

The Flying Telescope: How to Reach Remote Areas in the Colombian Andes for Astronomy Outreach

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The project Cielo y Tierra, Spanish for Sky and Earth, was undertaken in order to bring astronomy and ecology to remote villages throughout Colombia using sustainable transport. This transport included three horses and two paragliders. The innovative approach of the expedition helped to keep an extremely low budget whilst making it possible to cross the Colombian Andes from northeast to southwest. This article will show how projects like these can succeed, the need for this kind of project, and the possible impact, with this project reaching more than 1500 people. We hope to encourage others not to be afraid of going into countries like Colombia on a low-budget educational expedition. The success of this project shows that outreach and education projects are possible in these remote areas where little or no governmental or other support reaches.

Introduction

What happens when you combine astronomy, ecology, long distance horse trekking and cross country paragliding and undertake a 1000-kilometre journey through Colombia? Cielo y Tierra is the result of this experiment.

To our knowledge, it is the first expedition to bring telescope observations and small educational activities to villages via horse and paraglider instead of using expensive four wheel drives to reach these remote areas. The primary aim of this first expedition was not only to teach factual astronomy but also to excite people, in particular children, and encourage them to explore, discover and keep studying, while at the same time raising awareness of the uniqueness of our planet and the need to care for it.

Transport and equipment

To achieve our aims we decided to use sustainable means of transport: horse and paraglider. This combination is not only very low-budget, but also allows us to bring the necessary materials for our workshops and observations while minimising the weight on the horses because as soon as conditions allowed, one of us covered the daily distance with the paraglider while the other advanced with the three horses and our luggage. We carried two telescopes with us, a LightBridge Mini

82 for night-sky and especially lunar observations and a Coronado PST for daytime solar observations, both donated by the company Meade Instruments.

We also had to think carefully about the other materials we brought as electronic equipment, like computers and projectors, was normally not available in the villages we visited. We carried an inflatable solar system, magnifying glasses, a lunar puzzle, many different posters and of course play dough, string and other arts and craft materials.

Partnership

Before the expedition we were in touch with only four local collaborators in different major cities in Colombia; Bucaramanga, Tunja, Sopo and Medellín. However, each of them had a network of friends around the country who helped us to plan the route. Whilst useful, an exact plan and direct contacts at the village you plan to visit are not always possible, especially for very small villages with no internet connection. In these cases it is best to arrive in the village sometime in the late afternoon, make contact with the school's headteacher and organise the activities for the next morning.

The location

Colombia lies at the northwest of the South American continent. It has an extremely large variety of flora and fauna since its geology reaches from sea level up to more than 5000 metres in the Andean mountains. Horses are a strong part of Andean culture and the Andes offer some of the best paragliding conditions in the world. The reason for choosing Colombia for this project is that there still exists a huge gap between the urban and rural areas in respect of wealth and education.

While cities like Bogotá and Medellín have benefited from a number of astronomy outreach activities, such as Galileo Mobile, in recent years, remote locations in the countryside are usually not part of such initiatives. These regions suffer from a lack of resources in schools and are neglected by NGOs and government development programmes. This leads to large drop-out rates at the primary school level in these areas and a lower level of literacy in rural areas compared to urban areas (González & López; Unicef; WIN/Gallup International Association). This problem is not unique to Colombia. In the entirety of Latin America (and the Caribbean), about 35 million children between three and eighteen years old are not attending school, which is a total almost equal to the population of Colombia¹. Instead, children start work extremely early or drift into the narcotics trafficking scene, because these are often

the only possibilities they perceive and a higher education is not seen as an option.

The expedition

Over two months we travelled more than 1000 kilometres, from Bucaramanga to Cali, through remote terrain, and we offered workshops, observations and small experiments in almost thirty different schools, associations and village squares. Figure 1 shows the approximate route and locations. We started in the north and went by horse and paraglider (Figures 2 and 3) until close to Bogotá where we sold the horses and crossed the Magdalena river valley by bus to continue on foot and by paraglider to Cali.

Often we met with the entire school of the village we passed through. In the most remote places, this could mean only twenty to thirty children, but in the slightly bigger villages, we had up to three hundred children to entertain for an entire day with ages ranging from pre-school up to the graduating high school class. We were also joined by adults during the public observations and everyone, no matter what their age, was fascinated by the telescopes. During the day, we observed with a Coronado PST and during the night with a LightBride Mini, both generously donated by Meade Instruments. We still receive messages, mainly via our Facebook page⁴ or email, like “You really changed my perception of the world.” This is what makes it worth all the effort — and a lot of effort was needed.

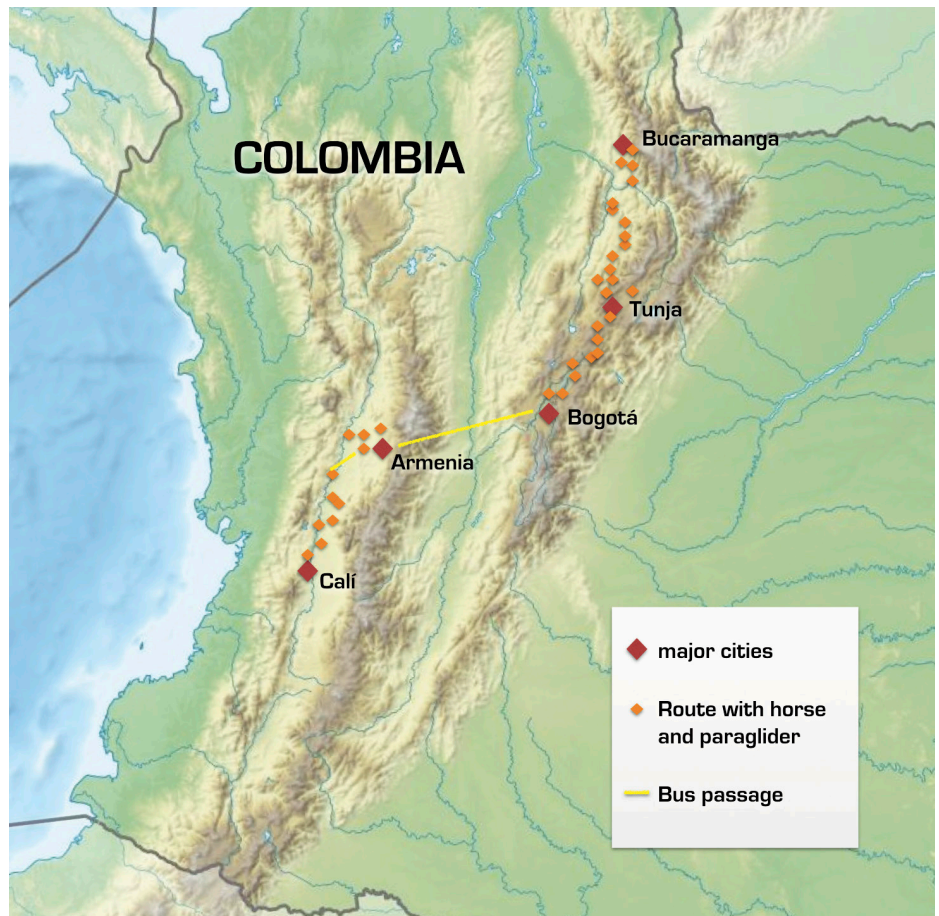


Figure 1. The route of the expedition on the map of Colombia. The starting point was Bucaramanga in the north and we then proceeded southwards to Bogotá and then from Armenia towards Cali. Credit: Marja Seidel

Apart from the challenging logistics of traveling to remote villages in Colombia, the El Niño phenomenon also caused severe droughts and thus did not ease our travel.

Workshops

The workshops were intended to incite dialogue, curiosity and the joy of exploration. But how to achieve this, the more so in



Figure 2. Travelling with the two horses and the mule through the valley of a canyon between two mountain ranges, north of Tunja. Sometimes paths were too steep to even ride the horses. Credit: Marja Seidel



Figure 3. Travelling with the paraglider (and the telescope in the backpack of the harness). Credit: Marja Seidel



Figure 4. Wrap up of the day of activities. Each participant tells us what he or she learned, was surprised by the most, and particularly enjoyed. This reflection on what has been learned is really helpful for the children to memorise what we have done with them and is a nice end to the day. Credit: Ricardo Gómez.



Figure 5. Solar observations with the Coronado P.S.T. from Meade. Credit: Marja Seidel

remote areas? In fact, it was far less complicated than one would expect. As soon as we arrived in a village, we would start talking to the inhabitants and ask for the local school teachers. Everyone always welcomed us really warmly and since these rural areas have normally never received support or international visits of any kind we were met with excitement. Arriving in the afternoon we would usually meet the school coordinator at home and plan activities for the next morning. So, early in the morning on the following day, we usually spent several hours with the entire local school on a central village square.

We brought an inflatable Solar System to teach about other planets. We had a large panel of different questions we could address with the help of our inflatable Solar System. Our goal was to provide a workshop different from their everyday school routine. We did not want to present information but rather motivate the children to learn and awaken their interest. In order to achieve this goal, our workshops did not follow a strict learning scheme but helped the attendees realise, understand and wonder about our unique planet and its place in the Universe.

We usually started with a simple question, such as “where is which planet in our Solar System?” and the attendees’ interests then dictated the further course of the activity. The workshop attendees then tried to reconstruct the Solar System. During this interactive workshop, we discussed each planet, first assessing prior knowledge and then giving detailed information, as detailed as we judged suitable according to the age group.

We also estimated the true size of the Earth with them. We again used our inflatable planets and started this activity by asking “Do you think this model of the Solar System is to scale? If the Sun was this size, who thinks the Earth would be this big? Who thinks it would be smaller? Bigger?” Compared to our large model of the Sun, the Earth was no bigger than half of their little fingernail. The interactive voting helped us to capture the children’s attention and awaken their curiosity. They were part of the activity, wanted to know more and were amazed at the sizes and distances when we re-created the Solar System to scale using the play dough, realising that the entire village would be too small to reach Neptune.

We also discussed the Earth. Again we used our inflatable model Earth to first find out: “Where are we right now?” Colombia is the answer but it was often surprisingly difficult for the children, or even adults, to find the country on the model planet. There are no borders, no city names — it is the Earth as seen from space.

Another question related to the Earth’s colours. We talked about oceans, their abundance and the important role water plays in our survival. We discussed plants, their importance both for food and as climate regulators. Often we used this observation as a transition to an activity about plants, their morphology and their extraordinary capacity to transform carbon dioxide into oxygen. Of course this activity was adapted to the attendees’ age and ranged from the simple statement that we cannot survive without plants to complex photosynthesis diagrams that we had prepared on our posters with different stickers for them to complete the diagrams.

The workshops usually ended with the solar observations. Children and adults alike could not get enough of observing



Figure 6. Observing on the village square at night, everyone from police to children was equally amazed by the view of the Moon and planets through the LightBridge Mini 82. Credit: Marja Seidel

the red ball with the tiny filaments to its sides all made visible by the H-alpha (ionised hydrogen) filter on our Coronado telescope (Figure 5). Sometimes, even the Moon was visible in the afternoon and we could observe it with the LightBridge Mini (Figure 6). One child claimed: “I always wanted to be a soccer player, but I think astronomer is just so awesome!” Of course, we do not think that everyone will become an astronomer. The aim of this project was not to teach detailed astronomy or ecology knowledge, but to transmit the joy of discovering and exploring and the feeling that there is so much more out there.

Challenges

All the above are just brief outlines of our workshops, which are generally similar to those delivered by other outreach organisations such as some programmes from Astronomers without Borders² or Galileo mobile³. In all cases, the activities rarely follow a very strict outline but end up as a mix of different activities, led by the children’s questions and interests. The major difference between this project and previous expeditions delivered by the above-named groups is the means of transport. Using the horses created a much stronger bond between us as the organisers and the local population than would have been possible had we used a motorised vehicle, and the

paraglider always seemed to inspire people’s imaginations. Of course these were also major logistical challenges around finding a place for us and the horses to stay but we always managed and this also enabled us to forge direct bonds with the people we stayed with.

The other major difference between our project and most other astronomy outreach projects is the focus on really remote locations which sometimes were only accessible on foot, by horse or maybe by a cross-country motorbike. A minor, but also important, difference was that we were an entirely female team. The fact that we as women travelled alone and worked as scientists seemed to encourage in particular the girls and women we met. Having undertaken projects in mixed and female-only teams, we have observed numerous times that girls seem to show more curiosity and are less afraid of trying out an experiment when a female team was leading the activity. This setup does also create challenges though, especially in Colombia where at first men will not necessarily grant women the same respect. However, as soon as they realised that we knew what we were doing and did it well they would help and support our project with due respect.

Another challenge concerning the workshops could be the coordination of differ-

ent age groups. We sometimes split the children between us and often found one or two local helpers who we briefed before the activities and who helped us — usually these were the teachers themselves. We recommend talking to the teachers beforehand and giving them a rough walk through of the planned activities so that they can be part of the workshops. At the end of our activities we usually formed a circle and had each person explain what he or she had learned.

Towards the end of this project we had to sell the horses early. The drought was so severe that Colombia’s largest river was at the lowest point for fifty years. So we reduced our luggage drastically and crossed by bus towards Armenia and continued on foot and by paraglider. It was probably the first time that someone has flown with a telescope in a paragliding backpack, but it worked. Our glider fitted the small LightBridge Mini along with the inflatable Moon and Earth. We hiked and flew our way down the Cauca Valley towards Cali, still continuing to offer workshops and observations in the small villages we passed through. During these last days Colombia once more offered breathtaking night skies and we were lucky enough to observe Jupiter, Saturn and Mars together with the local people. The children loved to play with our green laser pointer. Of course, safety measures are really important here, but the children seemed sometimes to understand better than the older people. Together, we invented new constellations and let them tell their stories, while trying to find answers to all their questions.

Conclusion

Unfortunately, we could not stay much longer than one or two days in each place, but we always took contact information from teachers and older students in order to remain in touch, typically over Facebook or Email, although sometimes they only had a local phone number. We hope that out of the more than 1500 people we met during the expedition, some have really become curious and will follow their dreams and pursue higher education. We also hope that projects like this continue and that we will not only reach the big cities, but really go where no other outreach is done.

Finally, we are so thankful for all the support during this trip: Meade Instruments for the two amazing telescopes which survived all this travel; Skywalk for paragliders that carried us about 400 km during this expedition; GoPro for a great camera capturing some of the extraordinary moments and Paula Iglesias and Ana Serna from Al Borde films who came along with proper equipment to film part of the journey; GPS live tracking and Spot for the live tracking and hence our parents' health; Salewa for good helmets and clothing; Petzl for giving us lights; Le Bip Bip for solar pads and instruments; and Colombia paragliding, Leito Rey and Ricardo Gómez for the local support in the country.

We would be extremely happy to tell you more about this educational outreach adventure and about what we learned, so please contact us via our webpage⁹ where you can also find updates on forthcoming projects and on the documentary that we are developing with Al Borde films about the Cielo y Tierra expedition.

Notes

- 1 Full education statistics for Colombia: www.unicef.org/infobycountry/colombia_statistics.html
- 2 Astronomers without Borders: <http://astronomerswithoutborders.org>
- 3 Galileo mobile: <http://galileomobile.astro.ufsc.br>
- 4 Project Facebook: www.facebook.com/cieloytierra.project
- 5 Project webpage: www.cieloytierra-project.com

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Biographies

Marja K. Seidel is an astrophysicist and currently works at the Carnegie Observatories, Pasadena, USA. She is an expert in integral field spectroscopy and uses both kinematics and stellar populations to better understand the multitude of galaxies that we find in today's Universe. Apart from her research, she is a dedicated science communicator in world-wide outreach events and expeditions.

Kira Buelhoff is both an environmental biologist with a special interest in alpine and arctic ecosystems and a nature guide. When she is not studying ecosystems or doing outreach projects, she guides hiking tours on glaciers and in the mountains.

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