ORAL PRESENTATIONS

Chris De Pree (Agnes Scott College)
Citizen Sky: An Overview

Citizen Sky is a citizen science project organized by the AAVSO and supported by a 3-year National Science Foundation (NSF) ISE grant focusing on the variable star, epsilon Aurigae. The source epsilon Aurigae is ideal for this project because of the timing of its transit (coinciding with the International Year of Astronomy - 2009), and the brightness of the source (allowing for naked eye observing). The overall goals of the project are to: help answer open questions about the epsilon Aurigae system, stimulate new interest in astronomy, allow citizen scientists to experience teamwork and scientific collaboration, and fully participate in the scientific method. The project and its web site provide ways for citizen scientists to practice observing variable sources, acquire and analyze data, and present results.

Russel White (Georgia State University)
The Search for Young Planets

We present a high-precision infrared radial velocity study of late-type stars using spectra obtained with NIRSPEC at the Keck Observatory. We demonstrate a radial velocity precision of 50 m/s using telluric features for calibration. This high-precision technique is applied to 20 stars K- and M-type stars in the Beta Pictoris and TW Hydrea Moving Groups (~10-20 Myr) and the chromospherically active field stars GJ 873 (EV Lac) and GJ 182; the goals are to (1) quantify the advantage infrared radial velocities have at minimizing star spot noise and to (2) search for young gas giant planets in short period orbits. Based on comparisons with previous optical observations of these young stars, radial velocity measurements at infrared wavelengths appear to mitigate the radial velocity noise caused by star spots, as predicted. Nevertheless, star spot noise is still a significant source of radial velocity error for young stars at 2.3 um, and this limits the precision to ~100 m/s for stars with vsini values < 15 km/s; there is nearly a linear dependence of the RV dispersion upon the projected rotational velocity. The observations reveal both GJ 3305 and TWA 23 to be single-lined spectroscopic binaries and identify 1 candidate hot Jupiter system in the TW Hydrea Association; a follow-up program is underway. For the remainder of the sample, these observations confidently exclude (>99%) any planets more massive than ~5 Jupiter with 10 day orbital periods or ~10 Jupiter with 100 day orbital periods. The limiting planet masses are considerably smaller assuming an edge-on orientations, as is reasonable for the edge-on disk system AU Mic. These results have important implications for the timescales of planet formation and migration, and for the future of young planet searches.

Tabetha Boyajian (Georgia State University)
Fundamental Properties of Stars

In this talk, I present highlights from a on-going survey to measure the fundamental properties of nearby, main sequence, A, F, G, K, and M-type stars. Angular diameters of these stars are obtained via interferometric observations made with Georgia State University's CHARA Array. These measurements combined with HIPPARCOS and ground-based parallaxes and bolometric fluxes provide an empirical determination of their effective temperatures, linear radii, and absolute luminosities. Empirically based relations for the stellar effective temperature for these types of stars are found to be accurate to the 1% level. Lastly, a short discussion on how these direct measurements compared to stellar models is presented.

Christine de Catanzaro and Mandi Johnson (Georgia Tech Library)
A Selection of Rare Books from the Georgia Tech Library

Two of the archivists from the Georgia Tech Archives display and discuss a selection of the rare books at the GT Library, including: the first three editions of Isaac Newton's *Principia* (1687, 1713, and 1726); Joan Blaeu's *Grand Atlas* (1664); and E. E. Barnard's *A Photographic Atlas of Selected Regions of the Milky Way* (1927). The presentation also includes a brief look at the GT Library's digitized version of the Barnard *Atlas*.

Pablo Laguna (Georgia Tech)
Center for Relativistic Astrophysics Overview

The Center for Relativistic Astrophysics (CRA) is devoted to interdisciplinary research and education linking astrophysics, astroparticle physics, numerical relativity and gravitational wave physics. Our research focuses on extreme astrophysics such as mergers of black holes and neutron stars, central engines of active galactic nuclei, gamma ray bursts, and sources of the high energy cosmic rays and neutrinos. I will give an overview of the CRA, its people and its science.

Agnes Kim and Donovan Domingue (Georgia College & State University)
Astronomy at GCSU

The GCSU department of Chemistry, Physics & Astronomy welcomed its first physics majors in Fall 2009. Since then we have quickly grown to 38 physics majors. Our students are actively involved in undergraduate research in physics and in astronomy. There are two astronomers on the faculty. Dr. Domingue is an observer who studies galactic interactions while Dr. Kim studies the interiors of white dwarfs using computational methods. Department facilities to do some Astronomy include a Beowulf cluster of 16 Dell workstations for the computational research, a planetarium, and a soon-to-be observatory. The planetarium has a 20 ft dome and sits about 20 people. We use it for astronomy labs, planetarium shows and outreach events for local schools, as well as for less serious activities, such as the Physics club's bad physics movie nights. The observatory is scheduled for completion in January 2010 and we are requesting funds to put in a research grade telescope, which will be used not only for public viewing nights, but also undergraduate research.

Dennis Marks (Valdosta State University)
Growing Space-Times Recursively

The universe is modeled as a recursive lattice of self-generating quantum bits (qubits). Direct products of qubits are 1-d bits of space and time. Connections in series are time-like; connections in parallel are time-like. To distinguish space from time, I use only real, not complex, geometric algebras. Basis vectors for space-times of any dimension and signature can be generated by inner and outer products of a space-like basis vector and a time-like basis vector. The outer product of space and time is 2-d space-time. 2×2 real matrices **R**(2) describe either the Minkowskian plane or the Euclidean plane. Their outer product **R**(4) describes Minkowskian space-time, whose inner products form bivectors, pseudo-vectors, and pseudo-scalars, describing spin, momentum-energy, and action, respectively, which automatically satisfy the Heisenberg Uncertainty Principle. The four space-time dimensions can be either open or closed. Microscopic closed loops appear in macroscopic open dimensions as the electromagnetic force [one time-like loop with U(1) symmetry] and the weak force [3 space-like loops with SO(3) ≈ SU(2) symmetry]. The outer product of the two 4-dimensional space-times yields an 8-dimensional space-time **R**(16), including 8 pseudo-vectors with the SU(3) symmetry of the strong force. After eight dimensions, the pattern of real geometric algebras repeats itself by Bott periodicity, leading to a recursive lattice, representing cosmically large expanding space-time with the Standard Model of physics at each lattice point.

Saida Caballero-Nieves & Douglas Gies (Georgia State University)
A Tale of Two Telescopes: A Closer Look at Hot Stars in Cygnus OB2 with the Hubble Space Telescope and Gemini

It was the best of times to be able to carry out a high angular resolution survey of the most massive stars in Cygnus OB2. The Fine Guidance Sensors (FGS) on the Hubble Space Telescope and Adaptive Optics at the Gemini Observatory North are ideal for finding widely separated binaries at high angular resolution within a differential magnitude of 3 mag or greater and separations of at least 0.1 arcseconds. At a distance of 1.7 kpc, Cyg OB2 provides a nearby, young stellar environment, rich in high-mass stars. We observed 75 O- and early B-type stars and determined that 42% of the sample have at least one statistical companion.

Robin Shelton (University of Georgia)
Our Place in the Galaxy: In a Sphere in a Cloud in a Bubble in a Cavity

Over the last 4 decades, astronomers have charted a large X-ray emissive bubble of interstellar gas that surrounds the solar neighborhood and extends outwards by at least 60 pc in every direction. The bubble, called the Local Bubble or the Local Hot Bubble, is thought to have been blown by the winds and supernova explosions of nearby massive stars. As the most local example of such a bubble, the Local Bubble, has been thought to hold the key to our under-standing of large interstellar bubbles and their effects on our galaxy. However, during recent years, the Local Bubble has come under renewed scrutiny due to the suggestion that much of the local X-ray emission results from Solar Wind Charge Exchange (SWCX) rather than Local Bubble plasma. During Solar Wind Charge Exchange, a highly charged ion in the solar wind receives an electron from neutral material. As the received electron de-excites, the ion emits an X-ray photon. Although this phenomenon was first observed in a relatively isolated location (the coma of a comet), it is now also thought to occur in the Earth's geocorona and between solar wind ions and neutral interstellar gas that flows into the heliosphere. With such widespread origins, SWCX emission could be seen in any direction on the sky and so could be confused with observations of the Local Bubble.

In this talk, I will describe both SWCX and the Local Bubble, outline the arguments on both sides of the debate over the Local Bubble's existence, and describe the spectroscopic signatures that distinguish SWCX emission from that of a real interstellar bubble. These signatures rely on our understanding of atomic physics and so may be of interest to members of the laboratory astrophysics community.

Philip Groce (AVI/Konica Minolta Planetariums)
The Future of Astronomical Visualization in Planetariums

In honor of the IYA, the National Astronomical Observatory of Japan created a powerful and easy-to-use astronomy visualization program named Mitaka as part of the 4D2U Project. The development of this free program was sponsored in part by Konica Minolta Planetarium (KMP). It was designed to be used by students and teachers in Japan for creating astronomical simulations and conducting interactive labs. Mitaka allows the operator to move in both 3-D space and time, hence the 4D2U name for the project. KMP has taken this basic program and databases and greatly expanded it as the operating system of its newest line of digital fulldome Mediaglobe planetarium products now installed in North Carolina and Florida.

Meanwhile, anyone can use the flat-screen version of Mitaka for classroom and student use. Simply go to http://4d2u.nao.ac.jp/html/program/mitaka/index_E.html to download the program. One of the amazing aspects of this free program is how smoothly it handles databases as one leaves the solar system and fly among the stars of the Milky Way, then outside our galaxy to navigate about the Local Group, travel among galactic clusters catalogued by the SDSS, and, finally, on to the edge of the known Universe. To make it even more interesting, the program has the ability to display any part of the solar system, the Milky Way and beyond in anaglyphic 3-D. It only requires a pair of anaglyphic red/blue glasses (red on left eye - blue on right eye).

Since the 4D2U Project was completed in 2008, Mitaka continues to be improved independently by users. The latest updated flat screen version is called Mitaka Plus and now runs on both PCs and MACS. The Mitaka Plus updates can be obtained by going to http://orihalcon.jp/mitakaplus/index_e.html.

Joe Jones (North Georgia College & State University)

The Student Telescope Operator (TO) Program at NGCSU

The TO program at NGCSU has provided experiential learning opportunities for introduce-tory and upper level students for almost 20 years. I will share a brief history and descript-tion of the program and how I believe the program has allowed our students to take full advantage of the astronomical facilities of North Georgia. Over the years a few students from other institutions have been able to take advantage of our program and I would like to explore ways that our program and facilities could be of service to others in the regional astronomical community.

Richard Schmude (Gordon College)

The Brightness and Color of Jupiter

Brightness measurements of Jupiter made through filters transformed to the Johnson B, V, R and I system are used in constructing models of Jupiter's brightness. Data collected between 1963 and September 2010 are included in the evaluation of models. All brightness values are normalized to a Jupiter-Sun and a Jupiter-Earth distance of 1.0 astronomical unit. The model for the V filter is $V = -9.40 + 5.0 * \log [r D] + 0.0084 a$. In this equation, r is the Jupiter-Sun distance, D is the Jupiter-Earth distance and a is the solar phase angle of Jupiter in degrees. It is concluded that Jupiter is about 5% brighter in 2010, in the V-filter, than what the model predicts because of the absence of the South Equatorial Belt.

Noel Richardson (Georgia State University)

Observations of Massive Stellar Winds

I detail my recent observations and progress made in the area of massive stellar winds. I begin with showing how the infrared excess associated with the winds of massive stars presents itself with angular diameter measurements made with the CHARA Array in the optical and near infrared (K-band) of the hot supergiant ε Orionis. The effective photosphere is larger (~ 7%) at longer wavelengths due to the winds contributing extra flux, which is in agreement with theoretical predictions. I also show results (from spectroscopy and photometry) on wind variability obtained on luminous blue variables. Results on eta Carinae and P Cygni are shown in detail, with some other initial results presented.

Adric Riedel (Georgia State University)
Hiding in Plain Sight

Over the last 200 years, proper motion (the apparent motion of stars relative to the rest of the sky, over periods of years) has been used to find nearby stars. The argument has been that the nearest stars should have the highest proper motion, and as a result, nearly all searches for nearby stars have looked at objects moving 0.18 arcseconds/year or faster.

We show that this is not always true, and present details on an all-sky photometric search to find nearby low proper motion stars. We detail the problems photometric searches face and how we're going about solving them. We also discuss preliminary results, particularly concerning a population of nearby young stars the search has revealed.

Nicole Cabrera (Georgia State University)
NSF Research for Undergraduates

The National Science Foundation Research Experience for Undergraduates (NSF REU) program provides opportunities for undergraduate students to conduct their own research through a 10-12 week paid internship. I summarize my experiences in two Astronomy REUs at the University of Hawaii Institute for Astronomy (IfA) in 2008 and at the National Solar Observatory (NSO) in 2009.

Carol Paty (Georgia Tech)
The Cassini Mission: A close look at Enceladus

The discovery of the Enceladus' plume raised important questions pertaining to the geologic activity in this tiny moon as well as the potential interaction of Saturn's magnetosphere with the variable jets of neutral gas and dust that make up the plume (and consequently supply the material for Saturn's E-ring and neutral cloud). Here we will focus on some of the striking observations and discoveries made at Enceladus during the first years of the Cassini flagship mission from a variety of instruments housed on the spacecraft. We will also discuss some of the open questions raised by these observations and the research efforts currently underway to bring closure to these outstanding issues.

Todd Henry (Georgia State University)
Grab Your Map to the Stars! A Tour of the Sun's Neighborhood (PUBLIC TALK)

Who are our neighbors? Since 1994, the Research Consortium On Nearby Stars (RECONS, www.recons.org) has been spying on the several hundred nearest stars, both old friends and new members of the neighborhood. During this talk I'll present the latest discoveries in our celestial neighborhood, including a comprehensive 2010 census of stars, brown dwarfs, and planets closer than 10 parsecs (about 33 light years). It turns out we've got many more small, red, neighbors than we knew, and some of them are orbited by planets. There are also other dark, hidden, companions that so far have eluded detection --- just who are they?