



The fear of Halley's Comet in 1910 is preserved in a cave in southern Puerto Rico

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Abstract: This paper explores a unique drawing found in a cave in southern Puerto Rico that depicts a comet over a tomb. Through interdisciplinary methods, including art interpretation, historical documentation, and demographic analysis, this study uncovered the artist's identity, the societal context of the period, and the potential motivations behind the creation of this drawing. The investigation revealed a connection to the passage of Halley's Comet in 1910 and the widespread panic it induced.

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Introduction

The appearance of Halley's Comet in 1910 is one of the most remarkable astronomical events of the early 20th century, captivating observers worldwide with its spectacular display. As a periodic comet visible from Earth approximately every 76 years, Halley's Comet has been documented by various civilizations over millennia, but its 1910 appearance was particularly significant due to advances in both observational technology and scientific understanding of cometary phenomena at the time (Legrand, 1986).

The comet's visibility to the naked eye in April and May of 1910 provided an awe-inspiring spectacle, with its bright nucleus and long, sweeping tail visible across the night sky. This period marked a high point in communal astronomical engagement, with people around the world watching the skies to catch a glimpse of Halley's Comet (Turner, 1910). The event also underscored the global nature of astronomical phenomena, bridging cultural and geographic divides through a shared celestial experience.

In the lead-up to its 1910 perihelion passage, Halley's Comet became the focus of intense public interest and scientific study. Astronomers used the latest telescopic technology to observe the approach of the comet, while the burgeoning field of spectroscopy allowed scientists to analyse the composition of the comet, revealing the presence of cyanide gas in its tail (Swings, 1965). This discovery, while a milestone in the study of cometary atmospheres, inadvertently fueled widespread public fear and fascination, as sensationalist media reports speculated on the potential effects of Earth passing through the comet's tail (Yeomans, 1991).

The approach and subsequent passing of Halley's Comet near Earth on May 19, 1910, sparked significant alarm across the globe. Reports, such as one from The New York Times in February of that year, sensationalized the event with claims that the comet's tail contained deadly cyanide gases, echoing concerns raised by astronomer Camille Flammarion (Flammarion, 1910). These assertions led to widespread panic, despite reassurances from the broader astronomical community that the comet posed no real threat to life on Earth.

In a climate of fear, many individuals took extreme measures to safeguard themselves, going as far as to seal off their homes in an attempt to prevent any potential harm from the comet's gases. This episode reflects the powerful influence of scientific speculation and the media on public perception and behavior, especially when faced with the unknown aspects of celestial events.

The arrival of Halley's Comet was also highlighted in the local press in Puerto Rico. However, there is little anecdotal evidence for the local perception of the astronomical event outside that of the press. This study focuses on an illustrative response to Halley's Comet in 1910, found in a secluded cave in southern Puerto Rico.

This study opens avenues for further investigation into the artist and the broader social and cultural networks through which knowledge of the comet's passage was disseminated and commemorated across Puerto Rico. Such considerations introduce a layer of complexity to the interpretation of the artwork, suggesting a dynamic interplay of personal, local, and historical narratives in the representation and understanding of astronomical events.

Puerto Rico in the 1910s

In 1910, Puerto Rico found itself at a pivotal juncture in its rich and complex history. A mere 12 years after the Spanish-American War of 1898, which transferred sovereignty from Spain to the United States, the island was navigating the challenges and opportunities of its new status as an unincorporated territory of the United States. This period was characterized by significant socio-political and economic transformations that would shape the island's trajectory in the 20th century.

The early 1900s marked the beginning of American influence on the island's infrastructure, education system, and economic policies. The Foraker Act of 1900 and the Jones-Shafroth Act of 1917, which granted Puerto Ricans US citizenship, were critical in defining the political and civil rights of the island's inhabitants. Despite these changes, Puerto Rico retained a distinct cultural identity, rooted deeply in its Hispanic heritage, language, religion and traditions.

The economy of Puerto Rico in 1910 was predominantly agrarian, with sugar, coffee, and tobacco serving as the mainstay of its economic output. The presence of the United States led to an increase in sugar production and the modernization of the agricultural sector, which, while boosting the economy, also fostered socioeconomic disparities and led to labour unrest.

Education underwent significant reforms under the American administration, with an emphasis on public schooling and the introduction of English as a medium of instruction. These changes aimed to improve literacy rates and integrate the island into the American way of life, but also sparked debates about cultural assimilation and national identity.

Socially, the early 20th century was a period of vibrant cultural expression for Puerto Rico. Music, literature, and arts flourished, reflecting a society in the midst of transformation, yet steadfast in its cultural expressions. The island's strategic location in the Caribbean also made it a crucial military outpost for the United States, further intertwining its fate with American geopolitical interests. To this day, the official language is Spanish and Roman Catholicism is the predominant religion after hundred of years of Spanish colonization.

The cave

The cave is located within the municipality of a small town in southern Puerto Rico. It has a significant karst formation, embodying both the geological complexity and the anthropological richness of the region. This cave is part of the extensive limestone karst systems prevalent in Puerto Rico, characterized by their formation through the dissolution of soluble limestone rocks, which led to features such as sinkholes, underground streams and caverns (Lace, 2013). The name of the cave and its exact location in Puerto Rico have been concealed intentionally, for conservation purposes. Contact Ángel Acosta-Colón (angel.acosta@upr.edu) for more information.

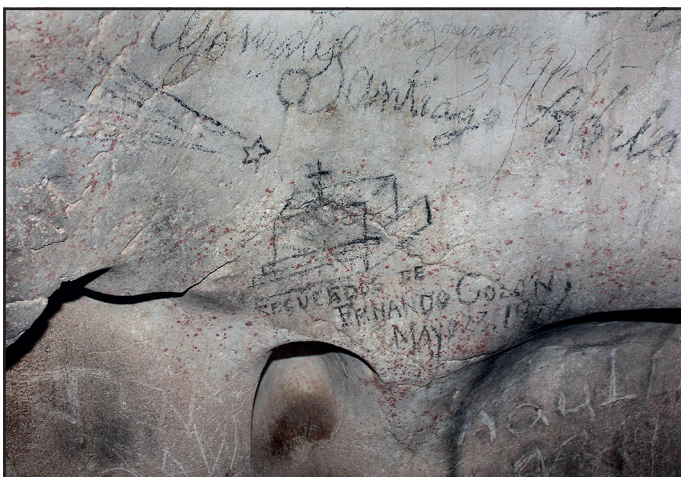


Figure 1: Portrait of “cave art” depicting a comet over a tomb. Other, more-recent, inscriptions are also visible. [Photo: A Acosta-Colón.]

The speleological characteristics of the cave, including stalactites, stalagmites, and various other speleothems, provide valuable data for the study of geomorphological processes and palaeoclimate interpretations. These calcite formations are the result of the deposition of calcium carbonate and other minerals, providing information on the past environmental conditions and the hydrogeological dynamics of the area.

Archaeologically, the cave is a site of paramount importance due to its collection of Taíno pictographs and petroglyphs, which contribute to our understanding of the Pre-Columbian cultures of the Caribbean. These petroglyphs, etched into the walls of the caves, serve as a tangible link to the indigenous populations that formerly thrived in Puerto Rico (Schwantes, 2011). The motifs and symbols depicted offer evidence of the religious, social, and possibly astronomical practices of the Taíno people, providing a focal point for ethnohistorical studies (Robiou-Lamarche, 1984).

Radiocarbon dates of organic pigments sampled from 11 different rupestrian anthrogenic marks in the cave date from between 1230 and 1380 AD (Ramos *et al.*, 2021; Acosta-Colón and Rodríguez Ramos, 2022). Petroglyphs in the cave are associated with the indigenous Taíno people, dating from a period of political and regulation nucleation of Borikén (the pre-Columbian name of Puerto Rico) between 1000–1500 AD (Rodríguez Ramos, 2014).

In the context of the early 20th century, the cave would have been situated in a predominantly agrarian landscape, with the surrounding area undergoing transformations due to shifts in agricultural practices and land use, including mining the cave for guano (bat droppings). Due to its relative isolation and inaccessibility, the cave itself remained largely untouched by these changes, preserving its natural and cultural heritage.

From a conservation perspective, the cave is indicative of the broader challenges facing karst regions in Puerto Rico, including habitat destruction, biodiversity loss, and the need for sustainable management practices. The cave ecosystem supports a variety of endemic and specialized species, highlighting the ecological value of subterranean habitats.

Scientifically, this cave offers a multidisciplinary research platform that includes geology, archaeology, biology, and environmental science. Its preservation and study are essential to advance knowledge of karst landscapes, understanding of human-environmental interactions in the Caribbean, and the protection of Puerto Rico's natural and cultural heritage for future generations. Based on the importance of the cave, it was recommended to the State Historic Preservation Office that it should be added to the National Register of Historical Sites, for its conservation, preservation and protection (Rodríguez Ramos, 2017).

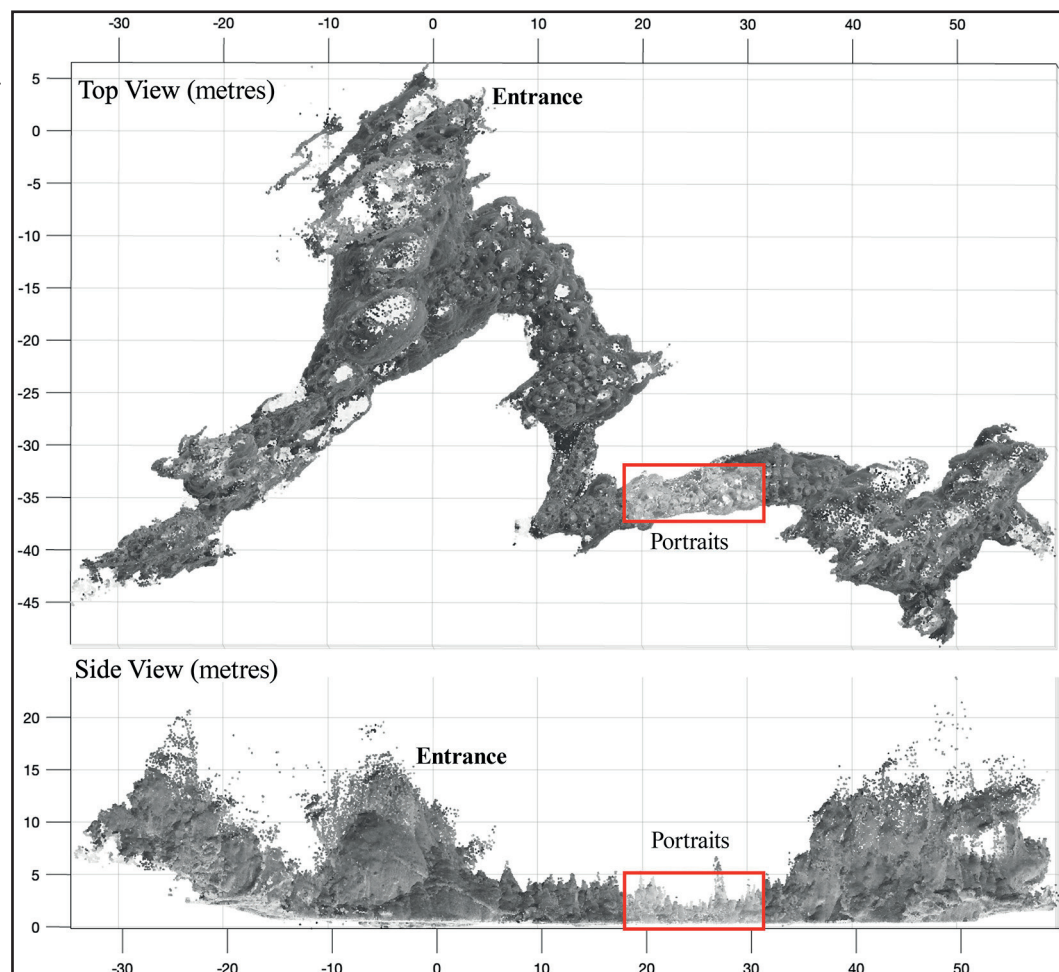
Methodology

Research was structured around four key steps: deciphering the drawing; identifying the depicted comet; determining the artist; and uncovering the motivation behind the artwork. Primary data were collected through field investigations, while secondary data were sourced from historical documents, including newspapers, census records, and astronomical reports.

Deciphering the drawing

A visit to the cave in 2018 revealed a drawing, probably made with charcoal. It illustrates a comet or meteor above a tomb, or possibly an altar, in close association with the inscription “RECUERDOS DE FERNANDO COLÓN, MAYO 23, 1910” [*MEMORIES OF FERNANDO COLÓN, MAY 23, 1910*] (Fig.1). This suggests a deliberate act of memorialization by the artist, highlighting a lasting impact and significance. Whereas it seems most likely that the date inscribed next to the drawing is also the date on which the artwork itself was made, it need not necessarily represent the actual time of the drawing's creation. Instead it might serve as a commemorative marker, reflecting on the event from a future perspective. Investigation of the origin of this drawing and inscription was commenced during October 2023.

Figure 2:
Three-dimensional LiDAR top and side renderings of the cave showing the location of its entrance and of the narrow passage leading to the location of the portraits (indicated by the red-framed boxes). Scale units are in metres.
[Image by: A Acosta-Colón.]



Reaching this part of the cave requires crawling, and it is devoid of natural illumination (Fig.2). Consequently, the artist would have needed to rely on artificial light sources, such as lanterns, candles or a makeshift fire, to execute his artwork. The use of artificial lighting in such a secluded and dark environment would have added complexity to the creation of the artwork, highlighting the artist's commitment to commemorating the celestial event despite the physical constraints of the cave's interior.

The artist might have drawn inspiration for his depiction of a comet from contemporary illustrations. The iconography of a comet, depicted as a star with a tail, has long been established in artistic representations, suggesting a connection to traditional visual language. Despite an exhaustive search, no direct parallels in existing literature were found, especially not the unique combination of a comet positioned above a tomb or altar. The isometric portrayal of the tomb shows considerable artistic talent, portraying the steps and the general aspects of tombs that can nowadays still be seen in Puerto Rican cemeteries.

The level of art literacy suggests that the artist was a person of significant education, given him access to, and engagement with, the newspapers of the time. Meticulous attention to orthographic details, such as accents and commas, provides further indication of a high level of scholastic achievement. Use of the American date format, specifying month, day, and year, implies familiarity with conventions outside the local norm, possibly reflecting broader educational or cultural exposure. A digital tracing of the writing and drawing is presented in Figure 3A.

This is particularly noteworthy considering that in 1910, only 35.5% of Puerto Rico's population over the age of ten were literate. The artist's proficiency in reading and writing, therefore, not only sets him apart within his contemporary societal context, but also hints at his privileged access to education and information, marking him as a distinct figure in the historical landscape of early 20th-century Puerto Rico.

Identification of the Comet

Halley's Comet (1910) is perhaps the most celebrated comet, which made a well-documented pass by the Earth in April and May of 1910. Its predictability, and the spectacle that it provides every 76 years, make it a cornerstone of comet observation. Both the timing of the cave art and the imagery that it includes are in agreement with contemporary media reports of the dates of the Halley's Comet transit and with accounts of the associated public fear. Furthermore, May 1910 accords with recorded dates of the Earth's passage through the comet's tail.

No other comet visible to the naked eye during the May 1910 to 2000 period matches the art date as closely as this occurrence. Comets visible to the naked eye are such rare astronomical phenomena that their appearances are inevitably significant events both for the scientific community and for the general public. Several such comets, each of them distinguished by unique characteristics and their individual impacts on observers, appeared between 1910 and 2000.

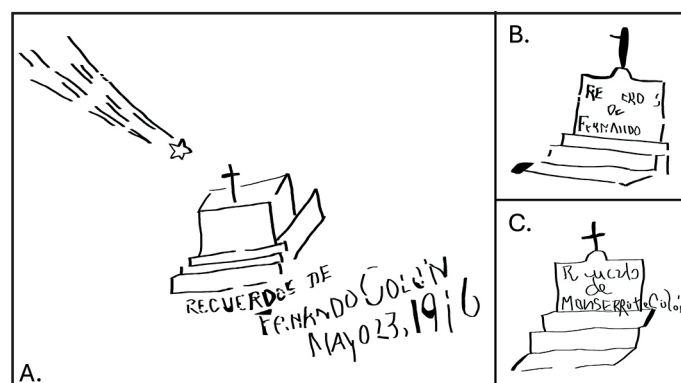


Figure 3: Tracings (approximately to scale) of the drawings shown in Figure 1 (pane A), Figure 5 (pane B), and Figure 6 (pane C).
[Images traced by: A Acosta-Colón.]

[illegible]

Figure 4: Extract from the 1910 Census register, including the members of the Colón-Vazquez household (yellow highlight) and their neighbours. **Note:** locational information shown on the original document has been redacted (black overprint).



Figure 5: A second drawing of a base or plinth and monument with the inscription “Recuerdos de Fernando” [“Memories of Fernando”]. Note: See also Figure 3B. [Photo: A Acosta-Colon.]

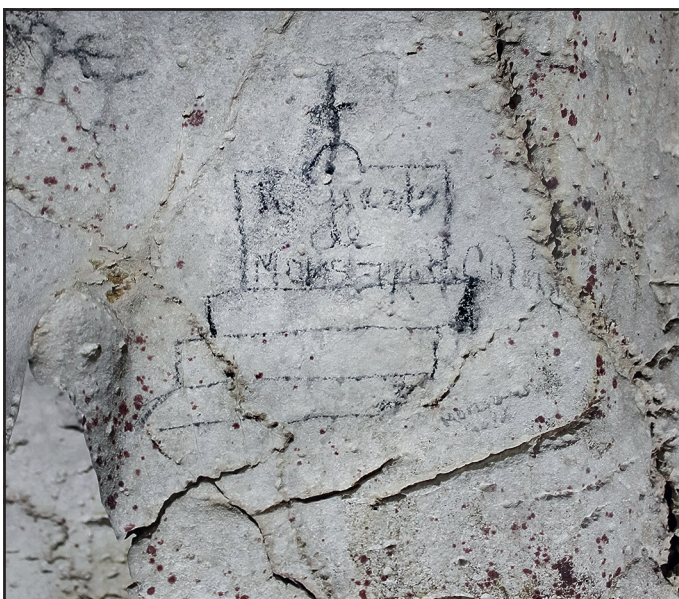


Figure 6: A third drawing of a base or plinth and monument with the inscription “Recuerdo de Monserate Colón” [“A memory of Monserate Colón”]. Note: See also Figure 3C. [Photo: A Acosta-Colón.]

Comet Skjellerup-Maristany, which was discovered in 1927, was visible without the aid of telescopes during May of that year. Though less famous than the others, its appearance contributed valuable data to the study of comets.

Comet Arend-Roland is known for its brilliant display in the night sky of April and May 1957, featuring a luminous nucleus and a pronounced tail, which captivated observers worldwide. Comet Mrkos was also discovered in 1957, the same year as Comet Arend-Roland. First reported late in July, Comet Mrkos remained visible to the naked eye until the end of September, offering another celestial spectacle for that year.

Comet Hyakutake, at its closest to Earth in March 1996, was distinguished by its extensive tail and striking blue-green hue. Because its maximum brightness lasted only a few days, it made less impression on the general public than did Comet Hale-Bopp, with its closest approach to Earth in March 1997. This was one of the most widely observed comets of the 20th century, remaining visible to the naked eye for an unprecedented 18 months.

These comets provided not only spectacular views, but also important opportunities for scientific observation and public engagement with astronomy. Their appearances are etched into the collective memory of those who saw them, providing vivid reminders of the dynamic, ever-changing, nature of the universe.

The Artist

Examination of census data for 1910 showed that only four individuals bearing the name Fernando Colón lived within the cave's municipality, with no records of anyone with the same name in the adjacent towns. Among the four, a Fernando Colón Vázquez stands out, not only because (according to the Census) he could read and write in both Spanish and English, but also because he lived in a more urbanized setting (Fig.4).

An urban lifestyle probably gave Fernando improved access to newspapers and periodicals, keeping him better informed and closer to contemporary events and intellectual currents than were his namesakes. This detail is crucial. It not only narrows down the identity of the potential artist behind the cave illustration but also highlights the importance of literacy and media access in early 20th century Puerto Rican society, especially in terms of engaging with global events like the passage of Halley's Comet. Another visit to the cave in November 2023 revealed similar drawings with the names Fernando and Monserate Colón (one of his brothers), confirming a connection between the Fernando of the cave and the one in the 1910 census (Figs 3B, 3C, 5, 6).

Fernando Colón Vázquez was a 15-year-old resident of the municipality where the cave was located, living on the main street of the town. His bilingual literacy in Spanish and English distinguished him in a time when such skills were not common, indicating a level of educational attainment that was likely superior within his community. This was an exceptional trait, shared with his siblings, suggesting a family environment that valued education highly.

Fernando's family background, with his mother managing a household of five children alone following the death of her husband, paints a picture of resilience and dedication to education amidst the challenges of early 20th-century life in Puerto Rico. This context not only highlights the personal achievements of Fernando and his family but also provides insight into the socio-economic conditions of the time, where widowhood and large families often faced significant hardships.

Throughout his career, Colón engaged in specialized work that required a high degree of literacy and precision, including transcription and typographical roles across multiple organizations. His contributions extended beyond the civilian sector to military service, highlighting his role as a veteran, which would have added a diverse range of experiences to his professional and personal life.

In the latter stages of his career, Colón was employed by the State Insurance Fund, indicating his involvement in the administrative and financial sectors. This detail not only reflects on his professional versatility but also on the socio-economic landscape of Puerto Rico during his lifetime, where veterans often transitioned into pivotal roles within the burgeoning public and private sectors.

Fernando Colón's life spanned from approximately 1896, with his birth date remaining somewhat ambiguous, to his death in the mid-20th century 1950, marking a life of 54 years. Colón's life and work thus encapsulate a period of significant change and development in Puerto Rican society, with his contributions leaving an indelible mark on the island's historical and cultural fabric.

Societal context and public reaction

In 1910, Puerto Rico had not yet entered the radio era, which would not commence until the inauguration of WKAQ, the island's first radio station, in 1922. Introduction of a modern means of communication via telephones had, however, begun a decade earlier, around 1900. Predominantly, the early telephones, which were identified by their three-digit numbers, were located and accessible in urban centres, reflecting a disparity of available technological facilities between urban and rural areas at the time.

This urban-centric distribution of telephones underscores the technological and infrastructural development of Puerto Rico in the early 20th century, highlighting a period of gradual modernization that was limited by geographical and socio-economic factors. Absence of radio broadcasts until the 1920s and the restricted availability of telephones paint a picture of a society on the cusp of a communications revolution, with significant implications for information dissemination and social connectivity across the island.

In 1910, Puerto Rican media extensively covered Halley's Comet's approach, sparking discussions on its potential catastrophic impact on Earth. Notably, *La Correspondencia de Puerto Rico* highlighted concerns over the comet's lethal consequences in an early January edition. Meanwhile, *Puerto Rico Ilustrado* adopted a more lighthearted tone by March, jestingly suggesting the uncertainty of survival post-May, directly alluding to the comet's expected passage.

These contrasting approaches in reporting underscore the wide spectrum of public sentiment and reaction to the comet, from genuine anxiety over its perceived threats to more satirical interpretations of the end-of-times fears. This coverage reflects the cultural and social milieu of early 20th-century Puerto Rico, where the intersection of science, sensationalism, and humour shaped the collective experience of astronomical phenomena.

Discussion

The drawing's style, lack of similar contemporary images, and the unique depiction of the comet in connection with a tomb suggests a personal interpretation of the event by Colón, rather than a direct replication of existing illustrations.

Spanning roughly nine kilometres along the primary routes, the journey from the home of Fernando Colón Vázquez to the cave represents a significant trek, requiring about two hours on foot. The popular means of transportation in those times were bicycles and horses, although the first cars were introduced five years earlier in 1905. This distance reflects not only the physical separation between his residential area and the cave but also underscores the effort and determination involved in reaching the cave.

The decision to undertake such a journey, in difficult karst topography and semi-arid climate, where modern transportation options were limited, highlights the importance of the destination or the motivation behind the visit. Given the historical context and the effort required to access the cave, this journey would have been a considerable undertaking, suggesting a strong incentive or a significant purpose behind Fernando Colón Vázquez's visit to the cave.

The widespread apprehension regarding the toxic gases associated with Halley's Comet's tail might have driven Fernando Colón, potentially accompanied by his family, neighbors, or many others to undertake a two-hour journey to the deep dark zone of the cave as a refuge. This action, taken in May, suggests a significant level of concern over the celestial event's potential effects.

The determination to isolate themselves in the cave, potentially for an extended period, indicates a profound impact of the comet's passing on the collective psyche of the time, revealing how celestial phenomena could influence human behavior. This episode underscores the interplay between scientific understanding, or lack thereof, and societal reactions to astronomical events, highlighting the lengths to which individuals would go to protect themselves from perceived cosmic threats.

Conclusion

Fernando Colón Vázquez, a literate 15-year-old resident of southern Puerto Rico, is identified as the artist behind the drawing of Halley's Comet over a tomb. His level of education and access to contemporary media are highlighted as critical factors enabling his awareness and reaction to the visit of the comet in 1910. The widespread panic over the comet, fueled by sensational media reports predicting catastrophic outcomes, probably motivated Colón Vázquez, his family, and possibly others to seek refuge in the cave.

The case of Fernando Colón's cave drawing illustrates the intersection of astronomical phenomena, societal fear, and individual expression. This incident sheds light on the broader impacts of celestial events on human societies, particularly in isolated communities with limited scientific understanding. His descendants might provide further details of this event.

The 1986 return of the comet was received with more enthusiasm worldwide (Seargent, 2008). The next visit will be in summer 2061. The 1910 Halley's Comet sighting in Puerto Rico, as captured by Fernando Colón in the cave, is another example of the blend of fear, fascination, and artistic expression that such events can provoke.

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