

# Center for Cosmology and Astroparticle Physics (CCAPP)

## --Year 1 Update --

**Executive Summary:** The original proposal to establish CCAPP set three objectives which are fundamentally linked to advancing the goals of the Academic Plan and contributing to the overarching goal of becoming one of the world's top public research and teaching universities: (1) to create a highly visible Postdoc/Visitor/Workshop Program that would mark CCAPP affiliation as a "badge of honor" in a visiting researcher's career, (2) to initiate world-leading interdisciplinary research efforts in fields where OSU can make unique and fundamental contributions: dark energy, the origin of cosmic structure, and the highest energy particles of the Universe, and (3) to enhance the education of our graduate students and postdocs while increasing external research funding for CCAPP and its research initiatives.

In our first year CCAPP has made substantial progress in reaching all three objectives. We have set up an efficient infrastructure enabling us to host 50 visitors and run 4 workshops with 200 participants. We hired 5 long-term postdocs with elite pedigree, coming from Chicago, Stanford, Caltech, and Carnegie Observatories. Through CCAPP, OSU joined the Dark Energy Survey (DES), teaming with Chicago, Illinois, Michigan, and Penn, along with national labs (Fermilab, SLAC, and Argonne) and international collaborators to measure the properties of dark energy, viewed by many as the top science challenge in the 21<sup>st</sup> century. Our graduate students and postdocs, though somewhat new to CCAPP, are already making their mark, winning University research competitions and doing world class research using state-of-the-art resources like the Large Binocular Telescope (LBT), space borne observatories (GLAST), and remote large scale detectors in Argentina and Antarctica, looking for the universe's highest energy particles. CCAPP leveraged 1/3 of its budget against the potential for federal funding, already returning \$600k on this investment while placing OSU scientists in leading fundamental roles on major research initiatives.

We are not finished. Over the next year we will continue to use the Center to place the right people in the right place at the right time. Our on-going research will be enhanced by carefully targeted investments, visitors, and workshops. We will continue investments in new research initiatives, designed to place OSU at the forefront of some of the world's most exciting and fundamental science while at the same time actively pursuing new sources of external funding.

## Overview of Accomplishments

### (1.) Establish CCAPP Postdoc/Visitor/Workshop Program

- CCAPP has *set up an efficient infrastructure and established a center of operations* in the PRB. We have hired a Program Coordinator (Ms. Yavonne McGarry) to oversee the day-to-day activities of the Center. Using OSU undergrad students from the Studio CT group we have worked to *establish a CCAPP identity and website* (ccapp.osu.edu).
- CCAPP has *hosted 50 seminar speakers and short term visitors* from world leading research Universities.
- CCAPP has *hosted roughly 200 workshop and conference participants in 4 conference venues*: Sloan Digital Sky Survey collaboration meeting, small mini-workshop on novel detection of dark matter, Gary Steigman's 65<sup>th</sup> Birthday Conference, and coming this May, the Great Lakes Cosmology Workshop 8 (a 3 day meeting aimed at the 100 best graduate students and postdocs in cosmology and astroparticle physics).
- CCAPP has *hired 5 high caliber long-term postdocs*: M. Gill (Stanford) and E. Rozo (Chicago) are already on board. S. Profumo (Caltech), S. Jeltama (Carnegie Observatories), and S. Kazantzidis (Stanford) will arrive this autumn.
- CCAPP has *established its long term visitor program*, designed to bring world-leading senior scientists for extended stays. Kim Greist from UCSD visited CCAPP for 1 month last January and Martin White and his wife Joanne Cohn will be here for 4 months starting this autumn.

### (2.) Initiate and Enhance Interdisciplinary Research Initiatives

- Through CCAPP, OSU (Depoy, Kochanek, Martini, Terndrup, and Weinberg in Astronomy; Honscheid and Walker in Physics) has *joined the Dark Energy Survey*, along with Chicago, Illinois, Michigan, and Penn, national labs (Fermilab, SLAC, and Argonne), and international collaborators to measure the properties of dark energy. Our collaboration is *taking a leading role*: Walker and Weinberg have co-authored a DES white paper outlining the theory support required to obtain the key science initiatives. Honscheid is the OSU DES spokesman and has helped lead DES through the various approval stages by DOE/NSF. He also has taken a lead role on DES DAQ. *Depoy was recently appointed the DECam project scientist*, a senior level leadership position in charge of making a wide variety of technical decisions necessary to get a working instrument on the telescope.
- Related to our DES work, CCAPP has *initiated a project on the Large Binocular Telescope (LBT)*. A subset of the OSU DES team is currently measuring the weak lensing of clusters to determine their properties – the Ohio State Weak Lensing Survey (OWLS) involves faculty, postdocs, and grad students.
- CCAPP is also *initiating new projects with seed funding*: AS2, the next generation of the Sloan Digital Sky Survey (of which CCAPP's David Weinberg is currently the spokesman); the Large Synoptic Survey Telescope (LSST), perhaps the ultimate dark energy telescope; ARIANNA, a new Antarctic detector to look for high energy neutrinos.
- CCAPP is *reaching out to new faculty* in both Departments with natural CCAPP overlap. CCAPP nominally provides funding mechanisms in the start-up packages for new faculty designed to bring their research into CCAPP, optimally taking advantage of our resources.
- All of the CCAPP *science initiatives are supported by a vigorous workshop and visitor program*, designed to get the best science return.

### (3.) Increase External Research Funding/Produce stronger grad students and postdocs

- ***Roughly 1/3 of CCAPP's yearly budget is leveraged against external funding***
- This year, we ***invested in two large projects: DES and OSMOS*** (a new spectrograph being built in Astronomy for use on the MDM telescope, optimizing its use for CCAPP related science).
- Our investment in DES is \$155k in cash (to be applied to the instrument) and in postdocs and technical support staff, housed here at OSU. We expect large and nearly immediate payoff on this investment in terms of new DOE and NSF support for OSU DES scientists, postdocs, and students.
- Our ***investment in OSMOS of \$150k was used as a match on a just awarded \$520k NSF grant*** (CCAPP's P.Martini, PI).
- CCAPP also supports CCAPP scientists by ***providing matches for postdocs and graduate students*** against existing and new external funding. Roughly, this year we provided a match on 4 postdocs and two graduate students, all of which were matched against about \$80k of federal funding, half of which was new.
- The CCAPP postdocs and these matched positions have clearly created a critical mass of young researchers of spectacular quality and, although they are just starting out and difficult to quantify in terms of effect, they are ***influencing the growth of our students and postdocs***, who were already quite good to begin with. An example is Greg Mack, a GRA with strong CCAPP overlap, who just won the Hayes Research Competition for graduate research.