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THE DIACHRONIC PROJECTION:

Past and future movements of hydrographic systems on early modern maps

To this day, the Mercator projection allows cartographers to flatten the three-dimensional world onto two-dimensional paper. As this article shows, Mercator's was not the only cartographic innovation pioneered in the early modern period: contemporary hydraulic experts routinely included the fourth dimension, time, in their maps. Capturing past movements of water, such as floods, but also future ones, such as planned land reclamation, required the development of a visual language allowing several temporalities to coexist within the same space. Early modern hydraulic experts can thus be said to have developed the diachronic projection. As well as allowing for the reduction of four dimensions onto two, this captured affects and desires on paper by combining depictions of the undesired (floods) and the desired (land reclamation). Given the recent interest for the history of projects, and the reframing of the early modern period as a projecting age, this article argues that it is time for scholars to recognise the importance of the diachronic projection.

'About four or six days ago I went along the Arno to draw, at the end of the large road where there is a breakage [in the riverbank]', wrote Bernardo Buontalenti in January 1572.[2] These words feature at the outset of a report he sent to the Florentine *Ufficiali dei Fiumi* (Rivers' Officials), in which he recommended prolonging the 'large road'—the highway running west from Florence to the fluvial port of Signa, which also served as the southern embankment of the river Arno.[3] The area had been repeatedly flooded in previous decades, and in the summer of 1568 Duke Cosimo I de' Medici, the ruler of Tuscany, had requested that Buontalenti examine the issue.[4] Buontalenti is best-known today as an architect and scenographer. In addition to designing and erecting fortresses all over Tuscany, he was responsible for grand *palazzi* within Florence and luxurious villas outside the city.[5] His octagonal Tribuna, its cupola incrusted with shells and mother-of-pearl, was added around 1580 to Giorgio Vasari's Uffizi to host the grand-ducal art collections, thus becoming the nucleus of the modern museum.[6] A floor below, in the Uffizi theatre, actors wore fantastically elaborate costumes designed by Buontalenti to perform in the courtly plays and *intermezzi* which he choreographed.[7] In 1572, when he wrote his report to the *Uffi-*

ciali dei Fiumi, he had also been working for two years on Prince Francesco de' Medici's new villa at Pratolino.

The words with which Buontalenti opened his report are thus significant: here was one of the busiest architects of late Cinquecento Florence who 'went along the Arno to draw'. This highlights the crucial importance of on-site inspections for early modern hydraulic experts—among whom we can number Buontalenti, who was *Ingegnere dei Fiumi* (Rivers' Engineer) from 1569 to 1587.[8] The contemporary German and Dutch words to designate these inspections, *schau* and *schouw* respectively, are both derivations of the same verb, 'to watch, to look'.[9] This draws our attention to one crucial activity which hydraulic experts performed during these inspections: looking.[10] Their trained gaze was expected not just to take stock of a given hydraulic situation, but also to discern its causes, as well as the elements which may contribute to its alteration or solution. Hydraulic experts, in other words, beheld the past and future of the hydraulic landscape as much as its present.

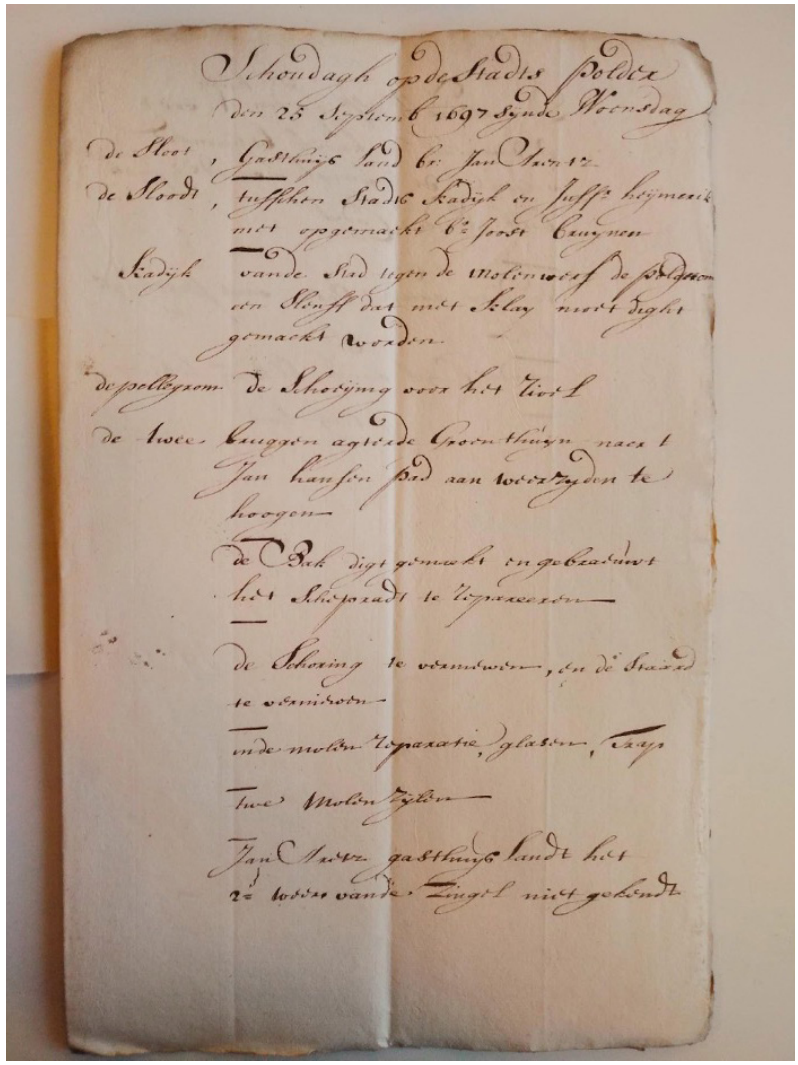


Fig. 1. Neat copy, drawn up from pencil notes, of the inspection report from 25 September 1697, Stads- en Godshuispolder, Amsterdam.

Image source: Stadsarchief Amsterdam, 92 (Archief van de Stads- en Godshuispolder), 60, fol [6].

(Image: Courtesy of Stadsarchief Amsterdam).

Looking at water was by no means a leisurely undertaking, pursued from a safe distance: if necessary, hydraulic experts were expected to get their feet wet. In his 1556 report to the councillors governing the Free Imperial City of Augsburg, for example, the hydraulic expert Pilgram Marpeck wrote that the municipal employees tasked with the upkeep of the city's drinking water supply system should be ready to 'work in water or elsewhere'.[11] Although explicit comments of this kind are few and far between, other traces of the working conditions of hydraulic experts while out on inspections can be found in the notes they took: often hastily scribbled in pencil, on paper which got just as damp as its carrier, these almost invariably needed to be copied before they could be submitted to the relevant office. The archives of these offices thus largely consist of neat copies, but notes have occasionally been preserved as well: in the papers of the Amsterdam Stad- en Godshuispolder, for example, the on-site inspection carried out on 25 September 1697 was recorded in pencil before being copied out in neat italics (fig. 1).[12]

In his 1572 report, Buontalenti did not mention looking; instead, he wrote that he 'went along the Arno to draw'. In Florence, drawing had a specific place among the arts, institutionalised in and defended by the Accademia del Disegno. Seen as the foundational creative act, *disegno* (drawing but also design) was cultivated by Florentines as an essential skill for the figurative arts as well as for a whole host of other visual practices. In his definition of *disegno*, Giorgio Vasari described the act of drawing as epistemic, as the fruit of an intellectual process which could know and represent the universal form of what was being drawn.[13] The concept of *disegno* was thus foundational for Florentine visual culture. The importance of draughtsmanship for hydraulic inspections, however, was not limited to Florence: drawing was an essential medium through which all hydraulic experts recorded and communicated their findings in early modern Europe. The trained eye thus needed to be accompanied by a trained hand during on-site inspections. Just like notes, indeed, sketches could be made on the go and later turned into beautiful maps, complete with colour and annotations. These maps often included previous and planned variations of a body of water, committing to paper the hydraulic expert's gaze into the past, present, and future. By examining two examples where this was the case, this article will show the significance of this mode of cartographic representation, arguing that it should be called 'diachronic projection'.

The sixteenth century saw several innovations in cartographic techniques, the most famous of which is the Mercator projection. In his 1569 world map, engraved on eighteen copper plates, the Flemish geographer and instrument-maker Gerard Mercator flattened the Earth's spherical surface in a new manner. By increasing the distance between parallels near the poles, and reducing it near the Equator, he was able to obtain a map on which rhumb lines (or loxodromes, the lines of constant bearing used by seafarers to plot a course for their ship) were straight, always crossing the likewise straight meridians at constant angles. Its practical use

for navigation has ensured the projection's enduring popularity to this day.[14] This was not the only early modern innovation in the field of cartography. Before issuing his 1569 world map, Mercator himself had experimented with another way of flattening the Earth: in 1538, he borrowed Oronce Fine's double cordiform projection to publish his first flat map of the whole world.[15] Urban cartography also witnessed important innovations in the sixteenth century, evolving in at least two different directions. One was the tradition of spectacular bird's eye views of entire cities, inaugurated by Jacopo de' Barbari's celebrated view of Venice (1500).[16] Their combination of painstaking detail and commanding vista made these bird's eye views into prime sources of and outlets for civic pride—as well as turning them into valuable visual sources for urban historians thereafter. The other tradition was the 'ichnographic' city plan, which implied an even greater degree of abstraction than bird's eye views.[17] Rather than viewing the city from a single vantage point, ichnographic plans assumed an infinity of virtual viewpoints, each perpendicular to the Earth's surface, resulting in a representation of the ground plan of an entire city. Pioneered by Leonardo da Vinci at Imola in 1502, the ichnographic plan was less about ostentation and more about military defence and offence, as well as urban planning.

The two examples of diachronic projection examined here were concerned with a different conflict, between humans and water. The first map (fig. 2) depicts the aftermath of a flood of the river Marina, just upstream of its confluence with the river Bisenzio, in the countryside west of Florence and north of the town of Campi (today Campi Bisenzio). A manuscript drawing, the map is anonymous; its preservation among the papers of the Florentine *Ufficiali dei Fiumi* suggests that it was drawn up by one of the *capimaestri* (foremen) employed to assist *Ingegneri dei Fiumi* in carrying out their hydraulic duties.[18] If court architects like Buontalenti, whose skills were known to and trusted by the Medici ruling family, initially occupied the post of *Ingegnere dei Fiumi*, the *capimaestri* in their employ tended to be recruited for their technical skills instead. By the seventeenth century, this had become a prerequisite for the post of Ingegnere, too—signalling a stricter separation between architects' building activities and the grand-ducal officials' role in designing the landscape and infrastructure of Tuscany.[19]

A date for the first map is also lacking, but three clues concur to suggest a plausible dating to the late 1550s. Indeed, the other documents preserved under the same archival classmark all date from the period 1556–9.[20] Furthermore, the building labelled as 'palace of Ottaviano de' Medici's heir' was only in the possession of this branch of the Medici family until the 1560s, when Ottaviano's two sons moved to Rome and Naples.[21] Most importantly, in 1557 Florence's river, the Arno, burst its banks in one of the worst recorded floods of all times, comparable to the catastrophes of 1333 and 1966. Several of its tributaries, of which the Bisenzio is one, also flooded; it is therefore highly likely that the flood depicted on this map was only the local component of the wider regional cataclysm of 1557.[23] As well as the water, in a blue hue, the *capomaestro* has


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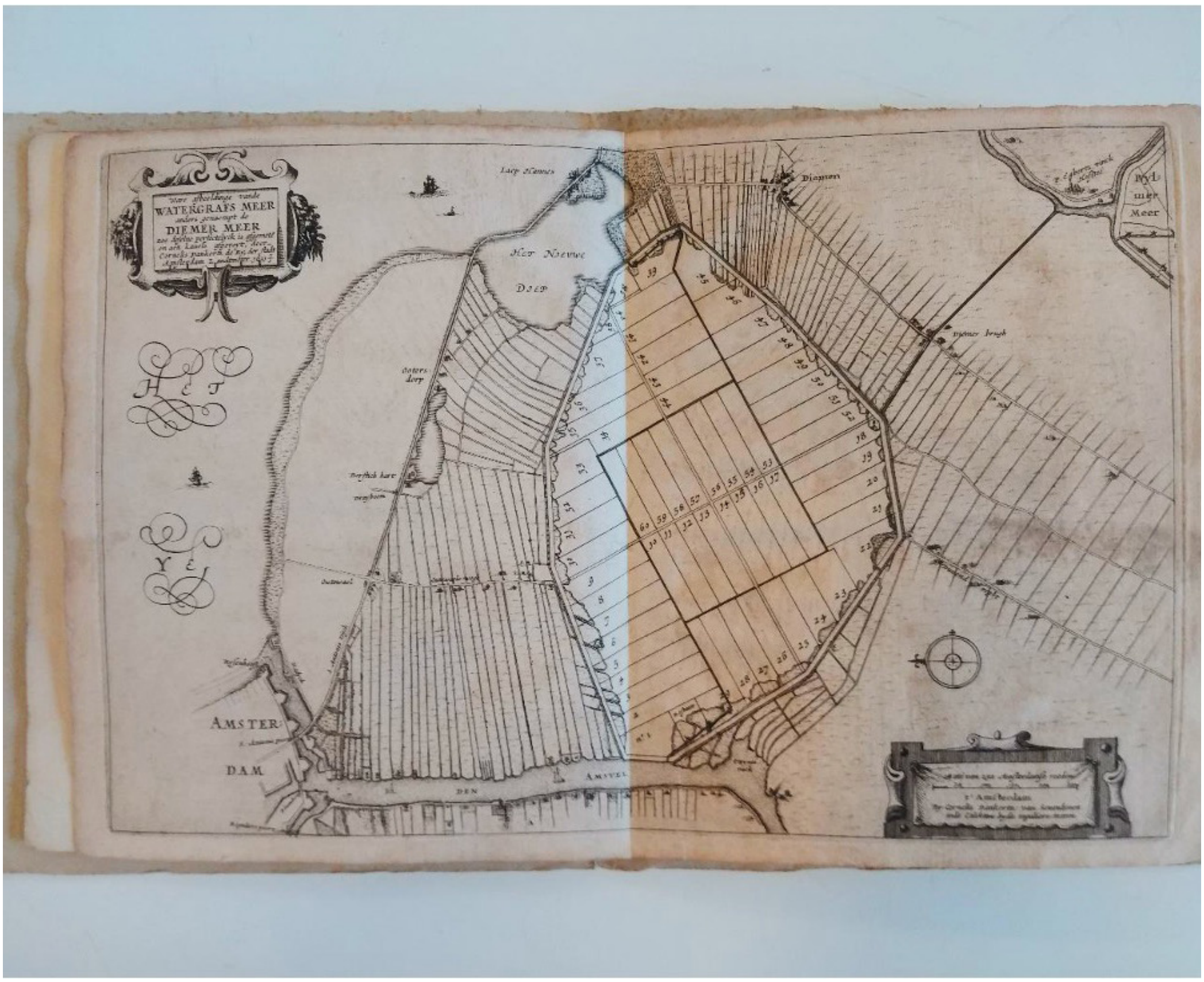

WATERGRAFS MEER
DIEMER MEER
Het Nieuwe Diep
Diemen
Rydamer Meer
AMSTER
DAM

Fig. 2. Anonymous map of the confluence of the rivers Marina and Bisenzio, west of Florence (c. 1558).

Image source: Archivio di Stato di Firenze (ASFi), Capitani di Parte Guelfa, Numeri Neri, 960, rep. [248bis].

(Image: Courtesy of Ministero della Cultura, Archivio di Stato di Firenze).

depicted in red the banks which should have prevented the Marina from flooding, and the built structures damaged by the flood, including the Medici palace.[24] Colour coding was commonplace in early modern maps; its specific use in this map allowed its author to depict both the *status quo ante* and the dramatic events of the flood in one and the same space. The location of future repairs is not explicitly identified, but may be surmised by an informed observer.

The second map (fig. 3) is of more straightforward identification, being signed, dated, and published in printed form—although there may be more than meets the eye in its dating. It was drawn up by Cornelis Danckertsz. de Ry, *stadslandmeter* (city surveyor) of Amsterdam in the 1620s. Its title, *Ware afbeeldinge vande Watergrafs Meer* (True depiction of the Watergraafsmeer), suggests an accurate representation of this lake east of the city of Amsterdam, also known as Diemermeer. The only bodies of water visible on the map, however, are the river Amstel, at the bottom; 'Het Ye', commonly spelled Ij today, then a sea arm; and 'Het Nieuwe Diep', an enclosed portion of the Ij. The Watergraafsmeer, a large lake measuring over 5 km2 (500 hectares), is represented as drained: its outline is still marked by the perimetral ditch surrounding the drained land, which is subdivided in numbered plots of equal size. So de Ry's map claims to be a 'true depiction' of the state of the Watergraafsmeer after drainage.

Fig. 3. C. Danckertsz. de Ry, True depiction of the Watergraafsmeer or Diemermeer (1631).

Image source: StadAAm, 524 (Archief van het Hoogheemraadschap van de Watergraafsmeer), 485 (1629 drainage advertisement).

(Image: Courtesy of Stadsarchief Amsterdam).

Its inclusion in a 1629 booklet, issued by the Amsterdam municipal administration to advertise its latest land reclamation project, however, casts this claim into doubt.[25] In 1629, indeed, the drainage of the Watergraafsmeer was only just getting underway: receipts show a first payment to 'Cornelius Jansz. millwright of Alkmaar' for the construction of drainage windmills on 16 August 1629.[26] De Ry's map was therefore not a 'true depiction' of the state of affairs in 1629, but of the planned outcome of the works then begun. Its dating, in the top left cartouche, reinforces this interpretation: despite being issued with a 1629 booklet, the map bears the date of 1631. Akin to modern digital renderings of the result of a construction project, de Ry's map was meant to entice investors into buying real estate which was only just emerging from the waters of the Watergraafsmeer. This was not so common in the early modern Low Countries: the earliest known map of the Beemster drainage, one of the largest and most famous land reclamation projects of the seventeenth century, was for example printed in 1612, when the watermills had already drained most of the water from the former lake.[27]

The two examples of diachronic projection examined in this article differ not just in their temporality—respectively past and future occurrences coexist with the present—but also in their relationship to 'affective projecting'. This is the term coined by Tina Asmussen to describe the projection of the dreams and desires of Duke Julius von Braunschweig-Lüneburg onto the landscape of his Duchy.[28] In the first instance under scrutiny here, indeed, the 'affective projecting' of the *capomaestro* is directed towards the restoration of order,

the undoing of an undesired event, a flood. In the second instance, by contrast, de Ry seeks to direct the affects of his audience towards a new future situation, the completion of a desired process, land reclamation. These two maps can therefore be termed projections in more senses than one: they are diachronic in that they fix past, present, and future onto the same plane. They are also, however, projections insofar as they materialised projects, and insofar as they represent projections of their authors' affects onto the landscape.

Diachronic projections, like the two maps briefly discussed here, ought therefore to be considered as part of a broader early modern visual culture concerned with the visual form of projects and affects. Examples include horoscopes and astrological charts; plans, elevations, and other visual representations of projected buildings; as well as drawings and diagrams accompanying patent applications. One might also stretch this category to include portraits which idealised the sitter or represented them with a future attribute, as well as works of art materialising ambitions of power, wealth, or success. Within this visual culture of projects, maps utilising the diachronic projection should be recognised by scholars as another of the cartographic innovations of the early modern period, an age of projecting in more senses than one.[29]

ENDNOTES

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[2] 'Circa quattro /o/ sei Giorni sono Jo andai insu Arno a disegnare alfine dello stradone doue é vna rottura'. Florence, Archivio di Stato (ASFi), Capitani di Parte Guelfa (Parte), Numeri Neri: 1464, doc. 27 (letter from Bernardo Buontalenti to Ufficiali dei Fiumi, [day partly illegible, 16 or 18] January 1571/1572).

[3] Local landowners offered to cover all costs and workforce needs; Buontalenti recommended assisting them by supplying timber and paying for pile drivers: ASFi, Parte, Numeri Neri: 1464, docs 25 (letter from *Provveditore* Benedetto Uguccioni to Prince [Francesco], 24 February 1572), 26 (letter from *Cancelliere* Luca Fabbroni to Prince [Francesco], 11 February 1572), and 27 (letter from *Ingegnere* Bernardo Buontalenti to *Ufficiali dei Fiumi*, [day partly illegible, 16 or 18] January 1572).

[4] ASFi, Parte, Numeri Neri: 1463, doc. 305 (letter from *Provveditore* Benedetto Uguccioni to Prince [Francesco], 14 June 1568): Prince Francesco's *rescritto*, added two days later on 16 June 1568, ordered 'Bernardo vadie a ueder' et riferisce' ('Bernardo [Buontalenti] shall go see and report').

[5] I.M. Botto, 'Buontalenti, Bernardo' in *Dizionario Biografico degli italiani*, vol. 15 (1972) [online at https:// www.treccani.it/enciclopedia/bernardo-buontalenti_(Dizionario-Biografico); last consulted 26 April 2024].

[6] Botto, 'Buontalenti, Bernardo'; and P. Barocchi & G. Ragionieri (eds), *Gli Uffizi: quattro secoli di una galleria* (conference proceedings Florence, 20 to 24 Sep 1982; Firenze: Olschki, 1983).

[7] S. Mamone, *Il teatro nella Firenze Medicea* (Milano: Mursia, 1981).

[8] On Buontalenti's tenure, see G. Casali, 'Buontalenti "ingegnere" dei Capitani di Parte' in *idem* & E. Diana, *Bernardo Buontalenti e la burocrazia tecnica nella Toscana medicea* (Firenze: Alinea, 1983), pp. 7–28.

[9] 'schau' in J. Grimm & W. Grimm, *Deutsches Wörterbuch* (DWB), vol. 14 (1893) [online at https:// woerterbuchnetz.de/; last consulted 26 April 2024]; 'schouw' in P. Marlies et al. (eds), *Etymologisch woordenboek van het Nederlands* (EWN), 4 vols (Amsterdam: Amsterdam University Press, 2003–2009) [online at https://etymologie.nl/; last consulted 26 April 2024].

[10] On the specific skill of looking at water, and hydraulic experts' trained gaze in Venice, see K. Appuhn, *A Forest on the Sea: Environmental Expertise in Renaissance Venice* (Baltimore: Johns Hopkins University Press, 2009), pp. 61–74.

[11] 'Jm waser oder sunst zue arbaten'. Stadtarchiv Augsburg, Kommunales Archivgut – Altbestände (StadtAAu, KA-A), Baumeisteramt, VII: 28d, [1] (P. Marpeck, 'Bericht der brunwerck' (1556)), p. 10.

[12] The Stads- en Godshuispolder will be discussed at more length below, section c.

[13] On *disegno* in Florence, see K. Barzman, *The Discipline of Disegno: The Florentine Academy and the Early Modern State, 1563–1737* (Cambridge: Cambridge University Press, 2000); for Vasari's definition, see ibid., esp. pp. 145–50. On its application within the *Parte Guelfa*, see also F. Barreca, 'Between *matematici* and *architetti d'acque*: Vincenzo Viviani, Galileo's legacy, and hydraulic engineering' in *Galilæana* XX:1 (2023), pp. 121–52.

[14] M. S. Monmonier, *Rhumb Lines and Map Wars: A Social History of the Mercator Projection* (Chicago: University of Chicago Press, op. 2004), pp. 31–61.

[15] Ibid., 35–6.

[16] J. Schulz, 'Jacopo de' Barbari's View of Venice: Map Making, City Views, and Moralized Geography Before the Year 1500' in *The Art Bulletin* 60:3 (1978), pp. 425–74; and D. Stroffolino, *La città misurata: tecniche e strumenti di rilevamento nei trattati a stampa del Cinquecento* (Roma: Salerno Editrice, 1999), pp. 145–83.

[17] John A. Pinto, 'Origins and Development of the Ichnographic City Plan' in *Journal of the Society of Architectural Historians*, 35 (1976), 35–50.

[18] The map is kept in the Florence Archivio di Stato (ASFi), within the collection of the Capitani di Parte Guelfa (Parte), a sort of Ministry of Public Works for the Grand Duchy of Tuscany. See ASFi, Parte, Numeri Neri, 960, rep. [248bis].

[19] See Casali & Diana, *Bernardo Buontalenti e la burocrazia tecnica*; D. Toccafondi & C. Vivoli, 'Cartografia e istituzioni nella Toscana del Seicento: gli ingegneri al servizio dei Capitani di parte e dello Scrittoio delle possessioni' in *Cartografia e istituzioni in età moderna* (conference proceedings Genova, Imperia, Albenga, Savona, La Spezia, 3–8 Nov 1986; Roma: Ministero per i Beni Culturali e Ambientali, 1987), pp. 167–202, esp. pp. 170–89; and E. Ferretti, '"Imminutus crevit". Il problema della regimazione idraulica dai documenti degli Ufficiali dei Fiumi di Firenze' in C. Travaglini (ed.), *La città e il fiume* (secoli XIII-XIX) (Roma: École Française de Rome, 2008), pp. 105–28.

[20] See ASFi, Parte, Numeri Neri, 960.

[21] 'palazo de lerede di mesere otauiano de medici'. ASFi, Parte, Numeri Neri, 960, rep. [248bis]. Ottaviano de' Medici died in 1546; his son Bernardetto moved to Ottajano, near Naples, some time between 1567 and 1570; his son Alessandro (later Pope Leo XI) moved to Rome in 1569. See M. Sanfilippo, 'Leone XI, papa' in *Dizionario Biografico degli Italiani* 64 (2005) [online at https://www.treccani.it/enciclopedia/papa-leone-xi_(Dizionario-Biografico)/; last consulted 13 March 2024].

[22] On the 1557 flood, see for example A. Lapini, *Diario fiorentino: dal 252 al 1596* (Firenze: G.C. Sansoni, 1900), pp. 119–20; and E. Ferretti & D. Turrini, *Navigare in Arno: Acque, uomini e marmi tra Firenze e il mare in età moderna* (Firenze: EdiFir, 2010), pp. 27–8.

[24] Now known as Villa Montalvo, after the family Ramirez de Montalvo who bought it from the Medici in the late sixteenth century, it has again been damaged by the most recent flood of the Bisenzio and Marina, in the autumn of 2023. See 'Alluvione Campi Bisenzio, allagata Villa Montalvo: i libri persi nel fango e lo strazio di Sandra' in *Corriere Fiorentino*, 4 November 2023 [online at https://corrierefiorentino.corriere.it/notizie/cronaca/23_novembre_04/alluvione-campi-bisenzio-allagata-villa-montalvo-i-libri-persi-nel-fango-e-lo-strazio-di-sandra-1930c3de-571d-4b09-a1a4-f91d1c661xlk.shtml; last consulted 13 March 2024].

[25] A copy of this booklet, including the printed map, is kept in the Stadsarchief Amsterdam (StadAAm): 524 (Archief van het Hoogheemraadschap van de Watergraafsmeer), 485 (1629 drainage advertisement).

[26] 'Corn. Jansz. molenmacher van aelckmaer'. StadAAm, 30536 (Archief van de Gemeente Watergraafsmeer), 108 (polder accounts, 1629–30), fol. 2.

[27] Lukas Jansz. Sinck, Beemsterlants caerte met syne dycken ende ommelanden (c. 1612). Leiden, Universiteitsbibliothek, COLLBN 009-01-062 [online at https://digitalcollections.universiteitleiden.nl/view/ item/2039904; last accessed 29/04/2024].

[28] T. Asmussen, 'Affective Projecting: mining and inland navigation in Braunschweig-Lüneburg' in I. Leemans & A. Goldgar (eds), Early Modern Knowledge Societies as Affective Economies (London: Routledge, 2020), pp. 87–110.

[29] The phrase 'projecting age', originally coined by Daniel Defoe to describe the late seventeenth century, has experienced a recent regain in popularity. See for example M.E. Novak (ed.), *The Age of Projects* (Toronto: University of Toronto Press, 2008).