PURDUE UNIVERSITY

## Department of Physics and Astronomy Seminars, Etc.

**The Week of November 20, 2017**

**Monday, 20 November 2017**

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| 10:30 – 12:30 PM | PHYS 298 | **Prelim**<br>**YingKang Chen**<br>**Advisor: Professor Rudro Biswas**<br><br>*Quantum geometry of topological phases of matter* |
| 11:00 – 12:00 PM | PHYS 242 | **AMO Special Seminar**<br>**Yeghishe Tsaturyan**<br>**Host: Chen-Lung Hung**<br><br>*Ultrahigh Q mechanical resonators for quantum cavity optomechanics*<br><br>(Refreshments served at 10:45am) |
| 1:30 – 4:00 PM | PHYS 298 | **Defense**<br>**Ethan Stanley**<br>**Advisor: Professor Matthew Lister**<br><br>*Kiloparsec-Scale Jets of Hybrid and High Synchrotron Peaked Blazars* |

**Tuesday, 21 November 2017**

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| 12:00 – 1:00 PM | PHYS 242 | **AMO Journal Club** |

### Yeghishe Tsaturyan

Over the past decade the field of cavity optomechanics has experienced remarkable progress and has emerged as a strong candidate for future quantum technologies. This progress has heavily relied on the ongoing experimental and theoretical studies of dissipation in micro- and nano-mechanical resonators.

Most notably, stressed silicon nitride (SiN) resonators have generated a tremendous amount of interest and a large number of researchers in the nano- and optomechanics communities have devoted their time to study and perfect mechanical resonators based on stressed SiN thin films.

In this talk I will present a novel approach to significantly improve the performance of SiN membrane resonators, suppressing radiation-, as well as intrinsic mechanical losses. This is achieved by localisation of vibrations by means of phononic crystal patterning of a stressed SiN membrane, which ultimately leads to a reduced curvature in the displacement field of the membrane and thus reduced losses due to bending. This “soft clamping” approach enables realisation of mechanical resonators with a *Qf*-product of $(1.66 \pm 0.02) \times 10^{14}$ Hz at room temperature, which is the highest reported value of any microfabricated mechanical resonator to date. Finally, I will present recent work in quantum cavity optomechanics conducted at the Niels Bohr Institute involving soft clamped resonators. These results pave the way for long-coherence quantum optical experiments involving macroscopic mechanical resonators.