Introducing Data Analysis in the University System

Summary for Website

Copperbelt University is primarily a teaching university in the Copperbelt region of Zambia. As with universities everywhere and in tune with the Government understanding that research is necessary for the country's development, they are actively trying to improve their research productivity. My proposal was to use astronomy to provide a path to implementing a research culture in the students and the faculty. I spent one month in the Physics Department and conducted a workshop for the students and informal tutorials for the faculty. The workshop was well attended and the students were enthusiastic; however, a single visit of one month is not sufficient to ensure sustainability.

I have been in discussions with the funding agencies to support more programs including an exchange of students and faculty. This is particularly relevant in the context of Zambia's participation in the Square Kilometre Array (SKA). SKA is a frontier instrument which will produce a wealth of high quality data that the country is not prepared for. It is my hope that we can build a framework to benefit both communities.

Proposed Goals

There is a wealth of astronomical data that is freely available but requires expertise to understand and analyze. This is particularly relevant with SKA where one has to build the community before the instrument is available. Much of the most exciting science from any telescope is done early in its existence and there should be qualified people poised to take advantage of the opportunity. This is certainly recognized by the Zambian government and the scientific community.

Given my expertise in astronomical data analysis—albeit in the ultraviolet—I had proposed to help build a group in Copperbelt University to begin analysis. In order to build a long-term partnership, I had planned to make several trips over the period of the year so that progress could be made on each trip. However, I was only awarded about 40% of my original request and I modified my trip to make a single visit of one month. In retrospect, the original plan of several visits was not realistic and would not have led to significantly more progress.

Achievements

- I was able to introduce the students to GDL (GnuDataLanguage) and many of them learnt enough to proceed further, if they choose and they have the opportunity.
- I also showed the faculty the basics of data analysis and where to get data from.
- We discussed and designed a curriculum for an MSc program in astronomy, modified from an
existing syllabus used in India.

- We will work out a mechanism for joint supervision of students. They will work in Copperbelt University but will have guides from India.
- We visited the University of Zambia (UNZA). The response was very positive there and we will work out further activities. One possibility is a dedicated two week camp dedicated to data analysis.
- We met senior officials at the Department of Science and Technology and at the NSTC. They expressed their support for a collaboration. I have put them in touch with the Indian Department of Science and Technology and hope that links will develop.

**Challenges**

- Copperbelt University is an undergraduate teaching institute and is not set up to make research activities easy, although they understand the importance. The economy is depressed and it will not be easy for them to devote the resources necessary to build an active research community. It is difficult for a teaching college to become a research university. Because of the importance of teaching, it is difficult to find free time for the faculty to become involved in research.
- Infrastructure is still lacking in the University although they do plan to improve. I had intended a dedicated one week program in data analysis but there were not enough computers to do that. Instead, I lectured for two days and then took them to the computer lab for two days. I did not have reliable internet access for the entirety of my visit.
- Clearly, a more sustained interaction is needed with both UNZA and Copperbelt University involved. Funding will be required which means governmental involvement but I don't see a clear path there.

**Recommendations for OAD**

- This is a long-term project which will require relatively long stays in Zambia. Fortunately, my hotel in Kitwe was quite comfortable; however, the Commonwealth Guest House in UNZA was not. Personally, I had a difficult time in Kitwe because it is a small town where one needs a vehicle to go outside. Food was a problem because I am a vegetarian. Thus, although the referees rightly said that Copperbelt University should have given me local hospitality, that may have made my stay uncomfortable. The Kwacha had halved in value from the time was award was given to my arrival – otherwise, I would not have been able to manage within the allotted budget.
- One month is a long to stay but if I hadn't stayed that long, I would not have been able to accomplish much, particularly in meeting people. Many of the meetings happened at the last moment and could
only happen because of my flexibility. It would have been very useful if the OAD could have facilitated those meetings.

• Much of the progress was only because Prospery Simpemba, my local contact, was proactive despite his own busy schedule. I was unaware of the local conditions, which are significantly poorer than the colleges I normally work with in Bangalore. It would again have helped if the OAD had someone with expertise in arranging these visits to maximize the output and, even more so, local living conditions.

• Copperbelt University is a node for the OAD and is involved in the SKA. I did not see much effective interaction between any of the three bodies in my time at Kitwe. SKA is coming and they are not ready, either in Copperbelt or in UNZA.

**Future Plans**

• I would like very much to continue this program both in UNZA and in Copperbelt University, if funds can be found. I will explore this with both governments and with the OAD.

• Because of my trip, I am collaborating with one of my colleagues to write an open book on Data Analysis. We hope to finish this in the next few months.
Illustration 1: An introduction to IDL for students at Copperbelt University.

Illustration 2: More data analysis at Copperbelt University
Illustration 3: Students having lunch at Data Analysis Workshop in Copperbelt University

Illustration 4: NSTC meeting in Ndola
Illustration 5: Physics Department seminar at UNZA