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Some Methods for Indicating Cartographic Uncertainty, Fifteenth through Eighteenth Centuries

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▼ **ABSTRACT** We have a strong tendency to trust maps as accurate depictions of the world, and most early modern cartographers are content to enjoy that *prima facie* trust without raising questions about the trustworthiness of their sources. In this article I will examine several methods that cartographers used from the fifteenth to the eighteenth centuries of departing from this convention, and indicating to their viewers in a forthright manner which parts of their map they were certain about, and which they were uncertain about. Some of these methods include listing sites about whose location the cartographer is uncertain, using a different graphic style to depict unknown coastlines, using signs to distinguish between certain and uncertain regions, and surrendering to uncertainty and reprinting varying maps of the same region together. Determining what earlier scholars did not know, and how they dealt with that lack of knowledge, is an essential step in producing the history of knowledge.

▼ **KEYWORDS** history of cartography; maps; uncertainty; Abraham Ortelius; Didier Robert de Vaugondy; Alexander Dalrymple

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J.B. Harley and David Woodward have given a usefully broad definition of maps as "graphic representations that facilitate a spatial understanding of things, concepts, conditions, processes, or events in the human world."[1] Our experience with this capacity of maps to facilitate our spatial understanding results in a strong tendency to trust what we see in them—to accept them as reflecting true knowledge. Even though a deeper experience with them teaches us that no map is an objective document, but rather a partisan expression of the cartographer's interests,[2] the initial tendency to trust maps still persists. The historian Henry Wagner highlighted this important characteristic of maps when he remarked that "there is nothing that has such an air of verisimilitude as a map," and some decades later J. Paul Goode similarly wrote that "a well-drawn map creates an aura of truth and exactness."[3] Many cartographers are content to have their maps go forth into the world with the benefit of this *prima facie* credibility and trustworthiness—and indeed try to enhance it by adding words such as *nova*, *accuratissima*, or *exactissima* to their titles—while doing nothing to weaken it by expressing doubts about their sources.[4]

In this chapter I will discuss some of the ways early modern cartographers have addressed issues of uncertainty in their representations of the world—how they have represented uncertainly on their maps, when they have chosen to do so. The subject is a very important one in terms of both the history of knowledge and history in general. As Alain Corbin has written:[5]

> The first duty of all historians is to identify lacunae and to inventory and measure gaps in the knowledge of earlier generations and, by the same token, discrepancies in the social reach of what facts were known. We cannot fully understand our forebears without some idea of what they did not know, either because no one knew it, or because they in particular were not in a position to know it.

And the cartographer's choice to indicate uncertainty on maps is an unusual response to an interesting epistemological dilemma, namely: "Will acknowledging what we do not know necessarily expose the fragile nature of our knowledge, undercutting any claims to epistemic authority? Or … will it render our

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1 Harley and Woodward, "Preface," xvi.

2 The fundamental work here is Harley, "Maps, Knowledge and Power."

3 Wagner, *The Cartography*, 3; Goode, *Goode's World Atlas*, vii, quoted by Wood, *The Power of Maps*, 25. Also see Boggs's remark that educated people "usually accept subconsciously and uncritically the ideas that are suggested to them by maps" in his article "Cartohypnosis," 469.

4 The word *nova* ("new") was first added to the titles of the four modern, post-Ptolemaic maps added to the 1482 edition of Ptolemy's *Geography*; in the 1486 edition the word *moderna* was used instead. The earliest map with a variant of the word *exactissima* in the title is the modern world map in the 1522 edition of Ptolemy's *Geography*, titled *Orbis typus universalis iuxta hydrographorum traditionem exactissime depicta 1522*. The first occurrence of *accurata* or a variant thereof in the title of a map is in Ortelius's *Theatrum orbis terrarum* of 1570, namely *Caletensium et Bononiensium ditionis accurata delineatio*.

5 Corbin, *Terra incognita*, 1. A similar point was made earlier by Tuana, "Coming to Understand," 194–95.

knowledge more robust for having its limitations and its perspectival nature exposed?"[6]

Any discussion of uncertainty in early modern maps should begin by acknowledging Wilcomb Washburn's 1968 article "Representation of Unknown Lands in XIV-, XV- and XVI-Century Cartography," a fundamental contribution to this area of study.[7] Washburn examines several cases in which cartographers deployed special graphical signs to indicate that a coastline was uncertain. One cartographer he mentions who engaged in this practice, and whose work I addressed in a book a few years ago, is Pierre Desceliers (d. 1558). In his 1546, 1550, and 1553 world maps, Desceliers has a special standardized visual style for depicting coastlines about which he was uncertain—for example, the northwestern coast of North America, the northern coast of Asia, the western coast of South America, and the northern coast of the hypothetical southern continent: he depicted these coasts as a series of headlands separated by rivers, often labeling the river simply "R."[8]

In what follows I discuss some other ways that cartographers deal with uncertainty, hoping to broaden our appreciation and understanding of this aspect of mapmaking. I begin with a striking example of cartographic uncertainty expressed in a cartouche designed to conceal cartographic uncertainty.

Uncertainty in the Maps of Abraham Ortelius

To his famous atlas the *Theatrum orbis terrarum*, which he first printed in 1570, Abraham Ortelius (1527–1598) first added his *Parergon* or supplement of historical maps in 1579, and he added more maps to it in successive editions of the atlas.[9] In 1603 he added a map titled *Geographia sacra* ("Sacred Geography"),[10] and this map contains a cartouche in Africa that covers the area where Ortelius might have depicted the sources of the Nile, thus concealing his ignorance of the river's sources [**Fig. 1**]. To the left is another cartouche that declares the purpose of this inset map,[11] which is to show the various

6 Gross and McGoey, "Revolutionary Epistemology," 5.

7 Washburn, "Representation of Unknown Lands." For discussion of the theoretical aspects of mapping the unknown, see the essential work by Lois, *Terrae incognitae*.

8 See Washburn, "Representation of Unknown Lands," 11 in the reprint, and Van Duzer, *The World for a King*, 23 with figs. 26, 32, and 33; also see 179, note 120. Desceliers's 1546 map is in Manchester, John Rylands Library, French MS 1*; his 1550 world map is in London, British Library, Add. MS 24065; his 1553 map was destroyed in a fire in 1915, but there is a facsimile of the map in Oberhummer. A good zoomable image of Desceliers's 1550 map is available at https://www.bl.uk.

9 On Ortelius's *Parergon*, see Meurer, "Ortelius as the Father"; Wellens-De Donder; and Tolias.

10 On Ortelius's *Geographia sacra*, see van den Broecke, *Ortelius Atlas Maps*, 231, no. 179; a high-resolution image of the copy of the map illustrated here is available at https://searchworks.stanford.edu.

11 The text in this cartouche is transcribed by van den Broecke, no. 179; in this text Ortelius mentions that he discusses his thoughts about the locations of Ophir in his *Thesaurus geographicus* (Antwerp: Christophe Plantin, 1587). For discussion of Ortelius's *Thesaurus*, see Meurer, "*Synonymia – Thesaurus*

Figure 1. Abraham Ortelius, *Geographia sacra* (Antwerp, 1603). The exemplar illustrated here was printed in 1612. Courtesy of the Leonard and Juliet Rothman Holy Land Map Collection, Stanford University Libraries.

locations that different scholars have suggested for the rich port or region of Ophir, which is mentioned several times in the Bible.[12] The text above the map reads *Haec notula locum Ophirae designat*, "This little note indicates the location of Ophir." And the map includes four possible locations for Ophir: one in the Caribbean, one in western South America, one in southern Africa (Ortelius's preferred option), and one in southern Asia, in each case indicating the name of the authority who locates it there. Ortelius's devoting two large cartouches—a substantial percentage of the map's area—to the uncertainty regarding the location of Ophir is unusual, and it is particularly remarkable that he cartographically depicts his uncertainty about the location of Ophir using a cartouche in which he hides his uncertainty about the source of the Nile.

In fact Ortelius openly grapples with uncertainty in several of the maps in his *Parergon*, though in a different way than in his *Geographia sacra*. Making maps according to the geography of classical antiquity was very challenging, particularly locating various cities, peoples, mountains, and so forth that had been mentioned by classical authors without enough context to allow their precise placement on a map. Ortelius might have simply omitted these place names from his maps and made no mention of them, but he chose the more intellectually honest method of listing the cities and other features that he had not been able to locate.

There is a good example of this in Ortelius's map *Hispaniae veteris descriptio* ("Map of Ancient Hispania"), which he first printed in 1586.[13] In the lower right corner of the map there is a large cartouche titled *Hispaniae loca aliquot incognitae positionis* ("Several Places in Hispania of Unknown Position") which lists 50 peoples, 112 cities, 2 mountains, 2 rivers, and 3 springs [**Fig. 2**]. At the end of the list Ortelius explains his rationale for including this list on his map and points to a source of further information about these place names:

> Although I did not know the location of all these places, I thought it disadvantageous that they should be absent from this map. For from all the ancient history (I call "ancient" up to the time of Charlemagne) I wanted to set forth the names of all the places of this region: and unless I am mistaken, I have done so. If, however, some names will seem to the reader to be missing from these, they will perhaps be synonyms of some of these, all of which are discussed in our *Thesaurus geographicus*.[14]

– *Nomenclator*." Ortelius also discusses the location of Ophir in the text that accompanies the map *Geographia sacra*, which is also transcribed and translated by van den Broecke.

12 For discussion of the different locations assigned to Ophir, see Romm; Ward, 227–48; and Magasich-Airola and de Beer.

13 On Ortelius's *Hispaniae veteris descriptio*, see Hernando and also van den Broecke 245, no. 193. A high-resolution image of a hand-colored copy of the map is available in Stanford's copy of the 1595 edition of the *Theatrum*, at https://searchworks.stanford.edu/view/201273, image 409.

14 Ortelius's text here reads *Horum omnium situm quamvis ignorarem, abesse tamen ab hac tabula iniquum putavi. Ex omni enim vetere historia (veterem voco ad Caroli Magni usque tempora) omnium huius regionis locorum vocabula exprimere volui: & ni fallor expressi. Si quae autem lectori in ea desse videbuntur; erunt*

Figure 2. Detail of Abraham Ortelius, *Hispaniae veteris descriptio* (Antwerp, 1586), showing the cartouche with a list of classical places about whose location Ortelius is uncertain. Courtesy of Barry Lawrence Ruderman Rare Maps.

Ortelius also alludes to uncertainty about the location of a place on the map itself. Off the northeastern coast of the Iberian Peninsula he writes *Cassiterides insulae, hic Ptolomeo* ("The Cassiterides islands [are located] here according to Ptolemy")—but he does not show the islands here, because he locates them off the coast of England, as he briefly explains in the text that accompanies the map.

Ortelius similarly indicates his uncertainty on several other maps in the *Parergon*, including in cartouches lists of places whose locations he does not know, and occasionally indicating his uncertainty with a brief text on the map itself. In his map *Insular. Aliquot Aegaei Maris Antiqua Descrip.* ("Ancient Map of Some of the Islands in the Aegean Sea"), first printed in 1584 for the *Parergon*, the list of place names of unknown location in Euboea takes up about as much space as the map of the island itself.[15] His *Thraciae Veteris Typus* ("Map of Ancient Thrace"), first printed in 1590,[16] has two cartouches that list places whose locations he does not know. The smaller cartouche in the upper right corner of the map is titled *Loca Circa Byzantium, Incertae Positionis* ("Places near Byzantium Whose Locations are Uncertain"), and a larger cartouche in the lower right corner is titled *Thraciae Aliquot Incogniti Situs, Loca* ("Some Places in Thrace Whose Locations are Unknown"). The long list in the latter includes places, regions, cities, peoples, mountains, rivers, towns, a bay, a forest, a spring, and a field. Following the list, Ortelius adds, "There were many more to be added to these, as also in the map itself, from Zonara, Cedrenus, Nicephorus, and the other Greek writers of Byzantine history; but because I do not count these authors among the ancients, I have purposely omitted them."[17] This sentence shows that Ortelius was strict about confining his map to depicting Thrace according to ancient sources.

An interesting and innovative system for visually distinguishing on his map places he was uncertain about because he had not visited them is employed by Jacob van Deventer (d. 1575) in his map *Geldria Duc. Gelderlandt*. The map was commissioned by Charles V, the Holy Roman Emperor, to mark the incorporation of Gelderland into his kingdom, and was first printed in 1543. No exemplars of the 1543 woodcut printing survive, but there is one surviving

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fortasse horum quorundam synonyma, de quibus omnibus in nostro Thesauro geographico. The translation is mine.

15 On Ortelius's *Insular. Aliquot Aegaei Maris Antiqua Descrip.*, see van den Broecke, 268–69, no. 216. A high-resolution image of a hand-colored copy of the map is available in Stanford's copy of the 1595 edition of the *Theatrum*, at https://searchworks.stanford.edu/view/201273, image 460.

16 On Ortelius's *Thraciae Veteris Typus*, see van den Broecke, 266, no. 214. A high-resolution image of a hand-colored copy of the map is available in Stanford's copy of the 1595 edition of the *Theatrum*, at https://searchworks.stanford.edu/view/201273, image 448.

17 Ortelius's original Latin reads: *Plura erant his addenda, uti quoque in ipsa tabula refferenda, ex Zonara, Cedreno, Nicephoro, ceterisque Byzantinae historiae graecis scriptoribus at quia hos inter veteres non numero, consulto omisi*. The authors he mentions are Joannes Zonaras (twelfth century), George Kedrenos (eleventh century), and Nicephorus Bryennius (1062–1137).

exemplar of the 1556 copperplate print.[18] The map was created on the basis of accurate surveys of towns, cities, castles, monasteries, and rivers. Yet van Deventer was unable to survey all of the locations included in the map, and in a remarkable gesture of epistemic forthrightness, he uses a special symbol ("⊙") to mark the locations that he had surveyed, omitting this symbol in the places he had not surveyed. He explains this system to the reader in both Latin and Dutch in the cartouche in the lower left corner of the map [**Fig. 3**]. As the explanation in Dutch is a bit fuller, I transcribe and translate that text (I expand contractions):

> Die carte van tvermaerde hertoochdom van Gelre, met die frontieren van alle die landen daer aen roerende oft stotende, bescreven ende gemaect doer bevel ende ten costen van Keÿserlÿcke Maiesteÿt. Te weten alle die Steden [city symbol], dorpen [town symbol], cloosteren [cloister symbol], casteelhuÿsen [castle symbol], met alle die Scoon excellente rivieren, gemeten ende gestelt nae rechter aert der Geographien. Maer soe wat plaetsen dit teÿken ⊙ niet hebben, die selve en syn soe volcomen ende sekerlyck geset als dander, om datmen over all niet soe vrÿlÿck die metingen heeft moeghen ghebruÿcken. Sÿn nochtans die selve plaetsen beter ende sekerlÿcker gestelt dan enighe andere Carten voertÿts bÿ anderen wtgegeven.
>
> The map of the extensive Duchy of Gelre, with the frontiers of all the lands adjacent to it, described and made by order and at the expense of [His] Imperial Majesty. Namely, all the cities [city symbol], towns [town symbol], monasteries [cloister symbol], castles [castle symbol], along with all the beautiful and excellent rivers, measured and arranged according to the true principles of geography. However, for those places that do not have this mark ⊙, they are [not] placed as accurately and securely as the others because measurements were not freely available everywhere. Nevertheless, these places are better and more securely positioned than some other maps previously published by others.[19]

The distribution of these signs on the map shows that it was mostly the locations in the eastern part of the map that van Deventer did not have an opportunity to survey. It is remarkable how unusual it is for cartographers to indicate the areas on their maps about which they were uncertain.

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18 The unique surviving exemplar of the 1556 print of van Deventer's *Geldria* is in Wolfenbüttel, Herzog August Bibliothek, K K 2. For discussion of the map, see Avis, "Jacob van Deventer's kaart"; Vredenberg-Alink, *Kaarten van Gelderland*, 18; Meurer, "Metrische analyse"; and Blonk and van der Krogt, *Geldria Ducatus*, 55–58. For discussion of van Deventer's cartographic career, see van 't Hoff, *Jacob van Deventer*; and de Smet, "De plaats."

19 On van Deventer's text in which he describes this system, see de Smet, "De plaats," 469–70; Vredenberg-Alink, *Kaarten van Gelderland*, 18; and Meurer, "Metrische analyse," esp. 38–39. In the translation of the penultimate sentence I supply the "not" required by sense.

Figure 3. Detail of the cartouche explaining the cartographer's system for indicating uncertainty, from Jacob van Deventer, *Geldria Duc. Gelderlandt* (Antwerp, 1556). Wolfenbüttel, Herzog August Bibliothek, K K 2, 3. Courtesy of the Herzog August Bibliothek.

Moving from the sixteenth to the seventeenth century, we encounter a map with a different, but equally forthright, system for distinguishing between information the cartographer was certain about, and information about which he had less confidence, namely the famous 1612 map of Virginia by Captain John Smith (1580–1631).[20] In the upper right corner of the map there is a brief legend that reads in part "Signification of these markes, To the crosses has bin discouerd, what beyond is by relation," followed by an image of a cross. He means that what is closer to Jamestown and the Chesapeake than the crosses was well known to him, whereas what was beyond the crosses he knew about only from the reports of others.[21] He deploys the crosses from the northwestern edge of

20 On Smith's map of Virginia, see Ford, Verner, Brod, and Burden, vol. 1, no. 164. A high-resolution image of the map is available via https://jcb.lunaimaging.com.

21 For discussion of the crosses on Smith's map, see Haile, Appendix 1.

Figure 4. John Smith's map *Virginia* (Oxford: Joseph Barnes, 1612), highlighting the locations of the crosses that separate territory explored by Smith from territory he had only heard about. Courtesy of the John Carter Brown Library.

the map eastward in an irregular line that in the eastern part of the map runs south to encompass Chesapeake Bay, running much closer to the bay's southern shore than its northern [**Fig. 4**]. One might wish that this candid system of setting forth the relative reliability of information in different parts of a map would have been adopted by other cartographers, but it should be noted that Smith himself uses no similar system in his map of New England of 1616,[22] and moreover Jodocus Hondius (1594–1629) in his 1618 copy of Smith's map of Virginia, titled *Nova Virginiae Tabula*,[23] entirely misconstrues Smith's system of crosses, confusingly labeling them in his legend *Lucubrationes Anglorum*, which means "Nocturnal studies of the English." Hondius's map, with its incorrect explanation of the crosses, was reprinted many times.[24]

22 On Smith's 1616 map of New England, see Brod, and also Burden, vol. 1, no. 187. A high-resolution image of the map is available via the Luna site of the John Carter Brown Library at https://jcb.lunaimaging.com.

23 On Hondius's 1618 map, see Verner, and also Burden, vol. 1, no. 193.

24 Another derivative of Smith's map of Virginia, namely that titled *Virginia. Erforschet und beschriben durch Capitain Iohan Schmidt* in Theodore de Bry's *Grand Voyages, Dreyzehender Theil Americae*, published

Figure 5. Andrés Salgado, *Mapa de la tierra descubierta de las Montañas de los Andes, Cerro de la Sal, y ciudad que fundaron los españoles conquistadores, primeros della, de la una y otra banda del río Marañon*, c. 1651. Spain, Ministerio de Cultura, Seville, Archivo General de Indias, MP-PERU_CHILE, 194. By permission of the Ministerio de Cultura.

Another map which, like Smith's map of Virginia, clearly distinguishes between information the cartographer was certain about and things he had heard by report is an anonymous manuscript map made in 1663 titled *Mapa de la tierra descubierta de las Montañas de los Andes, Cerro de la Sal, y ciudad que fundaron los españoles conquistadores, primeros della, de la una y otra banda del río Marañon* ("Map of the Discovered Land of the Andes Mountains, Cerro de la Sal, and the City Founded by the First Spanish Conquerors on Both Sides of the Marañon River").[25] The map accompanied a report presented to the Spanish Crown by Andrés Salgado in which he shows the results of an expedition to Peru he had been on in 1650–1651 under the leadership of Pedro

in 1627 after de Bry's death by his son-in-law, Matthäus Merian, retains the correct interpretation of the crosses: the legend reads *Die Bedeuting der Merckzeichen wo ein ✠ bey stehet, ist es durch sie selber erkundiget worden: was weiter ist, hat mann auss der Einwohner Relation und Bericht*.

25 This anonymous manuscript map is in Seville, Archivo General de Indias, MP-PERU_CHILE, 194, and a medium-resolution image of the map is available online at http://pares.mcu.es/ParesBusquedas20/catalogo/show/22847. The map is discussed in *Los siglos de oro*, 198. I thank Roberto Chauca Tapia for bringing this map to my attention.

de Bohórquez and seeks permission to return to Peru to explore the eastern part of the Viceroyalty.

The cartouche in the upper left-hand corner of the map supplies a numbered list of 27 towns, sites for mineral extraction, and rivers that had been fully explored (*descubierta*) by Bohórquez and Salgado.[26] The cartouche in the upper right-hand corner, on the other hand, titled "Land according to Tidings" (*Tierra de noticia*) lists 21 places that they had not explored but had heard about by report (*por relación*) [**Fig. 5**].[27] This careful division between lands that had actually been explored and those about which the explorers only had reports is similar to the division we saw on Smith's map of Virginia, but in this case the division is not indicated by a line on the map—instead, the viewer has to find each of the numbered places to understand the division. At the same time, there is an important additional motivation that underlies the division on this map which is absent from Smith's: the explorers are seeking permission to make an additional trip to the region, and listing the areas about which they had only heard but were unable to reach gives good reasons for a return voyage. In particular, item 40 on the list in the upper right mentions Paititi, an alleged Inca city of gold,[28] which would certainly have been of interest to the Spanish Crown.

Another very forthright way to indicate uncertainty is by leaving part of a coastline blank. This is quite different than the practice of Pierre Desceliers and other cartographers mentioned above who use a distinctive visual style for rendering coastlines about whose details they are uncertain, for in those cases there is at least a pretense at locating the coastline, and an inattentive viewer might not notice the difference in visual style, and accept the hypothetical coastline as reflecting knowledge. To leave a section of coastline entirely blank signals to the viewer the cartographer's uncertainty in the clearest possible way. This strategy is adopted by the cartographer who made the map of the eastern hemisphere in the 1505 edition of Amerigo Vespucci's letter on the New World, Amerigo Vespucci, *Epistola Albericij. De novo mundo* (Rostock:

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26 The text introducing the list in the cartouche in the upper left-hand corner of the map reads *Tierra descubierta de la conquista de los yndios Andes hecha por el capitán Don Pedro de Bohorquez y Don Andrés Salgado de Araujo y Bernardo de Figueroa y Andrade y demás compañeros, la qual dejaron de proseguir como constará por los papeles que con éste ban*, that is, "Land discovered from the conquest of the Andes Indians made by Captain Don Pedro de Bohórquez and Don Andrés Salgado de Araujo and Bernardo de Figueroa y Andrade and other companions, which they stopped pursuing, as will be confirmed by the papers that accompany this [map]."

27 The text introducing the list in the cartouche in the upper right-hand corner of the map reads *Tierra de noticia que no está descubierta sino por relación hecha por los capitanes Don Pedro de Bohorquez y Don Andrés Salgado de Araujo y demás compañeros*, that is, "News-land which is not discovered except by report made by the captains Don Pedro de Bohórquez and Don Andrés Salgado de Araujo and other companions."

28 On Paititi, see de Acosta, *História natural* (1590), Book 3, chapter 25, p. 182 (here spelled Paytiti); de Acosta, *Historia naturale* (1596), Book 3, chapter 18, f. 51v; Malvenda, *De antichristo*, Book 3, chapter 14, p. 142; and Polia.

Figure 6. The map of the eastern hemisphere in Amerigo Vespucci, *Epistola Albericij. De novo mundo* (Rostock: Hermann Barckhusen 1505), with the southern coast of Africa left unprinted and filled in by hand. Universitätsbibliothek Rostock, SON B 2. Courtesy of the Universitätsbibliothek Rostock.

Hermann Barckhusen, 1505) [**Fig. 6**].[29] The southwestern and southeastern coasts of Africa are printed, but the southern coast of the continent was left blank, to be drawn in by hand when better information was available—as has been done in the exemplar in the Universitätsbibliothek Rostock illustrated here. This is an interesting and somewhat puzzling choice by the cartographer, since Vasco da Gama had sailed around the Cape of Good Hope in his voyage of 1497–1499, and it is well depicted on maps made before 1505. Various other

29 On the 1505 edition of Vespucci's letter, see Harrisse, *Bibliotheca Americana Vetustissima: Additions*, p. 16, no. 13. The copy of this at the Universitätsbibliothek Rostock, shelfmark SON B 2, is available in digital format at http://rosdok.uni-rostock.de/resolve/id/rosdok_document_0000015003. There are also exemplars of this book at Frankfurt am Main, Univ.-Bibliothek, Ausst. 218 and British Library, General Reference Collection C.20.e.18. The exemplars at the New York Public Library and the New

cartographers adopted this strategy: the anonymous cartographer of the so-called Kunstmann II chart, usually dated c. 1502–1506, leaves blank part of the northeastern coast of South America;[30] as does Martin Waldseemüller (1470–1520) in his *Carta marina* of 1516;[31] as does the King-Hamy map, which has usually been dated to the beginning of the sixteenth century, but I have recently argued is rather from the middle of that century.[32]

A map of the eastern Atlantic and the Indian Ocean made in 1687 by Vincenzo Coronelli (1650–1718) has not one but two systems of longitude: two sets of meridians, the first indicating traditional estimates, and the second reflecting more recent astronomical determinations of longitude by French Jesuit scientists.[33] The presence of the two systems, rather than just the one system reflecting the updated values, indicates uncertainty, and in fact Coronelli did not follow the new values in any of his subsequent maps of parts of the Indian Ocean.

Uncertainty Reflected Across a Corpus of Maps

Sometimes the degree of uncertainty in an individual map can be best appreciated by considering it together with other maps of the same region from the same period. Tony Campbell has remarked, "Perhaps the early mapping of Japan shows greater variations than that of any other region,"[34] and seeing the tremendous variation in the contours and orientation that European cartographers assigned to the Japanese archipelago can help one appreciate that each individual map—despite its *prima facie* visual authority—was actually based on the cartographer's overbold guesswork and extrapolation from vague textual descriptions. That is, beneath that veneer of *prima facie* authority lies a great deal of uncertainty. I would suggest that the same is true of sixteenth-century maps of South America: while one can see that the contours of the continent are not particularly accurate in any map from this period, considering several

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York Historical Society are photostats. The text above the map is conveniently transcribed by Avezac, *Martin Hylacomylus Waltzemüller*, 76.

30 The Kunstmann II map is in Munich, Bayerische Staatsbibliothek, Cod. icon. 133, and a digital image of the map is available via https://www.digitale-sammlungen.de. For discussion, see Kupčík, *Münchner Portolankarten*, 28–34; and Scafi, "The African Paradise."

31 A high-resolution image of Waldseemüller's *Carta marina* is available at https://www.loc.gov/item/2016586433/. For discussion of the map, see Van Duzer, *Martin Waldseemüller's Carta marina*.

32 The King-Hamy map is in San Marino, CA, Huntington Library, MS HM 45. A digital image of the map is available via https://hdl.huntington.org. For discussion of the map, see Van Duzer, "The King-Hamy Chart."

33 Coronelli's map is titled *Route maritime de Brest à Siam, et de Siam à Brest, faite en 1685 et 1686, selon les remarques de six pères jesuites, envoïez par le Roy de France en qualité de ses mathématiciens dans les Indes et la Chine* (Paris: J.B. Nolin, 1687). High-resolution images of the map are available at https://nla.gov.au/nla.obj-232187234/view and https://purl.stanford.edu/br370gx2011; there is a note about the two systems of longitude in the lower left corner of the map.

34 Campbell, *Japan*, 3. On early European maps of Japan, also see Marques, *A cartografia*; and Hubbard, *Japoniae insulae*.

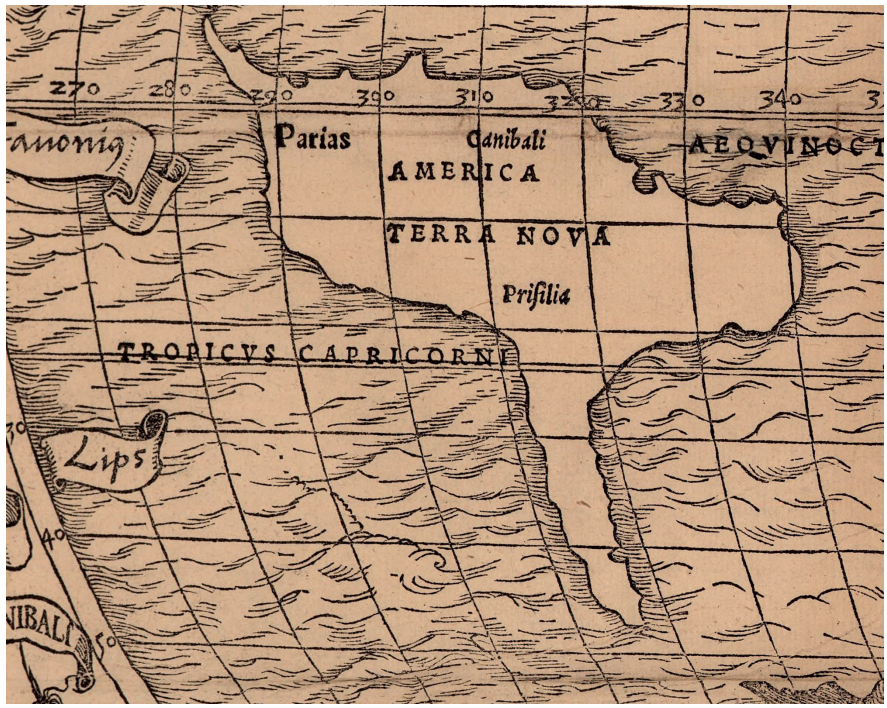

Figure 7. Detail of South America in Sebastian Münster's *Typus cosmographicus universalis* of 1532. Courtesy of the John Carter Brown Library.

Figure 8. Detail of South America in Sebastian Münster's *Novae insulae XVII*, *nova tabula*, a 1542 print. Courtesy of the Sidney R. Knafel Map Collection, Philips Academy, Andover, MA.

of the maps together very convincingly brings home the almost complete uncertainty with which the cartographers were operating. Considerations of space do not permit a programmatic illustration of these maps here,[35] but it is worth mentioning a few cases where a cartographer produced more than one map of South America in which the contours of the continent were entirely different. The contours of South America are completely different in the oft-reproduced world map of c. 1508 by Francesco Rosselli (1445–before 1513),[36] and his nautical chart of the world, also made c. 1508:[37] in the former the continent is basically oval, with a small peninsula jutting to the south, while in the latter it is crescent shaped, with a broad and elaborately indented northern coastline. The shape of South America is also completely different in the world map *Typus cosmographicus universalis* of 1532, reliably attributed to Sebastian Münster (1488–1552),[38] Münster's map of the Americas in his 1540 edition of Ptolemy's *Geography*,[39] and again in his world map in the 1540 edition of Ptolemy's *Geography* and his *Cosmographia universalis*, first printed in 1544.[40] In the first of these, the southern half of the continent is a very narrow peninsula [**Fig. 7**]; in the second the narrow peninsula is gone, the southern tip of the continent is quite rounded, and a huge peninsula juts westward from the northwestern part of the continent [**Fig. 8**]; in the third it has a huge gulf in the northwest, and a huge peninsula jutting eastward in the northeast. The variation in shape is remarkable even in maps by the same cartographer, and when we look more broadly, we discover that in the first half of the sixteenth century, we can find a map that assigns to South America almost any desired shape. This survey shows that behind the superficial visual authority of each map lurks tremendous uncertainty.

Another technique cartographers have used to deal with uncertainty was to cover coastlines or regions about which they were uncertain with a cartouche. To briefly mention one example, there was a long tradition, going back to the

35 A number of sixteenth-century maps of the New World are well reproduced in Nebenzahl.

36 On Rosselli's world map of c. 1508, see Crinò, "I planisferi," esp. 382 and 384–86; Shirley, *The Mapping*, 32, no. 38; Woodward, "Starting with the Map"; and Van Duzer, "A Newly Discovered."

37 On Rosselli's marine world chart of c. 1508, see Crinò, 383–386; Almagià, "On the Cartographic Work," 29, no. 9; and Shirley, 33, no. 39.

38 Sebastian Münster's *Typus cosmographicus universalis* of 1532 is discussed by Harrisse, *Bibliotheca Americana Vetustissima*, 291–296; Karrow, *Mapmakers*, 416; and Meurer, "Die Basler Weltkarte." A high-resolution image of the map is available via https://jcb.lunaimaging.com. For a good brief overview of Münster's cartographic work, see Meurer, "Cartography," 1209–13.

39 On Münster's map of the New World in his 1540 edition of Ptolemy's *Geography*, titled *Novae Insulae XVII Nova Tabula*, see Burden, vol. 1, 15–17, no. 12. A high-resolution image of the map is available via https://www.davidrumsey.com.

40 On the world map in Münster's 1540 edition of Ptolemy's *Geography* and in his 1544 *Cosmographia universalis*, see Ruland, "A Survey," 92. A high-resolution image of Münster's world map in his 1540 edition of Ptolemy's *Geography* is available via https://www.davidrumsey.com; on this map, also see Shirley, 87, no. 77.

1569 world map by Gerard Mercator (1512–1594), of covering the unknown interior of North America with a large cartouche. I have addressed this phenomenon in an earlier work.[41]

Uncertainty and the Failure of Cartography

Jumping ahead in time because of considerations of space, the availability of multiple maps of distant regions—whose distance made it very difficult to confirm their details—created uncertainty about which map was correct and to be trusted. And in some cases cartographers surrendered themselves up completely to this uncertainty, and rather than trying to reconcile different depictions of the same region, printed maps that reproduce several competing depictions. One such map is by the French cartographer Didier Robert de Vaugondy (1727–1786), namely his *Carte de la Californie: suivant I. la Carte manuscrite de l'Amérique de Mathieu Néron Pecci olen dressée à Florence en 1604, II. Sanson 1656, III. De l'Isle Amérique Sept. 1700, IV. le Pere Kino Jesuite en 1705, V. la Société des Jésuites en 1767* (S.l.: s.n., 1770) [**Fig. 9**].[42] The title of the map clearly indicates the cartographer's uncertainty, listing the different maps of which he includes copies whose originals range from 1604 to 1767, without any suggestion offered as to which is to be trusted most. There is some consistency among the maps in the naming of Mendocino and Cabo San Lucas, but otherwise they are almost entirely different with regard to place names, the locations of mountains, and the contours they ascribe to California. Indeed one map depicts the famous myth of California as an island, while the other four do not.[43]

Robert de Vaugondy's *Carte de Californie* is one of ten maps Jean-Baptiste-René Robinet commissioned from the cartographer to add to the *Supplément* to Diderot's *Encyclopedie*, to illustrate articles on geography by Samuel Engel.[44] And the text of the article about "Californie"[45] in the *Supplément* makes it clear that the map is illustrating uncertainty, rather than providing a conspectus of

41 See Van Duzer, *Frames that Speak*, pp. 12–13, 62, 71, 74, 106-109, 162, and 165.

42 The source maps are, in their numbered order: 1. a manuscript map by Mathieu Neron Pecci made in 1604; 2. a detail of Nicholas Sanson's map *Le nouveau Mexique* of 1656; 3. a detail of Guillaume Delisle's map *L'Amerique Septentrionale* of 1700; 4. a detail of Eusebio Kino's map *Passage par terre a la Californie*, printed in 1705; and 5. Isaac Tirion's *Kaart van het Westelyk Gedeelte van Nieuw Mexico en van California* of 1767. Robert de Vaugondy drew inspiration for his map from an earlier map by Philip Buache that shows three of these same maps of California and is titled *La Californie d'apres une tres grande carte espagnole M.ste de l'Amerique …* (Paris, 1752). A high-resolution image of Buache's map is available at https://davidrumsey.com.

43 See, for example, McLaughlin and Mayo, *The Mapping of California*.

44 Warren, "The 'Diderot' Maps," Robert de Vaugondy also published these ten maps separately: see Didier Robert de Vaugondy, [*Recueil de 10 cartes …*] ([Livourne], 1779): see Phillips, *A List*, vol. 1, p. 627. For a general discussion of the articles on geography in the *Encylopedie*, see Dörflinger, *Die Geographie*.

45 Engel, "Californie."

Figure 9. Didier Robert de Vaugondy's *Carte de la Californie: suivant I. la Carte manuscrite de l'Amérique de Mathieu Néron Pecci olen dressée à Florence en 1604, II. Sanson 1656, III. De l'Isle Amérique Sept. 1700, IV. le Pere Kino Jesuite en 1705, V. la Société des Jésuites en 1767* (S.l.: s.n., 1770). Courtesy of the Library of Congress.

historical cartography of the region (for example). It prominently features a quotation from Philippe Buache's *Considerations geographiques* to the effect that, "It is astonishing that we still have so little knowledge of this country."[46] And after praising Kino's map, which shows California as part of the mainland rather than as an island, Engel writes that "Father Kino, not having crossed Rio de Hila, let alone the Rio Colorado, was unable to account for the rivers coming from the west; we must therefore adhere to the old maps, which must regain their rights."[47] Two of the other ten maps in this set similarly reveal uncertainty about recently discovered regions by reproducing multiple differing maps of that region.[48]

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46 The quote is on p. 132 of Engel's article about "Californie" and comes from Philippe Buache, *Considerations geographiques*, p. 64: *Il est étonnant qu'on ait encore si peu de connoissance de ce Pays …*

47 The quote is on p. 133 of Engel's article about "Californie": *Le P. Kino n'ayant point passé Rio de Hila, encore moins le Rio Colorado, n'a point pu rendre compte des rivieres qui viennent de l'ouest; il faut donc s'en tenir aux anciennes cartes qui doivent reprendre leurs droits.*

48 The two maps in question are Didier Robert de Vaugondy, *Carte qui représente les différentes connoissances que l'on a eues des Terres Arctiques depuis 1650 jusqu'en 1747* (Paris, 1772); and *Carte des Nouvelles*

Figure 10. Alexander Dalrymple's *Charts of the Malabar Coast Comparing the Various Published and MS. Charts from Mangalore to Bombay* (London: published according to an Act of Parliament by A. Dalrymple, 1789). Courtesy of the Biblioteca Nacional de España.

Another map of this type is one by Alexander Dalrymple (1737–1808), first Hydrographer of the British Admiralty, namely his *Charts of the Malabar Coast Comparing the Various Published and MS. Charts from Mangalore to Bombay* (London: published according to an Act of Parliament by A. Dalrymple, 1789) [**Fig. 10**].[49] Dalrymple lists his source maps as a chart made by Jean Baptiste d'Après de Mannevillette in 1745, a chart by the Dutch cartographer Gerard van Keulen, an anonymous and undated Dutch chart, an old manuscript chart by the English cartographer Augustine Fitzhugh, and a map made by the English cartographer John Thornton in 1703. We see that there is even uncertainty about the sources Dalrymple chooses: he gives us no easy way to trace the anonymous and undated Dutch chart, for example. Dalrymple

Découvertes dressée par Phil. Buache Pr. Géogr[aphe] du Roi présentée à l'Acad[emie] des Sciences … (Paris, 1772), the latter based on Philippe Buache's *Carte des terres aux environs du Japon ou du nord-est de l'Asie* (Paris, 1752).

49 This chart by Dalrymple and his mapmaking practices are discussed by Cook, "Surveying the Seas," 87.

provides some explanation about the difficulty of reconciling different maps, and his rationale for publishing maps of this sort:

> Whoever knows anything of making Charts from a variety of materials, must know that it is impossible to reconcile those materials perfectly. Indeed it often happens that they are totally contradictory: where I find disagreement in particular charts, I have thought the best way was to engrave both, when I had nothing to enable me to decide on the merits of either.[50]

To make a map of this type is to declare that the uncertainty in and disagreement among the various cartographic models make it impossible to create a map of the region until additional information is obtained.[51] That is, the map paradoxically declares the impossibility of a map.

Conclusions

Thus we see that there is a whole spectrum of ways that cartographers have dealt with uncertainty. Most early modern cartographers do not address the issue at all, preferring not to diminish their maps' *prima facie* credibility and trustworthiness. These cartographers make it difficult for us to fulfil what Alain Corbin (quoted earlier) identified as "the first duty of all historians," namely "to identify lacunae and to inventory and measure gaps in the knowledge of earlier generations."[52] Uncertainty revolves around sources and their reliability, and some cartographers identify their sources—Martin Waldseemüller does so at great length in his *Carta marina* of 1516, for example—but do little to address disagreements among these sources, or explain how they chose among them.[53] Other cartographers, such as Pierre Desceliers and John Smith, deploy signs to convey their level of confidence or uncertainty about different parts of the map—but they are nonetheless bold enough to depict the areas about which they are uncertain. Still others either decline to depict the coastline or region about which they are uncertain, or cover it with a cartouche to avoid

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50 Dalrymple, *General Collection*, 3–4. Another of Dalrymple's composite and "uncertain" maps of this type is his *Sketch Shewing the Cuddalores Track along the Coast of Borneo by A Dalrymple 1761; Chart of the Track of Ship Warren Hastings by John Pascal Larkins …* (1795). As Cook, "Surveying," 313, note 45, remarks, Dalrymple also reprinted five different charts of the Mozambique Channel in May 1791, but these were separate publications, rather than combining the different depictions onto one map.

51 For a remarkable mid-eighteenth-century discussion of the uncertainty resulting from disagreeing maps, see Brooke, *The Fool of Quality*, pp. xxiv–xxvi; for a good discussion of an interesting seventeenth-century case of cartographic uncertainty, see Verdier, "Des cartes en situation d'incertitude."

52 Corbin, *Terra incognita*, p. 1.

53 See Van Duzer, *Martin Waldseemüller's Carta marina*, pp. 128–33 for Waldseemüller's listing of his sources, and pp. 10–19 for discussion of his use of them. One cartographer who does occasionally discuss disagreements among his sources is Fra Mauro in his world map of c. 1455: see Falchetta, *Fra Mauro's World Map*, *53, *149, *270, *389, *480, *560, *707, *957, *1043, *1219, *1405, *1466, *2403, *2435, *2489, *2834, and *2892.

having to commit to any depiction. Finally, a cartographer overwhelmed by a lack of evidence for choosing among various cartographic models for a region could in effect decline to make a map by reproducing several of those models. It is noteworthy that this last solution, or rather acknowledgment that there is no solution, only emerged in the eighteenth century: earlier cartographers often had fewer qualms about mapping hypotheses and extrapolations, such as the hypothetical southern continent.[54]

About the Author

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54 See for example Van Duzer, "The Cartography"; and Hiatt, *Terra Incognita*.

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