

# Lectures on Pure and Applied Math



## Announcing

A Seminar Presentation

on Thursday

October 20, 2016

at 3:15 pm in

North Hall 102

at The University of New Haven

**Dr. Nikodem Poplawski**

Department of Mathematics and Physics  
University of New Haven

**Title: Black hole cosmology in gravity with torsion**

### **Abstract:**

The conservation law for angular momentum of elementary particles in curved spacetime, consistent with relativistic quantum mechanics, extends general relativity to the Einstein-Cartan theory of gravity. In this theory, spacetime has a geometric structure called torsion which is related to the spin of Dirac particles. At extremely high densities existing in black holes, torsion generates gravitational repulsion which prevents the formation of singularities. The collapsing matter in a black hole bounces at a finite density and then forms a new region of space on the other side of the event horizon, which is equivalent to a closed, expanding universe. Consequently, every black hole may be a one-way bridge to a new universe. We show that quantum particle production near a bounce can create enormous amounts of matter and generate a period of exponential expansion of this universe, known as inflation. Depending on the production rate, such a universe may have multiple bounces until it reaches a size at which it can expand forever because of dark energy. The last bounce can be regarded as the big bang. We show that the dynamics of this universe is consistent with the 2015 Planck observations of the cosmic microwave background radiation. Accordingly, our Universe may have originated from the interior of a black hole existing in another universe.

### **Further Information**

For further information, please contact Angie Domschine at the Department of Mathematics and Physics, Office: Maxcy 204, 203-932-7250, [ADomschine@newhaven.edu](mailto:ADomschine@newhaven.edu).