CIAO in India

Antonella Fruscione, for the CIAO team

"The Chandra X-ray Center (CXC) offers a series of workshops aimed at helping users to work with the Chandra Interactive Analysis of Observations (CIAO) software.[...]

If you are planning your own CIAO workshop and would like to request support from the CXC, please submit the relevant details to the Helpdesk. Proposals will be considered on a case-by-case basis."

Figure 1: Workshop students came from all corners of India.

This is the statement on the *CXC CIAO workshop page.* And this is what led Dr. Dharam Vir Lal, from the *National Centre for Radio Astrophysics* in Pune (India) to contact the *CXC* requesting help to organize a CIAO workshop at his institution.

Dr. Lal is himself an alumnus of one of the first CIAO workshops at the CfA. A few months and several logistical hurdles later, four *CXC* scientists left for India where forty students were eagerly awaiting to learn all about *Chandra*, X-ray astronomy and how to perform data analysis using CIAO. A group of *CXC* members in Cambridge was ready to support the workshop remotely, both with talks and support during the hands-on sessions, despite the ten-and-a-half hour time difference between Cambridge and Pune. The workshop lasted five days from the 23rd to the 27th of October 2017 and was hosted by the National Centre for Radio Astrophysics of the Tata Institute for Fundamental Research (NCRA-TIFR). The days were filled with talks (given on site and remotely from Cambridge), food, hands-on sessions, food and, did I mention, food?

The workshop was mainly aimed at students and post-docs new to X-ray and *Chandra* data. Talks covered a broad range of topics from an introduction to *Chandra*, X-ray data analysis, *Chandra* calibration, and CIAO, to more specific talks about X-ray imaging, spectroscopy, timing, statistics, modeling and fitting. The *full program* shows the breath of subjects that were covered. The majority of the participants were graduate students and postdocs coming from all over India, with the addition of a few local radio astronomers–NCRA is home to the Giant Metrewave Radio Telescope–interested in learning more about the X-ray band to complement their own radio data. All the students showed themselves to be extremely interested and engaged and, except for a small fraction who already had some experience with X-ray data analysis and had their own data to work on, followed a set of propaedeutic exercises aiming at teaching the basics of X-ray data analysis with CIAO.

As is often the case during CIAO workshops, the learning process was not unidirectional; watching the students learn and search for information, and interact with the soft-ware, always provides insight for the CIAO team on where improvements are needed in terms of documentation and tools. It is so easy to believe that everything in the documentation is spelled out in the clearest way until a beginner tries to follow the instructions! Furthermore, by being physically present at the institute in India, we learned first hand just how much laptop setups can vary and how the absence of infrastructure that we take for granted (large bandwidth, latest and greatest laptops, uniform operating systems) can make using our software and documentation difficult. The experience highlights the need for software that addresses such environments. To overcome some of the connectivity problems the CIAO team brought the entire *Chandra* archive on a portable hard drive–all the X-ray photons detected by *Chandra* fit in less than 4Tb!– plus we had all the tar files needed for CIAO and CALDB installation on several flash drives, and we pointed the students to tools like download_obsid_caldb which performs a partial download of the *Chandra* Calibration Database (CALDB) and only downloads the files required for the analysis of a specific observation (OBSID). This tool tries to overcome the fact that the file size of the *Chandra* CALDB has become prohibitive for certain users on slow internet connections and those with limited free disk space. We also made use of the capability to download the entire CIAO website on a local laptop as explained in the *Download the CIAO website* thread.

The workshop logistics were entirely organized by NCRA-TIFR who did a fantastic job advertising the workshop all over India, inviting students whom they knew would be

Figure 2: Workshop participants. See *http://cxc.cfa.harvard.edu/ciao/workshop/oct17_pune/* for complete workshop information.

particularly interested (for example because of their involvement with the Indian X-ray mission *ASTROSAT*) and selecting students from the many applicants. The workshop had no registration fee and all the students were provided room and board and some reimbursement toward travel expenses. Dr. Vir Lal of course took care of us from the time we landed in India to the time we left!

On the last day a "feedback session" was held between Dr. Vir Lal and the students (no CIAO team present!). The feedback for the CIAO team was extremely positive with the only request being the wish that the workshop were longer with more hands-on time and more in depth coverage of some subjects (e.g., psf simulation, Sherpa 2D modeling, timing).

Here is an excerpt of some of the most rewarding comments:

Did the participants get enough help/support during hands-on sessions?

Yes! In fact much more than what they asked for. It did not matter if the question was stupid or sensible, the CIAO people answered everything that was asked, they were not in a hurry and answered with patience.

Would your recommend this workshop to your friends/ colleagues?

Yes! In fact one participant even shared that a colleague of his would also have benefited by coming. All said they would share the workshop website, their experiences with friends and colleagues in their home institution.

What about the CIAO documentation?

They found whatsoever they were looking for easily as well!

Maybe more examples on gallery (ciao/sherpa/chips) would be helpful.

Any general comment?

Everyone appreciated this effort! A complete new workshop, which was never conducted earlier. They especially appreciated the efforts of Nick [Lee] and Kenny [Glotfelty], who stayed awake at odd hours, fixed typos immediately, kept the workshop website updated with presentations, fixed issues pertaining to CIAO installations on Linux and anything else which was asked of them.
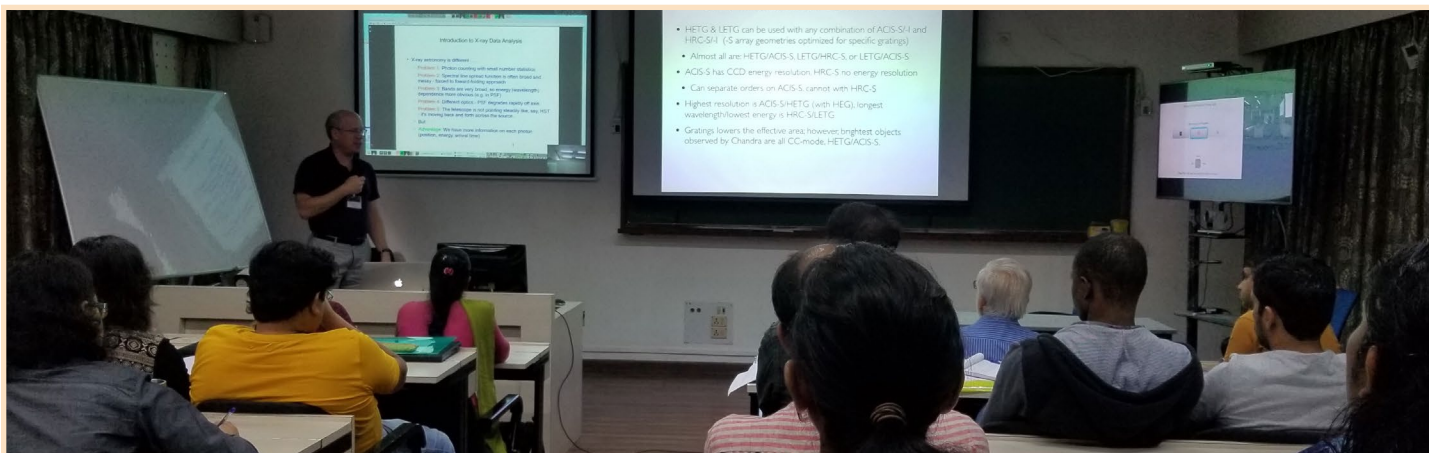

Figure 3: Workshop in progress

To read the entire Newsletter, please visit *http://cxc.harvard.edu/newsletters/*

Figure 4: Mike Nowak (MIT), Antonella Fruscione, Rodolfo Montez, Vinay Kashyap (SAO) ready for the workshop banquet

From Dr. Lal

"Many many thanks to the Chandra X-ray Center teams of CfA and MIT to conduct an excellent Chandra/CIAO workshop at the NCRA-TIFR. We at NCRA-TIFR thank you and your team members for taking time to help and provide support, more importantly your patience and perseverance to conduct and to make this workshop a successful one. The participants have really appreciated the efforts and they have (hopefully, at least they claim so!) learnt a great deal and hence the future looks bright!"

Word is spreading about this first off-site *Chandra* workshop. Where is CIAO going to land next? ∎

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