Conference on Harmonic Analysis, Function Theory, Operator Theory and Applications

in honor of Jean Esterle

Spring School of the GdR Network
"Analyse Fonctionnelle, Harmonique et Probabilités"

June, 1 - 6, 2015

Institute of Mathematics of Bordeaux
University of Bordeaux

NB: this booklet contains information both on the Conference "Harmonic Analysis, Function Theory, Operator Theory and Applications" and the Spring School of the GdR Network "Analyse Fonctionnelle, Harmonique et Probabilités".

Contents

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Acknowledgements

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Organizing Committee of the Conference: A. Hartmann, P. Jaming, K. Kellay, S. Kupin, M. Zarrabi.
Organizing Committee of the Spring School: R. Deville, P. Jaming, K. Kellay.

1. Organization of the conference : location, registration, computer access, and reimbursement information

The conference takes place at the Institute of Mathematics of Bordeaux (= IMB, for short). The Institute is located at Building A33, see Section 7 for more directions to the site.

The talks will be given at the Conference Auditorium of IMB (= "Salle des Conférences" in French) located on the first floor right to the left after the entrance to IMB and Room 1 (= "Salle 1" in French) situated on the first floor of IMB twenty of meters further in the corridor with respect to the Conference Auditorium (after the elevator/staircase landing). The Conference Auditorium and Room 1 of IMB are often abbreviated as "Room A" and "Room B", respectively.

Coffee breaks will take place in the Coffee Lounge of IMB, located on the first floor of IMB (take the corridor to the right after the entrance).

The REGISTRATION of the participants will take place on June, 1, 2015, at the Coffee Lounge of IMB from 8:30 to 9:30 and from 12:30 to 14:00. During the registration, participants will be asked to provide the following information:

- If he (she) intends to attend the guided tour on Tuesday afternoon, see Section 6.2 for more details.
- If he (she) will take part in the Conference Dinner (to be held on the evening of June, 3, 2015),
- If yes, the number of accompanying persons and the choice of courses, see Section 6.3 for more details,

and make the payment for the dinner. The dinner is 20€ per participant of the conference (and/or the spring school) and 40 € per accompanying person. Please have the exact amount in cash.

WIFI-COMPUTER ACCESS: the participants of the conference will get a UNIX account for the duration of the event. Your personal login and password is inserted inside your conference folder.

To get the WI-FI access on your laptop computer, please start your web browser, connect to REAUMUR and click on "Connect / Se connecter" button on its capturing screen. This will bring you to a screen with a sort of login form; please choose ".Conférences / Invités" session, enter your login/password and proceed as usually.

You can also directly login to IMB terminals located at Room 151 (it is on a half-way from the Conference Room to the Coffee lounge); the door to the room will be kept open. To use the computers, please choose "Mode VISITEUR / clavier français" or "GUEST mode / English keyboard", and open the session with your login and password. Please be aware that any file saved on the computer during the session will be erased after you log off.

IMPORTANT: if you were agreed some REIMBURSEMENT of your fares (for instance, hotel expenses) please do not pay upon your hotel check-out, since your stay at the hotel is already covered by a money transfer from University of Bordeaux. In this case, you are asked to provide the following data (if this has not been done yet):

- Name, surname,
- The date and the place of birth,
- Citizenship (if French one, please also give your social security number),
- Your university address,
- Your personal address,
- Your bank account coordinates (the name and the address of your bank, IBAN(= your international bank account number) and SWIFT code; a RIB for participants from France is perfectly ok).

2. Program

Notations "Room A" and "Room B" stay for the Conference Auditorium of IMB (= "Salle des Conférences" in French) located on the first floor right to the left after the entrance to IMB and Room 1 (= "Salle 1" in French) situated on the first floor of IMB twenty of meters further in the corridor with respect to the Conference Auditorium (after the elevator/staircase landing).

Monday, June, 1.		
8:30-9:30 12:30-14:00	Registration, Coffee Lounge	
9:30-10:15	H. Queffélec, Room A Hardy spaces of Dirichlet series and their composition operators	
10:20-10:50	Coffee break, Coffee Lounge	
10:50-11:35	J. Leblond, Room A Uniqueness results for boundary value problems concerning 2D elliptic PDEs	
11:40-12:25	T. Ransford, Room A A Gleason-Kahane-Zelazko theorem for modules and applications to holomorphic function spaces	
12:30-14:00	Lunch	
14:00-14:45	S. Pott, Room A Sharp bounds for Calderon-Zygmund operators in a vector-valued setting	
14:55-15:20	A. Baranov, Room A Hypercyclic Toeplitz operators	J. Peláez, Room B Embedding derivatives of weighted Bergman spaces into Lebesgue spaces via harmonic analysis
15:30-15:55	K. Fedorovskiy, Room A Nevanlinna domains and density of certain polynomial modules	C. Kriegler, Room B Decomposable Schur multipliers and non-commutative Fourier multipliers
16:00-16:25	Coffee break, Coffee Lounge	
16:25-16:50	D. Timotin, Room A Schur coupling and other equivalence relations on Banach spaces	Z. Lykova, Room B Algebraic and geometric aspects of rational Γ-inner functions
17:00-17:25	Yu. Belov, Room A Uniqueness of Gabor series	N. Young, Room B Finite Blaschke products and rational Γ-inner functions
19:00-20:15	Reception at the City Hall of Bordeaux, see Sect. 6.1 for more details	

Tuesday, June, 2.		
9:00-9:45	G. Dales, Room A Norming the infinitesimals of large fields - old theorems and remaining questions	
9:50-10:35	A. Borichev, Room A Random and pseudo-random Taylor series	
10:40-11:10	Coffee break, Coffee Lounge	
11:10-11:55	S. Grellier, Room A Non linear Fourier transform and wave turbulence	
12:00-12:45	B. Wick, Room A Two Weight Estimates for Commutators	
12:50-14:10	Lunch	
14:10-14:35	I. Simon, Room A Césaro-summability on some local fields	N. Hamda, Room B The Hardy space H^1 in the rational Dunkl setting
14:45-15:30	H. Hedenmalm, Room A The Klein-Gordon equation, the Hilbert transform, and dynamics of Gauss-type maps	
16:30-18:00	Guided tour of Bordeaux, see Sect. 6.2 for more details	

Wednesday, June, 3.		
9:00-9:45	S. Grivaux, Room A Some universal linear dynamical systems in the sense of Glasner and Weiss	
9:50-10:35	O. El-Fallah, Room A Asymptotic behavior of eigenvalues of Toeplitz operators on the weighted analytic spaces	
10:40-11:10	Coffee break, Coffee Lounge	
11:10-11:35	C. Câmara, Room A Asymmetric truncated Toeplitz operators	A. O'Farrell, Room B Boundary smoothness of analytic functions
11:45-12:10	R. Zarouf, Room A Optimal estimates for condition numbers and norms of resolvents in terms of the spectrum	J. Rosendaal, Room B Operator Lipschitz functions on Banach spaces
12:10-14:00	Lunch	
14:00-14:25	V. Petkova, Room A Spectra of Wiener-Hopf operators on weighted spaces	M. Ozgur, Room B Disjoint hypercyclic and supercyclic weighted shifts
14:35-15:00	E. Gallardo Gutiérrez, Room A An extension of a Theorem of Domar on invariant subspaces	J. Galé, Room B Griffiths positive curvature of reproducing kernels
15:10-15:35	C. Badéa, Room A Harnack inequality, unitary dilations and singular measures	M. H. Mortad, Room B Conditions implying commutativity of self-adjoint operators
15:40-16:00	Coffee break, Coffee Lounge	
16:05-16:50	I. Chalendar, Room A Semigroups of composition operators on spaces of analytic functions	
17:00-17:45	A. Volberg, Room A Monge-Ampère equations with drift and sharp weak type estimates in harmonic analysis	
19:30-22:30	Conference dinner at "Café du port", see Sect. 6.3 for more details	

Thursday, June, 4.	
9:30-10:15	G. Kozma, Room A Lace expansion: a challenge to harmonic analysis
10:20-10:50	Coffee break, Coffee Lounge
10:50-11:35	S. Petermichl, Room A Mixed commutators and little product BMO
11:40-12:25	G. Pisier, Room A On the metric entropy of the Banach-Mazur compactum
Closing of the Conference	
12:30-14:00	Lunch
Opening of the Spring School of the GdR	
14:00-15:30	I. Chalendar, Room A **Lecture 1:** Opérateurs de composition pondérés sur divers espaces de fonctions analytiques
15:30-16:00	Coffee break, Coffee Lounge
16:00-17:30	Poster session:
	A. Ben Ali Essalah, Strong-local and weak $*$-local $*$-automorphisms S. Chefai, Inverse problems and approximations in quantum calculus R. Ghabii, Sur la transformée de Fourier généralisée associée à un opérateur de type Cherednik sur $\mathbb{R}$ M. Hleili, Generalized q-Bessel Operator M. Karmouni, On algebraic and analytic core S. Menkad, On the injective norm and Moore-Penrose inverse S. Negzaoui, Principes d'incertitudes associés à la transformation de Bessel-Struve A. Saoudi, Littlewood-Paley decomposition in quantum calculus P. Sharma, On Approximation Properties of Generalization of Kantorovich-Type Discrete q-Beta Operators

Friday, June, 5.	
9:00-10:30	I. Chalendar, Room A **Lecture 2:** Opérateurs de composition pondérés sur divers espaces de fonctions analytiques
10:30-10:50	Coffee break, Coffee Lounge
10:50-12:20	B. Wick, Room A **Lecture 1:** Carleson measures for spaces of analytic functions
12:30-15:30	R. Tessera, Room A **Lecture 1:** Plongements grossiers d'espaces métriques dans les espaces de Banach
15:30-15:50	Coffee break, Coffee Lounge

Saturday, June, 6.	
9:00-10:30	B. Wick, Room A **Lecture 2:** Carleson measures for spaces of analytic functions
10:30-10:50	Coffee break, Coffee Lounge
10:50-12:20	R. Tessera, Room A **Lecture 2:** Plongements grossiers d'espaces métriques dans les espaces de Banach
Closing of the Spring School of the GdR	

3. Abstracts of the Talks and Short Courses

3.1. Abstracts of the Talks at the Conference.

Catalin Badea, Université Lille 1
Harnack inequality, unitary dilations and singular measures

We discuss several properties of the Harnack domination of Hilbert space contractions. Thus, the maximal elements for this relation are identified as precisely the singular unitary operators, while the minimal elements are shown to be the isometries and the adjoints of isometries. We also show how a large range of properties (e.g. convergence of iterates, peripheral spectrum, ergodic properties) are transfered from a contraction to one that Harnack dominates it.
This is joint work with Laurian Suciu and Dan Timotin.

Anton Baranov, Chebyshev Laboratory, St. Petersburg University, Russia
Hypercyclic Toeplitz operators

Starting from the well-known result by S. Rolewisz, Toeplitz operators with antianalytic symbols were among the basic examples of hypercyclic operators. However, it seems that hypercyclicity phenomenon for general Toeplitz operators is much less studied and the hypercyclicity criteria are not known. Recently, S. Shkarin described hypercyclic Toeplitz operators with symbols of the form $\Phi(z) = a\overline{z} + b + cz$ (i.e., with tridiagonal matrix). In this talk we give new examples of hypercyclic Toeplitz operators with symbols having polynomial antianalytic part. For the case $\Phi(z) = a\overline{z} + \varphi(z)$ where $\varphi \in H^\infty$, the necessary and sufficient conditions of hypercyclicity essentially coincide.
The talk is based on a joint work with Andrei Lishanskii.

Yuri Belov, Chebyshev Laboratory, St. Petersburg University, Russia
Uniqueness of Gabor series

We prove that any complete and minimal Gabor system of Gaussians is a Markushevich basis in $L^2(\mathbb{R})$. This result is an analogous to Young's theorem for systems of complex exponentials $\{e^{i\lambda_n t}\}$ in L^2 of an interval.

Alexandre Borichev, Université Aix-Marseille
Random and pseudo-random Taylor series

We study the asymptotical behavior of entire functions represented by random and pseudo-random Taylor series.
Joint work with Alon Nishry and Mikhail Sodin.

Cristina Câmara, Technical University of Lisbon, Portugal
Asymmetric truncated Toeplitz operators

Truncated Toeplitz operators and their asymmetric versions are studied in the context of the Hardy spaces H^p of the half-plane. It is shown that they are equivalent after extension to Toeplitz operators with 2×2 matrix symbols, which allows one to deduce information about their spectral properties.
This talk is based on joint work with Jonathan Partington.

Isabelle Chalendar, Université Lyon 1
Semigroups of composition operators on spaces of analytic functions

In this talk I will give a complete characterization of quasicontractive groups and analytic C_0-semigroups on Hardy and Dirichlet space on the unit disc with a prescribed generator of the form $Af = Gf'$. In the analytic case, it is also possible to give a complete characterization of immediately compact semigroups. When the analyticity fails, sufficient conditions for compactness and membership in the trace class are presented. Finally, the case where the unit disc is replaced by the right-half plane is analyzed, showing that the results are drastically different.
Joint work with C. Avicou and J. Partington.

Harold Garth Dales, Lancaster University, UK
Norming the infinitesimals of large fields - old theorems and remaining questions

We introduce some large ordered fields and ask whether one can put an algebra norm on the subalgebra of infinitesimals of such a field. In particular we shall introduce a 'grown-up version of the real line'. We shall explain a connection with a the following question of Kaplansky: Let Ω be a compact space, and let $C(\Omega)$ denote the Banach algebra of all continuous functions on Ω. Are all homomorphisms from $C(\Omega)$ into a Banach algebra automatically continuous? To answer this question we shall discuss prime ideals in the algebras $C(\Omega)$, and the 'super-real fields' that are built from them.

In fact, Kaplansky's question is independent of ZFC, as proved by W. H. Woodin; we shall explain what this means.

Answers to Kaplansky's question (in ZFC + CH) were given long ago by Jean Esterle and by myself. For example, Jean characterized the Banach algebras that are the ranges of discontinuous homomorphisms. However some new results have been proved, and there are several challenging open questions for the younger generation.

Omar El–Fallah, University of Rabat, Morocco

Asymptotic behavior of eigenvalues of Toeplitz operators on the weighted analytic spaces

We consider the Toeplitz operators on a class of analytic function spaces, containing Bergman and Bargman-Fock spaces. We give a characterization of compact Toeplitz operators having the eigenvalues going slowly to zero.

Konstantin Fedorovskiy, Bauman Moscow State Technical University, Russia

Nevanlinna domains and density of certain polynomial modules

In the talk the problem of density in the space $C(X)$ (where X is a compact subset of the complex plane) of polynomial modules $\{p + \overline{z}^k q \colon p, q$ are polynomials in the complex variable z and $k \in \mathbb{N}\}$ and two related problems in theory of model spaces, namely the problem of existence of univalent functions and the problem of taking roots, will be discussed.
The talk is based on the joint work with Anton Baranov and Joan Carmona.

José Galé, University of Zaragoza, Spain

Griffiths positive curvature of reproducing kernels

It will be explained how to associate covariant derivatives and corresponding curvature forms to reproducing kernels on Hermitian vector bundles. In the case when the bundles and kernels are holomorphic, it will be shown that sch a derivative is compatible with the complex and the Hermitian structures, and that the curvature form is of Griffiths positive type for the metric defined by the kernel.
This is part of joint work with D. Beltita.

Eva Gallardo Gutiérrez, Universidad Complutense de Madrid, Spain

An extension of a Theorem of Domar on invariant subspaces

A remarkable theorem of Domar asserts that the lattice of the invariant subspaces of the right shift semigroup $\{S_\tau\}_{\tau \geq 0}$ in $L^2(\mathbb{R}_+, w(t)dt)$ consists of just the *"standard invariant subspaces"* whenever w is a positive continuous function in $\mathbb{R}_+$ such that

(1) $\log w$ is concave in $[c, \infty)$ for some $c \geq 0$,

(2) $\lim_{t\to\infty} \dfrac{-\log w(t)}{t} = \infty$, and $\lim_{t\to\infty} \dfrac{\log|\log w(t)| - \log t}{\sqrt{\log t}} = \infty$.

We prove an extension of Domar's Theorem to a wider class of weights w not fulfilling condition (1); which answers a question posed by Domar.
Joint work with Jonathan Partington (Leeds) and Daniel Rodriguez (Zaragoza).

Sandrine Grellier, Université d'Orléans

Non linear Fourier transform and wave turbulence

We establish an inverse spectral result on compact Hankel operators on the unit sphere. Namely, we describe the set of symbols of compact Hankel operators having a prescribed sequence of singular

values. It is done by constructing a one-to-one correspondence between a symbol of a compact Hankel operator and its sequence of singular values as well as some additional spectral parameters.

This one-to-one correspondence plays the role of a non linear Fourier transform for some hamiltonian equation: the cubic Szegő equation. It allows to obtain explicit formulae of the solutions of the cubic Szegő equation and to prove a wave turbulence phenomenon: a small perturbation at the origin may create for large time large oscillations on small space scales.
Joint work with Patrick Gérard.

Sophie Grivaux, Université Lille 1
Some universal linear dynamical systems in the sense of Glasner and Weiss

A linear dynamical system is given by a pair (Z, A), where Z is a separable Banach space and A is a bounded linear operator on Z. Such systems can be studied from the topological point of view as well as from the ergodic-theoretic point of view, when Z is endowed with an interesting A-invariant probability measure. Glasner and Weiss recently gave an example of such a dynamical system which is universal in the following sense: for every ergodic dynamical system $(X, \mathcal{B}, \mu; T)$ on a standard probability space, there exists an A-invariant probability measure m on H with full support such that the two dynamical systems $(X, \mathcal{B}, \mu; T)$ and $(H, \mathcal{B}_H, m; A)$ are isomorphic. We will present a large class of linear dynamical systems enjoying this property, as well as certain applications.

Nabila Hamda, University Tunis El Manar, Tunisia
The Hardy space H^1 in the rational Dunkl setting

This work is perhaps the first attempt at a study of the Hardy space H^1 in the rational Dunkl setting. Following Uchiyama's approach, we characterize H^1 atomically and by means of the heat maximal operator. We also obtain a Fourier multiplier theorem for H^1. These results are proved here in the one-dimensional case and in the product case.
Joint work with J.-P. Anker, J. Dziubanski and N. Ben Salem.

Haakan Hedenmalm, Royal Institute of Technology, Stockholm, Sweden
The Klein-Gordon equation, the Hilbert transform, and dynamics of Gauss-type maps

We extend the standard transfer operator for Gauss-type maps to the space $L^1 + H(L^1)$, where H is the Hilbert transform. From a physical perspective, this amounts to allowing not just point localized states but also the Hilbert transform of such a state as a fundamental state. The extended transfer operator fails to be a contraction, but nevertheless it has no eigenfunction with eigenvalue 1. This means that there is no invariant distribution in the given space, which goes beyond the standard theory of maps with weakly repelling fixed points. It is explained what are the consequences for the Klein-Gordon equation in one spatial dimension.
This reports on joint work with A. Montes.

Gady Kozma, Weizman Institute, Rehovot, Israel
Lace expansion: a challenge to harmonic analysis

Lace expansion, pioneered by Brydges and Spencer in 1985, is a powerful technique for understanding statistical mechanics model in high dimension. At the heart of the proof is an analysis of convolution inequalities. We will discuss a new, simplified proof that revolves around certain Banach algebras.
Joint work with Remco van der Hofstad and Erwin Bolthausen.

Christoph Kriegler, Université de Clermont-Ferrand
Decomposable Schur multipliers and non-commutative Fourier multipliers

A linear operator $T : L^p(\Omega) \to L^p(\Omega)$ is called decomposable if it is a linear combination of positive operators T_k, i.e. $T_k f \geq 0$ for any $f \geq 0$. Decomposable operators allow tensor extensions $T \otimes S$ on $L^p(\Omega; X)$ for any bounded $S : X \to X$. In this talk, we extend this notion to operators acting on non-commutative L^p spaces and show some properties of decomposable Schur multipliers $S^p \to S^p$, $[x_{ij}] \mapsto [\phi_{ij} x_{ij}]$ and decomposable non-commutative Fourier multipliers acting on group

von Neumann algebras. This generalises work of W. Arendt and J. Voigt from 1991.
The talk is based on joint work with Cédric Arhancet (Université de Franche-Comté).

Juliette Leblond, INRIA Sophia Antipolis
Uniqueness results for boundary value problems concerning 2D elliptic PDEs.

We will discuss sufficient conditions for a strong unique continuation result to hold, for harmonic functions in simply connected domains of the plane [1]. Namely: a harmonic function whose trace vanishes on a boundary subset of positive Lebesgue measure as well as that of its normal derivative does identically vanish at least if: the domain is Dini smooth, or the boundary trace of the harmonic function admits a square summable derivative there.

It generalizes Holmgren's theorem and similar results in smoother cases, and relies on tools of complex analysis, holomorphic functions and Hardy spaces. It can be shown still to be valid for solutions to conductivity and time harmonic Schrödinger equations, for smooth enough coefficients / potential [2], using Hardy classes of pseudo-holomorphic functions [3] and their factorization property through holomorphic functions.

As a consequence, we derive a uniqueness property for inverse boundary value problems with bounded Robin coefficients in the above mentionned PDEs which we will comment, together with physical applications and other uniqueness issues.
References:
[1] L. Baratchart, L. Bourgeois, J. Leblond. Uniqueness results for 2D inverse Robin problems with bounded coefficient. Inria Research Report no. 8665, 2015.
[2] L. Baratchart, L. Bourgeois, J. Leblond. Uniqueness results for inverse Robin problems with bounded coefficient. Submitted for publication, 2014, arXiv:1412.3283v1
[3] L. Baratchart, J. Leblond, S. Rigat, E. Russ, Hardy spaces of the conjugate Beltrami equation. J. Functional Analysis, 259 (2), 2010.
Joint work L. Baratchart (INRIA Sophia Antipolis, team APICS) and L. Bourgeois (ENSTA ParisTech, POEMS).

Zinaida Lykova, Newcastle University, UK
Algebraic and geometric aspects of rational Γ-inner functions

The set

$$\Gamma = \{(z + w, zw) : |z| \leq 1, |w| \leq 1\} \subset \mathbb{C}^2$$

has intriguing complex-geometric properties; it has a 3-parameter group of automorphisms, its distinguished boundary is a ruled surface homeomorphic to the Möbius band and it has a special subvariety which is the only complex geodesic that is invariant under all automorphisms. We exploit this geometry to develop an explicit and detailed structure theory for the rational maps from the unit disc to Γ that map the boundary of the disc to the distinguished boundary of Γ.
References:
[1] Jim Agler, Zinaida A. Lykova and N. J. Young: Algebraic and geometric aspects of rational Γ-inner functions, arXiv: 1502.04216 [math.CV] 17 Febr. 2015. 22 pp.
The talk is based on joint work with Jim Agler and Nicholas Young.

Hichem Mortad, University of Oran, Algeria
Conditions implying commutativity of self-adjoint operators

Let A and B be two self-adjoint operators, one of them, A say, is unbounded. I would like to study the question of the normality of AB implying its self-adjointness. Indeed, in case of self-adjointness, this means that A and B commute. Other interesting results will be given. In the end, some open problems will be posed.

Anthony O'Farrell, Maynooth University, Ireland
Boundary smoothness of analytic functions

When an algebra of analytic functions admits an (abstract) bounded point derivation at some boundary point, it becomes interesting to know whether this derivation may be evaluated in a concrete

way as a limit of difference quotients. We discuss this, including some new results in the case of Lipschitz-norm algebras.

Martin Ozgur, Mimar Sinan University, Istambul, Turkey
Disjoint hypercyclic and supercyclic weighted shifts

We will characterize disjoint hypercyclic and supercyclic weighted shifts in terms of their weight sequences. It turns out that some well-known dynamical properties of a single operator fail to hold true in the disjoint setting.
This is a joint work with J. Bes and R. Sanders.

José Peláez, University of Malaga, Spain
Embedding derivatives of weighted Bergman spaces into Lebesgue spaces via harmonic analysis

Let A^p_ω denote the Bergman space in the unit disc induced by a radial weight ω with the doubling property $\int_r^1 \omega(s)\,ds \leq C \int_{\frac{1+r}{2}}^1 \omega(s)\,ds$. The positive Borel measures such that the differentiation operator of order $n \in \mathbb{N} \cup \{0\}$ is bounded from A^p_ω into $L^q(\mu)$ are characterized in terms of geometric conditions when $0 < p, q < +\infty$. En route to the proof a theory of tent spaces for weighted Bergman spaces is built.
References:
[1] W. S. Cohn and I. E. Verbitsky, Factorization of tent spaces and Hankel operators, J. Funct. Anal. 175 (2000), no. 2, 308–329.
[2] R. R. Coifman, Y. Meyer and E. M. Stein, Some new functions spaces and their applications to Harmonic Analysis, J. Funct. Anal. 62 (1985), no. 3, 304–335.
[3] D. H. Luecking, Embedding derivatives of Hardy spaces into Lebesgue spaces, Proc. London Math. Soc. 63 (1991), no. 3, 595–619.
[4] J. A. Peláez and J. Rättyä, Weighted Bergman spaces induced by rapidly increasing weights, Mem. Amer. Math. Soc. 227 (2014), no. 1066.
[5] J. A. Peláez and J. Rättyä, Embedding theorems for Bergman spaces via harmonic analysis, to appear in Math. Annalen, DOI: 10. 1007/s00208-014-1108-5.
Joint work with Jouni Rättyä.

Stephanie Petermichl, University Toulouse 3
Mixed commutators and little product BMO.

We characterise the L^p boundedness of iterated commutators of multiplication by a symbol function and tensor products of Hilbert and Riesz transforms. We combine classical tools such as Toeplitz operators with very recent $T(1)$ theorems for Journé operators.
Joint work with Yumeng Ou and Elizabeth Strouse

Gilles Pisier, Université Paris VI, Texas A&M University, College Station, USA
On the metric entropy of the Banach-Mazur compactum

We study the metric entropy of the metric space $\mathcal{B}_n$ of all n-dimensional Banach spaces (the so-called Banach-Mazur compactum) equipped with the Banach-Mazur (multiplicative) "distance" d. We are interested either in estimates independent of the dimension or in asymptotic estimates when the dimension tends to ∞. For instance, we prove that, if $N(\mathcal{B}_n, d, 1+\epsilon)$ is the smallest number of "balls" of "radius" $1+\epsilon$ that cover $\mathcal{B}_\setminus$, then for any $\epsilon > 0$ we have

$$0 < \liminf_{n\to\infty} n^{-1} \log\log N(\mathcal{B}_n, d, 1+\epsilon) \leq \limsup_{n\to\infty} n^{-1} \log\log N(\mathcal{B}_n, d, 1+\epsilon) < \infty.$$

We also prove an analogous result for the metric entropy of the set of n-dimensional operator spaces equipped with the distance d_N naturally associated to $N \times N$-matrices with operator entries. In that case N is arbitrary but our estimates are valid independently of N. In the Banach space case (i.e. $N = 1$) the above upper bound is part of the folklore, and the lower bound is at least partially known (but apparently has not appeared in print). While we follow the same approach in both cases, the matricial case requires more delicate ingredients, namely estimates (from our previous work) on

certain n-tuples of $N \times N$ unitary matrices known as "quantum expanders".

Violeta Petkova, University of Lorraine, Metz
Spectra of Wiener-Hopf operators on weighted spaces

We study bounded operators T on weighted spaces commuting either with the right shift operators or the left shift operators, and we establish the existence of a symbol. We characterize completely the spectrum of the operators of the semi-group of translations. We obtain a characterization of the spectra of a Wiener-Hopf operator en weighted $L^2(R^+)$-spaces.

Sandra Pott, Lund University, Sweden
Sharp bounds for Calderon-Zygmund operators in a vector-valued setting

In recent years, the attempt to prove sharp bounds for Calderon-Zygmund operators on weighted L^p spaces in terms of the A_p (or A_∞)-characteristic of the weight has been an important driving force in Harmonic Analysis, with the conjectured linear bound for $p = 2$ first being proved for dyadic martingale transforms by Janine Wittwer, then for the Hilbert transform by Stefanie Petermichl. After further contributions by a number of authors, the A_2 conjecture was settled by Tuomas Hytönen . At the same time, the sharp bound of for example the Hilbert transform on the vector-valued L^p space $L^p(\mathbb{R}, X)$, X a UMD-space, in terms of the UMD constant is still not known. Again, a linear bound is conjectured, while the best known bound is quadratic.

In this talk, I want to address sharp bounds for Calderon-Zygmund operators in two different vector-valued settings, namely matrix-weighted L^2-spaces of $\mathbb{C}^n$-valued functions, and the space $L^p(\mathbb{R}, X)$. In both cases, we can reduce bounds to the case of martingale transforms. This work was inspired by S. Treil's proof of the A_2 conjecture in the scalar setting.
This is joint work with Andrei Stoica.

Hervé Queffélec, Université Lille 1
Hardy spaces of Dirichlet series and their composition operators

To fully answer a question of Beurling on Riesz systems of dilates, Hedenmalm, Lindqvist and Seip (1997) were led to introduce a Hilbert space of Dirichlet series, analogue to the Hardy space H^2 but very different in some respects. Shortly afterwards (1999), Gordon and Hedenmalm characterized bounded composition operators on that space, and F.Bayart (02-03) introduced (for any $1 \leq p \leq \infty$) a natural substitute for the Hardy space H^p, the Hardy space $\mathcal{H}^p$ of Dirichlet series, which can be identified with $H^p(\mathbb{T}^\infty)$ and naturally lives on the half-plane

$$\mathbb{C}_{1/2} = \{s \in \mathbb{C} \ ; \ \Re s > 1/2\}$$

and he studied its composition operators.

The study in the case $p = 2$ was recently completed (Queffélec-Seip, JFA 2015).

When $p \neq 2$, several new difficulties appear:

(1) The existence of a local embedding of $\mathcal{H}^p$ into the Hardy space $H^p(\mathbb{C}_{1/2})$ is an open problem when p is not an even integer.
(2) Accordingly, the description of analytic self-maps φ of $\mathbb{C}_{1/2}$ generating composition operators $C_\varphi : f \mapsto f \circ \varphi$ on $\mathcal{H}^p$ is not fully understood.
(3) $H^p(\mathbb{T}^\infty)$ is not complemented in $L^p(\mathbb{T}^\infty)$, therefore its dual is badly known (kind of BMO situation).
(4) One has to find a substitute for the multiplicative Weyl inequalities.

Insisting in this talk more on methods than on statements, we will see how those difficulties can be, to some extent, circumvented and lead to precise results concerning the approximation numbers of a compact composition operator $C_\varphi : \mathcal{H}^p \to \mathcal{H}^p$ when $p \neq 2$. Many open problems await further study.
Recent joint work with F. Bayart and K. Seip.

Thomas Ransford, Université Laval, Québec, Canada
A Gleason-Kahane-Zelazko theorem for modules and applications to holomorphic function spaces

We generalize the Gleason-Kahane-Zelazko theorem to modules. As an application, we show that every linear functional on a Hardy space that is non-zero on outer functions is a multiple of a point evaluation. A further consequence is that every linear endomorphism of a Hardy space that maps outer functions to nowhere-zero functions is a weighted composition operator. In neither case is continuity assumed. We also consider some extensions to other function spaces.
Joint work with Javad Mashreghi.

Jan Rozendaal, Delft University of Technology, The Netherlands
Operator Lipschitz functions on Banach spaces

Operator Lipschitz estimates of the form

$$\|f(B) - f(A)\|_{\mathcal{L}(H)} \leq C\|B - A\|_{\mathcal{L}(H)},$$

for normal operators A and B on a Hilbert space H, such as ℓ_2, have been extensively studied, in particular for f the absolute value function. In this talk, we will consider the more general estimate of the form

$$\|f(B)S - Sf(A)\|_{\mathcal{L}(\ell_p,\ell_q)} \leq C\|BS - SA\|_{\mathcal{L}(\ell_p,\ell_q)} \tag{1}$$

for so-called diagonalizable operators $A \in \mathcal{L}(\ell_p)$, $B \in \mathcal{L}(\ell_q)$ and $S \in \mathcal{L}(\ell_p, \ell_q)$, where $p, q \in [1, \infty]$. We obtain (1) for f the absolute value function and $p < q$. The results that will be presented imply Lipschitz estimates for diagonalizable matrices with a constant independent of the size of the matrix.
This talk is based on joint work with Fedor Sukochev and Anna Tomskova.

Ilona Simon, University of Pécs, Hungary
Césaro-summability on some local fields

Fourier analysis is considered on two locally compact topological groups: on the dyadic and 2-adic additive groups. As a brief introduction, the algebraical and some topological structures and some most important convergence results of the Cesaro means are summarized. The key points of a recent result of the lecturer on the maximal convergence space of the 2- adic Cesaro means in two- and more-dimensions is shown including a convergence and a divergence theorem.

Dan Timotin, Institute of Mathematics of Romanian Academy of Sciences, Bucarest, Romania
Schur coupling and other equivalence relations on Banach spaces

Several equivalence relations for operators on Banach spaces are shown to coincide in the hilbertian case. In particular, Schur coupling coincides with matricial coupling. A concrete description of this equivalence relation in several cases is provided, for instance for compact operators. Some related recent results for Banach spaces are also discussed.

Alexander Volberg, Michigan State University, East-Lansing, USA
Monge-Ampère equations with drift and sharp weak type estimates in harmonic analysis

We will show how the Monge-Ampère equations with drifts apear naturally while solving certain harmonic analysis problems pertaining tpo sharp estimates of singular operators. We will solve one of such PDE's.

Brett Wick, Georgia Institute of Technology, Atlanta, USA
Two weight estimates for commutators

In this talk we discuss a modern proof of a result by Bloom which characterizes when the commutator of a function and the Hilbert transform is bounded on weighted L^p spaces. Our method of proof extends Bloom's result to all dimensions and Calderon-Zygmund operators.
This talk is based on joint work with Irina Holmes and Michael Lacey.

Nicholas Young, Newcastle University and Leeds University, UK
Finite Blaschke products and rational Γ-inner functions

Let

$$\Gamma = \{(z + w, zw) : |z| \leq 1, |w| \leq 1\} \subset \mathbb{C}^2.$$

A Γ-*inner function* is a holomorphic map h from the unit disc to Γ whose boundary values at almost all points of the unit circle belong to the distinguished boundary $b\Gamma$ of Γ. A rational Γ-inner function h induces a continuous map $h|_{\mathbb{T}}$ from the unit circle $\mathbb{T}$ to $b\Gamma$. The latter set is topologically a Möbius band and so has fundamental group $\mathbb{Z}$. The *degree* of h is defined to be the topological degree of $h|_{\mathbb{T}}$. The authors have shown (see Zina Lykova's lecture) that if $h = (s, p)$ is a rational Γ-inner function of degree n then $s^2 - 4p$ has exactly n zeros in the closed unit disc $\mathbb{D}^-$, counted with an appropriate notion of multiplicity. In this talk, with the aid of a solution of an interpolation problem for finite Blaschke products, we explicitly construct the rational Γ-inner functions of degree n with the n zeros of $s^2 - 4p$ prescribed.
This is joint work with Jim Agler and Zinaida Lykova.

Rachid Zarouf, Université Aix-Marseille
Optimal estimates for condition numbers and norms of resolvents in terms of the spectrum

In numerical analysis it is often necessary to estimate the condition number $CN(T) = \|T\| \cdot \|T^{-1}\|$ and the norm of the resolvent $\|(\zeta - T)^{-1}\|$ of a given $n \times n$ matrix. In this article we derive optimal estimates for these quantities and compute explicit matrices that achieve our bounds. Clearly, we can only expect a finite estimate if the set of possible matrices T has certain *spectral* and *norm* restrictions. We show that under the regularity condition $\|T\| \leq 1$ in both cases the worst matrix is an triangular Toeplitz matrix. Computing the norm $\|T^{-1}\|$ we recover the well-known fact that the supremum of $CN(T)$ over all matrices with minimal absolute eigenvalue $r = \min_{i=1,\ldots,n} |\lambda_i| > 0$ is the Kronecker bound $\frac{1}{r^n}$. Using the same method we improve on a recent estimate for the norm of the resolvent $\|(\zeta - T)^{-1}\|$ for $|\zeta| = 1$. We take a unified approach to both cases $\zeta = 0$ and $|\zeta| = 1$, by giving a sharp bound for $\|(\zeta - T)^{-1}\|$ for any $|\zeta| \leq 1$. The Toeplitz matrices that reach our estimates are model matrices, i.e. matrix representations of the compressed backward shift operator on the Hardy space H^2 to a finite-dimensional invariant subspace.

3.2. **Mini-courses.**

Isabelle Chalendar, Université Lyon 1
Opérateurs de composition pondérés sur divers espaces de fonctions analytiques

Roman Tessera, ENS Lyon
Plongements grossiers d'espaces métriques dans les espaces de Banach

Brett Wick, Georgia Institute of Technology, Atlanta, USA
Carleson Measures for Spaces of Analytic Functions

3.3. **Poster session.**

Ahlem Ben Ali Essalah, University of Monastir, Tunisia
Quelques caractérisations des isométries partielles dans une C^*-algèbre.

Ce travail est consacré à la description des isométries partielles C^*-algèbre. En particulier, nous nous intéssons aux isométries partielles normales et quasi-normales. Arias et Mbekhta ont donné une description des isométries partielles dans C^*-algèbre avec les inverses généralisées. Nous donnons quelques caractérisations des isométries partielles et nous présentons quelques résultats élémentaires pour cette classe.

Soumaya Chefai, University Tunis El Manar, Tunisia
Inverse problems and approximations in quantum calculus

In this talk we study in quantum calculus the theory of inverse problem and approximation in a large class of Hilbert spaces with reproducing kernels.

Rabiaa Ghabii, University of Monastir, Tunisia
Sur la transformée de Fourier généralisée associée à un opérateur de type Cherednik sur $\mathbb{R}$

On considére la transformée de Fourier génealisée associée à l'opérateur de Jacobi-Cherednik sur $\mathbb{R}$ et on donne des conditions de tout autre nature pour qu'une fonction ait une transformation de Fourier généralisée appartenant à certaines classes L^p.

Manel Hleili, University Tunis El Manar, Tunisia
Generalized q-Bessel Operator

In this paper we attempt to build a coherent q-harmonic analysis attached to a new type of q-diff erence operator which can be considered as a generalized of the q-Bessel operator.

Mohammed Karmouni, Université Sidi Mohamed Ben Abdellah, Fès, Maroc
On the pseudo B-Weyl and pseudo B-Fredholm spectrum

In this talk, we show that the corresponding pseudo B-Fredholm spectrum [1] is compact and the difference between the pseudo B-Fredholm spectrum and pseudo B-Weyl spectrum [2] is at most countable. Afterwards, we study the links between the localized version of the single valued extension property at the points and the concept of the pseudo B-Fredholm and pseudo B-Weyl. We also describe the isolated point spectrum by the pseudo B-Fredholm and pseudo B-Weyl operator.
References:
[1] E. Boasso, Isolated spectral points and Koliha-Drazin invertible elements in quotient Banach algebras and homomorphism ranges, arxiv: 1403.3663v1.
[2] H. Zariouh, H. Zghitti, On pseudo B-Weyl operators and generalized drazin invertible for operator matrices. arxiv: 1503.06611v1.
(Joint work with Abdelaziz Tajmouati

Safa Menkad, Université de Batna, Tunisia
On the injective norm and Moore-Penrose inverse

Let H be a Hilbert space and $B(H)$ the algebra of all bounded linear operators on H. In this talk, we give new characterizations of the class of partial isometries using the injective norm of $A\otimes A^{+}+A^{+}\otimes A$, where A^{+} is the Moore-Penrose inverse of $A \in B(H)$.

Selma Negzaoui, university of Monastir, Tunisia
Principes d'incertitudes associés à la transformation de Bessel-Struve

On considére la transformation de Bessel-Strve $\mathcal{F}_{BS}^{\alpha}$ définie par

$$\mathcal{F}_{BS}^{\alpha} f(\lambda) = \int_{\mathbb{R}} f(x) S_{-i\lambda}^{\alpha}(x)\, d\mu_{\alpha}(x)$$

où $S_{\lambda}^{\alpha}(x) = j_{\alpha}(i\lambda\, x) - i\, h_{\alpha}(i\,\lambda\, x)$, j_{α} et h_{α} sont respectivement les fonctions de Bessel et de Struve normalisées d'indice α et $d\mu_{\alpha}(x) = |x|^{2\alpha+1}dx$. On prouve des analogues des théorèmes de Cowling-Price, de Hardy et de Morgan pour cette transformation.

Ahmed Saoudi, University Tunis El Manar, Tunisia
Littlewood-Paley decomposition in quantum calculus

We introduce Littlewood-Paley decomposition related to q-Rubin's operator, this allows us to provide a dyadic characterization of Sobolev, Holder and Lebesgue spaces associated with the q-Rubin's operators and to establish some embedding results for these spaces. We construct the paraproduct operators associated with the q-Rubin's operators and we establish his action on the Sobolev and Holder spaces.

Preeti Sharma, Sardar Vallabhbhai National Institute of Technology, Surat, India
On Approximation Properties of Generalization of Kantorovich-Type Discrete q-Beta Operators

The present paper deals with the Stancu type generalization of the Kantorovich discrete q-Beta operators. We establish some direct results, which include the asymptotic formula and error estimation in terms of the modulus of continuity and weighted approximation.

4. List of participants

1. *Evgueni Abakoumov*, Université Paris-Est Marne-la-Vallée,
2. *Said Amana Abdillah*, Université des Comores, Comores,
3. *Mbark Abkari*, Université Sidi Mohammed Ben Abdellah, Fès, Maroc,
4. *Eric Amar*, Université de Bordeaux,
5. *Marc Arnaudon* , Université de Bordeaux,
6. *Catalin Badea*, Université Lille 1,
7. *Mojtaba Bakherad*, University of Sistan and Baluchestan, Zahedan, Iran,
8. *Anton Baranov*, St. Petersburg State University, Russia,
9. *Line Baribeau*, Université Laval, Canada,
10. *Marie-Ailan Beaulieu*, Université Laval, Canada,
11. *Yurii Belov*, St. Petersburg State University, Russia,
12. *Ahlem Ben Ali Essalah*, Université de Monastir, Tunisie,
13. *Zohra Bendaoud*, Université Amar Telidji, Laghouat, Algérie,
14. *Fatima Zohra Benghia*, Université Amar Telidji, Laghouat, Algérie,
15. *Aline Bonami*, Université d'Orléans,
16. *Alexander Borichev*, Université Aix-Marseille,
17. *Fatiha Bouabdallah*, Université Ammar Telidji, Laghouat, Algérie,
18. *Cristina Câmara*, Technical University of Lisbon, Portugal,
19. *Fadil Chabbabi*, Université Lille 1,
20. *Isabelle Chalendar*, Université Lyon 1,
21. *Stéphane Charpentier*, Université Aix-Marseille,
22. *Soumaya Chefai*, Université Tunis El Manar, Tunisie,
23. *Bernard Chevreau*, Université de Bordeaux,
24. *Danielle Couty*, Université Paul Sabatier Toulouse,
25. *Garth Dales*, Lancaster University, UK,
26. *Eric Decreux*, Université d'Orléans,
27. *Robert Deville*, Université de Bordeaux,
28. *Omar El-Fallah*, Université Mohammed V, Rabat, Maroc,
29. *Romuald Ernst*, Université Aix-Marseille,
30. *Jean Esterle*, Université de Bordeaux,
31. *Konstantin Fedorovskiy*, Bauman Moscow State Technical University, Moscow, Russia,
32. *Emmanuel Fricain*, Université Lille 1,
33. *Loic Gaillard*, Université d'Artois, Lens,
34. *José Galé*, University of Zaragoza, Spain,
35. *Eva Gallardo Gutiérrez*, Universidad Complutense de Madrid, Spain,
36. *Rabiaa Ghabi*, Université de Monastir, Tunisia,
37. *Pierre Gillot*, Université de Bordeaux,
38. *Sandrine Grellier*, Université d'Orléans,
39. *Sophie Grivaux*, Université Lille 1,
40. *Nabila Hamda*, Université Tunis EL Manar, Tunisie,
41. *Andreas Hartmann*, Université de Bordeaux,
42. *Håkan Hedenmalm*, Royal Institute of Technology, Stockholm, Sweden,
43. *Manel Hleili*, Université de Tunis El Manar, Tunisie,
44. *Irina Holmes*, Georgia Institute of Technology, USA,
45. *Philippe Jaming*, Université de Bordeaux,
46. *Mohammed Karmouni*, Université Sidi Mohammed Ben Abdellah, Fès, Maroc,
47. *Karim Kellay*, Université de Bordeaux,
48. *Hubert Klaja*, Université Laval, Canada,
49. *Fatima Korichi*, Univeristé Amar Telidji, Laghouat, Algérie,
50. *Gady Kozma*, Weizmann Institute of Science, Rehovot, Israel,
51. *Christoph Kriegler*, Université Clermont-Ferrand 2,
52. *Stanislas Kupin*, Université de Bordeaux,
53. *Juliette Leblond*, INRIA, Sophia Antipolis,
54. *C. Levenez*, Université de Bordeaux,
55. *Daniel Li*, Université d'Artois, Lens,
56. *Zinaida Lykova*, Newcastle University, UK,

57. *Xavier Massaneda*, University of Barcelona, Spain,
58. *Dario Mena*, Georgia Institute of Technology, USA,
59. *Quentin Menet*, Université de Mons, Belgique,
60. *Safa Menkad*, Université de Batna, Algérie,
61. *Monia Mestiri*, Université de Mons, Belgique,
62. *Amirhossein Mokhtari*, Ferdowsi University, Mashhad, Iran,
63. *Mohammed Hichem Mortad*, Université d'Oran 1, Algérie,
64. *Selma Negzaoui*, Université de Monastir, Tunisie,
65. *Nikolai Nikolski*, Université de Bordeaux,
66. *Anthony O'Farell*, Maynooth University, Ireland,
67. *Maëva Ostermann*, Université Lille 1,
68. *Martin Ozgur*, Mimar Sinan Fine Arts University, Istambul, Turkey,
69. *Jordi Pau*, University of Barcelona, Spain,
70. *José Peláez*, University of Malaga, Spain,
71. *Stefanie Petermichl*, Université Paul Sabatier Toulouse,
72. *Violeta Petkova*, Université de Lorraine, Metz,
73. *Gilles Pisier*, Université Paris VI and Texas A&M University, College Station, USA,
74. *Sandra Pott*, University of Lund, Sweden,
75. *Elodie Pozzi*, Université de Bordeaux,
76. *Yunied Puig de Dios*, University of Pisa, Italy,
77. *Yanqi Qiu*, Université Aix-Marseille,
78. *Hervé Queffélec*, Université Lille 1,
79. *Thomas Ransford*, Université Laval, Canada,
80. *Maria Carmen Reguera*, University of Birmingham, UK, and University of Lund, Sweden,
81. *William T. Ross*, University of Richmond, USA,
82. *Jean Roydor*, Université de Bordeaux,
83. *Jan Rozendaal*, Delft University of Technology, The Netherlands,
84. *Valentin Samoyeau*, Université de Nantes,
85. *Ahmed Saoudi*, Université Tunis El Manar, Tunisie,
86. *Ridha Selmi*, University de Gabès, Tunisie,
87. *Preeti Sharma*, Sardar Vallabhbhai National Institute of Technology, Surat, India,
88. *Mohamed Sifi*, Université Tunis El Manar, Tunisie,
89. *Ilona Simon*, University of Pécs, Hungary,
90. *Elizabeth Strouse*, Université de Bordeaux,
91. *Romain Tessera*, ENS de Lyon,
92. *Pascal J. Thomas*, Université Paul Sabatier Toulouse,
93. *Dan Timotin*, Institut de Mathématiques de l'Académie Roumaine, Bucarest, Roumanie,
94. *Kamel Toumache*, Université Dr. Yahia Farèc de Medea, Algérie,
95. *Marius Tucsnak*, Université de Lorraine, Metz,
96. *Alexander Volberg*, Michigan State University, East-Lansing, USA,
97. *Brett Wick*, Georgia Institute of Technology, USA,
98. *Ameur Yagoub*, Université Ammar Telidji, Laghouat, Algérie,
99. *Nicholas Young*, Newcastle University and Leeds University, UK,
100. *El Hassan Youssfi*, Université Aix-Marseille,
101. *Fouad Zarouf*, Université de Bordeaux,
102. *Rachid Zarouf*, Université Aix-Marseille,
103. *Mohamed Zarrabi*, Université de Bordeaux.

5. Everyday meals

Starting from June, 1, the lunch for the participants of the conference is planned at the University restaurant "Haut-Carré" (= C1), see Figure 1, for directions. The lunch is approx. 6.50€, and the participants are asked to pay in cash at the cashier desk (having coins, little bills, etc. might be useful).

Besides that, there is a number of restaurants in the close neighborhood of IMB, see Figure 1. For instance:

(C2) Bistrot "Le régent" (traditional French cooking, 10-15€/a meal),
(C3) Le café bleu (crêperie, 7-15€/a meal) (closed on Mondays),
(C4) Croc' o' pain (sandwich shop, 3-5€/a sandwich),
(C5) Fac Kebab (Maghribian/Mediterranean style, 3-5€/(a very big) sandwich)
(C6) "48" (bakery-sandwich shop, 3-4€/a sandwich).

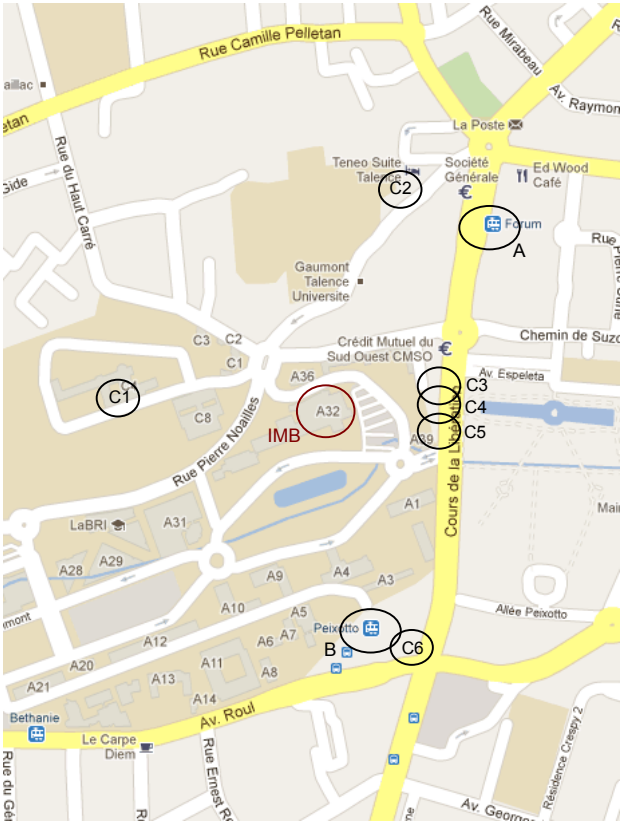

Figure 1. Some restaurants in a neighborhood of IMB, University of Bordeaux.

There is a misprint on the above figure - the right number of the IMB building is A33 (and not A32).

6. Social events

6.1. **Reception at the City Hall of Bordeaux on June, 1, 2015.** The participants of the conference and the spring school are kindly invited to a reception offered by the Office of the Mayor of Bordeaux (="Mairie de Bordeaux" in French). The reception will take place on June, 1, 2015, from 19:00 to 20:15 at the City Hall of Bordeaux (="Hôtel de Ville" aka "Palais Rohan").

The way from IMB to the City Hall takes approximately 20 min.; please take the tram "line B" at "Forum" or "Peixotto" stops (direction "Bassins à Flot", "Berges de la Garonne") and step off at "Hôtel de Ville" stop. Cross the square Pey-Berland along St. André Cathedral to the opposite side following the map of Figure 2.

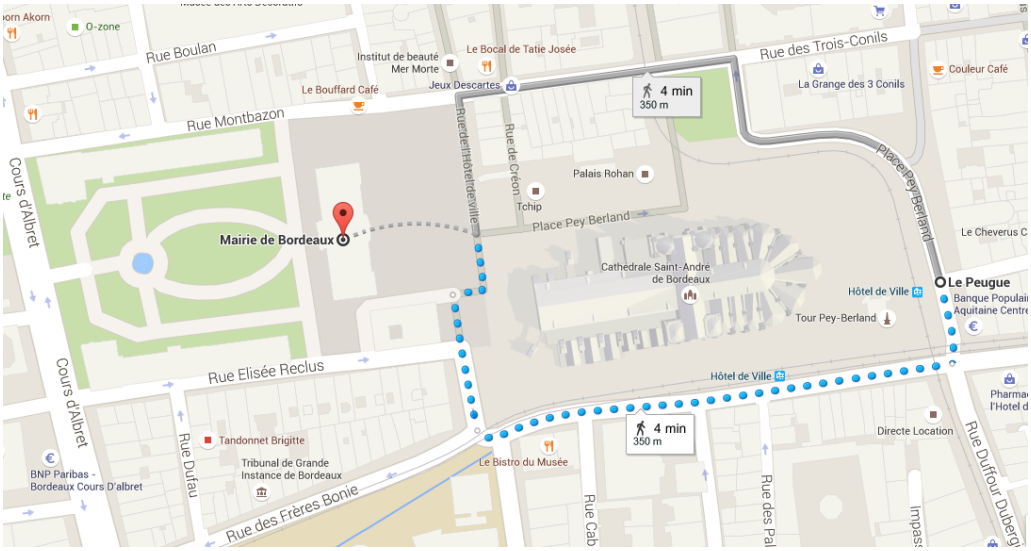

Figure 2. Walk from "Hôtel de Ville" tram stop to the City Hall of Bordeaux.

6.2. **Guided tour of Bordeaux on June, 2, 2015.** The (free) guided tour of Bordeaux will take place on June, 2, 2015, from 16:30 to 18:30. Please be informed that the number of places for the tour is limited. We can provide some printed material for people who prefer to make the tour on their own.

The gathering point for the guided tour is the tram stop "Hôtel de Ville" at 16:30. This is exactly the tram stop you have to step off the tram for the reception at the City Hall on June, 1, 2015. Please see the directions in Section 6.1 and Figure 2.

For some foretaste of architectural legacy of Bordeaux city center, please visit the web site of Bordeaux Office of Tourism (http://fr.bordeaux-tourisme.com/).

6.3. **Conference dinner at "Café du port" on June, 3, 2015.** The conference dinner will take place on June, 3, 2015 at "Café du Port" restaurant (http://www.lecafeduport.com) from 19:30 to 22:30.

Please inform the organizers of the conference on special diet indications (*e.g.,* food allergies, vegetarian, vegetalian, etc.) in advance. The dinner is partially sponsored by the conference. We kindly ask you for a financial participation of 20 € per participant of the conference or the spring school and 40 € per accompanying person.

The proposed menu (there is some choice to make!) is:

- (Starter 1, (S1)): Fresh prawns, arugula sauce and crunchy vegetables, or
- (Starter 2, (S2)): Pressed foie gras, quail filets, with bacon and basil.
- (Main course 1, (MC1)): Meagre à la plancha, potato pancake, vegetable battle, or
- (Main course 1, (MC2)): Veal snackée, crispy rice cake with parmesan, Sichuan pepper juice, green vegetables wok.
- (Dessert 1, (D1)): Tart tatin with pineapple, caramel sauce with salted butter, or
- (Dessert 2, (D2)): The real haouse made Opera cake.

You can make your choice in advance via http://doodle.com/hu45e4973rxx3ep8. We will ask you to tell us if you come to the dinner, the number of accompanying persons and your choices of courses as well as *the payment upon the registration on June, 1, 2015*. Please have the exact amount of money in cash.

The way from IMB to "Café du Port" restaurant takes approximately 35-40 min.; please take the tram "line B" at "Forum" or "Peixotto" stops (direction "Bassins à Flot", "Berges de la Garonne") and step off at "Hôtel de Ville" stop. Change to the tram of "line A" (direction "La Gardette" or "Dravemont") and step off at "Stalingrad" tram stop (just after crossing Garonne river). Then take a short walk following Figure 3.

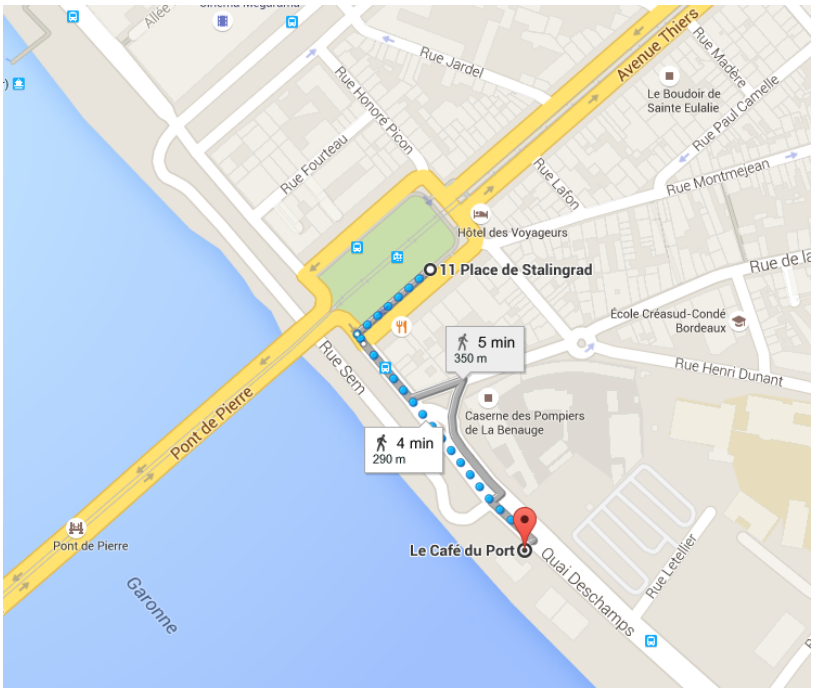

FIGURE 3. Walk from "Stalingrad" tram stop to "Café du Port".

7. Appendix: directions, maps, etc.

Bordeaux and surrounding communities have a fairly good system of public transportation (TBC). Please see the transportation network web site (http://www.infotbc.com/); the site is also available in English, though the English versions seems somewhat truncated. Googlemaps site (https://www.google.fr) also provides a reliable information; please do not forget to tick the "public transportation" option. Tickets are kindly provided for all conference participants by TBC for the duration of the conference; they can be found in conference folder. However, if you need to purchase tickets yourself, be informed that you can buy them either from the bus driver (but not the tram one!) or at automatic distributor machines at tram stops. The tickets are valid during one hour since the first obliteration and they should be validated every time you take a bus or a tram.

To get to the Institut of Mathematics of Bordeaux (IMB, Université de Bordeaux, 351 cours de la Libération, 33405 Talence), please take the tram "line B" and step off at "Forum" or "Peixotto" stops, and then walk to the Institute, see Figure 4.

Figure 4. Walk from tram stops "Forum" and "Peixotto" to IMB, University of Bordeaux.

More directions to get to IMB can be found at (http://www.math.u-bordeaux1.fr/imb/acces-et-localisation).

Some participants of the conference stay at "Victoria Garden" hotel. The way from the hotel to IMB takes approximately 30 min.; please walk to the tram stop "Bergonié" following the map of

Figure 5, take the tram “line B” (direction “Pessac Centre”), and then follow the directions of the previous two paragraphs.

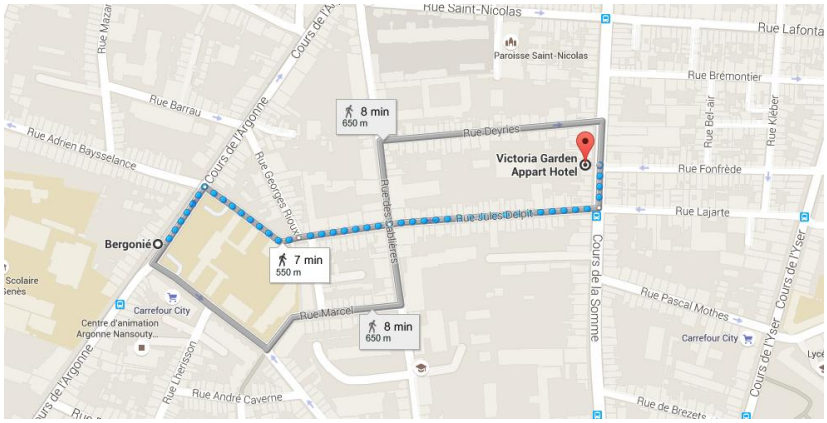

FIGURE 5. Walk from the hotel “Victoria Garden” to tram stop “Bergonié”.

For the location map of social events of the conference and the spring school on the general scheme of the public transportation of Bordeaux see Figure 6 on the next page.

FIGURE 6. Location of social events and public transportation network