Overview: The long-term objective of this project is to identify the physical mechanisms underlying the basic observation that galaxies in large-scale filaments tend to have lower star formation rates (SFR) than their field counterparts. The proposal has three specific aims in support of this objective. The first aim is to directly measuring whether the amount of neutral and/or molecular gas available to eventually form stars is measurably lower in filament galaxies compared to those in the field, group, or cluster environment. The second aim focusing on their spatial distribution within each galaxy. This aim will determine whether ram pressure stripping, starvation, and/or mergers are significant mechanisms for quenching star formation. The third aim uses the results of the first two aims to confront theoretical models of star formation quenching in the context of cosmological structure growth. This proposal is built upon a large imaging survey in H-alpha along with observing of the neutral (from HI) and molecular (from CO) gas.

Intellectual Merit: It has been known for a long time that star formation within galaxies in the densest regions of the universe, galaxy clusters and groups, is suppressed relative to the general population. Very recently, the community has turned its attention to the filamentary network that feeds clusters and groups and initial results show that star formation is suppressed in these environments, as well. If true, this could pinpoint filaments as the site where galaxies first encounter environmental effects. Unfortunately, it is not clear what physical mechanisms affect filament galaxies and whether they differ from those that affect cluster and group galaxies. This proposal uses a novel approach that combines direct measurements of the \*amount\* of neutral and molecular gas inside filament galaxies with measurements of the \*spatial distributions\* of the stars, star formation, and dust disks within the same galaxies. With these measurements, the co-PIs will identify the step in the star formation cycle that is being disrupted within galaxy filaments, a key piece of information for constraining the physical mechanisms that implemented in galaxy formation models.

The team includes established researchers, data analysis experts, and a leading theorist. They are well prepared out the proposed work.

Broader Impacts: Co-PI Rudnick will continue a successful research-based outreach program at a local Kansas high school. This program leads students through a year-long program of astronomy instruction and hands-on research. This proposal will expand the number of students to 20 per year view a peer mentor program. Lawrence High School has a much larger fraction of underrepresented minorities than most of Kansas and the participants in this program are representative of the student body. The effectiveness of the activities will be rigorously and quantitatively assessed and the program will be made sustainable by the end of the funding period.

Co-PI Finn will fund workshops for high school teachers to learn a modeling approach for teaching physics. At Siena college, four undergraduate students mentored by co-PI Finn will participate in the project each year of the grant. These students will have opportunities to use telescopes, to reduce data, to present results, and to meet and discuss science with professionals.