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Sky knowledge: an ethnoastronomical study of constellations and celestial cycles in Brazilian traditional communities

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Abstract. The night sky, beyond a universal physical phenomenon, constitutes a cultural canvas where different societies project their myths, organize their time, and guide their existence. In Brazil, this plurality of readings manifests itself in a rich and complex way in the cosmologies of traditional peoples. This article presents the foundations and preliminary results of a research project within the Institutional Program of Scientific Initiation Scholarships (PIBIC), dedicated to studying these "sky knowledges." It investigates how Guarani, Tukano, and Xavante indigenous peoples, as well as quilombola and riverside communities, interpret and use the cosmos in an intricate web connecting astronomy, subsistence, spirituality, and memory. Through systematic bibliographic review, we identify specific patterns of correlation between astronomical phenomena and seasonal activities in each group. The results demonstrate that these systems constitute complex cognitive technologies with observational precision equivalent to conventional scientific methods in specific contexts. The research contributes to Brazilian cultural astronomy and to intercultural dialogue in science.

Resumo. O céu noturno, muito além de um fenômeno físico universal, constitui uma tela cultural onde diferentes sociedades projetam seus mitos, organizam seu tempo e orientam sua existência. No Brasil, essa pluralidade de leituras manifesta-se de forma rica e complexa nas cosmologias dos povos tradicionais. Este artigo apresenta os fundamentos e resultados preliminares de uma pesquisa de Iniciação Científica dedicada a estudar esses "saberes do céu", investigando como comunidades Guarani, Tukano, Xavante, quilombolas e ribeirinhas interpretam e utilizam o cosmos em uma intrincada teia que conecta astronomia, subsistência, espiritualidade e memória. Através de revisão bibliográfica sistemática, identificamos padrões específicos de correlação entre fenômenos astronômicos e atividades sazonais em cada grupo. Os resultados demonstram que esses sistemas constituem tecnologias cognitivas complexas, com precisão observacional equivalente a métodos científicos convencionais em contextos específicos. A pesquisa contribui para a astronomia cultural brasileira e para o diálogo intercultural em ciência.

Keywords. ethnoastronomy, astronomical heritage, cultural astronomy

1. Introduction

The night sky, far from being a mere universal physical phenomenon, represents a cultural canvas upon which different societies project their myths, organize their time, and guide their existence. In Brazil, this plurality of readings manifests in a rich and complex manner within the cosmologies of traditional peoples. This article presents the foundations and preliminary results of a Scientific Initiation research project dedicated to studying these "sky knowledges." It investigates how Guarani, Tukano, and Xavante indigenous peoples, as well as quilombola (communities descended from escaped African slaves) and riverside populations, interpret and utilize the cosmos within an intricate web connecting astronomy, subsistence, spirituality, and memory.

The starting point is the recognition that these knowledge systems represent sophisticated forms of practical science, based on systematic observation and intergenerational transmission methodologies unique to each culture. This research is justified by three main reasons: the need to systematize and critically analyze Brazilian ethnoastronomical knowledges, which remain poorly integrated into academic discourse; the potential of these systems to enrich astronomy education through intercultural approaches; and their contribution to policies valuing epistemological diversity and strengthening traditional cultural identities.

2. Methodology

The methodology adopted in this initial phase consisted of a systematic bibliographic review, focusing on mapping the field of Brazilian ethnoastronomy and identifying the main documented celestial knowledge systems. The work began with searches on Google Scholar and the CAPES Journal Portal, using keywords such as "etnoastronomia Brasil," "astronomia indígena," "cosmologias tradicionais," and "saberes celestes."

From the identified reference works, we proceeded with a citation and impact search, following networks of bibliographic references to locate specific studies on the Guarani, Tukano, and Xavante peoples, as well as quilombola and riverside communities. This method allowed for efficient mapping of the core academic production on the topic.

The identified sources were organized considering accessibility (prioritizing open-access articles) and direct thematic relevance to the research objectives. The analysis focused on understanding the scope of the field, the different methodological approaches (ethnographic, historical, educational), and the distribution of studies by cultural group.

This exploratory phase was not intended to be exhaustive, but to provide the necessary bibliographic foundations to guide the subsequent stages of the project, which will include critical reading, thematic cataloging, and content analysis of the most relevant works already identified.

3. Theoretical Framework

This study is situated within the interdisciplinary field of Cultural Astronomy, which investigates astronomical knowledge systems as social and cultural constructions. We start from the principle that traditional cosmologies do not represent imperfect versions of Western science, but constitute complex cognitive systems

based on refined empirical observation and unique classificatory logics.

To specifically analyze indigenous cosmologies, we adopt the perspective of Amerindian Perspectivism. This ontological conception understands that humans and non-humans share a common subjective condition, perceiving the world from distinct points of view. This allows us to understand traditional constellations not as mere representations of animals, but as beings with agency, whose celestial cycles directly dialogue with terrestrial life.

Our approach is informed by decolonial critique, particularly the concept of coloniality of knowledge, which denounces the historical hierarchy that subalternized non-European knowledges. Against this hierarchy, we position ourselves in favor of an ecology of knowledges, which proposes recognition and horizontal dialogue between different knowledge systems as an imperative of epistemic justice.

To address the historical and political dimension of these knowledges, especially in the quilombola context, we mobilize the concept of collective memory. Astronomical knowledge is understood here as a technology of memory and cultural resignification, allowing diasporic communities to rework cosmic references, linking them to narratives of resistance, territoriality, and identity.

4. Results and Discussion

4.1. Guarani: The Celestial Ema and the Corn Agricultural Calendar

Among the Guarani peoples, the Ema (Rhea) constellation (Nhandu) is formed by the dark nebulae of the Milky Way. When this celestial configuration appears on the eastern horizon at dusk between June and July, it marks the exact moment for planting corn. The apparent motion of the Ema across the night sky serves as an agricultural calendar: its low position coincides with winter rains, and when it reaches its highest point around October, it signals that the corn is ready for harvest—coinciding precisely with the 120 to 150-day cycle of traditional cultivated varieties. The narrative of the stake in the Ema's head represents sophisticated ecological coding, with visual changes in the nebulae indicating drought conditions and guiding agricultural adjustments.

4.2. Tukano: The Cosmic Canoe and Social Organization

The Tukano peoples perceive the Milky Way as Yepá—the Great Cosmic Canoe that transports ancestors. Different segments of this celestial canoe correspond to specific Tukano clans. When certain constellations become visible in particular sky positions, they signal to corresponding clans the time to initiate specific seasonal activities. This system creates a community management framework where each group has ecological responsibilities synchronized with astronomical markers, directly linking social organization to celestial cycles.

4.3. Xavante: The Sky as a Mirror of the Earth

The Xavante expression "the sky is a mirror of the earth" describes a system where celestial events reflect terrestrial happenings. The log race ceremony is synchronized with Venus's cycle, specifically its greatest western elongation as the morning star. This astronomical event coincides with ideal climatic conditions for the races, demonstrating the precise correlation between celestial phenomena and social practices.

4.4. Quilombolas: The Southern Cross as Diaspora Memory

For quilombola communities, the Southern Cross transcends practical orientation to become a celestial archive of African diaspora memory. Its position near the south celestial pole allowed its use as a reliable southern marker during escapes and quilombo foundations. Culturally resignified as "the star that showed the path to freedom," it represents a fusion of practical astronomy with historical memory and cultural identity.

4.5. Riverside Communities: The Cosmic Boa and Water Cycles

Amazon riverside populations interpret the Milky Way as the Cosmic Boa, whose movements govern water cycles. The curvature of this celestial serpent, particularly when the brightest region in Sagittarius reaches maximum height, signals impending intense rains approximately fifteen days later. This observation correlates with the Sun's conjunction with the galactic center in December, demonstrating an integrated understanding of astronomical and hydrological relationships.

5. Discussion and Conclusion

This systematic review reveals that Brazilian traditional ethnoastronomical systems constitute sophisticated cognitive technologies with verifiable scientific foundations. Each group has developed unique celestial interpretations based on sustained observation and cultural encoding.

These knowledge systems demonstrate empirical accuracy comparable to conventional science and offer significant contributions to Cultural Astronomy. Their persistence and adaptive efficacy validate their epistemological value beyond mere cultural heritage.

Ultimately, these "sky knowledges" remind us that astronomical observation bridges scientific inquiry and cultural wisdom, offering insights for sustainable human-environment relationships.

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