**What Physicists Do**

**Physics 123 Spring 2019**

(First 5 weeks) Fridays, 6a (3:30-4:30), Olin 141 1 Credit; S/CR/NC

The Department of Physics and Astronomy is pleased to announce this year’s Physics 123 Line-up. “What Physicists Do” is our annual series of five lectures by invited speakers, many of whom are Carleton Physics alumni. It is intended to introduce students to a broad range of real-world physics and to give some perspective on the kinds of work done by people with a physics background. The course is open to all interested students who have taken PHYS 151; those considering a major in physics are particularly encouraged to enroll.

The presentations are in OLIN 141 on Fridays during 6th period (3:30-4:30pm). The only requirement, beyond attending five talks, is to read an assigned article beforehand and then to submit a short (one page) typed essay afterwards commenting on both the talk and the reading. Speakers will be available for informal discussions over refreshments afterward. Questions: Arjendu Pattanayak, Olin 337, x7166, arjendu@carleton.edu

**April 5th Chris Payne ’91: “Christopher Payne, ‘91: 25 years at a National Laboratory”**

Christopher Payne ‘91 will discuss his career at Lawrence Berkeley National Laboratory, where he has studied energy policy and energy efficiency in buildings for more than 25 years. His work has ranged from early comparative analysis of the effectiveness of utility-sponsored efficiency programs, to research in consumer comprehension of energy information, to federal sustainable acquisition policy, to organizational decision-making and adoption of technological innovation. The presentation will illustrate how the research he has done throughout the years has been strongly influenced by his Carleton physics education.

**April 12th Catrice Carter ’11: “Device and Metasurface Designs for Next-Generation Blue-Emitting Organic LEDs: Cost, Sustainability, Efficiency, and Stability”**

Proponents for sustainable alternative lighting and display options advocate for organic light-emitting diodes (OLEDs), particularly polymer organic light-emitting diodes (P-OLEDs), because of their potential for low-cost fabrication, more versatile device formats, and lower power consumption compared to traditional options. Typically, red, green, and blue phosphorescent OLEDs (Ph-OLEDs) are necessary for white lighting and display applications. However, blue Ph-OLED device architectures have lower efficiency relative to that of red and green with with EQEs of 3.5%, 5.5%, and 9%, and 3.5%. Further, OLED luminaires have lifetimes 25% less than that for a typical inorganic LED. Prior studies have proposed methods such as new materials (metal oxides and fluorides) for the charge transport layers, alternative device architectures (such as top-emitting and inverted devices), and integrated light management structures (such as using noble metal nanostructures) to resolve these issues, but not much consideration has been given to the environmental and economic ramifications. Hence, in this work various P-OLED device architectures are theoretically and experimentally studied to determine efficiency and stability enhancement approaches, while accounting for cost and sustainability concerns within the research and development phase. The approaches to improve OLED device performance reported in this presentation have the potential to save on capital costs and on energy consumption, to improve stability and efficiency gains, and to minimize the carbon footprint associated with OLED devices.

Additionally, an overview of other research efforts and interests will be discussed, including topics in technology scaling and Moore’s Law.

**April 19th Henry Brock ’02: “There and Back Again: a Physics Adventure”**

Inspired my Mr. Neurauter, Physics teacher at Bemidji High School, I chose Physics as my major at Carleton.

Since graduation, I have made occasional use of the subject, only recently revisiting it in earnest. Through graduate school, travel, bicycle mechanics, tutoring, teaching, engineering, and computer science, attempting to understand how things work (and how to use those resources) has been the backbone of my adventure so far. I will talk about how I made decisions along the way and how what I’ve learned so far informs my decision points now, in hopes that reflecting on my web of failures and successes may be useful to you on your journey.

**April 26th Lisseth Gavilan ’06: “The astrochemical journey of cosmic dust: from space to the lab”**

How was the solar system formed? What is the origin of complex molecules? How far is the observable universe? To answer these questions we require a clear understanding of how dust forms and evolves in space. This can be achieved via astronomical observations but also via laboratory experiments. In this talk I will discuss how laboratory data helps interpret observations of cosmic dust and how such observations are guiding experiments to unveil new mechanisms of dust evolution. I will introduce current challenges in laboratory astrophysics and will present how state-of-the-art facilities, like radio telescopes and synchrotrons, are helping us unravel the dusty and molecular universe.

**May 3rd Sean Hollands ’96 “Practical solutions to theoretical problems – working as a Physicist in**

**Industry”**

Modern technological advancement has changed our societal expectations requiring that we find new methods for expediting development.  Historically, there were many more iterations between design and test before a product release.  To be competitive in today’s market that is no longer possible as technology needs to be implemented nearly instantly.  This has created an opportunity for organizations that specialize in helping companies ensure what they are working on will meet both the market needs and fulfill their goals.  On a daily basis I get to interact with world leading companies that are developing products that change the way we live.  Each of these companies relies on my team to enable them to do their job.  Their product development cycle would not move forward without our assistance.  In our hour together, I will share the story of how I ended up in the world of Applied Physics and will highlight some of the exciting things we get to work on and share how you can network your way into working with these companies after Carleton.