Pacific Institute *for the* Mathematical Sciences

Analysis and Partial Differential Equations

Conference program

July 8-12, 2013

Pacific Institute for the Mathematical Sciences
Earth Sciences Building (ESB)
2207 Main Mall, Vancouver


Analysis and Partial Differential Equations

July 8 - July 12, 2013, UBC

Earth Sciences Building, 2207 Main Mall

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.
- **Event Evaluation Survey**: Please help PIMS to improve the quality of its events and plan for the future by filling out the survey at the end of the conference. It is located at: http://www.pims.math.ca/scientific-event/130707-apde
- **All Speaker Abstracts can be found beginning on Page 5.**

Monday July 8th (ESB 1012)

08:30-08:55	Registration
08:55-09:00	Welcome
09:00-09:45	**Yann Brenier** : Volume and topology preserving diffusion equations
09:45-10:15	Coffee break (ESB Lobby)
10:15-11:00	**Wilfrid Gangbo**: A class of variational problems involving polyconvex integrands.
11:05-11:50	**Robert McCann**: Academic wages and pyramid schemes: a mathematical model
11:50-13:50	Lunch (Self Catered: See last page for dining options on campus)
13:50-14:35	**Frederic Robert**: Sign-changing solution to scalar-curvature type equations: the case of a degenerate metric
14:40-15:25	**Oliver Druet:** The Einstein-Lichnerowicz constraint system
15:25-15:55	Coffee break (ESB Lobby)
15:55-16:40	**Mary Pugh**: Special Solutions in Smectic Electroconvection
16:45-17:30	PDE Conference Reception- ESB Atrium

Tuesday July 9th (ESB 2012)

09:00-09:45	**Sun-Yung Alice Chang**: On a class of non-local conformal invariants on asymptotic hyperbolic manifolds
09:45-10:15	Coffee break (ESB 2012 Lobby)
10:15-11:00	**Pengfei Guan**: Two uniqueness Theorems in geometry, old and new.
11:05-11:50	**Xavier Cabre**: Sharp isoperimetric inequalities with densities via the ABP method
11:50-13:50	Lunch
13:50-14:35	**Chang-Shou Lin**: Mean field equations, hyper-elliptic curves and modular forms
14:40-15:25	**Fanghua Lin**: Geometric Measure and Topology of Nodal Sets
15:25-15:55	Coffee break (ESB 2012 Lobby)
15:55-16:40	**Jalal Shatah**: Resonances in PDE's
16:45-17:30	**Yanyan Li**: TBA

Wednesday July 10th (ESB 2012)

09:00-09:45	**Walter Craig**: Dynamics of near-parallel vortex filament interactions.
09:45-10:15	Coffee break (ESB 2012 Lobby)
10:15-11:00	**Dominique Bakry**: Diffusions and orthogonal polynomials
11:05-11:50	**Eric Sere**: Energy minimization in Peierls models of one-dimensional molecular chains
11:50-13:50	Lunch (Self Catered)
13:50-14:35	**Paul Rabinowitz**: Multi-transition solutions for Allen-Cahn model equations
14:40-15:25	**Angela Pistoia**: New concentration phenomena in some 2-dimensional problems
15:25-15:55	Coffee break (ESB 2012 Lobby)
15:55-16:40	**Vitali Milman**: Geometric Study of Convex and Quasi-Concave Functions in R^n
18:00	PDE Banquet: University Golf Club. See map on page 4

Thursday July 11th (ESB 2012)

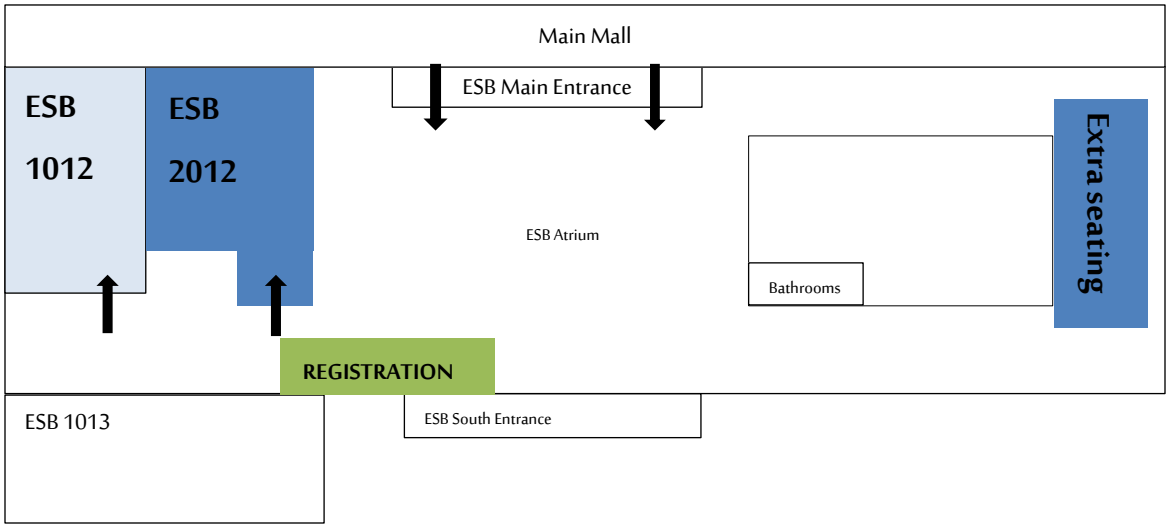
09:00-09:45	**Yiming Long**: Multiple closed geodesics on spheres
09:45-10:15	Coffee break (ESB 2012 Lobby)
10:15-11:00	**Gideon Schechtman**: A quantitative version of the commutator theorem for zero trace matrices
11:05-11:50	**Maria J. Esteban**: Spectral estimates in spheres and compact manifolds
11:50-13:50	Lunch (Self Catered)
13:50-14:35	**Michael Struwe**: The supercritical Lane-Emden equation and its gradient ow
14:40-15:25	**Filomena Pacella**: Multibump analysis and bubble towers for Lane Emden problems in dimension 2
15:25-15:55	Coffee break (ESB 2012 Lobby)
15:55-16:40	**Pierpaolo Esposito**: Non-topological condensates for the self-dual Chern-Simons-Higgs model

Friday July 12th (ESB 2012)

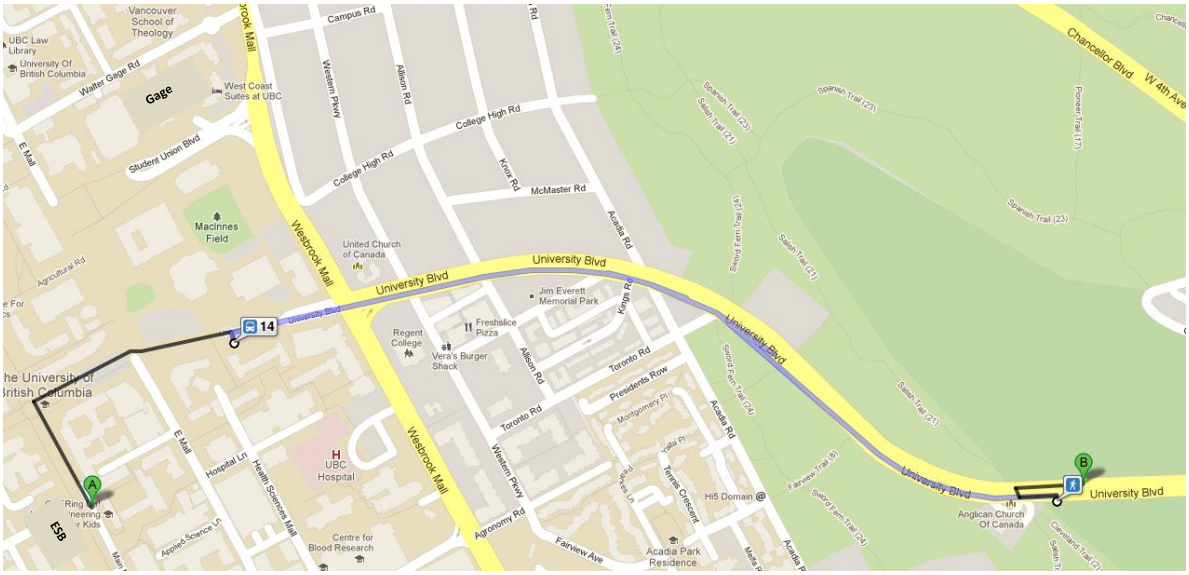
09:00-09:45	**Claude Viterbo:** TBA
09:45-10:15	Coffee break (ESB 2012 Lobby)
10:15-11:00	**Nader Masmoudi**: Gevrey spaces : Prandtl system and nonlinear inviscid damping for 2D Euler.
11:05-11:50	**Alessio Figalli**: Stability results for sumsets in R^n
11:50-13:50	Lunch (Self Catered)
13:50-14:35	**Walter Schachermayer**: An optimal transport approach to martingale inequalities and the Skorhod embedding problem
14:40-15:25	**Gang Tian**: Regularity of Ricci curvature equations
15:25-15:55	Coffee break (ESB 2012 Lobby)
15:55-16:40	**Neil Trudinger**: Weak continuity of nonlinear operators

Directions

ESB Building Ground Floor Plan:



Banquet Location Map: Wednesday July 10th, 2013: UBC Golf Club: 5185 University Blvd



2207 Main Mall, Vancouver:

- Walk to UBC Trolley loop (about 6 minutes)**UBC Trolley Loop: Take either of these buses**
- Bus – 4, or 14 - UBC/Downtown or Bus 9- Alma/ Commercial
- Alight at EB University Blvd at **5100 Block,** Cross University Boulevard to enter Golf Club

UBC Golf Club: 5185 University Blvd **Exact coin fare is needed $2.75 per trip, if using transit;This distance is walkable in 30-45 minutes**

General Travel Directions:

UBC Map link: http://www.maps.ubc.ca/PROD/images/pdf/ubcmap.pdf

Airport to UBC: Easiest by taxi (25min, around $30). If your accommodation is at Walter H Gage Towers, please give them the address: *5959 Student Union Boulevard, UBC*. 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. Walk 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.

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

Speaker Abstracts

Abstracts

Analysis and Partial Differential Equations: A Conference in Honour of the 60th Birthday of Nassif Ghoussoub, July 8 – July 12, 2013, UBC

Speaker 1: Dominique Bakry

Toulouse

Title. Diffusions and orthogonal polynomials

Abstract. Diffusion semigroups are described through their generators, which are in general in $\mathbb{R}^n$ or an open set in it second order differential operators of the form

$$L(f)(x) = \sum_{ij} a^{ij}(x) \frac{\partial^2 f}{\partial x_i \partial x_j} + \sum_i b_i(x) \frac{\partial f}{\partial x_i}.$$

The easiest cases are when one is able to diagonalize this operator in an basis of orthogonal polynomials, since then one is able to have a quite explicit description of the associated law of the underlying process. In dimension 1, there are not many examples of such a situation. It reduces to the family of Jacobi, Laguerre and Hermite polynomials. In higher dimension, many examples come from Lie group actions of homogeneous spaces, or generalizations of them, through root systems or other algebraic constructions.

We shall give a complete characterization of the problem : on which open sets in $\mathbb{R}^n$ one may expect to find a probability measure for which the associated orthogonal polynomials are eigenvectors of diffusion operators.

We shall give a complete description of all the models in dimension 2, where we are able to completely solve this problem. There are exactly 11 compact sets (up to affine transformations), and 7 non compact ones, on which there exist such a measure. We shall also describe all the associated measures and operators.

Speaker 2: Yann Brenier

CNRS, CMLS, Ecole Polytechnique, FR-91128 Palaiseau, France

Title. Volume and topology preserving diffusion equations

Abstract. In sharp contrast with the usual heat equation, some degenerate diffusion equations enjoy the property that the level sets of their solutions keep their volume and their topology unchanged during the evolution, at least formally.These equations admit as stationary solutions all scalar functions which are functions of their own Laplacian. (This corresponds, in two space dimensions, to all stationary solutions of the Euler equations for incompressible fluids.) For such equations, we provide a suitable concept of "dissipative solutions" that exist globally in time and are unique as long as they stay $C^{1,1}$ in space (which we are not able to prove). At the discrete level, we will relate these equations and their equilibrium states to the quadratic assignment problem, a well known NP problem in combinatorial optimization.

Speaker 3: Xavier Cabre

ICREA and UPC, Barcelona

Title. Sharp isoperimetric inequalities with densities via the ABP method

Abstract. We prove some old and new isoperimetric inequalities with the best constant using the ABP method applied to an appropriate linear Neumann problem. More precisely, we obtain a new family of sharp isoperimetric inequalities with weights (also called densities) in open convex cones of $\mathbb{R}^n$. Our result applies to all nonnegative homogeneous weights satisfying a concavity condition in the cone. Remarkably, Euclidean balls centered at the origin (intersected with the cone) minimize the weighted isoperimetric quotient, even if all our weights are nonradial —except for the constant ones. We also study the anisotropic isoperimetric problem in convex cones for the same class of weights. We prove that the Wulff shape (intersected with the cone) minimizes the anisotropic weighted perimeter under the weighted volume constraint. As a particular case of our results, we give new proofs of two classical results: the Wulff inequality and the isoperimetric inequality in convex cones of Lions and Pacella.

Speaker 4: Sun-Yung Alice Chang

Princeton University

Title. On a class of non-local conformal invariants on asymptotic hyperbolic manifolds

Abstract. We will discuss properties of a class of conformal invariants in conformal geometry and their connection to geometric quantities on asymptotically hyperbolic manifolds. Special emphasis will be on the extension theorem of Caffarelli-Silvestre and applications in this setting.

Speaker 5: Walter Craig

McMaster University

Title. Dynamics of near-parallel vortex filament interactions

Abstract. Mathematicial analysts have developed techniques for the phase space analysis of the dynamics of many model nonlinear Hamiltonian PDEs. In this talk I will describe some applications and extensions of these ideas to a problem in fluid dynamics that concerns the interaction of two near-parallel vortex filaments in three dimensions. In addition, as well as generalizations of this problem, I will speculate about further applications of the techniques of Hamiltonian PDEs to other nonlinear systems of fluid dynamics that are nonlinear evolution problems of physical significance.

Speaker 6: Oliver Druet

Lyon

Title. The Einstein-Lichnerowicz constraint system

Abstract. We investigate the constraint system obtained via the conformal method when trying to get initial data for the Einstein equation coupled with a scalar field. We shall give the main

existence results known up to now and discuss stability and compactness issues for this system. These are the first results obtained in the coupled case when the Yamabe class of the manifold is positive.

Speaker 7: Pierpaolo Esposito

Rome III

Title. Non-topological condensates for the self-dual Chern-Simons-Higgs model

Abstract. For the abelian self-dual Chern-Simons-Higgs model I will discuss existence issues of periodic vortex configurations – the so-called condensates– of non-topological type for small values of the Chern-Simons parameter k. We provide a positive answer for the existence of non-topological condensates with magnetic field concentrated at some of the vortex points (as a sum of Dirac measures) as k tends to 0. Joint work with M. del Pino, M. Musso and P. Figueroa.

Speaker 8: Maria J. Esteban

Paris-Dauphine

Title. Spectral estimates in spheres and compact manifolds

Abstract. In this talk I will present recent work with Jean Dolbeault and Ari Laptev about optimal estimates of the principal eigenvalue of Schrdinger operators on the sphere, or in general, on general compact manifolds, based on the best constants for some functional inequalities. These estimates show that for compact manifolds both Keller and Lieb-Thirring-like estimates do not hold true with the usual constants and exponents as in the Euclidian space.

Speaker 9: Alessio Figalli

UT Austin

Title. Stability results for sumsets in $\mathbb{R}^n$

Abstract. Given a Borel A in $\mathbb{R}^n$ of positive measure, one can consider its semisum $S = (A+A)/2$. It is clear that S contains A, and it is not difficult to prove that S and A have the same measure if and only if A is equal to his convex hull minus a set of measure zero. We now wonder whether this statement is "stable": if the measure of S is close to the one of A, is A close to his convex hull? More in general, one may consider the semisum of two different sets A and B, in which case our question corresponds to proving a stability result for the Brunn-Minkowski inequality. When $n = 1$, one can approximate a set with finite unions of intervals to translate the problem onto Z, and in the discrete setting this question becomes a well studied problem in additive combinatorics, usually known as Freiman's Theorem. In this talk I'll review some results in the one-dimensional discrete setting, and discuss their extension to arbitrary dimension.

Speaker 10: Wilfrid Gangbo

Georgia Tech

Title. A class of variational problems involving polyconvex integrands.

Abstract. Finding the dual problem of minimization problems involving polyconvex integrands (instead of convex integrands), remains an outstanding problem in the calculus of variations. Duality is a powerful tool for studying uniqueness and stability of minimizers, and for writing the Euler-Lagrange equations when standard growth conditions, as imposed by C.B. Morrey in his pioneer work in 1952, fail to hold. In this talk, motivated by integrands which appear in the study of Ogden material, we consider a collection of discrete variational problems which would help tackling some of the challenges in the calculus of variations. (This is a joint work with R. Awi).

Speaker 11: Pengfei Guan

McGill

Title. Two uniqueness Theorems in geometry, old and new.

Abstract. We discuss two uniqueness theorem in classical differential geometry: Cohn-Vossen's rigidity theorem and Alexandrov uniqueness theorem for C^2 compact convex surfaces in $\mathbb{R}^3$. We present a new proof of Alexandrov's theorem using Bers-Nirenberg's weak uniqueness continuation theorem for general convex surfaces in $\mathbb{R}^3$. In another direction, we prove a higher dimensional Cohn-Vossen rigidity theorem for compact hypersurfaces with positive scalar curvature in $\mathbb{R}^n$.

Speaker 12: Yanyan Li

Rutgers

Title. TBA

Abstract. TBA

Speaker 13: Chang-Shou Lin

National Taiwan University

Title. Mean field equations, hyper-elliptic curves and modular forms

Abstract. I will explain how mean field equations is naturally related to hyper- elliptic curves and modular forms. In literature, this hyper-elliptic curve arises also in the study of KdV equation as the spectral curves. We show there is a modular form attached to this curve. So this is the case of type 2 in the mean field equations. As the case of type 1, the modular forms are also naturally entered. I will explain it on the simplest situations: the mean field equation with 4π and 8π singular source. The modular form is the Eisenstein series of weight one associated with N-torsion points. This series was first discovered by Hecke. Our PDE results provide a deformation of those Modular forms. As an application of the PDE results together with the theory of modular forms, we completely determine the geometry of critical points of the Green function at any torus.

Speaker 14: Fanghua Lin

New York University

Title. Geometric Measure and Topology of Nodal Sets

Abstract. The aim of this talk is to illustrate the relations between the rates of grow of solutions of elliptic equations(local or global) with the complexity of their nodal sets through the controls on the geometric measures and the total Betti numbers. The basic ideas involved are quantitative versions of several classical theorems in algebraic geometry and geometric measure theoretic arguments

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Speaker 15: Yiming Long

Chern Institute of Mathematics, Nankai University

Title. Multiple closed geodesics on spheres

Abstract. The problem of closed geodesics is a traditional and important topic in dynamical systems and differential geometry. There is a long standing conjecture that there exist infinitely many distinct closed geodesics on every compact Riemannian manifold. The current interest on this problem is on compact simply connected manifolds including spheres. So far not much is known on the multiplicity of closed geodesics on such manifolds, besides the result of Gromoll and Meyer in 1969, when their dimensions are at least 3. Recently, Dr. Huagui Duan and myself proved the following Theorem: There exist always at least 2 distinct closed geodesics on every compact simply connected Finsler (including Riemannian) manifold whose dimension is at least 2. In this lecture, I shall give a brief survey on the study of the problem of closed geodesics and explain some ideas in the proof of the above theorem.

Speaker 16: Nader Masmoudi

New York University

Title. Gevrey spaces : Prandtl system and nonlinear inviscid damping for 2D Euler.

Abstract. We will discuss two recent applications of Gevrey spaces: The first one is the local existence of the Prandtl system without analyticity and without the Oleinik monotonicity assumptions. More precisely, we assume Gevrey regularity in the horizontal variable (joint work with David Gerard-Varet). The second one is the global asymptotic stability of shear flows close to planar Couette flow in the 2D incompressible Euler equations. Specifically, given an initial perturbation of the Couette flow which is small in a suitable Gevrey space, we show that the velocity converges strongly in L^2 to another shear flow which is not far from Couette. This strong convergence is usually referred to as "inviscid damping" and is analogous to Landau damping in the Vlasov-Poisson system (joint work with Jacob Bedrossian).

Speaker 17: Robert McCann

University of Toronto

Title. Academic wages and pyramid schemes: a mathematical model

Abstract. Wages are determined by supply and demand. In a steady state economy, individuals will choose between being workers, managers, or teachers, depending on their skills and market conditions. But these skills are determined in part by the education market. Some individuals participate in the education market twice, eventually marketing as teachers the skills they acquired as students. This feedback mechanism has the potential to produce larger and larger wages for the few most highly skilled individuals at the top of the market. We analyze this phenomena using a toy model. We show that a competitive equilibrium exists, and it displays a phase transition from bounded to unbounded wage gradients, depending on whether or not the cumulative influence of each teacher increases or decreases as we pass through successive generations of their students.

Based on work in progress with Alice Erlinger, Xianwen Shi, Aloysius Siow, and Ronald Wolthoff.

Speaker 18: Vitali Milman

Tel Aviv University

Title. Geometric Study of Convex and Quasi-Concave Functions in $\mathbb{R}^n$

Abstract. The plan of the talk (instead of abstract):

1. Duality and new structures on the family of convex (and log-concave) functions in $\mathbb{R}^n$
2. Classical constructions in analysis which appear (uniquely) from elemntary (simplest) properties.
3. Extension of Minkowski polarization result to the classes of log-concave and quasi-concave functions; Mixed integrals.

The talk is built to be understandable to graduate students.

Speaker 19: Filomena Pacella

Rome Sapienza

Title. Multibump analysis and bubble towers for Lane Emden problems in dimension 2

Abstract. I will describe some recent results about concentration phenomena for solutions of the Lane Emden Dirichlet problem in dimension 2, when the exponent of the nonlinearity tends to infinity. The analysis is done for positive and sign changing solutions and shows that a suitable rescaling of the solutions can converge to a limit problem which can be either a regular or a singular radial Liouville problem in the plane.

As a consequence we get estimates on the concentration levels and prove the existence of a sign changing bubble tower solution in some bounded symmetric domains.

Speaker 20: Angela Pistoia

Rome I

Title. New concentration phenomena in some 2-dimensional problems

Abstract. I will show some new existence results of solutions to the sinh-Poisson equation and to the Toda system obtained in collaboration with M.Grossi, M.Musso and J.Wei

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Speaker 21: Mary Pugh

University of Toronto

Title. Special Solutions in Smectic Electroconvection

Abstract. We discuss electroconvection in a free submicron-thick liquid crystal film in an annular geometry. The film is flat in the xy plane; seen from above it looks like a DVD. (Seen from above, it has two boundaries: concentric circles.) A voltage is applied across the film, from the inner boundary to the outer boundary; this voltage provides a convective forcing. Because of the annular geometry, the dynamics are periodic in the azimuthal direction and the only boundaries are those at which the convective forcing is applied. The liquid crystal is in smectic A phase, forming a nearly-perfect two-dimensional fluid because the film does not change thickness, even while flowing. Also, the inner electrode can be rotated and so the experiment can be used to study the interplay between a stabilizing force applied via the boundary (Couette shear) and convection. We present preliminary numerical simulations of special solutions such as convection cells, oscillatory convection cells, undulating convection cells, and localized vortex solutions.

Speaker 22: Paul Rabinowitz

University of Wisconsin

Title. Multi-transition solutions for Allen-Cahn model equations

Abstract. We survey some recent joint work with Jaeyoung Byeon on the existence of various kinds of multi-transition solutions for a class of spatially dependent Allen-Cahn model equations.

Speaker 23: Frederic Robert

Nancy

Title. Sign-changing solution to scalar-curvature type equations: the case of a degenerate metric

Abstract. Given (M, g) a compact Riemannian manifold of dimension $n > 2$, we are interested in the existence of blowing-up sign-changing families $(u_\epsilon)_{\epsilon>0} \in C^{2,\theta}(M)$, $\theta \in (0,1)$, of solutions to

$$\Delta_g u_\epsilon + h u_\epsilon = |u_\epsilon|^{\frac{4}{n-2}-\epsilon} u_\epsilon \text{ in } M$$

where $\Delta_g := -\mathrm{div}_g(\nabla)$ and $h \in C^{0,\theta}(M)$ is a potential. We prove that such families exist in two main cases: in small dimension $n \in \{3,4,5,6\}$ for any potential h or in any dimension when

$h \equiv \frac{n-2}{4(n-1)} R_g$ and (M, g) is locally conformally flat. These examples complete previous existence and nonexistence results on blowing-up solutions and allow to have a complete panorama of the stability/instability of critical elliptic equations of scalar curvature type on compact manifolds, in particular when degenerate metrics are involved. The changing of the sign is necessary due to the compactness results of Druet and Schoen. This is joint work with Jérôme Vétois.

Speaker 24: Walter Schachermayer

Vienna

Title. An optimal transport approach to martingale inequalities and the Skorhod embedding problem

Abstract. We combine the duality theory for the optimal transport problem with the idea of filtrations and the integration theory of stochastic processes. For example, we provide a pointwise proof of Doob's classical maximal inequality, which also allows for a financial interpretation of this theorem and gives a sightly sharper result. We also present a pathwise approach to the problem of Skorohod embedding.

Speaker 25: Gideon Schechtman

Weizmann

Title. A quantitative version of the commutator theorem for zero trace matrices

Abstract. As is well known, a complex $m \times m$ matrix A is a commutator (i.e., there are matrices B and C of the same dimensions as A such that $A = [B, C] = BC - CB$) if and only if A has zero trace. If $\|\cdot\|$ is the operator norm from ℓ_2^m to itself and $|\cdot|$ any ideal norm on $m \times m$ matrices then clearly for any A, B, C as above $|A| \leq 2\|B\||C|$.

Does the converse hold? That is, if A has zero trace are there $m \times m$ matrices B and C such that $A = [B, C]$ and $\|B\||C| \leq K|A|$ for some absolute constant K? If not, what is the behavior of the best K as a function of m?

I'll give some partial answers to this problem, one for $|\cdot| = \|\cdot\|$ (based on joint work with Johnson and Ozawa) and one for $|\cdot|$ = the Hilbert–Schmidt norm.

Speaker 26: Eric Sere

Paris-Dauphine

Title. Energy minimization in Peierls models of one-dimensional molecular chains

Abstract. The Peierls models describe independent electrons in a deformable one-dimensional finite or infinite chain of atoms. The atoms are treated as classical objects and the electrons are described by a simplified version of quantum mechanics. This leads to a system of coupled, discrete, nonlinear and nonlocal equations. The solutions can be obtained as critical points of an energy functional. In 1987 Kennedy and Lieb studied finite chains and proved that if the number N of nuclei is even, the energy has exactly two minimizers which are periodic of period 2, and are

translates of one another by a translation of one unit in the lattice. We study rigorously the case of an odd number of atoms. We prove that if N is odd and converges to infinity, the global minimizer of the energy converges to a "kink" soliton in the infinite chain. This soliton is asymptotic to one of the periodic minimizers found by Kennedy-Lieb in one direction of the chain, and to the other solution in the other direction. It minimizes a 'renormalized' energy. We also study the limit of strong interatomic forces in which the discrete model can be replaced by a continuous model involving the Dirac equation. This is joint work with Mauricio Garcia Arroyo.

Speaker 27: Jalal Shatah

NYU

Title. Resonances in PDE's

Abstract. (later)

Speaker 28: Michael Struwe

ETH-Zurich

Title. The supercritical Lane-Emden equation and its gradient flow

Abstract. In joint work with Simon Blatt we establish Morrey estimates for solutions to the heat flow for the Lane-Emden equation $-\Delta u = u|u|^{p-2}$ in the supercritical regime when $p > \frac{2n}{n-2}$ and show the existence of partially regular tangent maps at blow-up.

Speaker 29: Gang Tian

Princeton

Title. Regularity of Ricci curvature equations

Abstract. In this talk, I will discuss some progresses on the following regularity problem: What can we say about metrics with Ricci curvature bounded various norms? Those metrics involve Einstein metrics whose Ricci curvature is constant. I will also discuss some applications. This is an expository talk.

Speaker 30: Neil Trudinger

Canberra

Title. Weak continuity of nonlinear operators

Abstract. We are concerned with the weak continuity of nonlinear operators acting on associated classes of subharmonic functions. Such results enable us to extend the operators as measures on non-smooth functions and can be the basis for an ensuing potential theory. Particular classical examples are the real and complex Monge-Ampère operators on convex and plurisubharmonic functions. The

programme was initiated in collaboration with Xu-jia Wang in the late 1990s in the context of Hessian measures in Euclidean space, extending the Monge-Ampère measure of Aleksandrov. In particular we will report on recent developments related to mean curvature measure, with Qui-yi Dai and Xu-jia Wang, and the discovery of a new measure on Heisenberg groups, with Wei Zhang.

Speaker 31: Cedric Villani

IHP and Lyon

Title. TBA

Abstract. cancelled

Speaker 32: Claude Viterbo

ENS Paris

Title. TBA

Abstract. TBA

Campus Dining

at the University of British Columbia

From world-class catering to casual dining, coffee shops and internationally-inspired food outlets, UBC offers a delicious assortment of food services solutions. Here is an overview of food service providers certain to deliver a satisfying campus dining experience.

UBC Food Services

www.food.ubc.ca

Serving only locally-roasted fair trade organic shade-grown coffee at all UBC Food Services non-franchise locations

Wescadia Catering

Conference and special event catering

www.catering.ubc.ca

Sage Bistro at University Centre

Casual fine dining available for breakfast, lunch and special events

www.sage.ubc.ca

The Point Grill at Marine Drive Residence

New upscale casual dining restaurant open for brunch, lunch, and dinner. Open M-F

Triple O's at David Lam Research Centre

Casual dining in a family-friendly environment. Open daily

Residence Dining

Totem Park and Place Vanier Cafeterias

For information about group meal plans, please call 604-822-6204 or email rene.atkinson@ubc.ca

Pacific Spirit Place Cafeteria at the SUB

Student Union Building, 6138 Student Union Blvd

Pacific Spirit Place is open weekdays for breakfast and lunch. For information about group meal plans, please call 604-822-9310 or email fred.cheng@ubc.ca

- Bakeshop
- Pasta Bar
- Salad Bar
- Pizza Pizza
- A&W
- Koya Japan
- Manchu Wok
- Subway

Proudly Brewing Starbucks Coffee

- **Starbucks Coffee** at Student Union Building
- **The Barn** at Main Mall
- **Starbucks Coffee** at Fred Kaiser
- **Steamies Café** at the Bookstore
- **Pond Café** at Ponderosa Centre

More Great Locations…

- **Niche Café** at Beaty Biodivesity Museum
- **Caffé Perugia** at Life Sciences Centre
- **Café MOA** at Museum of Anthropology
- **Ike's Café** at Irving K. Barber Learning Centre
- **Tim Horton's** at Forest Sciences Centre

For guests, visitors, or groups visiting the UBC Campus, the UBC Food Services gift card is the easiest way for you and your group to dine at any of our locations.

Food Outlets

at the Student Union Building (SUB)

The SUB features a variety of food outlets all under one roof and conveniently located at the heart of campus. Get a delicious bagel or muffin to go, grab a slice of pizza at Pie R Squared, pick up some freshly made sushi or sit and enjoy a juicy beef burger at Pit Pub. The SUB has something for everyone!

Concourse and Sub-Level

Blue Chip Cookies

Proudly serving organic, fair trade coffees, cappuccinos and lattés. All our cookies and fabulous baked goods are made in-house and baked fresh daily.

Bernoulli's Bagels

Montreal-style bagels, sandwiches, and bagel melts using high-quality ingredients and freshly squeezed vegetable or citrus juice!

The Delly

Fresh sandwiches made to order. A wide selection of salads, wraps, curries, soups and pasta made daily.

The Moon Noodle House

Great wonton soup, daily specials, fresh steamed veggies, combos and hot & sour soup.

The Honour Roll

Maki rolls, nigiri, sushi, donburi rice bowls and bento boxes are made fresh throughout the day. Ask about party platters and catering.

The Patio BBQ

On the south side of the SUB, Monday to Friday (weather permitting) offering grilled 1/4 pound burgers, veggie burgers, smokies and drinks.

The Pit Burger Bar

Charbroiled hamburger specials, veggie burgers, hot wings, beer-battered fish & chips and more!

The Pendulum Restaurant

Delicious grilled sandwiches and panninis, and lots of vegetarian and vegan dishes!

The Pit Pub

Satellite big-screen sports, six high-definition TV's, great drink prices, and a great atmosphere!

Pie R Squared

Great house-made pizza slices, great prices, cold drinks. Now offering soft-serve ice cream and doughnuts.

www.catering.ubc.ca

NEED CATERING? *For catered events or meals on the go, Wescadia Catering offers a multitude of menu ideas to meet a range of dietary needs. We pride ourselves on our knowledgeable, friendly staff, professional service and quality ingredients.*

University Boulevard

Restaurants and Food Outlets

University Boulevard boasts a vibrant neighbourhood feel, and features dozens of places to enjoy a sit-down meal, people-watch over coffee, or grab a quick bite on the run. Visitors will feel right at home choosing from internationally-recognized franchises and unique offerings from local entrepreneurs.

The Boulevard Coffee Roasting Co.

at David Strang, 5870 University Blvd.
theboulevard.ca

Mahony & Sons Public House

at David Strang, 5990 University Blvd.
www.mahonyandsons.com

The Well Café

at Regent College, 5800 University Blvd.

University Village

5700 Block, University Blvd.

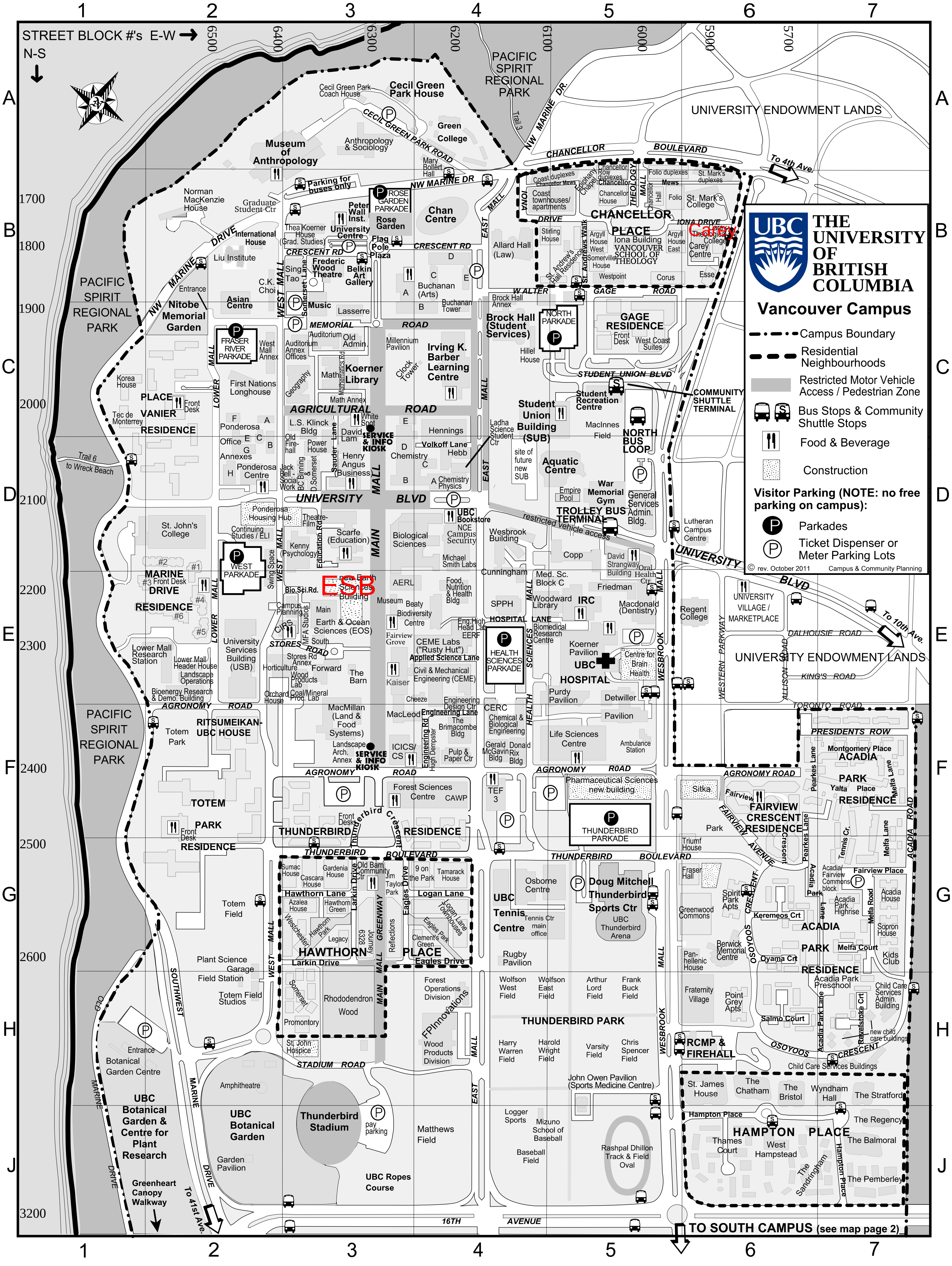
- Blenz — Coffee Shop
- Booster Juice — Juice & Snack Bar
- Mio Japan — Japanese Fast Food
- McDonald's — Breakfast – Late-Night Fast Food
- Pearl Fever — Tea House & Snack Bar
- Pita Pit — Lunch – Late-Night Take-Out & Delivery
- One More Sushi — Japanese Dining
- Only U Café — Deli & Diner
- Starbuck's — Coffee Shop
- University Pizza — Take-Out & Delivery
- Vera's Burger Shack — Diner
- Village Restaurant — Chinese Dining

International Food Fair

University Marketplace, Lower Level

- A-1 Vietnamese Food — Pho & Noodle House
- Curry Point — East Indian
- Donair Town — Persian, Mediterranean, Catering
- Leona Mediterranean Food — Lebanese
- Malaysian Cuisine — Malaysian, Thai
- Osaka Sushi — Japanese
- Timpo Mongolian BBQ — Stir-Fry
- Yi Kou Xiang — Chinese

ALSO RECOMMENDED… ***Westward Ho! PublicHouse & Grill Room*** *at the University Golf Club*
www.universitygolf.com/dine


STREET BLOCK #'s E-W
N-S
THE UNIVERSITY OF BRITISH COLUMBIA
Vancouver Campus
Campus Boundary
Residential Neighbourhoods
Restricted Motor Vehicle Access / Pedestrian Zone
Bus Stops & Community Shuttle Stops
Food & Beverage
Construction
Visitor Parking (NOTE: no free parking on campus):
Parkades
Ticket Dispenser or Meter Parking Lots
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Campus & Community Planning
PACIFIC SPIRIT REGIONAL PARK
UNIVERSITY ENDOWMENT LANDS
CHANCELLOR BOULEVARD
To 4th Ave.
To 10th Ave.
To 41st Ave.
NW MARINE DR
Museum of Anthropology
Cecil Green Park House
Green College
Chan Centre
Rose Garden
Nitobe Memorial Garden
CHANCELLOR PLACE
Carey
VANCOUVER SCHOOL OF THEOLOGY
Brock Hall (Student Services)
GAGE RESIDENCE
Irving K. Barber Learning Centre
Koerner Library
PLACE VANIER RESIDENCE
Student Union Building (SUB)
Aquatic Centre
NORTH BUS LOOP
COMMUNITY SHUTTLE TERMINAL
TROLLEY BUS TERMINAL
UNIVERSITY BLVD
MAIN MALL
EAST MALL
WEST MALL
WESBROOK MALL
AGRICULTURAL ROAD
MEMORIAL ROAD
St. John's College
MARINE DRIVE RESIDENCE
WEST PARKADE
ESB
Earth & Ocean Sciences (EOS)
Biological Sciences
UBC HOSPITAL
HEALTH SCIENCES PARKADE
Regent College
UNIVERSITY VILLAGE / MARKETPLACE
RITSUMEIKAN-UBC HOUSE
TOTEM PARK RESIDENCE
THUNDERBIRD RESIDENCE
THUNDERBIRD PARKADE
FAIRVIEW CRESCENT RESIDENCE
ACADIA PARK RESIDENCE
HAWTHORN PLACE
UBC Tennis Centre
Doug Mitchell Thunderbird Sports Ctr
THUNDERBIRD PARK
THUNDERBIRD BOULEVARD
AGRONOMY ROAD
STADIUM ROAD
UBC Botanical Garden & Centre for Plant Research
UBC Botanical Garden
Thunderbird Stadium
UBC Ropes Course
RCMP & FIREHALL
HAMPTON PLACE
16TH AVENUE
TO SOUTH CAMPUS (see map page 2)

Map Directory

Site or Building Name & Address	Grid
Abdul Ladha Science Student Ctr, 2055 East Mall	D4
Acadia/Fairview Commonsblock, 2707 Tennis Cres	G7
Acadia House, 2700-2720 Acadia Rd	G7
Acadia Park Residence	F/H-6/7
Acadia Park Highrise, 2725 Melfa Rd	G7
Acadia Park Preschool, 2750 Acadia Park Lane	H7
Allard Hall [Faculty of Law], 1822 East Mall	B4
Anthropology & Sociology Bldg, 6303 NW Marine Dr	A3
Aquatic Centre, 6121 University Blvd	D5
Aquatic Ecosystems Research Lab (AERL), 2202 Main Mall	E3
Asian Centre, 1871 West Mall	B2
Auditorium (a.k.a. "Old Auditorium"), 6344 Memorial Rd	C3
Auditorium Annex Offices, 1924 West Mall	C3
Barn (daycare), 2323 Main Mall	E3
B.C. Binning Studios (formerly Hut M-17), 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 Bldg., 2337 Lower Mall	E2
Biological Sciences Bldg [Science Faculty office], 6270 University Blvd	D3
Biomedical Research Ctr, 2222 Health Sciences Mall	E4
Biotechnology Laboratory, 2125 East Mall	D4
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, 6088 S. Campus Rd	South Campus
Brimacombe Building, 2355 East Mall	F4
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
C.K. Choi Building for the Institute of Asian Research, 1855 West Mall	B2
Campus & Community Planning, 2210 West Mall	E3
Campus Security, 2133 East Mall	D4
Carey Centre, 5920 Iona Drive	B6
Carey Theological College, 1815 Wesbrook Mall	B6
CAWP (Centre for Advanced Wood Processing), 2424 Main Mall	F4
Cecil Green Park Coach House, 6323 Cecil Green Park Rd	A3
Cecil Green Park House, 6251 Cecil Green Park Rd	A3
CEME — *see Civil & Mechanical Engineering Building*	
Centre for Comparative Medicine, 4145 Wesbrook Mall	South Campus
Centre for Interactive Research on Sustainability (CIRS), 2260 West Mall	E3
CERC (Clean Energy Research Ctr), 2360 East Mall	F4
Chan Centre for the Performing Arts, 6265 Crescent Rd	B4
Chancellor Place neighbourhood	B5
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 Cresc and Revelstoke Crt	H7
CIRS — *see Centre for Interactive Research on Sustainability...*	
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 [Pharmaceutical Sc.], 2146 East Mall	E4
David Lam Learning Centre, 6326 Agricultural Rd	C3
David Lam Management Research Ctr, 2033 Main Mall	C3
Donald Rix Building, 2389 Health Sciences Mall	F4
Doug Mitchell Thunderbird Sports Centre, 6066 Thunderbird Blvd	G5
Dorothy Somerset Studios (formerly Hut M-18), 6361 University Blvd	D3
Earth Sciences Building (ESB) under construction, 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
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 Department, 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 (Forest Operations & Wood Products), 2601/2665 E. Mall	H4
FPInnovations (Pulp & Paper Division), 3800 Wesbrook Mall	South Campus
Fraser Hall (public rental housing), 2550 Wesbrook Mall	G6
Fraternity Village, 2880 Wesbrook Mall	H6
Frederic Wood Theatre, 6354 Crescent Rd	B3
Friedman Bldg, 2177 Wesbrook Mall	E5
Gage Residence, 5959 Student Union Blvd	C5
General Services Administration Bldg (GSAB), 2075 Wesbrook Mall	D5
Geography Building, 1984 West Mall	C3
Gerald McGavin Building, 2386 East Mall	F4
Graduate Student Centre — *see Thea Koerner House*	
Green College, 6201 Cecil Green Park Rd	A4
Greenheart Canopy Walkway, Botanical Garden, 6804 SW Marine Dr	H1
Greenwood Commons (public rental housing), 2660 Wesbrook Mall	G6
Hampton Place neighbourhood	H/J-6/7
Hawthorn Place neighbourhood	G/H3
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 - The Diamond Foundation Centre for Jewish Campus Life, 6145 Student Union Blvd	C4
Horticulture Building/Greenhouse, 6394 Stores Rd	E2/3
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
John Owen Pavilion & Allan McGavin Sports Medicine Centre, 3055 Wesbrook Mall	H5
Kaiser (Fred) Building [Faculty of Applied Science], 2332 Main Mall	E3
Kenny (Douglas T) Building, 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
Law, Faculty of — *see Allard Hall*	
Leon and Thea Koerner University Centre, 6331 Crescent Rd	B3
Life Sciences Centre, 2350 Health Sciences Mall	F5
Liu Institute for Global Issues, 6476 NW Marine Dr	B2
Lower Mall Header House, 2269 Lower Mall	E2
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
M.F.A. Studios (formerly B.C. Binning MFA Studios), 6363 Stores Rd	E3
Michael Smith Laboratories, 2185 East Mall	D4
Museum of Anthropology (MOA), 6393 NW Marine Dr	A2/3
Music Building, 6361 Memorial Rd	B/C3
Networks of Ctrs of Excellence (NCE), 2125 East Mall	D4
Nitobe Memorial Garden, 1895 Lower Mall	B/C2
Nobel Biocare Oral Heath Centre (David Strangway Bldg), 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 — *see Auditorium*	
Old Barn Community Centre, 6308 Thunderbird Blvd	G3
Old Firehall, 2038 West Mall	D3
Orchard House, 2336 West Mall	E2
Osborne (Robert F.) Centre/Gym, 6108 Thunderbird Blvd	G4
Panhellenic House, 2770 Wesbrook Mall	G6
Peter Wall Institute for Advanced Studies, 6331 Crescent Rd	B3
Place Vanier Residence, 1935 Lower Mall	C/D2
Plant Ops Nursery/Greenhouses, 6029 Nurseries Rd	South Campus
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 Centre, 2071 West Mall	D2
Ponderosa Office Annexes: A, B, & C, 2011-2029 West Mall	C/D2
Ponderosa Office Annexes: E to H, 2008-2074 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
Roy Barnett Recital Hall - in Music Building	
Rugby Pavilion, 2584 East Mall	G4
Scarfe (Neville) Building [Education], 2125 Main Mall	D3
School of Population & Public Health (SPPH), 2206 East Mall	E4
Simon K.Y. Lee HKU-UBC House — Bldg #1, Marine Drive Residence	E2
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's College, 2111 Lower Mall	D2
St. Mark's College, 5935 Iona Dr	B6
Staging Research Centre, 6045 Nurseries Rd	South Campus
Stores Road Annex, 6368 Stores Rd	E3
Student Recreation Ctr, 6000 Student Union Blvd	C5
Student Union Bldg (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 Stadium, 6288 Stadium Rd	J3
Thunderbird Winter Sports Ctr — *see Doug Mitchell Thunderbird Sports...*	
Totem Field Studios, 2613 West Mall	H2
Totem Park Residence, 2525 West Mall	F/G2
TRIUMF, 4004 Wesbrook Mall	South Campus
Triumf House (TRIUMF Visitor's Residence), 5835 Thunderbird Blvd	G6
UBC Bookstore, 6200 University Blvd	D4
UBC Farm, 6182 Wesbrook Mall	South Campus
UBC Hospital, 2211 Wesbrook Mall	E5
UBC Tennis Centre, 6160 Thunderbird Blvd	G4
UBC Thunderbird Arena (in Doug Mitchell Centre), 2555 Wesbrook Mall	G5
University Centre (Leon & Thea Koerner), 6331 Crescent Rd	B3
University Neighbourhoods Association, 5923 Berton Ave	South Campus
University Services Building (USB), 2329 West Mall	E2
Vancouver School of Theology, 6000 Iona Drive	B5
Walter H. Gage Residence, 5959 Student Union Blvd	C5
War Memorial Gymnasium, 6081 University Blvd	D5
Wayne & William White Engineering Design Ctr, 2345 East Mall	E4
Wesbrook Bldg, 6174 University Blvd	D4
Wesbrook Place neighbourhood	South Campus
Wesbrook Village shopping centre	South Campus
West Mall Annex, 1933 West Mall	C2
West Mall Swing Space Bldg, 2175 West Mall	D2
Wood Products Laboratory, 2324 West Mall	E3
Woodward IRC, 2194 Health Sciences Mall	E4/5
Woodward Library, 2198 Health Sciences Mall	E4/5

SOUTH CAMPUS MAP

Campus & Community Planning
www.planning.ubc.ca

Note:
Local traffic only along Wesbrook Mall on South Campus

Map Information

Need help finding your way on campus? Call the Campus & Community Planning MapInfo Line at 604-827-5040, M-F, 8:30-4:30

Or use the online searchable colour map at www.maps.ubc.ca