

Travelling Telescope Expert Exchange Report

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I arrived in Kenya on the 11th of September, and got to work right away. Over the next 39 days, I experienced the full range of the work that the Travelling Telescope engages in, and assisted them in every aspect of their enterprise. Throughout the Exchange, I used my experience in science communication, data science and event organisation, as well as my technical background in astrophotography and stargazing using powerful telescopes.

During my stay, I helped with the running of shows in the Nairobi Planetarium. After initially observing the general setup and presentation of the shows displayed there, I began presenting parts of the shows myself. These included live presentations of the night sky, how to navigate using it, and our solar system and the objects in it. Once comfortable with these aspects of the show, I began running the narrated shows too. These were on topics such as the high energy universe, black holes, and life as an astronaut in the ISS. At the end of these shows, I would answer questions posed by members of the audience which included children and adults alike. With my help, the length of the shows was able to be increased for the visitors, and the workload for the planetarium operator was halved.

The Travelling Telescope has a number of partnerships with schools both inside and outside of Nairobi. These include both boarding and non-residential schools, as well both unisex and mixed schools. These sessions are either night-time stargazing sessions or day time sessions in their mobile, inflatable planetarium. I assisted with both of these sessions, giving guided tours of the equatorial night sky for the kids, and presenting engaging lessons in the mobile planetarium.

In addition to this, I visited Pembroke House, a British boarding school in Gilgil, and represented the travelling telescope. I used equipment provided by both the school and the Travelling Telescope to give multiple classes a day teaching science, astronomy, music, and the ethos of the Travelling Telescope to kids ranging between 2 and 13 years old. My stay at the school lasted 8 days.

One of my key contributions during my short time with the Travelling Telescope was in the lead up, observation, and aftermath of NASA's DART mission; the first legitimate test of planetary defence, where a spacecraft was intentionally crashed into an asteroid in order to observe the resulting change in its trajectory. I was tasked with evaluating the capabilities of two sensitive CCD cameras, one of which was thermally cooled. The cameras were the SBIG ST9-XE and a Point Grey Chameleon CMLN-13S2M. On top of becoming proficient at the associated computer software to run these cameras (IDS and CCDOPS), I performed observational tests and evaluated that both would give us the capability to observe Dimorphos before and especially after the impact.

Another vital element to this endeavour was ensuring that our telescopes had smooth and reliable tracking. To achieve this, I helped the team add counterweights to their 8 inch newtonian on a tracking EQ5 mount, and to dismantle and relubricate their larger, 12 inch newtonian on a tracking alt/az mount. This resulted in a much better track, giving us a superior chance at a successful observation. See pictures attached.

Up to date and precise data on the asteroid was required, and so for this reason, we were invited to join the official DART science team meetings, to share how we would be sharing our work with the public, and communicating the science of the mission. Following a few moderately successful nights of testing our telescopes and new cameras, we travelled to Laikipia, a remote location about 4 hours drive outside Nairobi. Here, we set up our equipment and prepared to attempt to observe the impact. On that evening, our team was interviewed by the BBC on what we were attempting to do, the reason we chose such an exotic location etc. The day after this, we visited a nearby girls boarding school called Daraja and as well as showing them the beautiful African night sky, spoke with them about what we had done the night before, and the significance of the DART mission.

In the early hours of the 27th of September, we successfully observed the DART impact with 2 out of 3 of our telescopes. We observed a dramatic brightening, and a large cloud of ejecta spread through the Didymos system. See timelapse below as well as our delighted reaction to it. Over the following days, I used the Astropy Python package to convert the data we collected into a more useful form, such that we could create time-lapses and enhance its quality in post-processing.

Due to intermittent power outages in Nairobi and the surrounding areas, the Travelling Telescope required a backup source of power. I assisted with the cleaning and installation of 2 spare solar panels. I also helped with the repair of the mobile, inflatable planetarium, which had a rip that needed to be fixed. Furthermore, I attended a number of meetings between the Travelling telescope C suite and prospective customers which included schools and hotel chains around Kenya.

Towards the end of my stay in Nairobi, I took part in the monthly Star Safari experience, an all inclusive camping and stargazing experience on the outskirts of Nairobi. Here I talked about the DART mission, and also my research with the Armagh Observatory and Planetarium on measuring the distances to galaxies. I also assisted with the setup and use of the telescopes throughout the night, to maximise their usefulness and the visitors viewing ability. On this night, we were able to observe the moon, Saturn, Jupiter(which was in opposition) the spiral arm of the Milky way, as well as some deep sky objects such as the Orion and the Eagle nebulae.

In summary, I and the Travelling Telescope team firmly believe that my help was of direct benefit to them and their enterprise: both in the practical day to day running of their income streams, and in the expanding of the depth and breadth of their knowledge on telescopes, projectors and the latest research on extragalactic astronomy.

I was able to use my experience in science communication to inspire kids and to encourage them to ask questions about the world around them. I shared my technical experience and skills in programming in order to help them process similar data sets in future.

We would like to thank Europlanet for accepting us into their Expert Exchange program. Without Europlanet's help, this experience would not have been possible and both sides may have lost out on potential gains. With my help, the Travelling Telescope was able to grow into not just an outreach organisation, but in the direction of becoming a real scientific observational team. They were able to reach more people, and to share the wonders of our universe with them. Please enjoy some photos from my stay below.

Photos



















