 *Coprimalité d'éléments de suites du type Piatetski-Shapiro*

Deshouillers, Jean-Marc (Institut de mathématiques de Bordeaux (Université de Bordeaux, Bordeaux-INP, CNRS)

The study of the coprimality of elements from Piatetski-Shapiro sequences goes back to Lambek and Moser (1955). I shall give a short outline of recent developments obtained jointly with M. Drmota and C. Müllner, with S. Naik and with H. Iwaniec.

42 *Tate cohomology and base change of cuspidal representations of* GL_n

Dhar, Sabyasachi (Indian Institute of Technology, Kanpur)

Let l be a prime number, and let F be a number field. Let $\mathbf{G}$ be a reductive algebraic group over F, and let σ be an automorphism of order l of $\mathbf{G}$. D.Treumann and A.Venkatesh have constructed a functorial lift of a mod-l automorphic form for $\mathbf{G}^\sigma$ to a mod-l automorphic form for $\mathbf{G}$ ([2]). They conjectured that the mod-l local functoriality at ramified places must be realised in Tate cohomology, and they defined the notion of linkage ([2, Section 6.3]). Among many applications of this set up, we focus on mod-l base change lift from $\mathbf{G}^\sigma = \mathrm{GL}_n/F$ to $\mathbf{G} = \mathrm{Res}_{E/F}\mathrm{GL}_n/E$, where E/F is a Galois extension with $[E:F] = l$. Truemann and Venkatesh's conjecture on linkage in Tate cohomology is verified for local base change of depth-zero cuspidal representations of GL_n by N.Ronchetti, and a precise conjecture in the context of base change of l-adic higher depth cuspidal representations was formulated in [1, Conjecture 2].

In this talk, we give an overview of various notions like Tate cohomology, base change of cuspidal representations of GL_n. Then we discuss about the conjecture and the main results.

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43 *Multidimensional Integer Trigonometry*

Dolan, James G. (University of Liverpool)

In this talk I will provide an introduction into multidimensional integer trigonometry as outlined in our recently published paper [1]. We start with an exposition of integer trigonometry in two dimensions, which was introduced in 2008, and use this to generalise these integer trigonometric functions to arbitrary dimension. We then move on to study the basic properties of integer trigonometric functions. We find integer trigonometric relations for transpose and adjacent simplicial cones, and for the cones which generate the same simplices. Additionally, we discuss the relationship between integer trigonometry, the Euclidean algorithm, and continued fractions. Finally, we use adjacent and transpose cones to introduce a notion of best approximations of simplicial cones. In two dimensions, this notion of best approximation coincides with the classical notion of the best approximations of real numbers.

For further reading on integer trigonometry see [2].

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44 *Multiplicative dependence of two integers shifted by a root of unity*

Drungilas, Paulius (Vilnius University)

We prove a result on the multiplicative independence of the numbers $m-\alpha$, $n-\alpha$, where $m>n$ are positive integers and α is a reciprocal algebraic number with the property that $\alpha+1/\alpha$ has at least two real conjugates over $\mathbb{Q}$ lying in the interval $(-\infty, 2]$. As an application, we show that for any positive integers $m>n$ and $k\geq 3$ the numbers $m-\zeta_k$, $n-\zeta_k$, where ζ_k is the primitive kth root of unity, are multiplicatively independent except when $(n,k)=(1,6)$. This settles a conjecture of Madritsch and Ziegler.

45 *Thue equations over $\mathbb{C}(T)$: the complete solution of a simple quartic family*

Faye, Bernadette (Université Alioune Diop de Bambey, UFR SATIC, Département de Mathématiques, Diourbel, Sénégal)

In 1909, Axel Thue considered equations of the form $F(x,y)=m$, where m is a non-zero integer, and $F(x,y)\in\mathbb{Z}[x,y]$ is an irreducible homogeneous *binary form* of degree $n\geq 3$. He managed to prove that such equations (now known as *Thue equations*) have only finitely many integer solutions $(x,y)\in\mathbb{Z}^2$. Thue's result, however, was not *effective*. Baker resolved this in the 1960's, by developing powerful methods to compute lower bounds for linear forms in logarithms. Such tools could then be applied to solve Thue equations effectively.

One direction of investigation then turned towards studying parametrized *families* of Thue equations. E. Thomas, for instance, considered the family of cubic forms

$$F_t^{(3)}(x,y) := x^3-(t-1)x^2y-(t+2)xy^2-y^3 \tag{3}$$

for $t \in \mathbb{Z}_{\geq 0}$. He conjectured that for $t \geq 4$, the Thue equation

$$F_t^{(3)}(x, y) = \pm 1$$

has only the "trivial" solutions $(x, y) \in \{(0, \mp 1), (\pm 1, 0), (\mp 1, \pm 1)\}$. Such a conjecture was eventually proved correct by Mignotte in 1993. More general questions related to such Thue equations over numbers fields were addressed by many authors.

One may also consider Thue equations in the function field setting. More precisely, we consider equations of the form $F(x, y) = m$, for some non-zero $m \in \mathbb{C}[T]$, where

$$F(x, y) = a_0 x^n + a_1 x^{n-1} y + \cdots + a_{n-1} x y^{n-1} + a_n y^n, \qquad a_i \in \mathbb{C}[T], \tag{4}$$

is irreducible, and where we now seek solutions $(x, y) \in \mathbb{C}[T] \times \mathbb{C}[T]$. Families of Thue equations over $\mathbb{C}(T)$ were first discussed by *Fuchs and Ziegler in 2006*.

In this paper we completely solve a simple quartic family of Thue equations over $\mathbb{C}(T)$. Specifically, we apply the ABC-Theorem to find all solutions $(X, Y) \in \mathbb{C}[T] \times \mathbb{C}[T]$ to the set of Thue equations $F_\lambda(X, Y) = \xi$, where $\xi \in \mathbb{C}^\times$ and

$$F_\lambda(X, Y) := X^4 - \lambda X^3 Y - 6X^2 Y^2 + \lambda X Y^3 + Y^4 \qquad \lambda \in \mathbb{C}[T]/\{\mathbb{C}\} \tag{5}$$

denotes a family of quartic simple forms.

This is a joint work with E. Waxman, I. Vukusic and V. Ziegler.

46 *Log-behaviour of quasi-polynomial-like functions*

Gajdzica, Krystian (Jagiellonian University)

By a quasi-polynomial-like function, we mean any function $f(n)$ which grows as fast as a polynomial and takes the form

$$f(n) = t_k(n) n^k + t_{k-1}(n) n^{k-1} + \cdots + t_d(n) n^d + o(n^d),$$

where the coefficients $t_d(n), \ldots, t_k(n) \in \mathbb{R}$ might depend on the residue class of n modulo some positive integer $M \geqslant 2$. For those types of functions, we investigate both the r-log-concavity problem and the higher order Turán inequalities. In particular, we apply the obtained results and deduce the analogous criteria in the case of the restricted partition function $p_{\mathscr{A}}(n, k)$ — that is the number of partitions of n with parts in a given mulitset $\{a_1, a_2, \ldots, a_k\}$ of positive integers.

47 *Geometric progressions of rational points on elliptic curves*

Garcia-Fritz, Natalia (Pontificia Universidad Catolica de Chile)

In 1980, Mohanty conjectured that a non-trivial arithmetic progression of rational points on a Mordell elliptic curve cannot have more than four terms. In earlier joint work with Hector Pasten, we proved that the maximal length of a non-trivial arithmetic progression on an elliptic curve only depends on its rank, hence unconditionally proving Bremners conjecture about arithmetic progressions on elliptic curves. This also proves Mohantys conjecture for several families of elliptic curves. One can study geometric progressions on elliptic curves and try to find a bound of the maximal length of non-trivial geometric progressions, depending on similar data. The case of geometric progressions, however, turns out to be much more delicate from a technical point of view and new ideas are necessary. In this talk I will show how to get a bound of this type for geometric progressions on elliptic curves, as an application of Nevanlinna theory and uniform Mordell-Lang.

48 *Arithmetic nature of q-Euler-Stieltjes constants*

Garg, Sonam (Indian Institute of Technology Ropar)

Kurokawa and Wakayama (2003) introduced a q-analogue of the Euler constant and studied the irrationality of certain numbers that involve q-Euler constant. In this talk, we discuss the extension of their results and the linear independence result for certain numbers involving q-analogue of the Euler constant. Moreover, we obtain the closed-form expression for a q-analogue of the k-th Stieltjes constant, $\gamma_k(q)$. Further, using Nesterenko's result, we discuss a question which Erdős mentioned in 1948 concerning the arithmetic nature of the infinite series $\sum_{n\geq 1} \frac{\sigma_1(n)}{t^n}$, where t is any integer greater than 1. Finally using an answer to Erdős's question, we discuss the arithmetic nature of some infinite series involving $\gamma_1(2)$.

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49 *Second best approximations and the Lagrange spectrum*

Gayfulin, Dmitry (TU Graz)

Given an irrational number α consider its irrationality measure function

$$\psi_\alpha(t) = \min_{1\leq q\leq t, q\in\mathbb{Z}} \|q\alpha\|.$$

The set of all values of

$$\lambda(\alpha) = \left(\limsup_{t\to\infty} t\psi_\alpha(t)\right)^{-1},$$

where α runs through the set $\mathbb{R}\setminus\mathbb{Q}$ is called the Lagrange spectrum $\mathbb{L}$. Denote by $\mathcal{Q} = \{q_1, q_2, \ldots, q_n, \ldots\}$ the set of denominators of the convergents to α. One can consider another irrationality measure function

$$\psi_\alpha^{[2]}(t) = \min_{1\leq q\leq t, q\in\mathbb{Z}, q\notin\mathcal{Q}} \|q\alpha\|$$

connected with the properties of so-called second best approximations. Or, in other words, approximations by rational numbers, whose denominators are not the denominators of the convergents to α. Replacing the function ψ_α in the definition of $\mathbb{L}$ by $\psi_\alpha^{[2]}$, one can get a set $\mathbb{L}_2$ which is called the "second" Lagrange spectrum. In my talk I give the complete structure of discrete part of $\mathbb{L}_2$.

50 *Class numbers, the Ono invariant and some wear primes*

Gica, Alexandru (University of Bucharest)

We will use the standard notation $\omega(n)$ for the number of distinct prime factors of the positive integer n. Our aim is to find all the prime numbers p such that $\omega(p+a^2)\leq 2$ for any odd positive integer a such that $a^2 < p$. We will give a complete list for the prime numbers $p \equiv 1,3,5 \pmod 8$ with the above property. The proof relies upon some classical results concerning the imaginary quadratic fields having the class number $1,2,4$. The case $p \equiv 7 \pmod 8$ is not completely solved. Using a result of S. Louboutin about the Ono invariant of a imaginary quadratic field, we were able to give a list of prime numbers $p \equiv 7 \pmod 8$ with the above property and we were able to prove that there is at most one extra value of p besides our list.

51 *Arithmetic progressions in finite fields*

Göral, Haydar (Department of Mathematics, Izmir Institute of Technology)

In this talk, we focus on how many arithmetic progressions we have in certain subsets of finite fields. For this purpose, we consider squares and cubes in finite fields and we use the results on Gauss and Kummer sums. The technique is based on finite Fourier analysis and certain types of Weil estimates. We obtain the exact formulas for the number of arithmetic progressions in squares when the length is 3, 4 or 5.

52 *On the elliptic Gauss sums*

Goto, Akihiro (Kyushu university)

We denote K imaginary quadratic field $\mathbb{Q}(\sqrt{-1})$ or $\mathbb{Q}(\sqrt{-3})$. The elliptic Gauss sum introduced by Asai is an analogous object to an elliptic curve (with CM by K) of the classical Gauss sum. For example, the classical Gauss sum appears as the value of the Dirichlet L-function at $s=1$, but Asai has shown that the elliptic Gauss sum appears as the value of the Hasse–Weil L-function at $s=1$ for CM elliptic curves.

There is also a congruence formula which is known by Cauchy between the class number of an imaginary quadratic field and the Bernoulli numbers. For an infinite family of elliptic curves $\{E_\lambda/K\}$ with CM by K as an analogue of the congruence, we obtain a congruence between the order of the Tate–Shafarevich group of E_λ/K and the Bernoulli–Hurwitz type number by using the elliptic Gauss sum. Here, λ is degree 1 prime element of K. This requires the assumption that the elliptic Gauss sum does not vanish, i.e., the value of the Hasse–Weil L-function at $s=1$ does not vanish. The Bernoulli–Hurwitz numbers are obtained as expansion coefficients of some elliptic functions.

In addition, we obtained that vanishing the elliptic Gauss sum is equivalent to that a certain Bernoulli–Hurwitz type number is divisible by ℓ which is norm prime of λ. This fact can be proved by viewing the elliptic Gauss sum as an element of a local field and using the theory of Lubin–Tate formal group. Using these conditions, we know that if the Hasse–Weil L-function of a CM elliptic curve at $s=1$ does not vanish, then the order of its Tate–Shafarevich group is not divisible by ℓ. In this presentation, I will summarize these facts.

53 *The exponential density set*

Grekos, Georges (Université de Saint-Étienne)

Work in common and in progress with Rita Giuliano, Università di Pisa.

Given a nonempty subset A of $\mathbb{N}=\{1,2,\ldots\}$, its *upper* and *lower exponential densities*, denoted by $\overline{\varepsilon}A$ and $\underline{\varepsilon}A$, are defined, respectively, as the limit superior and the limit inferior of

$$(\log n)^{-1}\log|A\cap[1,n]|$$

when n tends to infinity. The *density set* of A is the set

$$S(A)=\{(\overline{\varepsilon}B,\underline{\varepsilon}B);B\subseteq A\}.$$

We present some properties of $S(A)$.

For the definition of the exponential density and its generalisations, see for instance [1].

The density set corresponding to the *asymptotic* (or *natural*) density was studied for the first time in [2]. Some extensions (concerning the asymptotic density case) are studied in a series of papers; example [3]. It should be noted that in all these cases, the density set is a convex domain of $\mathbb{R}^2$

In the third and final chapter of [2] some other density concepts are considered and a big part of the chapter is devoted to the exponential density set. In this talk I will quickly summarize these results and, going on, I shall present an example which shows that the exponential density set is not necessarily convex. Nevertheless, it has the property of being a starry set with respect to the origin and some other points [*ensemble étoilé par rapport à l'origine et certains autres points*].

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54 A coupling for prime factors of a random integer

Haddad, Tony (Université de Montréal)

The sizes of large prime factors for a random integer N sampled uniformly in $[1, x]$ are known to converge in distribution to a Poisson-Dirichlet process $\mathbf{V} = (V_1, V_2, \ldots)$ as $x \to \infty$. In 2002, Arratia constructed a coupling of N and $\mathbf{V}$ satisfying $\mathbb{E}\sum_i |\log P_i - (\log x)V_i| = O(\log\log x)$ where $P_1P_2\cdots$ is the unique factorization of N with $P_1 \geq P_2 \geq \cdots$ being all primes or ones. He conjectured that there exists a coupling for which this expectation is $O(1)$.

I will present a modification of his coupling which proves his conjecture, and show that $O(1)$ is optimal. As a corollary, I will provide a probabilistic proof of the arcsine law in the average distribution of divisors proved by Deshouillers, Dress and Tenenbaum in 1979. This is joint work with Dimitris Koukoulopoulos.

55 Some properties on extended Eulerian numbers

Hadj Benelezaar, Imane (Université des sciences et de la technologie Houari-Boumédiène, Algiers, Algeria)

Abstract not available at the time of printing.

56 Polynomials with only rational roots

Hajdu, Lajos (University of Debrecen, Hungary)

In the talk we present various results concerning polynomials in $\mathbb{Z}[x]$ with only rational roots. First we give sharp upper bounds for the degree assuming that the coefficients are bounded. Then we present a theorem saying that if the primes 2 and 3 do not divide any coefficient then the degree is at most 3. Finally, we give a finiteness result in the case where all coefficients are composed of primes from a fixed finite set. The results presented are joint with R. Tijdeman and N. Varga.

57 *The distribution of partial quotients of reduced fractions with fixed denominator*

Hauke, Manuel (Graz University of Technology)

In this talk, we discuss the distribution of the partial quotients of fractions a/N where the denominator N is fixed, and a runs through the set of all integers which are coprime with N. The presented method is rather flexible and allows to compute statistics for various entities of interest. Among other results (such as Gauss-Kuzmin statistics), we recover concentration results for the sum of partial quotients and for Dedekind sums, matching the tail behaviour that is known under an extra averaging over the denominators N. A similar result for the distribution of the maximal partial quotient gives the currently best bound for Zaremba's conjecture for general N. This is joint work with Christoph Aistleitner and Bence Borda (arXiv:2210.14095).

58 *On construction of Salem numbers*

Hichri, Hachem (Université de Monastir, Tunisie)

Mainly, we explain how we can produce subsets $\mathscr{T}_-$, $\mathscr{T}_+$, $\mathscr{T}_{\frac{\pi}{3}}$ of Salem numbers τ with all their other conjugates τ_i of modulus one satisfying respectively $\Re(\tau_i) < 0$, $\Re(\tau_i) > 0$ and $\frac{-1}{2} < \Re(\tau_i) < \frac{1}{2}$. We note that in this case, it follows that $\tau + \frac{1}{\tau}$ is a totally real algebraic integer greater than 2 with all its conjugates respectively in $]-2,0[$, $]0,2[$ and $]-1;1[$. Thus respectively $\tau + \frac{1}{\tau} + 1$, $\tau + \frac{1}{\tau} - 1$ and $\tau + \frac{1}{\tau}$ is a totally real algebraic integer respectively greater than 3, 1, 2 with all its other conjugates in $]-1;1[$, i.e. a totally real Pisot number. Hence from the corresponding characterization of all totally real Pisot numbers of degree 3 and 4, the author obtained a characterization of Salem numbers of degree 6 and 8 belonging to $\mathscr{T}_{\frac{\pi}{3}}$.

First, we show that using totally real Pisot numbers, we can characterize all Salem numbers of degree 6 and 8 such that their Galois conjugates of modulus one have all either positif or negative real parts. Moreover, we provide an easy construction of infinite sequences of such numbers of any degree $2n \geq 10$.

Next, using Tchebychev polynomials, we provide an easy construction of infinite sequences of second kinds of numbers of any degree ≥ 5. As a consequence, we get the necessary and sufficient conditions that make a degree 6 or degree 8 Salem number belong to $\mathscr{T}_{\frac{\pi}{3}}$. Moreover we explain how these results can be used to determine all second kind of degree 6 and degree 8 Salem numbers and to provide infinite sequence of such Salem numbers of any given degree $2n \geq 10$.

59 *On a conjecture of Levesque and Waldschmidt*

Hilgart, Tobias (University of Salzburg, Austria)

One of the first parametrised Thue equations,

$$\left|X^3 - (n-1)X^2Y - (n+2)XY^2 - Y^3\right| = 1,$$

over the integers was solved by E. Thomas in 1990. If we interpret this as a norm-form equation, we can write this as

$$\left|N_{K/\mathbb{Q}}(X - \lambda_0 Y)\right| = |(X - \lambda_0 Y)(X - \lambda_1 Y)(X - \lambda_2 Y)| = 1$$

if $\lambda_0, \lambda_1, \lambda_2$ are the roots of the defining irreducible polynomial, and K the corresponding number field.

Levesque and Waldschmidt twisted this norm-form equation by an exponential parameter s and looked, among other things, at the equation $\left|N_{K/\mathbb{Q}}\left(X - \lambda_0^s Y\right)\right| = 1$. They solved this effectively and conjectured that introducing a second exponential parameter t and looking at $\left|N_{K/\mathbb{Q}}\left(X - \lambda_0^s \lambda_1^t Y\right)\right| = 1$ does not change the effective solvability.

We want to partially confirm this, given that

$$\min(|2s-t|,|2t-s|,|s+t|) > \varepsilon \cdot \max(|s|,|t|),$$

i.e. the two exponents do not almost cancel in specific cases.

60 *Counting reciprocal Littlewood polynomials with square discriminant*

Hokken, David (Utrecht University, Mathematical Institute)

A Littlewood polynomial is a single-variable polynomial all of whose coefficients lie in $\{\pm 1\}$. It is reciprocal if its list of coefficients forms a palindrome. We establish the leading term asymptotics of the probability that a random reciprocal Littlewood polynomial has square discriminant. This relates to a bounded-height analogue of the Van der Waerden conjecture on Galois groups of random polynomials.

61 *Random Diophantine equations in the primes*

Holdridge, Philip (University of Warwick)

Given a homogeneous polynomial equation, one expects that if there is a non-trivial solution in the real numbers and in every p-adic field, then there is a solution in the integers. This is called the Hasse principle, and while it does not always hold, it does hold in many cases. In this talk, we discuss the solubility of certain equations in the primes. We develop a so-called prime Hasse principle and prove that it holds for almost all equations of a certain type, based on some work of Brüdern and Dietmann on the Hasse principle. Time-permitting, we will explain some further results on prime solubility, including some explicit counterexamples to the prime Hasse principle.

62 *A Diophantine property of postcritically finite unicritical polynomials*

Ih, Su-ion (University of Colorado, Boulder, USA)

I will give a definition of postcritically finite maps (or pcf points) in dynamical systems, state an equidistribution property of pcf unicritical polynomials and a finiteness property of integral pcf unicritical polynomials, and include what similar properties to expect in general. This is joint work with R. Benedetto (Amherst College, USA).

63 *Realizable sequences*

Jaidee, Sawian (Khon Kaen University)

First, I shall give a quick overview, for considering sequences of non-negative integers arising from counting points of n period under a map $T\colon X \to X$, where X is a non-empty set, and introducing the dynamical zeta function, which produces such sequences in an appropriate setting. Then, I give a definition of a realizable sequence a_n which actually means that it is a non-negative integer sequence and a_n is also equal to the number of points of n period under some map $T\colon X \to X$, and X is a non-empty set for any natural number n. Constructing some nicely realizable sequences is described after that. Lastly, I will be focusing on the paper entitled "Time-changes preserving zeta function", joint work with Patrick Moss and Tom Ward.

64 *Ranks of quadratic twists of Jacobians of generalized Mordell curves*

Jędrzejak, Tomasz (University of Szczecin)

Consider a two-parameter family of hyperelliptic curves $C_{q,b} : y^2 = x^q - b^q$ defined over $\mathbb{Q}$, and their Jacobians $J_{q,b}$ where q is an odd prime and without loss of generality b is a non-zero squarefree integer. The curve $C_{q,b}$ is a quadratic twist by b of $C_{q,1}$ (a generalized Mordell curve of degree q). First, we obtain a few upper bounds for the ranks e.g., if $q \equiv 1 \pmod 4$ and any prime divisor of $2b$ not equal to q is a primitive root modulo q then rank $J_{q,b}(\mathbb{Q}) \le (q-1)/2$. Then we focus on $q = 5$ and get the best possible bound (by 1) or even the exact value of rank (0). In particular, we found infinitely many b with any number of prime factors such that rank $J_{5,b}(\mathbb{Q}) = 0$. We deduce as conclusions the complete list (or the bounds for the number) of rational points on $C_{5,b}$ in such cases. Finally, we found for any given q infinitely many non-isomorphic curves $C_{q,b}$ such that rank $J_{q,b}(\mathbb{Q}) \ge 1$.

65 *The transcendence and distribution of Euler-Kronecker constants*

Kandhil, Neelam (Max Planck Institute for Mathematics)

The Euler-Kronecker constant of a number field K is the ratio of the constant and the residue of the Laurent series of the Dedekind zeta function $\zeta_K(s)$ at $s = 1$. Ihara gave a conjectural upper bound of the absolute value of the Euler-Kronecker constant of a cyclotomic field. We will talk about some known results in support of this conjecture and introduce our results in an analogous setup. We will also discuss the transcendence of generalized Euler-Kronecker constants.

66 *Solving Fermat type equations over number fields via modular approach*

Kara, Yasemin (Bogazici University)

The asymptotic Fermat conjecture (AFC) states that for a number field K not containing ζ_3, there is a bound B_K depending only on the field K such that for all prime exponents $p > B_K$, the equation $x^p + y^p + z^p = 0$ has only trivial solutions. The strategy which is referred as the “modular method” to solve the Fermat equation, used by Wiles in his famous proof, can be adapted to attack AFC and its several different generalizations. Similar results are quite rare for other Fermat type equations such as $x^p + y^q = z^r$ although the solutions of this equation have been studied over rationals. In this talk, we will mention some recent asymptotic results for the classical Fermat equation as well as some other Fermat type equations over number fields by assuming some standard modularity conjecture. Moreover, we will explain how this bound can be made explicit for some specific number fields.

This talk is based on joint works with Erman Isik and Ekin Ozman.

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67 *Quintic number fields defined by $x^5 + ax + b$*

Kaur, Sumandeep (Panjab university, Chandigarh)

Let $K = \mathbb{Q}(\theta)$ be an algebraic number field with θ a root of an irreducible quintic polynomial of the type $x^5 + ax + b \in \mathbb{Z}[x]$. Let A_K stand for the ring of algebraic integers of K. If ind θ denotes the index of the subgroup $\mathbb{Z}[\theta]$ in A_K and $i(K)$ stand for the index of the field K defined by

$$i(K) = \gcd\{\operatorname{ind} \alpha \mid K = \mathbb{Q}(\alpha),\ \alpha \in A_K\}.$$

A prime number p dividing $i(K)$ is called a prime common index divisor of K. In this talk, for every rational prime p, we provide necessary and sufficient conditions on $a,\ b$ so that p is a common index divisor of K. In particular, we give sufficient conditions on $a,\ b$ for which K is non-monogenic.

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68 *Isogeny classes of typical principally polarized abelian surfaces over $\mathbb{Q}$*

Kieffer, Jean (Harvard University)

Faltings proved that the isogeny class of any abelian variety over a fixed number field is finite. This raises a classification question: what can be said about the possible shapes of these isogeny classes?

In the case of elliptic curves over $\mathbb{Q}$, we have a satisfactory answer. Mazur's isogeny theorem lists all the primes ℓ that can appear as the degree of an isogeny over $\mathbb{Q}$, and Kenku showed that every isogeny class has size at most 8. In fact, the possible isogeny graphs (whose vertices are elliptic curves in an isogeny class, and whose edges are irreducible isogenies labeled by degree) can be completely listed.

For higher-dimensional abelian varieties, much less is known on the theoretical side. Nevertheless, one can hope to gain some insight by carrying out explicit computations of isogeny classes. This talk represents a first step in this direction: I will describe an algorithm to compute isogeny classes in the simplest higher-dimensional case, namely principally polarized abelian surfaces over $\mathbb{Q}$ with endomorphism ring equal to $\mathbb{Z}$. The algorithm is practical, and has been employed to constitute a database of more than 1.5 million isogeny classes. This is joint work with Raymond van Bommel, Shiva Chidambaram and Edgar Costa.

69 *Translations and extensions of the Nicomachus identity*

Kim, Seon-Hong (Sookmyung Women's University)

We search for Nicomachean identities by adding translation parameters, variable parameters, sequence products and adjoining further numbers to sequences. The solutions of definite and indefinite quadratic forms arise in this study of cubic equations obtained from translation parameters. Our search leads to many general Nicomachean-type identities. We also study the geometry of adjoining two numbers to sequences satisfying Nicomachean identity. This is joint work with Kenneth Stolarsky.

70 *Problems and results on additive representation functions associated to linear forms*

Kiss, Sándor (Budapest University of Technology and Economics)

Let $k \geq 2$ and $\lambda_1, \dots, \lambda_k$ be fixed positive integers. For a set A of nonnegative integers, the additive representation function associated to linear forms is

$$R_{A,\underline{\lambda}}(n) = |\{(a_1, \dots, a_k) \in A^k : \lambda_1 a_1 + \dots + \lambda_k a_k = n\}|.$$

In my talk I would like to summarize our recent results about representation functions associated to linear forms. We will extend an earlier result of Nathanson to representation functions associated for linear forms. Furthermore, we will describe all the k-tuples $\underline{\lambda} = (\lambda_1, \dots, \lambda_k)$ and the sets of nonnegative integers A with $R_{A,\underline{\lambda}}(n) = 1$ for every nonnegative integer n. We also have several open problems for further research. This is joint work with Csaba Sándor.

71 *On q-generalized (r,s)-Stirling transforms*

Komatsu, Takao (Zhejiang Sci-Tech University)

By using q-numbers and r-shift, the (q,r)-Stirling numbers with level s are studied. One of the main aims is to give several identities in their transforms, which are analogues of the famous binomial transforms. We also give some applications to the values of a certain kind of q-multiple zeta functions.

72 *Transcendence of infinite products involving binary linear recurrences*

Kurosawa, Takeshi (Tokyo University of Science)

For an algebraic number α, we denote by $\overline{|\alpha|}$ the maximum of the absolute values of its conjugates and by $\mathrm{den}(\alpha)$ the least positive integer such that $\mathrm{den}(\alpha)\,\alpha$ is an algebraic integer, and define $\|\alpha\| = \max\{\overline{|\alpha|}, \mathrm{den}(\alpha)\}$.

Let $\{R_n\}_{n\geq 0}$ be a binary linear recurrence sequence with some conditions. We discuss the transcendence of the infinite product

$$\prod_{k=1}^{\infty}\left(1+\frac{a_k}{R_{r^k}+b_k}\right),$$

where $r \geq 2$ is an integer and a_k and b_k are sequences of algebraic numbers with

$$\log\max(\|a_k\|, \|b_k\|) = o(r^k).$$

We also give new examples of algebraic cases such as

$$\prod_{k=1}^{\infty}\left(1+\frac{2}{\sqrt{5}F_{3^k}-1}\right) = \frac{1+\sqrt{5}}{2},$$

where $\{F_n\}_{n\geq 0}$ is the Fibonacci sequence. This is joint work with Daniel Duverney (Baggio School for Engineering).

73 *Solutions to polynomial congruences with variables restricted to a box*

Kydoniatis, Kostas (Kansas State University)

We prove that for any positive integers k, q, n with $n > N(k)$, integer c, and polynomials $f_i(x)$ of degree k whose leading coefficients are relatively prime to q, there exists a solution $\underline{x}$ to the congruence

$$\sum_{i=1}^{n} f_i(x_i) \equiv c \pmod{q}$$

that lies in a cube of side length at least $\max\{q^{1/k}, k\}$. Moreover, the result is best possible up to the determination of $N(k)$.

74 *A walk on Legendre paths*

Lamzouri, Youness (Université de Lorraine)

In this talk, we shall explore what we call "Legendre paths", which are certain paths that encode information about the values of the Legendre symbol. More precisely, the Legendre path modulo p is defined as the polygonal path in the plane, whose vertices are located at the points $(j, S_p(j))$ for $0 \leq j \leq p-1$, where $S_j(p)$ is the normalised sum of the Legendre symbol $\left(\frac{n}{p}\right)$ where n varies from 0 to j. In particular, we will attempt to answer the following questions as we vary over the primes p: how are these paths distributed? how do their peaks behave? and what proportion of the path is above the x-axis? We will see that some of these questions correspond to important and longstanding problems in analytic number theory, including understanding the size of the least quadratic non-residue, as well as the maximum of character sums in the spirit of the Pólya-Vinogradov inequality. Among our results, we prove that as we average over the primes, the Legendre paths converge in law, in the space of continuous functions, to a certain random Fourier series constructed using Rademacher random multiplicative functions. This last result is a joint work with Ayesha Hussain.

75 *Construction of a normal number in continued fraction and Pisot bases*

Laureti, Renan (Université de Lorraine)

In an integer base b, a normal number is a real number such that every digit blocks of a given length ℓ in its base b expansion appear with the same frequency $\frac{1}{b^\ell}$. For example, Chanpernowne's number $x = 0.12345678910111\ldots$ is known to be normal to base 10. A number is said to be absolutely normal if it is normal to all integer bases, and it is known since their introduction by Borel in 1917 [4] that almost all real number are absolutely normal with respect to Lebesgue's measure. There is however no easy construction of an absolutely normal number, but algorithmic constructions of such numbers exist, such as Turings construction from 1936 [1]. A recent construction is the one of Becher, Heiber and Slaman [2], in which an absolutely normal number is constructed in polynomial time. This construction has been extended to larger sets of bases, Becher and Yuhjtman [3] have constructed a number that is absolutely normal, as well as normal with respect to its continued fraction expansion, and Madritsch, Scheerer and Tichy [5] have constructed a number that is normal to every Pisot base. In this talk, we will present a construction for a number that is normal to every Pisot base, and with respect to its continued fraction expansion.

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76 Zagier-Hoffman's conjectures in positive characteristic

Le, Khac Nhuan (Université de Caen Normandie)

In the function field setting, Thakur introduced the concept of multiple zeta values (MZVs) as an analogue of MZVs of Euler, leading to the question of determining linear relations among these values. In 2018, Todd proposed a conjecture regarding the dimension of the vector space spanned by Thakur's MZVs of a fixed weight, and Thakur later provided a refinement of this conjecture by giving an explicit basis. These conjectures are analogous to the Zagier-Hoffman's conjectures in the classical setting. In this talk, we will present our results towards conjectures of Todd and Thakur. This is a joint work with B.-H. Im, H. Kim, T. Ngo Dac, and L. H. Pham.

77 Affine quadratic Chabauty

Leonhardt, Marius (Universität Heidelberg)

Quadratic Chabauty is a very successful method for computing all rational points on smooth projective curves of genus > 1 over the rationals. In this talk, I will introduce this method and its modifications to compute S-integral points on affine hyperbolic curves. In particular, I will explain the different shape of the occurring quotients of the fundamental group of the curve and how to obtain unconditional bounds for the number of S-integral points from their Bloch–Kato Selmer groups. All of this is joint work with Martin Lüdtke and J. Steffen Müller.

78 Curves are algebraic $K(\pi,1)$: theory and practice

Levrat, Christophe (LTCI, Télécom Paris)

It is well known that smooth connected algebraic curves are $K(\pi,1)$ spaces, meaning that the étale cohomology of a locally constant contructible sheaf on the curve may be computed as the continuous group cohomology of the associated π_1-module. In this talk, we would like to sketch a simple proof of an extension of this result to singular curves, and explicitly describe, given such a sheaf $\mathscr{F}$ on such a curve X, some Galois coverings of the curve which allow to compute the cohomology groups of $\mathscr{F}$ as well as cup-products between these groups.

79 *On a congruence arising from permutation polynomials*

Luca, Florian (Wits)

We present an algorithm which given an odd positive integer n finds a solution to the congruence

$$-1 \equiv \prod_{i=1}^{r}(2^{a_i}+1) \pmod{2^n-1}.$$

Whenever such a solution exists, the inverse function in $\mathbb{F}_{2^n}$, the finite field with 2^n elements, can be represented as a composition of quadratics. The algorithm produced one such solution for every odd positive integer $n \le 100$. Along the way we recall old facts about Mersenne numbers and conjecture new ones. We also use a Jacobi symbol formula due to Rotkiewicz. In addition, we show that the positive integers n such that the congruence $n-1 \equiv 2^a \cdot 3^b \pmod{2^n-1}$ holds with some integers a, b form a subset of asymptotic density zero and give an explicit bound on their counting function.

80 *Étude arithmétique et combinatoire de la fonction somme héréditaire des chiffres*

Maatoug, Mabrouk (Faculté des sciences de Monastir, Université de Monastir)

Le but cet exposé est de présenter la fonction somme héréditaire des chiffres en base q dans des classes de congruence données lorsqu'ils sont évalués sur une progression arithmétique. On se propose de réaliser une étude semblable au théorème de Gelfond en utilisant la fonction somme héréditaire des chiffres en base q. Plus précisément, on va estimer de la somme exponentielle $S_q(t,s,N) = \sum_{k=0}^{N-1} e^{2i\pi(\omega_q(n)t+sn)}$, où N est un entier naturel strictement positif, $s, t \in \mathbf{R}\backslash\mathbf{Z}$ et ω_q désigne la fonction somme héréditaire des chiffres en base q. Dans cette présentation, on mentionnera des références qui sont liées au sujet de la recherche tout en soulevant les problèmes. Et à la fin, on fixera des perspectives très intéressantes dans la théorie des nombres.

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81 *Some degree problems in number fields*

Maciulevičius, Lukas (Institute of Mathematics, Vilnius University)

We say that a triplet (a,b,c) of positive integers is product-feasible if there exist algebraic numbers α, β and γ of degrees (over $\mathbb{Q}$) a, b and c, respectively, such that $\alpha\beta\gamma = 1$. An analogous notion has been introduced for number fields, too. Namely, a triplet $(a,b,c) \in \mathbb{N}^3$ is said to be compositum-feasible if there exist number fields K and L of degrees a and b (over $\mathbb{Q}$), respectively, such that the degree of their compositum KL is c. We extend the investigation of compositum-feasible and product-feasible triplets started by Drungilas, Dubickas and Smyth. More precisely, for all positive integer triplets (a,b,c) with $a \le b \le c$ and $b \in \{8,9\}$, we decide whether it is compositum-feasible. Moreover, we determine all but one product-feasible triplets $(a,b,c) \in \mathbb{N}^3$ satisfying $a \le b \le c$ and $b \le 7$.

82 *Barsotti-Tate groups with ramified endomorphism structure*

Marrama, Andrea (École Polytechnique)

Barsotti-Tate groups with ramified endomorphism structure appear in the study of Shimura varieties at places of bad reduction. In this short talk, I will focus on a concrete example of p-adic analytic family of such objects. In order to analyse it, I will present different polygons associated to Barsotti-Tate groups with endomorphism structure, whose variation is particularly relevant in the ramified case.

83 *The Li criterion and its variations in the Selberg class*

Mazhouda, Kamel (University of Sousse, Tunisia and UPHF (France))

The Riemann hypothesis (HR), that all non-trivial (non-real) zeros of the Riemann zeta function ζ lie on the critical line $1/2 + i\mathbb{R}$, is a conjecture formulated by Riemann in 1859 in the only work he devoted to number theory; (HR) is always open. One of the particular charms of the study of (HR) is the great diversity of its equivalent formulations, which extend to a large class of L functions (the Selberg class, the class of automorphic L functions and the zeta function on function fields). The presentation deals with the study of a relation equivalent to (HR) (the Li criterion and its variations). Furthermore, we reformulate the Li criterion for the Riemann hypothesis for a function F in the Selberg class using some modified Li coefficients defined by

$$\lambda_F(n,a) = \sum_{\rho} \left[1 - \left(\frac{\rho - a}{\rho + a - 1} \right)^n \right],$$

where the above sum varies over the non-trivial zeros of F and $a \neq 1/2$ is a real number, and we gives an arithmetic and asymptotic formula of $\lambda_F(n,a)$. The main results presented can be found in the paper [1], which is a joint work with Bouchaïb Sodaïgui.

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84 *On CM values of modular functions that are S-units*

Menares, Ricardo (Pontificia Universidad Católica de Chile)

This is joint work with Sebastián Herrero and Juan Rivera-Letelier [1].

Modular functions are meromorphic functions defined on the upper half plane, which are invariant under the action of a finite index subgroup of $SL_2(\mathbb{Z})$ (they also satisfy a suitable condition at the cusps). Classical examples are the j invariant (which classifies elliptic curves) and the λ invariant (which classifies elliptic curves together with a basis of the 2-torsion). A CM value of a modular function f is the image through f of an imaginary quadratic element of the upper half plane. When f is the classical j invariant, a CM value is called a singular modulus.

We show that, for any given finite set of prime numbers S, the set of CM values of j that are S-units is finite. On the other hand, the λ invariant has infinitely many CM values that are algebraic units (thus, in particular, S-units). In this talk, we will present a result and a conjecture towards the characterization of modular functions having only finitely many CM values that are S-units.

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85 Friable polynomials with several prescribed coefficients over finite fields

Mérai, Lászlo (Austrian Academy of Sciences, Linz, Austria)

In 2015, Bourgain investigated the distribution of primes with a positive proportion of preassigned bits. His method has been adapted in different settings, for example in 2016 Ha considered this question in the case of rational function fields over finite fields by studying the distribution of irreducible polynomials with preassigned coefficients.

In this talk, we explore this quesetion for friable (or smooth) polynomials. We recall that a polynomial is m-friable if all of its irreducible factors are of degree at most m.

Among others, we show that under some natural conditions, the number of m-friable polynomials of degree n with r preassigned coefficients over the finite field of size q tends to

$$\rho(n/m)q^{n-r},$$

where ρ is Dickman's ρ function.

86 Generalized campana points and adelic approximation on toric varieties

Moerman, Boaz (Utrecht University)

In recent years there has been considerable interest into Campana points and Darmon points, which provide a geometric framework for studying questions involving powerful numbers. We will considerably generalize these points, to also be able to study squarefree numbers, powers and more. For these generalized Campana points, we study when when these points are dense in the corresponding space of adelic points. We characterise when this analog of strong approximation is satisfied on a toric variety and give it a concrete combinatorial description, generalizing and strengthening classical results on strong approximation and generalizing the recent study of weak Campana approximation in [1].

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87 The Hasse principle for intersections of two quadrics

Molyakov, Alexander (Département de mathématiques et applications, École normale supérieure, Paris)

One of the first non-trivial examples of geometrically rational varieties is given by geometrically integral non-conical intersections of two quadrics in the projective space $\mathbb{P}^n$ $(n \geqslant 4)$. In 1987 Colliot-Thélène, Sansuc and Swinnerton-Dyer proved the smooth Hasse principle for such a variety $X \subset \mathbb{P}^n$ over a number field when $n \geqslant 8$, they also conjectured that the smooth Hasse principle holds starting with the dimension $n = 6$. Thirty years later, Heath-Brown established the Hasse principle for smooth intersections of two quadrics in $\mathbb{P}^7$. In the talk we will discuss the recent progress on this problem for singular intersections in $\mathbb{P}^7$. (Based on arXiv:2305.00313.)

88 On ergodic theorems and the Riemann hypothesis

Nair, Radhakrishnan (University of Liverpool)

We use subsequence ergodic theorems applied to Booles transformation and its variants and their invariant measures on the real line to give new characterisations of the Lindelöf Hypothesis and the Riemann hypothesis. This builds on earlier work of R. L. Adler and B. Weiss, M. Lifshits and M. Weber, J. Steuding, J. Lee and A. I. Surijaya using Birkhoffs ergodic theorem and probability theory. The talk is on work with Jean-Louis Verger-Gaugry (Chambéry) and Michel Weber (Strasbourg).

89 Patterns in the iteration of an arithmetic function

Nathanson, Melvyn (City University of New York, USA)

Abstract not available at the time of printing.

90 Some remarks on weak approximation and Brauer and R-equivalence relations for homogeneous spaces over global fields

Nguyêñ, Q. Thăńg (Institute of Mathematics, Vietnam Academy of Sciences and Technology, Hanoi, Vietnam)

We discuss some new formulae relating an obstruction to the weak approximation on homogeneous spaces, defined over a global field, to the set of local and global Brauer and R-equivalence classes via some exact sequences involving the Brauer groups.

91 La conjecture de Syracuse et les applications quasi-affines

Niboucha, Razika (Faculté de Mathématiques, USTHB, Alger, Algérie)

Une application quasi-affine de largeur d est une application de $\mathbb{Z}$ dans $\mathbb{Z}$, vérifiant la récurrence

$$\forall m \in \mathbb{Z}, \qquad \varphi(m+d) - 2\varphi(m) + \varphi(m-d) = 0.$$

La composée de deux applications quasi-affines de largeurs respectivement d_1 et d_2 est une application quasi-affine de largeur $d_1 d_2$. Des formules explicites ont été données pour représenter ces applications [2], ce qui les relient avec la conjecture de Syracuse dont l'énoncé est [1] : Soit $N > 0$ un entier naturel, tel que $U_0 = N$ et

$$U_{n+1} = \begin{cases} \frac{U_n}{2} & \text{si } U_n \text{ est pair,} \\ \frac{3U_n+1}{2} & \text{si } U_n \text{ est impair.} \end{cases}$$

Alors pour toute valeur de U_0, il existe un entier n tel que $U_n = 1$.

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92 *On congruence classes of orders of reductions of elliptic curves*

Pajaziti, Antigona (University of Luxembourg)

Let E be an elliptic curve defined over $\mathbb{Q}$ and $\widetilde{E}_p(\mathbb{F}_p)$ denote the reduction of E modulo a prime p of good reduction for E. Given an integer $m \geq 2$ and any a modulo m, we consider how often the congruence $|\widetilde{E}_p(\mathbb{F}_p)| \equiv a \mod m$ holds. We then exhibit elliptic curves over $\mathbb{Q}(t)$ with trivial torsion for which the orders of reductions of every smooth fiber modulo primes of positive density at least 1/2 are divisible by a fixed small integer. We show that the greatest common divisor of the integers $|\widetilde{E}_p(\mathbb{F}_p)|$ over all rational primes p cannot exceed 4. We also show that if the torsion of E grows over a quadratic field K, then one may explicitly compute $|\widetilde{E}_p(\mathbb{F}_p)|$ modulo $|E(K)_{tors}|$. More precisely, we show that there exists an integer $N \geq 2$ such that $|\widetilde{E}_p(\mathbb{F}_p)|$ is determined modulo $|E(K)_{tors}|$ according to the arithmetic progression modulo N in which p lies. It follows that given any a modulo $|E(K)_{tors}|$, we can estimate the density of primes p such that the congruence $|\widetilde{E}_p(\mathbb{F}_p)| \equiv a \mod |E(K)_{tors}|$ occurs. This is joint work with Assoc. Prof. Mohammad Sadek.

93 *A Generalization of H-fold sumset of set of integers*

Pandey, Ram Krishna (Department of Mathematics, Indian Institute of Technology Roorkee, India)

Let A be a nonempty finite set of integers and h be a positive integer. The *h-fold sumset*, denoted by hA, is the set of integers that can be written as the sum of h elements of A and the *restricted h-fold sumset*, denoted by $h^\wedge A$, is the set of integers that can be written as the sum of h pairwise distinct elements of A. Several generalizations of these sumsets have been introduced in the literature. For a finite set H of positive integers, Bajnok introduced the *sumset* HA and the *resticted sumset* $H^\wedge A$, where HA is the union of the sumsets hA for $h \in H$ and the restricted sumset $H^\wedge A$ is the union of the sumsets $h^\wedge A$ for $h \in H$. Recently, Bhanja and Pandey considered a generalization of HA and $H^\wedge A$, the *generalized H-fold sumset*, denoted by $H^{(r)}A$, defined by

$$H^{(r)}A := \bigcup_{h \in H} h^{(r)}A,$$

where $h^{(r)}A$ is the set of integers that can be written as sum of h elements of A in which each summand is repeated at most r times. Therefore, HA and $H^\wedge A$ are particular cases of $H^{(r)}A$ for $r = h$ and $r = 1$, respectively. In this talk, we present the optimal lower bound for the cardinality of $H^{(r)}A$, i.e., for $|H^{(r)}A|$ (called *Direct Problem*) and the structure of the underlying sets A and H when $|H^{(r)}A|$ is equal to the optimal lower bound in the cases A contains only positive integers and A contains only nonnegative integers (called *Inverse Problem*). Furthermore, the sumset $H^{(r)}A$ becomes more important as it also generalizes *subset sums* and *subsequence sums*, so we get several results of subsequence sums and subset sums as special cases on choosing particular sets H.
(This is a joint work with Mohan.)

94 *Arithmetic dynamics of unicritical polynomials: a study on rational periodic points*

Panraksa, Chatchawan (Mahidol University)

Arithmetic dynamics is a fascinating interdisciplinary field that combines the study of dynamical systems, number theory, and algebraic geometry. This area of research investigates the properties of discrete dynamical systems arising from arithmetic objects, such as rational maps, as well as the behavior of number-theoretic quantities under iteration.

In this presentation, we will delve into arithmetic dynamics, with a particular focus on period 2 for the unicritical polynomial $f_{d,c}(x) = x^d + c$, where d is an integer larger than two. We will explore the rational periodic points of the polynomial within the field of rational numbers. Our investigation will encompass periodic points for degrees $d = 4$ and $d = 6$, and we will present evidence supporting the absence of rational periodic points with an exact period of two for $d = 2k$, under the conditions that $3 \mid 2k - 1$ and k contains a prime factor greater than three.

95 *Northcott property for special values of L-functions*

Pazuki, Fabien (University of Copenhagen)

Pick an integer n. Consider a natural family of objects, such that each object X in the family has an L-function $L(X,s)$. If we assume that the collection of special values $L(X,n)$ is bounded, does it imply that the family of objects is finite? We will first explain why we consider this question, in link with Kato's heights of mixed motives, and give two recent results: a Northcott property for families of Dedekind zeta functions, and a Northcott property for some families of L-functions attached to pure motives. This is joint work with Riccardo Pengo.

96 *Mahler measure of successively exact polynomials*

Pengo, Riccardo (Max Planck Institute für Mathematik, Bonn)

The Mahler measure of a polynomial P with integer coefficients measures the complexity of P by taking a geometric average of P on the unit torus. Perhaps surprisingly, this invariant has been shown to be related to special values of L-functions by the seminal works of Boyd, Deninger and Rodriguez-Villegas at the end of the last century. More precisely, the Mahler measure of P is usually related to the special value at the origin of the L-function associated to the hypersurface defined by P. However, sometimes one sees special values of smaller dimensional objects appearing, whose appearance has been explained in work of Maillot and Lalin by introducing the exactness property of a polynomial. In this talk, based on joint work with François Brunault, I will explain how one can push this line of thought, getting a conjecturally complete list of special values which should potentially be related to the Mahler measure of the polynomial in question. If time permits, I will explain how one may hope to find such polynomials, and prove this kind of identities, by a generalization of a method of Rogers and Zudilin.

97 *GRACYASK: GRAphs CYcles And SKyrmions: Topological invariants in discrete re-writing fiber bundles*

Perea, Sinuhé (King's College London)

In the context of finite lattice systems of fibre bundles, we establish a basic taxonomy of states that preserve continuity [inelastic] property in discrete spaces, trying to find measurable conserved quantities in physical systems, such as winding number or energy. The basic cases have been characterised (OEIS: A081113, A354548) and later we proceed to host diverse field configurations, from domain walls to [mathematical] skyrmions. We determine that these configurations required a minimum size, which can be interpreted as minimal energy useful for optimisation of the stabilization of quantum skyrmions. This comprehensive bottom-to-top approach allows us to uncover the fundamental mathematical properties underlying this mesoscopic phenomenon, to deeper understanding of the problem in other disciplines from magnetism to optics.

98 *A generalization of Artin's primitive root conjecture among integers with few prime factors*

Péringuey, Paul (Université de Lorraine)

Artin's conjecture states that the set of primes for which an integer a different from -1 or a perfect square is a primitive root admits an asymptotic density among all primes. In 1967 C. Hooley [1] proved this conjecture under the Generalized Riemann Hypothesis.

The notion of primitive root can be extended modulo any integer by considering the elements of the multiplicative group generating subgroups of maximal size. One can then look for which elements of a set of integers a given integer is a generalized primitive root, as did S. Li and C. Pomerance for all the integers [2]. I will discuss the set of almost primes and of rough numbers for which an integer a is a generalized primitive root, and present results similar to Artins conjecture for primitive roots.

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99 *Unified treatment of Artin-type problems*

Perucca, Antonella (Department of Mathematics, University of Luxembourg, Esch-sur-Alzette, Luxembourg)

Since Hooley's seminal 1967 resolution of Artin's primitive root conjecture under the Generalized Riemann Hypothesis, numerous variations of the conjecture have been considered. We present a framework generalizing and unifying many previously considered variants, and prove results in this full generality (under GRH). This is joint work with Olli Järviniemi and Pietro Sgobba.

100 *On bounds for $B_2[g]$ sequences and the Erdős-Turán Conjecture*

Pliego, Javier (KTH Royal Institute of Technology)

We say that $A \subset \mathbb{N}$ is an asymptotic basis of order 2 if for every sufficiently large natural number n, we have

$$n = a_1 + a_2, \qquad a_1 \leq a_2, \qquad a_1, a_2 \in A,$$

and denote by $r_A(n)$ the number of such solutions. An old conjecture of Erdős and Turán claims that there is no asymptotic basis A and no fixed $g \in \mathbb{N}$ with the property that $1 \leq r_A(n) \leq g$ for sufficiently large n. We first show after suitably weakening the preceding requirements in the conjecture that the corresponding statement does not hold. We also provide for $g \geq 2$ and some sequence $A \subset \mathbb{N}$ with the property that $r_A(m) \leq g$ new lower bounds for the counting function $|A \cap [1, x]|$.

101 *On the binary digits of n and n^2*

Popoli, Pierre (Université de Lorraine)

Let $s(n)$ denote the sum of digits in the binary expansion of the integer n. Hare, Laishram, and Stoll [4] studied the number of odd integers such that $s(n) = s(n^2) = k$ for a given positive integer k. These authors could not treat the remaining cases $k \in \{9, 10, 11, 14, 15\}$. In this talk, I will present the results of our article [1] on the cases $k \in \{9, 10, 11\}$ and the difficulties in settling for the two remaining cases $k \in \{14, 15\}$. Our proof is based on an efficient algorithm and new combinatorial techniques.

A related problem is to study perfect squares of odd integers with few binary digits. Szalay [5] showed that the set of solutions for three binary digits comprises a finite set $\{7, 23\}$ and one infinite family. The set of solutions for four binary digits is radically different since Corvaja and Zannier [3] and Bennett, Bugeaud, and Mignotte [2] independently proved that there are only finitely many solutions. The last authors conjectured that the set of solutions is $\{13, 15, 47, 111\}$. In the same paper [1], we have developed an algorithm that finds all solutions with a fixed sum of digits value. This algorithm supports the conjecture of [2] and shows new related results for perfect squares of odd integers with five binary digits.

This is joint work with K. Aloui, D. Jamet, H. Kaneko, S. Kopecki and T. Stoll.

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102 *Sato-Tate conjecture in arithmetic progressions for certain families of elliptic curves*

Pujahari, Sudhir (National Institute of Science Education and Research (NISER))

In this talk we will study moments of the trace of Frobenius of elliptic curves if the trace is restricted to a fixed arithmetic progression. In conclusion, we will obtain the Sato-Tate distribution for the trace of certain families of Elliptic curves. As a special case we will recover a result of Birch proving Sato-Tate distribution for certain family of elliptic curves. Moreover, we will see that these results follow from asymptotic formulas relating sums and moments of Hurwitz class numbers where the sums are restricted to certain arithmetic progressions. This is joint work with Kathrin Bringmann and Ben Kane.

103 *Exploring recurrence relations and explicit formulas in Generalized Hyperbolic Pascal Triangles*

Rami, Fella (USTHB, Faculty of Mathematics, RECITS Laboratory, Algiers, Algeria)

We consider a generalization of a relatively new variant of Pascals triangle, the hyperbolic Pascal triangles, when the two leg-sequences are general sequences $\{\alpha_n\}_{n\geq 0}$ and $\{\beta_n\}_{n\geq 0}$ instead of constant 1 sequences. Our goal then is to derive the classical problems of Pascal-like triangles for our generalized hyperbolic Pascal triangles, such as the sum and alternating sum of items in a row.

104 *Monogenity of parametric families of number fields*

Remete, Laszlo (University of Debrecen)

Let $\mathbb{Q} \leq K$ be a field extension of degree n and let $\mathcal{O}_K$ be the ring of integers of K. We say that K is monogenic over $\mathbb{Q}$, if $\mathcal{O}_K$ is mono-generated as a ring over $\mathbb{Z}$, i.e. $\mathcal{O}_K = \mathbb{Z}[\alpha]$ for some $\alpha \in \mathcal{O}_K$. In this case $(1, \alpha, \alpha^2, \ldots, \alpha^{n-1})$ is an integral basis of K and consequently, the index $[\mathcal{O}_K : \mathbb{Z}[\alpha]]$ of α is one. It is a classical problem in algebraic number theory to decide if a number field is monogenic or not.

The first example of a non-monogenic number field was given by Dedekind. His example is based on the fact that if a prime $p \in \mathbb{Z}$ does not divide the index of α, then the prime ideal decomposition of $p\mathcal{O}_K$ is in one-to-one correspondence with the modulo p factorization of the minimal polynomial of α over $\mathbb{Q}$. He proved that one can deal with the monogenity of a number field through the prime ramification if and only if the field index is not 1. Unfortunately, this approach is not complete in the sense that there are non-monogenic number fields with field index 1.

The problem of finding all of the generators of a power integral basis in the number field is equivalent to the problem of solving the index-form equation. It is a Diophantine equation of $n-1$ variables and of degree $\binom{n}{2}$, so it is very complicated to solve in general. However, this approach can be successful even in the case when the field index is 1.

In this talk I mention some classical results and methods concerning the monogenity of infinite parametric families of number fields and some new directions that has been in the scope of the most recent papers.

105 *On ranks of quadratic twists of a Mordell curve*

Roy, Bidisha (Scuola Normale Superiore di Pisa, Italy)

Ranks of elliptic curves is a classical topic and it has a vast literature in algebraic number theory. In this talk, we will consider the quadratic twists of the Mordell curve $E : y^2 = x^3 - 1$. For a square-free integer k, the quadratic twist is given by $E_k : y^2 = x^3 - k^3$. In the first part of this talk, we will see that there exist infinitely many k with more than one prime factors such that the rank of E_k is 0. Next, we will conclude by witnessing an infinite family of curves $\{E_k\}$ such that the rank of each E_k is positive.

106 *Equidistribution of CM points*

Saettone, Francesco Maria (Ben-Gurion University of the Negev)

We describe an equidistribution result of reduction of (special) CM points in the special fiber of a Shimura curve associated to a ramified quaternion algebra. The main results boils down to a combination of Ratner's theorem and various descriptions in terms of double quotients of the points of our interest. This is part of my doctoral project.

107 *A simple extension of Ramanujan-Serre derivative map and some applications*

Sahu, Brundaban (NISER Bhubaneswar)

We derive a simple extension of Ramanujan-Serre derivative map and use it to get a general method to derive certain convolution sums of the divisor functions. We shall provide explicit expressions for four types of convolution sums. This is a joint work with B. Ramakrishnan and Anup K. Singh.

108 *Étude du graphe divisoriel*

Saias, Eric (Sorbonne-Université)

Le graphe divisoriel est le graphe dont l'ensemble des sommets est $\mathbb{N}^*$ et deux entiers sont reliés par une arête quand le petit divise le grand. En 1983, Erdős, Freud et Hegyvarí se sont intéressés au comportement asymptotique de la quantité $f(x)$ définie comme le nombre maximum de sommets dans un chemin injectif de la restriction du graphe divisoriel aux entiers inférieurs ou égaux à x.
On évoquera dans l'exposé les résultats anciens et récents sur (et autour de) cette question.

109 *New results in arithmetic statistics*

Saikia, Neelam (Indian Institute of Technology Bhubaneswar)

In the 1980's, Greene introduced ${}_nF_{n-1}$ *hypergeometric functions* over finite fields using normalized *Jacobi sums.* The structure of his theory provides that these functions possess many properties that are analogous to those of the classical hypergeometric series studied by Gauss, Kummer and others. These functions have played important roles in the study of Apéry-style supercongruences, the Eichler-Selberg trace formula, Galois representations, and zeta-functions of arithmetic varieties. In this talk we will discuss the value distributions of simplest families of these functions. For example, we will consider ${}_2F_1$ and ${}_3F_2$ hypergeometric functions and will discuss their limiting value distributions. For the ${}_2F_1$ functions, the limiting distribution is semicircular, whereas the distribution for the ${}_3F_2$ functions is *Batman* distribution. This is a joint work with Ken Ono and Hasan Saad.

110 *Topological properties and algebraic independence of sets of prime-representing constants*

Saito, Kota (University of Tsukuba)

Let $\lfloor x \rfloor$ us denote the integer part of $x \in \mathbb{R}$. Let $(c_k)_{k=1}^{\infty}$ be a sequence of positive integers. Assume that $(c_k)_{k=1}^{\infty}$ satisfies certain suitable conditions. We investigate the set of $A > 1$ such that $\lfloor A^{c_1 \cdots c_k} \rfloor$ is always a prime number for every positive integer k. Let $\mathscr{W}(c_k)$ be this set. Mills was the first to propose such a constant A. He showed that there exists a constant $A > 1$ such that $\lfloor A^{3^k} \rfloor$ is always a prime number. Therefore, $\mathscr{W}(3)$ is non-empty. The minimum of $\mathscr{W}(3)$ is called Mills' constant. It is still open to determine whether Mills' constant is rational or irrational. Interestingly, Alkauskas and Dubickas constructed a transcendental number in $\mathscr{W}(c_k)$ if $\limsup_{k\to\infty} c_k = \infty$.

The first goal of this talk is to determine the topological structure of $\mathscr{W}(c_k)$. Under suitable conditions on $(c_k)_{k=1}^{\infty}$, we reveal that $\mathscr{W}(c_k) \cap [0, a]$ is homeomorphic to the Cantor middle third set for some real a. The second goal is to propose an algebraically independent subset of $\mathscr{W}(c_k)$ if c_k is rapidly increasing. As a corollary, we disclose that the minimum of $\mathscr{W}(k)$ is transcendental. In addition, we apply the main result to $\mathscr{W}(c_k)$ with $c_1 \cdots c_k = 3^{k!}$. As a consequence, we give an algebraically independent and countably infinite subset of $\mathscr{W}(c_k)$. This research is joint work with Wataru Takeda (Tokyo University of Science).

111 *Bi-periodic recurrence sequences and elliptic curves*

Salhi, Celia (RECITS Laboratory, USTHB, Algeria)

This work is motivated by previous research on periods of linear recurrences sequence over elliptic curves. In 2006, Coleman et al. studied the classical Fibonacci sequence on elliptic curves, and more recent papers have extended this investigation to encompass more general linear recurrence sequences over elliptic curves.

In this talk, we further expand on this idea by considering bi-periodic recurrence sequences. These sequences involve incorporating periodic parameters into a non-linear recurrence relation, where the values of these parameters depend on the parity of the sequence term's subscript. Specifically, we focus on the bi-periodic Horadam sequence $(H_n)_{n\geq 0}$, defined by $H_n = \chi(n)H_{n-1} + cH_{n-2}$, where $\chi(n) = a$ if n is even and $\chi(n) = b$ if n is odd with arbitrary initial conditions H_0 and H_1. We assume that a, b, and c are positive integers. Moreover, we consider an elliptic curve E defined over the finite field $\mathbb{F}_p$, where p is an odd prime. To establish a connection between the sequence $(H_n)_{n\geq 0}$ and E, we define the bi-periodic Horadam sequence associated with E as follows:

$$\mathbf{H}_n^{(U,V)} = \begin{cases} [a]\mathbf{H}_{n-1}^{(U,V)} + \mathbf{H}_{n-2}^{(U,V)}, & \text{for } n \text{ even;} \\ \\ [b]\mathbf{H}_{n-1}^{(U,V)} + \mathbf{H}_{n-2}^{(U,V)}; & \text{for } n \text{ odd,} \end{cases} \qquad (n \geq 2).$$

Where U and V are two points on E chosen as initial conditions.

Our objective is to investigate the periods of the bi-periodic Horadam sequence $(\mathbf{H}_n^{(U,V)})_{n\geq 0}$ on the elliptic curve E. We begin by examining the periods of the sequence $(H_n)_n$ modulo an integer $m > 1$. Additionally, we establish a close relationship between the periods of the sequence $(\mathbf{H}_n^{(U,V)})_{n\geq 0}$ and the periods of the sequence $(H_n)_n$, particularly in the special case where the initial conditions are set as $H_0 = 0$ and $H_1 = 1$.

In conclusion, we observe that the period of the sequence $(\mathbf{H}_n^{(\mathcal{O},V)})_n$, where $\mathcal{O}$ denotes the point at infinity, depends on the order of the point V on E. Consequently, any points on E with the same order will generate the sequence $(\mathbf{H}_n^{(\mathcal{O},V)})_n$ with exactly the same length.

112 *Multiplicative complements*

Sándor, Csaba (Budapest University of Technology and Economics)

The set of nonnegative integers is denoted by $\mathbb{N}$. The counting function of a set $A \subseteq \mathbb{N}$ is defined as $A(x) = |A \cap \{0, 1, \dots, x\}|$ for every $x \in \mathbb{N}$. Let $A, B \subseteq \mathbb{N}$. The sets A and B are said to be additive complements if every nonnegative integers n can be written as $n = a + b$, $a \in A$, $b \in B$. Clearly, if $A, B \subseteq \mathbb{N}$ are additive complements, then $A(x)B(x) \geq x + 1$ for every $x \in \mathbb{N}$, therefore $\liminf_{x\to\infty} \frac{A(x)B(x)}{x} \geq 1$. In 1964, answering a question of Hanani, Danzer proved that this bound is sharp, that is there exists infinite additive complements $A, B \subseteq \mathbb{N}$ such that $\lim_{x\to\infty} \frac{A(x)B(x)}{x} = 1$.

Similarly, the sets A and B are said to be multiplicative complements if every nonnegative integers n can be written as $n = ab$, $a \in A$, $b \in B$. We show that, in contrast to the additive complements, $\lim_{x\to\infty} \frac{A(x)B(x)}{x} = \infty$ for every infinite multiplicative complements A and B. In this talk we present some further tight density bounds on multiplicative complements.

This is joint work with Anett Kocsis, Dávid Matolcsi and György Tőtős.

113 *A geometric description of the factors of Fermat numbers*

Sauras-Altuzarra, Lorenzo (TU Wien)

We will present some recent results on the geometry of numbers, which were obtained by means of proof-theoretic techniques, and in particular an application of these to the study of the factors of Fermat numbers.

114 *Division quaternion algebras over some cyclotomic fields*

Savin, Diana (Faculty of Mathematics and Computer Science, Transilvania University, Braşov, Romania)

Let p_1, p_2 be two distinct prime integers, let n be a positive integer, $n \geq 3$ and let ξ_n be a primitive root of order n of the unity. In this paper we obtain a complete characterization for a quaternion algebra $H(p_1, p_2)$ to be a division algebra over the nth cyclotomic field $\mathbb{Q}(\xi_n)$, when $n \in \{3,4,6,7,8,9,11,12\}$ and also we obtain a characterization for a quaternion algebra $H(p_1, p_2)$ to be a division algebra over the nth cyclotomic field $\mathbb{Q}(\xi_n)$, when $n \in \{5,10\}$. In the last section of this article we obtain a complete characterization for a quaternion algebra $H_{\mathbb{Q}(\xi_n)}(p_1, p_2)$ to be a division algebra, when $n = l^k$, with l a prime integer, $l \equiv 3 \pmod 4$ and k a positive integer.

115 *Isogeny estimates along families of abelian varieties*

Schmidt, Harry (Universität Basel)

I will talk about joint work with Gal Binyamini in which we prove estimates for the maximal degree of an isogeny from a fixed abelian variety to a member of a family of abelian varieties. These estimates do not depend on the particular member of the family and depend polynomially on the degree of a field of definition.

116 *Stability of certain higher degree polynomials*

Sharma, Himanshu (Indian institute of technology, Delhi)

Let K be a field and let $f(z) \in K[z]$ be a polynomial of degree d. Then, for $n \in \mathbb{N} \cup \{0\}$, the n-th iterate of $f(z)$ is defined inductively as follows

$$f^0(z) = z, f^n(z) = f(f^{n-1}(z)).$$

A polynomial $f(z) \in K[z]$ is *stable* over K if $f^n(z)$ is irreducible over K for each $n \in \mathbb{N}$. If the number of irreducible factors of all the iterates of $f(z)$ is bounded above by a constant, then we say that $f(z)$ is *eventually stable*. An important question in the field of arithmetic dynamics is to study the stability or eventual stability of polynomials over a field. In this talk, we discuss the stability of $f(z) = z^d + \frac{1}{c}$ for $d \geq 3$, $c \in \mathbb{Z} \setminus \{0\}$. We show that for an infinite family of $d \geq 3$, the irreducibility of $f(z)$ implies stability of $f(z)$; for the remaining values of d, explicit-abc conjecture implies that $f(z)$ is stable whenever it is irreducible. Moreover, for $d = 3$, if $f(z)$ is reducible, then we show that the number of irreducible factors of $f^n(z)$ is exactly 2, for each $n \in \mathbb{N}$ and for $|c| \leq 10^{12}$. This is a joint work with Prof. Ritumoni Sarma and Prof. Shanta Laishram.

117 The existence of primitive pair over finite fields

Sharma, Jyotsna (Department of Mathematics, IIT Delhi)

Let $\mathbb{F}_q$ be a finite field of order q and let $f(x) = f_1(x)/f_2(x) \in \mathbb{F}_q(x)$ be a rational function of degree sum n, that is, $n = n_1 + n_2$ where $n_1 = deg(f_1(x))$ and $n_2 = deg(f_2(x))$. We say a rational function $f(x)$ is exceptional, if $f(x)$ is of the form $f(x) = cx^i(g(x))^d$, where i is any integer, $d > 1$ divides $q-1$, $c \in \mathbb{F}_q^*$ and $g(x) \in \mathbb{F}_q(x)$ such that both numerator and denominator of $g(x)$ are co-prime to x. A generator of $\mathbb{F}_q^*$ is referred as a primitive element of $\mathbb{F}_q$. For an (n_1, n_2)-rational function $f(x) \in \mathbb{F}_q(x)$ and $\alpha \in \mathbb{F}_q$ we call $(\alpha, f(\alpha))$, a primitive pair if both α and $f(\alpha)$ are primitive elements in $\mathbb{F}_q$. In this talk, we will focus on the improvement of the sufficient condition proposed by Cohen et.al. for the existence of primitive pair $(\alpha, f(\alpha))$ over a finite field $\mathbb{F}_q$, where f is a (odd or even, non-exceptional) rational function over $\mathbb{F}_q$ of degree sum n for every prime power q with $q \equiv 3 \pmod 4$). This is a joint work with R.Sarma and S.Laishram.

118 On the spaces of spherical polynomials and generalized theta-series for quadratic forms of any number of variables

Shavgulidze, Ketevan (Iv. Javakhishvili Tbilisi State University, Tbilisi, Georgia)

Let

$$Q(X) = Q(x_1, x_2, \ldots, x_r) = \sum_{1 \le i \le j \le r} b_{ij} x_i x_j$$

be an integer positive definite quadratic form of r variables and let $A = (a_{ij})$ be the symmetric $r \times r$ matrix of the quadratic form $Q(X)$, where $a_{ii} = 2b_{ii}$ and $a_{ij} = a_{ji} = b_{ij}$, for $i < j$ and a^*_{ij} is the element of the inverse matrix A^{-1}.

A homogeneous polynomial $P(X) = P(x_1, \cdots, x_r)$ of degree ν with complex coefficients, satisfying the condition

$$\sum_{1 \le i,j \le r} a^*_{ij} \left(\frac{\partial^2 P}{\partial x_i \partial x_j} \right) = 0$$

is called a spherical polynomial of order ν with respect to $Q(X)$. Let $P(\nu, Q)$ denote the vector space of spherical polynomials $P(X)$ of even order ν with respect to $Q(X)$.

Let

$$\vartheta(\tau, P, Q) = \sum_{n \in \mathbb{Z}^r} P(n) z^{Q(n)}, \qquad z = e^{2\pi i \tau}, \qquad \tau \in \mathbb{C}, \qquad \operatorname{Im} \tau > 0$$

be the corresponding generalized r-fold theta-series and $T(\nu, Q)$ denote the vector space of generalized multiple theta-series, i.e.,

$$T(\nu, Q) = \{\vartheta(\tau, P, Q) : P \in \mathscr{P}(\nu, Q)\}.$$

Gooding [1] calculated the dimension of the vector space $T(\nu, Q)$ for reduced binary quadratic forms Q. In [2] the upper bounds for the dimension of the space $T(\nu, Q)$ for some quadratic forms of r variables are established.

In this talk, some positive diagonal and non-diagonal quadratic forms of any number of variables are considered; the spaces of spherical polynomials and corresponding generalized theta series are studied; and finally the upper bounds of the dimensions (in some cases, the dimensions) of these spaces are obtained.

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119 *Prime functions*

Šimėnas, Raivydas (Vilnius University)

The fundamental theorem of arithmetic says an essential fact about natural numbers: each natural number is uniquely expressible by a product of prime numbers. Similarly, we can factor a meromorphic function, only this time in terms of functional composition.

Suppose f is a meromorphic function satisfying

$$f = g \circ h \tag{6}$$

with g meromorphic and h entire or h meromorphic and g rational. Then the expression (6) is called a *decomposition* of f. If for all decompositions of f, g or h is linear, then f is *prime*.

In my talk, I will consider the conditions under which the extended Selberg class functions are prime. In addition, I will present the result that the Hurwitz zeta function is prime.

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120 *Hankel determinants associated with weighted binary sum of digits*

Sobolewski Bartosz (Jagiellonian University)

For a number sequence $(a_n)_{n\in\mathbb{N}}$ its Hankel determinant of order n is defined by

$$H(n) = \det[a_{i+j}]_{0\le i,j<n}.$$

Recently, there has been a lot of interest in Hankel determinants of automatic sequences, such as the Thue–Morse, paperfolding, and related sequences. In particular, results concerning non-vanishing of Hankel determinants allowed to compute irrationality exponents for real numbers with digits given by the terms of these sequences.

In the talk we will focus on Hankel determinants of a closely related family of sequences $(s_{\mathbf{w}}(n))_{n\in\mathbb{N}}$, describing weighted binary sums of digits of $n \in \mathbb{N}$, where $\mathbf{w} = (w_j)_{j\in\mathbb{N}}$ is a sequence of weights. We will provide an explicit formula for the Hankel determinants for $a_n = s_{\mathbf{w}}(n+1) - s_{\mathbf{w}}(n)$, which generalizes a result of Fokkink, Kraaikamp and Shallit for the period-doubling sequence. In the case $a_n = s_{\mathbf{w}}(n)$ we will give a recurrence relation satisfied by $H(n)$, which partially answers a question by Allouche and Shallit concerning usual binary sum of digits. For the weights $w_j = t^j$ and we will give further results concerning vanishing and non-vanishing of infinitely many Hankel determinants, as well as their divisibility in the case $t \in \mathbb{Z}$. Joint work with Maciej Ulas (Jagiellonian University).

121 Primes and squares with preassigned digits

Swaenepoel, Cathy (Université Paris Cité)

Bourgain (2015) estimated the number of prime numbers with a positive proportion of preassigned digits in base 2. We first present a generalization of this result to any base $g \geq 2$. We then discuss a more recent result for the set of squares, which may be seen as one of the most interesting sets after primes. More precisely, for any base $g \geq 2$, we obtain an asymptotic formula for the number of squares with a proportion $c > 0$ of preassigned digits. Moreover we provide explicit admissible values for c depending on g. Our proof mainly follows the strategy developed by Bourgain for primes in base 2, with new difficulties for squares. It is based on the circle method and combines techniques from harmonic analysis together with arithmetic properties of squares and bounds for quadratic Weyl sums.

122 Characteristic sequences of the sets of sums of squares as columns of cellular automata

Tahay, Pierre-Adrien (FNSPE, Czech Technical University in Prague, Czech Republic)

A classical result due to Lagrange states that any natural number can be written as a sum of four squares. Characterizations of integers that are a sum of two and three squares were established by Fermat, Euler, Legendre and Gauss. In this paper we denote by s_1, s_2 and s_3 the characteristic functions of the integers which are respectively sums of one, two and three squares. We recall the already known results about the nonautomaticity of s_1 and about the 2-automaticity of s_3 and we prove the nonautomaticity of s_2. In the second part, we recall a construction of s_1 as a column of a cellular automaton and we give a construction for s_3 as an immediate application of a result of Rowland and Yassawi about the construction of p-automatic sequences when p is a prime number. Finally we show that s_2 is also constructible as a column of a cellular automaton and we provide an explicit construction.

123 Existence of the solutions to the Brocard-Ramanujan problem for norm forms

Takeda, Wataru (Tokyo University of Science)

The Brocard-Ramanujan problem, which is an unsolved problem in number theory, is to find integer solutions (x,ℓ) of $x^2 - 1 = \ell!$. Many analogs of this problem are currently being considered. As one example, it is known that there are at most only finitely many algebraic integer solutions (x,ℓ), up to a unit factor, to the equations $N_K(x) = \ell!$, where N_K are the norms of number fields $K/\mathbf{Q}$. In this talk, we construct infinitely many number fields K such that $N_K(x) = \ell!$ has at least 22 solutions for positive integers ℓ.

124 On bi-periodic Horadam numbers

Tan, Elif (Ankara University, Department of Mathematics, Ankara, Turkey)

In this talk, we consider a generalization of the Fibonacci sequence, namely bi-periodic Horadam sequence $\{w_n\}$, which is defined by the recurrence relation:

$$w_n = a^{\xi(n+1)} b^{\xi(n)} w_{n-1} + c w_{n-2}, \quad n \geq 2,$$

with arbitrary initial values w_0, w_1. Here $\xi(n) = n - 2\left\lfloor \frac{n}{2} \right\rfloor$ is the parity function of n and a, b, c are nonzero real numbers. When $a = b = c = 1$ and $w_0 = 0, w_1 = 1$, the bi-periodic Horadam sequence reduces to the classical Fibonacci sequence. We introduce bi-periodic incomplete Horadam numbers which give a natural generalization of incomplete Fibonacci numbers and we give recurrence relations, generating function, and some basic properties of them.

125 *Investigating divisibility properties of quotient sequences derived from Lucas and elliptic divisibility sequences*

Tangboonduangjit, Aram (Mahidol University International College)

In this study, we examine sequences generated by taking the quotient of Lucas sequences or elliptic divisibility sequences. Our investigation focuses on exploring various divisibility attributes of these derived quotient sequences. Furthermore, we establish a connection between elliptic divisibility sequences and a generalized form of Matijasevich's lemma related to Fibonacci numbers, which played a pivotal role in resolving Hilbert's tenth problem. Through this analysis, we aim to shed light on the inherent divisibility properties of these sequences and their potential implications in number theory. This is joint work with Chatchawan Panraksa.

126 *Ellipses and integer sequences*

Tebtoub, Soumeya.M (RECITS Lab. CATI team. USTHB. Algeria)

We suggest an extension to the work of Lucca [2]. Our goal is to examine chains of ellipses inside (outside) the branch of hyperbola, and we establish the recurrence relations of centers and minor (major) axes of the ellipse chains. As well as to determine conditions for these recurrence sequences that consist of integer numbers. We found more then fifty such integer sequences which appear in the On-Line Encyclopedia of Integer Sequences (OEIS [3]), and thus our investigation give them geometrical interpretations.
We mention that there are some sequences, i.e., [3, A098706], which have only definition and have not any combinatorial or geometry example. Our paper could provide a geometric interpretation for them.

This is joint work with Belbachir Hacène (RECITS Lab. CATI team, USTHB, Algeria) and Németh László (Institute of Mathematics, Univ. of Sopron Hungary, associated member of RECITS).

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127 *Sums of proper divisors with missing digits*

Thompson, Lola (Universiteit Utrecht)

Let $s(n)$ denote the sum of proper divisors of an integer n. In 1992 Erdős, Granville, Pomerance, and Spiro (EGPS) conjectured that if $\mathscr{A}$ is a set of integers with asymptotic density zero then $s^{-1}(\mathscr{A})$

also has asymptotic density zero. In this talk, we will discuss recent progress towards the EGPS conjecture. In particular, we show that the conjecture holds when $\mathscr{A}$ is taken to be a set of integers with missing digits. This talk is based on joint work with Kübra Benli, Giulia Cesana, Cécile Dartyge, and Charlotte Dombrowsky.

128 *Arithmetic of cubic number fields: Jacobi–Perron, Pythagoras, and indecomposables*

Tinková, Magdaléna (Czech Technical University in Prague)

Additively indecomposable integers are a useful tool in the study of universal quadratic forms or the Pythagoras number in totally real number fields. However, except for real quadratic fields and several families of cubic fields, we do not know their precise structure.

In the case of real quadratic fields $\mathbb{Q}(\sqrt{D})$ where $D > 1$ is square-free, they can be derived from the continued fraction of $\sqrt{D}$ or $\frac{\sqrt{D}-1}{2}$, depending on the value $D \pmod 4$. Thus, it is natural to ask whether we can obtain indecomposable integers in a similar manner in fields of degrees strictly greater than 2. Since classical continued fraction is not periodic for irrationalities of higher degrees, it is convenient to turn our attention to multidimensional continued fractions. There exist many algorithms generating such expansion, and we will focus on the Jacobi–Perron algorithm. In this talk, we will discuss elements originating from Jacobi–Perron expansions of concrete vectors in several families of cubic fields. This is joint work with Vítězslav Kala and Ester Sgallová.

129 *On the solutions of the Diophantine equation $P_n \pm \frac{a(10^m-1)}{9} = k!$*

Togbé, Alain (Purdue University Northwest, USA)

Let $\{P_n\}_{n\geq 0}$ be the sequence of Pell numbers given by $P_0 = 0,\ P_1 = 1$ and

$$P_{n+1} = 2P_n + P_{n-1}, \quad \text{for all } n \geq 1.$$

In this talk, we use Baker's method and the reduction method to find all the solutions of the Diophantine equation

$$P_n \pm \frac{a(10^m-1)}{9} = k!,$$

in positive integer variables m, n, a, k, where P_n is the nth Pell number. This is a joint work with K. N. Adédji, F. Luca.

130 *An expression for multiple L-functions in terms of the confluent hypergeometric function*

Toma, Yuichiro (Nagoya University)

This is the topic of my talk; The multiple zeta functions are generalizations of the Riemann zeta function and have expressions in terms of confluent hypergeometric functions. These yield the functional equation for the multiple zeta functions. In this talk, we report the extension of the result to multiple L-functions. Furthermore, from the degree of the Selberg class, which is a fundamental family of L-functions, we consider the condition for multiple L-functions with expressions in terms of the confluence hypergeometric function.

131 *On almost η-Ricci-Bourguignon solitons*

Traore, Moctar (İstanbul University, Faculty of Science, Department of Mathematics, İstanbul, Turkey)

In this presentation firstly, we will investigate a Riemannian manifold with almost η-Ricci-Bourguignon soliton structure. Then, we will use the Hodge-de Rham decomposition theorem to make a link with the associated vector field of an almost η-Ricci-Bourguignon soliton. Furthermore, we will show that a nontrivial, compact almost η-Ricci-Bourguignon soliton of constant scalar curvature is isometric to the Euclidean sphere. Finally using some results obtaining from almost η-Ricci Bourguignon soliton, we will give the integral formulas for compact orientable almost η-Ricci-Bourguignon soliton. See [1] and [2].

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132 *GCD problems in algebraic groups*

Tron, Emanuele (Institut Fourier, Université Grenoble Alpes)

The Ailon–Rudnick conjecture states that $\gcd(2^n - 1, 3^n - 1) = 1$ for infinitely many n. While this is still unsolved, its counterpart for large values of this GCD is the Bugeaud–Corvaja–Zannier method employing the Subspace Theorem. Silverman showed how this can be generalized in a natural way to associate, to any orbit in an algebraic group, a geometric divisibility sequence. With this, one can consider variants of this problem which are amenable to a variety of methods; in particular, we shall see an overview of recent progress in the case where the group is *not* a semiabelian variety, which is linked to CM theory and ideas in arithmetic statistics.

133 *p-torsion of Jacobians in unramified Artin-Schreier covers of curves*

Ulmer, Douglas (University of Arizona)

It is a classical problem to understand the set of Jacobians of curves among all abelian varieties, i.e., the image of the map $M_g \to A_g$ which sends a curve X to its Jacobian J_X. In characteristic p, A_g has interesting filtrations, and we can ask how the image of M_g interacts with them. Concretely, which groups schemes arise as the p-torsion subgroup $J_X[p]$ of a Jacobian? We consider this problem in the context of unramified $\mathbb{Z}/p\mathbb{Z}$ covers $Y \to X$ of curves, asking how $J_Y[p]$ is related to $J_X[p]$. Translating this into a problem about de Rham cohmology yields some results using classical ideas of Chevalley and Weil. This is joint work with Bryden Cais.

134 *Equidistribution of exponential sums indexed by roots of polynomials*

Untrau, Théo (Institut de Mathématiques de Bordeaux)

In this talk, we will consider variants of some classical exponential sums, such as the following "restricted sums of additive characters"

$$\sum_{\substack{x \in \mathbf{F}_p \\ g(x)=0}} e\left(\frac{ax}{p}\right)$$

for a fixed monic polynomial $g \in \mathbf{Z}[X]$. We will be interested in the distribution of these sums as p goes to infinity among the primes that split completely in the splitting field of g, and as a varies in $\mathbf{F}_p$. We show that they become equidistributed with respect to a measure that is related to the group of additive relations among the complex roots of g. This generalizes previous results obtained by Duke, Garcia, Hyde et Lutz in the case where $g = X^d - 1$, and of Burkhardt, Chan, Currier, Garcia, Luca and Suh in the case of "restricted Kloosterman sums" of the form

$$\mathrm{K}_p(a, b, d) := \sum_{\substack{x \in \mathbf{F}_p \\ x^d=1}} e\left(\frac{ax + bx^{-1}}{p}\right).$$

This is a joint work with Emmanuel Kowalski.

135 *A non-trivial minorant of the set of Salem numbers*

Verger-Gaugry, Jean-Louis (Univ.-Grenoble-Alpes, Univ. Savoie Mont Blanc, CNRS, LAMA, Chambéry, France.)

A Salem number is a real algebraic integer β which is > 1, for which the minimal polynomial is reciprocal, and the conjugates, except β and β^{-1}, are of modulus 1. The smallest Salem number known is Lehmer's number $1.176280\ldots$, dominant root of a degree 10 integer polynomial having coefficients in $\{-1, 0, +1\}$. Salem numbers play a role in various contexts [2]. Several questions are asked about Salem numbers: does there exist Salem numbers smaller than Lehmer's number? Could a Salem number be a limit point of sequences of Salem numbers? The topology of the set T of the Salem numbers is not known: whether T is closed or not in the half-line $(1, +\infty)$ is still obscure. Denote by S the set of Pisot numbers. Two Conjectures have been formulated (Boyd): (1) $\mathrm{S} \cup \mathrm{T}$ is closed, (2) the first derived set $\mathrm{T}^{(1)}$ of T satisfies $\mathrm{T}^{(1)} = \mathrm{S}$. Neighbourhoods of Salem numbers have been studied in [1] in terms of rational maps and Stieltjes continued fractions.

In this work we prove the (ex-)Lehmer Conjecture for Salem numbers (Theorem 1.5 in [3]). If θ_{31} denotes the unique root of the trinomial $-1 + x + x^{31}$ in the interval $(0, 1)$, then

$$\beta \in \mathrm{T} \qquad \Longrightarrow \qquad \beta > \theta_{31}^{-1} = 1.08544\ldots.$$

The proof relies upon the Rényi numeration dynamical system and the properties of the β-transformation, when β is a Salem number, and the completion of the lenticular curve of the zeroes of the polynomials P, inside the open unit disk in $\mathbb{C}$, when P runs over the class

$$\mathscr{C} := \{-1 + x + x^n + x^{m_1} + x^{m_2} + \ldots + x^{m_s} : n \geq 3,\ m_1 - n \geq n - 1, m_q - m_{q-1} \geq n - 1 \quad \text{for} \quad 2 \leq q \leq s\}.$$

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136 *Sums of arithmetic functions running on factorials*

Verreault, William (Université Laval)

Given an arithmetic function $f : \mathbb{N} \to \mathbb{R}$, it is customary to investigate the behavior of the corresponding sum $\sum_{n \le N} f(n)$ for large N. Here, for various classical arithmetic functions f, including the number of distinct prime factors function $\omega(n)$, Euler totient's function $\phi(n)$, the number of divisors function $d(n)$, the sum of the divisors function $\sigma(n)$, as well as the middle divisors functions $\rho_1(n)$ and $\rho_2(n)$, we investigate the behavior of $f(n!)$ and their corresponding sums $\sum_{n \le N} f(n!)$. Finally, if λ stands for the Liouville function, according to the Chowla conjecture, $\sum_{n \le N} \lambda(n)\lambda(n+1) = o(N)$ as $N \to \infty$; here, we show that the analogue of the Chowla conjecture for factorial arguments is true as we prove that, as $N \to \infty$, we have $\sum_{n \le N} \lambda(n!)\lambda((n+1)!) = o(N)$.

137 *Curves with few bad primes over cyclotomic $\mathbb{Z}_\ell$-extensions*

Visser, Robin (University of Warwick)

Let K be a number field, and S a finite set of non-archimedean places of K, and write $\mathcal{O}_S^\times$ for the group of S-units of K. A famous theorem of Siegel asserts that the S-unit equation $\varepsilon + \delta = 1$, with $\varepsilon, \delta \in \mathcal{O}_S^\times$, has only finitely many solutions. A famous theorem of Shafarevich asserts that there are only finitely many isomorphism classes of elliptic curves over K with good reduction outside S. Now let ℓ be a prime, and instead of a number field, let $K = \mathbb{Q}_{\infty,\ell}$ which denotes the $\mathbb{Z}_\ell$-cyclotomic extension of $\mathbb{Q}$. We show that the S-unit equation $\varepsilon + \delta = 1$, with $\varepsilon, \delta \in \mathcal{O}_S^\times$, has infinitely many solutions for $\ell \in \{2, 3, 5, 7\}$, where S consists only of the totally ramified prime above ℓ. Moreover, for every prime ℓ, we construct infinitely many elliptic or hyperelliptic curves defined over K with good reduction away from 2 and ℓ. For certain primes ℓ we show that the Jacobians of these curves in fact belong to infinitely many distinct isogeny classes. This talk is based on joint work with Samir Siksek.

138 *On sums of two Fibonacci numbers that are powers of integers with sparse Zeckendorf representation*

Vukusic, Ingrid (University of Salzburg)

In 2018, Luca and Patel [2] conjectured that the largest perfect power representable as the sum of two Fibonacci numbers is $38642 = F_{36} + F_{12}$. In other words, they conjectured that the equation

$$y^a = F_n + F_m$$

has no solutions with $a \ge 2$ and $y^a > 38642$. While this is still an open problem, there exist several partial results. For example, recently Kebli, Kihel, Larone and Luca [1] proved an explicit upper bound for y^a, which depends on the size of y.

In this talk, we find an explicit upper bound for y^a, which only depends on the Hamming weight of y with respect to the Zeckendorf representation. This is joint work with Volker Ziegler.

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139 *Construction of polynomials with prescribed divisibility conditions on the critical orbit*

Wafik, Mohamed (University of South Carolina)

Let $f_{d,c}(x) = x^d + c \in \mathbb{Q}[x]$, $d \geq 2$. We write $f_{d,c}^n$ for $\underbrace{f_{d,c} \circ f_{d,c} \circ \cdots \circ f_{d,c}}_{\text{n times}}$. The critical orbit of $f_{d,c}(x)$ is the set $\mathcal{O}_{f_{d,c}}(0) := \{f_{d,c}^n(0) : n \geq 0\}$.

For a sequence $\{a_n : n \geq 0\}$, a primitive prime divisor for a_k is a prime dividing a_k but not a_n for any $1 \leq n < k$. A result of H. Krieger asserts that if the critical orbit $\mathcal{O}_{f_{d,c}}(0)$ is infinite, then each element in $\mathcal{O}_{f_{d,c}}(0)$ has at least one primitive prime divisor except possibly for 23 elements. In addition, under certain conditions, R. Jones proved that the density of primitive prime divisors appearing in any orbit of $f_{d,c}(x)$ is always 0.

In this talk, I'll discuss joint work with Mohammad Sadek, in which we display an upper bound on the count of primitive prime divisors of a fixed iteration $f_{d,c}^n(0)$. Further, we show that there is no uniform upper bound on the count of primitive prime divisors of $f_{d,c}^n(0)$ that does not depend on c. In particular, given $N > 0$, there is $c \in \mathbb{Q}$ such that $f_{d,c}^n(0)$ has at least N primitive prime divisors. This, along with some previous results, allows for the construction of polynomials of the form $f_{d,c}(x)$ whose n-th iterates possess maximal Galois Groups.

140 *Friable numbers are orthogonal to nilsequences*

Wang, Mengdi (KTH Stockholm)

Call an integer $[y', y]$-friable if all its prime factors are in the interval $[y', y]$. In this talk, we will discuss the history of counting solutions to linear equations with friable number variables. Suppose that $K' \geq 1$ is a large integer and $y' = \log^{K'} N$. In joint work with Lilian Matthiesen, we show that the system of finite complexity linear equations always has a solution when the set of $[y', y]$-friable numbers is relatively dense. As part of the proof, we also prove that $[y', y]$-friable numbers are orthogonal to nilsequences (generalized polynomial phase functions) as long as $\log^K N \leq y \leq N$ and K/K' is sufficiently large.

141 *Series representations and asymptotically finite representations for the numbers* $\zeta(2m+1)$

Weba, Michael (Goethe University Frankfurt)

Consider the problem of finding representations for the numbers $\zeta(2m+1)$ where ζ denotes the Riemann zeta function and m is a prescribed positive integer. In the literature, special emphasis has been laid on series representations involving the numbers $\zeta(2n), n \geq 1$. In the specific case $m = 1$, a classical result due to Euler is given by

$$\zeta(3) = \frac{\pi^2}{7}\left(1 - 2\sum_{n=1}^{\infty} \frac{\zeta(2n)}{(n+1)(2n+1)4^n}\right). \tag{7}$$

Recently, Lupu and Orr established the formula

$$\zeta(3) = \frac{4\pi^2}{35}\left(\frac{3}{2} - \ln\frac{\pi}{2} + \sum_{n=1}^{\infty} \frac{\zeta(2n)}{n(n+1)(2n+1)16^n}\right). \tag{8}$$

This talk presents a parameterized family of series representations for the numbers $\zeta(2m+1)$. Based on Clausen functions of higher order, several conventional results are improved and generalized; in particular, the rate of convergence can considerably be improved. Regarding $m = 1$, for instance, one obtains

$$\zeta(3) = \frac{\pi^2}{12}\left(\frac{3}{2} - \ln\frac{\pi}{3} + \sum_{n=1}^{\infty}\frac{\zeta(2n)}{n(n+1)(2n+1)36^n}\right), \tag{9}$$

i.e., the power 16^n in the infinite series (2) can be replaced be 36^n.
The parameterized family is also applicable to represent the values $\beta(2m)$ of the Dirichlet beta function and to derive asymptotically finite representations for both $\zeta(2m+1)$ and $\beta(2m)$.

142 *Hooley's function along friable integers*

Wetzer, Julie (LMPA-ULCO)

Introduced by Erdős in 1974, *Hooley's Delta function* is defined as

$$\Delta(n) := \sup_{v\in\mathbb{R}} \sum_{\substack{d|n \\ v\le\log d<v+1}} 1 \quad (n \in \mathbb{N}^*).$$

Hooley's function is thus an arithmetic function which measures the logarithmic concentration of the set of divisors of an integer. It is known that there exists $c_0 > 0$ such that

$$\log_2 x \ll \frac{1}{x}\sum_{n\le x}\Delta(n) \ll \exp(c_0\sqrt{\log_2 x \log_3 x}) \qquad (x \ge 16).$$

The lower bound was proved by Maier and Tenenbaum in 1982 and the upper bound by Tenenbaum in 1985.
We obtain lower and upper bounds for the average order of Δ along friable integers, i.e. integers without large prime factors.
To get the lower bound we evaluate the quantity $\sum_{\substack{n\le x \\ P^+(n)\le y}} \Delta(n)$ over three non-disjoint domains, using results from saddle point approximations, probabilistic arguments and a parametrized version of a theorem by Tenenbaum and Wu. As for the upper bound, we extend a method developped by Tenenbaum in 1985 of the average value of Δ along friable integers.

143 *Irreducibility of truncated binomial polynomials*

Yadav, Prabhakar Ratipal (Stat-Math Unit, Indian Statistical Institute (ISI), Delhi Centre)

For positive integers $n \ge m$, let

$$P_{n,m}(x) := \sum_{j=0}^{m}\binom{n}{j}x^j = \binom{n}{0} + \binom{n}{1}x + \binom{n}{2}x^2 + \ldots + \binom{n}{m}x^m$$

be the truncated binomial expansion of $(1+x)^n$ consisting of all terms of degree $\le m$. These polynomials arose in the investigation of Schubert calculus of Grassmannians. It is conjectured that for $n > m+1$, the polynomial $P_{n,m}(x)$ is irreducible. We confirm this conjecture for $2m \le n < (m+1)^{10}$. Under explicit abc conjecture, for a fixed m, we give an explicit n_0 depending only on m such that $\forall n \ge n_0$, the polynomial $P_{n,m}(x)$ is irreducible. This is a joint work with Prof. S. Laishram.

144 *Hodge cycles on a product of CM abelian varieties*

Yanai, Hiromichi (Aichi Institute of Technology)

We consider the existence of exceptional Hodge cycles on a product of CM abelian varieties in two cases. One is the case of mutually nonisogenous abelian varieties and the other is mutually isogenous case.

145 *Quadratic forms and where to find them*

Yatsyna, Pavlo (Aalto University)

This talk will address questions concerning quadratic forms representing integers in rings of integers of totally real number fields, with a particular focus on universal quadratic formsforms that can represent all totally positive integers.

146 *The Hasse principle for homogeneous polynomials with random coefficients over thin sets*

Yeon, Kiseok (Purdue University)

In this talk, we first give an overall history of the problems of confirming the Hasse principle for projective hypersurfaces over $\mathbb{Q}$. Next, we provide the sketch of the classical approach via the circle method in order to confirm the Hasse principle. Lastly, we provide a motivation for establishing our main result, and we finish this talk by providing the main result at the end of the slides.

147 *The number of lattice points in thin sectors*

Yesha, Nadav (University of Haifa)

On the circle of radius R centred at the origin, consider a thin sector about the fixed line $y = \alpha x$, whose central angle shrinks as $R \to \infty$. In this talk, I will discuss the number of integer lattice points lying in such a sector, and how to establish an asymptotic count for this number. The results depend both on the decay rate of the central angle and on the rationality/irrationality type of α; in particular, if α is Diophantine, then the number of lattice points is asymptotic to the area of the sector in an essentially optimal regime for the angle's decay rate. Based on joint work with Ezra Waxman.

148 *Divisibility by 2 on quartic models of elliptic curves and rational Diophantine $D(q)$-quintuples*

Yesin, Tuğba (Sabancı University)

Let C be a smooth genus one curve described by a quartic polynomial equation over the rational field $\mathbb{Q}$ with $P \in C(\mathbb{Q})$. In this talk, I'll describe joint work with Mohammad Sadek, giving an explicit criterion for the divisibility-by-2 of a rational point on the elliptic curve (C, P). This generalizes the classical criterion of the divisibility-by-2 on elliptic curves described by Weierstrass equations.

We also employ this criterion to investigate the question of extending a rational $D(q)$-quadruple to a quintuple. We give concrete examples to which we can give an affirmative answer. One of these results implies that although the rational $D(16t+9)$-quadruple $\{t, 16t+8, 225t+14, 36t+20\}$ can not be extended to a polynomial $D(16t+9)$-quintuple using a linear polynomial, there are infinitely many rational values of t for which the aforementioned rational $D(16t+9)$-quadruple can be extended to a rational $D(16t+9)$-quintuple. Moreover, these infinitely many values of t are parametrized by the rational points on a certain elliptic curve of positive Mordell-Weil rank.

149 *Global series for height 1 multiple zeta functions*

Young, Paul Thomas (College of Charleston)

We use everywhere-convergent series for the height 1 multiple zeta functions $\zeta(s,1,\ldots,1)$ to determine the singular parts of their Laurent series at each of their poles, and give an expression for each first "Stieltjes constant" (i.e., the linear Laurent coefficient) as series involving the Bernoulli numbers of the second kind, generalizing the classical Mascheroni series for Euler's constant γ. The first Stieltjes constants at $s=1$ and at $s=0$ are then interpreted in terms of the Ramanujan summation of multiple harmonic star sums $\zeta^\star(1,\ldots,1)$.

150 *Equal-Sum-Product Problem*

Zakarczemny, Maciej (Cracow University of Technology)

In this talk, we present the results related to a problem posed by Andrzej Schinzel [1], [2, p. 261–262]. Does the number $N_1(n)$ of integer solutions of the equation

$$x_1+x_2+\ldots+x_n = x_1x_2\cdot\ldots\cdot x_n,\ x_1\geq x_2\geq\ldots\geq x_n\geq 1$$

tend to infinity with n? Let a be a positive integer. We give a lower bound on the number of integer solutions, $N_a(n)$, to the equation

$$x_1+x_2+\ldots+x_n = ax_1x_2\cdot\ldots\cdot x_n,\ x_1\geq x_2\geq\ldots\geq x_n\geq 1.$$

We show that if $N_2(n)=1$, then the number $2n-3$ is prime. The average behavior of $N_2(n)$ is studied. We prove that the set $\{n : N_2(n)\leq k,\ n\geq 2\}$ has zero natural density.

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151 *Le programme de Langlands appliqué à la théorie de Galois inverse*

Zenteno, Adrián (Centro de Investigación en Matemáticas, A.C. (CIMAT))

Ces dernières années, l'étude des images des représentations galoisiennes associées aux représentations automorphes cuspidales de $GL_n(\mathbb{A}_\mathbb{Q})$, via la correspondance de Langlands, a été une stratégie efficace pour traiter le problème de la théorie de Galois inverse pour les groupes finis de type Lie. Dans cet exposé, nous expliquerons comment, en combinant cette stratégie avec la fonctorialité de Langlands et la globalisation des représentations supercuspidales, nous pouvons construire des représentations galoisiennes résiduelles avec image contrôlée et obtenir de nouvelles familles de groupes finis de type B_m, C_m et D_m qui se réalisent comme le groupe de Galois d'une extension galoisienne $K/\mathbb{Q}$.

152 *Hecke continued fractions and orders in relative quadratic extensions*

Zeytin, Ayberk (Université Galatasaray)

In this talk, we will interpret a classical continued fraction as a(n) (in)finite path on the bipartite Farey tree. We will use a generalization of this interpretation to obtain a correspondence between orders in (relative) quadratic extensions and some combinatorial objects that we call (generalized) çark.

153 *Lower bounds for negative moments of $\zeta'(\rho)$*

Zhao, Liangyi (The University of New South Wales, Sydney, Australia)

We establish lower bounds for the discrete $2k$-th moment of the derivative of the Riemann zeta function at nontrivial zeros for all $k < 0$ under the Riemann hypothesis (RH) and the assumption that all zeros of $\zeta(s)$ are simple.

154 *On products of prime powers in linear recurrence sequences*

Ziegler, Volker (University of Salzburg)

In this talk we consider the Diophantine equation $U_n = p^x q^y$, where $U = (U_n)_{n\geq 0}$ is a linear recurrence sequence, p and q are distinct prime numbers and $x, y \geq 0$ are non-negative integers not both zero. We show that under some technical assumptions the Diophantine equation $U_n = p^x q^y$ has at most two solutions (n, x, y) provided that $p, q \notin S$, where S is a finite, effectively computable set of primes, depending only on U.

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Zhao, Liangyi
Zhu, Xinwen
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