Astronomy Open Night, Friday, September 2, 2016

ESS 001; 7:30 P.M.

For more information: http://www.astro.sunysb.edu/openight/opennite.html

James Lattimer

"Where Do Elements Heavier Than Iron Come From?"

The three lightest elements in the universe, hydrogen, helium and lithium, originally formed in the Big Bang. The next two, beryllium and boron, are primarily produced by cosmic ray interactions with the interstellar medium. The bulk of the next two dozen heavier elements come from ordinary stars and supernovae. But where do heavier elements, such as gold, platinum and lead, come from? Most of the heavier elements had to be synthesized in neutron capture processes, either slowly (the s-process) or rapidly (the r-process); each is responsible for about half of all isotopes heavier than iron. The source of s-process elements, such as copper, zinc, tin and lead, are thought to be stellar winds from evolving low- to medium-mass stars (up to about 8 solar masses). The source of the r-process elements, such as gold, platinum and uranium, is controversial. Since the 1950s, the prevailing theory has been supernovae. However, the r-process requires ejected matter that is more neutron-rich than computations indicate. In the mid-1970s, my advisor and I proposed a speculative alternative theory, that they are produced in matter ejected from neutron stars merging with neutron stars or black holes. In the last five years, evidence has been accumulating in favor of the neutron star theory. The evidence comes from observations ranging from spectra of the most metal-poor stars, studies of ultra-faint dwarf galaxies, and afterglows from short gamma-ray bursts (which may be mergers). Theoretical support stems from numerical simulations of both mergers and cosmological studies of galaxy formation. In the near future, mergers involving neutron stars might even be observed by gravitational wave observatories, which could vindicate or refute this theory.

Prof. Lattimer is a Distinguished Professor in the Dept. of Physics & Astronomy at Stony Brook. His interests lie mostly in nuclear astrophysics, especially with theories of dense matter and neutron stars.

World of Physics Open Night, Friday, September 9, 2016

ESS 001; 7:30 P.M.

For more information: http://www.physics.sunysb.edu/Physics/WorldsOfPhysics/20162017/

Thomas Allison

"Mastering the Electromagnetic Spectrum"

Most of what we associate with the word "technology" derives from our ever increasing ability to control electromagnetic fields. From the early days of telephone and radio communication to the current era of the internet and GHz microprocessors, physicists and engineers have worked relentlessly to produce and utilize electromagnetic fields of higher frequencies and larger coherent bandwidths. In this talk, I will discuss how now physicists can control light waves and even x-rays

using a new type of laser called a frequency comb. Frequency combs now allow us to build the most precise atomic clocks and generate attosecond pulses of soft x-rays - the shortest manmade events - pushing the boundaries of what scientists can measure.

Prof. Allison holds a joint appointment with the departments of Physics and Chemistry at Stony Brook University since 2013. His research group studies frequency comb lasers, ultrafast dynamics, and strong-field atomic physics. Prof. Allison is a recent recipient of the prestigious Early Career Award granted by the Department of Energy who has recognized his work on developing new light sources and techniques to follow the motions of molecular systems in real-time.

Living World Open Night, Friday, September 16, 2016

ESS 001; 7:30 P.M.

For more information: http://life.bio.sunysb.edu/marinebio/livingworld/

Jeffrey Levinton

Oysters: Can We Save Them? Can They Save Us?

Oysters live throughout the world, usually living in clusters on intertidal areas and in oyster reefs or mounds below the waterline. They secrete calcium carbonate shells which enclose a soft body whose gills pump water and capture enormous amounts of algae. Their abundance as oyster mounds probably absorbs wave shock and helps to protect shores. Their algal clearance rate contributes to water clarity, as planktonic algae are removed. The clarity allows light to reach seagrasses and prevents the algae from dying, decaying and resulting in a lack of dissolved oxygen. But oyster reefs are in trouble around the world owing to overexploitation by fishing and because of pollution.

Prof. Levinton will discuss the great loss of oysters and how we can restore reefs and might be able to substitute some of their ecosystem functioning by aquaculture approaches that can complement reef restoration. But he will also question how much oysters really benefit coastal ecosystems. Can they really clear out the water of modern coastal environments, which are enveloped in nutrients? Are oyster reefs, even if restored, capable of clearing our bays and harbors? Evidence new and old suggests that oysters are beneficial but they have limits that must be understood.

Jeffrey Levinton is a marine ecologist with broad experience on the ecology and feeding biology of marine bivalves. He has worked on oyster performance in this region and developed metrics of oyster clearance on local algae. He is author of several books, including the textbook "Marine Biology: Function, Ecology, Biodiversity" now being developed into a 5th edition. He is webmaster of the Marine Biology Web Page, with career advice translated into many languages, now about at one million visits. He is Distinguished Professor at Stony Brook University and is a John Simon Guggenheim Fellow, Fulbright Senior Scholar, was Chair of the Hudson River Foundation's Hudson River Fund, and is Fellow of the American Association for the Advancement of Science.

Geology Open Night, Friday, September 23, 2016

ESS 001; 7:30 P.M.

For more information: http://www.geo.sunysb.edu/openight/index.html

Gilbert N. Hanson

"The effects of acid rain on Long Island's ecosystems"

Westerly winds bring emissions from vehicular traffic and power plants to Long island. These emissions include nitrogen and sulfur oxides, which create acid rain. Unpolluted rain has a pH of 5.6. In the 1950's acid rain was already present when precipitation on Long Island had a pH of about 4.8; pH continued to decrease and was about 4.3 by the mid 1980's; as a result of clean air legislation the pH of precipitation has increased to about 4.6.

When acid rain infiltrates the soil, hydrogen ions replace the base cations (Ca, Mg, K and Na) on exchangeable sites on soil particles. At the same time, they react with insoluble aluminum hydroxide in the soil producing soluble aluminum ions. Exchangeable base cations in the soil are plant nutrients. Soluble aluminum in the soil is a poison to plants. Thus, the effect of the acid rain is to remove plant nutrients and to make a poison available to the plants.

Before acid rain, the soil in Long Island's forests was acidic with a pH of about 4.5 (using 0.01 m CaCl2). Presently, the forest soil has a pH of about 3 at the surface increasing to about 4.5 at a depth of about 50 cm. The results are that plants less sensitive to acid soil conditions are replacing plants that are more sensitive to acid soil conditions. In this presentation, I will discuss the effects of acid rain on soil and the natural ecosystems on Long Island.

Dr. Hanson, a distinguished service professor in the Department of Geosciences, has been interested in the geology and environmental problems of Long Island for the last couple of decades. High school students, undergraduate students, earth science education students, earth science teachers and MS in Geosciences students carried out various aspects of this research.

Astronomy Open Night, Friday, September 30, 2016

ESS 001; 7:30 P.M.

For more information: http://www.astro.sunysb.edu/openight/opennite.html

Doug Swesty

"Ripples in Space-time: Detecting Gravitational Waves"

During past year physicists and astronomers have, for the first time, directly detected gravitational waves. This phenomena, which was predicted over a century earlier by Albert Einstein as a part of his formulation of the General Theory of Relativity, has proven extremely difficult to observe because of the properties of gravity. However, a nearly half-century long effort culminating in the Laser Interferometric Gravitational Observatory (LIGO) experiment, funded by the National Science Foundation, has now detected at least gravitational wave events that are believed to be the

result of the coalesence of two black holes into a single larger black hole. In this talk we will discuss both the theory and experimental effort to verify the existence of gravitational waves.

Doug Swesty is a Research Associate Professor in the Department of Physics and Astronomy at Stony Brook. After obtaining his PhD at Stony Brook in 1993 he spent six years at the University of Illinois as a staff member of the National Center for Supercomputing Applications and as a Visiting Research Assistant Professor in the Department of Astronomy. He returned to Stony Brook in 1999 where he teaches and conducts research in the areas of computational and nuclear astrophysics.

Directions to SUNY Stony Brook and ESS Building

⇨ From exit 62 of the Long Island Expressway (LIE, I-495) follow Nicolls Road (Route 97) north for nine miles. Pass the South and Main entrances to the University.

⇨ Enter the North entrance which will be on your left.

⇨ At the top of the small hill, turn right on Circle Road.

⇨ Proceed about 1 mile.

⇨ Turn left onto Campus Drive and then immediately turn left again onto John S. Toll Drive.

⇨ Proceed about 50 yards then turn right into the large paved parking lot.

⇨ The Earth and Space Sciences building is the large concrete building at the northeast end of the parking lot.

Map of campus is on the web at: http://www.stonybrook.edu/sb/map/

TEACHER IN SERVICE CREDITS

If your school requires you to have a sequence of educational opportunities in order to receive in-service credit, please advise them that during the Fall 2016 semester we will provide attendance certification for each of the lectures attended.

Please contact the respective department for more information.