



PIMS SYMPOSIUM ON THE GEOMETRY AND TOPOLOGY OF MANIFOLDS

Program


June 29 - July 9, 2015

The University of British Columbia
Earth Sciences Building (ESB)
2207 Main Mall, Vancouver

ORGANIZERS: Boris Botvinnik (Oregon), Ian Hambleton (McMaster),
Alexei Kovalev (Cambridge) and Dale Rolfsen (UBC)



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.

FAQs

Q: Where do I check in on the first day?

Check-in and package pick up can be done in the Atrium.

Q: Where are the sessions?

- All plenary sessions will be in the **Earth Sciences Building room 1012**.
- Parallel sessions will be in the Aquatic Ecosystems Research Lab, in the Earth and Ocean Sciences Main building or at the Earth Sciences Building room 2012 at UBC.
- You will find a copy of the building floor 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 during the conference, please feel free to talk to one of the organizers.

Q: Where can I get refreshments and meals?

For snacks or quick meals, please view the list of UBC eateries attached at the end of the program. Coffee breaks and lunches are provided each day of the symposium.

Q: Where can I get directions for campus and the building?

You will find a copy of the building floor on page 3 and a campus map at the end of the program.

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 entrance and walk straight down to the intersection.

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.

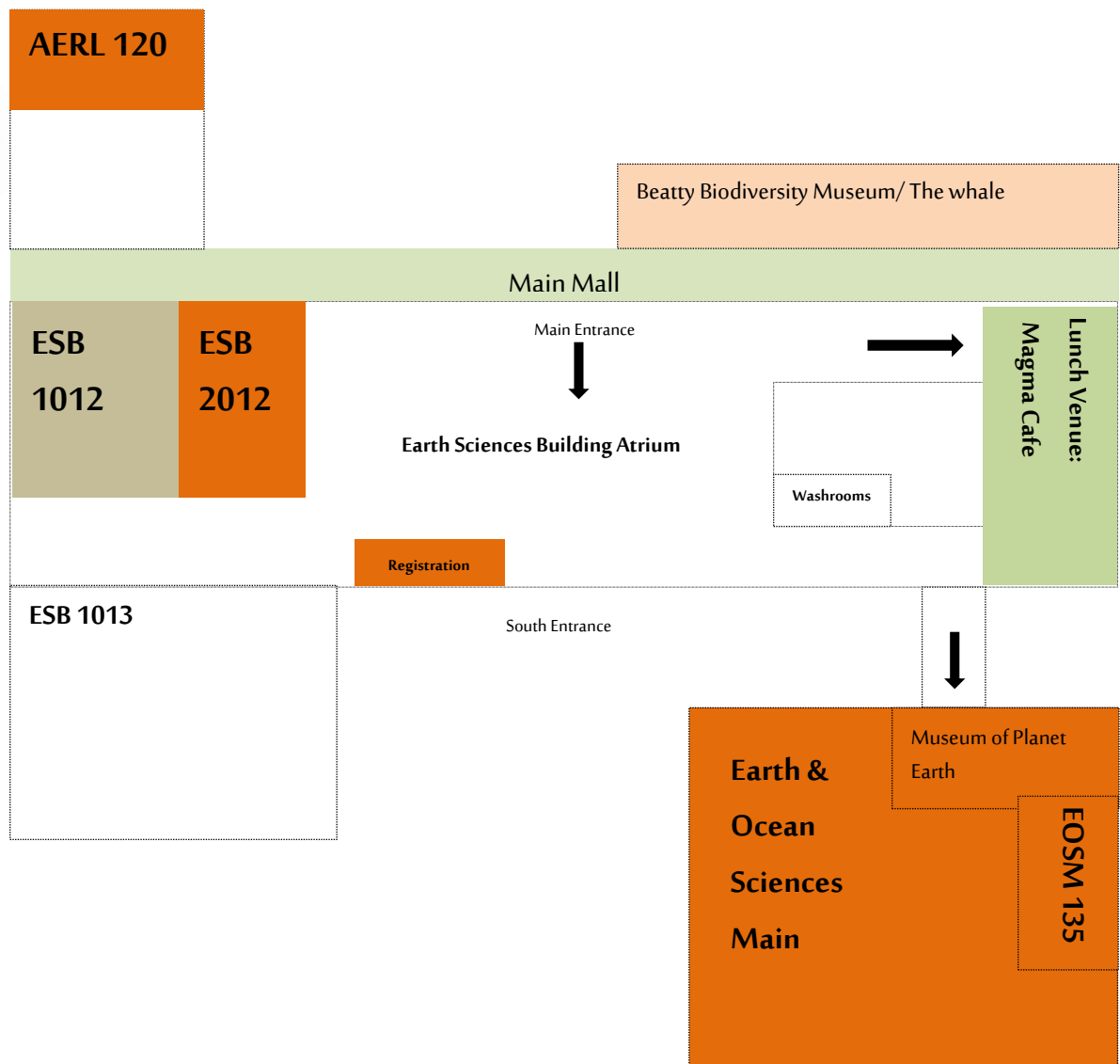
Conference Room Guide:

All Plenary Sessions:

- ESB 1012

All Breakout/ Parallel Sessions:

- AERL 120 (Aquatic Ecosystems Research Lab)
- ESB 2012 (Earth Sciences Building)
- EOSM 135 (Earth & Ocean Sciences Main)



** Not drawn to scale. See detailed UBC map on the last page.

Program Overview: Week 1

Time	Mon 29th June	Tue 30th June	Wed 1st July	Thurs 2nd July	Fri 3rd July
8:30am-8:50am	Check-in & Package pick-up (ESB Atrium)				
9:00am-10:00am	Rm: ESB 1012 Opening Lecture G. TIAN	Rm: ESB 1012 Plenary D. RUBERMAN		Rm: ESB 1012 Plenary O. RANDAL-WILLIAMS (1)	Rm: ESB 1012 Plenary O. RANDAL-WILLIAMS (2)
Coffee Break (ESB Lobby)					
10:30am-11:30am	Rm: ESB 1012 Plenary : M. GUALTIERI (1)	Rm: ESB 1012 Plenary: S. BOYER		Rm: ESB 1012 Plenary: W. LUECK (1)	Rm: ESB 1012 Plenary: M. GUALTIERI (2)
11:30am-12:30pm	Rm: ESB 1012 Plenary: B. FARB (1)	Rm: ESB 1012 Plenary: N. DUNFIELD		Rm: ESB 1012 Plenary: B. FARB (2)	Rm: ESB 1012 Plenary: T. SCHICK
Lunch (ESB Magma Café)					
2:30pm-3:30pm Parallel Sessions	Parallel Session 1 Rm: AERL 120 R. COHEN	Parallel Session 1 Rm: AERL 120 T. WALPUSKI		Parallel Session 1 Rm: AERL 120 O. UNLU	Parallel Session 1 Rm: AERL 120 H. REICH
	Parallel Session 2 Rm: ESB 2012 W. CHEN	Parallel Session 2 Rm: ESB 2012 J. DAVIS		Parallel Session 2 Rm: ESB 2012 B. HANKE	Parallel Session 2 Rm: ESB 2012 J. PARK
	Parallel Session 3 Rm: EOSM135 P. LU	Parallel Session 3 Rm: EOSM135 R. BUDNEY		Parallel Session 3 Room EOSM135 M. BERGERON	Parallel Session 3 Rm: EOSM135 S. LU
Coffee Break (ESB Lobby)					
4:00pm-5:00pm	Rm: ESB 1012 Plenary: O. CORNEA	Rm: ESB 1012 Plenary: A. FRASER		Rm: ESB 1012 Plenary: I.H. MADSEN	Rm: ESB 1012 Plenary: F. FANG
Evening Events		5:00pm- 6:30pm Welcome Reception and Networking Event: (ESB Lobby)			

Program Overview: Week 2

Time	Mon 6th July	Tue 7th July	Wed 8th July	Thur 9th July
8:30am-8:50am				
9:00am-10:00am	Rm: ESB 1012 Plenary: R. CHARNEY	Rm: ESB 1012 Plenary: M. DAVIS	Rm: ESB 1012 Plenary: S. GALATIUS (2)	Rm: ESB 1012 Plenary: J. PARDON
Coffee Break (ESB Lobby)				
10:30am-11:30am	Rm: ESB 1012 Plenary: S. GALATIUS (1)	Rm: ESB 1012 Plenary: W. LUECK (2)	Rm: ESB 1012 Plenary: I. LEARY	Rm: ESB 1012 Plenary: P. PRZYTYCKI
11:30am-12:30pm	Rm: ESB 1012 Plenary: T. FARRELL (1)	Rm: ESB 1012 Plenary: M. BRIDSON (1)	Rm: ESB 1012 Plenary: M. BRIDSON (2)	Rm: ESB 1012 Plenary: T. FARRELL (2)
Lunch (ESB Magma Café)				
2:30pm-3:30pm Parallel Sessions	Parallel Session 1 Rm: AERL 120 N. SAVELIEV	Parallel Session 1 Rm: AERL 120 J. NORDSTROM	Parallel Session 1 Rm: AERL 120 M. HEDDEN	Parallel Session 1 Rm: AERL 120 D. CROWLEY
	Parallel Session 2 Rm: ESB 2012 A. DANCER	Parallel Session 2 Rm: ESB 2012 A. STIPSICZ	Parallel Session 2 Rm: ESB 2012 G. CAVALCANTI	Parallel Session 2 Rm: ESB 2012 R.I. BAYKUR
	Parallel Session 3 Rm: EOSM135 T. PINSKY	Parallel Session 3 Rm: EOSM135 A. BERGLUND	Parallel Session 3 Rm: EOSM135 A. CLAY	Parallel Session 3 Rm: EOSM135 N. PERLMUTTER
Coffee Break (ESB Lobby)				
4:00pm-5:00pm	Rm: ESB 1012 Plenary: C. MANOLESCU (1)	Rm: ESB 1012 Plenary: J. LOTAY	Rm: ESB 1012 Plenary: M. PILCA	Rm: ESB 1012 Plenary: C. MANOLESCU (2)
Evening Events	6:15pm- 8:30pm Symposium Dinner: University Golf Club (RSVP required)			

Detailed Schedule: Monday June 29, 2015

8:30 am - 8:50 am Check-In/ Registration (ESB Atrium)

8:50 am - 9:00 am Welcome Remarks:

Alejandro Adem, Canada Research Chair in Topology & Director, MITACS

Plenary Sessions: Room 1012

9:00 am - 10:00 am **Gang Tian**, Princeton University

Curvature flows and geometric applications

10:00 am - 10:30 am Coffee break (ESB Lobby)

10:30 am - 11:30 am **Marco Gualtieri**, University of Toronto

Lecture 1: Generalized complex vs. logarithmic symplectic geometry

11:30 am - 12:30 pm **Benson Farb**, University of Chicago

Lecture 1: Point counting for topologists

12:30 pm - 2:30 pm Lunch (Magma Café, Please wear your name tag during lunch)

Parallel Sessions: Various

2:30 pm - 3:30 pm **Session 1: Room: AERL 120**

Ralph Cohen, Stanford University

Comparing Topological Field Theories: the string topology of a manifold and the symplectic cohomology of its cotangent bundle

Session 2: Room: ESB 2012

Weimin Chen, University of Massachusetts Amherst

Toward an equivariant version of Gromov-Taubes invariant

Session 3: Room: EOSM 135

Peng Lu, University of Oregon

A rigidity theorem for codimension one shrinking gradient Ricci Solutions in Euclidean space

Plenary Session: Room 1012

3:30 pm - 4:00 pm Coffee break (ESB Lobby)

4:00 pm - 5:00 pm **Octav Cornea**, Université de Montréal

Lagrangian cobordism and Fukaya categories

Detailed Schedule: Tuesday June 30, 2015

8:45 am - 9:00 am Check-In/ Registration (ESB Atrium)

Plenary Sessions: Room 1012

9:00 am - 10:00 am **Daniel Ruberman**, Brandeis University

End-periodic index theory

10:00 am - 10:30 am Coffee break (ESB Lobby)

10:30 am - 11:30 am **S. Boyer**, Université du Québec à Montréal

Foliations, left-orders, and L-spaces

11:30 am - 12:30 pm **Nathan Dunfield**, University of Illinois

Random knots: their properties and algorithmic challenges

12:30 pm - 2:30 pm Lunch (Magma Café, Please wear your name tag)

Parallel Sessions: Various

2:30 pm - 3:30 pm **Session 1: Room: AERL 120**

Thomas Walpuski, MIT

A compactness theorem for the Seiberg-Witten equation with multiple spinors

Session 2: Room: ESB 2012

Jim Davis, Indiana University

Bordism of L^2 -acyclic manifolds

Session 3: Room: EOSM 135

Ryan Budney, University of Victoria

Triangulations of 4-manifolds

Plenary Session: Room 1012

3:30 pm - 4:00 pm Coffee break (ESB Lobby)

4:00 pm - 5:00 pm **Ailana Fraser**, University of British Columbia

Minimal surface in the ball

Evening Event:

5:00 pm - 6:30 pm Welcome Reception and Networking (Please wear your name tag for this event)
(ESB Lobby)

Detailed Schedule: Thursday July 2, 2015

8:45 am - 9:00 am Check-In/ Registration (ESB Atrium)

Plenary Sessions: Room 1012

9:00 am - 10:00 am **Oscar Randal-Williams**, Cambridge University

Lecture 1: Infinite loop spaces and positive scalar curvature

10:00 am - 10:30 am Coffee break (ESB Lobby)

10:30 am - 11:30 am **Wolfgang Lueck**, Universität Bonn

Universal torsion, L^2 -invariants, polytopes and the Thurston norm.

11:30 am - 12:30 pm **Benson Farb**, University of Chicago

Lecture 2: Topology of spaces of holomorphic maps, revisited

12:30 pm - 2:30 pm Lunch (Magma Café, Please wear your name tag)

Parallel Sessions: Various

2:30 pm - 3:30 pm **Session 1: Room: AERL 120**

Ozgun Unlu, Bilkent University

Free Group Actions on Manifolds

Session 2: Room: ESB 2012

Bernhard Hanke, University of Augsburg

Inessential Brown-Peterson homology and bordism of elementary abelian groups

Session 3: Room: EOSM 135

Maxime Bergeron, University of British Columbia

The topology of representation varieties

Plenary Session: Room 1012

3:30 pm - 4:00 pm Coffee break (ESB Lobby)

4:00 pm - 5:00 pm **Ib Henning Madsen**, Copenhagen University

Automorphisms of manifolds and graph homology

Detailed Schedule: Friday July 3, 2015

8:45 am - 9:00 am Check-In/ Registration (ESB Atrium)

Plenary Sessions: Room 1012

9:00 am - 10:00 am **Oscar Randal-Williams**, Cambridge University
Lecture 2: Moduli spaces of high-dimensional manifolds

10:00 am - 10:30 am Coffee break (ESB Lobby)

10:30 am - 11:30 am **Marco Gualtieri**, University of Toronto
Lecture 2: The Stokes Groupoid

11:30 am - 12:30 pm **Thomas Schick**, Georg-August Universität Göttingen
Signature and higher index theory

12:30 pm - 2:30 pm Lunch (Magma Café, Please wear your name tag)

Parallel Sessions: Various

2:30 pm - 3:30 pm

Session 1: Room: AERL 120

Holger Reich, Free University of Berlin

Algebraic K-theory of group algebras and the cyclotomic trace

Session 2: Room: ESB 2012

Jongil Park, Seoul National University, Korea

On symplectic fillings of quotient surface singularities

Session 3: Room: EOSM 135

Stephen Lu, Université du Québec à Montréal

Orbifold uniformization and a DUY-Simpson's correspondence for singular varieties

Plenary Session: Room 1012

3:30 pm - 4:00 pm Coffee break (ESB Lobby)

4:00 pm - 5:00 pm **Fuquan Fang**, Capital Normal University
Nonnegative curvature and Tits buildings

Detailed Schedule: Monday July 6, 2015

8:45 am - 9:00 am Check-In/ Registration (ESB Atrium)

Plenary Sessions: Room 1012

9:00 am - 10:00 am **Ruth Charney**, Brandeis University

Morse Boundaries

10:00 am - 10:30 am Coffee break (ESB Lobby)

10:30 am - 11:30 am **Soren Galatius**, Stanford University

Lecture 1: Homological stability and non-stability for moduli spaces of closed manifolds

11:30 am - 12:30 pm **Tom Farrell**, Tsinghua University

Lecture 1: Bundles with extra geometric structure

12:30 pm - 2:30 pm Lunch (Magma Café, Please wear your name tag)

Parallel Sessions: Various

2:30 pm - 3:30 pm **Session 1: Room: AERL 120**

Nikolai Saveliev, University of Miami

On the deleted squares of lens spaces

Session 2: Room: ESB 2012

Andrew Dancer, University of Oxford

Hyperkahler implosion and Nahm's equations

Session 3: Room: EOSM 135

Tali Pinsky, University of British Columbia

Templates for geodesics on surfaces and the volumes of their complements

Plenary Session: Room 1012

3:30 pm - 4:00 pm Coffee break (ESB Lobby)

4:00 pm - 5:00 pm **Ciprian Manolescu**, University of California, LA

Lecture 1: The triangulation conjecture

Evening Event:

6:15 pm- 8:45 pm Symposium Dinner

University Golf Club (RSVP and payment required)

5185 University Boulevard, Vancouver, BC V6T 1X5

Detailed Schedule: Tuesday July 7, 2015

8:45 am - 9:00 am Check-In/ Registration (ESB Atrium)

Plenary Sessions: Room 1012

9:00 am - 10:00 am **Michael Davis**, Ohio State University

The action dimension of RAAGs

10:00 am - 10:30 am Coffee break (ESB Lobby)

10:30 am - 11:30 am **Wolfgang Lueck**, Universität Bonn

Lecture 2: Introduction to the Farrell-Jones Conjecture

11:30 am - 12:30 pm **Martin Bridson**, Oxford University

Lecture 1: Decision problems, curvature and topology

12:30 pm - 2:30 pm Lunch (Magma Café, Please wear your name tag)

Parallel Sessions: Various

2:30 pm - 3:30 pm

Session 1: Room: AERL 120

Johannes Nordstrom, University of Bath

Disconnecting the G_2 moduli space

Session 2: Room: ESB 2012

Andras Stipsicz, Alfréd Rényi Institute of Mathematics

Concordance homomorphisms from knot Floer homology

Session 3: Room: EOSM 135

Alexander Berglund, Stockholm University

Stable cohomology of automorphisms of high dimensional manifolds

Plenary Session: Room 1012

3:30 pm - 4:00 pm Coffee break (ESB Lobby)

4:00 pm - 5:00 pm **Jason Lotay**, University College London

Hyperkaehler 4-manifolds with boundary

Detailed Schedule: Wednesday July 8, 2015

8:45 am - 9:00 am Check-In/ Registration (ESB Atrium)

Plenary Sessions: Room 1012

9:00 am - 10:00 am **Soren Galatius**, Stanford University
Lecture 2: Tautological rings for high-dimensional manifolds

10:00 am - 10:30 am Coffee break (ESB Lobby)

10:30 am - 11:30 am **Ian Leary**, University of Southampton
Concerning KS Brown's question

11:30 am - 12:30 pm **Martin Bridson**, Oxford University
Lecture 2: Profinite rigidity and low-dimensional orbifolds

12:30 pm - 2:30 pm Lunch (Magma Café, Please wear your name tag)

Parallel Sessions: Various

2:30 pm - 3:30 pm **Session 1: Room: AERL 120**
Matthew Hedden, Michigan State University
Khovanov-Floer theories

Session 2: Room: ESB 2012
Gil Cavalcanti, Universiteit Utrecht
Stable generalized complex structures

Session 3: Room: EOSM 135
Adam Clay, University of Manitoba
Foliations of graph manifolds

Plenary Session: Room 1012

3:30 pm - 4:00 pm Coffee break (ESB Lobby)

4:00 pm - 5:00 pm **Mihaela Pilca**, University of Regensburg
Homogeneous Clifford structures on Riemannian manifolds

Detailed Schedule: Thursday July 9, 2015

8:45 am - 9:00 am Check-In/ Registration (ESB Atrium)

Plenary Sessions: Room 1012

9:00 am - 10:00 am **John Pardon**, Stanford University

Existence of Lefschetz fibrations on Stein/Weinstein domains

10:00 am - 10:30 am Coffee break (ESB Lobby)

10:30 am - 11:30 am **Piotr Przytycki**, McGill University and Polish Academy of Sciences

Arcs intersecting at most once

11:30 am - 12:30 pm **Tom Farrell**, Tsinghua University

Lecture 2: Space of constrained Riemannian metrics and their associated Teichmueller spaces

12:30 pm - 2:30 pm Lunch (Magma Café, Please wear your name tag)

Parallel Sessions: Various

2:30 pm - 3:30 pm

Session 1: Room: AERL 120

Diarmuid Crowley, University of Aberdeen

Exotic G_2 -manifolds

Session 2: Room: ESB 2012

R. Inanc Baykur, University of Massachusetts

Multisections of Lefschetz fibrations and topology of symplectic 4-manifolds

Session 3: Room: EOSM 135

Nathan Perlmutter, University of Oregon

Homological stability for diffeomorphism groups of odd dimensional manifolds

Plenary Session: Room 1012

3:30 pm - 4:00 pm Coffee break (ESB Lobby)

4:00 pm - 5:00 pm **Ciprian Manolescu**, University of California, LA

Lecture 2: Involutive Heegaard Floer homology

5:00 pm - 5:15 pm Concluding Remarks (Workshop organizers)

Titles and Abstracts: Plenary Speakers

1. Martin Bridson: (Oxford University)

Lecture 1: Decision problems, curvature and topology

I shall discuss a range of problems in which groups mediate between topological/geometric constructions and algorithmic problems elsewhere in mathematics, with impact in both directions. I shall begin with a discussion of sphere recognition in different dimensions. I'll explain why there is no algorithm that can determine if a compact homology sphere of dimension 5 or more has a non-trivial finite-sheeted covering. I'll sketch how ideas coming from the study of $CAT(0)$ cube complexes were used by Henry Wilton and me to settle isomorphism problems for profinite groups, and to settle a conjecture in combinatorics concerning the extension problem for sets of partial permutations.

Lecture 2: Profinite rigidity and low-dimensional orbifolds

Abstract: This lecture shares with Lecture 1 the theme of recognition problems, but the focus now is on low-dimensional manifolds and finite quotients of groups. I shall begin by discussing the history of the following problem: to what extent is a residually-finite group determined by its profinite completion? Fundamental groups of orbifolds of dimension at most 3 are determined to a greater extent than arbitrary groups. After surveying what is known in this context, I'll present recent work with Reid and Wilton showing that the fundamental groups of punctured torus bundles can be distinguished from each other and from other 3-manifold groups by means of their profinite completions.

2. Ruth Charney: (Brandeis University)

Morse Boundaries

Boundaries play an important role in the study of hyperbolic spaces and hyperbolic groups. Analogous boundaries exist for $CAT(0)$ spaces but they are not quasi-isometry invariant and hence do not give a well-defined boundary for a $CAT(0)$ group. In joint work with H. Sultan, we define a "contracting boundary" for $CAT(0)$ spaces by restricting to rays with hyperbolic-like behavior and we prove that the contracting boundary is a quasi-isometry invariant. More recently, M. Cordes has shown that these ideas can be generalized to any proper geodesic metric space by restricting to Morse geodesics.

3. Octav Cornea: (Université de Montréal)

Lagrangian cobordism and Fukaya categories

This talk is based on joint work with Paul Biran (ETH). The derived Fukaya category has emerged out of work of Gromov, Floer, Donaldson, Kontsevich, Fukaya, Seidel and many others starting in the 1980's. It is a triangulated category associated to a symplectic manifold that, in favourable cases, allows one to use iterated exact triangles to recover properties of a given Lagrangian submanifold from knowledge of a class of simpler objects. Constructions of exact triangles associated to specific geometric settings are essential from this perspective. The first important construction is due to Seidel (2003) and is associated to a Dehn twist. Another class of examples has emerged more recently in the work of Biran and myself (2013) and is a reflection of the relation given by Lagrangian cobordism, a natural notion introduced by Arnold at the end of the 1970's. After giving the

relevant background, the purpose of this talk is to explain the relation between cobordism and the derived Fukaya category and show how Seidel's exact triangle fits into the picture.

4. **Michael Davis: (Ohio State University)**

The action dimension of RAAGs

The "action dimension" of a discrete group G is the smallest dimension of a contractible manifold which admits a proper action of G . Associated to any flag complex L there is a right-angled Artin group, A_L . We compute the action dimension of A_L for many L . Our calculations come close to confirming the conjecture that if the L^2 -Betti number of A_L in degree l is nonzero, then the action dimension of A_L is greater than or equal to $2l$. This is a report on joint work with Grigori Avramidi, Boris Okun and Kevin Schreve.

5. **Tom Farrell: (Tsinghua University)**

Lecture 1: Bundles with extra geometric structure

The structure of smooth fiber bundles whose concrete fibers are each equipped with a Riemannian metric whose sectional curvatures are constrained to lie in a fixed interval S of real numbers (called S -bundles) will be explored in this talk. Some interesting cases being $S = (-\infty, 0)$, $(-\infty, 0]$, $(-4, -1)$, $[0, +\infty)$, $(0, +\infty)$ and $(1, 4)$. In examining negatively curved bundles -- i.e. the case where $S = (-\infty, 0)$ -- important use of Anosov flow bundles is made -- i.e. bundles whose concrete fibers are each equipped with an Anosov flow. This leads to an interesting partial result on the conjecture that negatively curved bundles with compact fibers and simply connected base space must be topologically trivial.

Lecture 2: Space of constrained Riemannian metrics and their associated Teichmueller spaces

This talk will focus on trying to make transparent some of the key ideas underlying the results mentioned in my first talk. For example how it is seen that the Teichmueller space of negatively curved metrics on many high dimensional closed smooth manifolds is not contractible. Also recent results about quarter pinched positively curved bundles and the space of non-negatively curved Riemannian metrics on certain open manifolds will be discussed.

These lectures represent work of many people including Pedro Ontaneda, Andrey Gogolev, Igor Belegradek, Vitali Kapovitch, Dan Knopf and Zhou Gang.

6. **Benson Farb: (University of Chicago)**

Lecture 1: Point counting for topologists

In this talk I will try to describe the remarkable bridge, built by Weil, Grothendieck, Deligne and others, between topology and number theory. I will concentrate on explaining how this bridge can be used to make topological (resp. arithmetic) predictions, and prove them, using arithmetic (resp. topology). A crucial intermediary in this story is the Grothendieck ring of varieties, or "baby motives".

Lecture 2: Topology of spaces of holomorphic maps, revisited

In 1979, Segal computed the stable homology of the space of degree d holomorphic maps from CP^1 to CP^n , inspiring a flurry of activity in the 1980's. In this talk I will describe a new (and still-developing) point-of-view on these theorems (and generalizations).

Applications include answers to questions such as: how many degree d rational curves are there in projective n -space $P^1(F_q)$? One theme is the transmission of information between three viewpoints: topology, algebraic geometry, and arithmetic. This is joint work with Jesse Wolfson.

7. **Soren Galatius: (Stanford University)**

Lecture 1: Homological stability and non-stability for moduli spaces of closed manifolds

Two closed manifold M and M' of dimension $2n$ are said to be stably diffeomorphic if they become diffeomorphic after replacing each with its connected sum with a finite number of copies of $S^n \times S^n$. In general there doesn't seem to be any good maps between the classifying spaces $B\mathrm{Diff}(M)$ and $B\mathrm{Diff}(M')$, but nevertheless it turns out that they have isomorphic rational cohomology in a range of degrees, provided the numbers $(-1)^n \chi(M)$ and $(-1)^n \chi(M')$ are both sufficiently large, and $n > 2$ and the manifolds are simply connected. The analogous statement in integral cohomology is false, but with p -local coefficients it is true provided in addition that the p -adic valuations of $\chi(M)$ and $\chi(M')$ agree. This is joint work with Oscar Randal-Williams.

Lecture 2: Tautological rings for high-dimensional manifolds

To each fiber bundle $f: E \rightarrow B$ whose fibers are closed oriented manifolds of dimension d and each polynomial $p \in H^*(BSO(d))$ there is an associated "tautological class" $\kappa_p \in H^*(B)$ defined by fiberwise integration. The set of polynomials in these classes which vanish for all bundles whose fibers are oriented diffeomorphic to M forms an ideal $I_M \subset \mathbb{Q}[\kappa_p]$ and the quotient ring $R_M = \mathbb{Q}[\kappa_p]/I_M$ is the "tautological ring" of M . In this talk I will discuss some recent results about the structure and particularly Krull dimension of this ring for various M . This is joint work with Ilya Grigoriev and Oscar Randal-Williams.

8. **Marco Gualtieri: (University of Toronto)**

Lecture 1: Generalized complex vs logarithmic symplectic geometry

I will review the notion of a generalized complex structure and describe recent developments in our understanding of this type of geometry, which interpolates between usual complex and symplectic manifolds. I will emphasize a new approach which reformulates the structure in terms of a usual symplectic form, but on a modification of the tangent bundle, a construction which may have independent interest in symplectic topology.

Lecture 2: The Stokes Groupoid

The solution to a singular ordinary differential equation is not well-defined on the original curve; I will explain that it is only well-defined on the corresponding Stokes groupoid, a complex surface equipped with groupoid structure. I will explain how this point of view leads to a new functorial regularization procedure for divergent perturbation series solutions as well as a canonical geometric solution of the isomonodromy system.

9. **Wolfgang Lueck: (Universität Bonn)**

Lecture 1: Universal torsion, L^2 -invariants, polytopes and the Thurston norm

We introduce universal torsion which is defined for L^2 -acyclic manifolds with torsionfree fundamental group and takes values in certain K_1 -groups of a skew field associated to the integral group ring. It encompasses well-known invariants such as the Alexander polynomial and L^2 -torsion. We discuss also twisted L^2 -torsion and higher order Alexander polynomials which can also be derived from the universal invariant and assign certain polytopes to the universal torsion. This gives especially in dimension 3 interesting invariants which recover for instance the Thurston norm.

Lecture 2: Introduction to the Farrell-Jones Conjecture

The Farrell-Jones Conjecture identifies the algebraic K - and L -groups for group rings with certain equivariant homology groups. We will give some details of its formulation, its status and indicate some ideas of proofs for certain classes of groups. We will try to convince the audience about its significance by considering special cases and presenting the surprising large range of its applications to prominent problems in topology, geometry, and group theory.

10. **Ib Henning Madsen: (Copenhagen University)**

Automorphisms of manifolds and graph homology

The lecture will describe the rational cohomology of the classifying space of the groups of homotopy automorphisms and block automorphisms of 2d-dimensional "generalized surfaces". The results will be given in terms of Lie algebra cohomology, and graph homology. The lecture represents joint work with Alexander Berglund.

11. **Ciprian Manolescu: (University of California, LA)**

Lecture 1: The triangulation conjecture

The triangulation conjecture stated that any n -dimensional topological manifold is homeomorphic to a simplicial complex. It is true in dimensions at most 3, but false in dimension 4 by the work of Casson and Freedman. In this talk I will explain the proof that the conjecture is also false in higher dimensions. This result is based on previous work of Galewski-Stern and Matumoto, who reduced the problem to a question in low dimensions (the existence of elements of order 2 and Rokhlin invariant one in the 3-dimensional homology cobordism group). The low-dimensional question can be answered in the negative using a variant of Floer homology, $\text{Pin}(2)$ -equivariant Seiberg-Witten Floer homology.

Lecture 2: Involutive Heegaard Floer homology

Using the conjugation symmetry on Heegaard Floer complexes, we define a three-manifold invariant called involutive Heegaard Floer homology, which is meant to correspond to \mathbb{Z}_2 -equivariant Seiberg-Witten Floer homology. Further, we obtain two new invariants of homology cobordism, explicitly computable for surgeries on L -space knots and thin knots. This is joint work with Kristen Hendricks.

12. John Pardon: (Stanford University)

Existence of Lefschetz fibrations on Stein/Weinstein domains

I will describe joint work with E. Giroux in which we show that every Weinstein domain admits a Lefschetz fibration over the disk (that is, a singular fibration with Weinstein fibers and Morse singularities). We also prove an analogous result for Stein domains in the complex analytic setting. The main tool used to prove these results is Donaldson's quantitative transversality.

13. Oscar Randal-Williams: (Cambridge University)

Lecture 1: Infinite loop spaces and positive scalar curvature

It is well known that there are topological obstructions to a manifold M admitting a Riemannian metric of everywhere positive scalar curvature (psc): if M is Spin and admits a psc metric, the Lichnerowicz–Weitzenböck formula implies that the Dirac operator of M is invertible, so the vanishing of the \hat{A} genus is a necessary topological condition for such a manifold to admit a psc metric. If M is simply-connected as well as Spin, then deep work of Gromov–Lawson, Schoen–Yau, and Stolz implies that the vanishing of (a small refinement of) the \hat{A} genus is a sufficient condition for admitting a psc metric. For non-simply-connected manifolds, sufficient conditions for a manifold to admit a psc metric are not yet understood, and are a topic of much current research.

I will discuss a related but somewhat different problem: if M does admit a psc metric, what is the topology of the space $\mathcal{R}^+(M)$ of all psc metrics on it? Recent work of V. Chernysh and M. Walsh shows that this problem is unchanged when modifying M by certain surgeries, and I will explain how this can be used along with work of Galatius and myself to show that the algebraic topology of $\mathcal{R}^+(M)$ for M of dimension at least 6 is "as complicated as can possibly be detected by index-theory". This is joint work with Boris Botvinnik and Johannes Ebert.

Lecture 2: Moduli spaces of high-dimensional manifolds

I will explain recent and ongoing work with Soren Galatius, in which we study moduli spaces of smooth $2n$ -dimensional ($2n > 4$) manifolds (or, what is equivalent, the classifying spaces of diffeomorphism groups of such manifolds). I will describe a homotopy-theoretic approximation to these spaces which allows us to compute their cohomology in many cases. This gives a high-dimensional extension of well-known results in dimension 0 (Nakaoka's stability theorem and the Barratt–Priddy–Quillen theorem) and dimension 2 (Harer's stability theorem and the Madsen–Weiss theorem).

14. Daniel Ruberman: (Brandeis University)

End-periodic index theory

We extend the Atiyah, Patodi, and Singer index theorem from the context of manifolds with cylindrical ends to manifolds with periodic ends. This theorem provides a natural complement to Taubes' Fredholm theory for general end-periodic operators. Our index theorem is expressed in terms of a new periodic eta-invariant that equals the Atiyah–Patodi–Singer eta-invariant in the cylindrical setting. We apply this periodic eta-invariant to the study of moduli spaces of Riemannian metrics of positive scalar curvature. This is joint work with Tom Mrowka and Nikolai Saveliev.

15. Gang Tian: (Princeton University)

Curvature flows and geometric applications

In last two decades, curvature flows have provided effective tools for studying geometry and topology of manifolds. A famous example is Perelman's solution of the Poincare conjecture by using Hamilton's Ricci flow. In this talk, I will start with Ricci flow and discuss some of its applications, then I will discuss some other curvature flows and show how they can be used to studying geometry and topology of underlying manifolds.

Titles and Abstracts: Invited Speakers

1. **R. Inanc Baykur: (University of Massachusetts)**

Multisections of Lefschetz fibrations and topology of symplectic 4-manifolds

We initiate an extensive study of positive factorizations in framed mapping class groups, which allows us to effectively build symplectic 4-manifolds with essential information on various surfaces in them. In this talk, we will demonstrate how these techniques can be used to reformulate and address several interesting problems related to the topology of symplectic 4-manifolds and Lefschetz pencils. Different parts of this work are joint with K. Hayano and N. Monden.

2. **Alexander Berglund: (Stockholm University)**

Stable cohomology of automorphisms of high dimensional manifolds

There is classical programme for understanding diffeomorphisms of high dimensional manifolds whereby one studies, in turn, the monoid of homotopy automorphisms, the block diffeomorphism group, and finally the diffeomorphism group. The difference in each step is measured by, respectively, the surgery exact sequence and, in a range, Waldhausen's algebraic K-theory of spaces.

In recent joint work with Ib Madsen, we calculated the stable rational cohomology of the block diffeomorphism group of the $2d$ -dimensional "generalized genus g surface", i.e., the g -fold connected sum of $S^d \times S^d$ minus a disk ($2d > 4$). Here, stable means g should be large compared to the cohomological degree. Our result is expressed in terms of a certain decorated graph complex. Curiously, the complex we obtain is closely related to the "hairy graph complex" that was introduced recently by Conant-Kassabov-Vogtmann in the study of the homology of automorphism groups of free groups.

3. **Steven Boyer: (Université du Québec à Montréal)**

Foliations, left-orders, and L-spaces

Much work has been devoted in recent years to examining relationships between the existence of a co-oriented taut foliation on a closed, connected, prime 3-manifold W , the left-orderability of the fundamental group of W , and the property that W not be a Heegaard-Floer L-space. Classic work shows that each of these conditions holds when W has a positive first Betti number and it has been conjectured that they coincide when the first Betti number of W is zero. In this talk I will discuss the known connections between these conditions and survey the current status of the conjectures.

4. **Ryan Budney: (University of Victoria)**

Triangulations of 4-manifolds

I will outline some developments in the study of PL-triangulations of 4-manifolds, a developing census, algorithmic challenges and some simple attacks on long-standing open problems.

5. **Gil Cavalcanti: (Universiteit Utrecht)**

Stable generalized complex structures

Stable generalized complex structures are a special class of generalized complex manifolds which are not too far from being symplectic. We show that the stable condition can be rephrased by saying that the structure is equivalent to a symplectic structure on a Lie algebroid. This equivalence allows us to show that deformations of these structures are unobstructed and we obtain a local normal form for the set of points where the structure fails to be symplectic. Some topological restrictions to the existence of such structures follow from the normal form.

6. **Weimin Chen: (University of Massachusetts Amherst)**

Toward an equivariant version of Gromov-Taubes invariant

Gromov-Taubes invariant of a symplectic four-manifold is defined by counting EMBEDDED pseudo-holomorphic curves (maybe disconnected) whose homology class is Poincare dual to a given cohomology class. The seminar work of Taubes asserts that the Gromov-Taubes invariant equals the gauge-theoretic Seiberg-Witten invariant of the underlying smooth four-manifold. Taubes' work has profoundly influenced the research in four-manifold topology (and beyond). Some of the most important consequences include a symplectic characterization and classification of rational and ruled surfaces (following the pioneering works of Gromov and McDuff), the equivalence of symplectic minimality and smooth minimality, and a new, differential and symplectic topology interpretation of the Kodaira dimension of complex surfaces. More recently, Taubes' work has been extended to the level of Floer homology, which, in particular, resulted in a resolution of the Weinstein conjecture in dimension three and an isomorphism between the various Floer homologies of three-manifolds.

It is a natural problem to extend Taubes' work to certain singular spaces. Two important cases which may yield interesting geometric or topological applications are normal projective surfaces and symplectic finite group actions (in which case the corresponding singular space is the quotient space of the group action). In this talk, we will discuss the problem of constructing an equivariant version of Gromov-Taubes invariant -- what can be done and what are the obstacles, as well as some of the geometric and topological applications obtained so far.

7. **Adam Clay (University of Manitoba)**

Foliations of graph manifolds

Boyer, Gordon and Watson have conjectured that the fundamental group of a closed, orientable, irreducible 3-manifold M is left-orderable if and only if M is not an L-space. The latter was also conjectured by Juhász to be equivalent to the existence of a co-orientable, taut foliation of M . When M is a Seifert fibred manifold these conjectures all hold, and there are well-understood constructions which show us exactly why. In this talk I will discuss these conjectures in the context of graph manifolds, with particular focus on the foliations needed in order to extend existing constructions from the case of Seifert fibred manifolds to the case of graph manifolds. This is joint work with Steve Boyer.

8. Ralph Cohen: (Stanford University)

Comparing Topological Field Theories: the string topology of a manifold and the symplectic cohomology of its cotangent bundle

I will describe joint work with Sheel Ganatra, in which we prove an equivalence between two chain complex valued topological field theories: the String Topology of a manifold M , and the Symplectic Cohomology of its cotangent bundle, T^*M . I will also discuss how the notion of Koszul duality appears in the study of TFT's.

9. Diarmuid Crowley: (University of Aberdeen)

Exotic G_2 -manifolds

I shall present examples of smooth 2-connected 7-manifolds M_0 and M_1 which admit G_2 holonomy metrics and which are homeomorphic but not diffeomorphic. These are the first examples of exotic pairs which admit Ricci flat special holonomy metrics. The key invariant is a generalisation of the classical Eells-Kuiper invariant for spin 7-manifolds. The generalised Eells-Kuiper invariant also appears in complete classifications for 2-connected 7-manifolds and 2-connected 7-manifolds with G_2 structure. This work is joint with Johannes Nordström.

10. Andrew Dancer: (University of Oxford)

Hyperkahler implosion and Nahm's equations

We describe implosion constructions in symplectic and hyperkahler geometry. We show how the latter case may be approached via Nahm moduli spaces, and also describe quasi-Hamiltonian analogues of implosion.

11. Jim Davis: (Indiana University)

Bordism of L^2 -acyclic manifolds

A manifold is L^2 -acyclic if all of its L^2 -betti numbers vanish. (It is also called *anharmonic* since there are no nontrivial L^2 -harmonic forms.) For a manifold with fundamental group \mathbb{Z}^n , a manifold is L^2 -acyclic if, and only if, it is acyclic with $\mathbb{Q}(t_1, \dots, t_n)$ -local coefficients. We are interested in $\Omega_n^{(2)}(BG)$, oriented bordism of L^2 -acyclic manifolds with respect to a regular G -cover.

Theorem 1: *There is a long exact sequence*

$$\dots \rightarrow \Omega_k^{(2)}(B\mathbb{Z}^n) \rightarrow \Omega_k(B\mathbb{Z}^n) \rightarrow L_k(\mathbb{Q}(t_1, \dots, t_n)) \rightarrow \dots$$

and $L_k(\mathbb{Q}(t_1, \dots, t_n))$ vanishes if k is odd.

This is proven by modifying the surgery program with a few tricks. Interesting connections with Witt groups of Hermitian forms will be discussed, as well as generalizations to virtually abelian groups. This is a joint work with Sylvain Cappell and Shmuel Weinberger.

12. Nathan Dunfield: (University of Illinois)

Random knots: their properties and algorithmic challenges

I will discuss various models of random knots in the 3-sphere, surveying what is known about them theoretically and what is conjectured about them experimentally. In particular, I will discuss experiments that probe the practical/average case complexity of

questions like computing the genus of a knot. I will then fit this into a broader picture of open questions about the computational complexity of various problems in 3-dimensional topology.

13. Fuquan Fang: (Capital Normal University)

Nonnegative curvature and Tits buildings

In this talk I will explain a surprise link between non-negatively curved manifolds with polar actions and Tits buildings. A new geometric characterization of normal homogeneous spaces (of certain types) can be described in terms of polar symmetric, where no transitive action is assumed.

14. Ailana Fraser: (University of British Columbia)

Minimal surface in the ball

I will discuss questions and results on existence, uniqueness, and compactness of free boundary minimal surfaces in the ball of fixed topological type.

15. Bernhard Hanke: (University of Augsburg)

Inessential Brown-Peterson homology and bordism of elementary abelian groups .

We revisit the bordism theory of free oriented G -manifolds, where G is an elementary abelian p -group. Complementing previous approaches we pay special attention to elements coming from proper subgroups of G . Our results can be applied to the Gromov-Lawson-Rosenberg conjecture concerning the existence of positive scalar curvature metrics on non-simply connected closed manifolds.

16. Matthew Hedden: (Michigan State University)

Khovanov-Floer theories

Khovanov homology is an easily defined homological invariant of links in the 3-sphere, which generalizes the Jones polynomial. An abundance of much less easily defined homological invariants of links have been defined using symplectic or gauge theoretic Floer homology theories. Quite surprisingly, these invariants are often related to Khovanov homology through spectral sequences. It is natural to wonder why Khovanov homology is connected to so many theories, and what types of structures persist through the spectral sequences. In this talk I'll define an abstract algebraic notion of a "Khovanov-Floer" theory, and sketch a proof that such theories behave naturally with respect to link cobordisms. I'll then show that all the known spectral sequences from Khovanov homology satisfy our definition, implying that link cobordisms induce invariant homomorphism between spectral sequences. I'll assume no knowledge of Khovanov homology, Floer homology, or spectral sequences. This is joint work with John Baldwin and Andrew Lobb.

17. Ian Leary: (University of Southampton)

Concerning KS Brown's question

Using finite extensions of right-angled Coxeter groups we construct groups G for which the minimal dimension of a classifying space for proper actions is strictly greater than the virtual cohomological dimension. In contrast to previous examples these groups do admit a cocompact model for this classifying space. This is joint work with Nansen Petrosyan.

18. Peng Lu: (University of Oregon)

A rigidity theorem for codimension one shrinking gradient Ricci Solutions in Euclidean space

I will present a joint work with Pengfei Guan and Yiyan Xu. In the work we prove a splitting theorem for complete gradient Ricci soliton with nonnegative curvature and establish a rigidity theorem for codimension one complete shrinking gradient Ricci soliton in \mathbb{R}^{n+1} with nonnegative Ricci curvature.

19. Steven Lu: (Université du Québec à Montréal)

Orbifold uniformization and a DUY-Simpson's correspondance for singular varieties

The solution to the Calabi conjecture by S.T. Yau (1978) implies directly the following uniformization results: An n -dimensional compact Kahler manifold with positive (respectively trivial) canonical class and vanishing of the integral of $(c_1^2 - 2(n+1)c_2)w^{n-2}$, where c_1 and c_2 are the Chern classes and w the Kahler class, is uniformed by the hyperbolic ball (respectively by the complex Euclidean space, with the standard Euclidean metric). These generalize directly to the case of compact Kahler orbifolds (i.e. Kahler varieties with at worst quotient singularities) if one replaces the respective Chern classes by their orbifold counterparts.

In 1994, a remarkable paper of Shepherd-Barron and Wilson shows that complex projective threefolds with at worst canonical singularities with "numerically trivial" first and second orbifold-Chern classes are uniformized by Abelian three-folds, giving the first instance of uniformization in higher dimensions for non-quotient singularities. Very little has taken place since until the recent article of Greb-Kebekus-Peternell that dealt with varieties that are nonsingular in codimension two but which avoids dealing directly with orbifolds (such as orbifold Chern classes ...). In this talk, I will give the outline of at least a couple of ways in a joint work with Behrouz Taji that generalizes the result of Shepherd-Barron and Wilson to arbitrary dimension and to the case of klt singularities (which are singularities that are more general than quotient singularities but natural in the setting of birational geometry). This also represent a full orbifold generalization of the said result of Greb-Kebekus-Peternell. The first uses the polystability of the tangent sheaves of such varieties and the second the semistability thereof. The first requires a generalization to the orbifold setting of the classical theorem of Narasimhan-Seshadri and Donaldson-Uhlenbeck-Yau while the second that of Simpson's correspondence between semi-stable sheaves and flat vector bundles.

20. Jason Lotay: (University College London)

Hyperkaehler 4-manifolds with boundary

Hyperkaehler geometry, which arises in the study of special holonomy and Ricci-flat metrics, is also important for theoretical physics and moduli space problems in gauge theory. In dimension 4, hyperkaehler geometry takes on a special character, and a natural question arises: given a compact 3-dimensional manifold N which can be a hypersurface in a hyperkaehler 4-manifold, when can it actually be "filled in" to a compact hyperkaehler 4-manifold with N as its boundary? In particular, starting from a compact hyperkaehler 4-manifold with boundary, which deformations of the boundary structure can be extended to a hyperkaehler deformation of the interior? I will discuss recent progress on this problem, which is joint work with Joel Fine and Michael Singer.

21. Johannes Nordstrom: (University of Bath)

Disconnecting the G_2 moduli space

Little is currently known about the global properties of the G_2 moduli space of a closed 7-manifold, ie the space of Riemannian metrics with holonomy G_2 modulo diffeomorphisms. A holonomy G_2 metric has an associated G_2 -structure, and I will define a $\mathbb{Z}/48$ valued homotopy invariant of a G_2 -structure in terms of the signature and Euler characteristic of a $\text{Spin}(7)$ -coboundary. I will describe examples of manifolds with holonomy G_2 metrics where the invariant is amenable to computation in terms of eta invariants, and which are candidates for having a disconnected moduli space. This is joint work in progress with Diarmuid Crowley and Sebastian Goette.

22. Jongil Park (Seoul National University, Korea)

On symplectic fillings of quotient surface singularities

One of active research areas in 4-manifold theory is to classify symplectic fillings of certain 3-manifolds equipped with a natural contact structure. Among them, people have long studied symplectic fillings of the link of a normal complex surface singularity. Note that the link of a normal complex surface singularity carries a canonical contact structure which is also known as the Milnor fillable contact structure. For example, P. Lisca classified symplectic fillings of cyclic quotient singularities whose corresponding link is lens space, and A. Nemethi and P. Popescu-Pampu identified the correspondence between the symplectic fillings in Lisca's classification and the Milnor fibers for cyclic quotient singularities. Furthermore, M. Bhupal and K. Ono tried to extend these results, so that they classified all possible symplectic fillings of quotient surface singularities.

In this talk, I'd like to investigate the correspondence between the symplectic fillings in Bhupal-Ono's classification and the Milnor fibers of quotient surface singularities. This is a joint work with Heesang Park, Dongsoo Shin, and Giancarlo Urzfiua.

23. Nathan Perlmutter (University of Oregon)

Homological stability for diffeomorphism groups of odd dimensional manifolds

I will present a new homological stability result for the diffeomorphism groups of manifolds of dimension $2n+1 \geq 9$, with respect to forming the connected sum with copies of an arbitrary $(n-1)$ -connected, $(2n+1)$ -dimensional manifold that is stably parallelizable. This work can be viewed as an odd dimensional analogue of a recent result of Galatius and Randal-Williams regarding the homological stability of the diffeomorphism groups of manifolds of dimension $2n \geq 6$, with respect to forming connected sums with $S^n \times S^n$.

24. Mihaela Pilca: (University of Regensburg)

Homogeneous Clifford structures on Riemannian manifolds

Clifford structures on Riemannian manifolds generalize almost Hermitian and almost quaternion-Hermitian structures. These recently introduced structures are in a certain sense dual to spin structures. In this talk I will present some recent results on Clifford structures, in particular on their classification in the homogeneous setting. Namely, we will show that there exists an upper bound for their rank on compact manifolds of non-vanishing Euler characteristic. Furthermore, we will give the complete description of the limiting cases of highest possible rank, which involves four of the exceptional Lie groups. In the other extreme case of rank 3 Clifford structures, i.e. homogeneous almost quaternion-Hermitian manifolds, we show that the manifold is either a Wolf space, the product of two spheres S^2 or the complex quadric $\text{SO}(7)/\text{U}(3)$. The talk is based on joint work with Andrei Moroianu and Uwe Semmelmann.

25. Tali Pinsky (University of British Columbia)

Templates for geodesics on surfaces and the volumes of their complements

A closed geodesic on a hyperbolic surface has a natural lift to the unit tangent bundle of the surface, and is a knot therein. At the same time, it is a periodic orbit of the geodesic flow on the surface. In the talk I'll show how templates, which are embedded branched surfaces carrying the set of periodic orbits of a flow, can be computed for the geodesic flows on certain surfaces called Hecke triangles. I'll then show how Ghys' template for the modular surface can be used to obtain results about the growth of the volumes of complements of closed geodesics.

26. Piotr Przytycki: (McGill University and Polish Academy of Sciences)

Arcs intersecting at most once

I will show that on a punctured oriented surface with Euler characteristic $\chi < 0$, the maximal cardinality of a set of essential simple arcs that are pairwise non-homotopic and intersecting at most once is $2|\chi|(|\chi|+1)$. This gives a cubic estimate in $|\chi|$ for a set of $2|\chi|$ curves pairwise intersecting at most once, which to a great extent answers a question of Farb and Leininger.

27. Andrew Ranicki: (University of Edinburgh)

The quadratic construction in surgery theory

This talk will be a report on the current state of a joint project with Michael Crabb on the use of the "geometric Hopf invariant" in \mathbb{Z}_2 -equivariant homotopy theory to extract π_1 -equivariant chain level quadratic structures from manifolds (or more generally Poincare duality spaces) and maps. The chain level Wall surgery obstruction of a normal map is the prime example of such a structure. All such constructions can be extracted from a natural transformation from the "certain exact sequence" of J.H.C. Whitehead involving the Hurewicz map for a Thom space to its algebraic analogue involving the \mathbb{Q} -groups of the speaker and Michael Weiss. On the numerical side, 8 plays a prominent role in the proceedings.

28. Holger Reich: (Free University of Berlin)

Algebraic K-theory of group algebras and the cyclotomic trace

The talk will report on joint work with Wolfgang Lueck (Bonn), John Rognes (Oslo) and Marco Varisco (Albany). The Whitehead group $Wh(G)$ and its higher analogues defined using algebraic K-theory play an important role in geometric topology. There are vanishing conjectures in the case where G is torsionfree. For groups containing torsion the Farrell-Jones conjectures give a conjectural description in terms of group homology. After an introduction to this circle of ideas, I will report on the following new result, which for example detects a large direct summand inside the rationalized Whitehead group of a group like Thompson's group T .

The Farrell-Jones assembly map for connective algebraic K-theory is rationally injective, under mild homological finiteness conditions on the group and assuming that a weak version of the Leopoldt-Schneider conjecture holds for cyclotomic fields. This generalizes a result of Boekstedt, Hsiang and Madsen, and leads to a concrete description of a large direct summand of $K_n(\mathbb{Z}G) \otimes_{\mathbb{Z}} \mathbb{Q}$ in terms of group homology. Since the number theoretic assumption holds in low dimensions, this also computes a large direct summand of $Wh(G) \otimes_{\mathbb{Z}} \mathbb{Q}$. In many cases the number theoretic assumptions always hold, so we obtain rational injectivity results about assembly maps, in particular for Whitehead groups, under homological finiteness assumptions on the group

only. The proof uses the cyclotomic trace to topological cyclic homology, Boekstedt-Hsiang-Madsen's functor C , and new general injectivity results about the assembly maps for THH and C .

29. Nikolai Saveliev: (University of Miami)

On the deleted squares of lens spaces

The congruence space $F_2(M)$ of ordered pairs of distinct points in a manifold M , also known as the deleted square of M , is not a homotopy invariant of M : Longoni and Salvatore produced examples of homotopy equivalent lens spaces M and N of dimension three for which $F_2(M)$ and $F_2(N)$ are not homotopy equivalent. We study the natural question whether two arbitrary 3-dimensional lens spaces M and N must be homeomorphic in order for $F_2(M)$ and $F_2(N)$ to be homotopy equivalent. Among our tools are the Cheeger-Simons differential characters of deleted squares and the Massey products of their universal covers. This is a joint work with Kyle Evans-Lee.

30. Thomas Schick: (Georg-August Universität Göttingen)

Signature and higher index theory

Higson and Roe have used homological algebra over C^* -algebras to map the surgery exact sequence for smooth manifolds to an exact sequence of K -theory groups of C^* -algebras (the latter containing as particular case the Baum-Connes assembly map). Jointly with Paolo Piazza, we have developed an appropriate secondary large scale index theory to directly construct all the maps involved in terms of higher index theory of the signature operator. This allows in particular to extend the result to the topological category. We present this result. To obtain numerical results we show how one can systematically map further to cyclic homology groups to obtain numerical invariants.

31. Andras Stipsicz: (Alfréd Rényi Institute of Mathematics)

Concordance homomorphisms from knot Floer homology

Knot Floer homology is a rather effective tool to study concordance properties of knots. By deforming the differential defining the homology, a 1-parameter family of concordance invariants can be defined. One of these invariants, indeed, can be used to derive a bound on the unoriented genus of the knot. This is joint work with Peter Ozsvath and Zoltan Szabo.

32. Ozgun Unlu: (Bilkent University)

Free Group Actions on Manifolds

In this talk we will discuss some methods for constructing free group actions on manifolds. Then we will talk about applications of these methods when these manifolds are products of spheres. Lastly, using the known group theoretic restrictions on finite groups that can act freely on these manifolds, we will give the characterization of the finite groups which can act freely on certain manifolds.

33. Thomas Walpuski: (MIT)

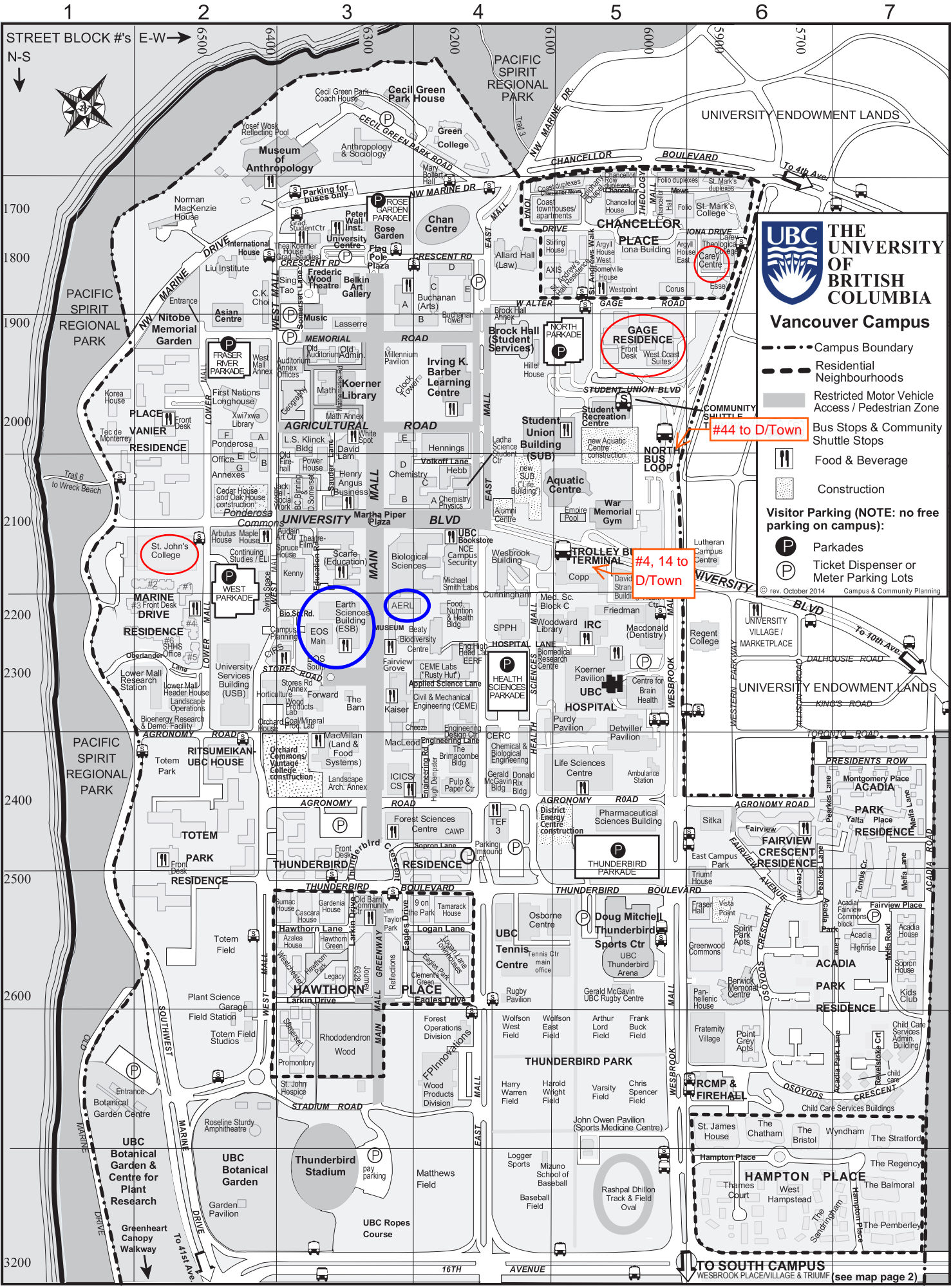
A compactness theorem for the Seiberg-Witten equation with multiple spinors

Unlike the usual Seiberg-Witten equation, its version with multiple spinors does not enjoy a priori estimates which lead to compactness. In fact, compactness can fail; however, in a rather controlled way: after suitable rescaling sequences of solutions of the Seiberg-Witten equation converge to Fueter sections of a bundle of moduli spaces of ASD instantons. I will give a brief sketch of our proof (based on ideas developed by Taubes for $PSL(2,C)$ -connections). Moreover, I will explain our point of view of the Seiberg-Witten equation within the context of Seiberg-Witten equations with ADHM targets, which will illuminate the connection with gauge theory on G_2 -manifolds. This is joint work with Andriy Haydys.

34. Maxime Bergeron: (University of British Columbia)

The topology of representation varieties

Let H be a finitely generated group and let G be a complex reductive linear algebraic group (e.g. a special linear group). The representation space $\text{Hom}(H,G)$, carved out of a finite product of copies of G by the relations of H , has many interesting topological features. From the point of view of algebraic topology, these features are easier to understand for the compact subspace $\text{Hom}(H,K)$ of $\text{Hom}(H,G)$ where K is a maximal compact subgroup of G (e.g. a special unitary group). Unfortunately, the topological spaces $\text{Hom}(H,G)$ and $\text{Hom}(H,K)$ usually have very little to do with each other; for instance, some of the components of $\text{Hom}(H,G)$ may not even intersect $\text{Hom}(H,K)$. Accordingly, I will discuss exceptional classes of groups H for which $\text{Hom}(H,G)$ and $\text{Hom}(H,K)$ happen to be homotopy equivalent, thereby allowing one to obtain otherwise inaccessible topological invariants.



UBC 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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#44 to D/Town

#4, 14 to D/Town

TO SOUTH CAMPUS
WESBROOK PLACE VILLAGE & TRIUMF (see map page 2)

Map Directory

Site or Building Name & Address	Grid
Abdul Ladhia 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-67
Acadia Park Highrise, 2725 Meifa Rd.....	G7
Allard Hall [Faculty of Law], 1822 East Mall.....	B4
Alumni Centre (under construction), 6163 University Blvd.....	D4
Anthropology & Sociology Bldg, 6303 NW Marine Dr.....	A3
Aquatic Centre, 6121 University Blvd.....	D5
Aquatic Ecosystems Research Lab (AERL), 2202 Main Mall.....	E3
Arbutus House (in Ponderosa Commons), 6488 University Blvd.....	D2
Asian Centre, 1871 West Mall.....	B2
Audain Art Centre (in Ponderosa Commons), 6398 University Blvd.....	D3
Auditorium Annex Offices, 1924 West Mall.....	C3
AXIS (faculty/staff rental), 6090 Iona Drive.....	B4/5
Barn ("Ow" child care), 2323 Main Mall.....	E3
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, 2337 Lower Mall.....	E2
Biological Sciences Bldg [Science Faculty office], 6270 University Blvd.....	D3
Biomedical Research Ctr, 2222 Health Sciences Mall.....	E4
Boilert (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. Greenhous/ Workshops, 3463 Ross Drive.....	South Campus
Brimacombe Building, 2355 East Mall.....	F4
BROCK HALL: Student Services & Welcome Centre, 1874 East Mall.....	C4
Brook 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
Cecil Green Park Coach House, 6323 Cecil Green Park Rd.....	A3
Cecil Green Park House, 6251 Cecil Green Park Rd.....	A3
CEME — see <i>Civil & Mechanical Engineering Building</i>	
Centre for Brain Health (Djavad Mowafaghian), 2215 Wesbrook Mall.....	E5
Centre for Comparative Medicine, 4145 Wesbrook Mall.....	South Campus
Centre for Interactive Research on Sustainability (CIRS), 2260 West Mall.....	E3
Chan Centre for the Performing Arts, 6265 Crescent Rd.....	B4
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 <i>Centre for Interactive Research on Sustainability</i>	
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
District Energy Centre (under construction), 6130 Agronomy Rd.....	F5
Donald Rix Building, 2389 Health Sciences Mall.....	F4
Doug Mitchell Thunderbird Sports Centre, 6086 Thunderbird Blvd.....	G5
Dorothy Somerset Studios, 6361 University Blvd.....	D3
Earth Sciences Building (ESB) [Science dean's office], 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 <i>Continuing Studies Building</i>	
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, 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
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 <i>Thea Koerner House</i>	
Green College, 6201 Cecil Green Park Rd.....	A4
Greenwood Commons (public rental housing), 2660 Wesbrook Mall.....	G6
Hebb Building, 2045 East Mall.....	D4
Hennings Building, 6224 Agricultural Rd.....	C4
Henry Angus Building [Sauder School of Business], 2053 Main Mall.....	D3
Hillie 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
Iving K. Barber Learning Centre, 1981 East Mall.....	C4
Jack Bell Building for the School of Social Work, 2080 West Mall.....	D3
John Owen Pavilion & Allan McGavin Sports Med.Ctr, 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
Landscapes Architecture Annex, 2371 Main Mall.....	F3
Lasserre (Frederic) Building, 6333 Memorial Rd.....	C3
Leon and Thea Koerner University Centre, 6331 Crescent Rd.....	B3
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 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
Maple House (in Ponderosa Commons), 6488 University Blvd.....	D2
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
Networks of Ctrs of Excellence (NCE), 2125 East Mall.....	D4
Nitobe Memorial Garden, 1895 Lower Mall.....	B/C2
Nobel Biocare Oral Health 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 (under construction), 6363 Agronomy Rd.....	F3
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
Pharmaceutical Sciences Building, 2405 Wesbrook Mall.....	F5
Place Vanier Residence, 1935 Lower Mall.....	CD2
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 Commons, 6398/6488 University Blvd; 2118 West Mall.....	D2/3

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 - see Staging Environmental Research Centre	
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
Spruce House (in Ponderosa Commons), 2118 West Mall.....	D3
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
Staging Environmental Research Ctr (SERC), 6045 Nurseries Rd.....	S. 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
Student Union Bldg - new under construction, 6133 University Blvd.....	D4
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
Totem Field Studios, 2613 West Mall.....	H2
Totem Park Residence, 2525 West Mall.....	F/G2
TRIUMF, 4004 Wesbrook Mall.....	South Campus
Triumph House (TRIUMF Visitor's Residence), 5835 Thunderbird Blvd.....	G6
UBC Bookstore, 6200 University Blvd.....	D4
UBC Farm, 3461 Ross Drive.....	South Campus
UBC Hospital, 2211 Wesbrook Mall.....	E5
UBC Parking Impound Lot, 2451 East Mall.....	F4
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 Services Building (USB), 2329 West Mall.....	E2
Vantage College (in C.K. Choi Building), 1855 West Mall.....	B2
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 Community Ctr (under construction), 5998 Berton Ave.....	S. Campus
Wesbrook Village Commercial 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

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Campus & Community Planning
www.planning.ubc.ca

Wesbrook Place
 Residential Neighbourhood

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 interactive online maps at www.maps.ubc.ca; OR m.ubc.ca

UBC also has an official app for prospective undergraduate students available as a free download from the Apple iTunes store.