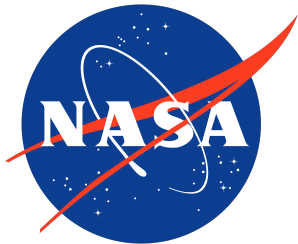


# Lorentzian Geometry and Topological Electromagnetism

Colin Roberts

Thanks and funding



# Section 1

## **Introduction**

# Outline

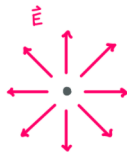
- 1 Intro Lorentzian geometry
- 2 Poincaré group  $A(1, 3)$  and its Lie algebra  $\mathfrak{a}(1, 3)$
- 3 de Rham (Co)homology
- 4 Topological electromagnetism

# Motivation

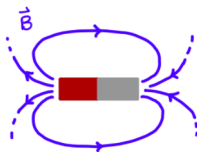
plasmas and what not

# Maxwell's Equations

## Gauss's Laws

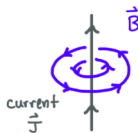


$$\vec{\nabla} \cdot \vec{E} = \rho(\vec{x}, t)$$



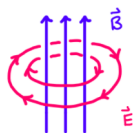
$$\vec{\nabla} \cdot \vec{B} = 0$$

## Ampere's Law



$$\vec{\nabla} \times \vec{B} - \frac{\partial \vec{E}}{\partial t} = \vec{J}(\vec{x}, t)$$

## Faraday's Law



$$\vec{\nabla} \times \vec{E} + \frac{\partial \vec{B}}{\partial t} = 0$$

## Section 2

# Lorentzian Geometry

stuff



## Section 3

# Poincaré Group

symmetries of lorentz space.

## Section 4

# de Rham (Co)homology