Ways of Knowing Cities

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Urban Intermedia: City, Archive, Narrative

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Urban Intermedia: City, Archive, Narrative is a multimedia research project, methodological experiment, and exhibition that is part of an ongoing exploration of new collaborative practices and projects that bring together scholarship, design, and media around the study of cities.[1] As a capstone project of the Harvard Mellon Urban Initiative (2013–2018)—a multi-year, cross-university research and teaching program, supported by funding from the Andrew W. Mellon Foundation—*Urban Intermedia* engages the objectives of the initiative: to connect scholars and designers to develop new visual and digital methods and cross-disciplinary approaches to the study of urban environments, societies, and cultures.[2] Four city-based research projects, in Berlin, Boston, Istanbul, and Mumbai, directed by Harvard faculty, form the core of the project. Conceived as *portals* into different geographies and urban issues, these projects open a broad field of comparative urban study.[3]

Three foundational ideas have guided the Harvard Mellon Urban Initiative and the *Urban Intermedia* project. The first: no discipline "owns" the city, an idea that acknowledges that each discipline produces its own forms of knowledge but also has its own blind spots or "residues" (as Henri Lefebvre called them) that "evade its grasp" and can be approached only through other disciplinary frameworks.[4] The second: the fixed categories by which we have traditionally understood the urban no longer hold. They have been undermined by the multiplicity of disparate urban formations that are transforming cities across the planet. In order to understand the dynamics of emerging conditions and the proliferating differences they produce, urban research needs to be both specific and site-based, as well as comparative across geographies and cultures. The third: we must engage directly with the relationship between the tools and objects of urban research—with how the digitized information, communication, and media technologies we use to visualize and understand urban environments are changing both the ways we research and the kinds of knowledge we produce from it. These conditions call for direct critical engagement with the dynamic and synergistic relationship between the instruments and the objects of research.

As points of departure, these ideas inform a set of research questions around urban processes, conditions, and practices. Together they provide the comparative ground between the individual city-based research projects and the issues they raise: (1) What can we learn about urban processes if we look at the interrelation of the *planned and the unplanned*; how do formal and informal practices work together to shape the city? (2) What does the urban imprint of patterns of migration and mobility tell us about the modalities of inclusion and exclusion, and the complex ways that claims on space are made by (or denied to) different groups? (3) How does the relationship between nature and technology create and sustain urban environments; how do technical

Fig 1: View of the *Urban Intermedia: City, Archive, Narrative* installation at the Aedes Architecture Forum, Berlin, January 2018. All images © Harvard Mellon Urban Initiative.

Fig 2: Still from the Berlin narrative, *City-Fabric: Between Systems and Sites*, Berlin: Experimental Ground, Urban Intermedia, 2018.

infrastructures shape natural landscapes in processes of urbanization; how do natural resource flows (material and energy) impact urban and larger territorial ecologies?

The overarching agenda of each research portal is to probe the blind spots of established narratives—focusing on topics and sites considered outside the dominant conceptual frameworks of urban research on those cities. Boston: Race and Space, for example, brings into focus the long-standing racialized policies and exclusionary practices that produced the enormous disparities (in terms of access to housing, jobs, public transportation, and social amenities) between predominantly white and nonwhite inner-city neighborhoods, which persist today. Mumbai: Claims on the City examines places in the megacity that acknowledge and commemorate the cultures and environments of those excluded from the space of global capital flow. Istanbul: Metropolitan Flux shows the collusion between government-sponsored large-scale planning and unregulated private development that enabled the massive expansion of the city into the European and Asian hinterlands on both sides of the Bosporus. Berlin: Experimental Ground reveals how the city's large-scale urban grid and block system was a structuring device that, rather than producing uniformity and dullness, engendered complexity and difference—supporting a productive urban mix of social uses, classes, and practices—and shows how this resilient urban form has been appropriated as a platform for a wide range of successive uses and constituencies.

The challenge for the *Urban Intermedia* project was how to present both the research findings and the methods developed in the course of investigating each city through its disciplinary blind spots, and to do so through the archival and analytical materials used and produced in the course of the research itself. This challenge became its own project—a collective project—developed collaboratively over the course of a year by the curators (Robert Pietrusko and I), the faculty directors of each city-based research portal, and an extensive team of doctoral and design students and recent Harvard Graduate School of Design graduates (see credits in footnote 1). In the pages that follow, I would like to focus on *this* project and the methods that were conceived to realize it— to represent conditions that resist representation and to construct arguments and stories that are more nuanced, multifaceted, and plurivalent than the disciplinary frameworks of any one field of inquiry.

Complexity is theoretical and empirical. Conceptually, as Manfredo Tafuri pointed out, a project that seeks to speak across disciplines, whether through a new kind of "intermedia" language or by some other means, must not only "ceaselessly question" its own methods and materials but also "continuously reconstruct itself" as a project.[5] This involves not only "incorporating uncertainty" into the methods and critical frameworks of research but also conceiving of the project itself as an experiment—the real

task of which, according to Tafuri, is to expand or "widen" the scope of the project "by taking apart, putting together, contradicting, provoking languages and syntaxes" in order to push the project "outside of its own boundaries" while nevertheless remaining "solidly anchored to the ground."[6] To chart such a course is to venture into perilous interdisciplinary territory, especially if the object of study is the urban.

Henri Lefebvre had a great deal to say about the perils and pitfalls of interdisciplinary urban study. "The urban phenomenon, taken as a whole," he asserts in *The Urban Revolution*, "cannot be grasped by any specialized science [because] no science can claim to exhaust it. Or control it. Once we have acknowledged or established this, the difficulties begin. How many of us," he asks, "are unaware of the disappointments and setbacks that resulted from so-called inter- and multi-disciplinary efforts? The illusions of such studies, and the myths surrounding them have been abundantly criticized"—indeed, extensively by Lefebvre himself.[7] The main problem is one of terminology—of language—which Lefebvre calls the "academic Babel" that produces "scientific hermeticism" and results in interdisciplinary "confusion."[8] Yet the complexity of "the urban phenomenon," Lefebvre acknowledges, requires disciplinary cooperation, precisely because of the blind spots that emerge out of it: "the farther a given science pushes its analysis, the more it reveals the presence of a *residue*. It is this residue that evades its grasp. And, although essential, it can only be approached using different methods."[9] He goes on to propose that "if every discipline were to succeed in bringing into view some residue, they would all soon become irreducible."[10] And, although "the complexity of the urban phenomenon is not that of an 'object,'" it can perform useful theoretical work as a *virtual object*—a theoretically possible object that "envelops a whole range of problems" that are too complex to be grasped by any field alone.[11] In fact, Lefebvre suggests, a new field could emerge, "a differential field" of urban praxis that could engage the full complexity of the urban, including the disciplinary residues of urban research, in terms of "the urban problematic."[12]

Lefebvre's notion of the virtual object of urban research as a conceptual tool for bridging disciplinary boundaries and for advancing a differential field of urban praxis that would make visible the accumulated blind spots of urban research informs both the critical framework of *Urban Intermedia* and the operative concept of *media* on which it is based. That concept (of media) is envisaged as a convergence of *science-based* and *culture-based* conceptions of medium—that is, as a matrix constituted of both the *environment* and the *means by which we engage and understand it*.[13] This convergence is itself conceived in ecological terms, as an ecosystem that is never static but is in a permanent state of disequilibrium, continuously triggering new sets of interactions between the environments and the cultures they support.

More specific questions about the dynamic and synergistic relationship between the tools and objects of urban research follow from the continuously transforming project of urban research, questions that revolve around the interrelation of physical and digital media: How are the materials and methods of urban research—and by extension the stories we tell with them—being transformed by new media formats and technologies? In this context, what constitutes an archive, and how might physical archival materials be incorporated into digital forms of urban scholarship? Is it possible to tell stories and construct arguments that speak across disciplinary boundaries through a shared media language? And how would such a "shared media language" challenge the dominant conceptual frameworks of urban research?

These theoretical questions drive the empirical research and the discursive format of the *Urban Intermedia* project and exhibition, which consist of a series of visual narratives composed of the research material gathered over three years of archival research and fieldwork in Berlin, Boston, Istanbul, and Mumbai. Digitized and animated, to unfold in space and over time, the narratives are constructed using a range of digital design techniques, developed by Robert Pietrusko, that allow us to combine the technologies and working methods of animation, drawing, typography, photography, 3D graphics, video, and other (physical, digital, and electronic) media technologies (see figure 3).

Conceptually, we imagine a virtual plane—an infinite white media surface—on which the images, maps, and other assembled materials are layered and brought into registration with one another. Once placed on the media surface, an image or piece of media never disappears. It remains an independent (virtual) object that can always be accessed. The virtual plane allows us to create densely layered assemblages that can be manipulated and reassembled as we explore the different spatialities and temporalities of the sites, and the layered social, political, and cultural meanings of the conditions and processes to which they give access. It also allows us to examine those conditions at multiple scales, from different perspectives, and across space and time, and to generate animated visual narratives exploring their meanings.[14] While the starting point of each narrative is always the present moment—the issues, topics, questions, and debates that are of urgent contemporary concern—the present is engaged historically and spatially through dense intermedia matrices, challenging any unitary understanding of urban environments and processes and leaving viewers to construct their own meanings from the material presented.

Each narrative is structured to tell its story without written or verbal narration (except for the occasional intertitle, a technique borrowed from silent films). Research material and media are left to narrate stories and shape arguments through their own visual languages and through the spatial and temporal relationships generated by animating new juxtapositions and adjacencies.

Fig 3: Virtual plane with layered media. Still from the Istanbul narrative, *Making of an Edge*, Istanbul: Metropolitan Flux, Urban Intermedia, 2018.

Iterative and incremental, the narratives capture a process of experimentation that involves a set of protocols, adopted in uncertainty, that transform the spatiotemporal unfolding of the narrative into a process of exploration and discovery. In the exhibition, the "final" narratives are presented in videos projected onto screens.

One of the three Berlin narratives, *City-Fabric: Between Systems and Sites*, for example, examines what makes the old inner-city district of Luisenstadt (today, part of Mitte and Kreuzberg and one of the principal sites of creative clustering in Berlin) such fertile, experimental ground (see figures 2 and 4). The narrative begins with the historical evolution of Berlin—through a sequential layering of historical maps, surveys, and plans that are brought into dialogue with one another. Luisenstadt emerges in relation to the region, its geology and its topography, and the growth of the city over centuries. As a low-lying, marshy swampland unsuitable for building, the site was one of the last inner-city districts of Berlin to be urbanized—beginning with a canal project by the landscape architect Peter Josef Lenné that was connected to a citywide system of waterways and parks. Zooming into the site, the layers thicken: new information and media create diverse entryways into a range of topics, questions, and lines of research. The canal (which made "nature suitable for culture") created the conditions for urban development: the expansion of infrastructure, the evolution of new institutions and legal codes, and the generation of new social practices and forms of cultural production.[15] These processes are examined through multiple lenses focusing on the intersection of technological innovation, political conflict, patterns of industrial development, migration, and settlement. Layering and animation make it possible to visualize processes of change and conditions of difference though narratives that are diachronic and synchronic—adding complexity and dimension to the multiple stories they bring together. Assemblages produce new knowledge. Through them, we begin to understand how planned and unplanned interventions, formal and informal practices, operate together to shape the organization and use of space in the city.

Other discoveries emerged out of the process of assembly. When we began materializing the narratives, we had detailed and carefully developed story lines and arguments that we wanted to build out of our research materials. But as the narratives began to take shape, so too did the images, documents, film footage, and other media but not in the way we anticipated. These materials would not stay within the confines of a single story line. Instead, they kept adding layers of information and introducing topics, critical perspectives, and new points of view that would break out of the original story line and send the narratives spinning off in new, unscripted directions. It became clear to us that the visual narratives we were constructing were uncontainable in terms of story line. Understanding that dynamic was critical to developing the project.

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Fig 4: Sequence of stills (pages 214–217) from
Berlin narrative, *City-Fabric: Between Systems
and Sites*.

1840
LENNÉ PLAN
PROPOSED PARK NETWORK
PROPOSED GRID

LUISENSTADT CANAL
1852
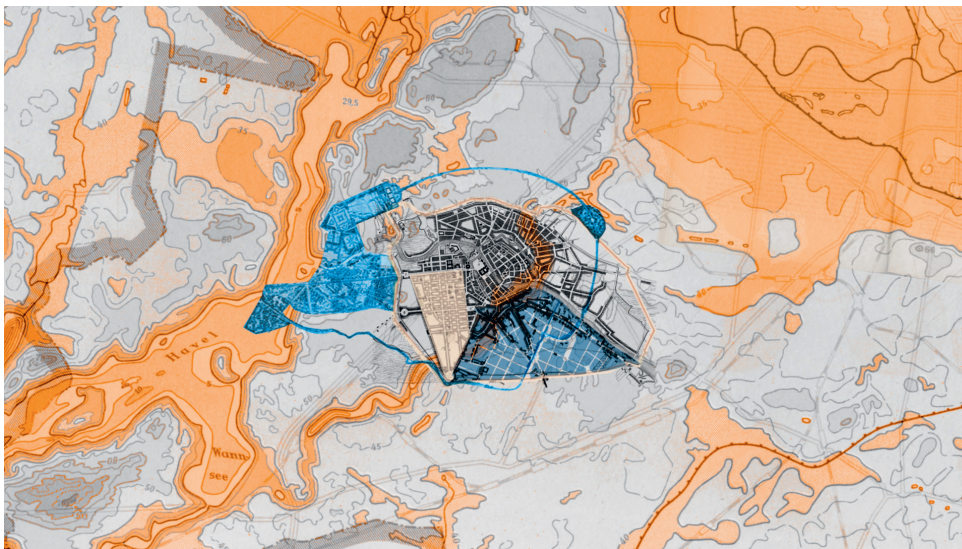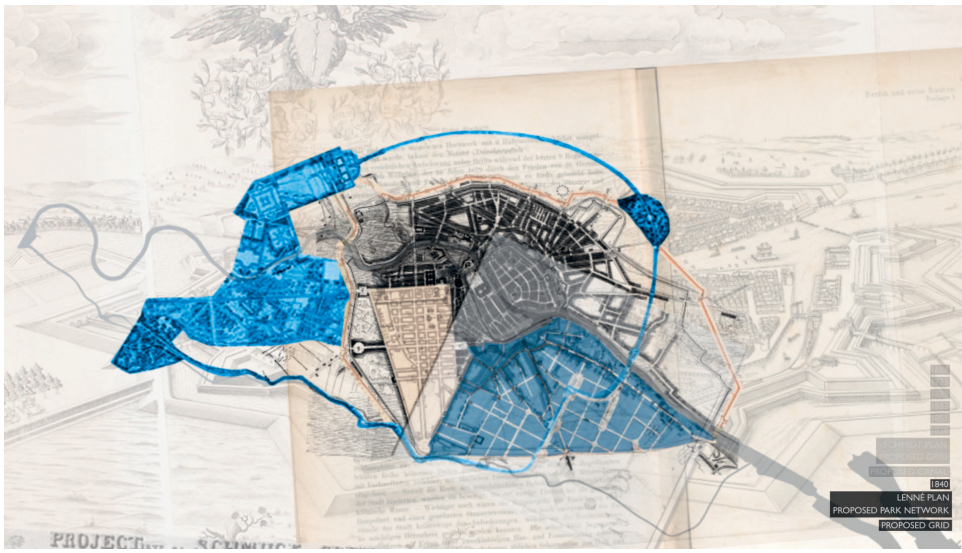
On one level, this uncontainability can be seen as a function of the "analog surplus value" of visual images—their potential and tendency to transmit information beyond the capacity of verbal language or to communicate more information about an object than verbal statements about the same object generally do.[16] As Otto Neurath, the Viennese philosopher of science and inventor of ISOTYPE (International System of Typographic Picture Education) argued, images invite multiple and conflicting readings and interpretations. Neurath called this ability—to shape and transfer (complex) information about the social and material world in a way that leaves the object itself open to shifting interpretations and meanings over time—the "either-or quality" of visual images or visual text: their capacity to embody a contradiction. He saw their most critical didactic value in "the teaching of how to argue."[17] The openness of the visual text, composed of images and other graphic forms of documentation, is a function of how (visual) texts themselves are constructed and the role of spatial design in their telling.

This is especially true in the context of the *Urban Intermedia* project. The narratives are constructed through a process of assembly, which is a method of composition that operates in terms of relationships—proximity, distance, juxtaposition, superimposition, transparency, opacity, and so on—that are spatial and visual. The process of assembly is very different from the process of explication as a way of telling stories and constructing arguments. The narratives that unfold are not only multiply layered and dense, they are also fundamentally open-ended, provisional, and mutable—continuously suggesting other stories that could be told with the same materials. They also tend to be nonlinear, to go backward and forward in time and to move freely in space. Assembly, in other words, leaves explication—the analytic process of explanation—to the viewers or users of the narratives. In doing so, it opens the narratives and the work as a whole to overwriting, to further imbrication, and to counternarration (see figure 5).

The concept of "intermedia" emerged over the course of our work and out of our practice. A hybrid word, *intermedia* references both the methods of digital compositing—by which the different media are brought together, hybridized, and animated in digital narratives—and the cultural significance of those capabilities for ways of knowing and producing knowledge about cities. As media theorist and designer Lev Manovich points out, these methods (of layering, remixing, and combining media of all kinds) were enabled by software programs developed in the early 1990s.[18] The software production environment of After Effects, for example, allows designers to "remix not only the content from different media [physical, digital, electronic] but also their fundamental techniques, working methods, and ways of representation and expression." The capabilities of After Effects and other digital design technologies make it possible to bring together

the previously unique "languages of cinematography, animation, computer animation, special effects, graphic design, typography, drawing, and painting" to form a "new *metalanguage*."[19] But "when physical or electronic media are simulated in a computer, we do not simply end up with the same media as before," Manovich argues.[20] Instead, the techniques of digital compositing that make it possible to combine multiple levels of imagery with varying degrees of transparency, using interactive working methods that make the results immediately visible, fundamentally change both what the images look like and what they can say: "By adding new properties and working methods, computer simulation fundamentally changes the identity of given media."[21] Through these methods, the distinct languages of different media interact at the deepest structural levels. They hybridize, exchange properties and techniques, and, in the process, generate new hybrid "intermedia" languages that are both richer and more complex.[22] While this hybridized media language "inherits the traits" of other image media, it is a "true hybrid" with its own "distinct identity" that "is not reducible" to any of those media formats.[23]

"Deep remixability," as Manovich characterizes the "interactions between the working methods and techniques of different media" in the hybridized compositive media language of intermedia narratives, is also a critical component of research.[24] Deep remixability gives us access to new methods of experiencing and representing, and therefore also of navigating, understanding, interacting, and communicating with others about the conditions we seek to understand. At the same time, any one of the intermedia narratives can be disaggregated into the individual elements of which it is composed, and each one of those elements can be independently accessed, manipulated, and incorporated into any number of other compositive intermedia narratives (see figure 6).

In *Urban Intermedia*, we make this point, and the process it involves, explicit. Each narrative, therefore, generates its own archive, which comprises all the media used in the narrative and which scrolls across the bottom of the screen as the narrative unfolds above it. In the archival register, each piece of media is identified and documented along with its source when it first appears in the narrative, so that each document, photograph, map, film or video clip, or other object retains its historical and material integrity as an object. Synchronized with the narratives, the algorithmically generated archival register (which also includes an image of each object) functions both as visual documentation (footnotes/bibliography) for the visual text and a rolling repository from which any number of different narratives could be constructed (see figure 7).[25]

The open-ended dialogic format of *Urban Intermedia* is key to both the criticality and potential uses of the project. It is open-ended in two senses: First, the meaning of each particular story is purposefully not fixed. The overlapping of temporalities

Fig 5: Sequence of stills (pages 220–223) from Berlin narrative, *City-Fabric: Between Systems and Sites*, showing methods by which temporalities and modes of representation are overlaid, allowing different media to tell stories about places and events simultaneously from different points of view and continuously suggesting other stories that could be told with the same materials.
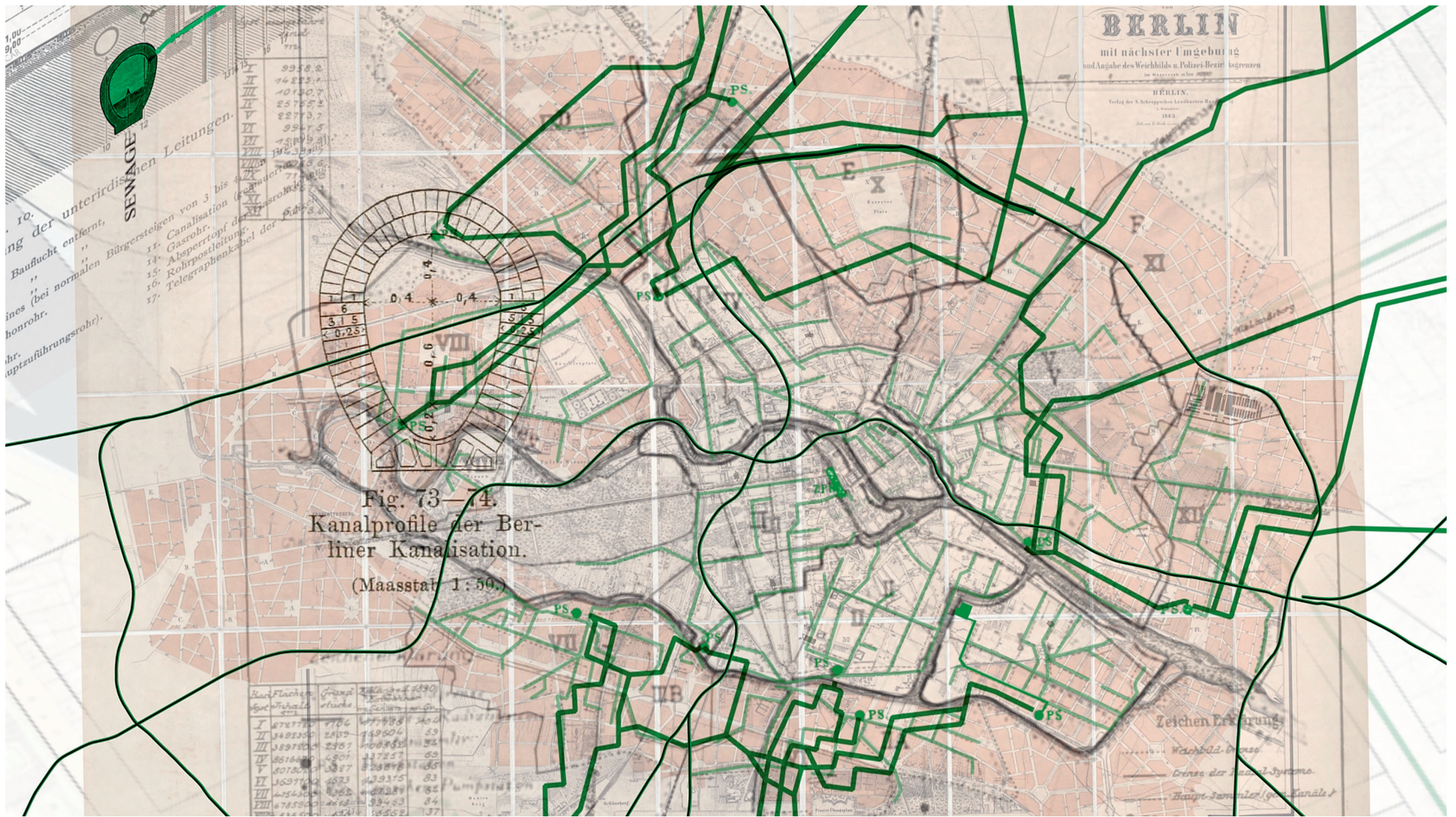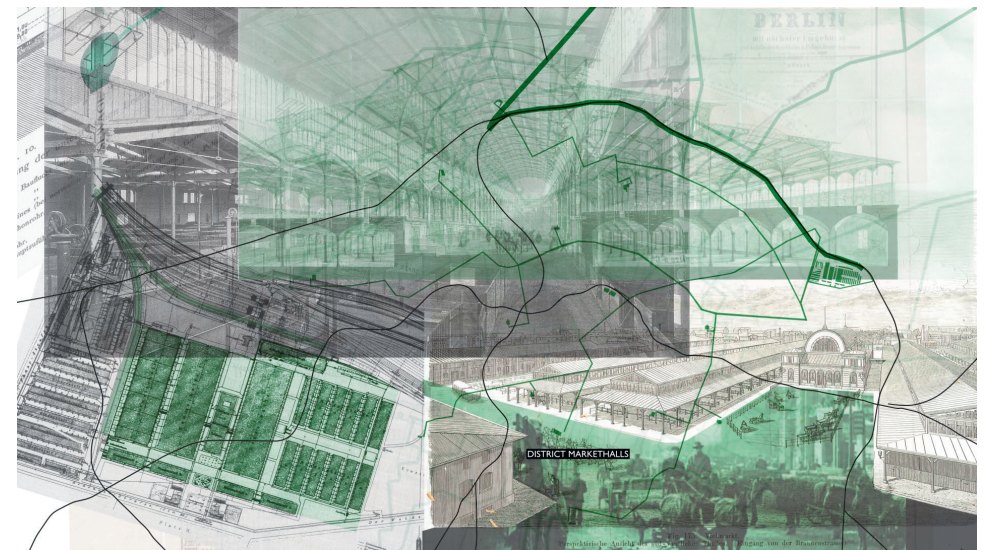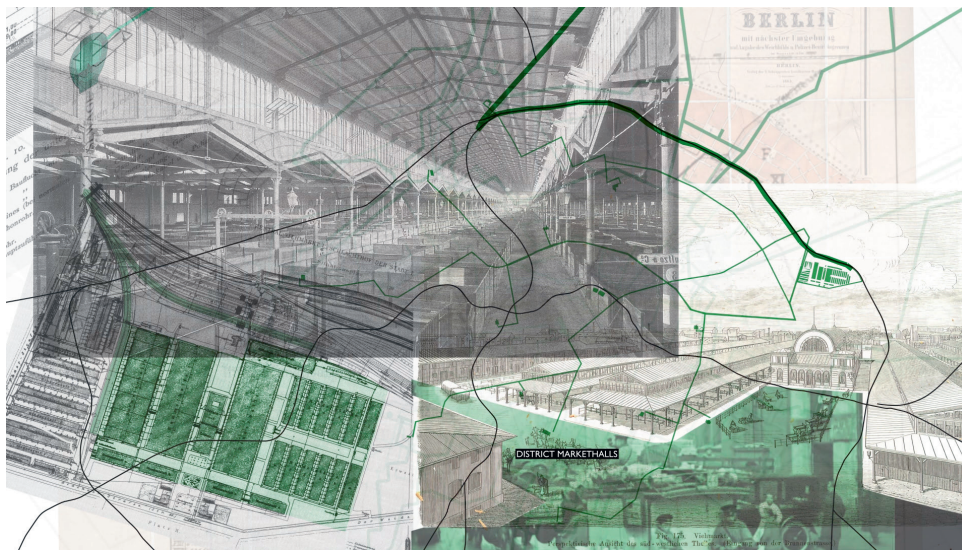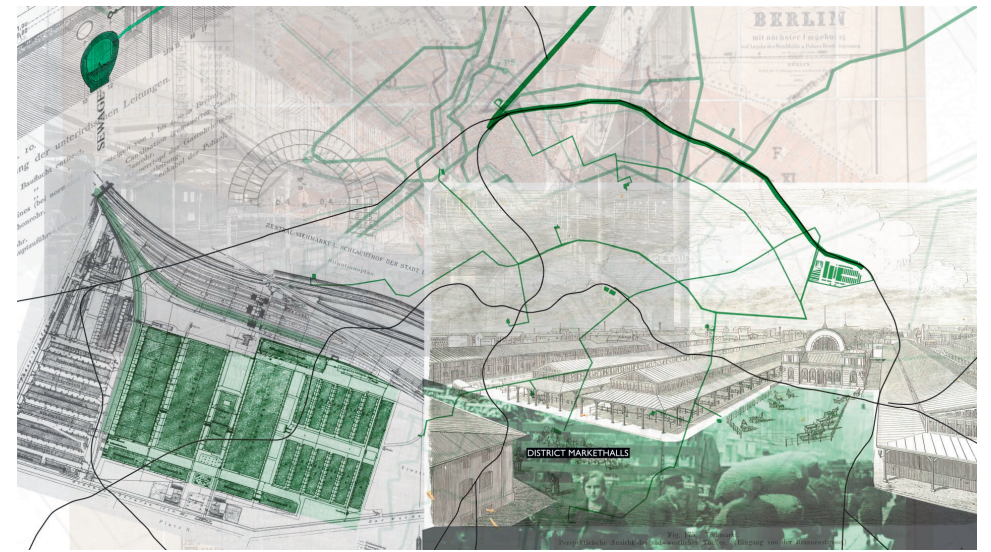
Fig 6: Sequence of stills (pages 224–227) from Berlin narrative, *City-Landscape: Rescaling the Urban*, Berlin: Experimental Ground, Urban Intermedia, 2018.

and spatialities and the composite modes of representation repli-
cate the complexity of the urban environments and conditions
they represent, and compel viewers and users of each narrative
to actively construct the meaning of any particular episode and
weave together the multiple story lines that comprise the narra-
tive itself. Second, the project is part of an ongoing study of
inherently dynamic conditions that make it necessary to go back
and forth between city, archive, and narrative. Permanently unfin-
ished, *Urban Intermedia* is what Umberto Eco called an "open
work"—a work that is integral and complete in itself yet open to
experience and interpretation—"because in every reception the
work takes on a fresh perspective for itself."[26]

This brings me to the final, third point about the open-
endedness of the *Urban Intermedia* project: It is not a tool, nor
is it an app or a platform. It is an experimental research-driven
project—an urban research project—that brings together the
media and materials of multiple disciplines to tell stories and
construct arguments that speak across disciplinary knowledge
bases through a kind of shared media language. The possibility
of a shared media language emerged (like so many other aspects
of the project) over the course of the work and through collab-
orative practice. Just as it became clear that the visual narratives
we were constructing could not be contained within a single
story line, we also came to realize that the hybridized interme-
dia language through which we were telling the stories was itself
creating this shared vocabulary and syntax—a common media
language that gave us access to multiple modes of interpretation.
Increasingly, as we collaborated, we found that we were not only
narrating stories in more prismatic and nuanced ways but also
reading them through more diverse lenses as well (see figure 8).

The open-ended format of the intermedia project is central to
its critical purpose: to engage issues that are multifaceted, contra-
diction filled, politically charged, and highly contested—issues
that are irreducibly complex and uncontainable—like the urban
phenomenon itself. It is a format that is suited to speculation and
experimentation, to opening up a field of study and exploring new
kinds of collaborative practices and projects around the study of
cities that combine scholarship, design, and media.

Fig 7: Still from Berlin narrative, *City-Fabric: Between Systems and Sites*, showing archival register at the bottom of the screen.

Fig 8: Sequence of stills (pages 230–233) from Mumbai narrative, *Space*, Mumbai: Claims on the City, Urban Intermedia, 2018, showing methods used to convey multiple ways of understanding any particular condition: how urban infrastructure in Mumbai is layered, and how it both connects and divides places and groups who inhabit and circulate through infrastructural layers.
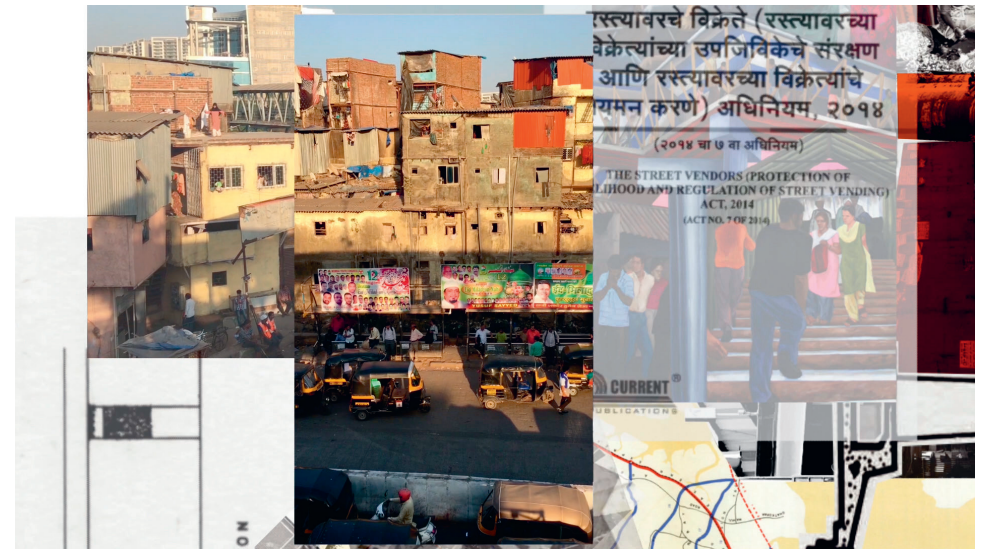
EVE BLAU teaches the history and theory of urban form at the Harvard Graduate School of Design. She is the author of *Baku: Oil and Urbanism* (Park Books/University of Chicago Press, 2018), *Project Zagreb: Transition as Condition, Strategy, Practice* (Actar, 2007), *Shaping the Great City: Modern Architecture in Central Europe* (Prestel, 2000), *The Architecture of Red Vienna 1919–1934* (MIT Press, 1999), and *Architecture and Cubism* (MIT Press, 1997), among others. Blau is director of research at the GSD, co-director of the Harvard Mellon Urban Initiative, and co-curator of the research project and exhibition *Urban Intermedia: City, Archive, Narrative*.

1   *Urban Intermedia: City, Archive, Narrative* traveled to the following venues (and cities): the Aedes Architecture Forum (Berlin), January 27–February 21, 2018; SALT (Istanbul), March 6–April 1, 2018; CSMVS (Mumbai), April 15–May 9, 2018; and Harvard University Graduate School of Design (Boston), August 23–October 14, 2018. For more information, see Travis Dagenais, "At GSD, a Tale of Four Cities," Harvard Gazette, September 21, 2018, https://news.harvard.edu/gazette/story/2018/09/urban-intermedia-is-a-tale-of-four-cities. The exhibition was curated by Eve Blau and Robert Gerard Pietrusko; installation design by Eric Höweler, David Hamm, and Caleb Hawkins; exhibition coordinated by Gül Neşe Doğusan Alexander; art direction by Robert Gerard Pietrusko; production by Scott Smith; web design and development by Nil Tuzcu, Namik Mačkić, and Rob Meyerson; and brochure design by Claudia Tomateo. The Berlin team consisted of Eve Blau (research director), Igor Ekštajn (research associate), Max Hirsh (research associate), Pedro Aparicio, Silvia Danielak, Mikela De Tchaves, Emma Goode, Adam Himes, Eli Keller, Michael Keller, Aleksandra Kudryashova, Namik Mačkić, Scott Smith, and Claudia Tomateo; the Boston team consisted of Stephen Gray (research director), Alex Krieger (research director), Caroline Filice Smith (research associate), Hannah Gaegler, Emma Goode, Jeremey Hartley, Renia Kagkou, Annie Liang, and Erica Rothman; the Istabul team consisted of Sibel Bozdoğan (research director), Gül Neşe Doğusan Alexander (research director), Nil Tuzcu (research associate), Marysol Rivas Brito, Ece Cömert, Adam Himes, Hazal Seval, and Dana Shaikh Solaiman; and the Mumbai team consisted of Rahul Mehrotra (research director), Kate Cahill (research associate), Smita Babar, Enrique Aureng Silva Estrada, Emma Goode, Mark Jongman-Sereno, Gabriel Munoz Moreno, Aditya Sawant, Esa Shaikh, Apoorva Shenvi, Claudia Tomateo, Sonny Xu, and Jessy Yang.

2   The Harvard Mellon Urban Initiative is itself part of the Mellon Foundation's Architecture, Urbanism, and the Humanities initiative launched in 2012 to support and promote research and pedagogy on the history of cities as distinct forms of human cohabitation and social organization—forging connections in research universities between schools of architecture and programs in the humanities and experimenting with new models of teaching that incorporate studio methods into the investigation of large humanistic questions and broadly based research projects in major global cities. See "Architecture, Urbanism, and the Humanities," Mellon Foundation, https://mellon.org/initiatives/architecture-urbanism-and-humanities. For more information on phase one of the initiative, "Reconceptualizing the Urban: Interdisciplinary Study of Urban Environments, Societies, and Cultures" (2013–2018), visit http://mellonurbanism.harvard.edu.

3   The city-based research portals were directed by Rahul Mehrotra (Mumbai), Stephen Gray and Alex Krieger (Boston), Sibel Bozdogan and Gül Neşe Doğusan Alexander (Istanbul), and Eve Blau (Berlin).

4   Henri Lefebvre, *The Urban Revolution*, trans. Robert Bononno (Minneapolis: University of Minnesota Press, 2003), 55, 56.

5   Manfredo Tafuri, *The Sphere and the Labyrinth: Avant-Gardes and Architecture from Piranesi to the 1970s*, trans. Pellegrino d'Acierno and Robert Connolly (Cambridge, MA: MIT Press, 1978), 12.

6   Manfredo Tafuri, *Theories and History of Architecture*, trans. Giorgio Verecchia (New York: Harper & Row, 1976), 104; Tafuri, *The Sphere and the Labyrinth*, 13.

7   Lefebvre, *Urban Revolution*, 53.

8   Lefebvre, *Urban Revolution*, 54.

9   Lefebvre, *Urban Revolution*, 54, 55–56 (emphasis in the original).

10   Lefebvre, *Urban Revolution*, 56.

11   Lefebvre, *Urban Revolution*, 56, 58.

12   Lefebvre, *Urban Revolution*, 3–5, 58.

13   See, for example, John Naughton, "Net Benefit: How the Internet Is Transforming Our World," keynote address for the UK Marketing Society, February 28, 2006, https://memex.naughtons.org/wp-content/Keynotefinal.pdf; John Naughton, "Blogging and the Emerging Media Ecosystem," background paper for an invited seminar to Reuters Fellowship, University of Oxford, November 8, 2006, http://davidgauntlett.com/wp-content/uploads/2018/08/Naughton-Blogging-and-Media-Ecosystem-2006.pdf.

14   A range of Adobe Creative Suite programs were used to produce the narratives; however, the principal animation software was After Effects; other applications, including Photoshop, Illustrator, Media Encoder, and InDesign, were used to process and annotate the media. Additional software used in the exhibition included Max/MSP/Jitter, and Processing.

15   This phrase is from Frank Eberhardt, "Der Luisenstädtische Kanal Wird Eröfnet," *Berlinische Monatsschrift*, May 15, 1852.

16   Fred I. Dretske, *Knowledge and the Flow of Information* (Cambridge, MA: MIT Press, 1981), 137.

17   See Otto Neurath, *International Picture Language/ Internationale Bildersprache*, trans. Marie Neurath (Reading, UK: University of Reading, 1980); see also Eve Blau, "Isotype and Architectural Knowledge," in *Emigré Cultures in Design and Architecture*, ed. Alison J. Clarke and Elana Shapira (London: Bloomsbury, 2017), 29–44.

18   Lev Manovich, *Software Takes Command* (New York: Bloomsbury, 2013), 44–46, 246–249.

19   Manovich, *Software Takes Command*, 268–269 (emphasis in the original). Manovich notes that After Effects continues to be the most popular, widely used, and best-known application. "After Effects' UI and tools bring together fundamental techniques, working methods, and assumptions of previously separate fields of filmmaking, animation, and graphic design. This hybrid production environment, encapsulated in a single software application, is directly reflected in the new visual language it enables—specifically, its focus on exploring aesthetic, narrative, and affective possibilities of hybridization." Manovich, *Software Takes Command*, 246, 247.

20   Manovich, *Software Takes Command*, 289.

21   Manovich, *Software Takes Command*, 278, 287, 289.

22   Manovich, *Software Takes Command*, 169.

23   Manovich, *Software Takes Command*, 260.

24   Manovich, *Software Takes Command*, 285, 305.

25   The algorithm and software for the archival register were developed expressly for the project by Robert Pietrusko.

26   Umberto Eco, *The Open Work*, trans. Anna Cancogni (Cambridge, MA: Harvard University Press, 1989), 4 (emphasis in the original).