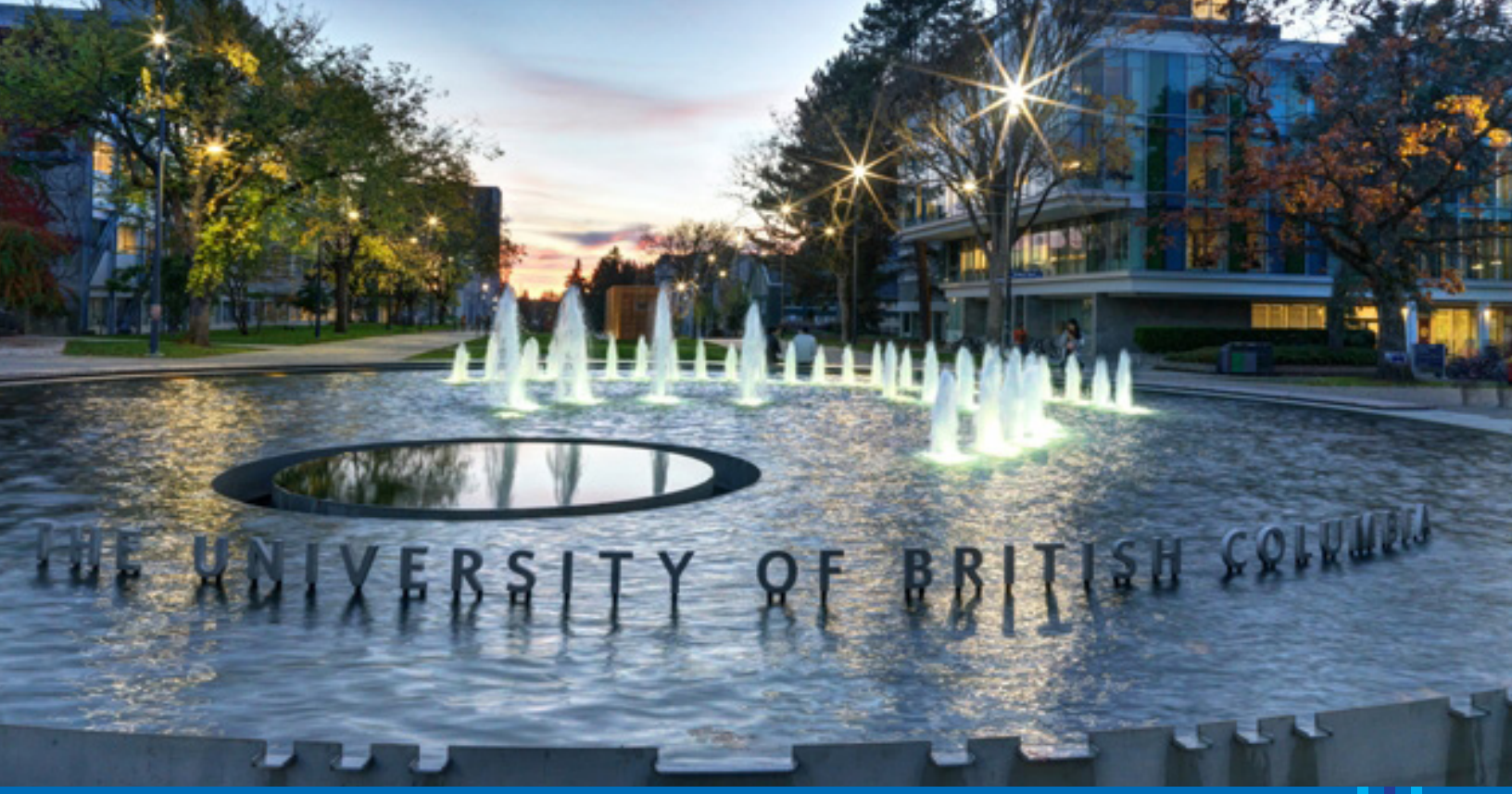


Current Trends in Dynamical Systems and the Mathematical Legacy of Rufus Bowen

July 30- August 4, 2017

University of British Columbia,Vancouver

Conference Schedule

Program at a Glance

	Sunday 30	Monday 31	Tuesday 1	Wednesday 2	Thursday 3	Friday 4
8:00		Registration and Check in **ESB Atrium** **2207 Main Mall**				
8:45		Welcome From PIMS and Orgs				
9:00		Steve Smale	Caroline Series	Yakov Pesin	Benjamin Weiss	Mike Hochman
10:00		Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
10:30		Omri Sarig	Poster session 1	Ian Putnam	Poster session 2	Ronnie Pavlov
11:30		Jérôme Buzzi	Alex Blumenthal	Ursula Hamenstadt	David Ruelle	Vaughn Climenhaga
12:30	**Arrivals and check-in to suites at UBC**: *Ponderosa Commons, *Totem Park, *Carey Centre Residence	Lunch, Hosted	Lunch, Hosted	Rufus Remembrance Lunch @the **UBC Alumni Centre** **6163 University Blvd**	Lunch, Hosted	Lunch, Hosted
14:00		Anatole Katok	Masato Tsujii		Jean-René Chazottes	Mark Pollicott
15:00		Coffee Break	Coffee Break	Free afternoon+ optional activities	Coffee Break	Coffee Break
15:30		Rufus Notebook	Lewis Bowen		Lai- Sang Young	Wrap up
16:30			Problem session 1		Problem session 2	
17:30	Meet & Greet @ **The Nest, Rooftop Garden 4th floor** **6133 University Blvd** **(prior RSVP required)**					

There will be photography throughout this event. PIMS' event photography is used across a variety of our communications platforms including web, print and electronic promotional materials. If, for any reason, you wish not to have your photo taken or used in this manner, please contact the event organizers.

Getting Started

Get connected: Select the "ubcvisitor" wireless network on your wireless device. Open up a web browser, and you will be directed to the login page. You can also log in through "eduroam" if this is available through your university.

FAQs

Q: Where do I check in on Monday Morning?

Check- in and package pick up can be done in the Earth Sciences Building (ESB) Atrium.

Q: Where are the sessions?

- All plenary sessions will be in the **Earth Sciences Building (ESB) Room 1013.**
- **Problem sessions will be in Neville Scarfe and ESB 1013** and will be announced prior to the session
- You will find a copy of the building floor plan on page 3 and a campus map at the end of the program.

Q: Will the program change? Program changes and updates will be announced at each session.

Q: When should I wear my badge? Please wear your name badges at all times on site so that PIMS Staff recognize you as a guest.

Q: Where can I go for help on site? If you need assistance or have a question, please feel free to talk to us at the registration desk

Q: Where can I get refreshments and meals? For snacks or quick meals, please view the list of UBC eateries online at http://www.food.ubc.ca/feed-me/. Coffee breaks and lunches are provided each day of the workshop.

Q: Where can I get a cab to pick me up from the Venue? You can call Yellow Cab (604-681-1111) and request to be picked up at the intersection of West Mall and Bio. Sciences Road. Use the South West entrance of ESB, and walk straight down to the intersection.

Q: How can I get around?

- **UBC Map link**: Here
- **Public Transit:** Feel free to search and plan your public transport rides by visiting http://www.translink.ca/, where directions, ticket costs and bus schedules are indicated.
- **Parking at UBC:** http://www.parking.ubc.ca/visitor.html

Q: What emergency numbers should I know?

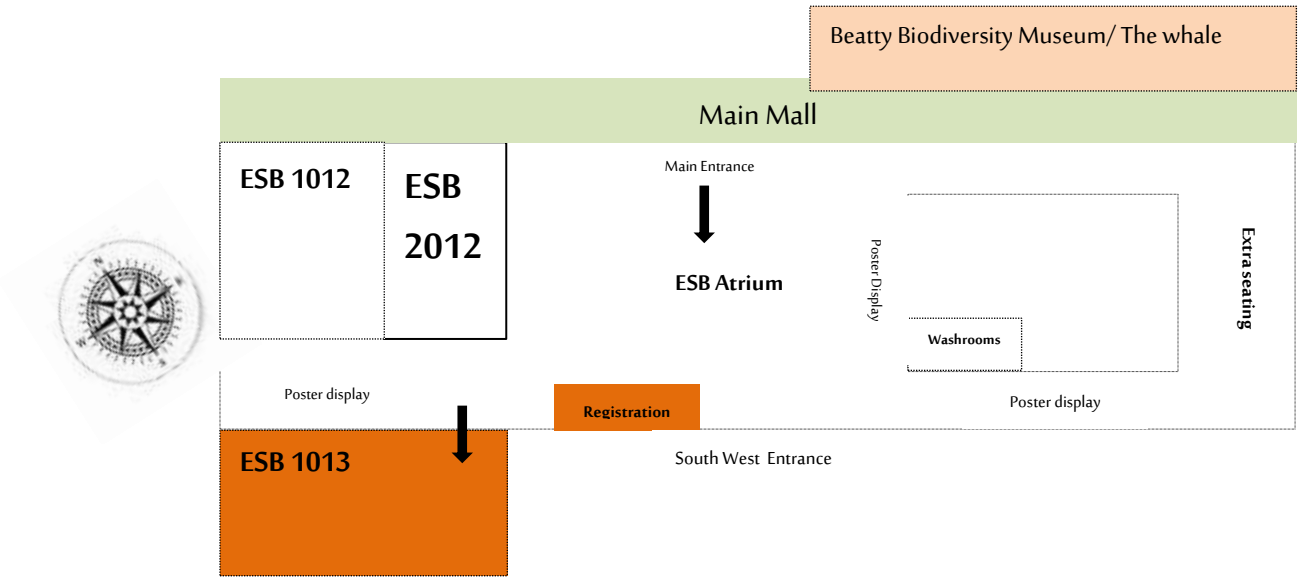
- **Campus security (604-822-2222);**
- **General Emergencies (911);**
- **UBC hospital (604-822-7121).**

Conference Room Guide:

Main Sessions:

Earth Sciences Building, 2207 Main Mall

Room ESB 1013



General Travel Directions:

Airport to UBC: Easiest by taxi (25min, around $30). By public transport, take the Canada Line (rail) to Broadway-City Hall station. From Broadway-City Hall station, cross Broadway and Cambie streets to get to the #99 UBC bus stop in front of London Drugs. Tickets (valid for the whole journey to UBC) can be purchased from the machine in the airport station. Cost: approximately $6. Journey time: Circa more than 1 hour

UBC Bus Loop/ Gage to Earth Science Building (ESB) 2207 Main Mall: A quick 10min walk. See UBC map. Head west past the student union building, cross East Mall and get onto Main Mall. Turn left (South) on Main Mall and Earth Science Building will be on your right after a few minutes. It is a large new building, and is on Main Mall directly across from the Beatty Biodiversity Centre and prominent blue whale skeleton.

Sunday July 30, 2017

5:30pm - 7:00pm	**Optional Meet and Greet:** Light refreshments and nibbles served AMS Nest 6133 University Blvd, Vancouver, BC V6T 1Z1

Monday July 31, 2017

8:00am- 8: 45am	Registration and Check in (ESB Atrium)
8:45am - 9:00am	Opening remarks and announcements from PIMS and the Event Organizers.
9:00am - 10:00am	**Steve Smale, University of Carlifornia at Berkeley** *Problem of introducing dynamical systems into genome biology*
10:00am – 10:30am	Coffee break
10:30am - 11:30am	**Omri Sarig, Weizmann Institute of Science** *Equilibrium states and the ergodic theory of positive entropy surface diffeomorphisms*
11:30am - 12:30pm	**Jérôme Buzzi, Université Paris-Sud Orsay** *Bowen factors of Markov shifts and surface diffeomorphisms*
12:30pm - 2:00pm	Hosted Lunch: **ESB Atrium; Please show/have your name tag at this break.**
2:00pm – 3:00pm	**Anatole Katok, Pennsylvania State University** *Entropy and lyapunov exponents: rigidity vs. flexibility*
3:00pm - 3:30pm	Coffee break
3:30pm - 4:30pm	**Rufus Bowen Notebook**

Tuesday August 1, 2017

9:00am - 10:00am	**Caroline Series, University of Warwick** *The Bowen-Series coding - A survey*
10:00am – 10:30am	Coffee Break
10:30am – 11:30am	Poster Session 1: ESB Atrium
11:30am – 12:30am	**Alex Blumenthal, University of Maryland** *Lyapunov exponents for small random perturbations of predominantly hyperbolic two dimensional volume-preserving diffeomorphisms, including the Standard Map*

12:30pm – 2:00pm	Hosted Lunch: **ESB Atrium; Please show/have your name tag at this break.**
2:00pm – 3:00pm	**Masato Tsujii, Kyushu University**
	Exponential decay of correlations for volume preserving Anosov flows in dimension 3
3:00pm – 3:30pm	Coffee Break
3:30pm – 4:30pm	**Lewis Bowen, University of Texas**
	Entropy theory in the nonamenable setting
4:30pm – 5:30pm	Problem session 1 (Neville Scarfe Building) Session titles and room numbers TBC

Wednesday August 2, 2017

9:00am - 10:00am	**Yakov Pesin, Pennsylvania State University**
	A geometric approach for constructing SRB measures in hyperbolic dynamics
10:00am – 10:30am	Coffee break
10:30am – 11:30am	**Ian F. Putnam, University of Victoria**
	A homology theory for Smale spaces
11:30am – 12:30pm	**Ursula Hamenstadt, Universität Bonn**
	Amenable actions, Lyapunov exponents and an idea of Bowen
12:30pm – 3:00pm	Rufus Bowen Remembrance Lunch:
	UBC Alumni Centre:
	6163 University Blvd
	Please wear your name tag for this event.
3:00pm	Free afternoon/optional activities including a short hike (See page 19 - 20 of program)

Thursday August 3, 2017

9:00am – 10:00am	**Benjamin Weiss, Hebrew University of Jerusalem**
	Smooth models for ergodic systems
10:00am - 10:30am	Coffee break
10:30am - 11:30am	Poster session 2: ESB Atrium
11:30am - 12:30pm	**David Ruelle, IHES**

	A theory of turbulence based on non-equilibrium statistical mechanics
12:30pm - 2:00pm	Hosted Lunch: **ESB Atrium, please show/have your name tag at this break**
2:00pm- 3:00pm	**Jean-René Chazottes, CNRS**
	Gibbs measures and equilibrium states at low temperature
3:00pm - 3:30pm	Coffee break
3:30pm - 4:30pm	**Lai-sang Young, Courant Institute & NYU**
	Natural invariant measures
4:30pm - 5:30pm	Problem session 2 (Neville Scarfe Building) Session titles TBC

Friday August 4, 2017

9:00am – 10:00am	**Mike Hochman, Hebrew University of Jerusalem**
	Borel isomorphism of systems with some hyperbolic structure
10:00am – 10:30am	Coffee break
10:30am – 11:30am	R**onnie Pavlov, University of Denver**
	Non-uniform specification properties for subshifts
11:30am – 12:30pm	**Vaughn Climenhaga, University of Houston**
	Unique equilibrium states for geodesic flows in nonpositive curvature
12:30pm – 2:00pm	Hosted Lunch: **ESB Atrium; please show your name tag at this break.**
2:00pm – 3:00pm	**Mark Pollicott, Warwick University**
	Bowen's dimension formula and rigorous estimates
3:00pm – 3:30pm	Coffee break
3:30pm – 4:30pm	Conference Wrap-Up

Speaker Titles and Abstracts

1. **Alex Blumenthal, University of Maryland**

   Lyapunov exponents for small random perturbations of predominantly hyperbolic two dimensional volume-preserving diffeomorphisms, including the Standard Map

   An outstanding problem in smooth ergodic theory is the estimation from below of Lyapunov exponents for maps which exhibit hyperbolicity on a large but non- invariant subset of phase space. It is notoriously difficult to show that Lypaunov exponents actually reflect the predominant hyperbolicity in the system, due to cancellations caused by the"switching" of stable and unstable directions in those parts of phase space where hyperbolicity is violated. In this talk I will discuss the inherent difficulties of the above problem, and will discuss recent results when small IID random perturbations are introduced at every time-step. In this case, we are able to show with relative ease that for a large class of volume-preserving predominantly hyperbolic systems in two dimensions, the top Lypaunov exponent actually reflects the predominant hyperbolicity in the system. Our results extend to the well-studied Chirikov Standard Map at large coupling. This work is joint with Lai-Sang Young and Jinxin Xue.

2. **Lewis Bowen, University of Texas**

   Entropy theory in the nonamenable setting

   I'll explain a recent extension of Kolmogorov-Sinai entropy from actions of Z to actions by much larger groups such as free groups and SL(n,Z). Applications include a classification of Bernoulli shifts over these groups up to measure-conjugacy. I'll also talk about more recent developments such as applications to algebraic dynamics or generalizations of Ornstein theory if time permits.

3. **Jérôme Buzzi, Université Paris-Sud Orsay**

   Bowen factors of Markov shifts and surface diffeomorphisms

   Classical theorems of Sinai and Bowen show that diffeomorphisms admit very simple symbolic dynamics. More precisely, they are factors of shifts of finite type. These factor maps are usually not injective but this failure has a combinatorial description, noticed by Bowen. This "Bowen property" was considered by several authors, including Manning (for zeta functions) and Fried (finitely presented systems).

   It turns out that the Bowen property extends to the non-uniform case, namely to the symbolic dynamics built by Sarig for surface diffeomorphisms. I will explain the role of this property in the analysis of their ergodic theory (joint with Boyle) and especially of the number of measures maximizing the entropy (joint with Crovisier and Sarig) as well as lower bounds on their number of periodic points.

4. **Jean-Rene Chazottes, CNRS**

   Gibbs measures and equilibrium states at low temperature

   We will be interested in what happens to a Gibbs measure when temperature is "low" or goes to 0. Our main motivation is to understand how "quasicrystals" can arise. We will deal with lattice models: at each site of the d-dimensional cubic lattice, one can have a finite number of possible states, e.g., 0 or 1. We will report on two types of behaviours: 1. the existence (or not) of the limit when temperature goes to 0, and what is the nature of the limiting measure when it exists; 2. freezing phase transitions, that is, the fact that for some non-zero critical temperature, the support of the Gibbs measure shrinks dramatically and one gets an equilibrium

state living on a substitution subshift for all temperatures below the critical one. In the latter case, nothing is known for dimension greater than or equal to two.

5. **Vaughn Climenhaga, University of Houston**

Unique equilibrium states for geodesic flows in nonpositive curvature

The geodesic flow on a negatively curved manifold is one of the classical examples of a uniformly hyperbolic (transitive Anosov) system; in particular, results of Bowen, Ruelle, and Sinai show that it has a unique measure of maximal entropy, and more generally, unique equilibrium states for Holder continuous potentials. When curvature is only assumed to be nonpositive, the geodesic flow becomes nonuniformly hyperbolic and much less is known. For a rank 1 manifold of nonpositive curvature, Knieper showed uniqueness of the measure of maximal entropy, but his methods do not generalize to equilibrium states for nonzero potentials. I will discuss joint work with Keith Burns, Todd Fisher, and Daniel J. Thompson, in which we use a nonuniform version of Bowen's specification property to establish existence and uniqueness of equilibrium states for a class of nonzero potential functions; this class includes scalar multiples of the geometric potential for an interval of parameter values, and includes an open and dense set of Holder continuous potentials in the specific case when the manifold has dimension two and the metric is analytic.

6. **Ursula Hamenstadt, Universität Bonn**

Amenable actions, Lyapunov exponents and an idea of Bowen

Given a random walk on a group G and a homomorphism B of G into GL(n,R), simplicity of the Lyapunov spectrum for the corresponding cocycle over the Markov shift defined by the random walk is well known to be a consequence of algebraic properties of B. We discuss an extension of this simplicity result to cocycles over a class of flows with some hyperbolicity properties and with respect to a sufficiently nice probability measure. This class of flows includes all geodesic flows on finite volume negatively curved manifolds. We also give some applications. The proof uses an idea of Bowen and does not rely on tools from random walks.

7. **Mike Hochman, Hebrew University of Jerusalem**

Borel isomorphism of systems with some hyperbolic structure

Systems with some hyperbolic structure have long been known to be essentially classified (up to isomorphism of large subsets of the systems) by entropy and periodic points. Such results can take several forms e.g. a continuous equivariant bijection on a dense G_delta set, or a measurble one a set supporting measures of large entropy, etc. All this raises the question of whether one can get a full isomorphsm of the Borel structure. It turns out that the (affirmative) answer involves the study of the irregular points in the system. In the talk I will try to explain this problem in more detail, and some ingredients in its solution.

8. **Anatole Katok, Pennsylvania State University**

Entropy and lyapunov exponents: rigidity vs. flexibility

The short but very influential and highly quoted Bowen's 1971 Transactions paper ``Entropy for group endomorphisms and homogeneous spaces'' can be viewed as the starting point for the study of two complementary phenomena: rigidity and flexibility for conservative (volume-preserving) systems. Bowen showed that for dynamical systems of algebraic origin, i.e. homogeneous and affine maps and flows on homogeneous spaces, the values of metic entropy with respect to Haar measure and topological entropy are always the same, and the range of their values (as well as the values of Lyapunov exponents) is limited.

Notice that the only situation beyond the algebraic ones where either invariant can be calculated precisely is discrete time Anosov systems on infranilmanifolds, including tori, that are topologically conjugate to the algebraic models. There is a number of situations where the values of those invariants determine algebraic systems within a large class of systems. Those are prototype rigidity results. On the other hand, beyond the algebraic case the flexibility paradigm should hold: *Under properly understood general restrictions within a fixed class of smooth dynamical systems quantitative dynamical invariants take arbitrary values.*

Most known constructions are perturbative and hence at best would allow to cover a small neighborhood of the values allowed by the model, or more often, not even that, since homogeneous systems are often ``extremal''. So establishing flexibility calls for *non-perturbative or large perturbation constructions* in large families to cover possible values of invariants.
Work on flexibility is still in its infancy and in many situations the proper ``general restrictions'' are not fully understood. In this talk I will discuss general conjectures and first two results in their direction.

9. Ronnie Pavlov, University of Denver

Non-uniform specification properties for subshifts

The celebrated specification property of Bowen implies many useful properties for an expansive topological dynamical system, among them intrinsic ergodicity, i.e. uniqueness of the measure of maximal entropy. In the setting of symbolic dynamics, this property is equivalent to the existence of a constant N such that any two n-letter words v,w in the language can be combined into a new word in the language given a gap between them of length at least N.
There are several natural weakenings of specification in the symbolic setting; for instance one can allow a gap which grows as a function f(n), or one can allow a small number g(n) of "edits" to the letters of v,w instead of leaving a gap; we call these properties non-uniform gap specification and non-uniform mistake specification. I will summarize some results about these properties, focusing mostly on thresholds for f(n) and g(n) which are known to either guarantee intrinsic ergodicity or allow for multiple measures of maximal entropy.

10. Yakov Pesin, Pennsylvania State University

A geometric approach for constructing SRB measures in hyperbolic dynamics

In dissipative dynamics hyperbolic SRB measures form a class of natural and physically meaningful measures supported on attractors and they have a rich collection of ergodic properties (up to the Bernoulli property). They were introduced and studied in seminal works of Sinai, Ruelle, and Bowen in the case when an attractor is uniformly hyperbolic, in particular, when the map is Anosov. The construction of SRB measures in these works uses finite Markov partitions that allow one to represent the system as a subshift of finite type. In more general situations one can make use of representing the attractor by a countable state Markov shift or a Young tower. I will outline a unified approach for constructing SRB measures in hyperbolic dynamics which is pure geometrical in its nature and which does not use any symbolic model of the system. This approach can be used to construct SRB measures for a broad class of non-uniformly hyperbolic "chaotic" attractors where building a symbolic model of the system may not be possible.

11. Mark Pollicott, Warwick University

Bowen's dimension formula and rigorous estimates

In Bowen's 1979 paper (published posthumously) he introduced a now famous formula which is used to give the dimension of a conformal repeller implicitly in terms of the pressure function. This is his 4th most cited publication on MathSciNet. In 1982,

Ruelle-related this to the dynamical zeta function. In this talk we will describe how these ideas can be further developed to give a method which accurately and rigorously estimates the dimension in some specific interesting cases.

12. Ian F. Putnam, University of Victoria

A homology theory for Smale spaces

Smale spaces were introduced by David Ruelle to provide an axiomatic framework for the dynamics on the basic sets of Smale's Axiom A systems. Anthony Manning proved that the Artin-Mazur zeta function for such a system is rational, leading Bowen to conjecture the existence of a homology theory for such systems which gave a Lefschetz-type formula for the number of periodic points of the system as the trace of a linear map. Such a theory was given by Krieger for shifts of finite type.
(Another was given by Bowen and Franks in this same case.) In this talk, we show how Krieger's theory can be extended to all Smale spaces. The key technical ingredient is the existence of a better type of Markov partition.

13. David Ruelle, IHES

A theory of turbulence based on non-equilibrium statistical mechanics

Abstract. In earlier work we have studied the turbulent flow exponents ζ_p, where $\langle|\Delta\mathbf{v}|^p\rangle \sim \ell^{\zeta_p}$ and $\Delta\mathbf{v}$ is the contribution to the fluid velocity at small scale ℓ. Using ideas of non-equilibrium statistical mechanics we have found

$$\zeta_p = \frac{p}{3} - \frac{1}{\ln\kappa}\ln\Gamma(\frac{p}{3}+1)$$

where $1/\ln\kappa$ is experimentally $\approx 0.32 \pm 0.01$. The purpose of the present note is to propose a somewhat more physical derivation of the formula for ζ_p. We also present an estimate ≈ 100 for the Reynolds number at the onset of turbulence.

14. Omri Sarig, Weizmann Institute of Science

Equilibrium states and the ergodic theory of positive entropy surface diffeomorphisms

I will revisit Bowen's famous 1975 monograph "Equilibrium states and the ergodic theory of Anosov diffeomorphisms", and discuss the parts of this text which we can now extend to general C^{1+\epsilon} surface diffeomorphisms with positive topological entropy.

15. Caroline Series, University of Warwick

The Bowen-Series coding - A survey

We will give a survey of the Bowen-Series coding, including its genesis, extensions, and a variety of applications old and new.

16. Steve Smale, University of Carlifornia at Berkeley

Problem of Introducing dynamical systems into genome biology

We address 2 problems of the title. 1) formalizing a dynamical system for gene expression levels 2) cellular dynamics where the states of the cells are equilibrium protein distributions.(so that the cell itself can change in time). The relations between 1) and 2) will be discussed.

17. **Masato Tsujii, Kyushu University**

Exponential decay of correlations for volume preserving Anosov flows in dimension 3

We present a result that generic volume-preserving Anosov flows on 3-dimensional manifolds are exponentially mixing. The proof is based on analysis of local geometric structure of the strong stable and unstable foliation. In the talk, I would like to discuss a generalization of the result to higher dimensional cases.

18. **Benjamin Weiss, Hebrew University of Jerusalem**

Smooth models for ergodic systems

Rufus Bowen made many fundamental contributions to our understanding of the ergodic theoretic properties of invariant measures for smooth mappings. I will describe some of the recent progress that has been made (jointly with Matt Foreman) on the basic question: How large is the class of ergodic transformations that have as a model a smooth mapping of a compact manifold preserving a volume element?

19. **Lai-sang Young, Courant Institute & NYU**

Natural invariant measures

The theory of SRB measures for Axiom A attractors has been the motivation for much of the development in the subject in the last 40 years. One of Rufus' legacies is his contribution to this theory. In this talk I would like to review some of the progress that has been made since, including extensions to nonuniformly hyperbolic systems, to random dynamical systems, to infinite dimensional systems (so the theory applies to some PDEs as well as ODEs), and to a range of other settings relevant to applications.
Both theory and examples will be discussed. The exposition will be somewhat personal in that it will be biased toward my own work and the work of my collaborators.

Poster Titles and Abstracts

1. **Jason Atnip, University of North Texas**

Dimension of Julia Sets of Certain Classes of Non-Autonomous Meromorphic Functions

In this poster we study two classes or meromorphic functions of finite order previously studied by Mayer in 2007 and by Kotus and Urbanski in 2008. In particular, under mild assumptions on the behavior of the functions near poles, we are able to estimate a lower bound for the Hausdorff dimension of the Julia set and an upper bound for the Hausdorff dimension of the set of escaping points for non-autonomous perturbations of functions from these two classes. We accomplish this by constructing non-autonomous iterated function systems, as described by Rempe and Urbanski, which sit inside of the aforementioned non-autonomous Julia sets.

2. **Raimundo Briceño, Tel Aviv University**

New techniques for pressure representation in Z^d shift spaces

Building upon previous work from several authors, given a Z^d shift space and a shift-invariant potential, we present new sufficient conditions for efficient approximation of pressure and, in particular, topological entropy. First, we explain some previous results that were based on a measure-theoretic property of Gibbs measures known as strong spatial mixing and a combinatorial analogue introduced by the author. Next, we proceed to define strictly more general pointwise versions of these two properties, explore some

of their implications, and show that they are sufficient to obtain efficient approximation algorithms for pressure. Similar to previous results, the techniques make use of a special representation theorem for pressure but, in contrast, the new conditions may apply in more general supports and when there are multiple equilibrium states. Finally, we exhibit some natural examples supporting this last claim. This is joint work with Stefan Adams, Brian Marcus and Ronnie Pavlov.

3. **Meagan Carney, University of Houston**

Dynamical Borel Cantelli lemmas and rates of growth of Birkhoff sums of non-integrable observables on chaotic dynamical systems

We consider implications of dynamical Borel-Cantelli lemmas for rates of growth of Birkhoff sums of non-integrable observables $\varphi(x)=d(x,q)^{-k}$, $k>0$, on ergodic dynamical systems (T,X,μ) where $\mu(X)=1$. In this presentation we discuss a few general results as well as some more concrete examples involving non-uniformly expanding maps, intermittent type maps as well as uniformly hyperbolic systems.

4. **Nishant Chandgotia, Tel Aviv University**

Skew Products Over The Irrational Rotation, The Central Limit Theorem And RATs

Let f be a step function on the circle with zero mean and rational discontinuities while alpha is a quadratic irrational. The point-wise ergodic theorem tells us that the ergodic sum, f(x)+f(x+alpha)+...+f(x+(n-1)alpha) is o(n) for almost every x but says nothing about its deviations from zero, that is, its discrepancy; the study of these deviations naturally draws us to the study of ergodic transformations on infinite measure spaces, viz., skew products over irrational rotations. In this poster we will discuss how the temporal statistics of the ergodic sums for x=0 can be studied via random affine transformations (RATs) leading to a central limit theorem and other fine properties like the visit times to a neighbourhood of 0 vis-à-vis bounded rational ergodicity.

5. **Felipe Garcia-Ramos, Universidad Autonoma de San Luis Potosi**

Synchronization on Bounded density shifts and beta shifts.

Beta shifts and bounded density shifts are similarly defined symbolic systems. We characterize the synchronization property in both families.

6. **Mukta Garg, University of Delhi**

On dynamics of maps possessing the almost average shadowing property

Pseudo-orbits are obtained during computer simulation of an orbit in a discrete dynamical system and a system possessing the shadowing property forces these simulated orbits to follow true orbits of the system. Pseudo-orbits play an important role in investigating properties of the system like detecting mixing and recurrent behaviors of the system which may not be evident by studying actual orbits. Situations occur where instead of an exact error bound in each step of a simulated orbit, one gets a small average error in long runs of the orbit which motivated us to define the notion of almost average shadowing property. Here we relate this notion with certain useful dynamical properties, for instance, variants of transitivity, different types of chaos (including topological entropy), proximality and some other types of shadowing properties. We also give some interesting examples and counterexamples to gloss the study done.

7. **Ben Hayes, Vanderbilt University**

Fuglede-Kadison determinants and sofic entropy

I will present on algebraic actions, which are actions of a countable, discrete group G by automorphisms of a compact, abelian, metrizable group X. This is a probability measure-preserving action, giving X the Haar probability measure. One is interested in classifying, or at least calculating invariants for, this class of probability measure-preserving actions. One common invariant to compute is the entropy of this action. I will present my results computing entropy for a large class of algebraic actions, when the group is sofic (the largest class of groups for which entropy is currently defined). The computation relates to operator algebraic invariants, namely the Fuglede-Kadison determinant.

8. **Yan Mary He, University of Chicago**

Basmajian-type Identities and Hausdorff Dimension of Limit Sets

We introduce Basmajian-type series identities on limit sets associated to familiar one-dimensional complex dynamical systems. We show that the series is absolutely convergent if and only if the Hausdorff dimension of the limit set is strictly less than one. In particular, this allows us to extend Basmajian's identity to certain Schottky groups and to find the Hausdorff dimension one locus in the complement of the Mandelbrot set for quadratic polynomials.

9. **Michihiro Hirayama, University of Tsukuba**

On the ergodicity of hyperbolic Sinai-Ruelle-Bowen measures

For a hyperbolic Sinai-Ruelle-Bowen measure having intersections for almost every pair of the stable and unstable manifolds, the measure is ergodic if the unstable dimension is constant. When the dimension of the ambient manifold is less than or equal to three, the ergodicity follows without the condition of constancy of the unstable dimension. Further, several topological conditions, which guarantee that there exists at most one hyperbolic ergodic Sinai-Ruelle-Bowen measure, are obtained.

10. **Daniel Ingebretson, University of Illinois at Chicago**

Hausdorff dimension of Kuperberg minimal sets

The Seifert conjecture was answered negatively in 1993 by Kuperberg who constructed a smooth aperiodic flow on a three-manifold. This construction was later found to contain a minimal set with a complicated topology. This minimal set is embedded as a lamination by surfaces with a Cantor transversal of Lebesgue measure zero. In this talk we will discuss the pseudogroup dynamics on the transversal, the induced symbolic dynamics, and the Hausdorff dimension of the Cantor set.

11. **Kieran Jarrett, University of Bath**

Non-singular actions of the Heisenberg groups

We present a sequence of subsets of the discrete Heisenberg groups which, when taken as the range of sums in the time average, satisfy the ergodic theorem for any non-singular action of the group. We apply the ergodic theorem to study the critical dimension of such actions.

12. Naotaka Kajino, Kobe University

Weyl's eigenvalue asymptotics for the Laplacian on circle packing limit sets of certain Kleinian groups

This poster presents the author's recent results on the construction of a ``canonical'' Laplacian on circle lacking fractals invariant under the action of certain Kleinian groups and on the asymptotic behavior of its eigenvalues. In the simplest case of the Apollonian gasket, the Laplacian was constructed by Teplyaev (2004) as the unique one with respect to which the coordinate functions on the gasket are harmonic, and the author has recently discovered an explicit expression of it in terms of the circle packing structure of the gasket, which immediately extends to general circle packing fractals and defines (a candidate of) a ``canonical'' Laplacian on those fratals. When the circle packing fractal is the limit set of a maximal cusp group on the Maskit boundary of the quasifuchsian space, the author has also proved Weyl's asymptotic formula for the eigenvalues of this Laplacian, which is of the same form as the circle-counting asymptotic formula by Oh and Shah (Invent. Math., 2012). The proof of this result heavily relies on ergodic-theoretic analysis of a Markov chain on a certain set of (equivalence classes of) Moebius transformations.

13. Sergey Komech, IITP RAS, Moscow, Russia

Deformation rate in dynamical systems

We study a relation between Kolmogorov entropy and boundary distortion rate. This phenomenon was mentioned for the first time in physics literature. There it is stated that the boundary of a set in the phase space of a dynamical system increases exponentially fast with coefficient that equals the entropy of the system corresponding to an invariant measure. But such a relation could be established only if there is some specific dependence between time and size of a set. First rigorous results were obtained by B. Gurevich for symbolic dynamical systems, precisely shifts of finite type. It turns out that the relation holds true for much wider class of dynamical systems: synchronized systems (which contain all sofic shifts), Anosov systems and some flows.

More precisely: In the case of symbolic dynamical systems we evaluate boundary distortion rate in terms of invariant measure, and establish that coefficient equals the entropyIn the case of smooth dynamical systems we evaluate boundary distortion rate in terms of Riemannian measure, which could be non-invariant, and establish that coefficient is equal to the sum of positive Lyapunov exponents of invariant measure (and hence, if invariant measure is Sinai-Ruelle-Bowen measure, to the entropy).

14. Robert Kozma, University of Illinois Chicago

Julia Sets Converging to Filled Quadratic Julia Sets

Previous results by Devaney et al. have shown that for the family of singularly perturbed quadratic maps $z^2 + \lambda/z^2$ the Julia sets converge to the unit disk as $\lambda \to 0$. We give a generalization of this result to maps of the family $F(z) = z^2 + c + \lambda/z^2$ where c is the center of a hyperbolic component of the Mandelbrot set. Using symbolic dynamics, Markov partitions, and Cantor necklaces, we show that as $\lambda \to 0$, the Julia set of F converges to the filled Julia set of $z^2 + c$ in the Hausdorff sense, thus coming arbitrarily close to containing an open set. This is surprising as it is well known that if a Julia set contains an open set it must be the entire complex plane.

15. Dominik Kwietniak, Federal University of CRio de Janeiro

Robust existence of nonhyperbolic ergodic measures with positive entropy and full support

We prove that for a large family of manifolds containing all manifolds supporting a transitive Anosov flow there is nonempty and open set of diffeomorphisms possessing a nonhyperbolic (with at least one zero Lyapunov exponent) ergodic measure with full

support and positive entropy. Several previous works established existence of nonhyperbolic measures in a similar setting and with some (but not all) of these properties. Our proof is based on a strengthening of the tools used by Boichi, Bonatti and Diaz in their recent construction of nonuniformly hyperbolic ergodic measures with full support. In order to show that the entropy of our measure is positive we use some single orbit techniques inspired by works of Kamae and Weiss. These are general results that hold beyond the setting of our paper.

16. **Martha Łącka, Jagiellonian University in Krakow**

Feldman-Katok pseudometric and the GIKN construction of nonhyperbolic ergodic measures

The \emph{GIKN construction} was introduced by Gorodetski, Ilyashenko, Kleptsyn, and Nalsky. It gives a nonhyperbolic ergodic measure which is a weak* limit of a special sequence of measures supported on periodic orbits. This method provided examples of nonhyperbolic invariant measures in various settings. We prove that the result of the GIKN construction is always a loosely Kronecker measure in the sense of Ornstein, Rudolph, and Weiss (equivalently, standard measure in the sense of Katok). For a proof we introduce and study the Feldman-Katok pseudometric $\bar F_K$. The pseudodistance $\bar F_K$ is a topological counterpart of the \emph{f-bar} metric for finite-state stationary stochastic processes introduced by Feldman and, independently, by Katok, later developed by Ornstein, Rudolph, and Weiss. We show that every measure given by the GIKN construction is the $\bar F_K$-limit of a sequence of periodic measures. We also prove that a measure which is the $\bar F_K$-limit of a sequence of ergodic measures is ergodic and its entropy is smaller or equal than the lower limit of entropies of measures in the sequence. Furthermore we demonstrate that $\bar F_K$-Cauchy sequence of periodic measures tends in the weak* topology either to a periodic measure or to a loosely Kronecker measure.

17. **Bingbing Liang, Max-Planck Institute for Mathematics in Bonn**

Dynamical correspondences of L^2-Betti numbers

We investigate dynamical analogues of the L^2-Betti numbers for modules over integral group ring of a discrete sofic group. As an application, we give a dynamical characterization of L\"{u}ck's dimension-flatness.

18. **Marco Lopez, University of North Texas**

Dimension of Shrinking Targets from Non-Autonomous Systems

The shrinking target problem refers to the the study of the set of points in a metric space, whose orbits under a dynamical system hit infinitely often a ball with radius shrinking to zero. In our work we focus on establishing Bowen's dimension formula for shrinking target sets in the context of non-autonomous iterated function systems on the unit interval. In special cases, such shrinking target sets arise in Diophantine approximation.

19. **Jeovanny de Jesus Muentes Acevedo, University of Sao Paulo**

On the Continuity of the Topological Entropy of Non-autonomous Dynamical Systems

Abstract Let M be a compact Riemannian manifold. The set $\mathrm{F}^r(M)$ consisting of sequences $(f_i)_{i\in\mathbb{Z}}$ of C^r-diffeomorphisms on M can be endowed with the compact topology or with the strong topology. A notion of topological entropy is given for these sequences. I will prove this entropy is discontinuous at each sequence if we consider the compact topology on $\mathrm{F}^r(M)$. On the other hand, if $r \geq 1$ and we consider the strong topology on $\mathrm{F}^r(M)$, this entropy is a continuous map.

20. Chen-Chang Peng, Department of Applied Mathematics, National Chiayi University

Estimate Hausdorff dimension and box dimension for Mira maps near anti-integrable limits

First we introduce why we study Mira maps and the dynamics for Mira maps near anti-integrable limits. Near anti-integrable limits, the repellers for Mira maps coincide with the attractors of the related iterated function systems. We estimate the upper bounds and the lower bounds of the fractal dimension of the attractors for the iterated function systems. The invariant subsets for Mira maps near anti-integrable limits are hyperbolic repellers but they are not all conformal.

21. Vytnova Polina, University of Warwick

Towards a Kinematic Fast Dynamo

The kinematic fast dynamo equation describes evolution of the magnetic field of large astrophysical objects, such as planets and stars. It is a special case of the Navier Stokes equation in the real 3 dimensional space, with two parameters, a vector field and a diffusion coefficient. A divergent free vector field is called a fast dynamo, if the corresponding equation has a solution in which energy grows exponentially with time. The existence of this vector field is an open question. We will present a recent progress on this problem.

22. Gabriel Ponce, State University of Campinas, UNICAMP

Measure Rigidity and Disintegration: Time one map of flows.

The results presented in this poster are mainly related to the classification of ergodic measures which are invariant by the time-1 map of a measurable flow on a Lebesgue space. Let $\phi_t:X \rightarrow X$ be a continuous flow on a compact metric space. In this work we are able to understand the restriction for an ergodic invariant probability measure for the time one map $\phi_1:X \rightarrow X$ to be invariant and ergodic for the flow. This restriction is an interesting phenomena closely related to the behavior of a pathological foliation as firstly described by Milnor over a Katok's example known as “Fubini's Nightmar”. We also describe all ergodic measures for ϕ_1 in terms of its Rohklin disintegration over the partition by orbits of the flow.

23. Luciana Salgado, UFBA/UFRJ

Dominated splittings for singular flows

We prove necessary conditions for an invariant splitting of the tangent bundle over a compact invariant set for a flow to be dominated. In particular, it is reduced to the requirements to obtain singular hyperbolicity. The flow known as "Bowen Example" is used to show that the result is not true if we remove the domination hyphothesis over singularities.

24. Vitalii Senin, TU Berlin

Pesin's Formula for Isotropic Brownian Flows

Pesin's formula has never been established for dynamical systems with invariant measure, which is infinite. The problem is that in this case the notion of entropy becomes senseless. Isotropic Brownian flows is a specific class of random dynamical systems, which are defined on d-dimensional Euclidean space, and invariant in distribution with respect to rotations and translations. They are called Brownian, because under the action of an isotropic Brownian flow the image of a particular point behaves purely like a Brownian motion. The invariant measure of isotropic Brownian flows is the Lebesgue measure, which is, clearly, infinite. Nevertheless, we define entropy for such a class of flows using the notion of local entropy, which was introduced by Brin and Katok

in 1983. This idea makes sense because of translation invariance of isotropic Brownian flows. Then we study the analogue of Pesin's formula for these flows using the defined entropy.

25. Mao Shinoda, Keio University

Properties of ergodic maximizing measures for dense continuous functions

Consider a continuous self-map of a compact metric space. The main purpose of ergodic optimization is to single out dynamically invariant Borel probability measures which maximize the integral of a given "performance" function. Jenkinson shows that for a generic continuous function there exists a unique maximizing measure. Moreover, Morris shows the unique maximizing measure of a generic continuous function is fully supported and has zero entropy, provided the self-map satisfies the specification property. However it is difficult to tell whether a given performance-function is generic. Indeed, no concrete example of a continuous function is known which is uniquely maximized by a fully supported measure. Hence it is natural to investigate properties which are not generic, yet hold for a reasonably large set of functions. In this poster we prove the existence of uncountably many ergodic maximizing measures for a dense subset of continuous functions. In the case of symbolic systems we can refine the property of the uncountably many ergodic maximizing measures.

26. Kathryn Spalding, Loughborough University

Growth of Values of Binary Quadratic Forms and Conway Rivers

We study the growth of the values of a binary quadratic form Q on a binary planar tree as it was described by Conway. We show that the corresponding Lyapunov exponents $\Lambda_Q(x)$ as a function of path determined by $x \in RP^1$ are twice the values of the corresponding exponents for the growth of Markov numbers, except for the paths corresponding to the Conway rivers, when $\Lambda_Q(x) = 0$. The relation with Galois results about continued fraction expansions for quadratic irrationals is explained and interpreted geometrically.

27. Adam Śpiewak, Warsaw University

A note on a Wiener-Wintner theorem for mean ergodic Markov amenable semigroups

Classical Wiener-Wintner ergodic theorem establishes almost sure convergence of a sequence \frac{1}{N} \sum_{n=0}^{N-1} \lambda^n f(T^n x) for every \lambda on the unit circle, where T is an ergodic measure preserving transformation and f : X \rightarrow \mathbb{C} is integrable. We prove a generalization of its topological version for semigroups of Markov operators on C(X). We assume that \{ S_g : g \in G \} is a mean ergodic representation of a right amenable semitopological semigroup G by linear Markov operators on C(X), where X is some compact Hausdorff space. The main result is necessary and sufficient conditions for mean ergodicity of a distorted semigroup \{ \chi(g)S_g : g \in G \}, where \chi is a semigroup character. Such conditions were obtained before under the additional assumption that \{ S_g : g \in G \} is uniquely ergodic. This is joint paper with Wojciech Bartoszek "A note on a Wiener-Wintner theorem for mean ergodic Markov amenable semigroups" (https://doi.org/10.1090/proc/13495).

28. Matteo Tanzi, Imperial College London

Heterogeneously Coupled Maps: hub dynamics and emergence across connectivity layers

We study expanding dynamical systems coupled on an heterogeneous network so that two systems interact if there is an edge of the network connecting them. In this setting, most systems make a small number of interactions, while those corresponding to the

highly connected nodes (hubs) interact with many. We study the regime where the coupling is a small perturbation for the former systems, but a large one for the latter so that global hyperbolicity might be lost. We show that, under some hypotheses on the heterogeneity of the network, the effect of the coupling on the hub nodes can be well approximated, for a large set of initial conditions and for a time exponentially long with respect to the connectivity of the hub, by a reduced map of the hub coordinate only. The map is given by the expectation of the interaction with respect to the invariant measure for the dynamics of the uncoupled nodes. This implies a bifurcation of the observed behaviour of the hub nodes when varying the coupling strength and their connectivity and forecast regimes of synchronisation and uncorrelation of the nodes.

29. Shirou Wang, Academy of Mathematics and Systems Science, Chinese Academy of Sciences

Upper semi-continuity of entropy map for nonuniformly hyperbolic systems

For a continuous transformation f on a compact manifold M, the entropy map of f is defined by the metric entropy on the set of all f-invariant measures and it is generally not continuous. However, it is still worth our effort to investigate the upper semi-continuity of it since, for instance, it implies the existence of invariant measures of maximal entropy. We prove that for C1 non-uniformly hyperbolic systems with domination, the entropy map is upper semi-continuous. On the other hand we give a counter example showing that this is not necessarily true for C1+r non-uniformly hyperbolic systems without domination. This goes a little against a common intuition that conclusions are parallel between these two kinds of non-uniformly hyperbolic systems.

30. Ren Yi, Brown University

Self-induced rectangle exchange maps

Rectangle exchange maps (REMs) are higher dimensional generalizations of interval exchange maps (IEMs) which have been well-studied for more than40 years. We study REMs induced by cut and projection lattices arisen from cubic Pisot numbers. We discover a family of self-induced REMs with fixed combinatorics. We find a Cantor set corresponding to the self-induced REMs in the parameter space and we give a symbolic encoding of their dynamics.

31. Kensuke Yoshida, Tokyo Metropolitan University

Sub-diffusion in a non-chaotic area-preserving map, continuous-time random walks and ergodic problems

We investigate a model of non-chaotic area-preserving map defined on the cylinder that is called the Generalized Triangle Map (GTM). GTM generates sub-diffusion in momentum-direction, and the probability density function of momentum obeys the fractional diffusion equation that describes the sub-diffusion process generated by continuous-time random walk (CTRW) model. In a CTRW, it is shown that the diffusion coefficient of time averaged mean-square displacement (TAMSD) becomes random variable. This situation is called ``weak ergodicity breaking" (WEB). On the basis of infinite ergodic theory, it was shown that the diffusion coefficient of TAMSD in dissipative maps with marginal fixed points becomes random variable. This means WEB appears in such maps. We expect that WEB is realized in GTM. However, the phase space is non-compact, so it is not trivial whether the invariant measure exists or not. In this poster, we discuss the description of sub-diffusion in GTM with the CTRW model.

32. Xin Zhang, University of Illinois at Urbana-Champaign

Statistical regularity of Apollonian Gasket.

Apollonian gaskets are formed by repeatedly filling the gaps between four mutually tangent circles with further tangent circles. In this paper we study the nearest neighbor spacing and pair correlation of centers of circles from Apollonian gaskets. Unlike many

other point processes investigated in the literature, a key feature in our consideration is that the centers are not uniformly distributed in any natural ambient space. Nevertheless, after proper normalization, we show that the limiting pair correlation and nearest spacing exist, and can be described by continuously differentiable functions. These are corollaries of the convergence of moments that we prove. The input from ergodic theory is an extension of Mohammadi-Oh's Theorem on the equidistribution of horospheres in infinite volume hyperbolic spaces, which can be obtained by the mixing of the frame flow under the Bowen-Margulis-Sullivan measure.

Suggested activities for Wednesday Aug 2nd Afternoon

The conference program for August 2 will end at 3 PM. You have a free afternoon which you can plan as you so wish. Below are some suggestions**:

a) **Join the planned beach hike**: plan to wear comfortable walking shoes, and plan your own dinner spot. There are a few beach concessions as well as Jericho Sailing Club- Galley Restaurant along the way (this is an optional hike, see page 20 for details)
b) **Tour UBC**: Nitobe Gardens, the Museum of Anthropology and the Beatty Biodiversity Museum are popular highlights
c) **Take the bus downtown and tour Stanley Park, Canada Place and English Bay**
d) **Go back to your room and rest, nap**

**Please note, that these events are not part of the conference program and are listed here as a suggestion only. For those of you opting to go for the hike or to tour downtown there will be a fireworks display by English Bay. This is a huge highlight in the Vancouver Summer and getting back to campus, on transit, may take longer than usual.

Optional afternoon hike to the Beach

You are invited to a hike through the forest from the Alumni Centre (venue for Remembrance lunch) to the beach. The hike will start at 3PM and take 60-90 minutes. We recommend that you wear good walking shoes and bring water. At the beach, there is food available for purchase at beach concessions or at Galley restaurant (Jericho Sailing Club), marked on map below. **Please note that the concessions and Galley restaurant cannot accommodate us all at the same time**. Also, there will be fireworks at 10PM over English Bay; best viewing spots are Vanier Park (near Granville Island) and Sunset Beach (other side of Burrard Bridge).

Hike route below: (There are other possible routes; however, note that **high tide will be at 4:30 PM**.)

1. Walk east on University Blvd and enter forest at Sword Fern Trail (24)
2. Sword Fern Trail to Spanish Trail (23) and go east
3. Spanish Trail to Pioneer Trail (17) and go north [be careful crossing Chancellor Blvd]
4. Pioneer trail to East Canyon Trail (7) and go west and then north; East Canyon trail to Admiralty Trail (1)
5. Go east on Admiralty Trail to NW Marine Drive
6. Cross NW Marine Drive to beach and continue east to find food at concession or sailing club.

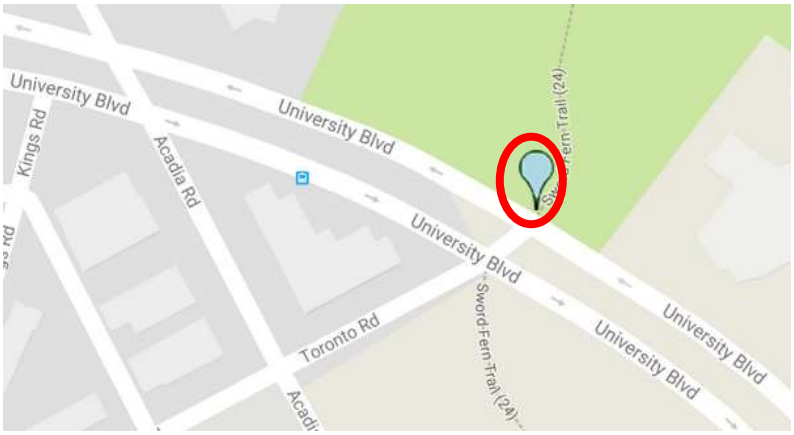
Start of hike: Sword Fern

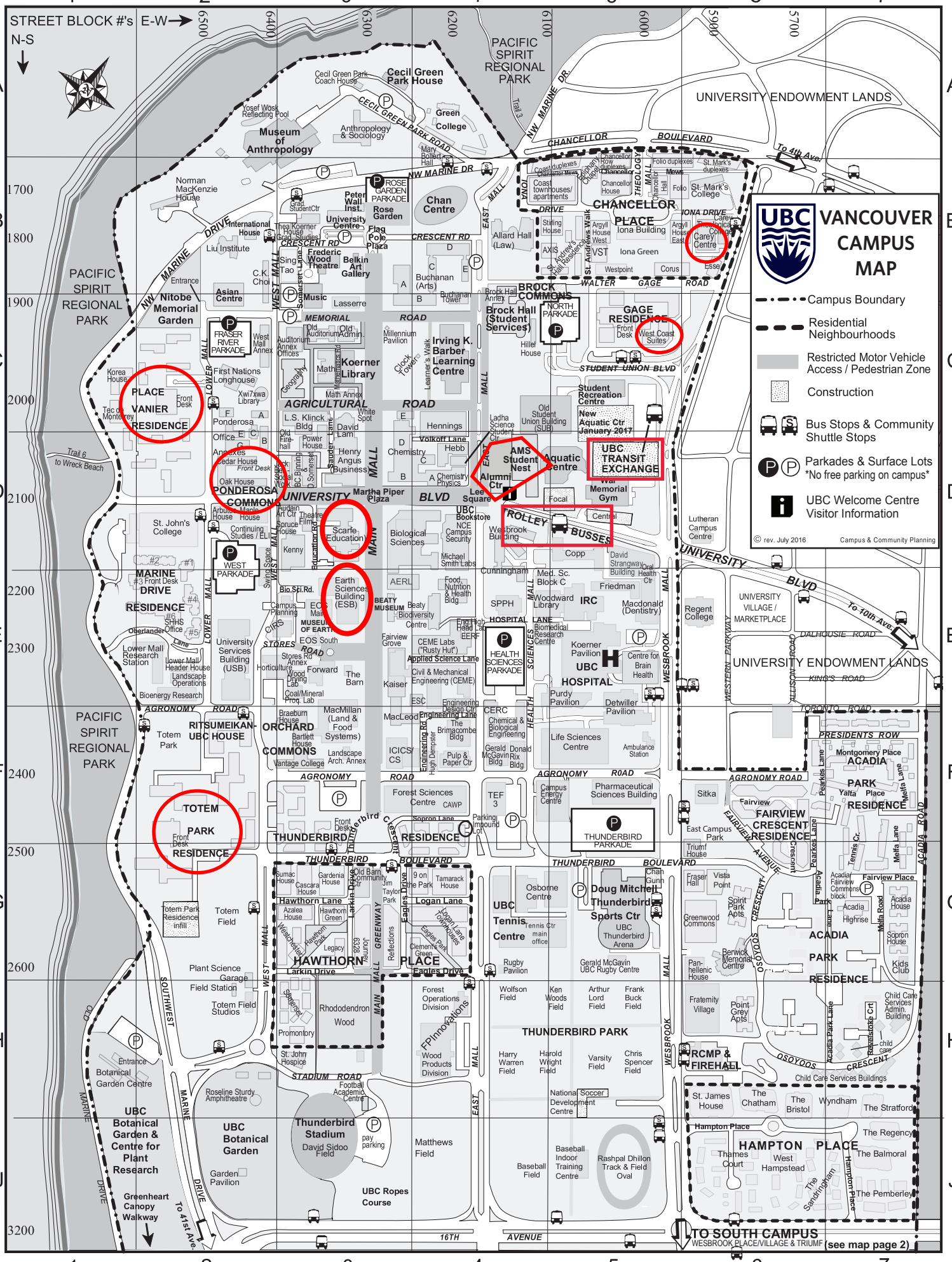
1 Spanish Banks West Concession

2 Spanish Banks East Concession

3 Locarno Concession

4 Jericho Sailing Club-Galley Restaurant




STREET BLOCK #'s E-W
N-S
6500
6400
6300
6200
6100
6000
5900
5700
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
3200
PACIFIC SPIRIT REGIONAL PARK
UNIVERSITY ENDOWMENT LANDS
Cecil Green Park House
Museum of Anthropology
Anthropology & Sociology
Green College
CECIL GREEN PARK ROAD
NW MARINE DR
CHANCELLOR BOULEVARD
To 4th Ave
Norman MacKenzie House
Peter Wall Inst.
ROSE GARDEN PARKADE
Rose Garden
Chan Centre
University Centre
Flag Pole Plaza
CRESCENT RD
Allard Hall (Law)
CHANCELLOR PLACE
Iona Building
VST
Iona Green
Carey Centre
Liu Institute
Frederic Wood Theatre
Belkin Art Gallery
Buchanan (Arts)
Asian Centre
Nitobe Memorial Garden
Lasserre
BROCK COMMONS
NORTH PARKADE
Brock Hall (Student Services)
GAGE RESIDENCE
West Coast Suites
WALTER GAGE ROAD
STUDENT UNION BLVD
FRASER RIVER PARKADE
Koerner Library
Irving K. Barber Learning Centre
Millennium Pavilion
Hillel House
Student Recreation Centre
New Aquatic Ctr January 2017
PLACE VANIER RESIDENCE
First Nations Longhouse
Xwi7xwa Library
AGRICULTURAL ROAD
L.S. Klinck Bldg
Ponderosa Annexes
PONDEROSA COMMONS
Cedar House
Oak House
Old Fire-hall
Chemistry
Hennings
Volkoff Lane
Hebb
Old Student Union Building (SUB)
AMS Student Nest
Aquatic Centre
UBC TRANSIT EXCHANGE
Alumni Ctr
War Memorial Gym
Focal
Central
UNIVERSITY BLVD
Martha Piper Plaza
Lee Square
UBC Bookstore
ROLLEY BUSSES
Scarfe Education
Biological Sciences
NCE Campus Security
Westbrook Building
Copp
David Strangway Building
Oral Health Ctr
Lutheran Campus Centre
St. John's College
Continuing Studies / ELL
WEST PARKADE
MARINE DRIVE RESIDENCE
Earth Sciences Building (ESB)
Michael Smith Labs
Cunningham
Med. Sc. Block C
Woodward Library
IRC
Friedman
Macdonald (Dentistry)
Regent College
UNIVERSITY VILLAGE / MARKETPLACE
To 10th Ave
DALHOUSIE ROAD
UNIVERSITY ENDOWMENT LANDS
KING'S ROAD
TORONTO ROAD
Food, Nutrition & Health Bldg
SPPH
HOSPITAL LANE
Biomedical Research Centre
HEALTH SCIENCES PARKADE
Koerner Pavilion
UBC HOSPITAL
Centre for Brain Health
Purdy Pavilion
Detwiller Pavilion
Lower Mall Research Station
University Services Building (USB)
Fairview Grove
CEME Labs ("Rusty Hut")
Applied Science Lane
Civil & Mechanical Engineering (CEME)
Kaiser
Engineering Design Ctr
Engineering Lane
MacLeod
CERC
Chemical & Biological Engineering
Life Sciences Centre
Ambulance Station
AGRONOMY ROAD
RITSUMEIKAN-UBC HOUSE
ORCHARD COMMONS
Braeburn House
Bartlett House
Vantage College
MacMillan (Land & Food Systems)
Landscape Arch. Annex
ICICS/CS
Pulp & Paper Ctr
Forest Sciences Centre
CAWP
TEF 3
Parking Intensive Lot
Campus Energy Centre
Pharmaceutical Sciences Building
Sitka
PRESIDENTS ROW
Montgomery Place
ACADIA PARK RESIDENCE
Yalta Place
Fairview
FAIRVIEW CRESCENT RESIDENCE
East Campus Park
Triumf House
THUNDERBIRD RESIDENCE
THUNDERBIRD PARKADE
THUNDERBIRD BOULEVARD
Sumac House
Cascara House
Gardenia House
Old Barn Community Ctr
Jim Taylor Park
9 on the Park
Tamarack House
Hawthorn Lane
Azalea House
Hawthorn Green
Logan Lane
Larkin Drive
Eagles Drive
Osborne Centre
Doug Mitchell Thunderbird Sports Ctr
UBC Tennis Centre
Tennis Ctr main office
UBC Thunderbird Arena
Chan Gunn
Fraser Hall
Vista Point
Spirit Park Apts
Greenwood Commons
Acadia Park
Acadia Highrise
Acadia House
Fairview Place
Melfa Road
Sopron House
Totem Park Residence infill
Totem Field
Plant Science Garage
Field Station
Totem Field Studios
HAWTHORN PLACE
Reflections
Clements Green
Rugby Pavilion
Gerald McGavin UBC Rugby Centre
Pan-hellenic House
Berwick Memorial Centre
Fraternity Village
Point Grey Apts
Child Care Services Admin. Building
Child Care Services Buildings
THUNDERBIRD PARK
Wolfson Field
Ken Woods Field
Arthur Lord Field
Frank Buck Field
Harry Warren Field
Harold Wright Field
Varsity Field
Chris Spencer Field
RCMP & FIREHALL
Forest Operations Division
FPInnovations
Wood Products Division
Rhododendron Wood
Promontory
St. John Hospice
Roseline Sturdy Amphitheatre
Football Academic Centre
National Soccer Development Centre
Baseball Indoor Training Centre
Rashpal Dhillon Track & Field Oval
Baseball Field
Matthews Field
Thunderbird Stadium
David Sidoo Field
pay parking
UBC Botanical Garden & Centre for Plant Research
UBC Botanical Garden
Garden Pavilion
Botanical Garden Centre
Entrance
Greenheart Canopy Walkway
To 41st Ave
UBC Ropes Course
HAMPTON PLACE
St. James House
The Chatham
The Bristol
Wyndham
The Stratford
The Regency
The Balmoral
The Pemberley
Thames Court
West Hampstead
The Sandringham
Hampton Place
TO SOUTH CAMPUS
WESBROOK PLACE/VILLAGE & TRIUMF
(see map page 2)
VANCOUVER CAMPUS MAP
Campus Boundary
Residential Neighbourhoods
Restricted Motor Vehicle Access / Pedestrian Zone
Construction
Bus Stops & Community Shuttle Stops
Parkades & Surface Lots
No free parking on campus
UBC Welcome Centre Visitor Information
© rev. July 2016
Campus & Community Planning

Map Directory

Site or Building Name & Address	Grid
Abdul Ladha Science Student Ctr, 2055 East Mall	D4
Acadia/Fairview Commonsblock & Front Desk, 2707 Tennis Cres	G7
Acadia House, 2700-2720 Acadia Rd	G7
Acadia Park Residence (Student Family Housing)	F/H-6/7
Acadia Park Highrise, 2725 Melfa Rd	G7
Allard Hall [Faculty of Law], 1822 East Mall	B4
Alumni Centre (Robert H. Lee), 6163 University Blvd	**D4**
AMS Student Nest (new student union building), 6133 University Blvd	**D4**
Anthropology & Sociology (ANSOC) Bldg, 6303 NW Marine Dr	A3
Aquatic Centre (New - opening Jan. 2017), 6080 Student Union Blvd	**C5**
Aquatic Centre (Old), 6121 University Blvd	**D5**
Aquatic Ecosystems Research Lab (AERL), 2202 Main Mall	E3
Asian Centre, 1871 West Mall	B2
Audain Art Centre (in Ponderosa Commons), 6398 University Blvd	D3
Auditorium Annex Offices A & B, 1924 West Mall	C3
Barn ("Owl" child care), 2323 Main Mall	E3
Baseball Indoor Training Centre, 3085 West Mall	J5
B.C. Binning Studios, 6373 University Blvd	D3
Beaty Biodiversity Centre & Museum, 2212 Main Mall	**E3/4**
Belkin (Morris & Helen) Art Gallery, 1825 Main Mall	**B3**
Berwick Memorial Centre, 2765 Osoyoos Cres	G6
Bioenergy Research & Demonstration Facility (BRDF), 2337 Lower Mall	E2
Biological Sciences Bldg, 6270 University Blvd	D3
Biomedical Research Ctr, 2222 Health Sciences Mall	E4
Bollert (Mary) Hall, 6253 NW Marine Dr	A4
Bookstore, 6200 University Blvd	D4
Botanical Garden Centre/Gatehouse, 6804 SW Marine Dr	**H1**
Botanical Garden Pavilion (enter at Gatehouse, 6804 SW Marine Dr)	J2
Botan. Gard. Greenhses/ Workshops, 3929 Wesbrook Mall	South Campus
Brimacombe Building, 2355 East Mall	F4
Brock Commons - Tallwood House (construction), 6088 Walter Gage Rd	B4
BROCK HALL: Student Services & Welcome Centre, 1874 East Mall	**C4**
Brock Hall Annex, 1874 East Mall	C4
Buchanan Building (Blocks A, B, C, D, & E) [Arts], 1866 Main Mall	B3/4
Buchanan Tower, 1873 East Mall	C4
Building Ops Nursery/Greenhouses, 6029 Nurseries Rd	South Campus
C.K. Choi Building for the Institute of Asian Research, 1855 West Mall	B2
Campus & Community Planning, 2210 West Mall	E3
Campus Energy Centre, 6130 Agronomy Rd	F5
Campus Security, 2133 East Mall	D4
Carey Centre / Theological College, 5920 Iona Drive/1815 Wesbrook Mall	B6
Cecil Green Park Coach House, 6323 Cecil Green Park Rd	A3
Cecil Green Park House, 6251 Cecil Green Park Rd	A3
Centre for Brain Health (Djavad Mowafaghian), 2215 Wesbrook Mall	E5
Centre for Comparative Medicine (CCM), 4145 Wesbrook Mall	South Campus
Chan Centre for the Performing Arts, 6265 Crescent Rd	**B4**
Chan Gunn Pavilion (new sports med. construction), 2553 Wesbrook Mall	G5
Chemical & Biological Engineering Bldg, 2360 East Mall	F4
Chemistry A Block - Chemistry Physics Building, 6221 University Blvd	D4
Chemistry B.C,D & E Blocks, 2036 Main Mall	D3
Child Care Services Administration Bldg, 2881 Acadia Rd	H7
Child Care Services Bldgs, Osoyoos Crescent and Revelstoke Crt	H7
CIRS (Centre for Interactive Research on Sustainability), 2260 West Mall	E3
Civil & Mechanical Engineering Bldg (CEME), 6250 Applied Science Lane	E4
Civil & Mechanical Eng. Labs ("Rusty Hut"), 2275 East Mall	E4
Coal & Mineral Processing Lab, 2332 West Mall	E3
Continuing Studies Bldg [English Language Institute], 2121 West Mall	D2
Copp (D.H.) Building, 2146 Health Sciences Mall	D5
Cunningham (George) Building, 2146 East Mall	E4
David Lam Learning Centre, 6326 Agricultural Rd	C3
David Lam Management Research Ctr, 2033 Main Mall	C3
David Strangway Building, 5950 University Blvd	D5
Donald Rix Building, 2389 Health Sciences Mall	F4
Doug Mitchell Thunderbird Sports Centre, 6066 Thunderbird Blvd	**G5**
Dorothy Somerset Studios, 6361 University Blvd	**D3**
Earth Sciences Building (ESB), 2207 Main Mall	E3
Earth & Ocean Sciences (EOS) - Main and South, 6339 Stores Rd	E3
Earthquake Engineering Research Facility (EERF), 2235 East Mall	E4
Engineering High Head Room Lab, 2225 East Mall	E4
Engineering Student Centre, 2335 Engineering Road	E4
English Language Institute (E.L.I.) — *see Continuing Studies Building*	
Environmental Services Facility, 6025 Nurseries Rd	South Campus
Fairview Crescent Residence, 2600-2804 Fairview Cres	F6
Fire Hall, 2992 Wesbrook Mall	H6
First Nations Longhouse, 1985 West Mall	C2
Flag Pole Plaza (Main Mall & Crescent Rd)	B3
Food, Nutrition and Health Bldg, 2205 East Mall	E4
Forest Sciences Centre [Faculty of Forestry], 2424 Main Mall	F4
Forward (Frank) Building, 6350 Stores Rd	E3
FPInnovations, 2601 & 2665 East Mall	H4
Fraser Hall, 2550 Wesbrook Mall	G6
Fraternity Village, 2880 Wesbrook Mall	H6
Frederic Wood Theatre, 6354 Crescent Rd	**B3**
Friedman Bldg, 2177 Wesbrook Mall	E5
Gage (Walter H.) Residence, 5959 Student Union Blvd	C5
Geography Building, 1984 West Mall	C3
Gerald McGavin Building, 2386 East Mall	F4
Gerald McGavin UBC Rugby Centre, 2765 Wesbrook Mall	G5
Graduate Student Centre — *see Thea Koerner House*	
Green College, 6201 Cecil Green Park Rd	A4
Hebb Building, 2045 East Mall	D4
Hennings Building, 6224 Agricultural Rd	C4
Henry Angus Building [Sauder School of Business], 2053 Main Mall	D3
Hillel House, 6145 Student Union Blvd	C4
Horticulture Building/Greenhouse, 6394 Stores Rd	E2/3

Site or Building Name & Address	Grid
Hugh Dempster Pavilion, 6245 Agronomy Rd	F4
ICICS/CS (Institute for Computing, Information & Cognitive Systems/Computer Science), 2366 Main Mall	F4
Instructional Resources Centre (IRC), 2194 Health Sciences Mall	E5
International House, 1783 West Mall	B2
In-Vessel Composting Facility, 6035 Nurseries Road	South Campus
Irving K. Barber Learning Centre, 1961 East Mall	**C4**
Jack Bell Building for the School of Social Work, 2080 West Mall	D3
Kaiser (Fred) Building [Faculty of Applied Science], 2332 Main Mall	E3
Kenny (Douglas T) Building, [Psychology] 2136 West Mall	D3
Kids Club, 2855 Acadia Rd	G7
Klinck (Leonard S.) Bldg, 6356 Agricultural Rd	C3
Koerner (Walter C.) Library, 1958 Main Mall	C3
Landscape Architecture Annex, 2371 Main Mall	F3
Lasserre (Frederic) Building, 6333 Memorial Rd	C3
Library Preservation Archives (PARC), 6049 Nurseries Rd	South Campus
Life Sciences Centre, 2350 Health Sciences Mall	F5
Liu Institute for Global Issues, 6476 NW Marine Dr	B2
Lower Mall Research Station, 2259 Lower Mall	E2
Macdonald (J.B.) Building [Dentistry], 2199 Wesbrook Mall	E5
MacLeod (Hector) Building, 2356 Main Mall	F3
MacMillan (H.R.) Bldg [Faculty of Land & Food Systems], 2357 Main Mall	F3
Marine Drive Residence (Front Desk in Bldg #3), 2205 Lower Mall	E2
Material Recovery Facility, 6055 Nurseries Rd	South Campus
Mathematics Annex, 1986 Mathematics Rd	C3
Mathematics Building, 1984 Mathematics Rd	C3
Medical Sciences Block C, 2176 Health Sc. Mall	E4
Michael Smith Laboratories, 2185 East Mall	D4
Museum of Anthropology (MOA), 6393 NW Marine Dr	**A2/3**
Music Building, 6361 Memorial Rd	B/C3
National Soccer Development Centre, 3065 Wesbrook Mall	H5
Networks of Ctrs of Excellence (NCE), 2125 East Mall	D4
Nitobe Memorial Garden, 1895 Lower Mall	B/C2
Nobel Biocare Oral Heath Centre, 2151 Wesbrook Mall	E5
Norman MacKenzie House, 6565 NW Marine Dr	B2
NRC Institute for Fuel Cell Innovation, 4250 Wesbrook Mall	South Campus
Old Administration Building, 6328 Memorial Rd	C3
Old Auditorium, 6344 Memorial Rd	C3
Old Barn Community Centre, 6308 Thunderbird Blvd	G3
Old Firehall, 2038 West Mall	D3
Orchard Commons, 6363 Agronomy Rd	F3
Osborne (Robert F.) Centre/Gym, 6108 Thunderbird Blvd	G4
Pacific Museum of Earth (in EOS-Main), 6339 Stores Rd	**E3**
Panhellenic House, 2770 Wesbrook Mall	G6
Peter Wall Institute for Advanced Studies (PWIAS), 6331 Crescent Rd	B3
Pharmaceutical Sciences Building, 2405 Wesbrook Mall	F5
Place Vanier Residence, 1935 Lower Mall	C/D2
Plant Science Field Station & Garage, 2613 West Mall	H2
Point Grey Apartments, 2875 Osoyoos Cresc	H6
Police (RCMP) & Fire Department, 2990/2992 Wesbrook Mall	H6
PONDEROSA COMMONS, University Blvd & West Mall	D2/3
Arbutus & Maple Houses, 6488 University Blvd.	D2
Cedar House (Ponderosa Commons Front Desk), 2075 West Mall	D2
Oak House, 6445 University Blvd	D2
Spruce House, 2118 West Mall	D3

Site or Building Name & Address	Grid
Ponderosa Office Annexes: A, B, & C, 2011-2029 West Mall	C/D2
Ponderosa Office Annexes: E, F & G, 2008-2044 Lower Mall	C/D2
Power House, 2040 West Mall	D3
Pulp and Paper Centre, 2385 East Mall	F4
Ritsumeikan-UBC House, 6460 Agronomy Rd	F2
Rose Garden	B3
Rugby Pavilion, 2584 East Mall	G4
Scarfe (Neville) Building [Education], 2125 Main Mall	D3
School of Population & Public Health (SPPH), 2206 East Mall	E4
SERC (Staging Environmental Research Ctr), 6045 Nurseries Rd	S.Campus
Sing Tao Building, 6388 Crescent Rd	B3
Sopron House, 2730 Acadia Rd	G7
South Campus Warehouse, 6116 Nurseries Rd	South Campus
Spirit Park Apartments, 2705-2725 Osoyoos Cresc	G8
St. Andrew's Hall/Residence, 6040 Iona Dr	B5
St. John Hospice, 6389 Stadium Road	H3
St. John's College, 2111 Lower Mall	D2
St. Mark's College, 5935 Iona Dr.	B6
Stores Road Annex, 6368 Stores Rd	E3
Student Family Housing (Acadia Park Residence)	F/H-6/7
Student Recreation Centre, 6000 Student Union Blvd	C5
Student Union Bldg (old) (Old SUB), 6138 Student Union Blvd	**C4**
TEF3 (Technology Enterprise Facility 3), 6190 Agronomy Rd	F4
Thea Koerner House [Faculty of Graduate Studies], 6371 Crescent Rd	B3
Theatre-Film Production Bldg, 6358 University Blvd	D3
Thunderbird Residence, 6335 Thunderbird Cresc	F3/4
Thunderbird Arena (in Doug Mitchell Centre), 2555 Wesbrook Mall	G5
Thunderbird Stadium, 6288 Stadium Rd	J3
Totem Field Studios, 2613 West Mall	H2
Totem Park Residence, 2525 West Mall	F/G2
TRIUMF, 4004 Wesbrook Mall	South Campus
Triumf House (TRIUMF Visitors' Residence), 5835 Thunderbird Blvd	G6
UBC Bookstore, 6200 University Blvd	**D4**
UBC Farm, 3461 Ross Drive	**South Campus**
UBC Football Academic Centre, 6298 Stadium Rd	H3
UBC Hospital, 2211 Wesbrook Mall	E5
UBC Parking Impound Lot, 2451 East Mall	F4
UBC Tennis Centre, 6160 Thunderbird Blvd	G4
University Centre (Leon & Thea Koerner), 6331 Crescent Rd	B3
University Services Building (USB), 2329 West Mall	E2
Vancouver School of Theology (VST), 6015 Walter Gage Rd	B5
Vantage College (in Orchard Commons, Fall 2016), 6363 Agronomy Rd	F3
War Memorial Gymnasium, 6081 University Blvd	D5
Wayne & William White Engineering Design Ctr, 2345 East Mall	E4
Wesbrook Bldg, 6174 University Blvd	D4
Wesbrook Community Centre, 5998 Berton Ave	South Campus
Wesbrook Village commercial centre	South Campus
West Mall Annex, 1933 West Mall	C2
West Mall Swing Space Bldg, 2175 West Mall	D2
Wood Drying Laboratory, 2324 West Mall	E3
Woodward IRC, 2194 Health Sciences Mall	E4/5
Woodward Library, 2198 Health Sciences Mall	E4/5