UNIVERSITY OF
COPENHAGEN

Young Topologists' Meeting

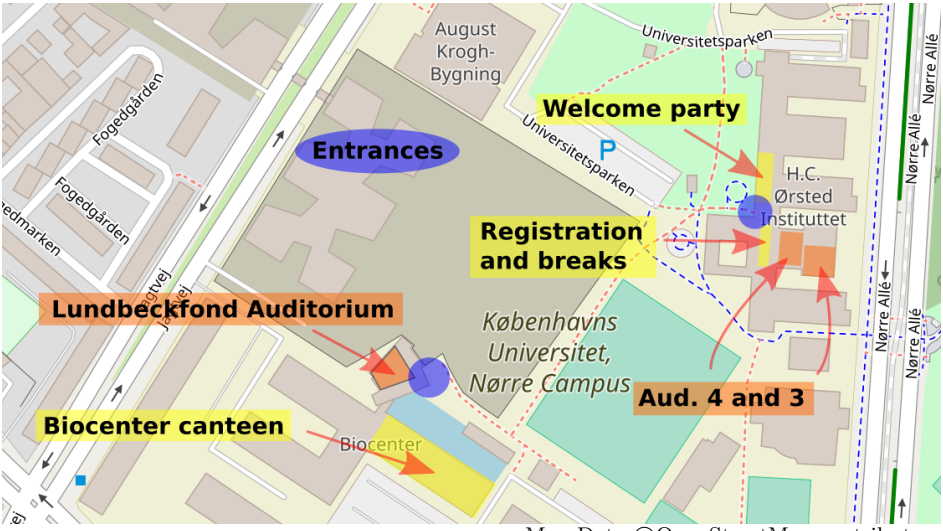
Contents

This conference was partially supported the Danish National Research Foundation through the Centre for Symmetry and Deformation (DNRF92). Travel for US participants was partially funded by NSF Grant DMS-1818905.

Conference Information

Schedule and Map

Talks will take place on the north campus of the University of Copenhagen, near the Museum of Zoology. Note that this is not the campus closest to the hostel!



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In the schedule, locations are abbreviated as follows:

- (LA) Lundbeckfond Auditorium,
- (V) Vandrehallen outside Auditoria 3/4,
- (A3) Auditorium 3,
- (A4) Auditorium 4.

Monday, 9 July 2018

8.30 - 9.00	Registration (V)	
9.00 - 9.30	**Stefania Ebli** (A3) *Signal processing on simplicial complexes*	**Tomas Zeman** (A4) *Operads with homological stability and infinite loop space structures*
9.45 - 10.15	**Víctor Sánchez** (A3) *Localization techniques*	**Ai Guan** (A4) *An L-infinity Poincaré lemma*
10.30 - 11.00	**Nikolas Schonsheck** (A3) *An introduction to symmetric spectra*	**Ariel Davis** (A4) *Knotty primes*
11.00 - 11.30	Coffee break (V)	
11.30 - 12.30	**Mike Hill** (LA) *Multiplicative transfer maps in equivariant stable homotopy theory*	
12.30 - 14.00	Lunch break	
14.00 - 15.00	**Kathryn Mann** (LA) *Flat bundles, foliations, and group actions on manifolds*	
15.00 - 15.30	Coffee break (V)	
15.30 - 16.00	**Bena Tshishiku** (A3) *Arithmetic groups and characteristic classes of manifold bundles*	**Benjamin Böhme** (A4) *Equivariantly multiplicative splittings of the sphere and of topological K-theory*
16.15 - 16.45	**Lior Yanovski** (A3) *The infinity categorical Eckmann-Hilton argument*	**Clover May** (A4) *$RO(C_3)$-graded cohomology*
17.00 - 17.30	**Berrin Şentürk** (A3) *Carlsson's rank conjecture and a conjecture on square-zero upper triangular matrices*	**Piotr Pstrągowski** (A4) *Synthetic spectra and the cellular motivic category*
18.00	Welcome Party (V)	

The schedule is also available online at `tinyurl.com/ytm2018`

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- (A4) Auditorium 4

Tuesday, 10 July 2018

9.00 - 9.30	**Jens Reinhold** (A3) *Characteristic numbers of manifold bundles over surfaces with highly connected fibers*	**Yu Zhang** (A4) *Bousfield localization for structured ring spectra with respect to homology*
9.45 - 10.15	**J.D. Quigley** (A3) *Towards chromatic complexity of algebraic K-theory of the Thom spectra $y(n)$*	**Lyne Moser** (A4) *Injective and projective model structures on enriched diagram categories*
10.30 - 11.00	**Bridget Schreiner** (A3) *A homotopy-theoretic approach to the topological Tverberg conjecture*	**Max Lipton** (A4) *From RAAGs to riches: right angled Artin groups and their topology*
11.00 - 11.30	Coffee break (V)	
11.30 - 12.30	**Mike Hill** (LA) *Multiplicative transfer maps in equivariant stable homotopy theory*	
12.30 - 14.00	Bias Session (LA)	Lunch break
14.00 - 15.00	**Kathryn Mann** (LA) *Flat bundles, foliations, and group actions on manifolds*	
15.00 - 15.30	Coffee break (V)	
15.30 - 16.00	**Yuri Sulyma** (A3) *Witt vectors and topological cyclic homology*	**Mariam Pirashvili** (A4) *In silico prediction of aqueous solubility through Topological Data Analysis*
16.15 - 16.45	**Danny Sugrue** (A3) *Rational Mackey functors of profinite groups*	**Luciana Basualdo Bonatto** (A4) *Decoupling in higher dimensions*
17.00 - 17.30	**Yang Xiao** (A3) *Incompressible surfaces in 4-punctured sphere bundles*	**Peter Patzt** (A4) *High dimensional cohomology of congruence subgroups*

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Wednesday, 11 July 2018

9.00 - 9.30	**Peter James** (A3) *Covariant homotopy theory of simplicial operads*	**Christy Hazel** (A4) The RO(C_2)-graded Bredon cohomology of C_2-surfaces
9.45 - 10.15	**Brandon Shapiro** (A3) *Comparing shapes for higher structures*	**Jannes Bantje** (A4) *Atiyah's KR-theory*
10.30 - 11.00	**Georg Frenck** (A3) *Topology and positive scalar curvature*	**Manuel Soriano-Trigueros** (A4) *Persistent homology and entropy*
11.00 - 11.30	Coffee break (V)	
11.30 - 12.30	**Mike Hill** (LA) *Multiplicative transfer maps in equivariant stable homotopy theory*	
12.30 - 14.00	Lunch break	
14.00 - 15.00	Excursion to Dyrehavn and Bakken	

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Thursday, 12 July 2018

9.00 - 9.30	**Dominik Wrazidlo** (A3) *The Milnor 7-sphere does not admit a special generic map into $\mathbb{R}^3$*	**Arturo Espinosa** (A4) *A cohomological characterization of nilpotent fusion systems*
9.45 - 10.15	**Thorben Kastenholz** (A3) *Homological stability for spaces of embedded subsurfaces with tangential structure*	**Asaf Horev** (A4) *Genuine equivariant factorization homology*
10.30 - 11.00	**Rachael Boyd** (A3) *Low dimensional homology of Coxeter groups*	**Adrian Clough** (A4) The ∞-categories of Riemannian and ordinary bordisms are equivalent
11.00 - 11.30	Coffee break (V)	
11.30 - 12.30	**Kathryn Mann** (LA) *Flat bundles, foliations, and group actions on manifolds*	
12.30 - 14.00	Lunch break	
14.00 - 15.00	**Mike Hill** (LA) *Multiplicative transfer maps in equivariant stable homotopy theory*	
15.00 - 15.30	Coffee break (V)	
15.30 - 16.00	**Keely Grossnickle** (A3) *Cycle index sum for non-k-equal configurations*	**Elise McMahon** (A4) *An introduction to Goodwillie calculus*
16.15 - 16.45	**Sylvain Douteau** (A3) *Stratified homotopy theory*	**Conrad D'Souza** (A4) *Predicting winners with topological data analysis*
17.00 - 17.30	**Jens Jakob Kjær** (A3) *Some v_1-periodic unstable homotopy groups through calculus*	**Espen Nielsen** (A4) *Topological Hochschild homology and topological conformal field theories*
19.00	Conference dinner at RizRaz (Kompagnistræde 20)	

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Friday, 13 July 2018

9.00 - 9.30	**Robin Gaudreau** (A3) *On Gauss' planarity problem*	**Alice Hedenlund** (A4) *Tate cohomology of Hopf algebras*
9.45 - 10.15	**Gillian Grindstaff** (A4) *A categorical introduction to topological data analysis*	**Aziz Kharouf** (A4) *Higher homotopy operations and differentials in spectral sequences*
10.30 - 11.00	**Markus Schmetkamp** (A3) *The Farey graph*	**Timothy Campion** (A4) *Stable homotopy theory via duality*
11.00 - 11.30	Coffee break (V)	
11.30 - 12.30	**Kathryn Mann** (LA) *Flat bundles, foliations, and group actions on manifolds*	
12.30	Fin!	

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Abstracts

Mini-Courses

Multiplicative transfer maps in equivariant stable homotopy theory

Mike Hill

The equivariant stable homotopy category is a perpetual source of surprise and confusion for algebraic topologists. Classically, the focus has been on the surprising occurrence of the transfer when we build a category in which G-manifolds have a good notion of duality. This makes computations significantly trickier, greatly increasing the complexity of the algebraic approximations to equivariant stable homotopy. More recent work has considered instead the multiplicative versions of the transfer and an enrichment to the symmetric monoidal structure on G-spectra. This has a host of exciting and often confusing computational ramifications. I'll focus on how we can encode these for finite groups, and then describe some exciting new work in the compact Lie and motivic cases.

Flat bundles, foliations, and group actions on manifolds

Kathryn Mann

The theory of flat (or foliated) fiber bundles is a rich subject at the intersection of topology, dynamics, geometry and foliation theory. This course will give an introduction to the area through discussion of accessible, low-dimensional examples and foundational results, including characteristic classes of flat bundles, dynamics of group actions on manifolds, bounded cohomology and the Euler class. I'll also devote some time to explaining techniques in new work on rigidity of geometric examples of flat circle bundles.

Participant Talks

Signal processing on simplicial complexes

Stefania Ebli

9.00-9.30 on Monday, 9 July 2018 in Auditorium 3

Real-world data, such as biological measurements, are naturally modeled using a graph, whose edges encode the pairwise relations between the measured signals. Traditionally, the graph underlying the data has been studied through the graph Laplacian, L, and its spectrum. The eigenvalues and eigenvectors of the graph Laplacian encode valuable information about the intrinsic structure of the graph. For instance, the number of connected components of the graph is equal to the multiplicity of the zero-eigenvalue of L. Recently, the spectrum of the graph Laplacian has been exploited for processing signals defined on graphs. A notion of frequency representation for graph signals was introduced, which made possible the definition of frequency filters, convolution, and other basic techniques in signal analysis.

In this talk I will explain how the theory of signal processing on graphs can be naturally extended to signal processing on simplicial complexes. The key ingredients are: the higher order combinatorial Laplacian, the well known combinatorial Hodge theorem and the new notion of higher order Laplacian Fourier transform, obtained by decomposing p-cochains into eigencochains of the Laplacian.

This is a joint work with Gard Spreemann, Michaël Defferrard and Kathryn Hess Bellwald.

Operads with homological stability and infinite loop space structures

Thomas Zeman

9.00-9.30 on Monday, 9 July 2018 in Auditorium 4

In a recent paper, Basterra, Bobkova, Ponto, Tillmann and Yeakel defined topological operads with homological stability (OHS) and proved that the group completion of an algebra over an OHS is weakly equivalent to an infinite loop space. The most interesting examples of OHSs come from moduli spaces of manifolds. These operads can be used to put a new infinite loop space structure on certain stable moduli spaces of high-dimensional manifolds, which were already known to be infinite loop spaces by the work of Galatius and Randal-Williams.

In this talk, I shall outline a construction which to an algebra A over an OHS associates a new infinite loop space. Under mild conditions on the operad, this space is equivalent as an infinite loop space to the group completion of A. This generalises a result of Wahl on the equivalence of the two infinite loop space structures constructed by Tillmann on the classifying space of the stable mapping class group, and could possibly lead to a proof that the infinite loop space structures on the stable moduli spaces of high-dimensional manifolds arising from the OHSs are in fact equivalent to those given by Galatius and Randal-Williams.

Localization techniques

Víctor Sánchez

9.45-10.15 on Monday, 9 July 2018 in Auditorium 3

Nowadays, homotopy theory has changed unexpectedly yielding a conceptual framework for a variety of subjects. One of the basic ideas that lie in the core of homotopy theory is localization. Roughly speaking, a localization is given by the data (C, W) where C is a category and W a subclass of morphisms which gives rise to a weaker notion of isomorphism in C. In this talk, I will show how localizations intervene in the well-known construction of triangulated categories in homological algebra and topology. If time permits, we will discuss more powerful applications of this machinery, such as how it is related to descent for stacks and Verdier duality.

An L-infinity Poincaré lemma

Ai Guan

9.45-10.15 on Monday, 9 July 2018 in Auditorium 4

The classical Poincaré lemma says that every closed differential form on a contractible manifold is exact. In 2012, Voronov proved a version of the Poincaré lemma for differential forms taking values in a differential graded Lie algebra (dgla), and asks whether an analogous result holds when the dgla is replaced by an L-infinity algebra. We will see how to use some theory of Maurer–Cartan moduli spaces and model categories to prove Voronov's result, and to generalize it to L-infinity algebras.

An introduction to symmetric spectra

Nikolas Schonsheck

10.30-11.00 on Monday, 9 July 2018 in Auditorium 3

In this expository talk, we begin by briefly motivating and recalling the classical notion of a spectrum, and how to obtain the stable homotopy category as it was first defined. We then examine a conceptually simpler way to view spectra – as modules over the sphere spectrum, a (noncommutative) monoid. By taking this viewpoint, we will see why defining a symmetric monoidal product on the category of spectra is problematic, just as in classical algebra, the tensor product of two R-modules does not itself necessarily carry the structure of an R-module if R is not commutative. This motivates the introduction of a symmetric group action on spectra, which turns the sphere spectrum into a commutative monoid, allowing a straightforward definition of the smash product on the category of symmetric spectra. We will conclude with a description of the stable model structure on symmetric spectra, and how it determines the classical stable homotopy category.

Knotty primes

Ariel Davis

10.30-11.00 on Monday, 9 July 2018 in Auditorium 4

In arithmetic topology, every prime number p in $\mathbb{Z}$ is depicted as a knot in a fixed 3-fold. Since all primes sit in the same 3-fold, one might hope to obtain invariants of a set T of primes in terms of these knots - and indeed one does: One such example is the linking number of two knots, counting how many times a knot L "wraps around" a knot K. In the number-theoretical context – modulo 2 – this is roughly the Legendre symbol. The symmetry of the linking number implies Gauss' quadratic reciprocity law.

One depicts primes as knots via a gadget that associates to every ring R (commutative, with unit) a "homotopy type": to an algebraically-closed field k we associate a point; if k is any field, then the homotopy type associated to k is $K(G, 1)$, where G is the absolute Galois group of k; the homotopy type associated to $\mathbb{Z}$ has cohomological dimension 3.

The analogies between knot theory and number theory are rich: many topological notions such as tubular neighborhoods - punctured or not, knot groups etc. admit an algebraic counterpart. Some notions are subtler than one would initially imagine. Such is the punctured neighborhood of a knot, which is a strangely twisted torus. Orientability in the number theoretical setting is a more delicate matter.

Arithmetic groups and characteristic classes of manifold bundles

Bena Tshishiku

15.30-16.00 on Monday, 9 July 2018 in Auditorium 3

Much recent work has gone toward computing the ring $H^*(\mathrm{BDiff}(M))$ of characteristic classes of smooth fiber bundles with fiber M. For some M (e.g. surfaces) we have a good understanding of the cohomology in the stable range, but very little is known beyond that. In this talk we will discuss some new characteristic classes that come from the unstable cohomology of arithmetic groups.

Equivariantly multiplicative splittings of the sphere and of topological K-theory

Benjamin Böhme

15.30-16.00 on Monday, 9 July 2018 in Auditorium 4

The notion of a "G-equivariant commutative ring spectrum" is ambiguous and can refer to many different flavours of equivariant commutativity. Passing from such a ring spectrum to one of its localizations by inverting homotopy elements typically decreases the extent to which it is equivariantly commutative. I

will describe this phenomenon in detail in the case of the G-equivariant sphere and topological K-theory spectra and their decompositions into idempotent summands, thus making some of the concepts introduced in Mike Hill's lecture explicit in a fundamental example.

The infinity categorical Eckmann-Hilton argument

Lior Yanovski

16.15-16.45 on Monday, 9 July 2018 in Auditorium 3

The Eckmann-Hilton Argument is a classical result in algebraic topology saying that given a set X with two unital binary operations satisfying a certain "interchange" law, the two operations must be the same and moreover, this one operation endows X with a commutative (and associative) monoid structure. This result, though remarkably easy to prove, has many surprisingly interesting applications (the most famous one is showing that higher homotopy groups are always abelian).

The Eckmann-Hilton Argument can be reformulated as a statement about *operads*. These are categorical gadgets which allow us to systematically study various algebraic structures and the way they interact (much like the notion of a group allows us to systematically study symmetries). For example, there is an operad U classifying the structure of a unital binary operation, such that endowing a set X with a unital binary operation can be encoded as giving X the structure of an algebra over U. Moreover, there is a notion of "tensor product" on operads. And the structure of two unital binary operations satisfying the interchange law can be encoded as an algebra structure over the tensor product of U with U. The statement of the Eckmann-Hilton argument then becomes that this tensor product is the operad Com classifying the structure of a commutative monoid.

Operads are particularly useful when trying to mix algebra and homotopy in order to study homotopy coherent algebraic structures. This is most elegantly done using infinity-operads. In a joint work with Tomer Schlank we formulated and proved an infinity-categorical generalization of the Eckmann-Hilton argument in terms of infinity-operads. This result assumes the form of a connectivity bound on the spaces of operations of the tensor product of two infinity-operads.

In this talk I will start by recalling the classical Eckmann-Hilton argument, explain briefly what operads are and the way we can use them to reformulate the classical result. Then I will sketch the infinity-categorical generalization of the setup and the statement. No prior knowledge of operads or infinity-categories is required.

$RO(C_3)$-graded cohomology

Clover May

16.15-16.45 on Monday, 9 July 2018 in Auditorium 4

For spaces with an action by a group G, one can compute an equivariant analogue of singular cohomology referred to as $RO(G)$-graded Bredon cohomology. Instead of coefficients in an abelian group, this theory requires coefficients in a Mackey functor. Computations in this setting are often challenging and not well understood, even for $G = C_p$, the cyclic group of order p.

In this talk, I will briefly introduce $RO(G)$-graded cohomology and discuss some results toward a structure theorem for $RO(C_3)$-graded cohomology with $\underline{\mathbb{Z}/3}$-coefficients. The structure theorem would describe the building blocks for the cohomology of all finite C_3-spaces. A recent structure theorem for C_2 with $\underline{\mathbb{Z}/2}$-coefficients shows the building blocks depend on two types of spheres, representation spheres and antipodal spheres. For C_3, we will see that we need two types of spheres, as well as a new space that is not a sphere at all.

Carlsson's rank conjecture and a conjecture on square-zero upper triangular matrices

Berrin Şentürk

17.00-17.30 on Monday, 9 July 2018 in Auditorium 3

Let k be an algebraically closed field of characteristic 2 and A the polynomial algebra in r variables with coefficients in k. G. Carlsson conjectured that for any DG-A-module M of dimension N that is free as an A-module, if the homology of M is nontrivial and finite dimensional as a k-vector space, then $2^r \leqslant N$.

In this talk, we discuss a stronger conjecture about varieties of square-zero upper-triangular $N \times N$ matrices with entries in A. Using stratifications of these varieties via Borel orbits, we show that the stronger conjecture holds when $N < 8$ or $r < 3$. This is joint work with Özgün Ünlü.

Synthetic spectra and the cellular motivic category

Piotr Pstrągowski

17.00-17.30 on Monday, 9 July 2018 in Auditorium 4

We describe how to any Adams-type homology theory E one can associate a homotopy theory of so called synthetic spectra based on E, this is in a precise sense a deformation of Hovey's homotopy theory of comodules whose generic fibre is given by the homotopy theory of spectra.

We discuss how the even variant of this construction based on MU is equivalent to the homotopy theory of cellular complex motivic spectra after p-completion at any prime p.

This talk is expository in nature and all the needed notions will be introduced.

Characteristic numbers of manifold bundles over surfaces with highly connected fibers

Jens Reinhold

9.00-9.30 on Tuesday, 10 July 2018 in Auditorium 3

It follows from a theorem of Hambleton–Korzeniewski–Ranicki, published in 2007, that the signature of a closed manifold of dimension $4m$ fibering over a surface is divisible by 4. Going further, one may ask if restricting the diffeomorphism type of the fiber gives stronger divisibility constraints. I present a synopsis of joint work with M. Krannich on the classification of manifolds which arise as total spaces of fiber bundles over a surface with fiber a highly connected $2n$-manifold, up to cobordism. As a corollary, we determine all signatures of such manifolds satisfying a weak condition; it turns out that signature 4 is viable if and only if n is one of 1, 3 or 7.

Bousfield localization for structured ring spectra with respect to homology

Yu Zhang

9.00-9.30 on Tuesday, 10 July 2018 in Auditorium 4

Localization is a well known method for simplifying problems. For example, given a Homology theory H on spaces, say singular homology with coefficient R, then localization of a topological space X with respect to H amounts to extracting "the part of X homology H can see". Hence localization only focus on the information we care about and simplifies spaces accordingly. Besides spaces, in homotopy theory people also care about structured ring spectra, which are generalized notion of spaces with additional algebraic structure. One might wonder whether the localization methods for spaces also work for structured ring spectra.

In this talk, we will review how Bousfield proved that for topological spaces, localization with respect to homology always exist. Then we will discuss how to adapt this argument to the category of structured ring spectra and prove an analogous existence theorem. This is joint work with John E Harper.

Towards chromatic complexity of algebraic K-theory of the Thom spectra $y(n)$

J.D. Quigley

9.45-10.15 on Tuesday, 10 July 2018 in Auditorium 3

One can associate to any ring spectrum E a non-negative integer called its *chromatic complexity*. Roughly stated, the red-shift conjecture of Ausoni-Rognes says that if a ring spectrum E has chromatic complexity n, then its algebraic K-theory spectrum $K(E)$ has chromatic complexity $n+1$. The red-shift conjecture has been verified for some spectra with low chromatic complexity by Quillen,

Hesselholt-Madsen, and Ausoni-Rognes. Work of Bruner-Rognes gives homological evidence for this conjecture at all levels of chromatic complexity.

I will review the red-shift conjecture and the above results, then recall Mahowald's definition of the Thom spectra $y(n)$, $n \geqslant 0$, which have chromatic complexity n. I will then describe how one can apply the work of Bruner-Rognes and Nikolaus-Scholze to prove the red-shift conjecture holds for these homology theories, up to a homotopy limit problem. This is joint work with Gabe Angelini-Knoll.

Injective and projective model structures on enriched diagram categories

Lyne Moser

9.45-10.15 on Tuesday, 10 July 2018 in Auditorium 4

R. Garner, K. Hess, M. Kedziorek, E. Riehl, and B. Shipley have developed methods to induce model structures from an adjunction. In particular, the injective and projective model structures on a category of diagrams can be induced from specific Kan extension adjunctions using these methods. In this talk, I will explain how to adapt this result to an enriched setting, in order to prove the existence of the injective and projective model structures on some categories of enriched diagrams.

A homotopy-theoretic approach to the topological Tverberg conjecture

Bridget Schreiner

10.30-11.00 on Tuesday, 10 July 2018 in Auditorium 3

Let $r \geqslant 2$ and $d \geqslant 1$ be integers, let $N = (d+1)(r-1)$, and let Δ^N denote a standard N-simplex. The Topological Tverberg Conjecture states that for any continuous map $f : \Delta^N \to \mathbb{R}^d$, there are r pairwise disjoint faces $\sigma_1, \ldots, \sigma_r$ of Δ^N such that $f(\sigma_1) \cap \ldots \cap f(\sigma_r)$ is non-empty. F. Frick announced a counterexample to the conjecture for $d \geqslant 3r+1$, when r is not a power of a prime, and other counterexamples have also been found. My talk will discuss an alternative analysis of these counterexamples using the manifold calculus of functors, a technique that we hope will provide insight into the minimal counterexample and other related questions. (Joint work with Ismar Volic and Franjo Sarcevic.)

From RAAGs to riches: right angled Artin groups and their topology

Max Lipton

10.30-11.00 on Tuesday, 10 July 2018 in Auditorium 4

A Right Angled Artin Group (RAAG) encodes the edge set of a graph via commutativity relations on its generators. In this talk, I will explore the depths of these deceptively easily-defined groups by using techniques from geometric group theory to recognize when a RAAG has a surface's homotopy group as a subgroup. I will also show how to solve the word problem of RAAGs. In the end of the talk, I will outline current research by Jon McCammond which is attempting to generalize these techniques to Artin and Coxeter groups.

Witt vectors and topological cyclic homology

Yuri Sulyma

15.30-16.00 on Tuesday, 10 July 2018 in Auditorium 3

Witt vectors are an important construction in number theory, generalizing the passage from $\mathbb{F}_p$ to $\mathbb{Z}/p^k$ and $\mathbb{Z}_p$. Interestingly, this construction, and others related to it, also arises naturally out of the formalism of S^1-equivariant stable homotopy theory – in particular the theory surrounding algebraic K-theory and the cyclotomic trace map. I will sketch a picture and some intuitions for the many connections between arithmetic geometry and topological cyclic homology, and then explain some of my recent work in this area.

In silico prediction of aqueous solubility through topological data analysis

Mariam Pirashvili

15.30-16.00 on Tuesday, 10 July 2018 in Auditorium 4

Topological data analysis has been used to understand the structure of the descriptor space of molecules from the point of view of solubility. We have created a mapper visualization of the descriptor space that revealed that the presence of chlorine is a much greater detriment to solubility in systems with 2 rings than in other cases. Furthermore, the 'chemical intuition' type descriptors (molecular weight, ring count) are prominent features in this space, reflecting their importance to chemical properties. Furthermore, a representation of the chemical space was generated using persistent homology applied to molecular graphs. Links between this chemical space and the descriptor space were shown to be in agreement with chemical heuristics. Lastly, norms on persistence landscapes allow the conversion of discrete shape descriptors (atom count, ring count) to continuous ones, and a perspective of the application of these descriptors to QSPR problems is presented.

Rational Mackey functors of profinite groups

Danny Sugrue

16.15-16.45 on Tuesday, 10 July 2018 in Auditorium 3

Rational Mackey functors for a compact topological group G are a useful tool for modeling rational G equivariant cohomology theories. Having a better understanding of Mackey functors will enhance our understanding of G-cohomology theories and G-equivariant homotopy theory in general. In the compact Lie group case, rational Mackey functors have been studied extensively by John Greenlees (and others). In this talk we will discuss what can be shown in the case where G is profinite (an inverse limit of finite groups).

Decoupling in higher dimensions

Luciana Basualdo Bonatto

16.15-16.45 on Tuesday, 10 July 2018 in Auditorium 4

We consider topological moduli spaces of d-dimensional manifolds with k particles. In these moduli spaces the location of the particles is constrained by the d-dimensional manifold. We will compare this moduli space with the moduli space of d-dimensional manifolds in which the location of the particles is no longer constrained, ie is decoupled. Using recent homology stability results of Galatius–Randal-Williams and others we will generalize work by Boedigheimer–Tillmann from surfaces to higher dimensional manifolds. This is work in progress.

Incompressible surfaces in 4-punctured sphere bundles

Yang Xiao

17.00-17.30 on Tuesday, 10 July 2018 in Auditorium 3

The majority of 3-manifold theory studies sub-manifolds of M (often surfaces) to gain information about M. Among these, the most relevant ones are the "incompressible" surfaces, which, in intuitive terms, are properly embedded surfaces that cannot be further simplified while remaining non-trivial. Their significance to 3-manifolds is analogous to the significance of essential simple curves to surfaces. In this talk, I will present my results on classifying orientable incompressible surfaces with non-empty boundary in a hyperbolic mapping torus with fibers homeomorphic to a 4-punctured sphere. By examining the transverse intersections of an incompressible surface with the fibers, we see that they yield a certain path in the arc complex of a 4-punctured sphere, thus reducing the problem to a combinatorial one. Our result generalizes the similar theorems proved by Floyd, Hatcher, and Thurston for incompressible surfaces in punctured torus bundles and 2-bridge link complements.

High dimensional cohomology of congruence subgroups

Peter Patzt

15.30-16.00 on Tuesday, 10 July 2018 in Auditorium 4

The level p congruence subgroup of $SL_n(\mathbb{Z})$ is defined to be the subgroup of matrices congruent to the identity matrix mod p. These groups have trivial cohomology in high enough degrees. In the 1970s, Lee and Szczarba gave a conjectural description of the top cohomology groups of these congruence subgroups. In joint work in progress with Miller and Putman, we show that this conjecture is false and that these congruence subgroups have extra exotic cohomology classes in their top degree cohomology coming from the first homology group of the associated modular curve. I will also discuss a result with Miller and Nagpal on a stability pattern in the high dimensional cohomology of congruence subgroups.

Tensor products of simplicial operads

Peter James

9.00-9.30 on Wednesday, 11 July 2018 in Auditorium 3

Simplicial operads model infinity operads, but the standard (Boardman-Vogt) tensor product is not homotopically well-behaved. In this talk, we will introduce the category of (colored) simplicial operads, investigate its Boardman-Vogt tensor product, and see why one might want to replace it with something 'better'. We will recover the Boardman-Vogt resolution of a simplicial operad, which is a construction strongly related to the homotopy coherent nerve of simplicial categories, as both a coend, and as a colimit of a tower of simplicial quivers. Then we will discuss how these constructions could generalize to give a tensor product of simplicial operads with some desirable properties. If there is time, we will also discuss some disadvantages of simplicial operads as a model for infinity operads, and some obstructions to finding the 'perfect' tensor product.

The $RO(C_2)$-graded Bredon cohomology of C_2-surfaces

Christy Hazel

9.00-9.30 on Wednesday, 11 July 2018 in Auditorium 4

Given a space with a C_2-action, we can consider the $RO(C_2)$-graded Bredon cohomology of the space. Dugger recently classified all C_2-surfaces up to equivariant isomorphism using equivariant surgery. This classification lends itself nicely to Bredon cohomology computations, and computations have now been done for all C_2-surfaces in coefficients given by both the constant $\underline{\mathbb{Z}}$ and $\underline{\mathbb{Z}/2}$ Mackey functors. In the case of $\underline{\mathbb{Z}/2}$-coefficients, the answer is nice and depends only on the fixed set and the singular cohomology of the underlying space. In this talk, we will introduce this cohomology theory and show how equivariant surgery can be used in computations for C_2-surfaces. We will then explore the answers in both of the coefficient systems mentioned above.

Comparing shapes for higher structures

Brandon Shapiro

9.45-10.15 on Wednesday, 11 July 2018 in Auditorium 3

It is common practice in algebraic topology to study spaces by analogy with simpler combinatorial objects. By far the most prevalent are simplicial sets, which describe spaces as being built out of simplicies in each dimension and have a homotopy theory equivalent to that of topological spaces. In a similar fashion, cubical sets describe spaces as built out of cubes in each dimension. Globular sets allow spaces to be built by specifying points, paths between those points, 2-dimensional paths between those paths, and so on in each subsequent dimension. Each of these objects is defined as a contravariant functor from some category of "cells" (like simplices or cubes) into sets, and each can be used to describe higher homotopy in topology, higher morphisms in category theory, and higher equalities in type theory. I will show how different cell shapes have distinct advantages in modeling this higher order information, with particular focus on how each encodes the algebraic structure corresponding to path concatenation in homotopy theory, composition in category theory, and transitivity of equality in type theory.

Atiyah's KR-theory

Jannes Bantje

9.45-10.15 on Wednesday, 11 July 2018 in Auditorium 4

Atiyah's KR-theory from his "K-Theory and Reality" paper (1966) establishes a unified view of complex and real K-theory and in particular gives a quite elegant proof of the periodicity theorem for KO. In this expository talk I will try to give a quick overview of the basic properties of this theory and afterwards focus on the proof of Bott periodicity in the real case via KR-theory. Contrary to the approach of the original paper we will also encounter a proof that the Atiyah-Bott-Shapiro homomorphism is an isomorphism during this discussion.

The audience should be familiar with basic vector bundle theory, the basics of (complex) K-theory and maybe a few facts about Clifford algebras.

Topology and positive scalar curvature

Georg Frenck

10.30-11.00 on Wednesday, 11 July 2018 in Auditorium 3

The Gromov–Lawson–Rosenberg conjecture predicts which high-dimensional Spin manifolds admit a metric of positive scalar curvature (psc). A priori this is a purely differential geometric problem which begs the question why topologists care about it. The answer is that positive scalar curvature has two great links to topology. The first comes from index theory. If (M, g) carries a spin structure, there exists a so called Dirac operator on M whose index is an obstruction to

the existence of a psc metric. The second one is the Gromov-Lawson surgery theorem which states that the existence of a psc metric is invariant under high codimension surgery. These two results interact nicely, which allows one to prove the above named conjecture for simply connected manifolds of dimension at least 5.

Persistent homology and entropy

Manuel Soriano-Trigueros

10.30-11.00 on Wednesday, 11 July 2018 in Auditorium 4

We will do a short review of persistent homology and see how Shannon entropy can be used to resume information in this context. Some theoretical results concerning stability will be given as well as some applications to other sciences.

The Milnor 7-sphere does not admit a special generic map into $\mathbb{R}^3$

Dominik Wrazidlo

9.00-9.30 on Thursday, 12 July 2018 in Auditorium 3

In this talk I will present recent progress in the following problem raised by O. Saeki in 1993. Determine the set of integers p for which a given homotopy sphere admits a special generic map into $\mathbb{R}^p$. Here, a so-called special generic map is by definition a map between smooth manifolds all of whose singularities are definite fold points.

By means of the technique of Stein factorization we introduce and study certain *standard special generic maps* of homotopy spheres into Euclidean spaces. Modifying a construction due to Weiss, we show that standard special generic maps naturally give rise to a filtration of the group of homotopy spheres by subgroups that is strongly related to the Gromoll filtration. Finally, we apply our result to some concrete homotopy spheres, which in particular answers Saeki's problem for the Milnor 7-sphere.

A cohomological characterization of nilpotent fusion systems

Arturo Espinosa

9.00-9.30 on Thursday, 12 July 2018 in Auditorium 4

Given G a finite group, and S a Sylow p-subgroup of G (p prime), we say that two subsets of S are fused in G if they are conjugates by a certain element of G. Trying to obtain a more general approach to the study of the G-fusion property, Puig began the development of the theory of fusion systems, categories with subgroups of S as objects, and monomorphisms of groups with certain conditions as morphisms. We generalize a classic cohomological characterization of p-nilpotency

of finite groups, due to Wong and Hoechsmann-Roquette-Zassenhaus, to the context of fusion systems, using the notion of classifying space of such systems, developed by Broto, Levi and Oliver, and a specific definition of module over a fusion system.

Homological stability for spaces of embedded subsurfaces with tangential structure

Thorben Kastenholz

9.45-10.15 on Thursday, 12 July 2018 in Auditorium 3

Homological stability for spaces of embedded subsurfaces of an at least 6 dimensional simply-connected manifold has been proven in 2017 by Frederico Cantero and Oscar Randal-Williams. In this talk I will explain parts of their proof and explain how to extend this to subsurfaces, which can carry a large class of tangential structure. In particular I will explain how to prove homological stability for spaces of symplectic subsurfaces.

Genuine equivariant factorization homology

Asaf Horev

9.45-10.15 on Thursday, 12 July 2018 in Auditorium 4

Factorization homology is a method for constructing quantum field theories from $\mathbb{E}_n$-algebras. We describe a genuine G-equivariant version of factorization homology for a finite group G. A G-factorization homology theory assigns to each smooth manifold with an action of a subgroup $H < G$ a genuine H-spectrum. Following Ayala and Francis we give an axiomatic characterization of such theories as satisfying a monoidal version of excision and intertwining topological induction of manifolds with multiplicative transfer of spectra. As a future application we present real THH as genuine $\mathbb{Z}/2$-factorization homology.

Low dimensional homology of Coxeter groups

Rachael Boyd

10.30-11.00 on Thursday, 12 July 2018 in Auditorium 3

Coxeter groups were introduced in the 1930s as abstractions of reflection groups. They appear in different areas of mathematics such as Lie theory, combinatorics, and geometric group theory. Any Coxeter group can be realized as the reflection group of a contractible complex, called the Davis complex. This talk focuses on a computation of the first three integral homology groups of an arbitrary Coxeter group using a spectral sequence argument: the answer can be phrased purely in terms of the original Coxeter diagram. I will give a gentle introduction to Coxeter groups and the Davis complex before outlining the proof.

The ∞-categories of Riemannian and ordinary bordisms are equivalent

Adrian Clough

10.30-11.00 on Thursday, 12 July 2018 in Auditorium 3

Topological quantum field theories are frequently obtained as quantum field theories which are constructed using some metric on the bordisms under consideration, but are then shown to be invariant under perturbations of the metric. This has led to the paradigm that topological quantum field theories are metric invariant quantum field theories. We turn this paradigm into a theorem in the ∞-categorical context by constructing a quasi-unital Segal space of Riemannian bordisms where the metric is allowed to vary continuously, and showing that the natural forgetful functor from Riemannian to ordinary bordisms is an equivalence. We will emphasize how on the one hand we need the Segal space technology to make the statement precise, but on the other hand the heart of the proof reduces to classical considerations in transversality theory.

Cycle index sum for non-k-equal configurations

Keely Grossnickle

15.30-16.00 on Thursday, 12 July 2018 in Auditorium 3

We present the cycle index sum of the symmetric group action on the homology of the configuration spaces of points in a Euclidean space with the condition that no k of them are equal. These configuration spaces have a bimodule structure over the little d-disc operad. This connection will be explained in the talk as well as the induced structure on the homology. (Joint work with Victor Turchin)

An introduction to Goodwillie calculus

Elise McMahon

15.30-16.00 on Thursday, 12 July 2018 in Auditorium 4

Goodwillie calculus uses the intuition of calculus to approximate functors between categories by simpler functors. One such type of simpler functors are the "linear" functors. Linear functors are simple because they are determined in a weak sense by their coefficient spectra. A reduced homotopy functor is "linear" if it takes homotopy co-Cartesian squares to homotopy Cartesian squares (a property called 1-excisive). As we can generalize the notion of linear to the notion to being polynomial of degree at most n, and this gives a better approximation, we generalize to n-excisive, and this gives a better approximation to the functor. The idea of n-excisive is to replace "squares" in the definition of 1-excisive with n-dimensional cubes. Then, in analogy with Taylor expansions, we can construct a resolution of the functor by a series of functors, P_n where each P_n is n-excisive. One application of this construction is to Waldhausen K-theory, from which the derivative gives Topological Hochschild homology.

Stratified homotopy theory

Sylvain Douteau

16.15-16.45 on Thursday, 12 July 2018 in Auditorium 3

Stratified spaces appear naturally in singularity theory. Their study relies on invariants, such as intersection cohomology, which are not invariant under all homotopies, rather they are only invariant under homotopies that "preserve" the stratification. Considering stratified objects in a simplicial context, those stratified homotopies lead to the definition of a model category of stratified spaces. In particular, new invariants for stratified spaces can be constructed: the filtered homotopy groups. One can show that these invariants completely characterize stratified weak equivalences, through a stratified version of Whitehead Theorem.

Predicting winners with topological data analysis

Conrad D'Souza

16.15-16.45 on Thursday, 12 July 2018 in Auditorium 4

In recent years, Topological Data Analysis has emerged as a framework for visualizing and analyzing data. This talk demonstrates how cohomology can be used to model pairwise comparisons, locate and understand contradictory information, and measure the underlying preference of a set of alternatives. This technique is used to predict winners of horse races, extracting information which produces profitable predictions.

Some v_1-periodic unstable homotopy groups through calculus

Jens Jakob Kjær

17.00-17.30 on Thursday, 12 July 2018 in Auditorium 3

The homotopy groups of a space are amongst the hardest invariants of a space to compute. In stable homotopy theory the perspective of chromatic homotopy theory, filtering the groups by v_h-periodicity, has had strong computational applications. Davis and Mahowald defined a similar filtration in the unstable case, allowing us to define $v_h^{-1}\pi_* X$ for a space X.

Topological Hochschild homology and topological conformal field theories

Espen Nielsen

17.00-17.30 on Thursday, 12 July 2018 in Auditorium 4

By generalizing previous work by Wahl and Westerland, I describe a method for producing operations on topological Hochschild homology and more generally on factorization homology of structured ring spectra. As an application, I prove an extension result for topological conformal field theories generalizing previous results of Costello and Wahl–Westerland. The proof is largely geometric and will be given in pictures.

On Gauss' planarity problem

Robin Gaudreau

9.00-9.30 on Friday, 13 July 2018 in Auditorium 3

C. F. Gauss was amongst the first mathematicians to study knots as mathematical objects. He introduced a combinatorial notation called the intersection sequence of a generic plane curve which contains the order in which labels of the double points are encountered, and asked the following question: "Which words can appear as intersection sequences of plane curves?" This talk presents the history of the works that this has spanned and the mathematical ramifications of this early encounter between topology and combinatorics.

Tate cohomology of Hopf algebras

Alice Hedenlund

9.00-9.30 on Friday, 13 July 2018 in Auditorium 4

We discuss how to define Tate cohomology for a Hopf algebra Γ over a commutative ring k from two perspectives: via complete resolutions and via the Tate complex. In particular, we consider the case $\Gamma = \pi_*(\mathbb{S}G)$, where $\mathbb{S}G$ denotes the spherical group ring of a compact Lie group, which is a Hopf algebra over $\pi_*(\mathbb{S})$ under suitable flatness conditions. We look at some computations for the case $G = \mathbb{T} = U(1)$, which gives us the second page of a homotopically based Tate spectral sequence for the circle group.

A categorical introduction to topological data analysis

Gillian Grindstaff

9.45-10.15 on Friday, 13 July 2018 in Auditorium 3

Recently, there has been a lot of work in developing algebraic and topological tools suitable for use on finite metric spaces (data), most notably persistent homology and level set techniques. These both involve functors from a real ordered

indexing set to Top to k-vector spaces, in which a classification theorem allows for a decomposition of indexed modules into intervals, under some conditions. These intervals, which commonly represent persistent homology classes, are then used to depict the results as barcodes or persistence diagrams, which can be analyzed statistically. With the right structure on the category of barcodes, this last transformation can also be defined as an equivalence of categories (Kashiwara–Schapira 2017, related work by Bauer-Lesnick 2016). I'll discuss the use and limits of this approach in TDA, and, time permitting, some applications of persistence techniques in topology and geometry. This is an expository talk.

Higher homotopy operations and differentials in spectral sequences

Aziz Kharouf

9.45-10.15 on Friday, 13 July 2018 in Auditorium 4

We explain a classical construction of higher Toda brackets in terms of filtered objects in stable model categories, and their relation to the differentials in the spectral sequence of a filtered complex. In the category of chain complexes we can obtain explicit formulas for these operations in terms of the classical Hom and Ext.

The Farey graph

Markus Schmetkamp

10.30-11.00 on Friday, 13 July 2018 in Auditorium 3

The Farey Graph is a beautiful mathematical object. As a metric space, it is hyperbolic. It is built from the rational numbers and is acted upon by the group $SL_2(\mathbb{Z})$. In this talk I would like to show how the study of the Farey Graph combines topology, group theory and number theory. There will be no ground breaking results, but the Farey Graph is an interesting object because of its simplicity and the many fascinating connections it provides. We will study hyperbolicity, relatively hyperbolic groups, the boundary at infinity, the Euclidean algorithm, a fool's way to add rational numbers, 2×2 matrices, geodesics and the real numbers.

Stable homotopy theory via duality

Timothy Campion

10.30-11.00 on Friday, 13 July 2018 in Auditorium 4

It is customary to construct the symmetric monoidal category Spt of spectra from the symmetric monoidal category of Top_* of pointed spaces by freely adjoining an *inverse* to S^1 under smash product: $\mathsf{Spt} = \mathsf{Top}_*[S^{-1}]$. Similarly, the category of genuine G-equivariant spectra for a finite group G and the category

of motivic spectra over a smooth scheme S are constructed by inverting representation spheres, and the Tate sphere respectively. But this begs the question: how do we know which objects ought to be inverted? We suggest an alternative approach: rather than choosing certain objects to invert, one may formally adjoin *duals* to a certain class of objects which may be easier to identify. For example, one may adjoin "Spanier–Whitehead" duals to all finite CW-complexes on Top_*. The resulting category splits as a product of easily-defined factors, one factor of which is the usual category Spt of spectra. Similar results apply in the equivariant and motivic settings, suggesting that duality properties may play an important role in determining, for a given "unstable homotopy theory", the "correct stable homotopy theory" associated to it.

Events

Welcome Party

To welcome the participants to Copenhagen, we will host a party on the first night of the conference with pizza and drinks. The welcome party will take place in Vandrehallen outside auditoria 3/4 on Monday 9th July, staring at 18.00.

Bias Session

We are hosting a session to promote awareness of and encourage discussion about bias and diversity in mathematics. We are not trying to promote a particular opinion, but rather stimulate debate and allow young mathematicians to express their opinions in a comfortable setting. We sincerely hope that many of you will participate!

This session will take place on Tuesday, 10th July during the lunch break. Sandwiches will be provided.

Dinner

The conference dinner will be held at RizRaz (Kompagnistræde 20) on Thursday, at 19.00.

Excursion

On Wednesday afternoon we are organizing an excursion to Dyrehaven and Bakken, but you are welcome to take the afternoon to explore other parts of Copenhagen instead. We have a list of alternative suggestions (see Things to do,

below). If you're interested in finding other people to do something with, then feel free to use the following Google Doc to coordinate: `https://tinyurl.com/ytm2018excursion`. Please do not hesitate to contact the organizers if you have any questions.

Dyrehaven & Bakken

Dyrehaven is a forest park and UNESCO World Heritage Site situated a little north of Copenhagen originally used as hunting grounds by the royal family. **Bakken** is an amusement park in Dyrehaven. It is the oldest amusement park in the world, starting out as a market place in 1583. Bakken has 32 rides and plenty of restaurants and bars.

Dyrehaven is a nice place for walking, picnicking and playing games. We'll bring frisbees, balls, and games and find a spot somewhere in front of the Hermitage to picnic. You could bring your lunch and maybe some beers if you like. There is also a beach near Klambenborg Station, so you may want to bring swimwear. We're crossing our fingers that the weather is with us! You can read more about the Dyrehaven at the url below.

`www.visitcopenhagen.com/copenhagen/dyrehaven-gdk414367`

If a Dyrehaven picnic is not exciting enough for you, head straight for Bakken. On Wednesdays, tickets for the rides are half price if you buy them at the ride and with cash (the average price is then 19,50 kr). So **bring cash if you want to try the rides!** You can also get all-ride-passes, which must be purchased from the webshop at `www.bakken.dk`. They cost 269 kr and give access to all rides (with a maximum of 10 trips per ride). Unfortunately, the webshop is only in Danish, so please don't hesitate to ask us for help! You can read more about Bakken at the url below.

`www.visitcopenhagen.com/copenhagen/bakken-gdk443528`

Bakken is open until midnight (but be aware that the last train from Klampenborg Station leaves at a 00.45).

How to get there

Because our group is so large, we will not travel to Dyrehaven in one group. Instead, we ask that you make your way to Dyrehaven in small groups or independently. We will meet in front of the Hermitage at 14.00 and take it from there.

See the map at the url below for directions.

`http://eng.naturstyrelsen.dk/media/207239/dyrehaven_m65_uk_2016_web.pdf`

By train: Take the C-line train to Klampenborg Station and enter the park through the Klampenborg Gate. The train departs from Nørreport, Østerport,

Nordhavn or Svanemøllen. (It is also possible to take the regional train from either Nørreport or Østerport).

Be aware that the last train back leaves from Klampenborg station at 00.45.

By bike: If you happen to be renting a bike for the week, the trip to Dyrehaven is a scenic 11km ride along the coast to Klampenborg Station. Check Google Maps for the route; be sure to take the one via Strandvejen.

Local Information

Hostel

Unless you have made separate arrangements, participants are housed in shared rooms at DanHostel Copenhagen City on H. C. Andersens Blvd. 50, 1553 København V.

The Hostel is approximately an hour walk or half an hour bus ride from the University of Copenhagen North Campus, where most events are held. The easiest bus route is to walk to the Rådhuspladsen (H.C. Andersens Boulevard) bus stop and take the 6A to the Nørre Campus (Tagensvej) stop, which involves no bus changes.

For more information on transportation, see Public Transportation, below.

Things to do

These are some of the things which we recommend doing while in Copenhagen, either on Wednesday afternoon instead of going to Dyrehaven or if you find the time outside of the conference.

Bastard Café

Bastard Café is a café for board games, card games, coffee and 'hygge' in Copenhagen. It is situated at Rådhusstræde 13 in the centre of town and is open noon till midnight Sunday to Thursday and noon till two o'clock in the morning Friday and Saturday. See more at `www.bastardcafe.dk`.

The Blue Planet

The Blue Planet is Northern Europe's largest aquarium, home to 7 million liters of water containing thousands of animals. The aquarium is open Mondays: 10-21 and Tuesday–Sunday: 10-17. The entrance fee is 170 kr and its address is Jacob Fortlingsvej 1. You can read more at

`www.denblaaplanet.dk/`.

Canal Tour

See the canals of Copenhagen on a 60 minute boat trip, departing from either Holmens Church or Nyhavn every 20-30 minutes. Read more at

`www.havnerundfart.dk/canaltours`.

Craft Beer

There are plenty of nice bars to try local craft beer. We suggest Mikkeller Bar at Victoriagade 8 B-C in Vesterbro, Mikkeller and Friends at Stefansgade 35 in Nørrebro or Ørsted Ølbar at Nørre Farimagsgade 13. You can read more about Mikkeller bar here:

`www.mikkeller.dk/location/mikkeller-bar-viktoriagade-copenhagen`

More about Mikkeller and Friends here:

`www.mikkeller.dk/location/mikkeller-friends`.

Read more about Ørsted Ølbar here:

`http://oerstedoelbar.dk`.

Experimentarium

Experimentarium is a science centre with exciting exhibits such as The Bubblearium, The Labyrinth of Light, The Tunnel of Senses, The Puzzler, and The Yeast Cell, among others. It is aimed mainly at children and young people, but is great fun for all ages. See more at `www.experimentarium.dk/en/`.

The Experimentarium hours are Monday, Tuesday, Wednesday, Friday: 9.30 - 17.00, Thursday: 9.30 - 20.00 and Weekend: 10.00 - 17.00. Admission is 195 kr. It is located at Tuborg Havnevej 7.

Louisiana

Louisiana is a contemporary art museum in Humlebæk just north of Copenhagen. Their collection includes work of Giacometti, Picasso, Kandinsky, Jorn, Hockney, Warhol, Miró and Moore. In July there will also be exhibitions with Gabriele Münter and Ed Ruscha.

Louisiana is open Tuesday to Friday 11.00 - 22.00 and on the weekends 11.00 - 18.00. Admission is 125 kr. The address is Gammel Strandvej 13, Humlebæk. It is an easy walk from Humlebæk Station to the museum. There are frequent regional trains from Nørreport or Østerport stopping at Humlebæk. You can see more at `https://en.louisiana.dk`.

Our Saviour's Church & Christiania

Our Saviour's Church in Christianshavn was built in the late 1600s. It has a twisted tower with an external staircase from which there is a great view of Copenhagen. The tower is open Monday to Saturday from 9.30 - 19.00 and Sundays and Holidays from 10.30 to 19.00 (in the summer months). Admission is 50 kr. The address is Sankt Annæ Gade 29.

Christiania is a famous and controversial freetown founded in 1971 by a group of squatters in unused military barracks. You will find it on Prinsessegade on Christianshavn. During the summer months there are guided tours every day; the price is 40 kr (cash) and they start at 15.00 at the main entrance.

You can read more about Our Savior's Church here:
`www.vorfrelserskirke.dk/english`.
You can read more about Christiania at:
`www.visitcopenhagen.com/copenhagen/christiania-gdk957761`.

Visit Carlsberg

Visit the original Carlsberg Brewery on top of Valby Bakke. You can visit the old brewhouse, see the world's (probably) largest bottle collection, visit the sculpture garden and the stables and try a beer or two. You can see more at

`www.visitcarlsberg.com`.

It is open Monday to Sunday 11.00 - 18.00. Admission is 100 kr and this includes one beer or soft drink. You will find it at Gamle Carlsberg Vej 11.

Places to eat

Near the conference

The area between Sankt Hans Torv, the lakes, and Nørrebrogade and around Blågårdsgade has a vast number of nice cafés, bars and restaurants (Café Gavlen, Props Coffee Shop, Ahaa Arabian Cuisine, Kaffesalonen, Ravnsborg Vinbar, Nørrebro Bryghus, Café Mahalle among others).

For lunch, you can either eat at the BioCentre canteen on campus, or go to nearby places such as Sapore D'Italia, Foodies and Det Eksotiske Hjørne.

Near the hostel

The old centre of Copenhagen has many cafés, restaurants and bars (The Greasy Spoon, Voulez-Vous, The Log Lady Café, La Gallette among others). The prices are a little above average, being the centre of town. Vesterbrogade in general also has a lot of good restaurants, e.g. Madklubben and the South Indian. Kødbyen in Vesterbro is also worth a visit.

Transportation

Public Transportation

Public transport is generally very reliable (both bus and metro). For 200,- DKK you can buy a 72-hour city pass that is valid for all public transport in Copenhagen and to/from the airport. There is also a 7-day *flexkort*, which can be purchased at DSB Salg & Service at the central train station. The *flexkort* are valid only for certain zones; zones 1 and 2 will suffice for the hostel-university commute, but will not take you to and from the airport.

Otherwise you can just buy a ticket each time you travel, which is normally 24,- DKK.

Bikes

You can hire a bike by the hour using the city's bycykel scheme:

`https://bycyklen.dk/en/`.

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