

— *Summer Learning Seminar on* —  
String Theory

**time** weekly TBD  
**venue** Exploratory Hall, Room TBD  
**organizer** Casey Blacker  
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Promoted as a contender for an ultimate account of the universe, string theory replaces the point particles of classical and quantum mechanics with extended objects called *strings* and *branes*. Independent of its physical viability, string theory has also driven new developments in pure mathematics, and may thus be a source of fascination and inspiration to both physicists and mathematicians.

**Objectives:**

The aim of this seminar is to convene physicists and mathematicians who are interested in gaining a broad, conceptual understanding of string theory, building on a foundation of quantum field theory.

**Format:**

The opening lecture will provide an expository overview of string theory and M-theory. Thereafter, participants are invited either to volunteer a presentation or to lead a reading-group session. Depending group interests, we may work through D'Hoker's notes (below), follow another set of notes, or branch out and pursue various adjacent topics.

**Potential topics:**

- string dualities
- mirror symmetry
- supersymmetry
- gerbes and higher structures in physics
- the AdS/CFT correspondence

**Prerequisites:**

Ideally, participants will be familiar with elementary quantum field theory.

**Sources:**

- Eric D'Hoker. String theory. In *Quantum fields and strings: a course for mathematicians, Vol. 1, 2* (Princeton, NJ, 1996/1997), pages 807–1011. Amer. Math. Soc., Providence, RI, 1999, <https://www.math.ias.edu/QFT/spring/index.html>
- Robbert Dijkgraaf. The mathematics of M-theory. In *European Congress of Mathematics, Vol. I* (Barcelona, 2000), volume 201 of *Progr. Math.*, pages 1–19. Birkhäuser, Basel, 2001, <https://www.math.uni-bielefeld.de/~rehmann/ECM/cdrom/3ecm/pdfs/pant3/dijkgr.pdf>
- Frederic Helein. An introduction to supermanifolds and supersymmetry, 2020, <https://arxiv.org/abs/2006.01870>
- A. Zaffaroni. Introduction to the AdS-CFT correspondence. volume 17, pages 3571–3597. 2000. Lectures from the Graduate School on Contemporary String Theory and Brane Physics (Turin, 2000), <https://laces.web.cern.ch/laces09/notes/dbranes/lezionilosanna.pdf>