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 than their field counterparts. The first aim supports this objective by directly measuring whether the amount of neutral and/or molecular gas available to eventually form stars is measurably lower in filament galaxies. The second aim takes a more detailed look at the gas within filament galaxies, focusing on its spatial distribution. This aim is designed specifically to determine whether ram pressure stripping 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.

Intellectual Merit: It has been known for a long time that star formation within galaxies in the densest regions of the universe, galaxy clusters, is suppressed relative to the general population. Over time, these studies expanded to include galaxy groups. Very recently, the community has turned its attention to the filamentary network that feeds clusters. Initial results show that star formation is suppressed in these environments, as well. However, it is not clear whether the physical mechanisms that affect filament galaxies are the same as those that affect cluster galaxies. A novel approach combines direct measurements of the \*amount\* of neutral and molecular gas inside filament galaxies with measurements of the \*spatial distributions\* of the star formation and dust disks within the same galaxies. These measurements allow the identification of the step in the star formation cycle that is being disrupted within galaxy filaments, a key piece of information for determining which of the candidate physical mechanisms implemented in cosmological models is dominating the observations.

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

Broader Impacts: In addition to directly funding a graduate student, this proposal engages high school and undergraduate students. The grant will support a high school outreach program previously established in Lawrence, Kansas by co-PI Rudnick. The funds would bring a Kansas University undergraduate into the high school classroom, provide training for a high school teacher, and expand the program to 20 students. In upstate New York, the grant 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.