Inscribing mining practice and theory: conceptions of knowledge production and the Iberian state in Capoche's and Hinestrosa's *relaciones*

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Abstract
This contribution uses two narratives composed by practicing miners in Spain's Viceroyalty of Peru to explore period conceptions of the Iberian state's interest in metallurgical knowledge. Luis Capoche's 1585 *Relación general … de Potosí* ("General Relation of Potosí") and Juan Francisco de Hinestrosa's 1596 *Relación breve y sumaria … del descubrimiento … de nuebo Potosí* ("Short relation and summary of the discovery of New Potosí") evince parallels in content and form. While these similarities can be attributed merely to the context of colonial Iberian mining administration, they also point to a horizon of expectations shared by these authors and their intended readers, the viceroy and king. An exploration of the varied ways that Capoche and Hinestrosa marshalled theoretical and practical metallurgical knowledge in their writings enriches previous scholarship that has argued for the Iberian state's interest in and promotion of knowledge production.

Keywords
Luis Capoche, Juan Francisco de Hinestrosa, Potosí, science and the Iberian state, early modern mining

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While historians of early modern science today often celebrate Georg Agricola's 1556 *De re metallica* as the "most famous mining treatise of the sixteenth century," a different geographical locale drew the interest of period actors: the silver mountain of Potosí, located in the Andean highlands of modern Bolivia.[1] Potosí was a site that inspired desire and horror for its technical processes, extravagant silver yields, and labor management practices. This contemporary excitement is evident in the multiple surviving images of Potosí. The town's silver mountain was memorialized by early Spanish visitors, including Pedro Cieza de León, whose 1553 woodcut (Fig. 1) was copied and reprinted in Europe and the Ottoman Empire. The sufferings of indigenous laborers were depicted by the Flemish engraver Theodor de Bry (Fig. 2) and the seventeenth-century Jesuit polymath Athanasius Kircher. Potosí was considered sufficiently important to the seventeenth-century Jesuit missionary Matteo Ricci that he marked it prominently on a world map designed for China's Wanli emperor.[2]

These contemporary visions of Potosí were grounded in technical, economic, and social realities. Potosí produced over half the world's silver from the mid-sixteenth century through the mid-seventeenth century.[3] These production levels were sustained by the patio process, a method of refining silver via mercury amalgamation first implemented in Potosí in the 1570s.[4] This new method of refining required substantial investment in terms of infrastructure and power (wind, horse, and human) to grind and process the silver ore. Its adoption was facilitated by administrative reforms introduced by Viceroy Francisco de Toledo (1515-1582). The institution of a coercive labor regime (*mita*) required indigenous communities to supply draft laborers for rotating terms of service in the area's mines and refineries, which were typically owned and operated by individuals of European descent. Administrative oversight over the production and distribution of raw materials, namely mercury, was designed to ensure that these individuals could afford to adopt the new refining technologies and still make a profit.[5]

These administrative and technological changes transformed Potosí into a cosmopolitan city with a global impact. Potosí's silver output shaped the global trade in silver, affecting not only the economies of Iberia and her near neighbors but also more distant regimes, including that of Ming China. The town, which by 1600 was home to over 100,000 residents, brought individuals from across the globe into proximity. Some, both of Euro-

1 Long, *Openness, Secrecy, Authorship*, 178-182.

2 Lane, *Potosí*, 10, 12, 16, 33, 47. Kircher's depiction is found in Kircher, *Mundus Subterraneus*, II, 209.

3 TePaske, *A New World of Gold and Silver*, 178.

4 Castillo Martos, *Bartolomé de Medina y el siglo XVI: un sevillano lleva la revolución tecnológica a América*; Muro, "Bartolomé de Medina"; Probert, "Bartolomé de Medina: The Patio Process and the Sixteenth Century Silver Crisis"; Bargalló, *Amalgamación*; Bargalló, *Minería*.

5 Lohmann Villena, *Minas de Huancavelica*; Presta, "Compañía del Trajín".

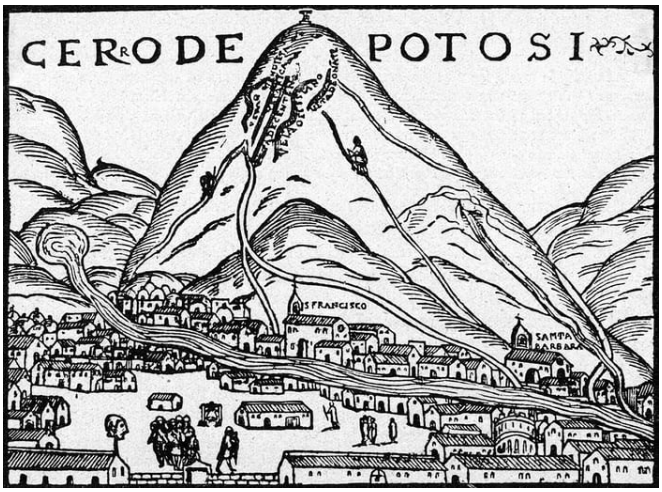

Fig. 1 – "Cerro de Potosí", Pedro de Cieza de León, *Crónica del Peru*, 1553. Image licensed under the Creative Commons Attribution-Share Alike 4.0 International license.

Fig. 2 – Mining in Potosí, engraving from Theodor de Bry, *Historia Americae sive Novi Orbis* (1596). Image licensed under the Creative Commons Attribution-Share Alike 4.0 International license.

pean and indigenous Andean descent, came willingly in the hopes of profiting from the city's rich ores. Iberian officials contracted others, both natives of the Iberian Peninsula and foreigners, for their metallurgical expertise. Others were coerced; these individuals included not only indigenous Andeans but also enslaved Africans, brought to labor in the mines and in the town's mint.

Contemporaries saw in Potosí's ores the promise of future riches through the application of industry, knowledge, and good fortune. Nearby mining sites, both those already in operation and those yet to be discovered, were regarded as tantalizing prospects, whose untapped mineral wealth might equal or surpass that of Potosí. Equally enticing was the possibility that silver yields could be augmented by new technical innovations, and individuals claiming to have developed such mining and refining technologies eagerly presented them to Spanish officials in exchange for protection and reward.

This contribution considers two such individuals whose narrative accounts survive in the Archivo General de Indias in Seville. The first, entitled *Relación general … de Potosí* ("General Relation of Potosí"), was composed by an individual named Luis Capoche, who was born in Seville and was the owner of several mines and refining mills in 1585, when he composed his account. The second is a manuscript dated 1596 and titled *Relación breve y sumaria … del descubrimiento … de nuebo Potosí* ("Short relation and summary of the discovery of New Potosí"). It was penned by Juan Francisco de Hinestrosa, who claimed to have discovered a new silver mine, "New Potosí", whose output, Hinestrosa asserted, would eventually rival that of the famed Potosí.

In their surviving texts, Capoche and Hinestrosa embraced approaches associated with the New Science of early modern Europe. Both authors describe experimental, empirical trials in the context of silver refining and rely on quantitative calculations to bolster their arguments. Hinestrosa, in addition, portrayed his metallurgical knowledge as derived from his reading of scholarly texts, his reliance on experimental methods, and his interactions with indigenous metallugists.

Texts like Capoche's and Hinestrosa's *relaciones* have been employed in recent decades to develop a more inclusive narrative of early modern European science. Such efforts at expansion and recovery of agency have operated at three registers. First, to challenge a traditional focus on elite European actors, scholars have emphasized the role of artisans and artisanal modes of production, including metallurgy, in fueling the embrace of experimental methods.[6] Second, documents like Capoche's and Hinestrosa's *relaciones* prompt a move towards greater geographical inclusivity by revealing the robust culture of scientific

[6] This tradition of scholarship is often attributed to Edgar Zilsel, Zilsel, "The Sociological Roots of Science". Important revisions of this thesis include Long, *Openness, Secrecy, Authorship*; Long, "Trading Zones in Early Modern Europe"; Long, "Trading Zones"; Smith, *Body of the Artisan*.

and technical inquiry beyond continental Europe.[7] Finally, Capoche's and Hinestrosa's descriptions of indigenous refining technologies and expertise provide a means of acknowledging and recovering subaltern contributions to early modern knowledge production.[8]

These approaches have shaped previous studies of Capoche and Hinestrosa. Peter Bakewell and many others have employed Capoche's descriptions to recover on-the-ground refining practices in sixteenth-century Potosí, including the transition from indigenous refining techniques to the use of mercury amalgamation.[9] Tristan Platt and Pablo Quisbert relied on Hinestrosa's account to reinterpret the role of indigenous Andeans in the discovery of Potosí.[10] More recently Heidi Scott argued that archival sources like Hinestrosa's provide valuable insight into how early modern geological theories were shaped and deployed on the ground.[11]

This contribution builds on these studies to nuance existing scholarship on the role of the Iberian state in natural and technical knowledge production. Scholars who pioneered the study of science in the early modern Iberian world combatted Spain's Black Legend by demonstrating the significant scientific and technical knowledge inscribed in administrative, archival documents.[12] More recently, scholars have shown how Spain's empire and institutions shaped both the nature of scientific and technical knowledge produced in its realm and the way such knowledge was recorded, disseminated and read. Iberian officials sought to collect knowledge useful for the state and relied on eye-witness reports, experiment, and visual evidence to do so.[13] Rather than promoting the public dissemination of natural knowledge in print, the early modern Iberian state privileged vertical transmission of knowledge, often in secret, between individuals.[14] These studies focused on the recovery of knowledge traditions, whose specific features have tended to be interpreted as shaped by the Iberian state.

This study takes the opposite approach. Rather than recovering the metallurgical knowledge inscribed in Capoche's and Hinestrosa's *relaciones*, it inquires into Capoche's and Hinestrosa's conceptions of the Iberian state Two approaches serve as methodolog-

7 Cañizares-Esguerra, "On Ignored Global 'Scientific Revolutions'".

8 In the context of Andean metallurgy, see Barragán Romano, "Extractive Economy"; Bigelow, *Mining Language*; Bigelow, "Técnica"; Salazar-Soler, "Álvaro Alonso Barba"; Scott, "Between Potosí and Nuevo Potosí: Mineral Riches and Observations of Nature in the Colonial Andes, ca. 1596-1797".

9 Bakewell, "Technological Change"; Lane, *Potosí*, 46-91.

10 Platt and Quisbert, "Tras las huellas del silencio: Potosí, los Inkas y el virrey Toledo".

11 Scott, "Between Potosí and Nuevo Potosí: Mineral Riches and Observations of Nature in the Colonial Andes, ca. 1596-1797".

12 Portuondo, "Finding 'Science' in the Archives of the Spanish Monarchy".

13 For key examples of these arguments, see Barrera-Osorio, *Experiencing Nature*; Bleichmar, *Visible Empire*; Crawford, *Andean Wonder Drug*; Portuondo, *Secret Science*.

14 Cañizares-Esguerra, "On Ignored Global 'Scientific Revolutions'"; Portuondo, *Secret Science*.

ical inspiration. First, in focusing on Capoche's and Hinestrosa's writings in the context of Iberian administration, it takes up Sebastian Felten and Christine von Oertzen's call to analyze administrative procedures as knowledge processes.[15] It relies particularly on the insights of Arndt Brendecke, who has demonstrated the way that documents providing information ostensibly intended to produce "more knowledge" often served to facilitate political and administrative goals.[16] This contribution builds on but moves in a different direction than Brendecke's through its focus on the perspective of local actors and its insistence that information could simultaneously serve political, administrative, and knowledge-production purposes. In doing so, it builds on current narratives about the history of science in Iberian colonial space that privilege context and networks of knowledge production.[17]

Second, it draws on the methods of historians of the book and archives, who have argued for the importance of situating the content of a text in the context of its production and reception. Capoche's and Hinestrosa's dedication of their treatises to royal officials, it argues, signals their roles as "readers" of Iberian administrative practices and ideals. The appeals each made to natural and technical knowledge can thus be interpreted as evidence of how contemporaries understood the role of natural and technical knowledge in the context of Iberian governance. It approaches Capoche's and Hinestrosa's texts according to Hans Robert Jauss's notion of a "horizon of expectations," the intellectual tradition and assumptions authors shared with readers.[18] Jauss's notion of a "horizon of expectations" invokes a similar shared set of assumptions as has been described by ethnohistorians in speaking of *visitas* as administrative "performances" and the act of "speaking like a state" that Michael Szonyi has applied to military households in Ming Dynasty China who appropriated state discourse in their dealings with the state.[19]

This investigation proceeds in three parts. Part 1 situates Capoche's and Hinestrosa's texts in the context of colonial Andean mining administration. While these efforts at contextualization account for the parallels in Capoche's and Hinestrosa's careers and writings. Part 2 argues that they simultaneously erase the authorial agency of both. It suggests an alternative approach, interpreting their *relaciones* as reflections of a horizon of expectations shared with their intended readers, the viceroy and king. Part 3 explores the varied ways

[15] von Oertzen and Felten, "The History of Bureaucratic Knowledge: Global Comparisons, c. 1200-c.1900".

[16] Brendecke, *Imperio e información: funciones del saber en el dominio colonial español.*

[17] Bauer, *Alchemy of Conquest.*

[18] Jauss, "Literary History". Other important works include Iser, *The Act of Reading: A Theory of Aesthetic Response*; Fish, *Is There a Text in This Class? The Authority of Interpretive Communities*; Suleiman and Crosman, *The Reader in the Text: Essays on Audience and Interpretation*; Tomkins, *Reader-Response Criticism: From Formalism to Post-Structuralism.*

[19] Guevara-Gil and Salomon, "A 'Personal Visit'"; Szonyi, *Art of Being Governed.*

that Capoche and Hinestrosa marshalled theoretical and practical metallurgical knowledge in their writings as a means of enriching previous scholarship that has argued for the Iberian state's interest in and promotion of knowledge production.

1. Aims and circumstances of production

This section examines the aims and circumstances in which Capoche and Hinestrosa composed their accounts. Their writings were generated in the context of Iberian colonial administration and exhibit striking parallels in form and content. Drawing on the insights of theorists of reader reception, this section argues that Capoche and Hinestrosa shared a horizon of expectations shaped by their quotidian interactions with local and royal officials. As a result, it is possible to read Hinestrosa and Capoche as contemporary "interpreters" or "readers" of the Iberian state.

Capoche and Hinestrosa pursued parallel career trajectories, which they aimed to further through the composition of their *relaciones*. Originally from Seville, Capoche was the owner of various mines and mills in Potosí when he composed his *relación*. The treatise, which was dedicated to the incoming viceroy Fernando Torres y Portugal, is well-known today via a print edition of 1959.[20] Though it remained unpublished in Capoche's lifetime, it appears to have circulated in manuscript in the period. Two separate copies exist in the Archivo General de Indias (AGI) in Seville, Capoche was mentioned as an authority by contemporaries, and his *relación* is thought to have influenced period descriptions of Potosí.[21] While Hinestrosa gives no indication that he encountered Capoche's *relación*, it is possible that a copy was passed to Torres y Portugal's successor to which Hinestrosa was privy.[22]

[20] Capoche, *Relación general*.

[21] These manuscript copies are found in AGI Charcas 134 and numbered 8-9 and 11ª. Subsequent references, unless specified, will be to the published edition of Capoche's text.

[22] Hanke has speculated that Capoche's treatise was brought to Lima shortly after Capoche completed it in August of 1585 and read by the viceroy and the *junta* he assembled to address the question of forced indigenous labor. At least one other copy of Capoche's treatise circulated independently in Peru, as Capoche indicates that he also sent an exemplar to Juan López de Cepeda, former president of the Audiencia de La Plata. By the seventeenth century, at least one of these copies had been sent to Spain, since the official chronicler Antonio de Herrera appears to have relied on Capoche's text in composing sections of his *Historia general de los hechos de los castellanos en las islas y tierra firme del mar Océano* (1601-1615), Capoche, *Relación general*, 64-65. However, even if a copy of Capoche's treatise remained amongst the papers held by the viceregal administration of Hurtado de Mendoza, it is unclear whether Hinestrosa would have been granted access. While Castillo Gómez has emphasized the restrictions on access to municipal and other official archives, Brendecke portrays early modern Iberian archives as open to consultation and the interests of private individuals, Castillo Gómez, "New Culture of Archives"; Brendecke, "'Arca, Archivillo, Archivo': The Keeping, Use and Status of Historical Documents about the Spanish Conquista".

Hinestrosa and his "New Potosí" are less well known. The information we have about Hinestrosa's life derives from his surviving text. When he wrote it in 1596, he described himself as living in the Xauxa province of Peru with a wife and three children. His self-reported metallurgical expertise included serving as an inspector, assayer, and consultant at various gold and silver mines in the Andes. He addressed his account to King Philip II and aimed to secure recognition for his discovery of "New Potosí", a metallurgical site he predicted would rival Potosí's output. Today the site, like Hinestrosa, has fallen into obscurity. His account also seems to have received little recognition from contemporaries or period historians. His *relación* is found in the AGI, bound in the same *legajo* as the copies of Capoche's treatise.[23] While it clearly was sent from Peru to the Iberian Peninsula, there is no evidence from readers' marks, additional copies, or references by contemporaries that it was circulated or read.

The composition and dedication of their texts to royal officials reflects the practices and aims of Iberian governance in this period. Capoche and Hinestrosa composed their *relaciones* in periods of administrative transition. Capoche's *relación* was dedicated to and intended in anticipation of the arrival of the seventh viceroy of Peru, Fernando de Torres y Portugal, who served from 1584 to 1589. Torres y Portugal was succeeded by García Hurtado de Mendoza, whose term as viceroy ended the same year that Hinestrosa completed his *relación*.

Mining administration was a central concern for both these viceroys, who advocated for and instituted new policies on behalf of the silver refining industry. To bolster production, Torres y Portugal urged the king to halve the percentage of silver that refiners were required to hand over to the crown. He also convened a council (*junta*) to reconsider and reinforce incentives granted by his predecessors to ensure a large indigenous labor force in Potosí, including the right to work mines for personal benefit outside the work week (*kapcha*) and to sell raw silver ores for profit (*rescate*). Concerned that the pool of *mita* laborers was declining, Hurtado de Mendoza ordered an administrative inspection of Potosí and issued new ordinances to regulate the assignment and pay of *mitayos*, the interactions between mine- and mill-owners and *mitayos*, and the rights of indigenous laborers to mine and refine ores on their own time.[24]

Efforts to boost silver production extended beyond viceregal administration of the *mita*. The perception that Potosí's ores were nearing exhaustion encouraged some individuals to seek out new sources of silver and improvements in refining technologies. Difficulties refining Potosí's *negrillos*, silver ores with high sulfide content, led Hurtado de Mendoza to write to the crown in 1595 advocating the subsidizing of other mining

[23] Hinestrosa, "Relaçion breve y sumaria", AGI Charcas 134, numbered 12.
[24] Cole, *Potosí Mita*, 62-63.

centers in the area.[25] Individual miners and refiners sought solutions for these and other technical difficulties, and they brought proposals for new refining techniques and mining apparatus to Potosí's municipal council, the viceregal administration, and the Council of Indies.[26] Recurring problems ensuring an adequate supply of mercury incentivized officials and private individuals to seek alternative administrative arrangements for Huancavelica and prompted attempts to develop new methods of refining mercury.[27]

This administrative context accounts for many of the striking parallels in form and content of Capoche's and Hinestrosa's treatises. Capoche described his text as offering an account of the *asiento* and *cerro*, the state of its mines, the quality of its metals, and "other particulars" regarding its *gobierno*. This information was conveyed, according to Capoche, by "referring to some things that have happened."[28] This enterprise, of "referring to some things that have happened," involved a variety of types of information and presentation styles. Capoche described the geography of the town and her mountain, narrated the discovery of Potosí's and nearby ore deposits, and addressed aspects of mining administration, including indigenous labor and contributions to the royal treasury. He interspersed his textual narrative with extracts of documents penned by others addressing the practice of *rescate*. He also included non-textual elements, including lists and tallies. His *relación*, for example, contains lists of Potosí's veins, the names of individuals who owned mines situated along them, and the *mitayos* (indigenous laborers) assigned to them. He also included descriptive lists of *ingenios* (refining mills) and their owners.

Hinestrosa's surviving manuscript incorporates many similar elements. He offered a textual narration that described his activities as a miner, his discovery of New Potosí, and his own theory of metallic ores. Like Capoche, Hinestrosa includes multiple lists: of the veins of New Potosí and their characteristics; of the discoverers of these veins; and of individuals who staked claims to them as owners. Hinestrosa also transcribed the writings

[25] *Ibid*., 63. On Potosí's ore chemistry, Bargalló, *Amalgamación*, 227-228; Guerrero, *Silver by Fire*, 26-32; Lane, *Potosí*, 22-26. On the racial implications of this terminology, Bigelow, *Mining Language*, 229-293.

[26] For this phenomenon in relation to the Iberian state and empirical practice, see Barrera-Osorio, *Experiencing Nature*, 56-80. On petitions originating in Potosí and local collaborations between individuals of European descent and indigenous Andeans, see Bigelow, "Técnica". On the bureaucratic practices and ideals in which these proposals were generated and received, see Raphael, "In Pursuit of 'Useful' Knowledge: Documenting Technical Innovation in Sixteenth-Century Potosí".

[27] Lohmann Villena, *Minas de Huancavelica*, 110-130; Presta, "Compañía del Trajín".

[28] "haciendo esta relación de lo que este asiento y cerro, del estado en que están sus minas con todas las de la provincia, y ley de los metales, y otros particulares tocantes a su gobierno, refiriendo algunas cosas que han sucedido para que mejor se entienda la dificultad que tienen los negocios de esta nueva tierra, que ha sido mi principal intento", Capoche, *Relación general*, 72.

of others, copying a letter of support from García Hurtado de Mendoza, the outgoing viceroy of Peru, testifying to Hinestrosa's metallurgical expertise.[29]

Both Hinestrosa and Capoche styled their accounts as *relaciones*, an early modern Iberian genre whose fluid nature tends to defy categorization. The late sixteenth century saw a concerted effort on the part of the Iberian crown to collect local information for improved governance, which scholars identify as the origin of the genre of the *relación*. To facilitate this endeavor, the crown issued directives to collect information regarding the natural environment and peoples of the Americas, which culminated in the 1577 *relaciones geográficas e históricas de Indias*.[30] According to Walter Mignolo, the genre of the *relación* includes directives, questionnaires, and accounts generated in the course of Iberian administration and other writings whose content was shaped by these official directives.[31] María Portuondo has offered a more expansive definition of *relación*. According to her, *relaciones* comprised "accounts of personal experiences in the New World … personal memoirs, letters, chronicles, replies to official questionnaires, and even personal interviews with travelers from distant lands."[32]

Hinestrosa's and Capoche's *relaciones* were penned in the context of the Iberian knowledge-production regime, which bestowed favor in return for meritorious service. In his composition, Hinestrosa argued that his discovery of New Potosí and previous service to the viceroy were acts of service to the crown that merited the granting of specific privileges as royal favors, including the assignment of indigenous laborers to the new site. Like Hinestrosa, Capoche presented his treatise as a service to the incoming viceroy, one that would facilitate an understanding (*se entienda*) of local affairs (*negocios*).[33]

Other details suggest that Capoche's *relación* was commissioned by representatives of the incoming viceroy. In his text, Capoche expressed a desire to shape viceregal policy on issues that affected him as a mine- and mill-owner. Capoche negated contemporaries' depictions of a mining industry in ruins, favored private over state control of quicksilver production and distribution, and opposed the awarding of privileges for new refining methods. With respect to labor policies, Capoche opposed the enslavement of indigenous Andeans, yet objected to the current policy allowing *mitayos* to collect, refine, and subsequently sell ores gathered on the side (*rescate*) for their personal profit.[34] These pronouncements on policy can be read in dialogue with Capoche's references to his interactions with Pedro de Córdova Mesía, who visited Potosí in anticipation of Torres y Portugal's tenure

[29] Hinestrosa, "Relaçion breve y sumaria", 4v.
[30] Álvarez Peláez, *Conquista*.
[31] Mignolo, "Cartas crónicas y relaciones del descubrimiento y la conquista", 72.
[32] Portuondo, "Secret Science: Spanish Cosmography and the New World", 85.
[33] "me pareció dar principio en servir a Vuestra Excelencia haciendo esta relación … suplico reciba este pequeño servicio no considerando lo poco que es sino a la voluntad con que lo ofrezco, la cual tengo dedicada al servicio de Vuestra Excelencia", Capoche, *Relación general*, 72.
[34] *Ibid.*, 57-61.

in Peru. Following the viceroy's arrival, Córdova Mesía participated in debates regarding the treatment of indigenous Andeans and the administration of Potosí. Though he did not mention Capoche by name, during these discussions, Córdova Mesía acknowledged his receipt of various *relaciones* composed by "experts."[35]

2. Hinestrosa and Capoche as "readers" of the Iberian state

Administrative practice and genre can account for the strong parallels observed in their lives and texts. This section argues that that such explanations assign agency above and outside Hinestrosa and Capoche as local actors and authors. It demonstrates the benefit of an alternative approach, namely the employment of Hinestrosa's and Capoche's *relaciones* to recover common assumptions regarding the Iberian state's valuation of metallurgical knowledge.

Attributing the parallels between Capoche and Hinestrosa to administrative practice or genre focuses our gaze on the intended readers and institutions to which their treatises were directed. Arguments that the state and its institutions shaped their writings inadevertently assign agency to their intended recipients. This approach interprets Capoche's and Hinestrosa's *relaciones* as expressions of the interests of the Iberian state not of Capoche and Hinestrosa as individuals.

Explanations based on conventions of genre similarly obscure Capoche's and Hinestrosa's agency. In seeking to identify how Hinestrosa and Capoche came to know what comprised a *relacion*, one might note that early modern petitioners often wrote with the help of others. Capoche, for example, is known to have received assistance from the Mercederian friar Nicolás Venegas de los Ríos, who was the copyist of one of the surviving manuscripts of his text.[36] Yet such explanations displace authorial decision-making onto other individuals or the disembodied nature of genre conventions themselves. They make it difficult to view Capoche and Hinestrosa as writers who purposefully selected the form and content of their treatises to appeal to their intended readers.

An alternative mechanism to account for the similarities between Hinestrosa's and Capoche's *relaciones* derives from the insights of theorists of reader reception. According to this explanation, Capoche's and Hinestrosa's interactions with municipal and royal officials in Andean mining centers led them to a shared understanding of administrative practices and its associated values. In the terminology employed by theorists of reader reception, these interactions provided Hinestrosa and Capoche with a "horizon of expectations," a set of assumptions regarding the type of information, both in terms of content and form, that was sought by administrative officials. The two authors then styled their *relaciones* to conform to their perceptions of their readers' expectations.

[35] *Ibid.*, 64-65.
[36] *Ibid.*, 50n32.

One avenue through which Capoche and Hinestrosa developed this shared set of expectations was via personal interactions with royal officials that directly shaped the composition of their *relaciones*. In his text, Capoche credited Córdova Mesía with influencing the subjects he chose to address. Córdova Mesía, he indicated, incentivized him to treat the subject of *tasas* (tribute), the "most serious subject" of this kingdom.[37] Capoche lauded Córdova Mesía's "advantageous and clear understanding," which, he proclaimed, gave him insight into the viceroy's concerns and interests.[38]

The relationship Capoche describes between himself and Córdova Mesía parallels Hinestrosa's own interactions with viceroy García Hurtado de Mendoza. Hinestrosa described how Hurtado de Mendoza had dispatched him to offer his expertise at the gold mines of Mataro in Huaylas province and at a set of abandoned silver mines registered by two brothers, Hernán and Lucas Ramírez. Hinestrosa's *relación* also concludes with a declaration of support from the outgoing viceroy.[39]

Quotidian interactions with officials in the context of their mining and refining operations also likely led Hinestrosa and Capoche to develop a parallel sense of what type of information interested administrators. Archival documents held today in Potosí contain the records of a lawsuit brought against Capoche in 1593 regarding payments he owed in connection with his refining mills. In 1596, Capoche's refining mills were surveyed as part of an official administrative inspection carried out by the visiting judge (*visitador*) Alonso Vázquez Dávila.[40] Capoche's *Relación* indicates his familiarity with other administrative practices no doubt known to Hinestrosa as well. These included the act of registering mines and the petitioning for royal privileges and protections for new refining methods.

The notion of a horizon of expectations shaped by interactions with royal officials facilitates analysis of Capoche's and Hinestrosa's *relaciones* in two ways. First, it suggests a plausible origin of attributes of these documents that seem to derive from metallurgical practice and administration, including tables and lists of veins, refining mills, and their corresponding owners and assigned *mitayos*. Both Hinestrosa and Capoche, for example, included lists of the discoverers of silver veins and of mine and mill owners (Fig. 3, Fig. 4). These lists follow

[37] "La materia más grave que hay en este reino es la de las tasas … Conozco que era menester otro ingenio que el mío para tratarlo y si a esto hubiera de tener consideración, mil causas había para dejarlo de hacer por mi rudeza", Capoche, 180.

[38] "Y excúsame el haberme hecho merced que tuviera este cuidado el muy ilustre señor don Pedro de Córdoba Mesía cuando vino a esta villa, para poder dar razón a Vuestra Excelencia, por vista de ojos, del estado de sus cosas. Y con su aventajado y claro entendimiento lo llevó tan comprendido y sondado el golfo de sus negocios y gobierno", Capoche, 180-181.

[39] Hinestrosa, "Relaçion breve y sumaria", ff. 3v-4r, 5v-6r, Scott, "Between Potosí and Nuevo Potosí: Mineral Riches and Observations of Nature in the Colonial Andes, ca. 1596-1797".

[40] See Capoche, *Relación general*, 45-46. These records are found in the Archivo Nacional de Bolivia (ANB) Minas 18 and the Bibliothèque Nacionale de France (BNF) Ms. Esp. num. 175, ff. 220-220v.

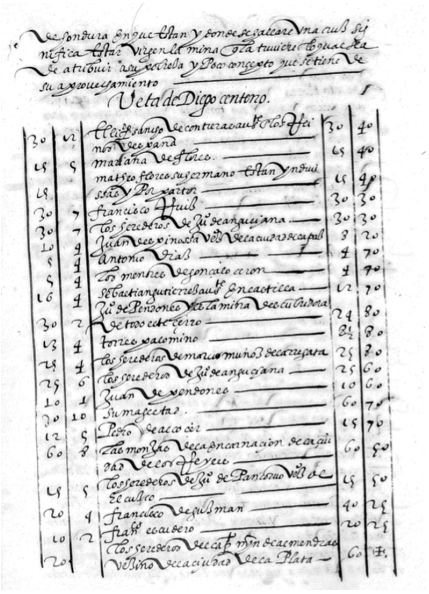

Fig. 3 – Capoche's table indicating distribution of mines along one vein of Potosí's *cerro ricco* and the number of *mitayos* assigned to each, España, Ministerio de Cultura y Deporte, Archivo General de Indias, CHARCAS 134, copy labeled "11a", f. 5v.

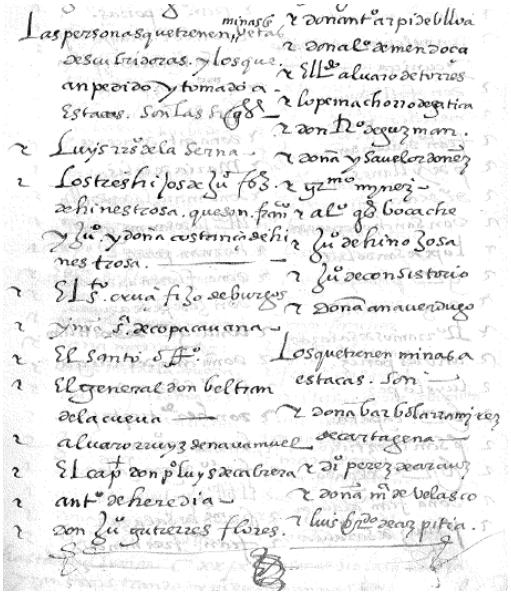

Fig. 4 – Hinestrosa's list of discoverers of silver veins in New Potosí, Hinestrosa, "Relaçion breve y sumaria", España, Ministerio de Cultura y Deporte, Archivo General de Indias, CHARCAS 134, ff. 22v-23r.

a format similar to contemporary administrative documents associated with accounting, financial administration, and the surveying of indigenous populations (Fig. 5, Fig. 6).

Second, it provides a mechanism that assigns agency to Hinestrosa and Capoche in their appropriation of the practices and aims of the Iberian state. This framework emphasizes Hinestrosa's and Capoche's roles as thinking authors who developed their own interpretations of the values and expectations of royal officials. It facilitates a reading of their texts as intentional efforts to appeal to these expectations.

3. Speaking to the state about natural and technical knowledge

Whereas scholars have often employed texts like Hinestrosa's and Capoche's as windows into local knowledge, the previous conclusions suggest the utility of a different approach. Rather than using their texts to reconstruct on-the-ground technical practice and metallurgical theory, this section focuses on the role Hinestrosa and Capoche assigned to technical and natural knowledge in the context of their goals as authors aiming to shape the

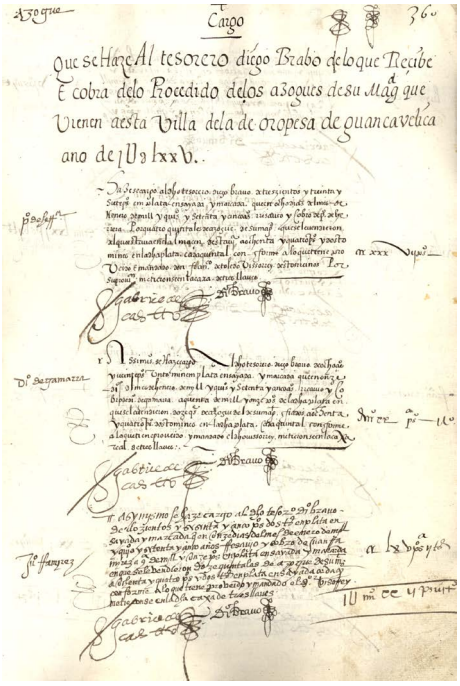

Fig. 5 – Quicksilver accounts, CNM, CR 16, 360r.

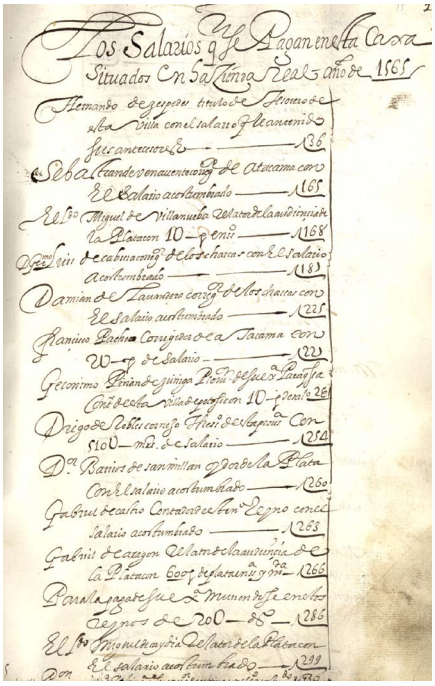

Fig. 6 – Accounts of administrative salaries, CNM, CR 3, 15r.

response of their intended readers. This approach enriches and nuances claims for the Iberian state's interest in and promotion of natural and technical knowledge. Such studies have attributed to the Iberian state these scientific and technical interests on the basis of centrally generated directives to collect such information and the presence in archives of petitions and treatises generated locally. Capoche's and Hinestrosa's texts offer an alternative approach, one directed at the recovery of contemporary, local understandings – what we might term "readings" – of the state's interest in such knowledge.

To bolster his claims that New Potosí would one day rival Potosí's silver yields, Hinestrosa offered details of his metallurgical practice and the theoretical understanding that undergirded it. Hinestrosa described how the mountain's veins, except one, all ran east to west. This orientation, he argued, was a sure sign of the richness of their ores, a fact he had come to know via experience and "discourses."[41] Hinestrosa's confidence in the future

41 "y metiendome en la consideraçion de las vetas y de los discursos q llevavan que son con el sol todas eçepto una sola y la mas caudalusa de ellas q esta sola la atraviesa el sol por que corre norte a sur", Hinestrosa, "Relaçion breve y sumaria", ff. 8v-9r.

productivity of New Potosí, moreover, rested on a "certain and established rule," which he had formulated that claimed that the richness of surface ores betrayed a poverty in deeper ores found underground and vice versa.[42]

This attention to metallurgical theory simultaneously served to underscore Hinestrosa's credibility as an author. Throughout his *relación*, Hinestrosa stressed the theoretical and practical foundations of his knowledge and emphasized its origins in text, personal experience, and the expertise of indigenous Andean metallurgists. His "certain and established rule," he claimed, revealed the presence of rich, deeper ores, but these ores often could only be accessed through the appropriation of indigenous refining methods.[43] In another section, Hinestrosa described how Potosí defied his general rule in possessing both rich surface and deeper ores, though the former had initially been overlooked even by "some Germans."[44] With this remark, Hinestrosa implicitly positioned himself as more capable than even German metallurgists, a group widely recognized in the period as having superior metallurgical knowledge.[45]

Hinestrosa's presentation style in this section may have been intended to further his claims for authorial credibility. He set his discussion of Potosí and the Germans apart from the main body of his text by labeling it an "example" (Fig. 7). Citation of an "example" calls to mind the early modern practice of commonplacing, the collection and citation of examples, both textual and based on experience, to buttress one's arguments.[46] "Examples" were also employed in certain textual genres that crossed learned-practical divides, such as texts of practical mathematics. Hinestrosa's decision to render this part of his discussion as an "example" may have been a deliberate attempt to bolster his own authority by demonstrating his familiarity with these learned practices and genres.

[42] "Y asi tengo por rregla çierta y averiguada que las minas fijas an de ser pobres de ley ençima de la tierra y si van encapadas por de baxo de quemazones y de tierra son mejores", Hinestrosa, "Relaçion breve y sumaria", ff. 14v.

[43] "pero a devido pocas vetas destas por que no an hecho caso dellas que si los indios no siguieran con guayras las de potosi no se descubriera su rriqueza y asi sean de yr conoçiendo los paninos de las piedras en que estan y sus caxas y las malezas con que se crian y como corren y la quemazon que llevan", Hinestrosa, "Relaçion breve y sumaria", ff. 15r.

[44] "Y labra treynta años que vi en ellas unos alemanes que los ensayaron por azogue y no tan solamente no les sacaron punta de plata pero los metalles y sus malezas les comio el azogue y provaron a hazer hornos de fundiçion con fuelles y rreberberaçiones y tanpoco les acudio cosa alguna y esto fue causa estar estas misturas dichas en su fuerça y punto. Y solos los indios a fuerça de soroches de plomo y fundiendolos tres y quatro vezes … con las guayras les sacava la plata", *ibid*., 17r.

[45] Herzog, "Merchants and Citizens", 146-147.

[46] Moss, *Printed Commonplace-Books and the Structuring of Renaissance Thought*, 101-214. On commonplacing in early modern natural philosophy and the incorporation of examples drawn from real-world experience, Blair, "Humanist Methods".

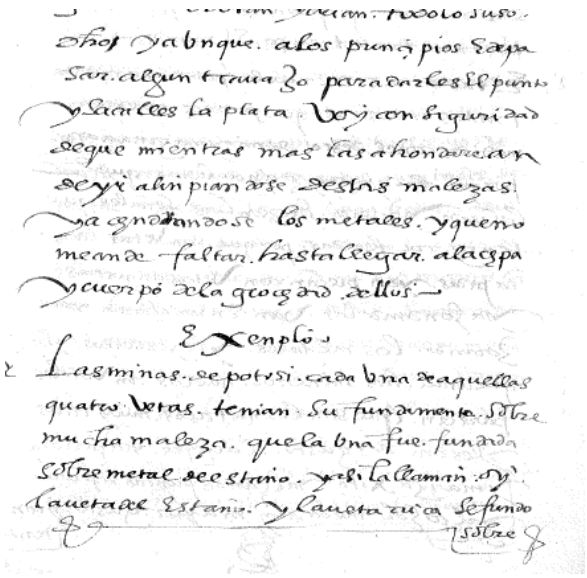

Fig. 7 – Hinestrosa's "example", Hinestrosa, "Relaçion breve y sumaria", España, Ministerio de Cultura y Deporte, Archivo General de Indias, CHARCAS 134, ff. 16v-17r.

Hinestrosa's presentation reveals a particular understanding of the Iberian state's relationship to natural and technical knowledge. Hinestrosa sought to convince his intended reader of his reliability as an author by emphasizing his superior metallurgical knowledge. Hinestrosa's claim for authorial credibility rested on the assumption that his intended reader associated credibility and authority with the acquisition of knowledge. Underlying Hinestrosa's argument is the idea that royal officials valued natural knowledge obtained via the reading of texts and verified by practical experience. For Hinestrosa, officials already recognized the value of technical and theoretical knowledge. His task, as he saw it, was to convince his reader that he possessed this knowledge and applied it correctly to the case of New Potosí.

Capoche similarly devoted large portions of his *relación* to detailed descriptions of technical information related to mining and refining, though he focused more on practical details than theoretical knowledge claims. The first section of the two-part work focuses almost exclusively on metallurgical practice. After offering a description of Potosí and its discovery, Capoche details the mountain's veins and the infrastructure developed to access its silver ores. He also describes indigenous methods of refining to process Potosí's ores. Capoche begins the second part of his treatise with an extended discussion of the history and technical details of the patio process, the method of refining silver via amalgamation with mercury introduced in Potosí in the 1570s. Elsewhere Capoche addressed

other topics related to metallurgical practice, describing nearby mining sites and detailing the dangers indigenous forced laborers faced.

Capoche's reason for including these details differed from Hinestrosa's. Capoche introduced the patio process by emphasizing the importance of understanding the technical details of silver refining. According to Capoche, although it is "very well known" that silver and gold can be refined by quicksilver, "everyone in general ignores the way it is done because it is a "finicky" thing and "used in few parts of the world." He noted that despite it being a "natural effect to discover such a beneficial use," this discovery required "great ingenuity and ability," which he intended to demonstrate to the viceroy through his description of the details of the process.[47] Rather than assuming the viceroy's positive valuation of technical knowledge, Capoche aimed for his *relación* to make that precise argument: he included technical information to make an argument about its importance for *gobierno* (governance). The incoming viceroy, Capoche argued, should value and appreciate this knowledge in the context of his political, legal, and administrative responsibilities.

Like Hinestrosa, Capoche felt compelled to persuade his intended reader of the credibility of his *relación*. Capoche addressed this issue directly in multiple passages of his *relación*. The truths of Peru, Capoche noted, were so strikingly different from those of the Iberian Peninsula for their "singularity" and "the subject of their matter" that "they are not understood except by the exercise of experience." This phenomenon, he noted, "is accustomed to happen in new regimes (*gobiernos*)."[48] He cautioned the viceroy regarding the difficulties of distinguishing between the representations of others. It was possible, Capoche wrote, to represent the affairs (*negocios*) of this land "in so many ways and adulterated." Because the viceroy was "far from his [accustomed] center and place," Capoche noted, "for some time there would be a risk in recognizing and choosing the true [representation]."[49]

Capoche, unlike Hinestrosa, represented his credibility as derived not from his metallurgical knowledge but from the methods he employed in composing his *relación*.

47 "Aunque es cosa muy sabida que con el azogue se saca la plata y oro de los metales, la manera que en esto se tiene todos lo ignoran en general, por ser cosa excquisita y en pocas partes del mundo usada. Por la cual pondré aquí el orden que se tienen en hacer esto, aunque es operación y efecto natural hallar uso tan provechoso, fué de mucho ingenio y habilidad, pues vemos se parte el azogue para sacar tres onzas, y [aun] dos, de plata que haya en un quintal de metal, incorporada y dividida toda la cantidad [de azogue], que bien se puede juzgar en qué forma tan chica está en las cien libras de metal", Capoche, *Relación general*, 122.

48 "son tan diferentes los de acá por la singularidad y sujeto de su materia que no se dejan comprender si no es por la experiencia en su ejercicio mente suele suceder en los nuevos gobiernos", *ibid*., 72.

49 "sería posible representarlos de tantas maneras y tan adulterados y fuera de su centro y lugar que por algún tiempo hubiese riesgo en conocer y elegir el verdadero", *ibidem*.

Capoche offered an account of local commerce in Potosí to demonstrate that the town was both the source of the realm's silver and the kingdom's guarantor. In this section, Capoche offered a textual narration accompanied by quantitative tables to describe how commercial activities in Potosí, including the production of silver, the sale of mercury, the *rescate* market, and the clothing trade, had contributed to the royal treasury.[50] According to Capoche, Potosí's contributions could be understood according to a narrative of rise, decline, and recovery. Potosí's riches, he noted, "withered and wasted away" to such an extreme that what was initially collected in a month in royal fifths could no longer be produced in an entire year. Yet, "with the introduction of refining via mercury amalgamation," which began to "give fruit" in 1574, these returns began "little by little to grow."[51]

In this section, Capoche addressed explicitly his expectation that the viceroy would receive reports contradicting his assessment. He explained that the information he offered conformed to a "*relación general*," which he understood as comprising the "exterior and public part" of governance (*gobierno*). The "interior and secret," he noted, would be revealed as a verbal report (*relación por palabra viva*) and provided by municipal officials (*procuradores*). Capoche also emphasized the reliability of his account in relation to that of Potosí's officials. His own account, he promised, "will be as much and truthful as is necessary, so that what is furnished will be with the rectitude and discretion that is suitable." In contrast, the "interior and secret" would be revealed via the process of administrative review (*visita*), provided "it suffers no detriment." [52]

Capoche underscored the reliability of his account by closing this section with a description of his method and sources. He noted that many witnesses can testify to the riches that have emanated from Potosí. In order to make these riches apparent for the viceroy, Capoche "made an account of what has been placed as fifths in the official archive (*caja*)." This accounting was not a straightforward task, for "the books of the first quintos are not preserved with the clarity of those today, since in the early years the quantity of silver was so great that the king's portion was determined via a steelyard (*por romano*)." The ambiguity of these early records was such, asserted Capoche, that the accuracy of his own account depended on what he had retained in memory of the accounting (*averiguación*) carried out by Viceroy Toledo in 1574.[53] These comments signaled to readers not only Capoche's care in composing his account but also his local reputation. They indicated that Capoche

[50] *Ibid*., 177.

[51] "esta riqueza se fué enflaqueciendo y delgazando en tanto extremo que lo que valían los quintos al principio en un mes no valían más en un año. Y desde el beneficio del azogue, que comenzó año setenta y cuatro a dar fruto, tornaron poco a poco a crecer", *ibidem*.

[52] *Ibid*., 176.

[53] *Ibid*., 180. I took this translation of "por romano" from the translation of a verbatim passage in Acosta, *Natural and Moral History of the Indies*, 178.

had composed his *relación* in consultation with official papers held in Potosí's municipal archives, access to which was predicated on a petitioner's good standing with municipal and royal officials.[54]

4. Conclusion

Modern scholars interested in premodern technological knowledge and practice are inexorably drawn to Capoche's and Hinestrosa's *relaciones*. Not only are they individuals with on-the-ground experience in the particulars of colonial Andean mining, but their narratives offer rich details recounting their personal experience in the industry. This contribution deliberately resisted such an approach. It aimed to recover not Capoche's and Hinestrosa's metallurgical knowledge but rather how they understood their intended readers' interest in that knowledge.

While both Capoche and Hinestrosa thought technical knowledge was important to Iberian officials, they differed as to how they understood the administration's valuation of that knowledge. Capoche sought to convince the viceroy that technical knowledge of metallurgical practice was important for viceregal governance. Hinestrosa, on the other hand, believed theoretical knowledge enhanced the credibility of his claims as an author.

The divergent goals underlying each *relación* likely shaped the roles each author assigned to metallurgical knowledge. Because Hinestrosa aimed to persuade the king of the viability of his discovery, he emphasized his metallurgical expertise. Hinestrosa likely believed that it was his experience in mining and refining that would make his claims of New Potosí's richness persuasive. Capoche, in contrast, aimed to convince Torres y Portugal that his account was more credible and truthful than those composed by other individuals in Potosí. While his technical expertise might distinguish him as an author, the credibility of his account had to rest on the methods of composition and the evidence he amassed. By assuring the incoming viceroy of his credibility, Capoche's arguments for the relevance of technical knowledge to governance would then be more persuasive.

These distinctions suggest the value of probing more deeply the Iberian state's role in early modern knowledge production. The presence of natural and technical knowledge in official archives testifies to a widespread appreciation of such knowledge. However, as this analysis has revealed, the agent (or assumed agent) of that appreciation may be less obvious. Tracing an appreciation of the acquisition of knowledge - and assumptions about that appreciation - would likely result in a more nuanced understanding of the relationship between science and the state and how it evolved over the course of the early modern period.

[54] Castillo Gómez, "New Culture of Archives", 554, 558-559.

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