This five-day mini will focus on Albert Einstein’s revolutionary views about space and time. The first class will describe what was known about light at the end of the 19th century. That will be followed by two classes on special relativity and two classes on general relativity. These sessions will be as interactive as possible: questions and comments are encouraged. There is no math prerequisite; the goal is to provide a conceptual understanding of these exciting ideas and the consequences that follow.

Title: Physics of Spacetime

1. All about light
   1. Measuring the speed of light (Galileo, Roemer, Bradley)
   2. Newton’s corpuscles (Probability…transmission/reflection)
   3. Huygens principle
   4. Thomas Young Experiment
   5. Waves and the aether
   6. Lorentz equation
   7. Michelson experiment
   8. Maxwell’s equations
2. Special relativity I
   1. Galilean relativity
   2. Early thought experiment
   3. Simultaneity
   4. Spacetime diagrams
   5. Principles of relativity
   6. Length contraction/Time dilation
   7. Experiments (airplane experiment, muons)
3. Special Relativity II
   1. Twin “paradox”
   2. Queen video, “39” by Brian May
   3. Barn problem
   4. Mechanics (momentum, energy)
   5. E=mc2
   6. Moving through spacetime
4. General Relativity I
   1. Need to generalize special relativity to accelerated frames
   2. Newton’s gravity/action at a distance/fields
   3. Orbit of Mercury
   4. Equivalence principle
   5. Space time diagrams
   6. Weight
   7. Geodesics
   8. 4-D space
5. General Relativity II
   1. Gravity lens
   2. Orbit of Mercury
   3. Einstein Rings
   4. Gravity waves/LIGO
   5. Cosmological constant/expansion rate of universe
   6. Black holes/worm holes
   7. Cosmology