

# Projects for 6321

## 0.1. *Derived smooth manifolds [Stephen]*

- Spivak: Derived smooth manifolds.
- Borisov, Noel: Simplicial approach to derived differential manifolds.

## 0.2. *Stacks and differential cohomology [Ramiro]*

- Bunke: Differential cohomology.
- Freed, Hopkins: Chern–Weil forms and abstract homotopy theory.

## 0.3. *Factorization homology and its applications to skeins [Rachel]*

- Juliet Cooke: Excision of Skein Categories and Factorisation Homology

## 0.4. *Complete Segal spaces and univalence [James]*

## 0.5. *Classifying spaces [Nilan]*

Classical Eilenberg–Steenrod axioms for cohomology theories. Classical Brown representability for pointed spaces. Its application to Eilenberg–Steenrod cohomology theories.

- Hatcher: Algebraic Topology, Chapter 4.E

Shape of an infinity-topos. Its relation to cohomology and representability.

- Pavlov: Structured Brown representability via concordance

## 0.6. *Quasicategories [Justin]*

- Joyal: Notes on quasi-categories.
- Lurie: Higher topos theory.

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## 1 Foundations

### 1.1. *Monoidal Dold–Kan correspondence*

Lax and colax structures on both functors in the Dold–Kan correspondence. Their symmetry properties. Bilax and Frobenius structure.

- Richter: Symmetry properties of the Dold–Kan correspondence.
- Aguiar, Mahajan: Monoidal Functors, Species and Hopf Algebras, §5.4.

### 1.2. *Stable Dold–Kan correspondence*

Establish an equivalence between 3 types of objects: filtered objects, simplicial objects, chain complexes.

- Lurie: Higher Algebra, §1.2.
- Gwilliam, Pavlov: Enhancing the filtered derived category.
- Tashi Walde: Homotopy coherent theorems of Dold–Kan type

### 1.3. *Rational homotopy theory*

- Félix, Halperin, Thomas: Rational Homotopy Theory (2001); Rational Homotopy Theory II (2015).

### 1.4. *Homotopy theory of operads and algebras over operads*

- Pavlov, Scholbach: Admissibility and rectification of colored symmetric operads.

### 1.5. *Localization and completion of homotopy types*

- May, Ponto: More Concise Algebraic Topology, Part 2 and 3.

### 1.6. *Deformation theory*

- Lurie: Moduli Problems for Ring Spectra

## 2 Applications

### 2.1. *Intersection (co)homology and perverse sheaves.*

• Saralegi-Aranguren, Tanré: Poincaré duality, cap product and Borel-Moore intersection Homology (And references therein.)

### 2.2. *Multiplicative Atiyah duality and the Pontrjagin–Thom collapse map*

- Cohen: Multiplicative properties of Atiyah duality

### 2.3. *Shifted symplectic structures*

- Pantev, Toën, Vaquié, Vezzosi: Shifted symplectic structures

### 2.4. *Derived critical locus in quantum field theory via factorization algebras of Costello–Gwilliam*

- Kevin Costello and Owen Gwilliam: Factorization Algebras in Quantum Field Theory, Volumes 1 and 2

### 2.5. *Higher prequantum geometry*

- Urs Schreiber: Higher prequantum geometry, arXiv:1601.05956

### 2.6. *The stack of Yang–Mills fields on Lorentzian manifolds [Stephen]*

- Marco Benini, Alexander Schenkel, Urs Schreiber: The stack of Yang–Mills fields on Lorentzian manifolds, arXiv:1704.01378