

## MEETING ON INFINITE ERGODIC THEORY & RELATED FIELDS

### Abstracts

**Michael Bromberg (Bristol)** *Temporal distributional limit theorem for cocycles over rotations*

. Abstract: For a measure preserving system  $(X, B, \mu, T)$  and a real valued function  $f$  on  $X$ , temporal random variables along an orbit of a fixed point  $x$  in  $X$  are obtained by considering the Birkhoff sums  $S_n(f, x)$ ,  $n = 1, \dots, N$  and choosing  $n$  randomly uniformly from  $\{1, \dots, N\}$ . These r.v.'s, measure the fraction of time that Birkhoff sums spend in various sets. If, under proper normalization, as  $N$  tends to infinity, these variables converge to a non-trivial distribution, we say that  $f$  satisfies a temporal limit theorem along the orbit of  $x$  (when the limit is Gaussian, we refer to this as temporal CLT). The aim of the talk is to introduce the relevant concepts and sketch a proof of a temporal CLT for piecewise constant cocycles with a single breakpoint, over an irrational rotation with a badly approximable rotation number. This result generalises earlier results by J.Beck and by D.Dolgopyat and O.Sarig. This is joint work with C.Ulcigrai.

**Nishant Chandgotia (TAU),** *Some universal models for  $Z^d$  actions*

. Abstract: Krieger's generator theorem shows that any free invertible ergodic measure preserving action  $(Y, \mu, S)$  can be modeled by  $A^Z$  (equipped with the shift action) provided the natural entropy constraint is satisfied; we call such systems ( $A^Z$  here) universal. Along with Tom Meyerovitch, we establish general specification like conditions under which  $Z^d$ - shift spaces are universal. These conditions are satisfied by a wide variety of shift spaces. Using these ideas we recover a strong form of the Alpern's lemma for  $Z^d$  actions and prove that the space of proper colourings of the  $Z^d$  lattice and the domino tilings of the  $Z^2$  lattice are universal (answering a question by Şahin and Robinson).

**Manfred Denker (PSU and Gottingen),** *Fractal Gaussian noise which connects to infinite ergodic theory*

. Abstract: Discrete time fractal Brownian motion with Hurst parameter  $H > 3/4$  has a local limit theorem conditioned on the future. This permits to apply Aaronson's extension of the Darling-Kac theory to derive convergence of local times of fBM towards a Mittag-Leffler distribution. The method of prove has a general formulation for stochastic processes once a local limit theorem at "0" is established. These results are jointly with Xiaofei Zheng.

**Mike Keane (TU Delft),** *Classification of noncommutative Bernoulli Schemes*

. Abstract: In this lecture a recent joint work with Toshihiro Hamachi will be discussed, in which we prove that two noncommutative Bernoulli schemes with the same entropy are isomorphic. The underlying ideas of our proof are largely

based on the finitary isomorphism theory developed with Meir Smorodinsky at this university in the 1970's. These ideas can best be understood by recalling the important first example of Meshalkin (1964), in which he showed that the commutative Bernoulli schemes based on the probability vectors  $(1/4, 1/4, 1/4, 1/4)$  and  $(1/2, 1/8, 1/8, 1/8, 1/8)$  are isomorphic. We also obtain a factor theorem for unequal entropies.

**Mariusz Lemanczyk (Torun) *Centralizer and liftable centralizer of special flows over rotations***

. Abstract: The liftable centralizer for special flows over irrational rotations is studied. It is shown that there are such flows under piecewise constant roof functions which are rigid and whose liftable centralizer is trivial. The talk is based on a joint work with J.-P. Conze.

**Michael Lin (BGU), *Averages along the primes of doubly power bounded operators on  $L^r$***

. Abstract: An operator  $T$  on a (real or complex) Banach space is called *power-bounded* if  $\sup_{n \geq 0} \|T^n\| < \infty$ . It is called *doubly power-bounded* if it is invertible and both  $T$  and  $T^{-1}$  are power-bounded. Let  $\mathbb{P} := \{p_1, p_2, \dots\}$  be the sequence of primes (in ascending order). We prove that if  $T$  is doubly power-bounded on  $L_r(\Omega, \Sigma, \mu)$  of a  $\sigma$ -finite measure space, then for every  $f \in L_r$  the averages along the primes

$$\frac{1}{n} \sum_{k=1}^n T^{p_k} f$$

converge in norm. For the proof we use (and show) the fact that for any power-bounded  $T$  on a Banach space, strong convergence of the averages along the primes is equivalent to strong convergence of the modulated averages

$$\frac{1}{n} \sum_{k=1}^n \Lambda(k) T^k$$

where  $\Lambda(k)$  is the von Mangoldt function defined by  $\Lambda(p^j) = \log p$  when  $p \in \mathbb{P}$ , and zero otherwise. An important tool in the proof is a variational estimate for the von Mangoldt-modulated averages of the shift on  $\mathbb{Z}$ , proved by Zorin-Kranich. Joint work with Tanja Eisner

**Hitoshi Nakada (Keio) *On the construction of translation surfaces based on the idea by Cruz and da Rocha***

. Abstract: The notion of the critical iterate was first introduced by Cruz and da Rocha (2005). We will see that for any given singularity order vector and any marked singularity, there exists a piecewise rotation of the circle such that one of discontinuous points and one of its associated critical iterate generate a translation surface which has the given singularity orders with the given marked singularity. (joint work with Kae Inoue)

**Ofer Shwartz (Weizmann) *Thermodynamic Formalism for Transient Potentials***

. Abstract: A potential function over a Markov shift with infinite number of states can be classified as either recurrent or transient. It is known that in the recurrent case, the eigenmeasure and the eigenfunction of the Ruelle operator exist and are

unique and the eigenmeasure is conservative. However, if the potential is transient, then there exist eigenmeasures and eigenfunctions which are not necessarily unique and the eigenmeasures are totally dissipative. In this talk, we will show that these eigenmeasures and eigenfunctions can be fully characterized by a suitable Martin boundary and present a duality between the two.

**Benjamin Weiss (HUJI)** *On some recent results in infinite ergodic theory*

. Abstract: In the last few decades the theory of infinite measure preserving transformations (IMPT) has expanded in many directions. I will describe some of these new developments including the work of H. Yuasa on uniquely ergodic models for ergodic IMPT's and some of the results that have been obtained in extending the classical theory of transformations with minimal self joinings to IMPT.