Boston University-Lowell Observatory Partnership in the DCT Era

BU astronomers are very interested in extending their partnership with Lowell Observatory to include substantial access to the DCT. Not only does the DCT fit well with the science goals of the BU astronomers, but expanding the partnership opens up areas of collaborative, interdisciplinary work involving non-astronomy faculty and students at BU (primarily from the School of Education and the College of Communications). Although we already have some specific plans for how these collaborations might proceed, BU would also be interested to know whether there are particular interests on the part of Discovery Communications that a broad, interdisciplinary BU-Lowell collaboration might help to fulfill.

BU Science with the DCT

The DCT will be used by about half of the current BU astronomy faculty (including their students and postdoctoral researchers), and will be an important recruiting tool for the best new faculty and students for a long time into the future. At present, BU astronomers do not have assured access to a large, modern optical/infrared telescope, and the DCT will fit our science needs very well. BU will also supply a new instrument, Flexi, for the DCT. Flexi will allow the spectra of 81 objects to be obtained simultaneously, and its use will figure very prominently in many of the studies that BU astronomers will carry out.

In the first few years of operations, BU astronomers will carry out a number of groundbreaking studies with the DCT. These include the discovery of massive clusters of galaxies at a time corresponding to about one-third of the present age of the universe, detailed studies of the dark matter that surround large galaxies like our own Milky Way, making the first 3-dimensional map of the Milky Way's magnetic field, detailed imaging of the shocked gas associated with low-mass stars in forming star clusters, studies of the time-variation of emission from material nearby supermassive black holes, studies of the physics of holes in the interstellar media of dwarf galaxies, and using binary star systems to test models of stellar, chemical, and dynamical evolution.

In the longer run, BU astronomers expect to carry out a large spectroscopic survey to supplement the photometric data that will be obtained by the Large Synoptic Survey Telescope (LSST). LSST is currently being built, and it will relentlessly survey the sky with a cadence of 3 days. LSST is expected to discover an enormous number of previously-unknown time-variable sources. However, LSST will only be able to take images; it will not be able to provide any spectroscopy of these new objects. BU will use Flexi and the DCT to capitalize on the LSST discoveries by performing an optical and near-infrared survey of the spectra of the LSST objects that can be observed from Arizona (approximately a one-third overlap). The BU-DCT survey will provide enormous added value to the LSST survey and, in particular, will contribute substantially to pure "discovery science" through

time-domain spectroscopy (a key priority that emerged from the most recent Decadal Survey of Astronomy, Astro2010).

One BU: A Connected University

In 2006, BU's Strategic Planning Coordinating Task Force laid out the foundation for a movement of BU from a position of "prominence" to a position of "preeminence". The report, entitled *One BU*, encourages a change in culture and philosophy that has already had impact within the university. The report states that BU "should adopt a new, inclusive, integrated, and interconnected view of Boston University and its academic mission: a culture and philosophy of One BU". One of the aims of this conscious choice to change the culture and philosophy of BU is the cultivation of "cooperative work across departments, Colleges and Schools, and administrative boundaries in order to eliminate disconnected pockets of activity and bureaucratic barriers to broad interdisciplinary study and research by students and faculty". At the moment, the choice to work as much as possible as a whole, and to foster interdisciplinary activity, is probably most visible to the outside community through BU's new University Honors College. Students began enrolling in this new program in Fall 2010, and over the course of their undergraduate careers Honors College students will develop programs of study for themselves that are highly-interdisciplinary, with a focus on what it truly means to engage in research. Honors College students will learn what constitutes "research" in their own discipline, but they will also be exposed to what constitutes "research" in other, vastly different disciplines (e.g., humanities, social science, and physical science). Becoming a major partner in the DCT offers the BU astronomers the opportunity to forge numerous, productive cross-college bonds with our colleagues in the greater University community. In fact, BU astronomers can find no better way to foster interdisciplinary work, and support the philosophy of One BU, than to become a major partner in the DCT.

A copy of the original One BU report can be found at:

http://www.bu.edu/strategicreport/report/

and a copy of the current BU strategic plan can be found at:

http://www.bu.edu/president/strategic-plan/

BU School of Education (SED) Collaboration

Prof. Don DeRosa (SED) is interested in collaborating with the BU and Lowell astronomers to expand and deepen the already outstanding outreach program that Lowell astronomers engage in with the Navajo and Hopi tribes of Arizona. Prof. DeRosa and his graduate students would work to develop the curriculum along the lines of a truly integrative approach to all sciences, which is the standard that is being adopted throughout US classrooms. The BU astronomers are excited to help out with the necessary manpower to run the outreach

program in Arizona, and will plan classroom visits around their observing runs at the DCT.

In addition, Prof. DeRosa and the BU astronomers would be very interested in assisting Lowell Observatory with a web-based distance learning system that would be hosted by the Lowell web-server. Here we would not try to be a complete "clearing house" for all of astronomy; rather we would focus in depth on topics for which Lowell is well-known and is particularly active with the DCT.

Locally, Prof. DeRosa, his students, and the BU astronomers want to bring Lowell's outreach program to the greater Boston area. In the long run, we wish to have a presence in the classroom, pairing "sister schools" in Arizona with ones in the greater Boston area (the Haitian magnet school in Cambridge, MA is one possibility). However, given the realities of overly-busy classroom schedules, we intend to begin by offering summer astronomy-based outreach programs at BU. As currently envisioned, the summer program will include a strong science-based curriculum, but will also have a substantial social studies component that focuses on "How other cultures see the sky". The latter is meant to tie in with the superb, and sensitive, inclusion of traditional Native American tribal knowledge in Lowell's existing outreach program.

The Dean of SED (Prof. Hardin Coleman) has expressed a keen interest in seeing this expanded outreach go forward, and he has stated that, if it does go forward, it is entirely likely that the next faculty hire in SED will be a math and science educator.

BU College of Communications (COM) Collaboration

Professors Ellen Shell and Doug Starr (COM) are interested in having students produce documentaries that center around the BU-Lowell Partnership, starting with the theme of "The Telescope as a Tool for Social Change". They hope to first document the expansion of the Lowell outreach program to the Navajo and Hopi tribes, and its resulting impact. Once we establish a classroom presence in the greater Boston area, they are also interested in documenting the interactions of the sister schools, both in the realm of science and in the realm of social studies.

Profs. Shell and Starr acknowledge that astronomy is one of the two top science interests of the general public (the other being early hominids) and are interested in having their students produce documentaries of particular discoveries and long-term research efforts at the DCT. Their primary focus is film, but given BU's close connection to National Public Radio (WBUR), they would also be interested in having students produce audio content that could air on, say, NPR's "Living on Earth" program.

In addition, as Lowell Observatory goes ahead with renovation of their Visitor Center, Profs. Shell and Starr expect that BU COM students would be interested in producing short educational films that could become an important part of the new displays in the Visitor Center.