The Department of Physics and Astronomy
Announces a Spring 2017 Artist in Residence program
in Creative Arts

Opportunity:
The Department of Physics and Astronomy invites proposals for three Artist-in- Residence projects that respond to Physics and Astronomy research from creative visual arts, literary, performance, and music composition perspectives. Artist residents are expected to embed themselves in the research lab/group to envision and produce a response that connects to the scientific research. (Participating research group descriptions included below.) Collaborative applications are welcome. Preference will be given to those who have not previously participated. Selected artists will receive $500 at the end of the program. Funding for reasonable material and presentation expenses will also be provided.

Expectations:
Selected artists/composers are expected to spend time each week with the research group, and create a unique work, body of work, composition, or set of compositions in response that is presented at an exhibition/performance at the end of the spring term.

About the participating Physics and Astronomy research groups:
There are a number of different Physics and Astronomy groups that are interested in participating in this program. Please see the attached descriptions provided by the Physics and Astronomy faculty.

Information sessions:
Potential applicants interested in learning more about participating Physics and Astronomy research groups should plan to attend an information session to meet sponsoring researchers for a brief tour of the labs.
Dates – November 3, 1:30-3:30; 321 Allen Hall and November 4, 1:30-3:30 pm; 321 Allen Hall.

Proposal requirements:
- Students should be in good academic standing and have declared a disciplinary major or minor in English, Music, Studio Arts, or Theatre Arts.
- Application file including contact info, GPA, faculty reference, current resume, unofficial transcript
- A two-page proposal for the creative plan that connects the creative work to the research groups
- A one-page budget estimating material and presentation expenses (wood, etching plates, paper, framing, pedestals, performers, recording equipment, equipment rental, etc.)
- Work samples, including 2-3 written works, 3-5 JPEG images of visual work (with brief image description of title, media, dimensions, year of completion) or two 5-10 minute MP3 composition/performance samples. Total file size should not exceed 20 MB.

Open to: Undergraduate and graduate Studio Arts, Music, Theatre Arts, and English majors and minors.

Deadline to apply: Monday, November 21, 2016. Application materials or questions should be emailed to Michele Slogan (slogan@pitt.edu). For more information on the program and descriptions of the 2016 artists go to http://www.physicsandastronomy.pitt.edu/artist-residence-program.

Carles Badenes, Astro/Cosmo

My work deals with supernovae - titanic explosions that mark the end of the lifetime of certain stars. Supernovae play a central role in our Universe, because they are the place where most heavy elements are formed. The iron in our blood and the calcium in our bones were formed billions of years ago in supernovae that exploded before the Solar System was formed. This massive recycling scheme powered by supernovae seeds the birthplaces of stars with the raw materials that are necessary for life.

Joe Boudreau, Particle

Our group studies the highest energy collisions ever created in the laboratory. We work at the most complicated machine ever constructed, the LHC and its associated detector ATLAS. The object of our study:

* the heaviest elementary particle known to exist (the top quark).
* the second heaviest particle and the most exotic form of matter known to exist, the most recently discovered particle, the Higgs boson.

We sift through one of the world's largest data samples in order to carry out these studies. There are three professors in our group, and also three postdocs, plus graduate students and undergraduate students. At the moment, the three postdocs live and work in Geneva Switzerland. Among the many tasks that we carry out is the production of high quality 3D images of the most important collisions in the dataset. The 3D event display software has a scientific purpose but also calls upon our aesthetic sensibilities as well, which may possibly make this an ideal collaborative project for an artist in residence.

Some of the images are collected here:
https://twiki.cern.ch/twiki/bin/view/AtlasPublic/EventDisplayPublicResults

Michael Hatridge, Condensed Matter

Our research focuses on the open challenge of building a quantum computer. Such a machine will harness the complexity and coherence of quantum bits to address challenges in computation and the simulation of complex quantum systems. Practically, we currently build systems which are composed of a few quantum bits, and working to develop the tools for larger modules. In our lab we work on a daily basis with the 'paradoxes' and thought-experiments of quantum theory such as Shroedinger's cat, Zeno's paradox, quantum jumps, and spooky action at a distance, realizing them in experiments and using them as engineering tools for our quantum machines. Key technologies for our work include precision analog microwave electronics, cryogenics, and nano-fabrication of superconducting circuits. Our lab is located in 100 OEH, and has a glass front wall, feel free to wander by and see us at work.

Tae Min Hong, Particle

Prof. Hong is an experimental physicist studying the Higgs boson, which is the physical remnant of the once unified interactions of the electromagnetic force and the weak nuclear force. The beautiful symmetries of physical forces can be studied using a proton smasher in Switzerland that are 16 miles in circumference. This powerful machine can potentially create new rare collisions that can give us a glimpse of the underlying structure of spacetime. This possibility is the primary lure of the field for most, whereas the unique apparatus itself is a lifelong pursuit for some. Prof. Hong engages in both aspects in the experimental framework in pursuit of truth.

Arthur Kosowsky, Astro/Cosmo

Over the past 20 years, we have made increasingly detailed and precise maps of the sky at microwave frequencies. The pattern of slight temperature differences in these maps is, quite literally, an image of what the universe looked like when it was 370,000 years old, a tiny fraction of its current age. It is the baby picture of the universe. And what do we discern in this picture? Sound waves.

We see clearly the imprint of sound waves moving about in the early universe, driven by small differences in gravity pulling on the primordial plasma. Cosmic rumbling as all of the structures in the universe begin to grow due to the inexorable pull of gravity.
Making this image of the early universe requires the combined efforts of dozens of scientists and engineers, using a custom-designed telescope perched atop a 17,000 foot mountain in Chile’s Atacama Desert. Radiation which has propagated largely unimpeded for 13 billion years is reflected from two mirrors, passes through several silicon lenses, and onto an array of detectors cooled to a tenth of a degree above absolute zero. Months of data are converted to maps of the sky through thousands of hours of supercomputer time. The effort is worth it: the maps show the seeds of our own origins.

Jeremy Levy, Condensed Matter

“Nano Sketches”
Jeremy Levy’s laboratory works with a material that can be “sketched” with a tiny (nanometer-scale) tip. Our “canvas” is an electrical insulator but when this tip moves across it can create conducting lines that are only a few atomic spacings wide. The proposed idea would involve creating art using the world’s smallest Etch-a-Sketch. The artist would be able to draw sketches on our nano-canvases in our laboratory, and work with scientists to forge a connection between science and art.

Jeffrey Newman, Astro/Cosmo

I do research on cosmology - the study of the Universe as a whole, its history and contents - as well as the formation of galaxies and their development over time. I work primarily with large statistical, "survey" datasets, generally assembled by large teams of astrophysicists. My current areas of focus include:

• CANDELS (the Cosmic Assembly Near-infrared Deep Extragalactic Legacy Survey), the largest project undertaken on the Hubble Space Telescope to date. CANDELS is providing our first comprehensive census of the demographics of galaxies as they were 10-13 billion years in the past, for comparison to those seen today.

• eBOSS (the Extended Baryon Oscillation Sky Survey), a component of the upcoming Sloan Digital Sky Survey IV. eBOSS will map out the large-scale structure of the Universe traced out by distant galaxies and quasars 5-11 billion years in the past, allowing us to explore the unknown nature of Dark Energy via the Baryon Acoustic Oscillation (BAO) method.

• The proposed DESI (Dark Energy Spectroscopic Instrument) project, which will use a new instrument on the Mayall Telescope to map out roughly 25 million galaxies with the BAO technique (a ten-fold improvement over eBOSS).

• I am particularly active in preparations for LSST (the Large Synoptic Survey Telescope), which is now under construction (an artist's conception is at right). LSST will survey the entire visible sky every few nights for 10 years, revealing what changes from night to night (e.g., asteroids that might hit the Earth, which move across the sky) while simultaneously providing rich information on billions of galaxies, allowing precision studies of dark energy.

• The Color of the Milky Way: In January 2012, Timothy Licquia and I presented a new determination of the color of the Milky Way Galaxy we live in. We found that to an observer from another galaxy, our own would appear as a smudge of a nearly pure shade of white.

Vittorio Paolone, Particle

Particle physics is the study of the fundamental constituents of matter and how they interact. One of these constituents are a set of particles called neutrinos. Presently there are three known types of neutrinos: electron neutrino, muon neutrino, and tau neutrino. A majority of the neutrinos around us were born around 15 billion years ago, soon after the birth of the universe. Neutrinos have incredibly small masses and in general don't like to interact with matter. The neutrino density in the universe is estimated to be about 330 million neutrinos per cubic meter and a neutrino could pass through a light years' worth of lead and still not interact. Therefore at any second several trillion neutrinos passed through a finger in your hand. My research focuses on the study of neutrino properties through their flavor (type) mixing (oscillations) and interactions with matter.

Hrvoje Petek, Condensed Matter

We use short pulses of light to stimulate the motion of electrons in small metallic structures and in molecules. The energized electrons travel in waves and molecules vibrate and rotate like strings and spinning tops. Our interest is in the physics of how light is converted into chemical and electrical energy. Our measurements are highly graphic and we appreciate skillful representation that stimulates interest in our research.

Vladimir Savinov, Particle

At the beginning of time, before there was light, the mystery of matter and antimatter asymmetry gave rise to the world that we are a part of today. The main focus of my research is on resolving this mystery that could explain our existence.

Michael Wood-Vasey, Astro/Cosmo

I work with exploding stars across the cosmos. We observe these "supernovae" to measure the expansion of the Universe over the past 10 billion years of it's existence (3/4 of the total age of the Universe). To find and study these events we use large telescopes and modern computing and statistical approaches to try to understand the nature of the dark energy that is accelerating the expansion of our Universe.

Andrew Zentner, Astro/Cosmo

I am a theorist with research interests that lie within cosmology, defined rather broadly. I strive to maintain a close connection with observation in large part because the amount and discriminating power of observational data is expanding rapidly and will continue to expand into the next decade. My aim is to make predictions that are unique and testable in the near term and to facilitate comparisons with data that are robust and maximize the discriminating power of the data. In many cases, this leads to studies of the particular capabilities of forthcoming instruments to study any variety of phenomena, from dark energy evolution to galaxy formation processes. My interests range throughout a broad cross section of cosmology to encompass galaxy formation, the phenomenology and identification of the dark matter and dark energy, and astrophysical limits on fundamental physics.