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# Keeping Our Eyes Open: Visualizing Networks and Art History

Stephanie Porras

*Tulane University*, [sporras@tulane.edu](mailto:sporras@tulane.edu)

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# Keeping Our Eyes Open: Visualizing Networks and Art History

## **Cover Page Footnote**

I would like to thank the convenors (Miriam Posner, Johanna Drucker, Todd Presner, and Francesca Albrezzi), speakers and my fellow participants in the 2015 summer institute Beyond the Digitized Slide Library, held at the University of California Los Angeles and funded by the Getty Foundation. I would also like to thank Angela Dressen, who organized a session at the 2017 Renaissance Society of America conference, where I delivered a draft of this paper.

# Keeping Our Eyes Open: Visualizing Networks and Art History

Stephanie Porras \*

*Tulane University*

## Abstract

Network visualizations have the potential to translate messy archival work into clouds of connection, powerful maps of relations that can reveal hidden agents or nodes of production. But network visualizations must also be understood as artifacts of our own visual culture, laden with the biases and limits of both past and present knowledge systems. Rather than seeing networks as uniform webs of connection, social network analysis must productively interrogate how biopolitical, cultural and social power are manifested within these visualizations, reinforcing the biases and lacunae of the archive.

## Résumé

Les visualisations en réseaux peuvent transformer des archives disparates en nuages de connexions, cartographies efficaces et hiérarchisées de relations qui mettent à jour des agents cachés ou des nœuds de production insoupçonnés. Cependant, les visualisations de réseaux doivent aussi être pensées comme des produits de notre culture visuelle contemporaine. Elles sont lourdes de préjugés, et limitées par nos systèmes de connaissances passés et présents. Plutôt que de concevoir ces réseaux comme des entrelacs uniformes de connexions, l'analyse des réseaux sociaux doit interroger de manière productive comment le pouvoir biopolitique, culturel et social se manifeste au sein de ces visualisations, et comment il risque de renforcer les préjugés et les lacunes des archives étudiées.

*\*Stephanie Porras is Assistant Professor of Art History at Tulane University. Her first book was Pieter Bruegel's Historical Imagination (2016) and her current book project The First Viral Images: Maerten de Vos, Antwerp print and the early modern globe retraces the global circulation of Flemish artworks in the 16<sup>th</sup> and 17<sup>th</sup> centuries.*

Network visualizations have the potential to translate messy archival work into clouds of connection, maps of relations that can reveal hidden agents or nodes of production. Network analysis software like Gephi can handle vast data sets, exposing creative, social and economic collaborations that may have previously been marginalized. While not denying the potential utility of digital tools for social network analysis, this essay considers how such network visualizations must also be understood as artifacts of contemporary visual culture, laden with the biases and limits of both past and present knowledge systems.

Data visualization proposes itself as meta-representation, a vehicle for what Sean Cubitt has called a “new formalist mimesis,” the presumption that the world is data.<sup>1</sup> But of course all data is mediated, wrangled and cleaned before use. The methodological underpinnings of network visualizations thus often contain structural imbalances, pressure points and weak spots. In my own work on the global circulation of Flemish and Dutch prints in the early modern period, I have been struck by how network visualizations may end up reinscribing imbalances of biopolitical, cultural and social power due to the availability and assumptions of their constitutive datasets.

I have been attempting to write an object biography of a sixteenth-century Flemish print (Fig. 1) that was sold, exchanged and distributed across Europe, Asia and the Americas (see Figs. 2, 4, 5).<sup>2</sup> My original aim was to describe the expanding network between print designer and publishers, merchants, missionaries, European and non-European artists who responded to the design. In Antwerp, where there are rich surviving archives, it was possible to build a web of familial and professional relationships between printmakers, publishers and

booksellers, some of which are now made available via the structured biographical data collection ECARTICO.<sup>3</sup>



**Figure 1.** Hieronymus Wierix after Maerten de Vos. *St Michael the Archangel*, 1584. Engraving published by Adriaen Huybrechts and Hieronymus Wierix. 29.1 x 20.2 cm (plate), 30 x 21.4 cm (sheet), Bernard F. Rogers Collection, 1935.149. The Art Institute of Chicago, Chicago. Photo: The Art Institute of Chicago / Art Resource, New York.

But when following this print across the Atlantic and/or Indian Oceans to viceregal Lima or colonial Manila, the archival sources shift or disappear. Networks need datasets with names of individuals, organizations or other entities to serve as nodes. Archives provide these names—except when they don’t. Ivory sculptures after my chosen print (Fig. 2) were most likely carved by Chinese immigrants from Fujian province, who relocated to the Spanish entrepôt of Manila.

<sup>1</sup> Sean Cubitt, “Data Visualization and the Subject of Political Aesthetics,” in *Postdigital Aesthetics: Art, Computation and Design*, eds. David M. Berry and Michael Dieter (London: Palgrave Macmillan, 2015), 179–190, especially 179–81. On visualizations as meta-representation see David M. Berry, *Critical Theory and the Digital* (London: Bloomsbury, 2014), 145–6.

<sup>2</sup> This work has been published as Stephanie Porras, “Going Viral? Maerten de Vos’ *St. Michael the Archangel*,” *Nederlands Kunsthistorisch Jaarboek* 66 (2016): 54–78; “*St. Michael the Archangel*: Spiritual, visual and material translations from Antwerp to Lima,” in Ed Wouk and Suzanne Karr-Schmidt, *Prints in Translation, 1450–1750: Image, Materiality, Space* (Burlington, VT: Ashgate, 2016): 183–202, both essays are

part of my ongoing book project *The First Viral Images: Maerten de Vos, Antwerp, print and the early modern world*.

<sup>3</sup> ECARTICO attempts to map the social networks of painters, engravers, printers, book-sellers, metalsmiths and others involved in the so-called cultural industries of the sixteenth- and seventeenth- century Low Countries. It is a project of the University of Amsterdam’s Amsterdam Centre for the Study of the Golden Age. Eric Jan Sluijter and Marten Jan Bok, “ECARTICO: Linking cultural industries in the early modern Low Countries, ca. 1475 - ca. 1725,” <http://www.vondel.humanities.uva.nl/ecartico/> (accessed September 16, 2017).



**Figure 2.** Hispano-Philippine, *St Michael the Archangel*, ca. 1650. Ivory with polychromy and gilding. 73 x 41 cm. Museo Nacional del Virreinato, Tepotzotlán, México. Photo: author.

These immigrants came for the economic opportunities presented by the Spanish entry into the intra-Asian trade and the newly established regular trans-Pacific links between Latin American and Asia via the annual Manila Galleon.<sup>4</sup> Much of colonial Manila and its archives were destroyed in World War II, so knowledge about seventeenth-century artistic production is primarily gleaned from a few surviving Spanish colonial archives, now primarily located in Seville's Archivo General de Indias. But Chinese carvers are largely anonymous in these documents. The Chinese merchants who brokered commercial and artistic transactions in the intra-Asian and trans-Pacific trade are rarely recorded, and when they are, it is only by the

<sup>4</sup> On Manila, Chinese immigration, Spanish colonization and the links to New Spain see: Ryan Dominic Crewe, "Pacific purgatory: Spanish Dominicans, Chinese Sangleys, and the Entanglement of Mission and Commerce in Manila, 1580-1620," *Journal of Early Modern History* 19 (2015): 337-65; and Katharine Bjork, "The link that kept the Philippines Spanish: Mexican Merchant interests and the Manila trade, 1571-1815" *Journal of World History* 9 (1998): 25-50, with earlier literature including the foundational work of William Schurz, *The Manila Galleon* (New York: E.P. Dutton, 1939).

Hispanicized names given to them by Spanish colonial administrators.

The production and export of ivories like this one clearly involved a network of Chinese carvers, export merchants in Manila and the European missionaries and/or Spanish colonial administrators who brought the Antwerp print to Asia. But there is little data besides the object itself. The ivory is a material trace of past spatial movements and social interactions, revealing actors in a network concealed or neglected by written historical sources.<sup>5</sup> This ivory reveals the lacunae of the surviving archival data, its inherent biases towards the interests and prerogatives of those holding biopolitical and military power in the seventeenth-century Philippines.

Digital tools for network visualizations require data. Where there is no data, there is no network—and those of us working in colonial, non-Western, underground or prehistoric contexts often have more limited sources of data with which to work. A recent "Notes from the Field" article in this journal observed that digital mapping projects in art history often addressed canonical sites and objects (primarily in Europe and the United States), rather than focusing on other geographies.<sup>6</sup> I would suggest this is not only a problem of funding or selection criteria for digital projects, but one inherent to the disposition of archival sources amenable to the production of data sets.

Johanna Drucker has argued that the first phase of digital activity in the discipline of art history has been repository building, the digitizing of images and sources.<sup>7</sup> This foundational work is not yet complete, particularly outside of well-funded institutions, regions or nations. It may not be possible to complete in some places where there are no archives to recover, or where artworks'

<sup>5</sup> On the idea of trace and traceability see: Vincent Veschambre, "Sur les traces de la fabrique artistique: quelques réflexions sur la dimension spatiale de l'histoire de l'art," *ARTL@S Bulletin* 4, no. 2 (2015): 7-13.

<sup>6</sup> Paul B. Jaskot, Anne Kelly Knowles, Andrew Wasserman, Stephen Whiteman and Benjamin Zweig, "A Research-Based Model for Digital Mapping and Art History: Notes from the Field," *ARTL@S Bulletin* 4, no. 1 (2015): 68. The authors note the preponderance of digital mapping projects addressing art of Europe and the US.

<sup>7</sup> Johanna Drucker, "Is There a 'Digital' Art History?" *Visual Resources* 29, no.1-2. (2013): 7.

material survival is under threat.<sup>8</sup> It is simple to call for the documentation of forgotten histories, but we must also acknowledge how such peripheral histories came to be marginalized—through the often systematic suppression or control of information.<sup>9</sup> It is easier to collect data on my Antwerp printmaker because biographical and historical data was recorded and stored—I cannot do the same work with the Filipino ivory because the relevant information about this object's facture does not survive in the same form.

The danger of network visualizations is in their potential to simply reinscribe historic and contemporary power differentials—between colonizer and colonized, places and people that benefited from political, economic and social stability that enabled the accumulation of records and archives and those that did not. This is not just an art history problem. Amy Earhart has described how little attention digital literary scholars have paid to non-canonical texts and authors, primarily those from diverse communities.<sup>10</sup> We must acknowledge how this “computational inequality”<sup>11</sup> is embedded in the digital tools for network analysis and in the very availability of data amenable for computational software.

Alexander R. Galloway has dubbed this the *Zuhandenheit* problem, where new digital tools are used unconsciously and without critical reflection, resulting in an emboldened ideological infrastructure that valorizes positivistic methods without hermeneutics.<sup>12</sup> Data is the product of history as much as a record of it. Identifying how historic and contemporary political, social and cultural power differentials translate into the

production of data and the visualization of networks is a necessary first step.

For example, the team behind [Six Degrees of Francis Bacon](#) used the Oxford Dictionary of National Biography and its nearly 14,000 biographical records to populate the database used to produce its network visualization (Fig. 3). On the project's blog, Scott Weingart and Jessica Otis describe the inherent gender bias of the written record, magnified by the use of the ODNB data, where women represent only roughly 6% of the entries.<sup>13</sup> In January 2016, the event *Networking Early Modern Women* recruited contributors to add women and female relationships to the *Six Degrees of Francis Bacon* database. This is a laudable first step, but one that must be dramatically expanded to counteract the systemic bias of the collecting and recording practices of the archive, not to mention the over-a-hundred-year compilation of the ODNB.

A hermeneutics of data, as defined by the historians Frederick W. Gibbs and Trevor J. Owens, requires that historians treat data as a text, to be approached from multiple points of view and with as much methodological transparency as possible.<sup>14</sup> The radical claim of network analysis is that it can illuminate peripheral nodes (people, places, institutions), who may have been previously overlooked. Yet, as the example of *Six Degrees of Francis Bacon* demonstrates, if those actors are vaguely or inconsistently recorded in the underlying data—biographical collections, object records, letters and historical archives—they remain absent in the network visualization. Network analysis, without methodological reflection, concretizes this absence and reinforces power differentials.

<sup>8</sup> In some cases there are real concerns that making digital images widely available enables thieves, smugglers or terrorists to identify and target vulnerable works of art via geotagging.

<sup>9</sup> This resonates with the arguments made by Béatrice Joyeux-Prunel. As she states, simply reclaiming artistic peripheries “risks overlooking the fact that the regions we want to empower were often cruelly deprived, and that the artists we exhibit today as heroes were in fact uncharacteristically mobile and/or benefitted from generous institutional support that gave them access to developments in the centers.” See Joyeux-Prunel, “The Uses and Abuses of Peripheries in Art History,” *ARTL@S Bulletin* 3, no. 1 (2014): 6; and the foundational work of Michel-Rolph Trouillot on historical silence, Trouillot, *Silencing the Past: Power and the Production of History* (Boston: Beacon, 1995).

<sup>10</sup> Amy E. Earhart, “Can Information be Unfettered? Race and the New Digital Humanities Canon,” *Debates in the Digital Humanities*, ed. Matthew K. Gold, (Minneapolis: University of Minnesota Press, 2012), 309–313.

<sup>11</sup> David M. Berry, *Critical Theory and the Digital*, (London: Bloomsbury, 2014), 176–77.

<sup>12</sup> David M. Berry and Alexander R. Galloway, “A Network is a Network is a Network: Reflections on the Computational and the Societies of Control” *Theory, Culture and Society* 33, no. 4 (2016): 151–72, 162.

<sup>13</sup> Scott Weingart and Jessica Otis, “Gender Inclusivity in Six Degrees,” *Six Degrees of Francis Bacon: reassembling the early modern social network Blog*, December 6, 2016, <http://6dfb.tumblr.com/search/gender>.

<sup>14</sup> Frederick W Gibbs and Trevor J Owens, “The Hermeneutics of Data and Historical Writing,” in *Writing History in the Digital Age*, eds. Kristen Nawrotzki and Jack Dougherty (Ann Arbor, MI: University of Michigan Press, 2013), accessed December 6, 2016, <http://quod.lib.umich.edu/d/dh/12230987.0001.001/1:7/-writing-history-in-the-digital-age?g=dculture;rgn=div1;view=fulltext;xc=1#7.3>.

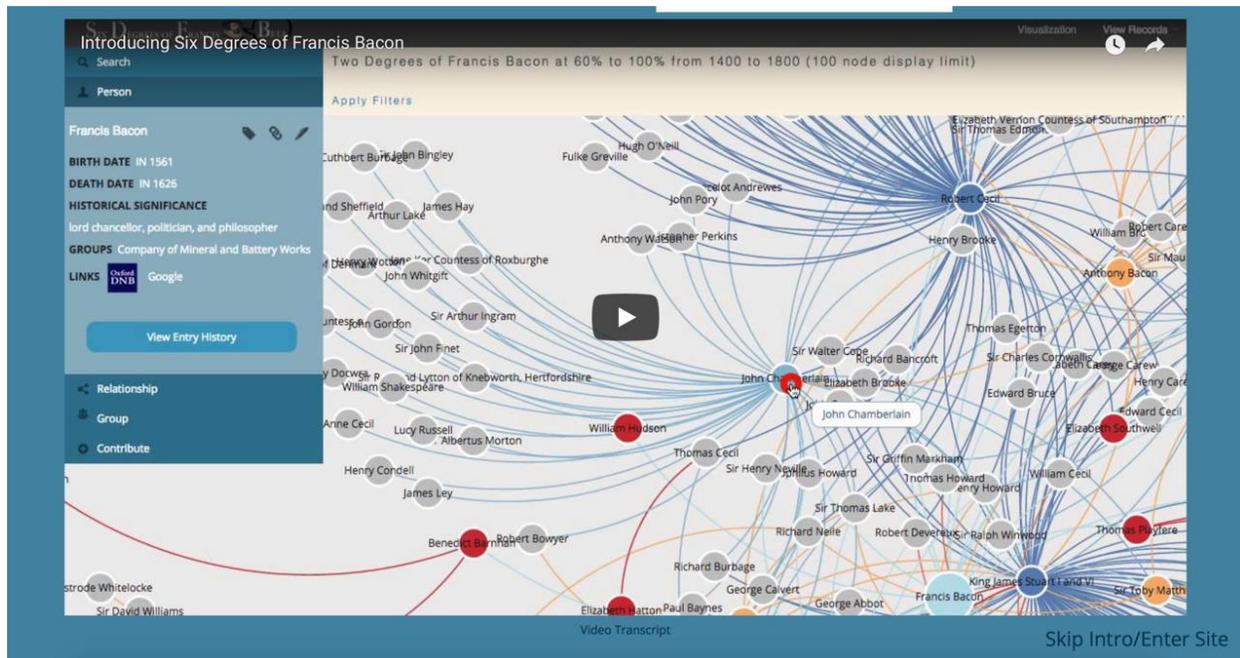


Figure 3. Screenshot of [www.sixdegreesoffrancisbacon.com](http://www.sixdegreesoffrancisbacon.com), SDFB team, *Six Degrees of Francis Bacon: Reassembling the Early Modern Social Network*. (accessed 5 December 2016).

Network visualizations produce clouds of connection, a swarm of nodes tied together by edges. The larger the dataset, the more manipulation is required to render the resulting visualization legible. These dots and lines necessarily abstract complex social and economic relationships: a line between a father and son is the same between a husband and wife in ECARTICO, between father and son and king and subject in *Six Degrees of Francis Bacon*. These are necessary simplifications, but ones that merit critical analysis.

If I produced a network visualization of a single Antwerp print, *St Michael* and the variants and copies of this print across the early modern globe, what would the edges represent? In some cases, the ties would reference a commercial relationship: print publishers often printed copies of competitors' prints and early modern painters' workshops regularly used engravings as models. But in some scenarios, the line between the print

and a resultant copy would refer to a more complex relation. Patrons in viceregal Latin America often compelled local artists to copy European prints, as stipulated in surviving contracts.<sup>15</sup> In this case the act of copying was used as a tool for the exercise of political and cultural power.

In the case of my Antwerp print, the Jesuit Order appears to have been a crucial intermediary, particularly promoting the design in the viceroyalty of Peru. While no surviving document explicitly links the print to the Order's activities in Peru, two copies of the composition can be found in the Jesuit church of San Pedro in Lima where the archangel was particularly promoted to the local populace.<sup>16</sup> One of these surviving paintings was produced in Spain (Fig. 4), then exported to the viceroyalty, while the other was painted locally (for example, Fig. 5).<sup>17</sup> The lines that connect these objects (the "original" engraving, paintings made in Spain and in viceregal Lima) in a network visualization would be equally weighted in a uniform web of connection.

<sup>15</sup> For example see the examples documented in Jorge Cornejo Bouroncle, *Derroteros de arte cuzqueño datos para una historia del arte en el Perú* (Cuzco: Ediciones Inca, 1960).

<sup>16</sup> Teresa Gisbert, *Iconografía y mitos indígenas en el arte*, (La Paz: Apartado 195, 1980), 87.

<sup>17</sup> On these paintings, see Porras, "St. Michael the Archangel," 192–98, with references to earlier literature.



**Figure 4.** Bartolomé Román, *St. Michael the Archangel*, ca. 1630. Oil on canvas, 190 x 147 cm. San Pedro Church, Lima, © Compania de Jesus, Comunidad de San Pedro.

All of the paintings are modeled after the print, but two of them were produced under very different patronage systems.

Not only does the pernicious simplicity of the line conceal the structural conditions that resulted in the proliferation of Latin American copies—network visualizations also have a hard time grappling with objects that move. The Spanish painted copy now in Lima is part of a broader network of painted copies produced around the Spanish royal court around 1600, but it also then went on to operate as part of a missionary Jesuit program in viceregal Lima, when the panel was exported. In this case, and for early modern European prints more generally, you have hundreds if not thousands of “original” impressions, rapidly sold and distributed across Europe but also exported to Asia and the Americas. The nature of print as a medium means that there are multiple mobile originals—that are notoriously fragile and difficult to trace. For example, there are roughly a dozen or so surviving Hispano-Filipino

ivories that can be related to the engraving and at least half-dozen extant paintings in Latin America, but there is no known surviving impression of the print in Asia or Latin America.

It is difficult to capture the accretive power underlying the circulation and reception of early modern prints, particularly those used in various colonial contexts. This print’s success as a model in Filipino ivory workshops likely was related to the design’s established success in Latin America, as the engraving probably was transported to the Philippines via the Manila Galleons, the annual shipment of Latin American silver from Acapulco, Mexico to Manila in order to purchase Asian luxury goods. We must therefore consider how network mapping and analysis can oversimplify complex geographies and obscure power relations.



**Figure 5.** Anonymous Lima painter, *St Michael the Archangel with Donor*, ca. 1630. Oil on canvas, 211 x 144 cm. Iglesia de San Pedro, Lima. Photo: Aaron Hyman.

This is true even when scholars address comparatively well-documented, ‘stable’ European artistic networks. For example, Matthew Lincoln’s recent article on print production in the Low Countries drew on the open data made available from the databases of two of the world’s largest print collections: London’s British Museum and Amsterdam’s Rijksmuseum.<sup>18</sup> His aim was to describe the balance between centralizing and decentralizing forces in regional print publishing networks from 1550-1750. Lincoln explains that he restricted his study to records that contain at least two identifiable creators, so that the study’s claims are restricted to the production of so-called “fine art prints,” those that record their authors’ names.<sup>19</sup> I want to highlight a few assumptions about this data that to my eyes significantly impact Lincoln’s resulting network analysis.

Lincoln’s decision to restrict his analysis to records of “fine art” prints with names is completely understandable, as one needs names to reconstruct a social network, but it nevertheless is a significant distortion of both the corpus of surviving early modern prints and what we know of the historic production of print publishers of this period. Print publishers and printmakers in the early modern Low Countries produced a diverse range of printed products beyond “art prints”: maps, broadsides, devotional prints, banners, wallpapers, etc. As Jan van der Stock argued nearly twenty years ago, far more examples of “fine art” prints survive because they were stored more carefully from the outset.<sup>20</sup> For example, a remarkably high proportion of all the original prints published by Rembrandt in his lifetime survive.<sup>21</sup> Yet of the documented 36,000 impressions of a single print distributed by the Jesuit Order in Mechelen during the 1660s, only a few prints survive.<sup>22</sup> Prints with named artists are

much more likely to survive than anonymous works, which were more common and had larger print runs. As a result, Lincoln’s list of the most central members of the Flemish and Dutch printmaking network is not hugely surprising to anyone who has ever catalogued prints—the names are largely familiar ones.

But most prints produced in this period did not bear the names of everyone involved in their production. Engravers’ names, outside of the most famous practitioners, are often not included on prints. Woodblock carvers’ names are even more rarely recorded. Less famous engravers and other printmakers often worked for multiple publishers, and were likely key figures in the early modern Low Countries’ print sector. Many print publishers in this period diversified their production, publishing both “art prints” and maps, for example. All this activity is underrepresented in Lincoln’s data set.

Even when a person is named on a print, this may or may not represent a relationship. For example, a significant proportion of early modern print publishers’ output were restrikes and copied prints: that is prints that bore other people’s names. Volcxken Diericx, the widow of Hieronymus Cock of the Antwerp publishing firm of Aux Quatre Vents, had around 1500 copper plates in her possession upon her death in 1601.<sup>23</sup> That is to say, Diericx published prints *without her name* for thirty years. Prior to her husband’s 1570 death, she was an active partner in Aux Quatre Vents but her name is not recorded on any print produced by the shop. After Diericx’s death, the Galle family acquired much of the firm’s stock of copperplates, with whom they remained well into the seventeenth century. But Theodoor Galle often simply added his own name to the original designer and/or engraver when he reissued prints, burnishing out Cock’s

<sup>18</sup> Matthew Lincoln, “Social Network Centralization Dynamics in Print Production in the Low Countries, 1550-1750,” *International Journal for Digital Art History* 2 (2016): 134–156, see page 138. Lincoln acknowledges at the outset of his article that data will be missing from the “lowest end of print production in illustrated broadsides, playing cards, calendars and cheap devotional prints.”

<sup>19</sup> Lincoln, “Social Network Centralization Dynamics,” 138–9. His supplementary methodological material—which must be downloaded separately—reveals all prints without names were not included.

<sup>20</sup> See Jan van der Stock, *Printing Images in Antwerp: The Introduction of Printmaking in a City: Fifteenth Century to 1585* (Rotterdam: Sound and Vision Interactive, 1998), 179–80. To mitigate against this “mistaken impression” that fine art prints dominated early modern print publishing in Antwerp, van der Stock advocates for a

“heuristic detour” to locate shadows of the early modern prints in the archive, while also recognizing the inherent bias of the archive.

<sup>21</sup> There are for example approximately 125 surviving impressions of Rembrandt’s etching *The Three Trees*. There is only one known state of this print and such a densely etched plate could only have produced up to around 200 impressions of any quality. See Erik Hinterding, *Rembrandt as an Etcher: the practice of production and distribution*, trans. Michael Hoyle (Ouderkerk aan den IJssel: Sound and Vision, 2006), I: 50–53.

<sup>22</sup> Example cited in van der Stock, *Printing Images in Antwerp*, 181.

<sup>23</sup> Erik Duverger, *Antwerpse kunstinventarissen uit de zeventiende eeuw* (Brussels: Koninklijke Academie voor Wetenschappen, 1984) I: 20–26.

name and replacing it with his own. So Galle's name appears alongside engravers he may never have worked with, many of whom were long dead. Alternatively, when the Dutch publisher Hendrick Hondius produced reprints, he often just added his name alongside that of the original publisher and printmaker, leaving two publishers' names legible on the resulting prints. Hondius reprinted at least 380 secondhand plates, representing close to a third of his publishing output.<sup>24</sup>

The "data" provided by the names on these early modern prints from the Low Countries then is often messy and unreliable. But there are also significant variations in the metadata standards used by modern museums as well. The British Museum uses the term "Netherlandish" to describe artists active before 1579, characterizing those active after that date as "Dutch" or "Flemish," reflecting the division of the Low Countries as a result of the Dutch Revolt. It is unclear if all these artists were included in Lincoln's dataset. The Dutch Revolt and the subsequent emigration of printmakers and publishers from the Low Countries to other locales is also an issue. Hans Vredeman de Vries (listed in the British Museum records as alternately Flemish, Dutch or both) was active in Antwerp and Amsterdam but also various towns in Germany and Prague. Were works published outside the Low Countries included in this analysis? How, for example, does one count the work of the Flemish publisher Justus Sadeler, active in Venice, but who maintained ties to Antwerp's print market via his extended family?

This is not to diminish the scholarly ambition and undoubted analytical skills demonstrated by Lincoln's work. Lincoln is the first art historian of Netherlandish art or of early modern print culture to grapple with the vast stores of W3C open data made available by museums. His research has the potential not only to identify otherwise neglected printmakers like Jonas Suyderhoef, but to reassess the centrality and transitivity of early modern print

publishing networks. However, when confronted by the neat graphs and network diagrams that accompany this kind of work, one must remain critically engaged. To productively interrogate such data visualizations, scholars need to be transparent about the limitations and biases of their datasets.

To this end, the methodology of the MapTap team led by Koenraad Brosens at the Katholieke Universiteit Leuven is an exemplary model in its acknowledgement of the complexity and limitations of its expanding dataset. The team describe their research methodology and philosophy as "slow digital art history";<sup>25</sup> their custom-built database on the historical network of Flemish tapestry producers, called Cornelia, allows users to click through to scans of the original archival source, allowing for greater data transparency. The database is primarily arranged by these sources, which may describe events, actors, places, roles, social groups or works of art. The result is a complex multimodal network with different kinds of ties that can be analyzed through visualization. Casting a wide net through archival records in Antwerp and Brussels City Archives as well as the State Archives of Belgium has resulted in greater gender parity in the database— as of February 2016, 30% of the actors recorded in Cornelia were women.<sup>26</sup> Cornelia's interactive visualizations demonstrate how women helped foster collaboration and the dispersal of models between cities.<sup>27</sup> Tapestry production is an artistic industry still too often marginalized in early modern art history. Cornelia's 2017 evolution into Coral—the team's broader study of both painting and tapestry workers' social networks, aims to demonstrate the connections between various creative industries in the early modern Low Countries. However, for all Cornelia's promise, this is a model only available to those art historians with access to comparably rich and varied archival resources, as well as considerable institutional and project resources.

<sup>24</sup> See Nadine Orenstein, *Hendrick Hondius and the Business of Prints in Seventeenth-Century Holland* (Rotterdam: Sound and Vision, 1996), 96.

<sup>25</sup> Koenraad Brosens, Klara Alen, Astrid Slegten, Fred Truyen, "MapTap and Cornelia: Slow Digital Art History and Formal Art Historical Social Network Research," *Zeitschrift für Kunstgeschichte* 79 (2016): 315–330, see page 320–21.

<sup>26</sup> See Brosens, et. al., "MapTap and Cornelia," 321.

<sup>27</sup> *Ibid.*, 324.

As a discipline, we must recognize data amenable to computational software and network analysis is not equally available to everyone, everywhere. Network visualizations can often obscure power relations, the geographic mobility of people and objects. As scholars of visual culture, art historians should critically reflect on the paradoxical power of such visualizations to both expand and to reinforce the canon. Data may be beautiful, but its biases must not go unexamined. We must keep our eyes open.<sup>28</sup>

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<sup>28</sup> I would like to thank the convenors (Miriam Posner, Johanna Drucker, Todd Presner, and Francesca Albrezzi), speakers and my fellow participants in the 2015 summer institute Beyond the Digitized Slide Library, held at the University of

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