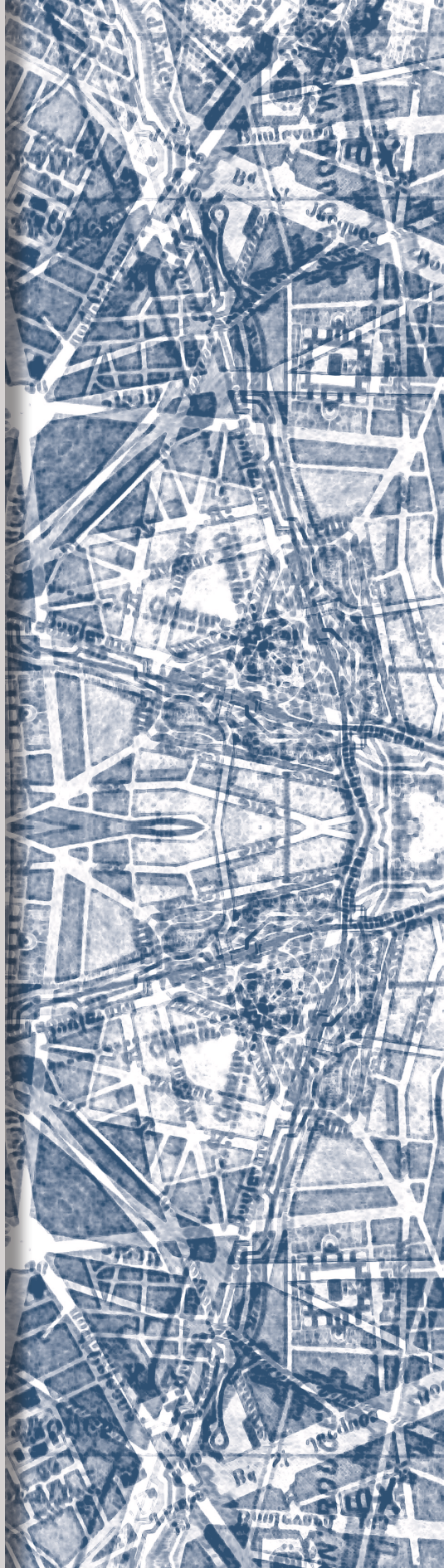




Michael Takeo Magruder



I will put together, piece by piece, the perfect city, made of fragments mixed with the rest, of instants separated by intervals, of signals one sends out, not knowing who receives them. If I tell you that the city toward which my journey tends is discontinuous in space and time, now scattered, now more condensed, you must not believe the search for it can stop.

— Italo Calvino, *Invisible Cities*, 1974



Michael Takeo Magruder

Imaginary Cities is an arts-research project and exhibition by British-American artist Michael Takeo Magruder that transforms the British Library's online collection of historic urban maps into fictional cityscapes for the Information Age. The work explores how large repositories of digitised cultural materials can give rise to unique born-digital artefacts, real-time experiences and physical creations that are inspiring and relevant to contemporary audiences.

Originally conceived for the British Library's Entrance Hall exhibition space, the first iteration of the project consists of four technology-based art installations that have been exclusively created using images and metadata of 19th-century city maps drawn from the Library's *One Million Images from Scanned Books* collection on Flickr Commons. Each artwork remixes a famous Western city and blends contemporary digital technologies with historical analogue processes. Elaborate computational systems and next-generation production tools are intermixed with fine art materials and traditional craft techniques.

Displayed alongside the source digital maps and their original printed books, *Imaginary Cities* reveals the changing nature of archives and collections in the Digital Age. The exhibition seeks to highlight how libraries are not simply repositories of old knowledge, but storehouses of creative potential that can engender new avenues and unprecedented possibilities for generating culture.

IMAGINARY CITIES: BUILDING A CONVERSATION WITH BRITISH LIBRARY LABS

The British Library is an international leader in digitising historic cultural materials and developing infrastructure to foster innovative digital research, services and projects. In 2013, I came to manage British Library Labs (BL Labs), an initiative funded by the Andrew W Mellon foundation, aimed at encouraging users to experiment with the Library's rapidly growing set of digital collections. Since its formation, BL Labs has become an important part of the Library's digital scholarship strategy and it has supported over 160 projects from numerous disciplines including digital humanities, computer science, further education and contemporary art. Nearly all of these ventures began as a conversation, and that was certainly the case with Michael Takeo Magruder's *Imaginary Cities*.

I was first introduced to Michael in 2015 at the annual BL Labs Symposium where I learned about his practice and discovered that he had just won the Immersive Environments Lumen Prize for his VR installation, *A New Jerusalem*¹. Intrigued, I sought out further examples of his work. I was particularly impressed with how many of his projects combined research with the use of historic archives and contemporary data: mixing old and new to create artworks and exhibitions that were not only thought provoking but emotionally engaging and aesthetically beautiful. I instinctively felt that his artistic interests and approach overlapped with the work and aspirations of BL Labs, so I invited him to the Library and showed him the various things we could offer.

It was clear from outset that Michael was drawn to the *One Million Images from Scanned Books* collection as it was (and still is) the Library's most prominent and accessible digital archive in the public domain. The collection had emerged from a Microsoft funded project involving the digitisation of some 65,000 19th-century books. One of BL Labs' early experiments employed novel computational methods to extract elements like illustrations, maps and photographs from the pages of these digitised texts. The result was a vast archive of one million images that provided a unique and unprecedented view of the 19th century. In 2013, after a series of discussions with colleagues, we decided to upload the images to Flickr Commons so that the wider public could contribute to their curation, discovery and reuse through tagging and sharing².

¹ Michael has said that he considers *A New Jerusalem* (2014, takeo.org/nspace/2014-dta-new-jerusalem) to be the aesthetic and conceptual precursor of the *Imaginary Cities* project.

² Since 2013, images from the *One Million Images from Scanned Books* collection on Flickr Commons ([flickr.com/photos/britishlibrary/](https://www.flickr.com/photos/britishlibrary/)) have been viewed over one billion times.

Releasing the images through Flickr Commons not only enabled us to easily create a robust and highly visible gateway for the collection but, more importantly, it opened an enormous range of unexpected benefits. Users flocked to the archive and started adding descriptive tags to the images. Soon after, groupings began to emerge as the metadata of the collection grew. Most significant was a sub-collection of 'maps' that would eventually include more than 50,000 items. And it was these maps that captured Michael's attention.

In the summer of 2016, Michael proposed *Imaginary Cities* as "an artistic exploration seeking to create provocative fictional cityscapes for the Information Age from the British Library's digital collection of historic urban maps". He envisioned the research project as an arts-humanities collaboration that would consider how large digital repositories of historic cultural materials and the public's interaction with them could be used to create born-digital artworks, real-time experiences and physical creations which would excite and be relevant to contemporary audiences. BL Labs secured funding for the programme of work and Michael became our first artist-in-residence during the autumn of that same year.

The residency provided Michael with the necessary environment to experiment and work through his creative ideas. As he explored different ways of finding specific types of images within the collection, BL Labs gave crucial technical advice and support that helped him identify a relevant and high-quality short list of around 2,000 urban maps depicting major Western cities. More importantly, however, the collaboration with BL Labs offered opportunities to meet and engage with specialists at the Library and further afield. It was from these introductions that Michael connected with Dr Philip Hatfield, the Library's former curator of digital maps, who revealed the history and context of the maps that he had discovered and was seeking to use.

As the residency transitioned from its initial research phase to the production of artistic-technical prototypes, Michael brought onboard two of his longstanding international collaborators to help refine and expand the project's desired outcomes. David Steele, a leading data architect and software programmer, developed a custom server-side infrastructure that would track the daily metadata changes of specified images in the collection and use this information to subtly alter Michael's aesthetic designs and configurations. Drew Baker, an expert specialising in virtual reality and 3D visualisation, devised ways to algorithmically transform Michael's static 2D 'map plans' into real-time 3D environments using the latest generation of games engines. For his own part, Michael experimented with creating physical artefacts that blended leading-edge digital production systems and processes with traditional analogue art materials and techniques.

In spring 2017, Michael was invited by the London-based gallery Gazelli Art House to be artist-in-residence on their online platform Gazell.io³ and publish the digital studies created during the BL Labs residency. This culminated in a special 'sharing event' at Gazelli's Mayfair gallery for Library staff and close colleagues from across academia, arts and culture in which Michael was able to present the various digital and physical prototypes that he and

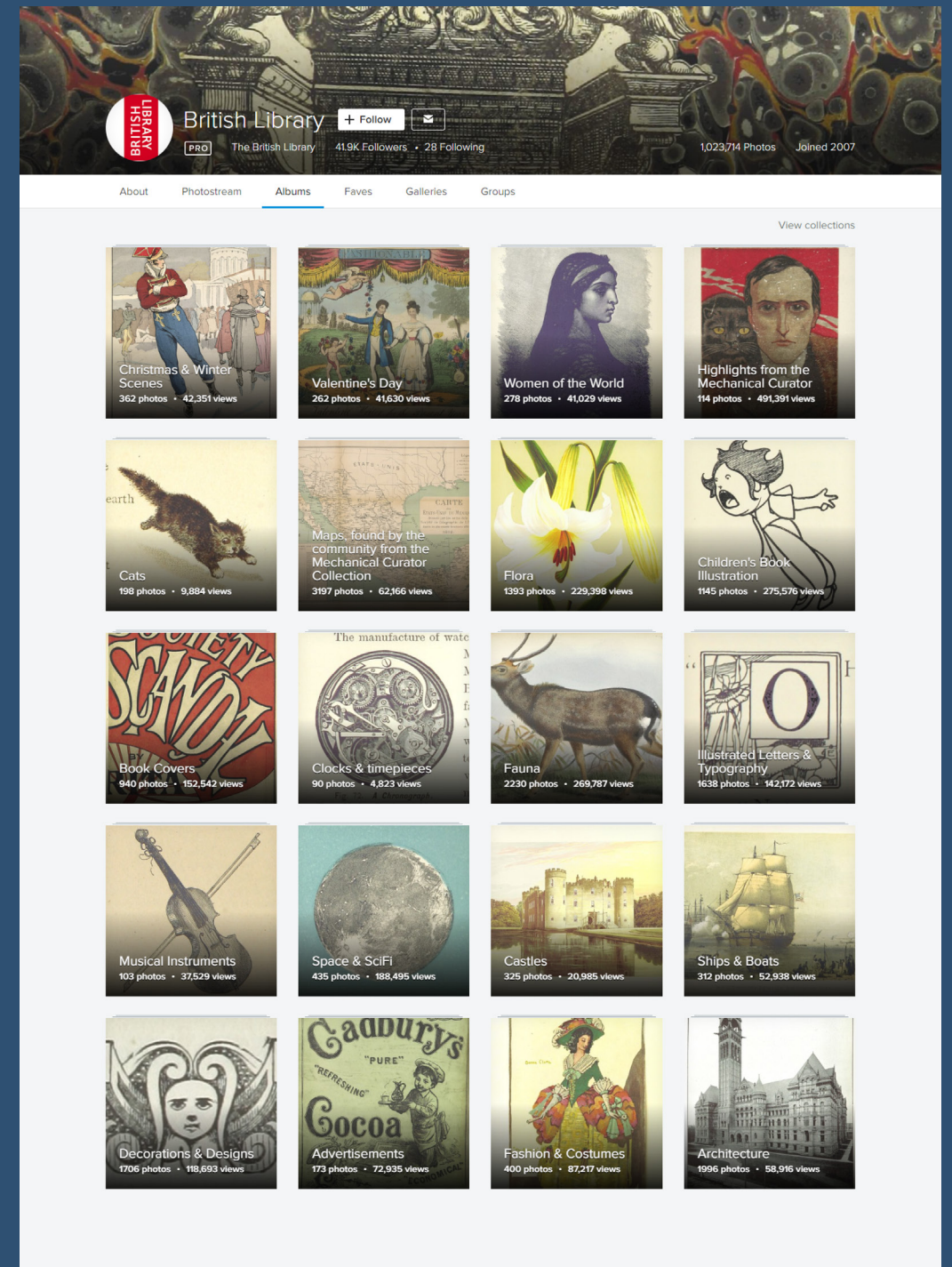
³ gazell.io/artwork/imaginary-cities_-_info

his team had created.

The *Imaginary Cities* showcase provided an insightful glimpse of the project's enormous potential to demonstrate the creative possibilities offered by large digital collections. At the end of 2017 Michael was recognised for his work on *Imaginary Cities* by winning the BL Labs Artistic Award. As a result, we were invited to draft a proposal outlining how the outcomes of the residency could become a major exhibition at the Library that would inspire the public and celebrate the institution's past three decades of digital research and ongoing journey into the Digital Age. And now that this exhibition has become a reality, I can't help but look back and remember how it all began because of a conversation.

Mahendra Mahey

Manager of British Library Labs

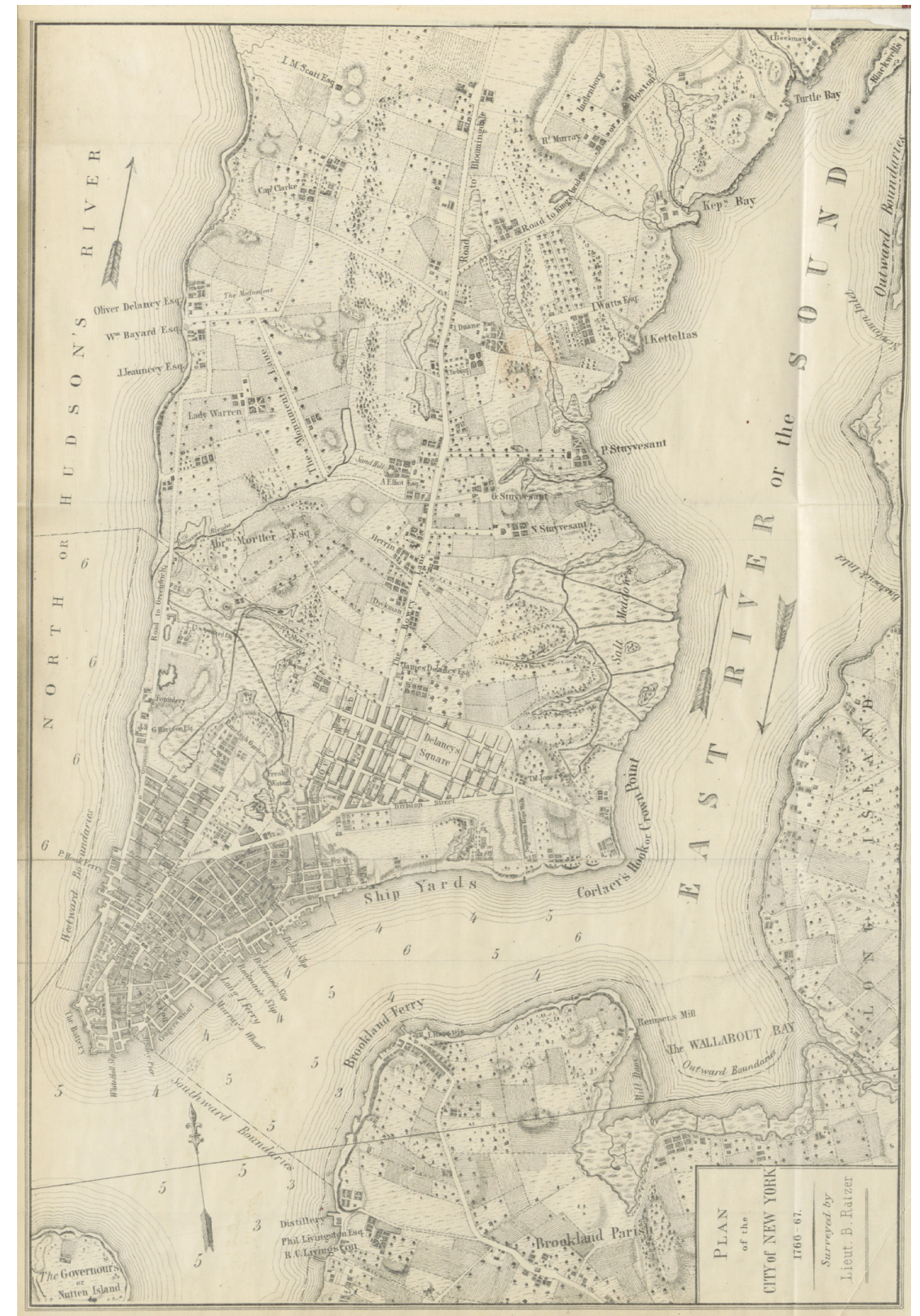


→ RIGHT: *One Million Images from Scanned Books* collection on Flickr Commons, the British Library, 2013-present, [flickr.com/photos/britishlibrary/](https://www.flickr.com/photos/britishlibrary/).

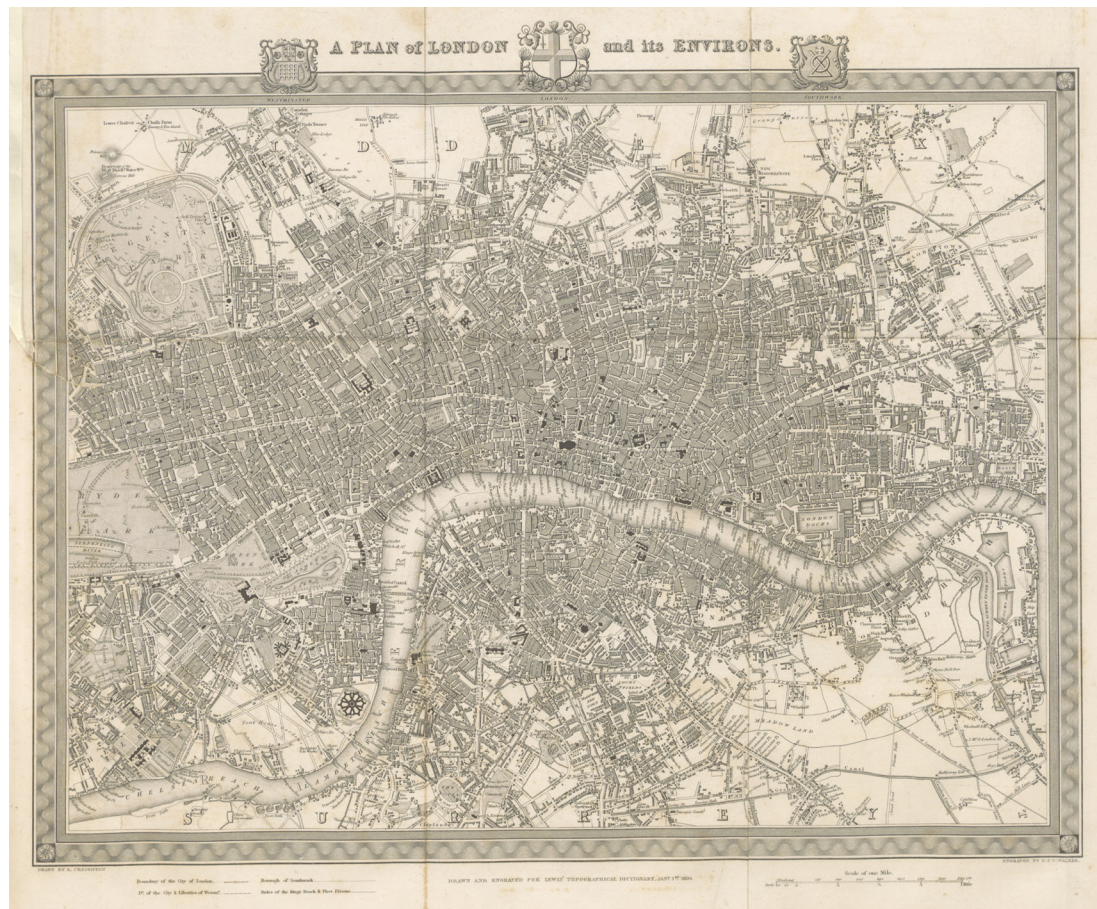
IMAGINARY CITIES: SOURCE MAPS



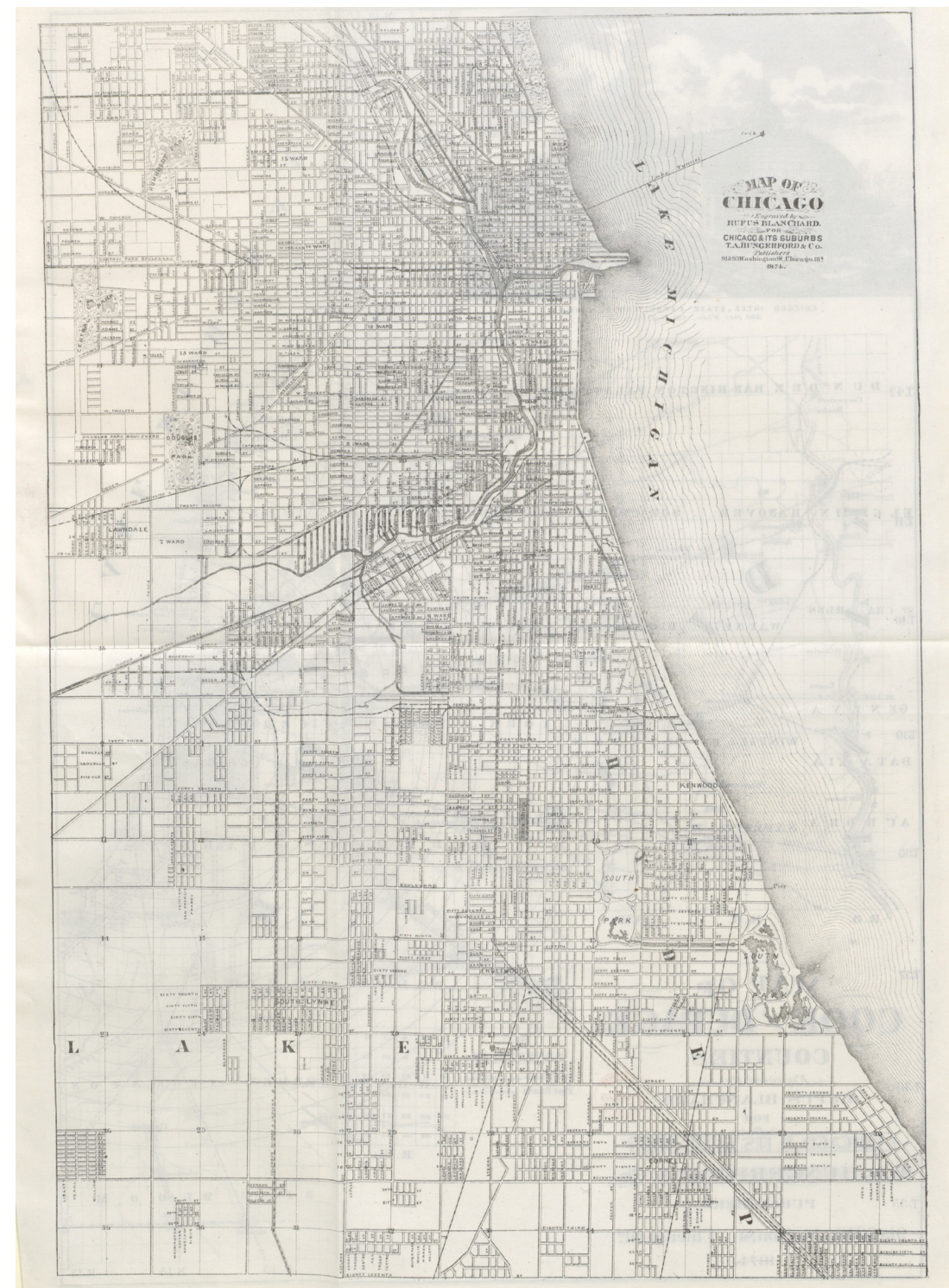
↑ ABOVE: 'Paris' by Malby & Sons, in D Appleton, *Appleton's European Guide Book* illustrated. London, 1872. 10107.bb.20



→ RIGHT: 'Plan of the City of New York, 1766-67' surveyed by Lieutenant B Ratzer, in HB Dawson, *New York City during the American Revolution...* New York, 1861. 9603.f.9



↑ ABOVE: 'A Plan of London and its Environs' drawn by R Creighton and engraved by J Walker, in Samuel Lewis, *A Topographical Dictionary of England*... London, 1834. Cup.1247.g



→ RIGHT: 'Map of Chicago' engraved by R Blanchard, in Everett Chamberlin, *Chicago and its Suburbs*. Chicago, 1874. 10411.dd.36

COLLABORATION, CONVERSATION, CREATION: THE JOURNEY TO IMAGINARY CITIES

Shush! Be quiet.

Silence is probably what most people call to mind when they imagine a library and yet, after nearly a decade of working at the British Library, the events I recall most fondly are not moments of hushed introspection or quiet research. Instead, this is a place of conversation. Discourse, discussion, debate, information sharing, exchanges and countless forms of dialogue drive the production of new research and creative work in this and many other libraries around the world. These communications provide research leads, help aid thinking, shape critical perspectives and sometimes surface a vital insight that brings a project together. Conversation is also the crucial link between myself, *Imaginary Cities* and Michael Takeo Magruder.

Michael and I first met years ago, introduced by Mahendra Mahey of British Library Labs. I was working as the Lead Curator for Digital Maps, and getting to know people and discussing the Library's collections was a key part of the job. Michael and Mahendra wanted to learn about a cache of digitised maps collated from the institution's *One Million Images from Scanned Books* collection on Flickr Commons. Having worked previously with Wikimedia Commons to release public domain copies of the Library's historic Canadian photographs, the ambition and scale of this archive had always appealed to me. At the time, I was also leading a project called Georeferencer¹, which asked volunteers to help overlay historic maps on a contemporary Google Map interface. The volunteer community was then working on georeferencing the maps in this collection, so I was already familiar with these items.

At the time, Michael and Mahendra were exploring what their collaboration might entail, and more specifically, what materials they could use and what outcomes they could look to achieve. Michael had been drawn to the urban plans and city maps that formed part of the collection, so Mahendra had invited me to meet with them in the hope that I could provide some context to the material. I immediately accepted as such conversations are always a highlight of a working day, allowing curators to provide insights into collections, tease out the nuance of a body of work and respond to someone else's thoughts around an object or group of items. Our conversation was particularly interesting because it crystallised around one observation I made about the maps in question: many of them seemed to have come from guides and histories published for the tourist market.

In the context of the Georeferencer project, these maps were challenging. Sometimes the cartography was erratic and often the production quality was low, making them unappealing materials for volunteers. These maps

were, after all, a big change from the beautiful and cartographically creative maps from earlier georeferencing batches, such as the King's Topographical Collection which was once in the possession of King George III. However, in the simplicity and, dare I say, cheapness of these maps there was an interesting end goal; to put them in the hands of a growing body of consumers who could use them not just in their homes but while they were travelling. The latter part of the 19th century saw rising numbers of the upper and middle classes engaging in cultural travel, which is to say, tourism, around Europe and North America. Correspondingly, repeated improvements to text and image printing techniques meant that books were available at progressively more affordable prices, making them useable on the move and increasingly disposable.

Growing numbers of travellers and the availability of cheaper printing came together to create a market in books that could be used for tourism such as local guides, history primers and so on. To make this profitable and keep the books portable, illustrations had to be relatively inexpensive and small, which of course had an impact on the quality and scope of the maps. In short, while they may not have been the most beautiful maps in the world, they combined form and function in a novel way for an emerging and dynamic audience.

Despite their importance, conversations like the ones I shared with Michael often get displaced. Other aspects of a curator's job can be quite distracting and, as a result, reflections on engaging and rewarding interactions can frequently slip away. Given this, I was particularly pleased when I later bumped into Michael and he brought the conversation back to the forefront of my mind. One detail stood out; that our discussion had a formative impact not only on the *Imaginary Cities* residency but also the major exhibition he was in the process of developing for the Library.

The reuse and re-imagining of collection items through *Imaginary Cities* is a prime example of what digitisation and, most broadly, the digital sphere bring to working with an archive. It opens new spaces of contact between users and collection items, supporting fresh insights and the potential to craft new ways of seeing both the objects and the things they represent, in this case the urban space itself. Yet, for all the significance of the new in this project, it is driven by something that has taken place in libraries for centuries – conversation. Dialogue has long been an integral part of how collections are developed, questioned, researched and understood, and in the digital age the forum within which these discussions can take place is now much wider. It has been a pleasure for me to be involved in the *Imaginary Cities* project, not only because it showcases the vast creative potential afforded by our digital collections, but more importantly, because it is testament to the significance of conversation and collaboration in library culture.

Dr Philip J Hatfield

Head of the Eccles Centre for American Studies

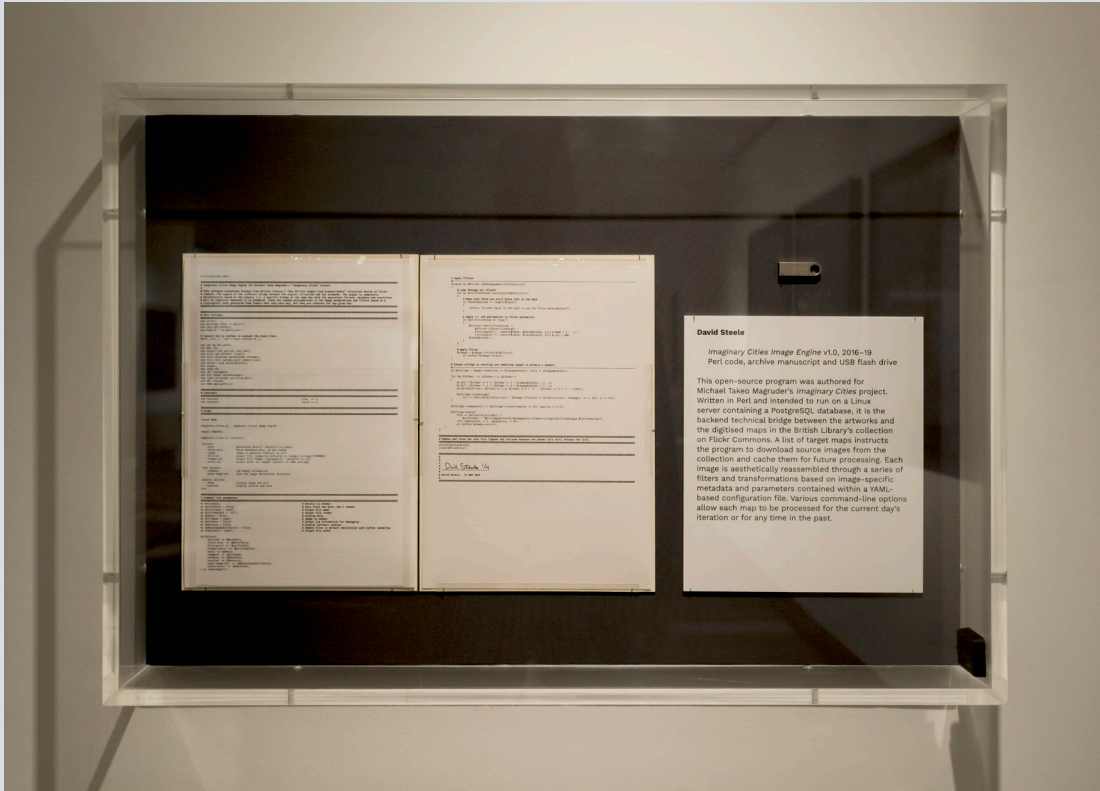
¹ georeferencer.com



As I delved into the archive of one million images, searching for precious moments and unknown fragments within the vast digital collection, I began to think about how I could use not only the image data to generate objects and experiences, but also the metadata like view counts, favourites and tags. When an archive becomes digital and is opened to the world it becomes a “living” structure that is constantly changing as people connect to it, use it, and leave traces of themselves. This, from an artistic standpoint, became most interesting to me. And so, I set out to create artworks that would capture and embody this essence; creations designed by me and my collaborators, but ultimately dictated by the choices of passers-by whom we would never know or meet.

— Michael Takeo Magruder, 2019

← LEFT: *Imaginary Cities*, Entrance Hall exhibition space, the British Library, London, 2019.



Imaginary Cities Image Engine v1.0, 2016–19

Perl code, archive manuscript and USB flash drive

This open-source program was authored for Michael Takeo Magruder’s *Imaginary Cities* project. Written in Perl and intended to run on a Linux server containing a PostgreSQL database, it is the backend technical bridge between the *Imaginary Cities* artworks and the digitised maps in the British Library’s *One Million Images from Scanned Books* collection on Flickr Commons. A list of target maps instructs the program to download source images from the collection and cache them for future processing. Each image is aesthetically reassembled through a series of filters and transformations based on three variables: the artist’s predefined parameters contained within a YAML-based configuration file; the chosen date; and the image’s unique metadata at that chosen moment in time. Various command-line options allow each map to be processed for the current day’s iteration or for any time in the past. As users access these maps on Flickr Commons, the metadata (view counts, tags, etc) surrounding the images shifts accordingly. These changes are recorded by the *Imaginary Cities Image Engine* and forever alter new iterations of the artworks.

by **David Steele** (data architecture & programming)

```
#!/usr/bin/env perl

#####
# Imaginary Cities Image Engine for Michael Takeo Magruder's "Imaginary Cities" Project
#
# This software transforms bitmaps from British Library's "One Million Images from Scanned Books" collection hosted on Flickr
# Commons. The engine is the technical bridge between the digital collection and the artworks. The output is completely
# deterministic based on the inputs, i.e. a specific bitmap on the same day with the equivalent filters, metadata and resolution
# will be identical whenever it is produced. There are random perturbations to the image permutations and filters based on a
# cryptographic hash generated from inputs that vary each day, but they are constant for any given day.
#####

#####
# Perl includes
#####
use strict;
use warnings FATAL => qw(all);
use Carp qw(confess);
use English '-no_match_vars';

# Convert die to confess to capture the stack trace
$SIG{__DIE__} = sub { Carp::confess @_ };

use Cwd qw(abs_path);
use DBD::Pg;
use Digest::SHA qw(sha1 sha1_hex);
use Fcntl qw(:DEFAULT :flock);
use File::Basename qw(basename dirname);
use File::Path qw(make_path remove_tree);
use Getopt::Long qw(GetOptions);
use Imager;
use JSON::PP;
use LWP::UserAgent;
use Pod::Usage qw(pod2usage);
use Time::JulianDay qw(julian_day);
use URI::Escape;
use YAML qw(LoadFile);

#####
# Constants
#####
use constant true => 1;
use constant false => 0;

#####
# Usage
#####

=head1 NAME

imaginary-cities.pl - Imaginary Cities Image Engine

=head1 SYNOPSIS

imaginary-cities.pl [options]

Options:
  --date          generation date(s) (defaults to today)
  --fetch-only    fetch metadata only, do not render
  --image         image to generate (default is all)
  --file-out      output file (image/dst/defaults to [image]-collage-YYYYMMDD)
  --format-out    output file format (jpg/png/tif - defaults to tif)
  --width-out     output width for images (default is YAML setting)

Test Options:
  --verbose       log debug information
  --wipe-image-dst wipe the image destination directory

General Options:
  --help          display usage and exit
  --version       display version and exit
=cut

#####
# Command line parameters
#####
my @stryDate;
my $bFetchOnly = false;
my $strFileOut = undef;
my $strFormatOut = 'tif';
my $bHelp = false;
my $strImage = undef;
my $bVerbose = false;
my $bVersion = false;
my $bWipeImageDestination = false;
my $iWidthOut = undef;

# Date(s) to render
# Only fetch new data, don't render
# Output file name
# Output file format
# Display help
# Image to render
# Output log information for debugging
# Display software version
# Remove files in default destination path before rendering
# Output file width

GetOptions(
  'date=s@' => \@stryDate,
  'fetch-only' => \$bFetchOnly,
  'file-out=s' => \$strFileOut,
  'format-out=s' => \$strFormatOut,
  'help' => \$bHelp,
  'image=s' => \$strImage,
  'verbose' => \$bVerbose,
  'version' => \$bVersion,
  'wipe-image-dst' => \$bWipeImageDestination,
  'width-out=s' => \$iWidthOut,
) or pod2usage(2);
```

↑ ABOVE: *Imaginary Cities Image Engine* v1.0
(page 1 of 5), A4 manuscript, 2019.

← LEFT: *Imaginary Cities Image Engine* v1.0 as displayed in
Imaginary Cities, the British Library, London, 2019.

DESIGNING AN ARCHITECTURE

My first collaboration with Michael Takeo Magruder was in the spring of 2005 when he hosted me after an extended period of international travel. Writing a bit of backend code for one of his art projects seemed like a fair way to repay his hospitality. The work was interesting enough, but at that moment I assumed our collaboration would be a one-time deal.

Despite my initial expectations I continued working with Michael, not just on new artworks and systems, but also maintaining old pieces and infrastructures in the constantly changing environment of the Internet. I came to realize that nothing in this area had a definitive endpoint as far as Michael was concerned. The continual refinement and evolution of the projects was a central aspiration, not simply a by-product of avoiding technological obsolescence.

Over time I began to focus on the potential longevity of any new collaboration and not just the technical aspects that I personally found most interesting. An emphasis on longevity changes all assumptions about how a piece of code should be written. In the technology sector constant maintenance and refactoring are the path to keeping software viable over an extended period. Knowing that I wouldn't be able to undertake that kind of demanding upkeep regime, especially as the number of projects continued to grow, a different mindset and approach was required.

I decided the best solution was to select an operating system, database, and set of programming languages that I was confident would remain stable and in use. To this end I chose long-term support Ubuntu Linux for the operating system, PostgreSQL for the database, and Java and Perl for the languages. As a longstanding contributor to PostgreSQL and other open source initiatives, I elected to exclusively use open source options and wherever possible, draw upon pre-existing libraries rather than authoring my own code. Although this methodology certainly made development more efficient, the primary reason was to reduce the quantity of code that I would need to maintain. Moreover, this permitted our work to benefit from the vast resources and support mechanisms offered by the wider open source software community and allowed new technical collaborators to easily join and contribute to projects.

This strategy has been reasonably successful, but it has certainly not prevented major problems from arising on occasion. Web technologies are incredibly transient and despite our best efforts some past artworks will now no longer render. Of course, these projects could be rebuilt from the beginning, but to do so would require such large and fundamental changes that one could argue the essence of the original works would be lost or even violated. Each of these failures has been a lesson learned, but even though we constantly rethink and adapt our designs and methods, the development of technology will always remain unpredictable and outpace us.

When Michael approached me about *Imaginary Cities*, I was intrigued. As an avid traveller I have always had a huge interest in maps and urban planning. Once we had discussed his initial ideas, I began exploring what

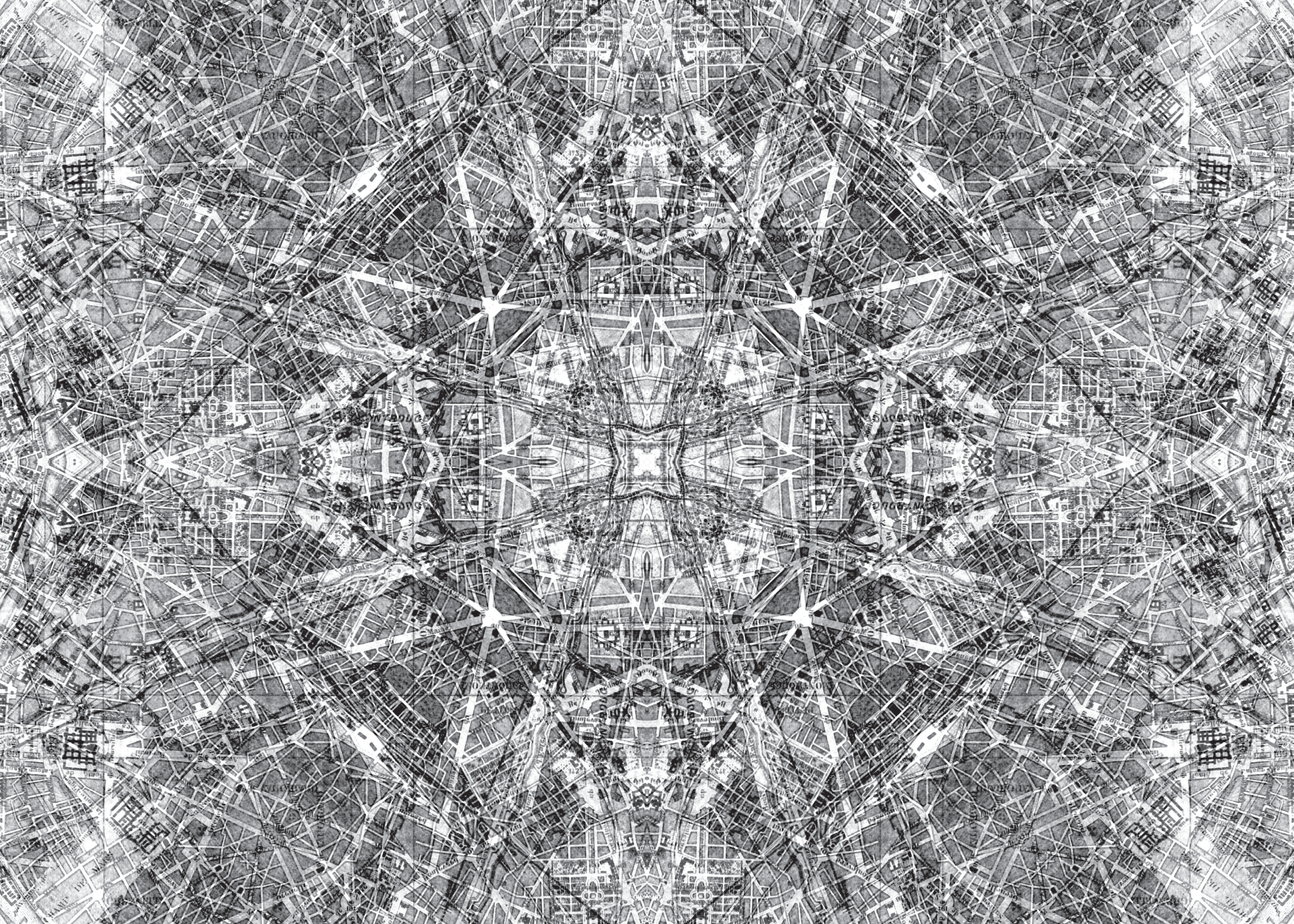
technologies would be required to bring the concept into reality. A back-end server infrastructure would be essential and would need to draw from a variety of disciplines, including image editing, internet technologies, and automation. Perl offered a powerful open source image manipulation module called Imager that could work with large resolutions rarely used for web-based applications and included numerous libraries for pulling content from the Internet. PostgreSQL was ideal for cataloguing metadata changes over time, while Linux provided robust automation tools, easy maintenance, and an inexpensive means to be hosted in the cloud. These technologies formed the basis of the *Imaginary Cities* server environment.

As with any software project, a considerable amount of dialogue and exchange was required as I developed the server prototype and sent test outputs to Michael for feedback. Over the winter of 2016 we refined the system and outlined all the capabilities it would need once it was released. Most importantly, the server software was implemented as a command line tool that could easily be run manually or from a standard Linux scheduler such as Cron. From the start I knew automation would be required, but I also recognized it was paramount that Michael could control the capabilities of the software directly in order to create without an intermediary. To this end I designed a YAML-based configuration system that allowed him to adjust numerous parameters and permutations without requiring any modifications to the base code so that his artistic process could be completely autonomous.

I was of course very eager for this project to go live after working on it for several years, but I'm even more excited to see how it will evolve from here as it engages with different audiences and contexts. As with art, a complex software project can sometimes take on a life of its own and the end results are often not obvious or expected at the point of inception. I'm certain that this project's path will be as unpredictable as the technology which underpins it, so I look forward to building new *Imaginary Cities* that we never envisioned at the start of our exploration.

David Steele

Principal Architect at Crunchy Data Solutions, Inc



Imaginary Cities — Paris (11097701034), 2019

Algorithmically generated monoprints on 24ct gold-gilded cotton board, 950×950mm (each)

This sequence of four monoprints has been created through combining leading-edge digital technologies and processes with precious fine art materials and historic craft techniques. The project's underlying custom server application has algorithmically generated the image data for each print from a single 19th-century map of Paris found in the British Library's *One Million Images from Scanned Books* collection on Flickr Commons. Each piece represents a unique moment from the work's continuously running computational framework. The final objects are fabricated using direct-to-media digital printing onto 24ct gold-gilded cotton boards that have been traditionally produced and hand finished by the artist.

Source data timepoints (90-day intervals from left to right):
01/01/2018, 02/04/2018, 02/07/2018, 01/10/2018

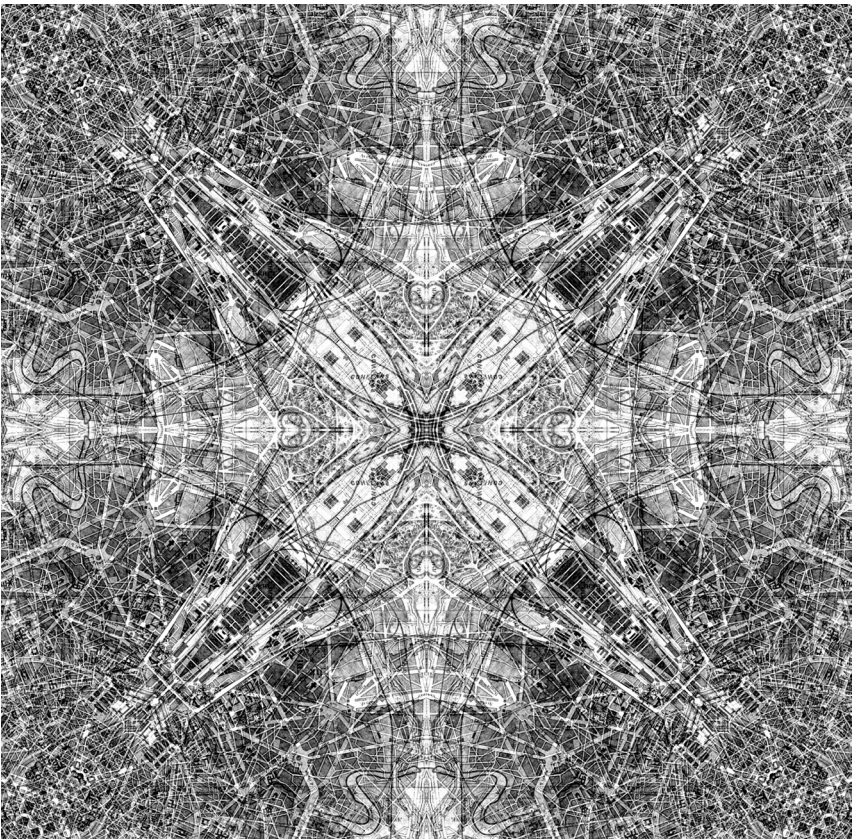


Source Map:
'Paris'
by Malby & Sons
in D Appleton, *Appleton's European Guide Book*
illustrated. London, 1872.

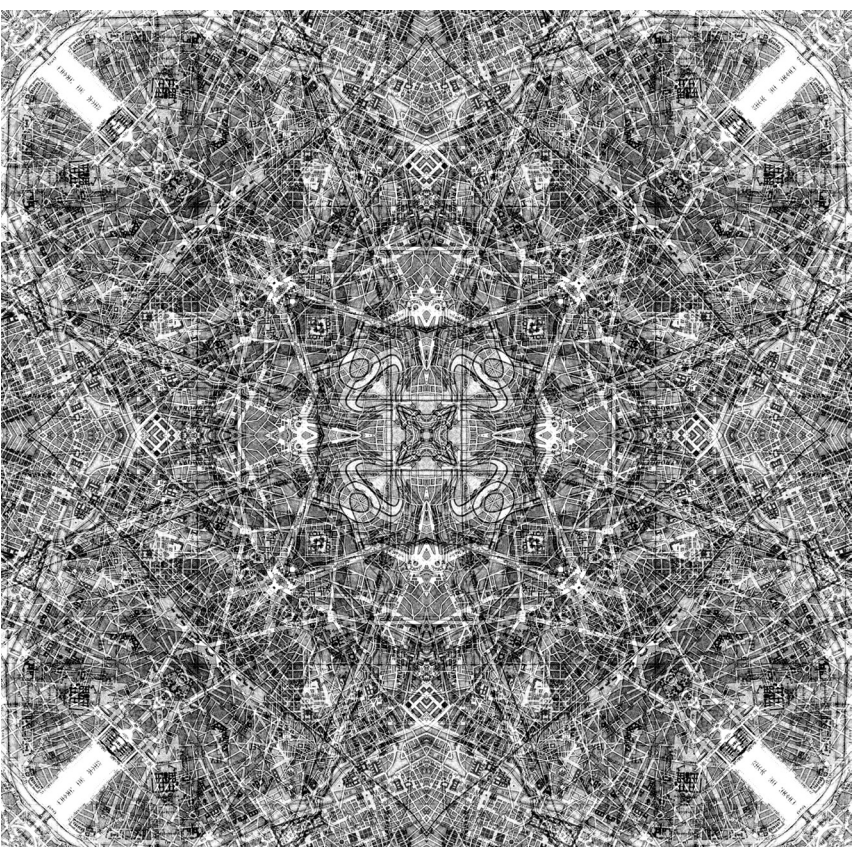
[flickr.com/photos/britishlibrary/11097701034](https://www.flickr.com/photos/britishlibrary/11097701034)

← PREVIOUS: *Imaginary Cities — Paris (11097701034) — 01/01/2018*, detail of digital master, 2019.

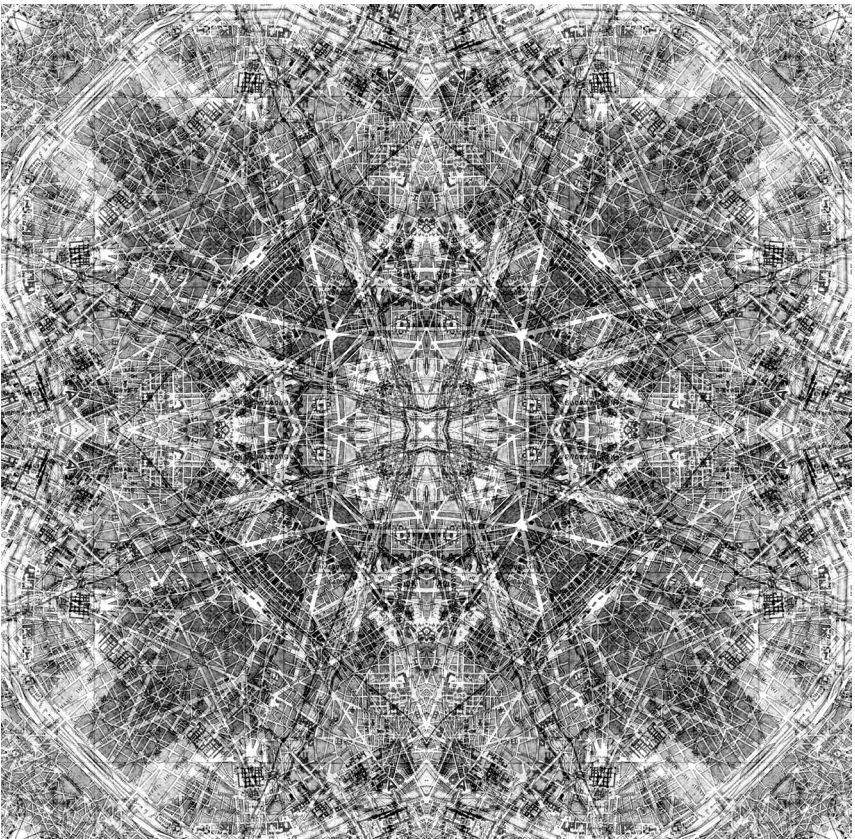
→ RIGHT: *Imaginary Cities — Paris (11097701034)*, installation as part of *Imaginary Cities*, the British Library, London, 2019.



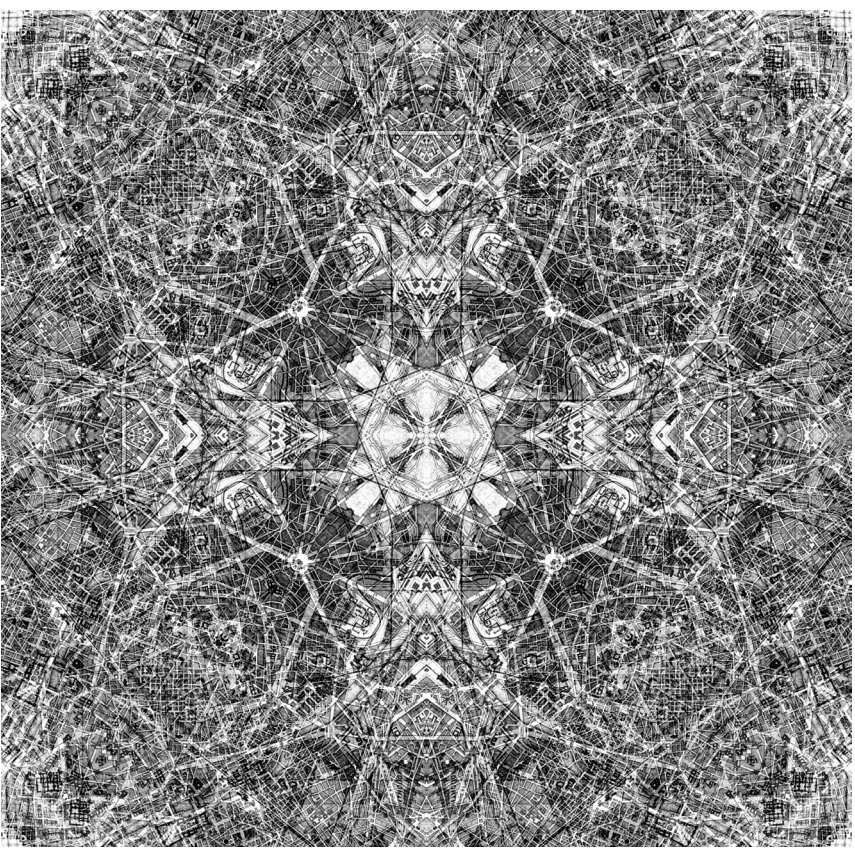
02/07/2018
digital master



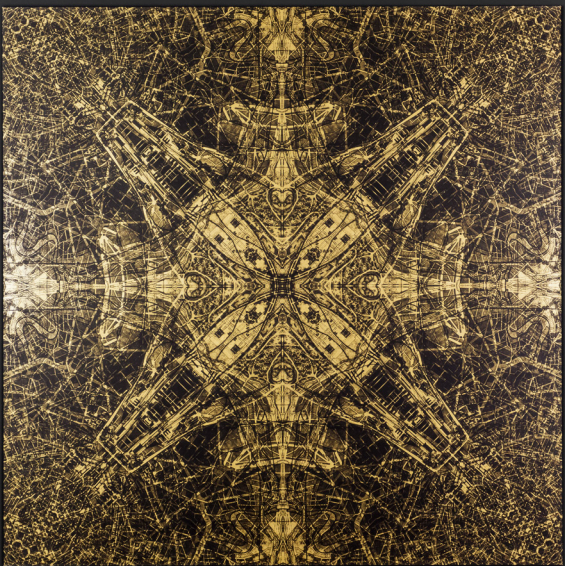
01/10/2018
digital master



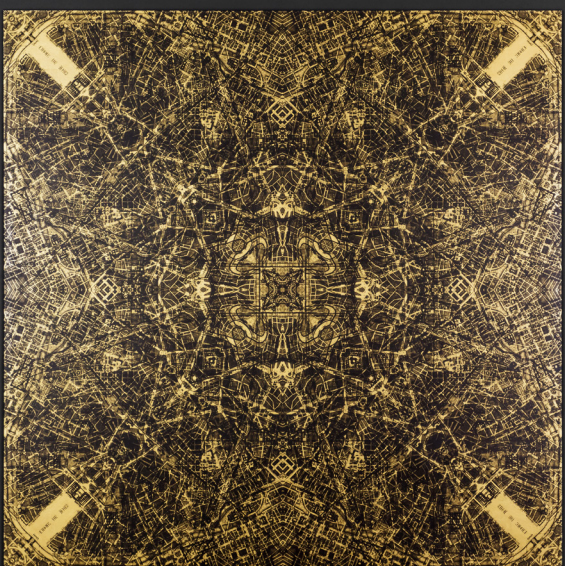
01/01/2018
digital master



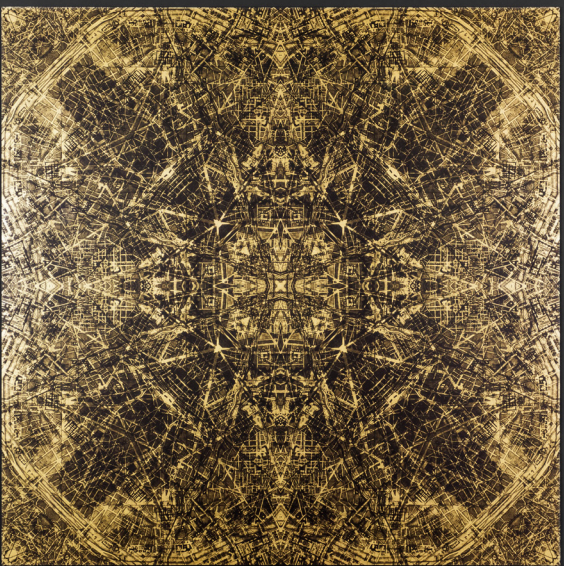
02/04/2018
digital master



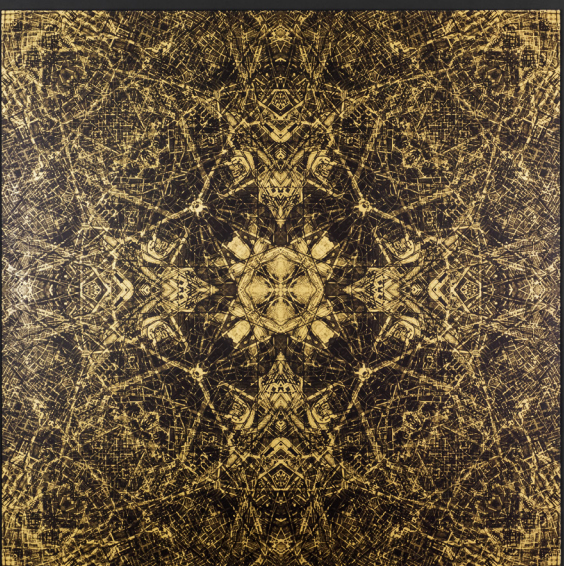
02/07/2018
physical artefact



01/10/2018
physical artefact



01/01/2018
physical artefact



02/04/2018
physical artefact



Imaginary Cities — NYC (11062471656), 2019

Real-time virtual environment (Unity3D) with
soundscape (Flash), dimensions variable, infinite duration

This installation is a real-time virtual 'city' exclusively created from an early urban map of New York City found in the British Library's *One Million Images from Scanned Books* collection on Flickr Commons. The 3D environment is algorithmically rendered anew each day from a 2D 'map' that is being constantly regenerated by the project's online server application. The synthetic world shifts according to a hyperreal day/night cycle and offers two primary viewpoints. The first is a randomly animated vista of the city's skyline, whilst the second is a floating street-view perspective that is experienced through an Oculus VR headset. An atmospheric soundscape (also generated in real time) completes the experience.

with Drew Baker (3D visualisation & programming)



Source Map:
'Plan of the City of New York, 1766-67'
surveyed by Lieutenant B Ratzer
in HB Dawson, *New York City during the American
Revolution...* New York, 1861.

[flickr.com/photos/britishlibrary/11062471656](https://www.flickr.com/photos/britishlibrary/11062471656)



← PREVIOUS: *Imaginary Cities — NYC (11062471656)*,
still from real-time virtual environment, 2019.

→ RIGHT & NEXT PAGE: *Imaginary Cities — NYC (11062471656)*, installation
as part of *Imaginary Cities*, the British Library, London, 2019.





Imaginary Cities - NYC (11062471656), stills from real-time virtual environment, 2019.

↖ TOP LEFT: dawn
↖ BOTTOM LEFT: day

↑ TOP RIGHT: dusk
↑ BOTTOM RIGHT: night

IMAGINING A CITY

What is a city? When we think of a city, what comes to mind?

These were some of the initial questions that arose when Michael Takeo Magruder invited me to be part of his *Imaginary Cities* project, and they are certainly typical of the kinds of musings we have had over our twenty years of collaboration. My background is in data visualisation and the use of three-dimensional graphics to study cultural heritage. At first glance the intersection between my research and Michael's practice may not be apparent. However, we share a deep interest in developing experiences that use the emerging digital technologies of our time to explore, interpret and contemplate data that is both historically and socially relevant.

Returning to that opening conversation, I first asked Michael what our base data set was. He said it was a single algorithmically generated image which would be produced daily from a historic map of New York City found in one of the British Library's online digital collections; surprising given our collaborations normally involve 'big data' and a plethora of source material being combined to produce an artwork. Next, I asked if there were any constraints, and he told me we could only use this image and any data that could be derived or reasonably inferred from it. And finally, I asked him what he was seeking to create. Michael responded that he wanted to construct a beautiful and ever-changing virtual cityscape which would be based solely on this digital collection item and could be interactively explored by visitors.

Such preconditions and open-ended specifications are normally deal breakers for software engineers and researchers. Nonetheless, part of a rewarding long-term collaboration is having the trust to accept these types of challenges and embrace a fluid process of experimental development knowing that it will likely lead to a mutual and much deeper exploration of the subject.

As the work began, I decided to use the project's title – *Imaginary Cities* – as my first point of reference. Imagination is by its definition a process of the human mind through which something new is formed. Would our finished piece embody Michael's notion of a city since it was his artistic vision, or my interpretation since I would be the translator of his instructions and the source data? Or could it be both and perhaps more; a blending of ideas and agency akin to William Gibson's "consensual hallucination"? Should the ultimate objective be to create "[a] graphic representation of data abstracted [...] of light ranged in the nonspace of the mind"¹, recognisable as a city to each viewer but at the same time clearly nonrealistic and therefore open to personal reflection and interpretation?

The result of our collaboration, *Imaginary Cities — NYC (11062471656)*, explores this notion of the city as an archetypal construct that engenders individual dreams. Visitors are presented with two simultaneous viewpoints

of the synthetic urban environment; one from above and one from below. A large immersive projection of the articulated skyline is offered as an initial communal experience. And while we have no autonomy as algorithms pull us through the upper parts of the city, we are given a chance to witness hidden and verboten places that are far out of reach in our real world. In contrast, the second, 'street' view uses an Oculus Rift headset to provide a personal experience of the virtual surroundings. Floating above the ground we see the city from a low vantage. Our journey is more eurythmic as we are squeezed between valleys of enclosed streets and break out into pockets of open space. Although we still have no control over our route, we can look at (or away from) whatever we choose and dictate how the verticality and vistas of the metropolis are experienced.

The virtual city is procedurally generated anew each day from the source 'map' output by the project's backend server infrastructure and is governed by a set of rules that never change. The passage of time is noted by a hyperreal day/night cycle that quickly shifts between light and dark while a continuous algorithmic soundscape envelops the installation space. The city has no representations of people, yet the lights turn on and off, and we can clearly see doorways, paths and other features that imply human presence. Is this absence of bodies alarming or calming? Do we feel anxiety from isolation or peace from solitude? Is this city a forgotten place or serene utopia? And why are we alone? Are we the last to leave or simply the first to come?

This piece, like the other artworks in *Imaginary Cities*, seeks to offer a personal space in which we can ask those and many more questions. Michael's explicit framing of his creations as 'maps' and 'cities' provides a context which encourages individuals to fill in the blanks with their own expectations and points of reference. Such a process fundamentally connects us to these works, for it is our imagination that instils them with meaning and makes them complete.

Drew Baker

Researcher in 3D Visualisation and Cultural Heritage

¹ William Gibson, *Neuromancer*, (New York, Ace Books, 1984), 51.



Imaginary Cities — London (11010962736), 2019

Real-time algorithmic triptych with soundscape (Flash), customised 4K LED screens with silver-gilded frames, 3805×708×43mm, infinite duration

This triptych is an ever-changing digital ‘landscape’ created from a historic map of late-Georgian London that is part of the British Library’s *One Million Images from Scanned Books* collection on Flickr Commons. The artwork’s physical ‘canvas’ is constructed from three 55” 4K LED screens that are encased in custom silver-gilded frames and controlled by a single computer. A Flash program running on the system composes the scene from a dataset containing an entire year (2018) of processed image material that was generated by the project’s online server application. The ephemeral visuals are constantly remixed in real time and are accompanied by an algorithmic soundscape that completes the aesthetic experience.



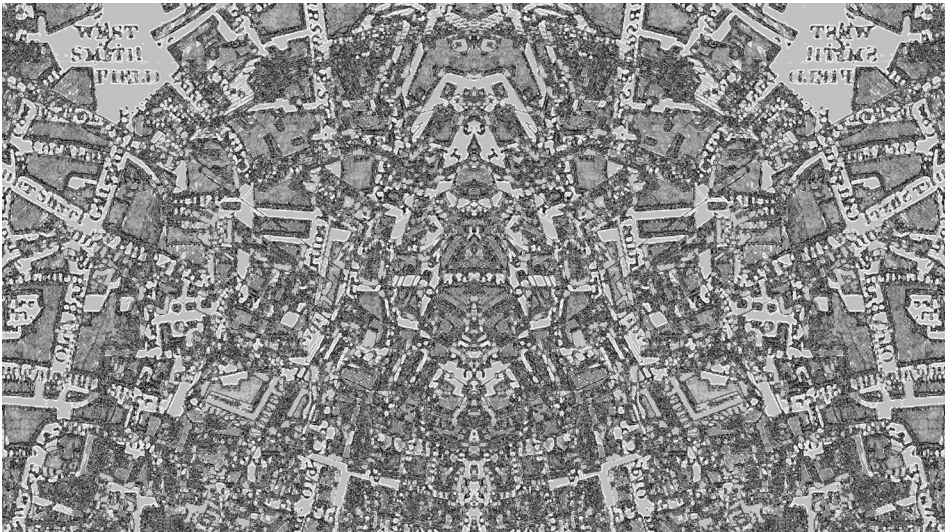
Source Map:
'A Plan of London and its Environs'
drawn by R Creighton & engraved by J Walker
in Samuel Lewis, *A Topographical Dictionary of England...*
London, 1834.

[flickr.com/photos/britishlibrary/11010962736](https://www.flickr.com/photos/britishlibrary/11010962736)

← PREVIOUS: *Imaginary Cities — London (11010962736)*, detail of digital source (Day 018), 2019.

→ RIGHT & NEXT: *Imaginary Cities — London (11010962736)*, installation as part of *Imaginary Cities*, the British Library, London, 2019.





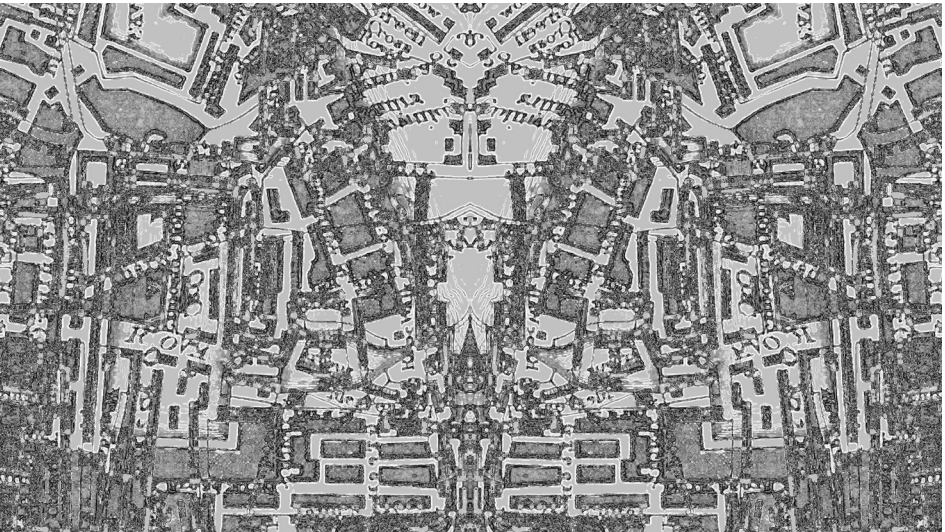
Day 220
digital source



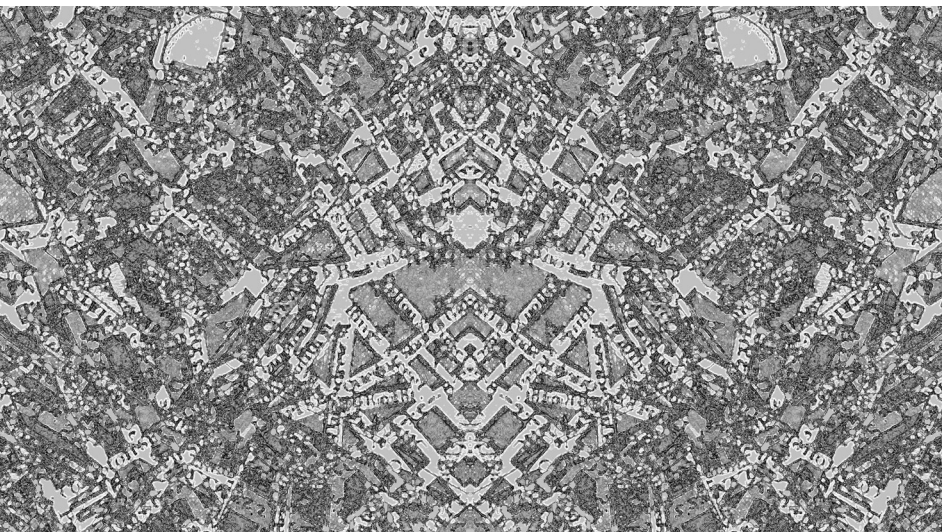
Day 293
digital source



Day 365
digital source



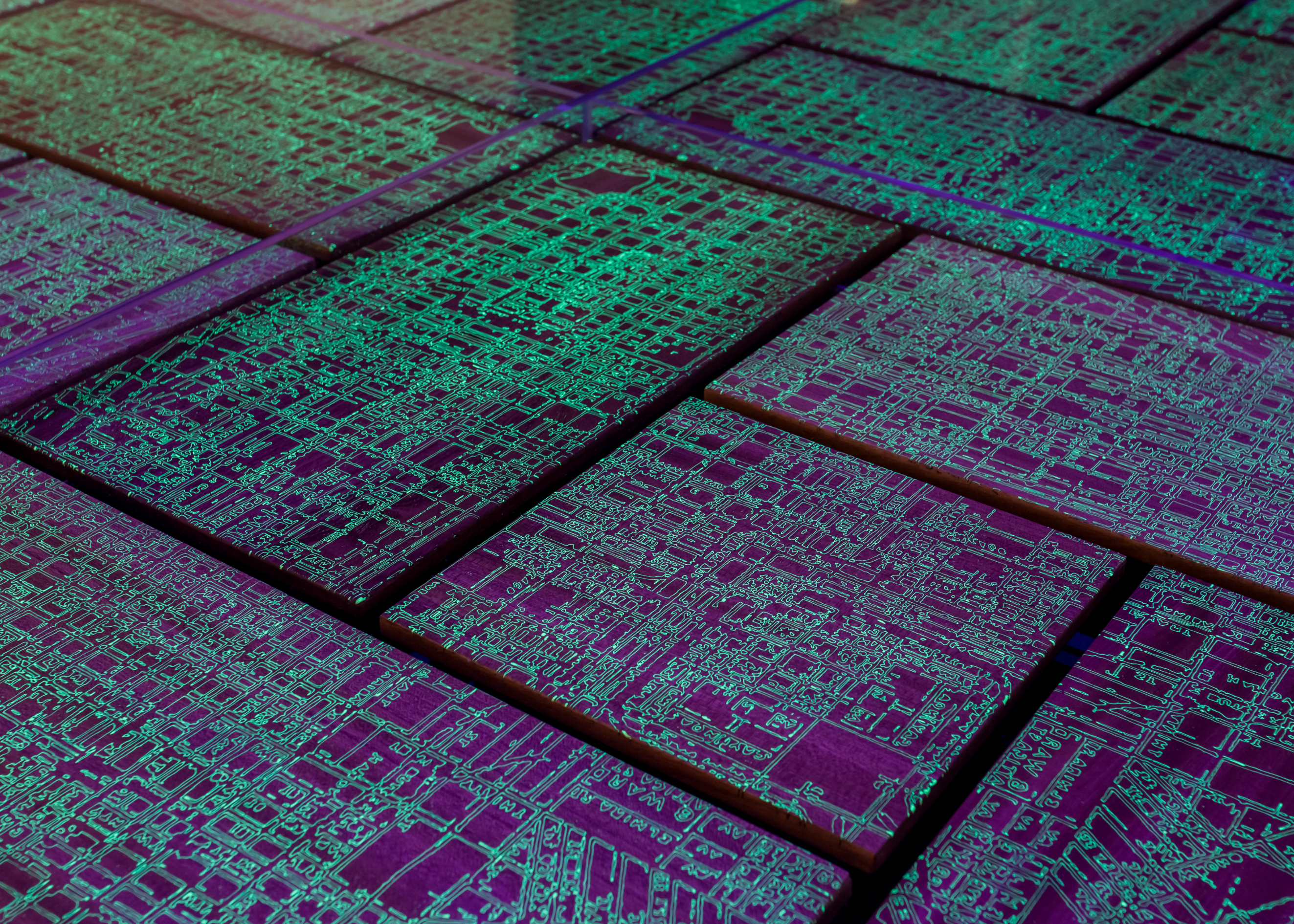
Day 001
digital source



Day 074
digital source



Day 147
digital source

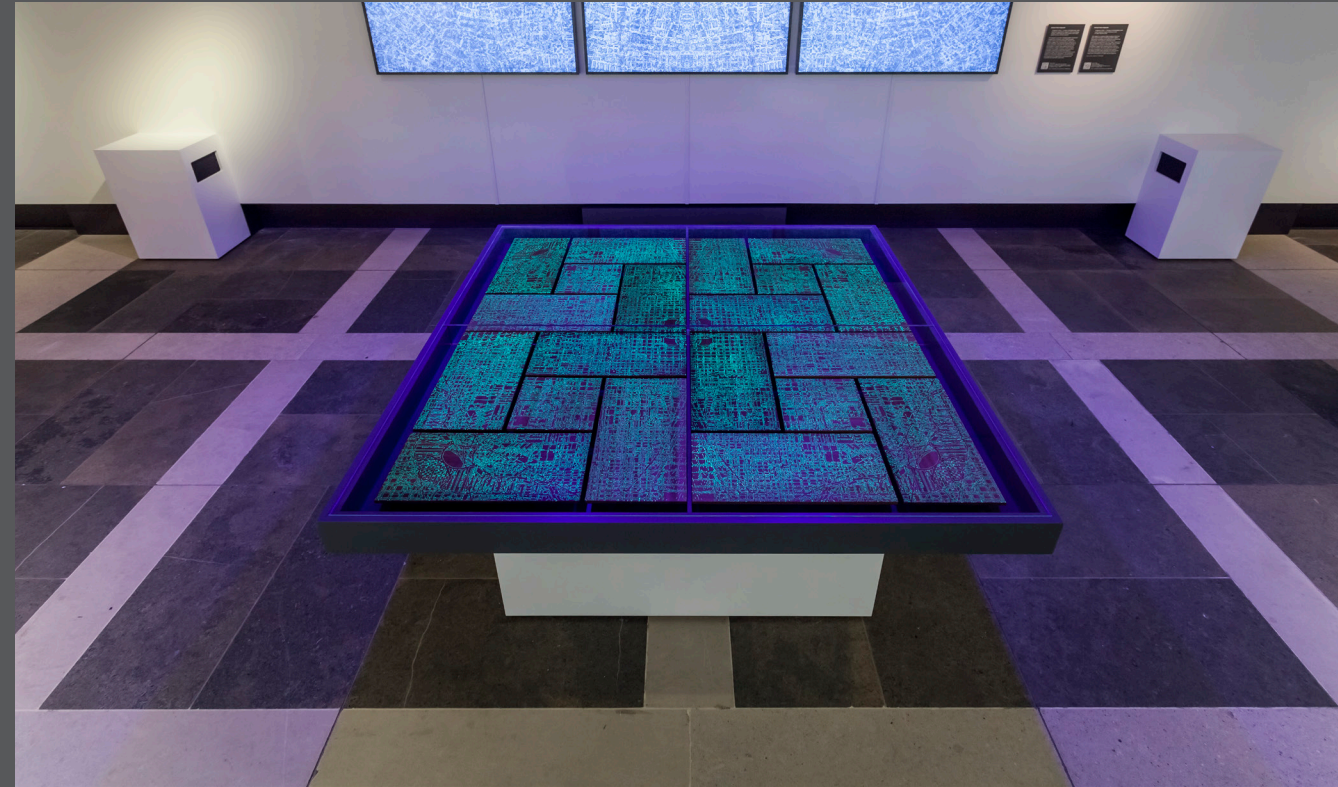


Imaginary Cities — Chicago (11107522893), 2019

Laser-engraved sapele hardwood with UV light-reactive inlay,
1530 × 1530 × 10mm

This object is a physical data sculpture that has been made through combining modern digital fabrication processes and traditional woodworking techniques. The project's underlying server application has generated the raw image material for the composition from an urban street map of 1870s Chicago that is included in the British Library's *One Million Images from Scanned Books* collection on Flickr Commons. The source data from the server has been translated to an intricate vector pattern. This design has been laser-engraved into a set of twenty solid pieces of hand finished sapele hardwood that were then inlaid with a fluorescent UV light-reactive pigment.

Source data timepoint: 07/06/2018

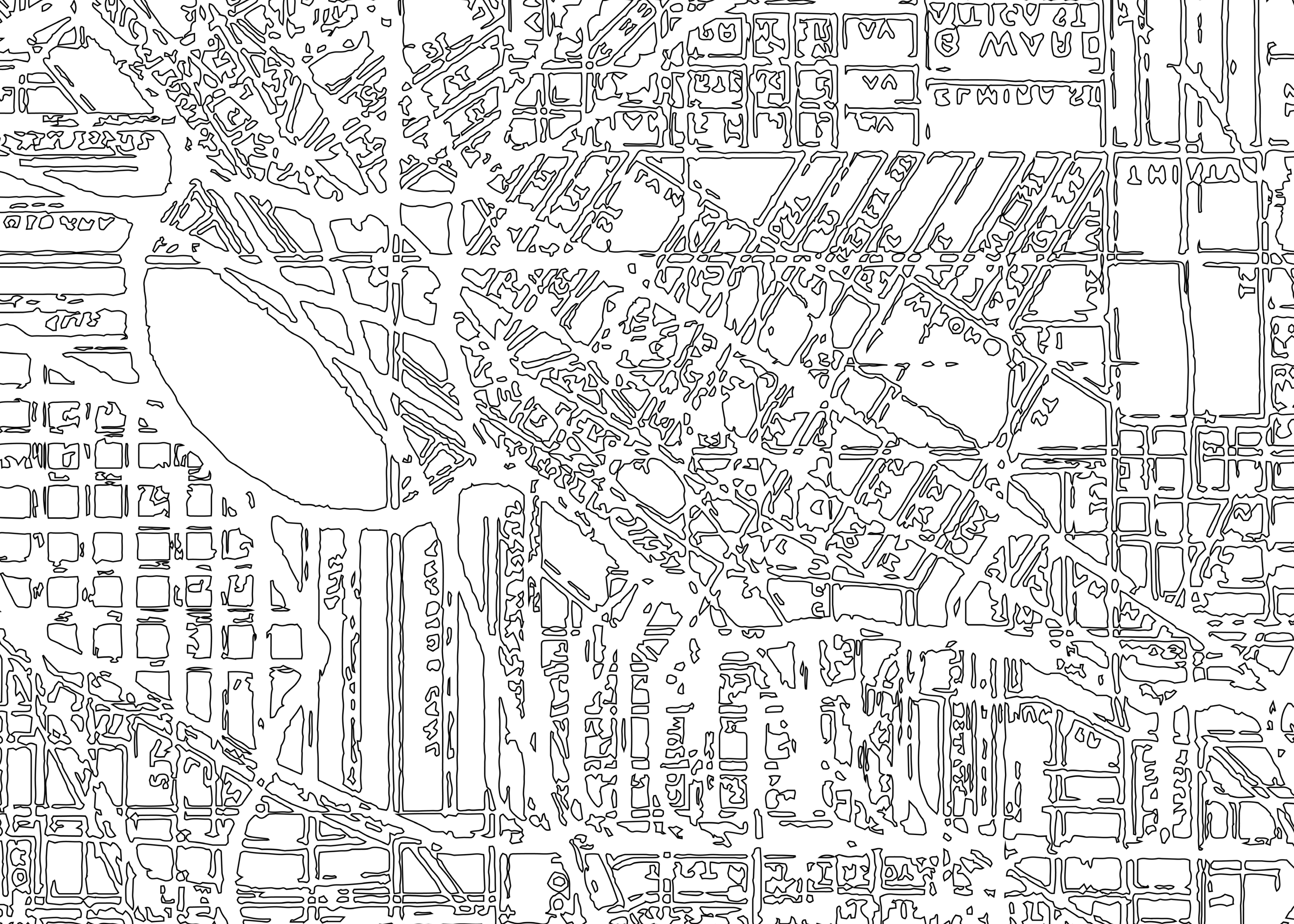


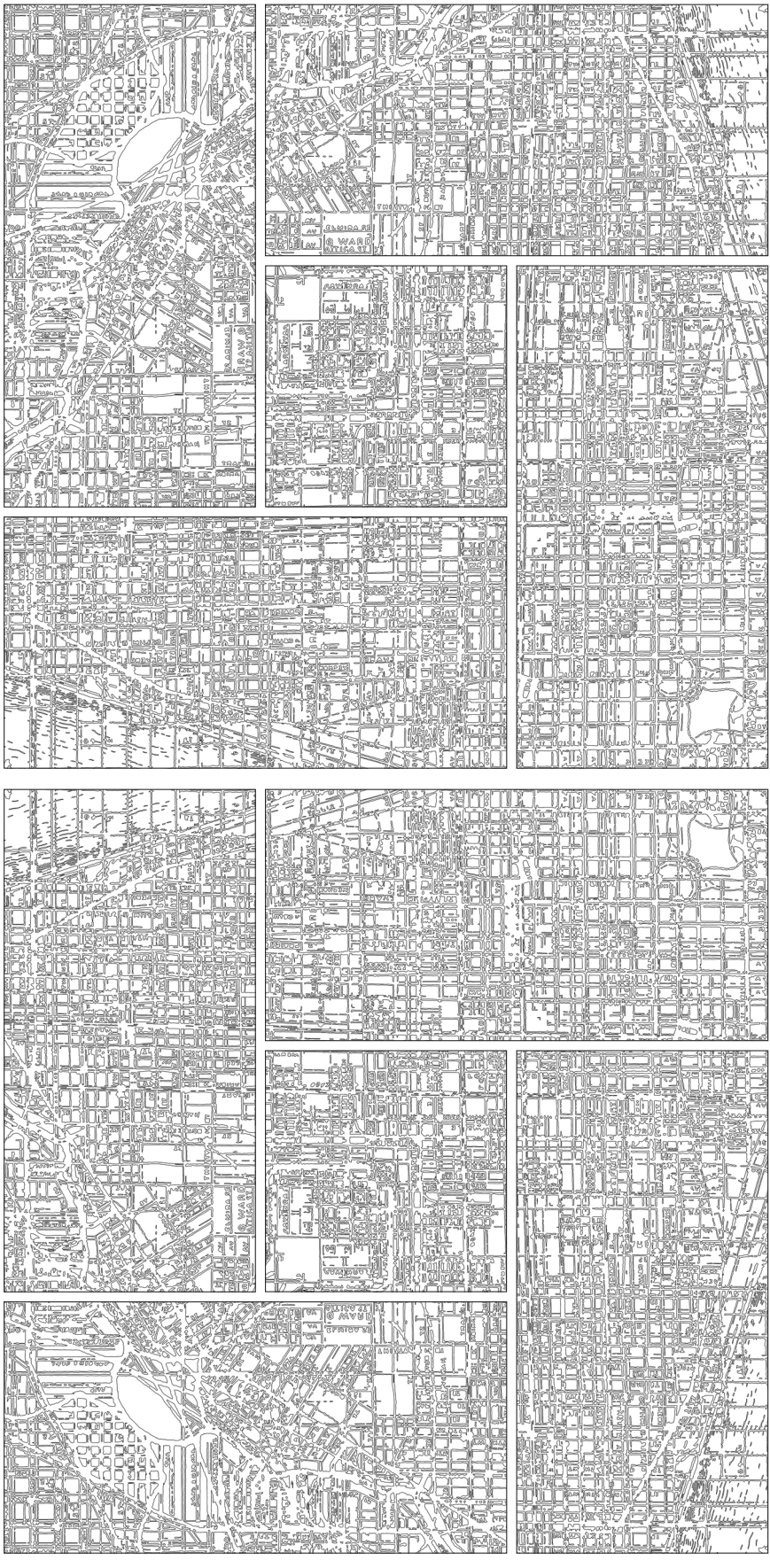
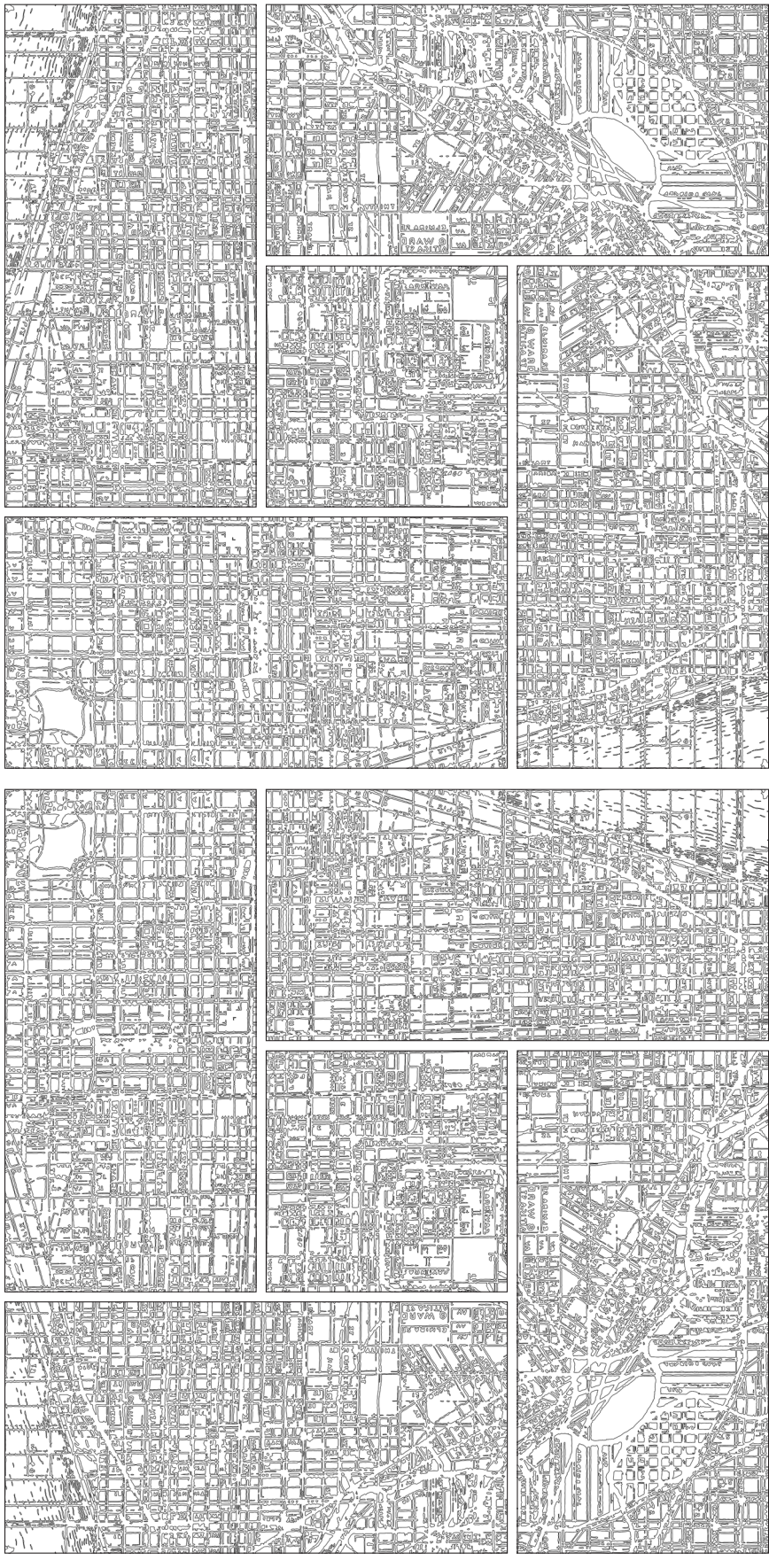
Source Map:
'Map of Chicago'
engraved by R Blanchard
in Everett Chamberlin, *Chicago and its
Suburbs*. Chicago, 1874.

[flickr.com/photos/britishlibrary/11107522893](https://www.flickr.com/photos/britishlibrary/11107522893)

← PREVIOUS: *Imaginary Cities - Chicago (11107522893)*, detail of
laser-engraved sapele hardwood with UV light-reactive inlay, 2019.

→ RIGHT: *Imaginary Cities - Chicago (11107522893)*, installation
as part of *Imaginary Cities*, the British Library, London, 2019.





UTOPIAN WORLDS IN PROGRESS

I could tell you how many steps make up the streets rising like stairways, and the degree of the arcades' curves, and what kind of zinc scales cover the roofs; but I already know that this would be the same as telling you nothing. The city does not consist of this, but of relationships between the measurements of space and the events of its past.

— Italo Calvino, *Invisible Cities*, 1974

When Michael Takeo Magruder started talking to me about his *Imaginary Cities* project, I couldn't help but think of Italo Calvino's *Invisible Cities*. How could I not? Calvino's tale of fictional cities is presented through a series of conversations between Kublai Khan, the Emperor of the Tartars, and the young explorer Marco Polo, whom Khan asks to recall the distant lands of the West. The book unfolds like a fluid system, an intertwined network, a simulation of hypertext links in the narrative. There is no beginning and no end. You can navigate through the invisible cities at any point in time as you select your own route and draw your own story.

In the 1960s Calvino was experimenting with the complex world of cybernetics as a different way to perceive and experience the lived environment. In *Invisible Cities*, following the logic of cybernetics, he writes about his imaginary urban spaces almost as if he applies algorithms to create such fantasy worlds, allowing room for elements of unpredictability 'like the letters in a name'¹. Michael, in his *Imaginary Cities*, achieves a strikingly similar effect. He blends the fantastical into the real and the virtual into the physical, creating hybrid artworks where time loses relevance and what matters most is the amalgamated experience of past, present and future.

Michael is a post-digital artist whose practice explores computational aesthetics, virtual environments and emerging technologies in ways that critically examine our networked, media-driven society. For his *Imaginary Cities*, Michael uses historic maps from the 19th century, applying onto them computer processes and algorithms, and thus creating alternative futuristic trajectories for each of the cities he has selected to remix. He then brings the constructions back to a human scale as installations that allow people to connect with them, to trigger their imagination and envision different scenarios and narratives for these places.

Delving into the British Library's *One Million Images from Scanned Books* collection on Flickr Commons – a pool of over one million digitised artefacts – he selects just four; making a critical statement about the seemingly unmanageable plethora of digital information and big data that is now a part of everyday life. He has explored this vast online collection searching for precious and meaningful 'small' data, applying a post-digital perspective to the archive.

Simultaneously drawing from his scientific background and extensive knowledge of fine art materials, Michael employs with ease both digital and analogue processes. Elaborate computational systems and next-generation production tools are blended with historical craft techniques such as precious metal gilding and traditional carpentry. These new hybrid mediums depict each of his *Imaginary Cities* through carefully selected components that reference various aspects of their real-world counterparts.

Paris is reconstructed with leading-edge digital print technologies and the finest physical materials. Ultra-high-resolution bitmaps are transcribed to large hand-made 24ct gold-gilded plates, reminding us of the abundant wealth and incredible beauty of the city during the 19th century. New York expands vertically and endlessly as an ever-shifting 3D virtual environment and soundscape that offers complete immersion for visitors through multiple means. One can watch collectively as a real-time projection of the city skyline gradually changes or don a VR headset to become a protagonist journeying through the hyper-real metropolis that far exceeds the scale of the actual city today. Chicago pays homage to its pioneering architect Frank Lloyd Wright. An angular geometric design created from solid pieces of hardwood is laser-routed with intricate vector patterns that are reminiscent of both modernist city grids and computer circuit boards. London is represented as a fluid, slowly changing landscape painting; a palimpsest in time, reflecting its long history and the waves of people who contributed to its growth and evolution. Its smooth and constant motion resembles the flow of the River Thames.

Displayed alongside the installations are the original source maps and their printed books. There is a beautiful life cycle in this aspect of the exhibition. These analogue artefacts have been fast tracked into the future and reconstituted into new digital forms that have in turn given rise to Michael's hybrid creations. His poetic and meticulous artistic vision is intertwined with layers of historical context and thus creates a rich and fully immersive experience for viewers.

Imaginary Cities alludes to future urban environments that have been stitched together from pieces of history and reside between fiction and hyper-reality. The future has never felt closer than it does today. Modern cities expand like complicated programmatic systems. Digital infrastructures are interwoven in their strata, and undercurrents of invisible data have increasingly become essential components in our present way of living. Constructed by algorithms and unpredictable variables these artworks are post-human landscapes that traverse the boundaries between contemporary digital art and speculative science fiction.

Michael's *Imaginary Cities* captivate us not because they are a by-product of some fantasy realm, but because they are generated from places, objects and interactions that are intrinsically linked to our real world. Whether in digital or physical form, now or in the future, these works transport us to places where reality embraces so many different versions and possibilities. They feel like retro-futuristic urban dreamscapes; utopian worlds in progress.

Foteini Aravani

Curator at Museum of London

1 Italo Calvino, *Invisible Cities*, (London, Secker & Warburg, 1974), 125.

Michael Takeo Magruder (b.1974, US/UK, takeo.org) is a visual artist who works with new media including real-time data, digital archives, immersive environments, mobile devices and virtual worlds. His practice explores concepts ranging from media criticism and aesthetic journalism to digital formalism and computational aesthetics, deploying Information Age technologies and systems to examine our networked, media-rich world.

In the last 20 years, Michael's projects have been showcased in over 280 exhibitions in 35 countries, and his art has been supported by numerous institutions within the UK, US and EU. In 2010, he represented the UK at *Manifesta 8: the European Biennial of Contemporary Art* and several of his most well-known digital artworks were added to the Rose Goldsen Archive of New Media Art. As a Leverhulme Trust artist-in-residence, Michael produced *De/coding the Apocalypse* (2014); a solo exhibition exploring contemporary creative visions based on the Book of Revelation. The following year, he was awarded the 2015 Immersive Environments Lumen Prize for his VR installation *A New Jerusalem*. More recently, he has developed projects reflecting on migration issues surrounding the Syrian Civil War (*Lamentation for the Forsaken*, 2016) and the US southern border crisis (*Zero Tolerance*, 2018). At present, Michael is artist-in-residence at the British Library, researching digital map archives and the *One Million Images from Scanned Books* collection.

David Steele (b.1972, US) is a computer scientist based in Arlington, Virginia, USA specialising in open source development and database architecture. He has been working with a wide range of technologies since the mid-nineties and was a pioneer in pairing next-generation web clients to existing corporate infrastructures. His work has enabled a variety of advanced applications from global text messaging frameworks to re-entry systems for the space shuttle. He is currently Principal Architect at Crunchy Data Solutions, Inc, and is leading the development of massively parallel backup solutions to protect the world's ever-growing data stores.

Drew Baker (b.1968, UK) is a researcher based in Melbourne Australia focusing on the visualisation of archaeology and cultural history. His explorations in 3D digital representation of spaces and artefacts as a tool for arts and humanities research laid the foundations for the London Charter, establishing internationally-recognised principles for the use of computer-based visualisation by researchers, educators and cultural heritage organisations. He is currently working with a remote community of Indigenous Australian elders from the Warlpiri nation, digitising their intangible cultural heritage assets for use within the *Kurdiji* project; an initiative seeking to improve mental health and resilience in the nation's young people through the use mobile technologies.

Published on the occasion of the exhibition

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by Michael Takeo Magruder

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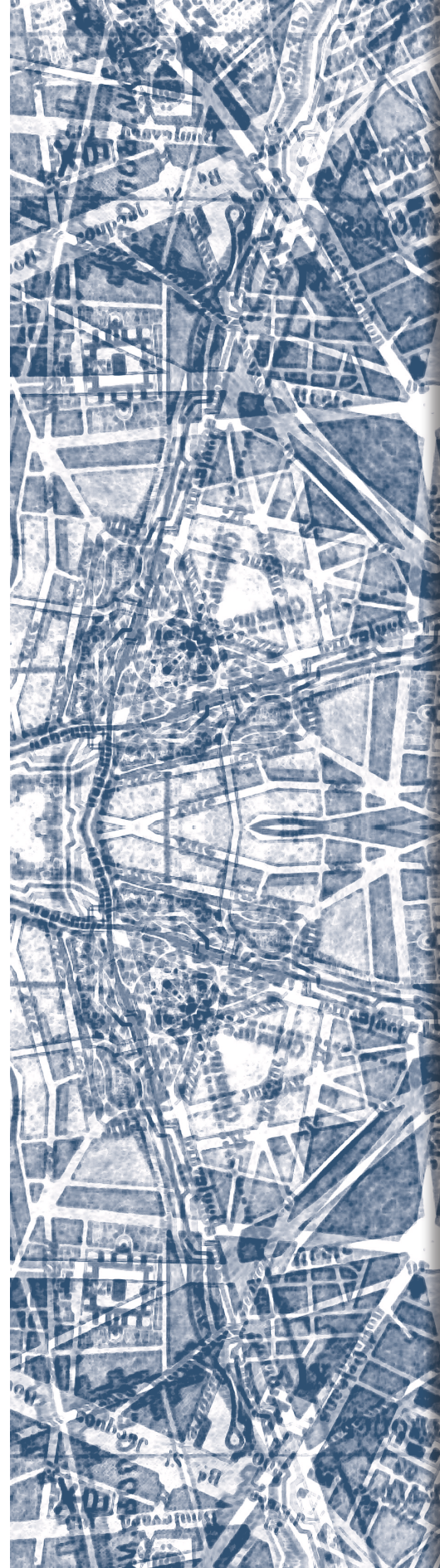
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Imaginary Cities is an arts-research project and exhibition by British-American artist Michael Takeo Magruder that transforms the British Library's online collection of historic urban maps into fictional cityscapes for the Information Age. The work explores how large repositories of digitised cultural materials can give rise to unique born-digital artefacts, real-time experiences and physical creations that are inspiring and relevant to contemporary audiences.

Originally conceived for the British Library's Entrance Hall exhibition space, the first iteration of the project consists of four technology-based art installations that have been exclusively created using images and metadata of 19th-century city maps drawn from the Library's *One Million Images from Scanned Books* collection on Flickr Commons. Each artwork remixes a famous Western city and blends contemporary digital technologies with historical analogue processes. Elaborate computational systems and next-generation production tools are intermixed with fine art materials and traditional craft techniques.

Displayed alongside the source digital maps and their original printed books, *Imaginary Cities* reveals the changing nature of archives and collections in the Digital Age. The exhibition seeks to highlight how libraries are not simply repositories of old knowledge, but storehouses of creative potential that can engender new avenues and unprecedented possibilities for generating culture.