*Astronomy for Equity, Diversity and Inclusion*
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# A multicultural constellation viewfinder

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**Abstract.** Teaching astronomy can be a great challenge, especially when the audience is unfamiliar about space and science concepts. A useful approach to teach about the night sky are the constellations, a source of diverse shapes and amazing mythological stories. However, it is not always easy to provide tools to get familiar with those imaginary figures, especially when your audience is part of an underrepresented, underserved community. This presentation addresses this issue by presenting a simple but useful tool: a constellation viewfinder using simple technology, with a special addition: it focuses on some "local" constellations, in order to provide an inclusive way to understand the sky, acknowledging the cultural heritage, as a powerful inspiring resource for those audiences.

**Keywords.** Inclusive astronomy education, cultural heritage in astronomy, multicultural constellation tools.

## 1. Introduction

When we teach about the night sky, the standard way is to identify the current constellations, (i.e, from the 88 officially recognized by the IAU). This is not an easy task for the beginner, and many tools are helping to face this issue: printed and digital celestial spheres, stellar charts, online planispheres, laser pointers and more, normally used in astro-tourism. These resources are very useful and important, but then a new question arises: How to motivate and engage our audiences (especially those from underrepresented, underserved communities) to learn about these constellations? Considering that the official constellations have its origins in the Greek culture, some people can feel "distant" about them (especially in the Southern Hemisphere, seeing upside-down shapes) and therefore, they may need a more "local" approach. This was the main motivation to create a useful resource to address this issue.

## 2. Context

In Northern Chile, several professional observatories are studying the night sky. The Antofagasta region has seen an important increase of these facilities in the last 20 years, from important foreign institutions, such as ESO (Europe), AURA, NRAO (United States) and other North American or Asian institutions (e.g. NAOJ) placing optical or radio telescopes in this territory. This is a very important baseline to create educational efforts and raise awareness in our community about the importance of astronomy, with the added benefit of dark and clear skies. However, while working with students, the general public and different audiences, the author of this presentation have noticed a relevant factor in how easy or difficult is to capture certain concepts, especially during interactions with indigenous or descendants from ancient cultures (such as the Atacama people, atacameños, the originally inhabitants of the Antofagasta region): how familiar or distant they feel about them.

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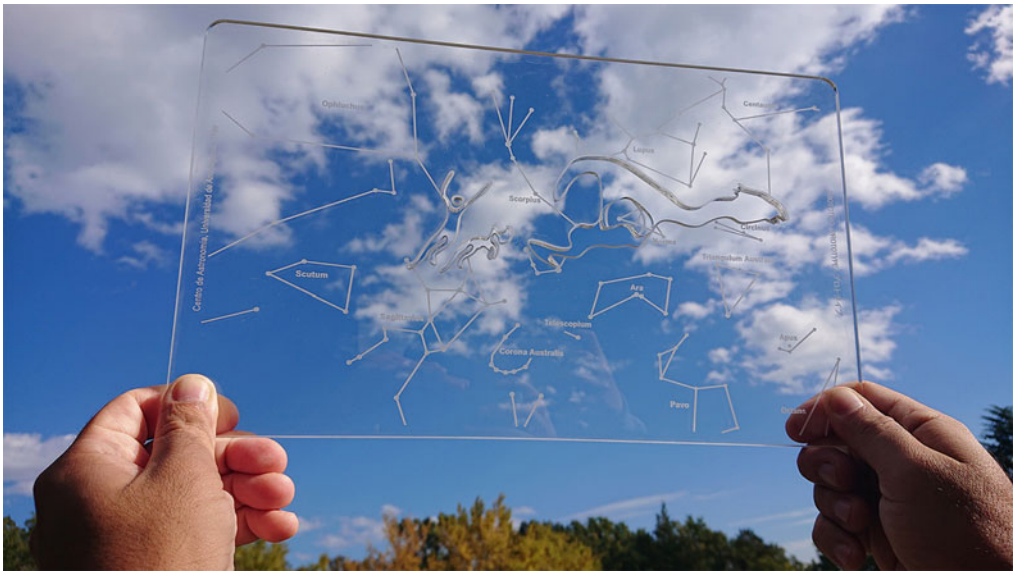



**Figure 1.** A prototype of a multicultural constellation viewfinder, made in acrylic.

Basically, and even with the advantage of enjoying clear skies, some audiences are a bit surprised when the official constellations are introduced, but it is not exactly about the Greek mythology or the upside-down shapes. Many South American indigenous cultures (including the atacameños) have been taught themselves about their own set of shapes, especially about the dark constellations: shapes not formed by "connecting dots" between the brighter stars, but using the dark spots in the sky (without stars) instead. The dark spots are mostly linked to the contrast between gas and dust in the Milky Way arms (such as the Galactic center), where some areas of the bright center, full of stars, is blocked by interstellar material. This different approach to the night sky is a distinctive feature from many cultures in South America, because this can be traced back to the Inca Empire, with strong presence between XIII-XVI centuries in at least six countries (Colombia, Ecuador, Perú, Bolivia, Argentina and Chile). Its (astronomical) influence, with some little variations, were the dark constellations, resembling familiar icons, such as local animals..

## 3. A multicultural approach

In order to face this issue, and therefore providing an inclusive way to teach about the night sky, the author developed a prototype tool with a multicultural approach in mind: a constellation viewfinder (A4 sized), similar to printed stellar charts, but made from a solid material (transparent acrylic) and using specific technology (laser cutter and engraver). This tool is used in a similar way than a stellar chart (comparing the constellation with the real sky), but this prototype includes some dark constellations (superimposed) in the viewfinder, therefore the user can "match" these shapes (accurate drillings) with the official constellations altogether (engraved). The result, as depicted in Fig. 1, is a reusable, durable and simple tool, with a unique and "custom" feature, enough versatile to be used as a teaching resource, but also a way to preserve our local heritage, and transmit a powerful message: we are all sharing the same sky. As a prototype, and meant to be versatile, the original design can be replaced by any other form. The official constellations (engraved) and dark counterparts (drilled) were drawn as vectors, therefore creating a SVG file, readable by many laser cutter/engravers in the market. The specific

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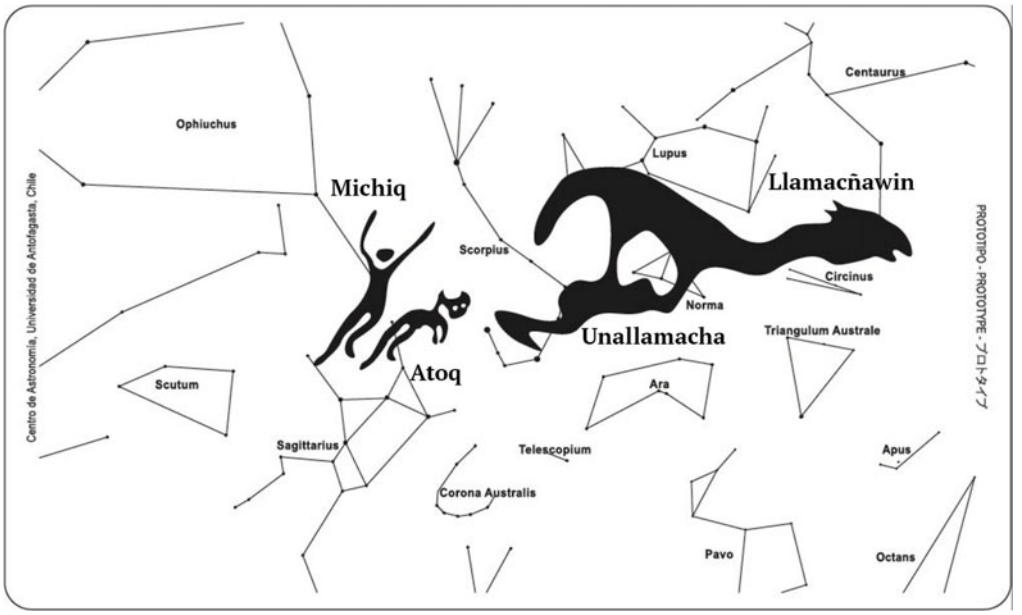



**Figure 2.** The dark constellations as depicted in the Prototype A (First design).

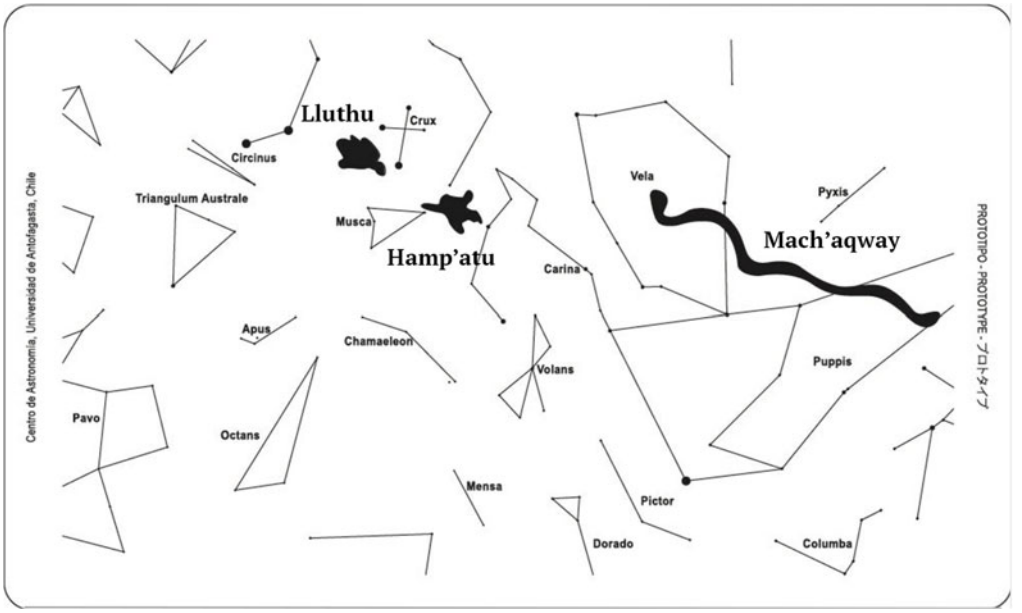



**Figure 3.** The dark constellations as depicted in the Prototype B (Second design).

model to create this tool was a FLUX Beambox Pro (priced USD 2000), but similar models can be found from USD 500, and therefore enough affordable for an Institute, a Center of Astronomy or educational institutions performing astronomy outreach.

## 4. The dark constellations of this prototype

This first prototype contain two designs (one of them presented during the IAUS358 Meeting). Prototype A (Fig. 2) depicts four dark constellations found in the Galactic

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center, next to the Scorpius and Sagittarius constellations, here named by its names in Quechua (the Inca language): Michiq (Sheperd), Atoq (Fox), Llamacñawin (Llama) and Unallamacha (Baby llama). Prototype B (Fig. 3) depicts three dark constellations next to the first ones: Lluthu (Partridge), Hamp'atu (Toad) and Mach'aqway (Serpent) Urton (1981). The shapes displayed in Prototype A can be observed from both hemispheres, while those portrayed in Prototype B, are only visible from the Southern hemisphere.

Each name has its own counterparts in the atacameño language, such as "Yakana" (Llama), but in order to present all shapes under a same parent culture (Incas), this document uses the language spoken by them. Thus, this prototype or a different version eventually used in a different South American country, is free to use the most common name within its community.

## 5. What needs can be addressed with this tool?

This resource, as presented in the current status, can be effectively used to address the following needs in inclusive astronomy education, in order to maximize our impact as educators:

(*a*) The need of didactic and versatile tool to help beginners and kids to recognize constellations, Kimura et al. (2008).
(*b*) A lack of tools addressing the "astronomical" heritage from ancient cultures in local communities, specifically in regions with strong presence of indigenous or descendants.

The main benefit of this tool, once addressed those needs, is the ability to teach about constellation with a regional focus, as well as understand the "dark constellation" concept. This can enrich a teacher's lesson by including elements of cultural heritage, providing an interactive way to observe the night sky, and finally, take advantage of a technology with several other applications.

## 6. Conclusions

This presentation was inspired by a challenge. One of the greater challenges of an astronomy educator, especially when it comes about introducing the night sky, is the ability to raise awareness and engage your audience. Many communities, with more or less presence of indigenous or descendants from ancient people, have a valuable cultural heritage, with more or less approaches to astronomy. Some remarkable examples can be found worldwide, including the Navajo Universe United States), the Tupi-Guaraní sky shapes (Brazil, Paraguay) or the Yokai, supernatural creatures depicted in the heavens (Japan).

In all cases, being considerate of those approaches and its worldview is always appreciated as a sign of respect, and educators can offer a more comprehensive way to understand the night sky, and how it amazed to our ancestors.

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