Vespucci's Triangle and the Shape of the World[*]

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Interdisciplinary interactions between sixteenth-century travellers and cosmographers produced visual models that challenged normative modes of visual thinking, even as they tried to clarify ideas about the earth's surface. For example, the unstable image that serves as a title-page of a slight mercantile pamphlet produced in Nuremberg c. 1506 (Fig. 1) is vexing both in its demand to be viewed from multiple points of view and its reticence about its content. From the accompanying text, it can be inferred that the image expresses the path of an itinerary to India and collapses notionally the distance between Europe and India via a schematic map layered over a pictorial image – a right triangle super-imposed on a rocky landmass, itself shorthand for the inhabited world. The peculiar image cannot be deciphered without considering both its pictorial properties and its two-dimensional diagrammatic cues.

Part of what makes certain early modern printed images perplexing to contemporary audiences is the distance from their original contexts: many were pirated from diverse and frequently unrelated sources. In the case of contemporary travel reports about new lands encountered by sea-faring Europeans in the early 16th century, recycled images of wild men or humanity's first parents in the Garden of Eden were routinely employed as stand-ins for new world inhabitants (cf. Colin, 1987; Leitch, 2010, especially 53-62). These early

[*] I would like to thank the editors for their helpful feedback and especially Christine Johnson for comments on an earlier draft. I am very grateful to John Kyrin Schafer and to Erik Leitch for their help in deciphering difficult material.

stereotypes produced generalizations that would die hard, as we can see in the title-page image's debt to shorthand that features inhabitants of India as wild men. The other layer of this image, the diagrammatic triangle, was also cribbed from pre-existing visual material that oversimplified the world, but this part was pressed into service to support larger theoretical claims. This phenomenon of transitory motifs in interdisciplinary contexts fashioned travel reports into more than mere records of distances logged, turning them into texts in which the world was reconceptualized.

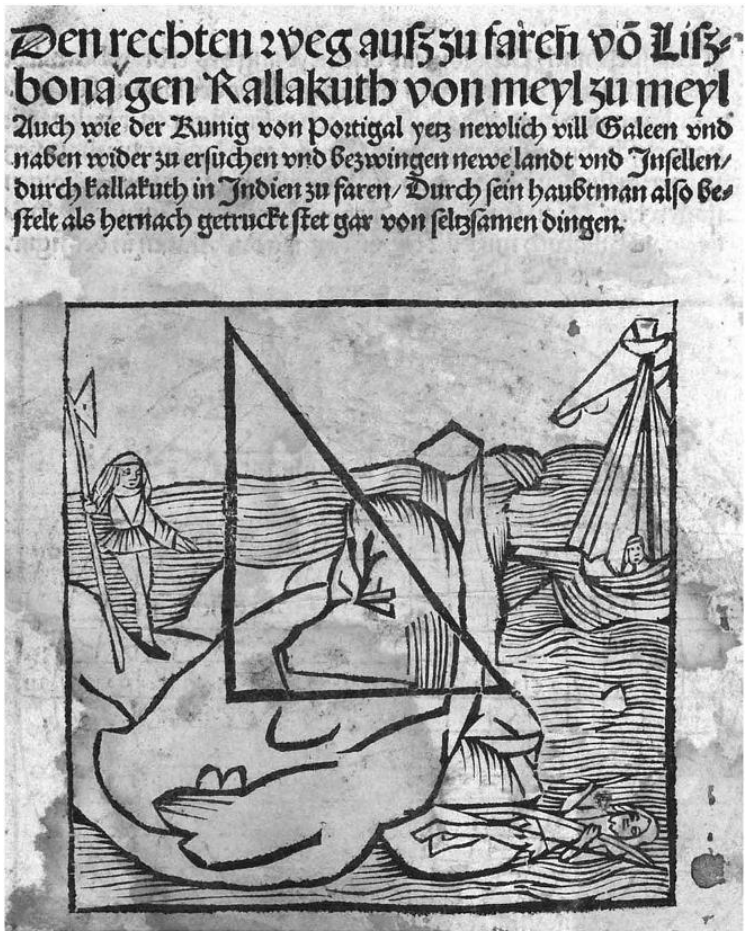

Fig. 1: Anon., *Den rechten weg ausz zu faren vo[n] Liszbona gen Kallakuth* (Nuremberg: Georg Stuchs, 1506), woodcut title-page, Herzog August Bibliothek, Wolfenbüttel, Sig 274 Quod (4).

The triangle opens an anonymous pamphlet entitled *Den rechten weg ausz zu faren von Liszbona gen Kallakuth*, or *The Correct Way to Sail from Lisbon to Calicut*, whose goal was to galvanize local support for commercial missions to India.[1] This visual model expresses the merchant's destination in relation to his point of departure; here, the locations of Lisbon and Calicut are shown perpendicular to each other. If we take seriously the promises made in the pamphlet's title, the triangle outlines the "correct" route as a deceptively simple path for the prospective European mariner bound for India: first head south and then turn left. This reductive interpretation would not have been an outlandish reading of this pamphlet whose purpose was to stimulate trade and to advertise the journey to India as a manageable one for a merchant. But, clearly this is not all that the image is trying to convey. Seemingly remote from the text's ostensible focus on navigational information were the cosmographic ambitions of this triangle for a new audience with both navigational and cosmographic skills.[2]

The inscrutability of this image to modern eyes suggests that it treads a tightrope between representational art and a how-to diagram. Mercantile forays into worlds new to early modern Europe yielded peoples, artifacts, and concepts that did not readily announce themselves to established categories or that could be organized into regular stalls of information. Novel representations of these newly discovered places and subjects were shaped by the visual rhetoric established by navigators, merchants, and cosmographers. Prints produced in the wake of these explorations were often expedient ones, fashioned by

[1] Anon., *Den rechten weg ausz zu faren vo[n] Liszbona gen Kallakuth*, woodcut title-page, Herzog August Bibliothek, Wolfenbüttel, Sig. 274 Quod (4); also Universitätsbibliothek, Munich, Inv. no. 4H.aux.1270:7. For an English translation, see Parker (1956). See also Bezzel (1995: 31-44).
[2] For an example of the breadth of a merchant and navigator's skill set, see Long; McGee; Stahl; Rossi (2009).

craftsmen rather than artists, and many of these images adopted their shorthand of recording. In some cases, shorthand seems even to be a misnomer, as some of these diagrams were extraordinarily ambitious in the complexity and kinds of information they sought to convey.

Rather than creating naturalistic renderings, these diagrams establish schematic representations of the world by capitalizing on the descriptive language of maps and contemporary strategies of recording. These schemata showed water, landmasses, as well as other notational ways of marking these, such as ships and peoples at relevant coordinates. The diagrammatic rhetoric of these images follows the precepts of images of record, whose purpose was to fashion a space for organizing knowledge about the world.[3] The images under discussion in this essay are ones that reflect and document principles, experiments, facts and conceptual pathways not inscribed on the earth's surface, but notional ones. They are not conventionally pictorial, do not focus on narrative content, and frequently work in conjunction with accompanying text. In some cases, the text provides prescriptions for how the image is to function, but in most cases, the image attempts to elucidate concepts expressed in the text.

The triangular space that unites these distant neighbors in *Den rechten weg* develops pictorially what had earlier been expressed in terms of pure geometry in the published editions of a more widely circulated merchant's account, Amerigo Vespucci's report of his third voyage to the Americas, the *Mundus Novus* letter. A German vernacular edition of this

[3] I anachronistically borrow "images of record" from Lorraine Daston and Peter Galison who use this term for visual strategies adopted by atlases, handbooks, survey and expedition reports from a later period. I do not mean to suggest these images' prescient engagement with the epistemic virtues the authors enumerate, such as truth to nature, trained judgment, and mechanical objectivity; however, I think the term is useful for the kinds of work these diagrams performed. I also subscribe to their idea of the community of researchers that made new kinds of knowledge possible (DASTON; GALISON, 2007, especially 18-27).

letter also printed in Nuremberg around 1505 may well have provided a precedent.[4] This edition included a triangular diagram that schematizes passages from Vespucci's text about the physical relationship of Europe vis à vis the new world, in this case present-day Brazil, and belies his thinking about his destination in terms of a world picture (Fig. 2).

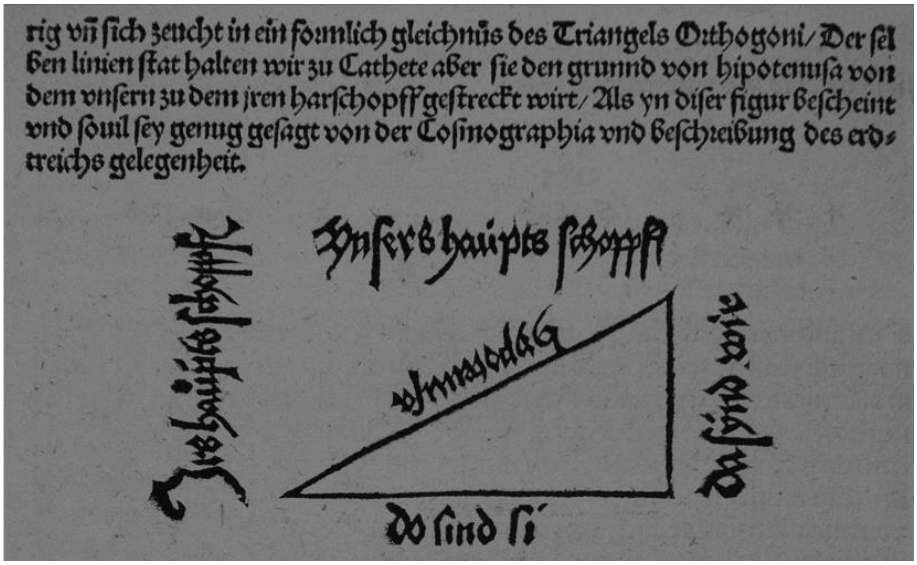

Fig. 2: Americo Vespucci, *Mundus Novus* SuStB Augsburg, Rar 84, fol A5v.

This triangular model charts Vespucci's navigations above and below the equator. Vespucci's itinerary began in Lisbon, at approximately 40 degrees north latitude, and he

[4] Amerigo Vespucci, *Von der neu gefunden Region die wol ain Welt genent mag werden*, SuStB Augsburg, Rar. 84. Alvin Prottengeier also sees a Vespucci edition as a precedent for the triangle in *Den rechten weg* (see PARKER, 1956: 23). Other early editions of Vespucci's *Mundus Novus* letter in the German speaking territories were *Mundus Novus* (Augsburg: Otmar, 1504); *Epistola Albericij/ De nouo mundo* (Rostock: Barkhusen, 1505); *Von der neu gefunden/ Region so wol ein welt genempt mag werden* (Basel: Furter, 1505); *Von den nawen Insulen* (Leipzig: Stöckel, 1505); *Mundus nouns* (Cologne; Landen, 1505); *Von der neüwen gefunde Region* (Munich: Schobser, 1505); *Mundus novus* (Nuremberg, 1505); *De ora antarctica* (Strassbourg: Hupfuff, 1505), and *Uon der neüw gefunden Region die wol ain welt genent mag werden* (Augsburg: Schönsperger,1505). For translations of the Vespucci editions, see Formisano (1992). While doubts about Vespucci's authorship of the *Mundus Novus* letter abound, I follow trends in recent scholarship in referring to Vespucci as the author (see GERBI, 1985: 45ff; JOHNSON, 2006: 9).

navigated to a site 50 degrees below the equator. The right triangle expresses this distance as a fraction of the world sphere through which he travelled, that is, 90 degrees.

> Therefore, as I said, from Lisbon, our point of departure, 39.5 degrees from the equator, we sailed 50 degrees beyond the equator, which together make about ninety degrees, and since this sum makes a quarter of the great circle, according to the true reasoning of measurement passed on to us by the ancients, it is clear that we sailed around a quarter of the world. And by this logic, we who live in Lisbon, 39.5 degrees this side of the equator in the northern latitude, are at an angle of five degrees in the transverse line to those who live at the fiftieth degree beyond the same line in the southern latitude, or, so that you may understand more clearly: a perpendicular line, which hangs over our heads from a point directly above us while we stand upright, hangs pointing toward their sides or ribs: thus we are in an upright line, and they in a transverse line, and a kind of orthogonal triangle is formed thereby, of which we form the perpendicular line, they the base, and the hypotenuse extends from our vertex to theirs, as is evident in the (figure).[5]

[5] I take this translation from Formisano (1992: 54). The German, as rendered in an 1505 edition *Von der neüw gefunden Region die wol ain welt genent mag werden durch den Cristenlichen künig von Portugal wunderbarlich erfunden* (Augsburg: 1505), 6v, reads thus: "So solichs aber nach ir zucht zu solcher form hat mir geburt solichs also zenennen Darumb als ich gesagt habe von Olisippo von dannen wir gefaren seind und abzogen und von den equinoctialem lynien so vern ist nemlich graden Neün und dreyssig semis haben wir geschifft und seind gefaren über die equinoctialischen lyninen wol fünffzig gradus die zesamen geschlagen machen bey neünzig gradus. Die selb sum die weil sy hat den vierden tayl des obersten zirckels nach warer sach und beweisung der mensur un aus messung uns von den alten geben. So ist kuntlich und offenbar das wir den vierden tail der welt durchschyffet haben/ Und aus solcher ursach wir die zu Olisippo wonen bet der equinoctialischen linien am neün und dreissigsten gradus semis in der Septentrionalishen oder gen mitnachtigen lynien das wir sein gegen denen im fünffhundertsten grad wonen über die selben lynien in der braite hynüber gegen mittag nach de winckel zurechten fünft gradus in der lynien überig Und umb das du solichs klerlich verstandest Die lynea genant perpendicularis die so wir gerad auff recht stand von dem puncten des hymels so das sich richtet auff unser habut und ynen in irseyten oder in ir rippe. Da von kumpt das wir seind in der rechten schlechten lynine und sy seind in der lynie überig und sich zeücht in ain formlich gleichnuß des Triangels Orthogoni Der selben lynien statt halten wir zu Cathete aber sy den grund von hipotenusa von dem unsern zu dem iren harschopf gestreckti wirt als in diser figure bescheint und so vil sey genug gesaft von der Cosmographia und beschreybund des erdtrichts gelegenhait".

While the text expressed these coordinates geographically for readers familiar with navigation, the visual diagram spells out these same coordinates in terms less opaque for the general reader. The triangle expressed the inhabitants' cosmographic relationship to each other by way of a pared-down geometric shape and sized up geography in terms of geometry. On the diagram itself, the legs of the triangle are labeled to mark their relative locations: "da sind wir" (we are here) and "da sind sie" (they are there), and it includes commentary indicating the direction in which the respective heads should point. This model literally triangulates between the inhabitants of Lisbon and those of Brazil, taking into account the shape of the world. The relationship of the two entities expressed in terms of their relative zeniths implies a round earth. But Vespucci viewed the sphere through the lens of its section, that is, another geometric form; the diagram preserves the word *hypotenusa*, foregrounding the fact that this schematic map is first and foremost a right-angled triangle.

This triangle explains the new world in relation to the old in terms of contemporary cosmographic thinking. This simple formula expresses the geographical relation of these inhabitants in cosmographic terms. That Vespucci's triangle had cosmographic ambitions cut short by his text's primary concerns is expressed in his concluding remarks: "This is as this figure appears, and this will suffice as regards cosmography and the description of the Earth's disposition."[6] Vespucci's nod to cosmographic learning indicates that he thought of his navigational points as coordinates derived from astronomical models. The triangular map cuts through the confusion of details like latitudes and geographic coordinates while

[6] Vespucci, *Von der neüw gefunden Region die wol ain welt genent mag werden durch den Cristenlichen künig von Portugal wunderbarlich erfunden* (Augsburg: 1505), 6v.

preserving the more important contours of the operative schema. This extraordinarily reductive model of the world reminds us that this is what cartographic models tend to do generally: reduce the territory into abstract constructs for ease of legibility, sometimes essentializing information in the process. Early modern images of record might clarify the visual field, but they often did so to establish an armature that could support multi-level readings. The triangle encouraged reading the data obtained by navigation in terms of broad schematics instead of the particulars; geometry helped to grid particular data onto the earth and sky.

Images treading the tightrope between mimetic and non-mimetic elements could sustain multivalent and abstract concepts – this multivalency allowed them to travel widely in a print culture that was already marked by liberal image piracy and recycling.[7] The merchant image accompanying the India journey retains the armature of Vespucci's original diagram. Liberating itself from the specific data of Vespucci's coordinates, the triangle preserves his intention of situating the world's peoples vis à vis each other; its contours follow those of Vespucci's original diagram and the visual language closely follows the prescriptions of his letter. Without Vespucci's precise coordinates, this geometric shorthand was cribbed by other printers to convey similar relationships. It surfaced again in examples of travel literature and other genres of printed materials relating to mercantile ventures.

That this cosmographic triangle could travel fluidly between Vespucci's travel account and a promotional publication like *Den rechten veg* testifies to the hybrid concerns of these genres. Promotional publications like *Den rechten weg* were related to pragmatic

[7] On the reception of this type of image recycling, see Orgel (2000: 59-94).

route books that outlined the logistics of reaching a destination and championed the economic reasons for maritime missions, usually for trade and the quest for spices.[8] Curiously, however, this pamphlet featured a printed globe on the verso of its title-page. The pamphlet itself was a practical accounting of the facts of the trip, but the world map marked with local coordinates set the journey into a worldview.[9] The astronomical component of texts like Vespucci's might account for the unusual appearance of cosmographic explanations in such a promotional publication.

That an image serviceable in travel accounts could also expand its relevance to promotional literature indicates the symbiosis of these genres and perhaps suggests a common origin in navigational astronomy. It is likely that the printer of the *Mundus Novus* letter had earlier astronomical models in mind when he fashioned this triangle for Vespucci's report. Printed versions of Sacrobosco's *Da Sphaera*, the standard text for elementary astronomy written in Paris in the early 13th century and printed several times during the 15th and 16th century, included illustrations that also aimed to triangulate between the earth's contours and points in the heavens.[10]

Woodcut illustrations in printed editions of *Da Sphaera* located man's place on the surface of the round earth and related that to his position in the firmament. Because geometry was critical to understanding this relationship, explanations of basic geometry were the first order of business in Sacrobosco's text. Several diagrams included in a 1501 edition printed in Cologne explain the implications of the earth's sphericity on the location

[8] Route books, or *roteiros*, were pilots' written sailing directions, mostly consisting of two parts: the first, a treatise on theoretical navigation, which included calendars, rules for latitude, and tables for dead reckoning, and the second, written sailing directions (see BOXER; BLACKMORE, 2001: 13).
[9] A Ptolemy map on the verso of the first sheet indicates by letters the location of Nuremberg, Lisbon, and Calicut (see PARKER, 1956: 4).
[10] For Sacrobosco's *De Sphaera*, see Thorndike (1949), Gingerich (1993: 64; 1988: 269-273).

of its inhabitants and express relative location in a manner reprised by Vespucci's triangle. An image of a ship at sea overlaid by a triangle representing sight lines demonstrates the relative visibility of a light on shore by differently positioned observers; a viewer at the mast's top would detect that light, while the earth's curvature would prevent an observer on deck from being able to see it (Fig. 3).

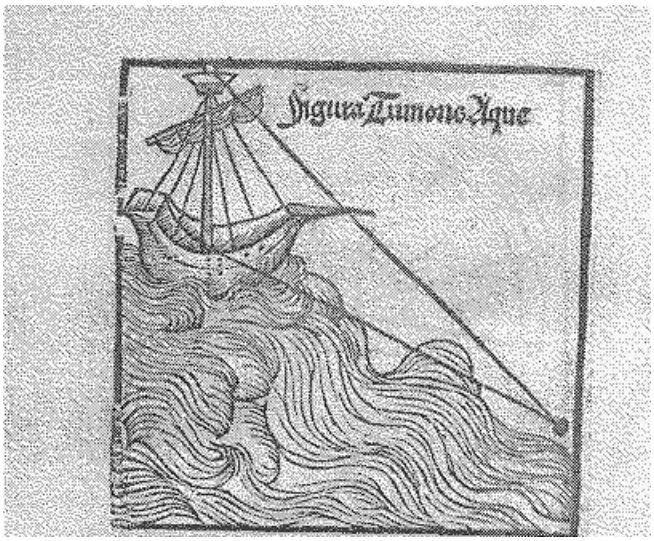

Fig. 3: Sacrobosco, Da Sphaera.

Another image tracks the rise of certain constellations relative to man's terrestrial positions by applying similar triangular models. Both images refer to empirical investigations and practical experiments that illuminate the shape of the earth's surface.[11] Navigational data offered astronomy practical demonstrations of the earth's sphericity; celestial concepts are explained relative to a viewer's position on the round earth. These diagrams simplified complex cosmographic digressions on abstract concepts such as the

[11] Later printed editions of Sacrobosco include a variety of volvelles which all serve to illustrate the earth's sphericity (GINGERICH, 1993: 66).

horizon, and thus made these ideas more accessible to a wider audience (VANDEN BROECKE, 2000: 134).[12] They expressed man's position on earth not as definitive geographical coordinates, but as a function of his place within a series of terrestrial and celestial circles. These types of diagrams of navigators' observations helped to establish the role of the triangle in the spatial rhetoric of describing the earth.

In the sixteenth-century, a new genre assumed the burden of plotting astronomic data onto geographic space. Images of astronomical principles triangulated between the heavens and earth and laid the groundwork for cosmography, a new way of packaging information about the earth. Earth-bound coordinates were plotted via astronomical data as early as Ptolemy's second-century *Geography,* which was given the name *Cosmographia* in its 15th century Latin translation by Jacopo d'Angelo. Cosmography was a term that was originally developed for descriptions of the world obtained through astronomical data in the tradition of Ptolemaic cartography, but whose focus was a study of the earth's geography (VANDEN BROECKE, 2000: 132). Those new conceptualizations of the earth expanded the parameters of geography by adding new information obtained by contemporary merchants and vernacular reports of the voyages of discovery – cosmography was the matrix in which this data met the astronomy primers.

One of these early cosmographic texts printed in Germany, Peter Apian's *Cosmographia* (editio princeps, Landshut: 1524), featured printed diagrams derived from

[12] Vanden Broecke argues that naturalistic elements that accompanied cosmographic diagrams made these pictorial statements more persuasive.

principles enunciated in Sacrobosco's *Sphaera.*[13] Cosmographies took empirical data from astronomic and geographic reports to create theoretical models. These empirically derived precepts were included alongside diagrams of the more theoretical explanations they supported, as well as with images of instrumentation. Other diagrams in Apian's *Cosmographia* featured renderings based on astronomical instruments, such as the armillary sphere, that showed the terrestrial model in the context of its celestial circles (VANDEN BROECKE, 2000: 135).[14] Two-dimensional visual representations of armillary spheres in Apian's text treat the object both as an instrument and a didactic model with which to explain the position of the earth within the celestial spheres.[15]

Visual representations in cosmographies fixed astronomical principles onto the world sphere. Three-dimensional interactive diagrams derived from armillary spheres helped to animate these relationships. Volvelles, or illustrations with moving parts, attempted to plot the terrestrial and celestial circles on to a geographical model of the world. One popular volvelle demonstrated the relationship between celestial coordinates and the observer's latitude (Fig. 4). Assuming the shape of a hemisphere comprised of two orthogonal triangles, this model demonstrated the angle of the depicted observer's horizon and zenith relative to the earth's axis. A circle with degree markings formed the fixed level of this illustration; a moving hemisphere that established the observer's zenith and horizon rotated on top of it. As one shifted the observer's zenith, one could observe his local

[13] These didactic volvelles were printed with increasing volume in subsequent cosmographies, but they find their inspiration in Apian, as do the printed instruments found in later editions of Sacrobosco's *Sphaera* (GINGERICH, 1993: 64-66).
[14] Vanden Broecke argues that illustrations of the celestial spheres shifted from an expression of theoretical principles that armillary spheres were designed to explicate to more naturalistic versions of the instrument itself.
[15] For the celestial spheres, see Johnson (2009: 52 and note 20, 220).

coordinate system relative to the celestial sphere.[16] The rotating diagram expressed celestial coordinates as a function of the observer's terrestrial position—the depicted observer rotated about a spherical representation of the earth on which he would then appear sideways or inverted (VANDEN BROECKE, 2000: 139).[17]

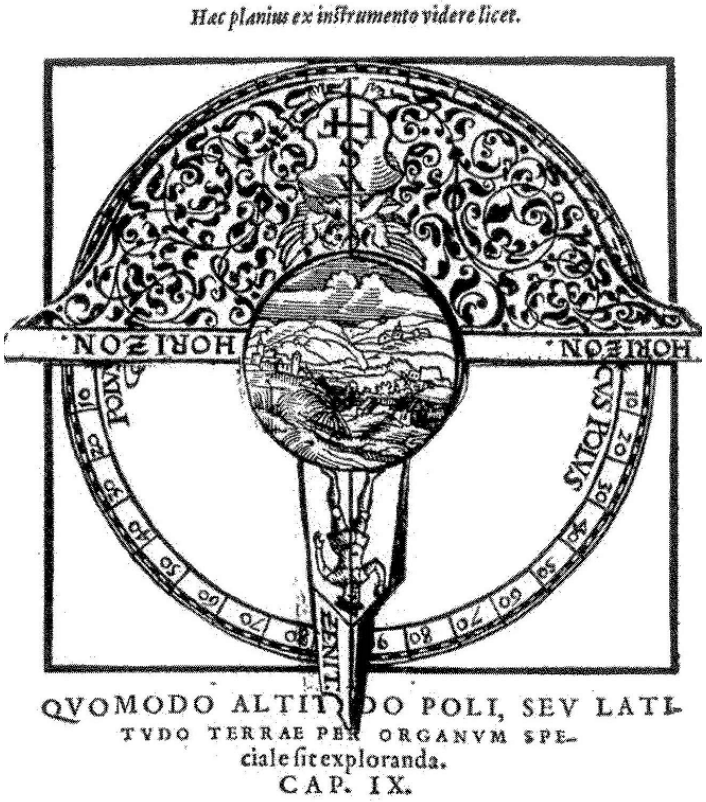

Fig. 4: Apian, Cosmographia 1524, volvelle.

[16] The accompanying inscription reads: "The zenith of the head is always equidistant from the horizon on every side (that is, by 90 degrees or a quadrant); and therefore it is called the pole of the horizon, and (excluding all other impediments) it always appears to people in any location as the middle point of the sky or hemisphere. Therefore, to the extent that someone proceeds from the equator to the north or south, to the same extent the horizon is pushed down under the pole on one side, but raised above the opposite pole on the other side. This can be seen more plainly from the instrument." I'm grateful to John Kyrin Schafer for his assistance with the translation, and to Erik Leitch for his astronomical assistance.

[17] Vanden Broecke argues that Apian's volvelle is derived directly from Sacrobosco's demonstration of the equivalence of the angle between the observer's horizon and the world pole and the angle between the observer's zenith and the equator; Apian relates this arc to the observer's latitude, thus linking Sacrobosco's proposition to geography. See also Gingerich (1993: 64).

Another cosmography, *Novus orbis regionum ac insularum veteribus incognitarum*, synthezied astronomical observations into the new geographic data reported in the voyages of discovery.[18] This volume, *A New Globe of Regions and Islands unknown to the Ancients*, collected reports dealing with the discovery of America collected by Johann Huttich. Simon Grynaeus, the Basel humanist and Hellenist, edited and contributed a preface to the edition.[19] Within the report furnished by Amerigo Vespucci was a cosmographic triangle formally similar to Apian's volvelle. In this circular model, two outsized inhabitants stand on a round earth with their zeniths perpendicular to each other (Fig. 5).[20]

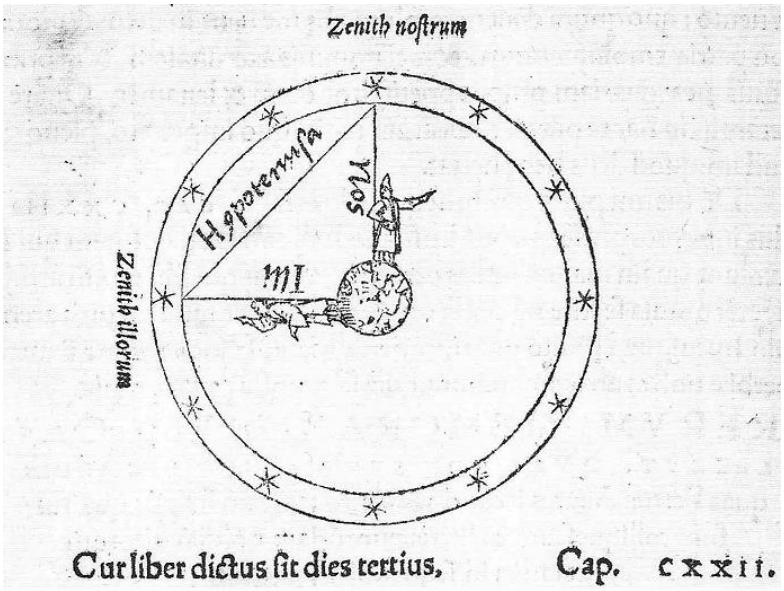

Fig. 5: Simon Grynaeus, *Novus orbis* (Basel: J. Herwagen, 1537), fol. 129.

[18] Later Latin editions also appeared from Herwagen in 1537 and 1555. A German edition expanded by Michael Herr appeared two years later (Strassbourg: Ulricher von Andla, 1534): *Die New welt der landschaften unnd Insulen, so bis hie her allen Altweltbeschrybern unbekant, Jungst aber von den Portugalesern unnd Hispaniern jm Nidergenglichen Meer herfunden*.

[19] For biographies of Simon Grynaeus and Johann Huttich, see Deutscher and Bietenholz (1986: 142-6 and 220-221 respectively).

[20] I'm grateful to Jasper van Putten for drawing my attention to this image; it is reproduced in Müller (1997), where it is attributed to Hans Holbein the Younger. For Holbein the Younger's workshop's involvement in printed instrumentation, see Gingerich (1993: 70). This is an example of a humanist connecting the work of a mariner to a community of artists.

These two men point to stars in a circle that represents the firmament above them. While their respective zeniths are also marked as "zenith nostrum" and "zenith illorum," and they follow Vespucci's model in labeling the legs "us" and "them," Grynaeus' model does not articulate differences in the peoples that might be implied by Vespucci's report. In the context of this cosmography, the depiction of these two men begins and ends in their role as stargazers.

The right triangle anchoring the observers uses the term *hypotenusa* to call attention to the geometric shape of the inscribed space, just as in Vespucci's diagram. The legs of the triangle extend past the tops of the men's heads to the boundaries of a celestial circle, thus entering the terrestrial data into a more significant cosmographic equation. This triangle, more explicitly than its antecedents, combines geographical principles with spherical astronomy. Appearing in the section on contemporary navigations with which Grynaeus' cosmography opens, this image summarizes passages culled from an earlier publication of Vespucci's, the *Four Voyages* (1505; see FORMISANO, 1992: xxii). Unlike in the *Mundus Novus* letter where this data first appeared, the coordinates mentioned in this version of the text gave way to latitudes rounded off to whole numbers (for example, 39.5 degrees becomes 40 degrees), more readily suggesting a right triangle to represent the quarter of the globe.[21] In this later retelling of Vespucci's account, we observe that the data itself has bent

[21] "Von der gestalt des vierden theyls der erden/ das zu jungst herfunden worden ist. Das CXXI capitel. Von Lisbona do wir außgefaren esind/ wie vor gesagt ißt/ das ligt von dem Equinoctial viertzig grad gegen Mitternacht zu/ von dannen seind wir gefaren bis zu dem land/ das ligt funffzig grad jhenselt des Equinoctials/ welches/so mans zu sammen rechnet/ macht neuntzig grad/ das ist ein vierd-theil des grossen zirckels/ wie die alten uns dar geben haben. So ist nun offenbar/ das wie das vierdtheil der welt umb gefaren seind. Darumb wir die zu Ulisbona wonend/ ligen herwerds des Equinoctials auff viertzig grad/ und sind von denen jhenseit des Equinoctials/ inn Mittaglicher lenge/ geradt winckelrecht neunzig grad/ das ist gerad uberzwerg/ Und auff das sud es bas verstandest/ die linige die ge gerad ob uns vom himmel herab gehet auff unser haupt/ und deren lignigen/ dis jhenseit des Equinochtials ligen auff funfftzig grad/ die treffen ein ander beseitz uberzwerg/ unnd

under the pressure of the diagram – the desire for the geometric rectitude of the triangle pitched Vespucci's voyage in terms of shapes in the world.

While the data of contemporary navigations such as Vespucci's were slow to challenge the overall tenacity of the world picture established by Ptolemy, the texts of these accounts did find a legitimate place in the cosmographic literature as the information provided by them was increasingly important to the rectification of the new world picture.[22] The cosmographies organized the travel reports, absorbed their contents and coordinates. The fact that astronomical observations like Vespucci's took the shape of a more official expression in this global diagram nicely encapsulates how astronomical and navigational knowledge was formalized in the cosmographies. This kind of geographic-astronomical hybrid model of the world squares with the types of investigations that were underway in the *Novus orbis*.[23] Grynaeus was a Hellenist who taught at the University of Basel from 1530-1541 and a cosmographer whose natural philosophy was grounded in geometric principles that would establish objective and measurable standards for comparisons. Grynaeus' introduction to the *Novus orbis* asserts the importance of the role of explorers and mariners in confirming the mathematical proofs established by astronomers and humanists.[24] Throughout the 1530s, Grynaeus published Proclus's *Treatise on the*

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seind wir inn der auffrechten lignigen/ und sie inn der uberzwerchen/ so sie zu uns gerechtnet werden/ das macht ein dreyangle mit eim guten winckel/ so sind wir inn der auffrechten linien/ wie diese figure anzeigt. Unser haupt punct. Ir haupt punct" (GRYNAEUS, 1534: 41r).

[22] Although the dismantling of the authority of classical Antiquity was done gradually, Anthony Grafton has demonstrated that a good bit of the chipping away was done by humanists engaged with geographic literature and vernacular travel accounts. Humanists used the reports of travelers to correct geographic infelicities in Ptolemy and newly printed maps reflected these edits (GRAFTON; SHELFORD; SIRAISI, 1992: 48-68).

[23] Gingerich defines cosmography as a mixture of geography and spherical astronomy. This also nicely describes the hybrid nature of the illustrations included in them (GINGERICH, 1993: 64).

[24] Jan N. Pendergrass suggests that Grynaeus saw these men as "vernacular" natural philosophers for their role in confirming earlier abstract mathematical principles (1992: 32ff).

Movement of the Stars (1531), an edition of Euclid's *Elements of Geometry* (1533), as well as the works of Ptolemy (PENDERGRASS, 1992: 30). Given these twin pursuits of cosmography and geometry, it is not surprising that the *Novus orbis* would relay Vespucci's triangle in the shape of a geometric and cosmographic formula. According to the *Novus orbis,* Vespucci's contribution involved the discovery of people whose relationship to each other was expressed in cosmographic principles, relative zeniths, and their place in the celestial sphere. In Grynaeus' work, Vespucci is placed in the larger cosmographic context of the classical works on astronomy and geometry.

Vespucci's own frequent boasting about his navigational prowess relied on his mastery of the principles of mathematical geography, skills for which he was praised in the cosmographies (JOHNSON, 2009: 77).[25] Vespucci also articulates his measurements in geometric terms, recording the presence of stars and planets in the sky, whose orbits he tracked and whose circumferences and diameters he claims to have measured with instruments and mathematical methods (FORMISANO, 1992: 52-53). The *Mundus Novus* letter records several constellations of the Antarctic celestial pole and includes a diagrammatic formation of the stars that aggregate around Canopus which also follow the outline of an orthogonal triangle.

The text of Vespucci's *Four Voyages* found its way into Grynaeus' *Novus orbis* and into German-speaking circles via the version Latinized by Basinus Sendacurius at St. Dié. This version was the one originally included in the *Cosmographiae Introductio* (Lyon,

[25] In the *Mundus Novus,* Vespucci makes frequent reference to his skill with astronomical instruments such as the quadrant and the astrolabe: "Indeed, we were wandering with uncertainty, with only the instruments to show us accurate altitudes of heavenly bodies: those instruments being the quadrant and astrolabe […] After this, everyone held me in great honor. For I truly showed them that, without any knowledge of sea charts, I was still more expert in the science of navigation than all the pilots in the world" (FORMISANO, 1992: 47ff).

1507?; Strassbourg: Grüninger, 1509), the document that introduced the name of Vespucci and shape of America to the world picture (see WALDSEEMÜLLER et al., 1907: 13, n. 2). This pamphlet, *The Introduction to Cosmography with Certain Necessary Principles of Geometry and Astronomy to which are added the Four Voyages of Amerigo Vespucci*, accompanied printed gores for a globe and the famous Waldseemüller map produced by the "Gymnase Vosgien," a group of Alsatian humanists active at St. Dié that included the cartographer Martin Waldseemüller, the author Matthias Ringmann, and the ducal secretary Walther Ludd.

The appearance of Vespucci's *Four Voyages* with the handbook of spherical astronomy that introduces the *Cosmographia Introductio* effectively sutured geometrical astronomy to Vespucci's narrative. This introduction to cosmography rehearsed the Ptolemaic model of the work, providing first an explanation of geometry, then the geographical location of the poles and the major circles, followed by a discussion of the celestial circles and the angular relationships of zeniths and horizons (WALDSEEMÜELLER, et. al., 1907: 49. Also accompanying this publication was the large-scale map that was the first to print the letters AMERICA over a continent located in the Atlantic, a declarative expression of the stakes of this navigator's data for the larger sea of Ptolemaic cosmography.

The synergy of Vespucci and Ptolemy was critical to the production of Waldseemüller's world map. The suturing of Vespucci's account to the Ptolemaic picture by the Gymnase Vosgien was emblematic of how data was processed by the early modern humanist computers: new information was hung on the armature established by the ancients, using Ptolemy as a starting point. Waldseemüller's map is shown as the result of

the calculations of two men with radically different backgrounds; Ptolemy, a mathematician, astronomer and geographer, on the one hand, and Vespucci, the mariner, on the other. Both men are only tangentially related to cosmography, but the still nascent discipline, as assembled by compilers, depended on them. Nor was either specifically allied with the production of maps per se; Ptolemy's second century *Geographia* provided coordinates of geographic location by way of astronomical observations to which maps were added only later (see JOHNSON, 2009: 54. Vespucci, a merchant mariner with ample navigational brawn but few pretensions to re-conceptualizing the world picture, did provide some astronomical coordinates and the triangle map in his *Mundus Novus.* But the fact that his name got attached to the map was an artifact of humanist post-production.

Vespucci's credibility as a reliable source to this group of humanists at St. Dié was tied to his contributions to cosmography. The emblematic role Vespucci plays in the early modern European discovery of America, according to Christine Johnson, was more an accident of naming and serendipity than intentionality on the part of sixteenth-century humanists to establish his agency. St. Dié humanists relied on texts in their possession, accessible maps, a period understanding of the chronology of discovery, and they credited Vespucci for his cartographic precision (JOHNSON, 2006: 27-29). Both Vespucci's *Mundus Novus* and the *Four Voyages* include many references to astronomical observations, calculations by which he determined geographic coordinates of his travel (JOHNSON, 2006: 14). With newly won traction as a cosmographic authority, the figure of Vespucci ascended to the top of the Waldseemüller map where he shared billing with Ptolemy, both with the instruments of navigation and mathematical cosmography in their

hands: Ptolemy with a quadrant and Vespucci with a compass. Vespucci's boasts as an expert navigator, able with an astrolabe and a quadrant, would appear to have been heard.[26]

Both Vespucci's status as a compass-wielding cosmographer on the Waldseemüller map and the positioning of his contributions as ones critical to the world picture in Grynaeus' *Novus Orbis* attest to the new status given to mariners and navigators by cosmography. Vespucci's contributions could be succinctly expressed by the cosmographic triangle that summarized both his journey, as well as by the shape of the world and its relation to the cosmos. Grynaeus privileged the information provided by mariners because he believed that seamen enacted the proofs of mathematicians' hypotheses (PENDERGRASS, 1992: 32ff). The *Novus Orbis*' amplification of Vespucci's original diagram (one which, it must be remembered, provided simply the correct orientation of heads), extrapolated the cosmographic dimension from his data and highlighted its relevance to cosmography. Merchants' data found a home in cosmography, where it was collected, synthesized, explicated and related to the expanding world picture (see JOHNSON, 2009: 47-87).

In early modern travel accounts and cosmographies, diagrams based on Vespucci's triangle floated effortlessly between these symbiotic genres. These triangles functioned multivalently, providing a variety of technical information: mercantile concerns, geographic coordinates, geometric propositions and astronomic principles. Their ability to present multiple facets of visual knowledge simultaneously supplied them with passports that allowed them to travel liberally and to shift their shapes when the demand arose.

[26] See note 25.

Images of record could acquire new dimensions or reduce themselves to their lowest common denominators.

The cosmographic triangle can be included in a class of technological images, ones that seek to understand the world, based on theoretical models but aiming to answer practical concerns. The transactions such images embody, according to Steven Vanden Broecke, express "a fundamental reliance on visual, non-verbal thinking" (2000: 138 ff). This type of visual thinking could even invert the primacy of the pictorial data, pushing images into organizational paradigms subsidiary to mimetic ones. Rebecca Zorach has also argued for the more abstract processes of cognition encouraged by images combining non-mimetic and mimetic elements.[27] This pictorial tension between mimetic and non-mimetic properties that we see span the permutations of Vespucci's triangle was a touchstone of early modern diagrams.

Only the basic geometry of Vespucci's original model remained in one vernacular edition of the *Mundus Novus*, but it was the critical geometry of the triangle. The title page image of a Dutch vernacular version of Vespucci's *Mundus Novus*, *Van der nieuwer werelt*, printed in Antwerp c. 1507, describes two legs of a right triangle (OBERMEIER, 2003: 12). It places a starkly naked couple perpendicular to comparatively overdressed Europeans, situating two pictorial fields at right angles to each other (Fig. 6).[28] The image describes the spatial relationship of the old world to the new, taking for granted the cosmographic principles that lurked beneath its mimetic surface. *Van der nieuwer werelt*

[27] Rebecca Zorach has argued that in other early modern diagrams, numeric principles provide the organizational program for prints featuring otherwise highly abstract imagery. Printed images featuring significant non-mimetic elements encouraged more abstract cognitive process (see ZORACH; COLE, 2009: 340).

[28] Jan van Doesborch also printed other variations on Vespucci's *Mundus Novus* edition, including a broadsheet (1509-10) preserved today in Rostock. See Levillier, 1-93, especially 25.

invoked the triangular space as a shorthand for describing peoples across the world from each other. Rebecca Zorach has raised the possibility of Vespucci's triangle oscillating between the suggestive relativism of two comparable points of view implied by an equilateral triangle and the more pernicious hierarchy embedded in the idea of a triangle right-side up. [29] Grynaeus's cosmographic triangle that shows two observers as stargazers provides evidence for the first possibility, but the narrative of difference seems alive and well in the Antwerp Vespucci, where the triangle tells a new story, only tangentially about navigation. The primary aim of this image that expressed peoples as contra-positives was to deliver a highly reductive statement about places as poles of cultural difference. Even as it embodied complex stories of stars at tangents to the earth's surface, the triangle could still hold these in visual check in favor of more sensationalistic material.

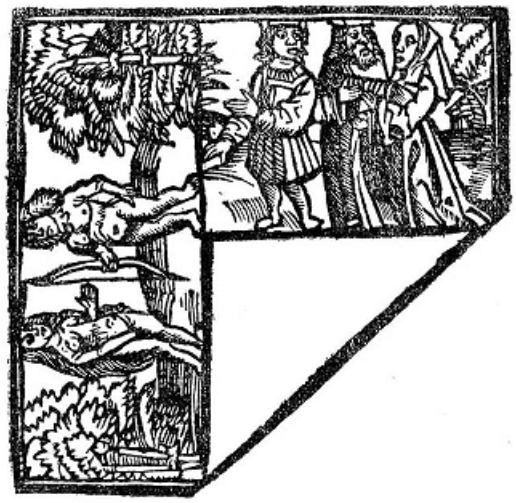

Fig. 6: Vespucci, Vander niewer werelt (Antwerp: Doesborch, 1507-8).

[29] For the larger resonance of this geometric form throughout Renaissance art-making, see Zorach (2011). Zorach treats Vespucci's triangle in the context of perspective, raising the intriguing possibility that the relativism of points of view suggested by an isosceles triangle was undercut by later campaigns of domination (see especially 129-134).

The triangle that first appeared in Vespucci's *Mundus Novus* oriented the world's peoples with respect to each other, but also bound the heads of the world's inhabitants into a larger equation by expanding its range to reference points in the heavens. The geometric model tried to tease out of the triangle a third dimension; implicit in this flat diagram was a spherical model of the earth. Unmoored from its original context, the triangular scaffold evolved into a spherical model of the earth from which men observed the heavens. From its humble origins in a mercantile report, the triangle's cosmographic aspirations sent both it and its author into orbit with cosmographic literature. Vespucci's geographic data itself lost traction, while the organizational principle of the triangle became the lasting mark of its identity. The geometric scaffolding could sustain both pictorial and non-mimetic knowledge, facts knit into new stellar and geographical constellations, made possible by navigators and their own attempts at triangulation.

Witnessing its flux between mimetic and more diagrammatic retellings in a series of related sixteenth-century publications, we can attribute the tenacity of Vespucci's triangle to its ability to accommodate a wide range of conceptual thinking about the earth. The triangle furnished the armature onto which many types of knowledge about the world were draped: geographical, cosmological, empirical and theoretical. Vespucci's triangle is also paradigmatic for the way in which knowledge was transmitted in print via borrowed, recycled, and re-adjusted visual models. Use of recycled imagery had the effect of bridging subject distinctions and resulted in interdisciplinary dialogue. Vespucci's triangle accrued information from geometrical and astronomical texts, and it mediated the flow of geographical information into later cosmographic texts where it produced data that sat sometimes uncomfortably between theoretical models and empirical experience. The

tension beneath the surface of Vespucci's triangle in *Den rechten weg* suspended the complex baggage of information it aimed at the viewer: the most expedient way to reach India, how to pack appropriately, where on earth to find it, and where in the universe it might be.

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Abstract

This essay examines the trajectory of a schematic diagram used in printed editions of Vespucci's *Mundus Novus* letter to situate the New World in relation to Europe. Originally a marker for the geographic location of the world's peoples, this triangular model later appears in cosmographic models representing the earth's sphericity. Variations on this paradigm appearing in both cosmographies and merchants' reports reflect the suturing of a navigator's shorthand to new kinds of visual knowledge. This essay argues that Vespucci's diagram was brought into the orbit of astronomic notation where it helped the viewer to visualize cosmographic principles. The itinerary of this triangle in early 16th century print culture tracks the merging of diagrammatic thinking of astronomical propositions with other genres in the nascent field of cosmography.

Keywords: cosmography, Vespucci, Americas.