Speculations in Contemporary Drawing for Art and Architecture

Edited by Laura Allen
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Speculative Drawing

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The Past, Present and Futures of Drawing

A conference on drawing in a world in which architecture is almost entirely based on computation might seem something of a paradox. Less than 30 years ago, the appearance of new software, first in engineering companies and then in architectural practices, triggered a debate about the changing nature of architectural drawing and about how what was previously drawn was becoming standardised and normalised through a singular language, a common identity and, perhaps most controversially, a normative creativity. Today, all architects work with programmes such as AutoCAD, Autodesk and Catia, and their projects conform to recognised standards of digital modelling and Building Information Modelling (BIM). However, we believe that this has not homogenised creativity – on the contrary, we believe that it has expanded it in unforeseen and inspired directions – and *Drawing Futures* stands as a testament to this.

To see drawing as bound to modern technology is to forget that in the Renaissance it was transformed by the ubiquity of printing and, concomitantly, by widely disseminated treatises by Palladio, Serlio and Vignola. Drawing soon became a technical tool, an instrument of codification that organised proportion and order; and such norms were reproduced again and again in manuals throughout the following centuries. The wide circulation of books such as Durand's seminal *Precis des Leçons d'Architecture* (1809) meant that drawing became an academic tool, defined to some degree by the rules of the École des Beaux-Arts. Its neoclassical conventions became a global standard (as recognised by the eponymous 1976 MOMA exhibition, *The Architecture of the École des Beaux-Arts*).

The idea of a 'creative architecture', of an experimentational architectural aesthetic that privileges drawing as an expressive tool, emerged less than a century ago. Aside from the utopian drawings of the eighteenth century – the visionary expressions of Boullée or Ledoux and the unlikely prisons of Piranesi – drawing found its true expressive value when space was liberated and it could become a free domain, an open field. The various movements of the modern avant-garde sought to make the drawing an instrument both critical and creative. Think of the Gläserne Kette, the drawings of Bruno Taut, Erich Mendelsohn, the Luckhardt Brothers, Hans Poelzig, Theo van Doesburg and the De Stijl movement, and the colour experiments of Bart van der Leck or Gerrit Rietveld. Think of the wildly redefined strategies of architectural conception, from Bauhaus to Mies van der Rohe, from the Constructivists to Le Corbusier.

Each architectural movement of the twentieth century contributed to this enrichment of the field and scope of drawing. We could name more, from Team X to the techno-utopias of the Metabolists and Archigram, or the radical architectural dystopias of Archizoom or Superstudio. Even critics of these movements understood the value of the drawing as a conceptual tool – witness, again, the work of Aldo Rossi, Massimo Scolari and La Tendenza, the diverse explorations of Peter Eisenman, the fictions of Madelon Vriesendorp or the paintings of Zaha Hadid. With Peter Cook, who described drawing as a "motive force", at the helm, The Bartlett School of Architecture also took the radical step of prioritising the status of drawing as a conceptual and critical tool, partly by way of its focus on portfolio work. Peter Cook, and after him Neil Spiller and Iain Borden, published books on architectural drawings, cementing the status of drawing as a fundamentally important expressive tool.

Today, *Drawing Futures* take its place within this tradition. It explores new relationships with art and other disciplines, offers alternative – often subversive – looks at computational resources and ultimately, along with the conference, navigates its way through myriad new territories that will define the future of drawing for decades to come.

Drawings seduce, and the drawings in this book are tantalising evidence of this. Yet the aim of *Drawing Futures* is to illustrate how drawing works as an abundantly rich, diverse, inventive, critical and serious research domain. In this regard, it is a ground-breaking study of the point and promise of drawing; a first of its kind, which both explores the microscopic detail of the craft and envisions the radical possibilities inherent in its expression. The academics, artists and architects whose work lies within conceive of drawing as a rigorous, liberating form of expression. Their contributions work together as a manifesto for the future of an artform that is capable of both utter simplicity and infinite complexity.

Our call for works attracted over 400 submissions from more than 50 countries and 120 institutions and practices. There are many people to thank for such an endeavour – firstly, all the contributors and speakers, especially our keynotes. Our peer reviewers, Lara Speicher and Chris Penfold at UCL Press, and the colleagues, students and associates behind the scenes. We also wish to thank our designers, A Practice for Everyday Life, for their vision, and our proofreader, Dan Lockwood, for his tirelessness. Finally, we wish to thank and congratulate editors Laura Allen and Luke Caspar Pearson and communications team Eli Lee and Michelle Lukins Segerström for operating as the driving force behind the entire project. It was their vision that began it and their relentless commitment that made it happen.

Professor Frédéric Migayrou
Chair, Bartlett Professor of Architecture

Professor Bob Sheil
Director of the Bartlett School of Architecture

Drawing Futures

While planning the inaugural *Drawing Futures* event and this book, which accompanies it, we were both intrigued by how to define what drawing practice is today and how it remains a vital part of both art and architecture.

In 2012, Yale School of Architecture held a symposium asking a rather morbid question: is drawing dead? At The Bartlett: no, most certainly it is not, and any attempt to kill it would surely only see it return as some form of zombie – imbued with new attributes and behaviours. So, alive or (un)dead, where might this drawing-creature be heading?

In the hope of answering this, we established the *Drawing Futures* conference as a venue for the discussion of, debate about and exhibition of the energetic life of drawing. Of course, it would be naïve to talk about drawing without recognition of the changing context in which it is produced, displayed and communicated. Understanding that this conversation must encompass contemporary technologies, emerging practices and the history of drawing itself, we established a series of themes for both the first conference and this accompanying book.

We saw these as general lines of inquiry – attempts to somehow categorise the diverse fields of drawing practice and, by implication, offer definitions of contemporary drawing to either build upon or summarily reject.

With *Augmentations*, we explore how the act of drawing may be extended through new technologies and materials. Can we augment or replace the hand, and how might we engage with new substrates for recording drawings on? *Deviated Histories* discusses how we might redefine or break from the history of drawing. How might critical re-readings of established histories offer new approaches for the future, and how might reframing the past shake the fundamental notions that we take for granted in drawing practice?

Future Fantasticals delves into drawing as an act of vision and speculation. How does drawing continue to hold its role as a vehicle for exploratory proposals that captivate us and allow us a window into the future? In what forms can unsteady and fantastical speculations prosper in a future that appears increasingly tied to swathes of data and precision? On the subject of all that information, *Protocols* asks how we might encode new data through drawings, and what new types of drawing practice will need to be invented to help articulate our digital world.

In each chapter, then, we establish different terms of engagement for discussing drawing today. It is a testament to the diversity of the work in this book that not only do we have 60 projects slotted into each of these chapters, but each project could easily be applied to another.

We hope that this will be clearly evidenced by our keynote speakers, who present as idiosyncratic a panel as one could hope to find. In *Augmentations*, we talk with Madelon Vriesendorp about the extents of her saturated 'world' and how her incredibly influential drawings mirror her own life. Pablo Bronstein's exquisitely drawn architectural proposals that open *Deviated Histories* twist historical London through a series of salacious scenarios that he explores in graphic detail. We embark on our *Future Fantasticals* journey with the remarkable drawn works of Neil Spiller, whose work surely demonstrates the speculative drawing as a philosophy in itself. And in *Protocols*, Hsinming Fung takes us through the drawings of Hodgetts + Fung, including the wonderful graphic novel world of *Cyberville*, to explain the "shift in the balance of design intelligence".

So as you read through these pages, we hope that you will find there are many borders being crossed and clichés being exploded.

AUTHENTICITY

The great master of chiaroscuro-meets-zoning-law, Hugh Ferriss, once remarked that "there is a difference between a correct drawing and an authentic one". For Ferriss, an 'authentic' drawing could hold the desires of the client or indeed those of the society from which it was borne. A 'correct' one might be well-rendered, yet still leave one cold. We can assume that Ferriss felt that his drawings alone were the vehicles of authenticity. But their success was closely tied to architectural technology. His charcoal renderings perfectly captured the heft of a steel and terracotta Gotham, driving the city into what Koolhaas called a "murky Ferrissian Void". Cometh the hour, cometh the drawing. And then architectural technologies changed. The glazed curtain wall of modernism did not lend itself to charcoal in the same way. Ferriss and his shadows could no longer be authentic in a world of transparency. The history of his career shows us at least two things about drawing: that it walks hand in hand with technology, and that it can be a capricious pursuit.

The *Drawing Futures* project really started with trying to establish what 'authentic' drawing practice might be in contemporary art and architecture. If that sounds like an act of hubris, then we should say that the suspicion from our side was that the answer would be a field of different methods intertwining rather than any one overbearing dogma.

Blogs, Tumblr and Pinterest give one vast swathes of visual material to sift through and unprecedented access to imagery that was once the preserve of university libraries and select collections. Walking around the studios of The Bartlett, one can see the many drawn influences pinned up on walls or flashing on screens. However, one could say that much of this rapid-fire transmission of imagery lacks any accompanying intellectual context – and this is often true in the world of reposts and pins

– but that does not denigrate the fact that sharing inspiring drawings is a large part of internet culture for students, architects and artists today. Given the media by which drawing is communicated now, we decided that this first edition should be drawn from an open call online. After all, what better way to understand the state of things than to dive into where the action is?

By opening up *Drawing Futures* through a public call for works, we sought to allow artists and designers from diverse fields to contribute to the project and to compile work into a broad-ranging anthology of contemporary drawing practices. As this book is composed of projects selected from over 400 submissions from more than 50 countries around the world, it is safe to say that we have done our fair share of sifting through digital imagery.

We always conceived of this book as more than a record of the proceedings of the conference – as an expanded look into all the many types of drawings being produced or discussed that might not fit into a conventional academic structure. So within these pages, you will find 26 projects and papers presented at the 2016 conference and 34 further works selected for their distinct interpretation of our call. We will leave it to the reader to attempt to distinguish between them.

THINGS TO COME

We have collected projects from architects, artists, illustrators, historians, theorists, computer scientists and more besides. Each of these fields carries its own protocols and approaches to the act of drawing that may seem incongruous or illegitimate to another industry. For instance, drawing is clearly not limited solely to the hand any more, and much writing asserting the importance of the hand-made might overlook the imaginative subjectivity also possible in digital image creation. Yet there is still something about the direct transmission of material onto paper that seems to defy the march of technology. Our hope with this book is that you will encounter work that pushes at the fringes of what you might consider drawing.

Although The Bartlett is a school of architecture, it has always mined inspiration from far and wide, and so it seems appropriate to us that this book takes such a diverse view on what drawing is (and will be). As a school, we wouldn't have it any other way. We hope that this first iteration of the *Drawing Futures* conference – and this book– will exist as a record of all the weird and wonderful ways to explore drawing in 2016.

Of course, we hope that this serves not only as a marker of what drawing currently is, but also as a sign of drawings yet to come.

ACKNOWLEDGEMENTS

We must also thank those who have made this project and book possible. Many thanks to Frédéric Migayrou, Chair and Bartlett Professor of Architecture and Bob Sheil, Director of The Bartlett School of Architecture, for their generous support in bringing this project, which has been a number of years in the making, to fruition. And thanks to Eli Lee and Michelle Lukins Segerström for all their tireless assistance in the development, editing, promotion and production of this book and conference.

As every project was selected through our extensive double-blind peer review process, we must also extend our thanks to all the reviewers who contributed their time and expertise to sort through the numerous submissions and help us to compile this book: Roberto Botazzi, Matthew Butcher, Marjan Colletti, James Craig, Penelope Haralambidou, Jonathan Hill, Perry Kulper, C.J. Lim, Bob Sheil, Mark Smout and Mark West.

Laura Allen
Luke Caspar Pearson
Drawing Futures Editors and Co-Chairs

Augmentations

Drawing has always had an implicit relationship to technology. While drawing is often framed as an instinctive and intuitive act, we should not forget that many of the principles we take for granted today were developed through technologies as much as through the hand. Alberti's devices for perspectival drawing helped the artist manage the complexities of perspective and in turn assisted its proliferation as a representational mode. Piranesi's *Carceri* were distributed as one might buy a contemporary mass-produced art print, the etching plate and the printing press working in combination. We might also think of tools like the pantograph as the precursor to systems of reproduction and replication used today.

Nowadays, it seems there is a tendency to frame drawing and computational technology as difficult bedfellows – representation pitted against simulation. We can take two positions in respect to this. We might point out that there are now innumerable surfaces and interfaces that rely on the interpolation of gesture to function, giving us many means to extend drawing practice through new technologies and materials. Or we might take any tension as a positive energy and move forward into weird and wonderful – perhaps even awkward – confluences of the technical and the intuitive. In this chapter, we will see projects examining the future of drawing through such approaches. *Augmentations* takes us from drawing the microscopic world of bacteria to virtual drawings, from representations embedded on the retina to radical, politicised CAD blocks. In each case we see the drawing practice expanded and challenged through the presence of technology as a fundamental collaborator.

The Head/Hand Dialogue

Madelon Vriesendorp

Drawing Futures: Your work is often described as 'a world', encompassing paintings, objects, games, etc. Where do you see drawings fitting in – what is the role of drawing in your world?

Madelon Vriesendorp: Paul Klee once said, "I take the line for a walk". Drawing is a universal, formal language. It's the hieroglyphs of communication. For me, drawing is like talking – it can formulate an idea, explain a thing or a possibility. It's important for me to translate my thinking process into an image, and drawing often pursues its own course while the brain just follows for a while, then suddenly you hit on an idea, and it sprouts from the pen. You can call it a creative shortcut. The brain/hand connection is crucial to any creative activity – being aware of it brings about a deeper understanding of what you are doing.

DF: How is your world evolving – what's new?

MV: My 'world', as you call it, centres at the moment around making things, installations, collaborations, folding. Mostly creating objects from cardboard or recycled materials.

DF: Tell us something about your collections of ephemera – postcards, toys, figures, etc. Are there any particular pieces that we can see the direct influence of in your own work? Does your collection include drawings, and if so, what kind?

MV: My collection is a constant inspiration. I rearrange families of objects or make collages with beautiful, mysterious or super-ordinary images combined. Some almost compose themselves. I draw cartoons and often start the day (a routine you could compare with brushing your teeth in the morning) with drawing monstrous teeth on a dictator or a celebrity on a newspaper. Or decorate a telephone bill while I'm talking to a friend on the phone. To start drawing – any kind of drawing – is preparing for this head/hand dialogue.

DF: You have a close working relationship with Charles Jencks, which you describe as 'sparring'. This suggests some kind of conflict, but it's clearly a productive rapport. Can you tell us more about the way you work and how drawing communicates between you?

MV: Charles and I have worked together for about twenty years now and he has been incredibly supportive and given me a lot of confidence over the years. His humour, enthusiasm and wealth of knowledge have been incredibly inspiring. While we talk, we sketch. I draw caricatures and cartoons while he conveys his ideas and I try to keep up – as Steinberg says, by "drawing as a sort of reasoning on paper". (Apart from his 'enigmatic signifiers', we produce watercolours and models of his designs).

DF: It seems you are often working in conversation with those writing about architecture. Do you see drawing as a way of stating things differently, or of extending ideas about architecture in ways written language cannot?

MV: Absolutely. One of my ongoing conversations is with Shumon Basar, who is the one that forced me to think about what I was doing. Hans-Ulrich Obrist was the first to call my collection an "Archive".

DF: You have said that being unfamiliar with your surroundings when you were generating ideas for 'Flagrant Delit', meant that you saw "the beauty of things obscure – the inspiration you get from not knowing, from speculating freely". Now, 40 years later, do you feel more 'knowing' and if so, how do this affect your work?

Fig. 1: Madelon Vriesendorp, *Après L'Amour*, from *New York Series*, 1975.

Fig. 2: Madelon Vriesendorp, *New York Juicer*, from *New York Series*, 1973.

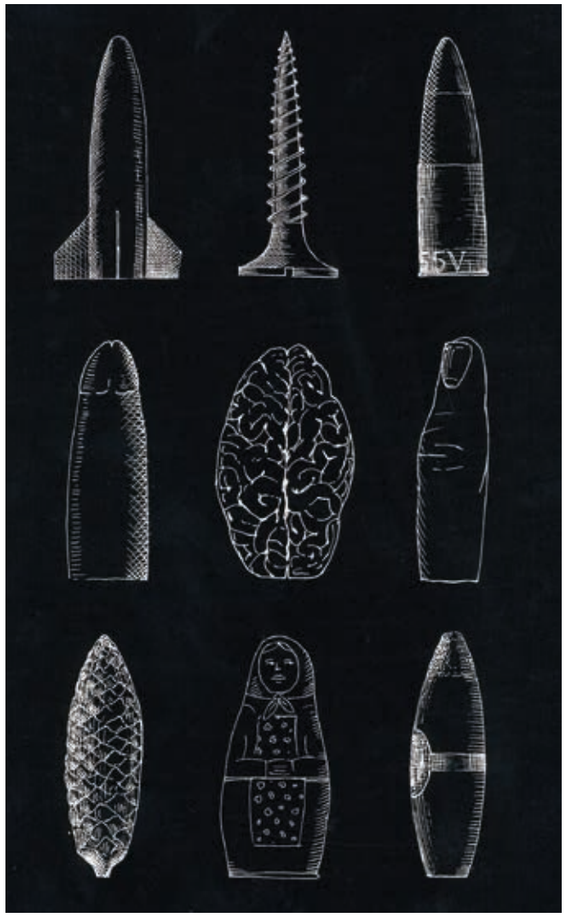


Fig. 3: Madelon Vriesendorp, *'Metaphorical Analysis' for Iconic Building* (with Charles Jencks), 2014.

MV: I don't feel I know anything. The cliché "the more I learn, the more I realise how much I don't know" still holds. Every revelation poses more questions. You keep looking for things that uniquely relate to your personal interests. You become a scavenger in the gigantic garbage heap of information. Every image or object informs and mystifies. All artists scavenge for the most unlikely and obscure, try to make sense of what they've found, and give it a place where it can be used at some opportune moment.

DF: The Manhattan Project was produced independently of *Delirious New York* but now they are synonymous; it forms part of its identity. In fact, much of your work has been used by others to illustrate book covers, magazines and much, much more. When you first made these works, they must have had a very different identity. You are the only person who knows their former life. Can you tell us what they meant and what they now mean to you? Does the work change in your eyes once others adopt it for alternative uses?

MV: No, THEY don't change identity, it's me who's changed. They are a timepiece relating to the time in which we lived in New York, collecting material, i.e. books and postcards for his book *Delirious New York*. These paintings were not produced for the book, independently made, but massively influenced by Rem's research on New York. It was Rem's editor who insisted in putting the painting on the cover. I was at first playing with 'Liberty', making her lie on a bed of Manhattan skyscrapers, like a fakir. Then played with skyscrapers. That's when Rem suggested putting the two in bed together. Saul Steinberg, another influence, had drawn a question and an exclamation mark in bed together. Rem's brother, an artist, had drawn two love-making airplanes in bed. So it happened quite naturally. Then Rem insisted that the Rockefeller Centre, representing modernity, would catch them in the act.

DF: Your drawings are part of some of the most influential texts ever written about architecture. Rem Koolhaas describes himself as a 'ghostwriter for the city'. How do you see your role in forming opinions and attitudes to architecture?

MV: I don't see myself as having a 'role', at least not within the 'practice of architecture'. I'm mostly concerned with the identity, or rather the 'personality' of buildings (male or female, etc.) and how they relate to each other. I collaborate with presentation only. I assume an outsider's role, I observe in a critical way. The skyscrapers of Manhattan were built largely during the Great Depression. There was a craving for optimism and it produced a celebrity culture and stardom, so buildings also became celebrities. Assuming personalities, they lifted the spirits, and inspired hope and admiration.

The same is happening right now. To lift us out of the recent depression, we build iconic buildings, again mirroring celebrity culture and the need for stardom. Now 'big' Architects build big, and 'big' artists make BIG art. I'm afraid we will always hopelessly reflect a vision of ourselves in whatever we do.

DF: The theme of this chapter is 'Augmentations: extending drawing through technologies and materials'. Is there any media or technology that you feel has fundamentally affected your work, particularly your drawing practice?

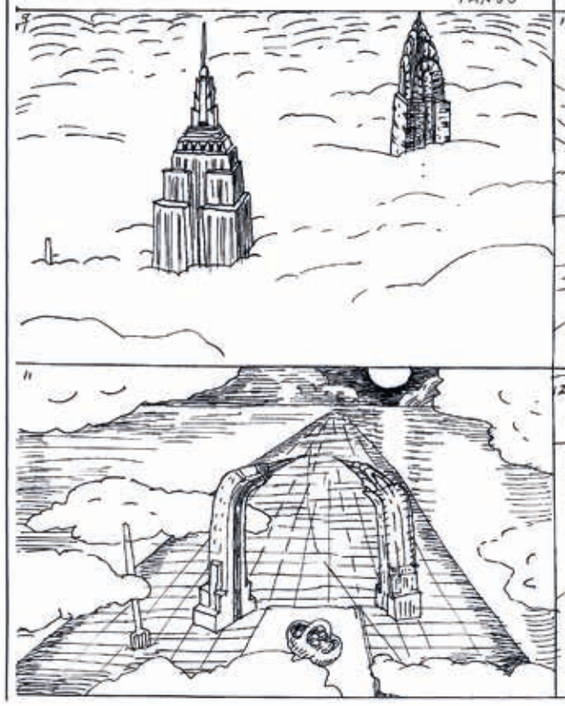
MV: Yes! A pen! I'm always in search of the ultimate pen – one that doesn't allow you to make a bad drawing (and computers drive me crazy).

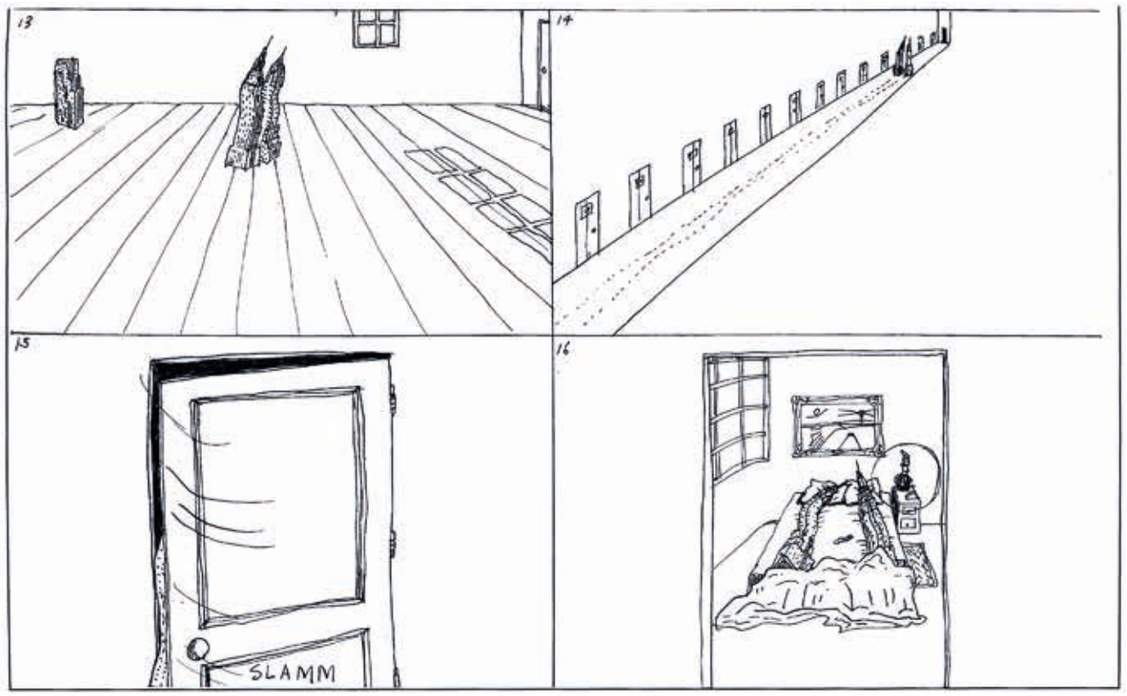
Fig. 4 (overleaf): Madelon Vriesendorp, *Storyboard for Animation: Flagrant Délit*, animation with Teri Wehn-Damisch for French TV, 1979.

(9) clouds moving higher
(10) and lower again while the '2' are coming slowly towards one another
(11) devotion (angelus) scene on manhattan grid
(12) walking to end of island, moon changing into sun, then zooming in on the '2'
(13) and zooming out again.
Showing them on a dancing floor, dancing a tango

(14) walking through a long corridor, along numbered doors, to enter a room at the far end
(15) slamming the door in front of us
(16) we get a look through the door, which has become transparant (see painting: 'après l'amour')

B

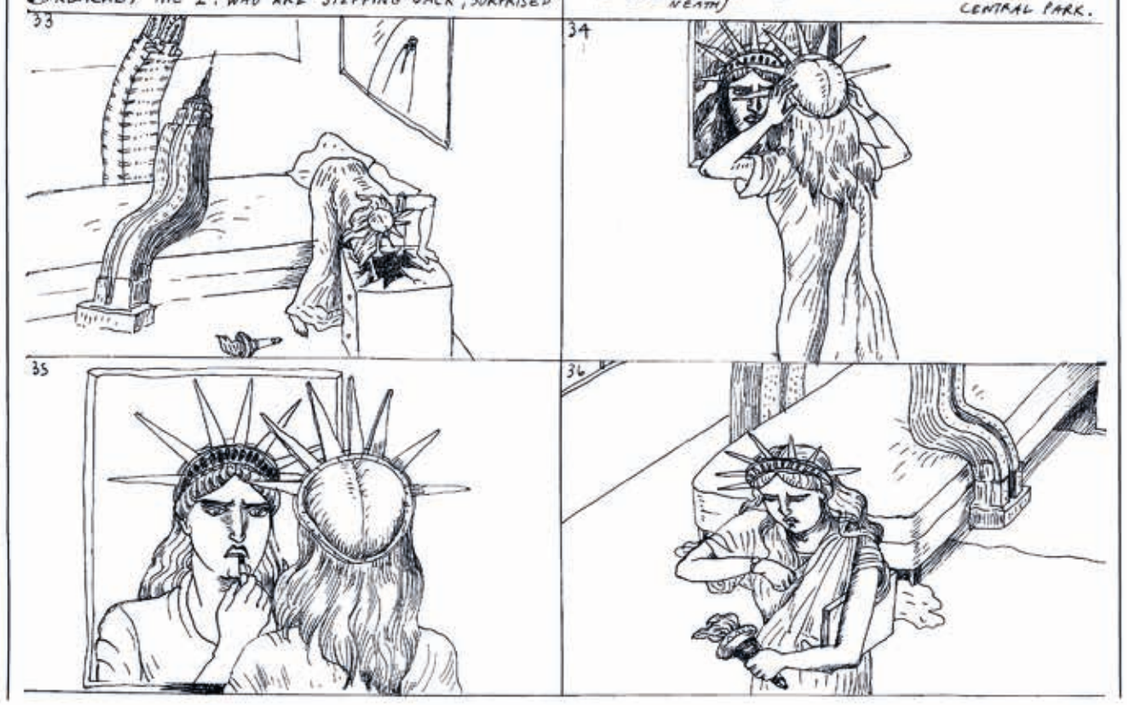


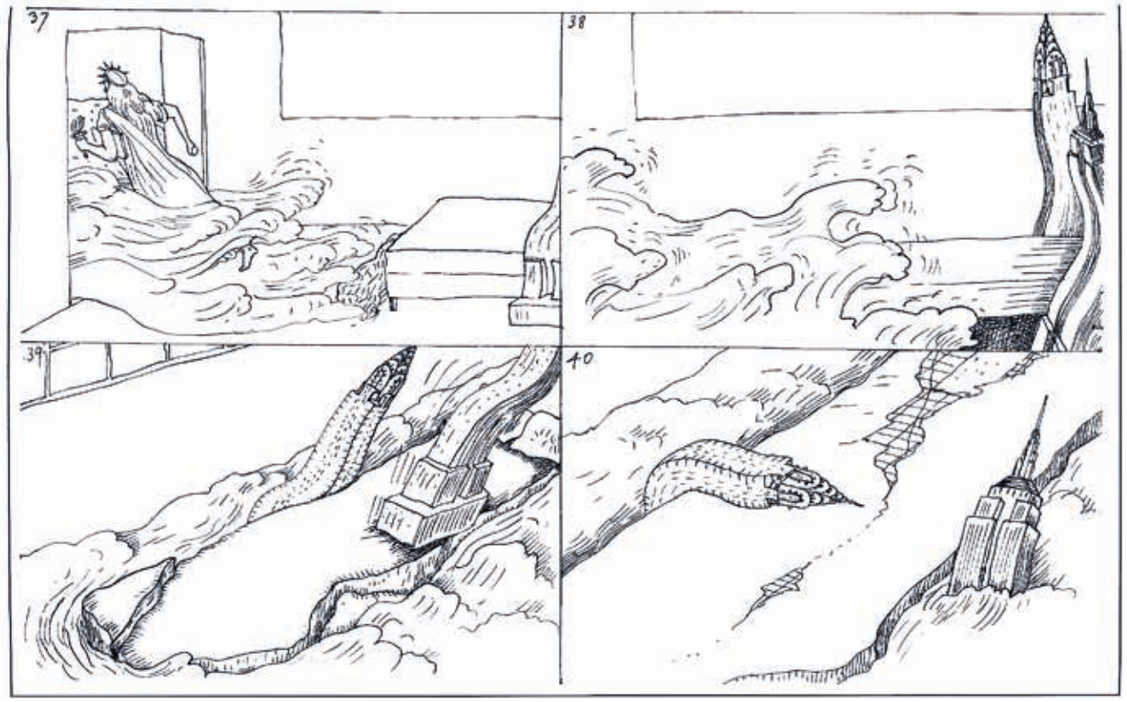


(33) she reaches back for her constitution (book)
(34) fixes her 'crown'
(35) paints her lips
(36) looks at her watch
(37) and leaves in a hurry,
opening the door, she struggles with an enormous wave; which soon
(38) reaches the 2, who are stepping back, surprised

(39) trying to find rescue on the bed
E.S. even jumps on top, but it breaks cracks under his 'feet'
(40) he falls back, ch.b. still struggling to get on top; while the bed keeps on showing cracks and beginning to look more & more like manhatten; its sheet tears & (under-neath) we see the manhattan grid & central park.

E





Drawing the Glitch

Matthew Austin
Gavin Perin

The introduction of glitches into the production of architectural drawing has the capacity to open up and transform what is understood to constitute digital-architectural production. Traditionally, the architectural drawing uses lines as codified indexical representations of existing or proposed real-world objects.[1] The representation of an edge between a floor and a wall, for instance, requires the line to function *through* analogy. Vidler[2] starkly points out that over the past two centuries architectural drawing has steadily become more abstract in its use of analogy and its representations of real-world objects. Digital technologies potentially transform the traditional analogue notion of the line from a projected analogy to an analogy in itself, made up of the discrete units used by digital technology, namely zeroes and ones and the pixel. However, the capacity for the *image* plays a central role in what architecture 'means' and how it is drawn and formulated.[3] The nature of lines, and by extension drawings, in the digital age has fundamentally shifted from being about abstractions of abstractions to "nothing more nor less than the mapping of three- or four-dimensional relations in two [dimensions]".[4]

The ubiquity of the computer in architectural practice means that the drawing is now a purely digital form of information communicated through the channels of the monitor and printer as a pixel array. The intention behind the drawing is usually to transfer this information seamlessly without distortion or deterioration. With traditional modes of drawing, and analogue media in general, duplication inevitably results in the degradation of the artefact, making it of lesser quality than the original.[5] in contrast, digital drawings are copied precisely because they exist as binary-numeric information. The *authentic* site of drawing is no longer the medium on which the line is placed but the way in which the line is digitally represented. This leads Mitchell to write: "A digital copy is not a debased descendant but is absolutely indistinguishable from the original".[6] The nature of the digitisation of drawings means that they can be easily and rapidly transferred, reworked and manipulated. In fact drawings – perhaps for the first time sitting outside explicit authorship and intent – are now open to multiple channels of transference and representation. The capacity to manipulate drawings according to channels means that lines are no longer the fundamental element of the drawing. Instead, the drawing is generated from the fundamental elements of the channel itself. The polymorphism of architectural drawing opens the drawing up to strategies and techniques that operate upon its different modes of representation, whether they are vector-, raster-, textually, sonically or numerically based.

Irrespective of the claim that digital architecture represents a new formal language for architecture, the processes used to deliver form reinforce the ambition for a clear indexical correlation between the form and meaning of the line. The one conversation absent in digital discourse is how the mediation of binary-numeric information opens the drawing up to glitches as this information courses through its various channels of re-presentation. The glitch, working within the hard/solid-state drive and/or RAM of the computer, disrupts the clear transformation of the pixel array as a faithful geometrical-mathematical representation of form. The glitch offers a level of abstraction to the act of drawing similar to that of algorithmic design but, unlike algorithmic processes, the glitch offers *resistance* to the representational capacity of a drawing instead of concerning itself with the production of complex forms.

ON THE NATURE OF DIGITAL DRAWING

With the introduction of computer technology into architecture, the hand gestures of drawing a line have been replaced by the pressing of 'keys', the clicking of 'buttons' and the moving of 'mice'. The act of drawing a line is no longer associated with the bodily movements of its traditional production, but is now the job of the algorithm. These algorithms look after the translation from user input to its visual representation in the design process. However, this opens up two important consequences. First, there is both temporally and mechanically a fundamental *gap* between the drawer (i.e. the designer) and the visual representation of the drawing on the pixel array. Second, the author has very little control over *how* the line physically appears once drawn; the pixels of a monitor or printer change colours as the device gives a digital approximation of the line.

The visual digitisation of the line has transmuted it from an analogy of a real-world – or at the very least a proposed real-world – object to an analogy in its own right. In this sense, the visual representation of the digital line, and by extension the digital drawing, is constructed from a finite set of numerical values mapping onto an orthogonal pixel array.[7] For Matthews,[8] this represents an important shift in the nature of drawing as "the discrete, individual nature of each pixel means that the line is no longer the dominant organising principle of image-making". However, the introduction of the pixel, which is the focus of much curiosity within the study of digital images, highlights an important fissure between digital drawings and pixel arrays; a pixel array can be understood both as a $m \times n$ grid of pixels (the space in which images are printed to monitors or printers) and a linear sequence of $m \times n$ sets of numbers (the space in which algorithms of image analysis and manipulation are designed), which in turn are also zeros and ones (the space in which the computer transforms and works with the drawing).[9] Thus, digital drawings, unlike their analogue counterparts, can be expressed not only visually (via monitors and printers), but also as mathematical sets and binary-numerically (as the information stored on a computer's hard or solid-state drives). For Davis, the visual representation of an image constitutes its 'surface' while other forms of its expression constitute its 'structure'[10] and "selective

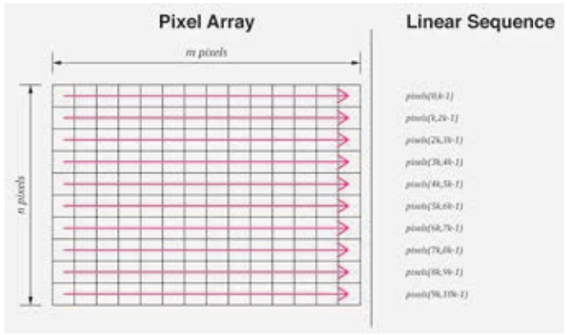


Fig. 1: Diagram showing how an image file can be understood as a two-dimensional array and a linear sequence of values on the computer's hard or solid-state drive.

focus onto the surface of an image greatly ignores the digital code of which the medium is entirely composed".[11] Further, Mitchell aptly points out:

> "It follows from the fundamental constitution of the raster grid that, just as the elementary operation of painting a picture is the brush stroke and the elementary operation of typing a text is the keystroke, the elementary operation of digital imaging is the assignment of an integer value to a pixel in order to specify (according to some coding scheme) its tone or color. Complete images are built up by assigning values to all the pixels in the gridded picture plane."[12]

However, it is common practice within the production of architectural drawings to work through abstract-mathematical representations of lines within vector-based CAD packages, rather than literally change the value of each individual pixel either through transformations of the pixel array or through its linear-sequence representations. In this sense, drawings may not necessarily always be stored on the hard drive as a linear sequence of pixels, but as a series of Cartesian points and geometric constructions around those points. This information is mathematically distorted into 'view space' (shown from the perspective of some 'camera' which may or may not be orthographic), then clipped to the viewport (the size of the image the 'camera' allows).[13] This abstract mathematical representation of objects is then discretised into two separate pixel arrays (the depth buffer, which in turn helps calculate the final pixel-colouring information)[14] and finally rendered directly onto the pixel array of the monitor. This highlights two crucial points. The first is that a wide variety of algorithms are fundamental to the translation of a drawing moving between the hard or solid-state drive and the pixel array. There is a difference in the way the computer 'opens' a vector file in comparison to a raster file, and there is a further difference in the way that the computer 'opens' different types of these files. Different algorithms are used to interpret a drawing for *every* individual file format; there are algorithms that open .JPGs, algorithms that open .PNGs, algorithms that open .DWGs, algorithms that open .DOCs, etc. These algorithms may transmute the drawing in different ways and thus subtly or significantly create different results upon the pixel array.[15] Further, once a digital drawing has been released to its respective audience, it "forestalls the capacity of the author to maintain control over the imaging process".[16] This in turn gives the original author very little control over not only what is done with their drawings, but also the software with which they are viewed (i.e. what algorithms are used to translate them from their binary-numeric representation to the pixel array of the monitor?). The second point is that two identical pixel array arrangements may have two drastically different structural representations, as revealed by Fig. 2.

ENTER THE GLITCH

In the early part of this decade, an artist-photographer named Melanie Willhide had her computer, backup drive and by extension digital-photographic work stolen by Adrian Rodriguez. Rodriguez had wiped the machine and was using it as his own until caught by the local authorities. After the machine was returned to Willhide, she ran recovery software in an attempt to restore her lost work.[17] The result was a series of fragmented and distorted copies of her original digital images. In 2012, Willhide exhibited the work in a show in New York titled 'To Adrian Rodriguez with love'.[18] This is a story which offers two important insights for the discussion around digital drawing.

The first is that Mitchell's assertion that "a digital copy is not a debased descendent but is absolutely indistinguishable from the original"[19] is thrown into question. If errors can enter the visual surface of the digital image via the very nature of the image being stored on a hard or solid-state drive, then quite equally other modes of storage and transference can result in debased copies. This should come as no surprise – Shannon highlighted that "since, ordinarily, channels have a certain amount of noise, and therefore a finite capacity, exact transmission is impossible".[20] Here, a channel is considered any medium that has the capacity to transfer information.[21] While there are modes of digital transfer between computers (such as email, Dropbox.com and external hard drives), the internal mechanism of the computer transfers the information of a digital drawing from its hard or solid-state drive to RAM, GPU(s) and CPU(s), as well as transferring

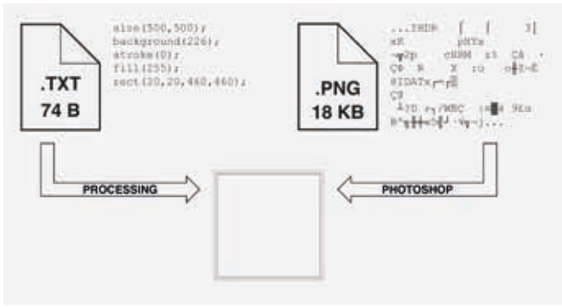


Fig. 2: A simple example of how a text file and an image file can create the same outcome if put through specific algorithms, in this case Processing and Adobe Photoshop respectively.

it to the monitor and/or printer. Mitchell's position on digital images arises from the ideal that "developers design their technologies in order that the user will forget about the presence of the medium, following the ideal logic of transparent immediacy".[22] In fact, computer science has gone to great lengths to check for transmission errors and attempts to correct them.[23] [24] The digital drawing has been designed to be copied and *appear* "absolutely indistinguishable from the original".[25] However, in reality, this is not the case.

The second, and more important, point is that this suggests a new method of working with digital drawings, through non-visually derived manipulations of a digital drawing's structural representations. The fetishised application of these techniques is colloquially referred to as 'glitching', with the distorted outcomes referred to as 'glitches'. Gaulon[26] formalises this colloquial definition as follows: "The digital glitch [...] is a way of seeing the code behind a document." And: "When a digital glitch occurs, it is not the image, the sound or the video that is changed, but their binary code."

It is worth noting that this definition of what constitutes a glitch is still problematic, as it refuses to engage with important phenomenological and technical issues of definition, highlighted by Moradi[27] and Menkman.[28] However, for the purpose of understanding what the glitch within the nature of architectural drawing constitutes, Gaulon's more colloquial definition suffices as a mechanism to explore these potentials.

GLITCHING ARCHITECTURE

For the purposes of this paper, a two-dimensional plan of the Barcelona Pavilion is used to visualise the results of a glitch being applied to a digital drawing. The preference for a plan drawing is based on the fact that three-dimensional drawing files are generally quite resistant to transformations because the glitch will likely result in invalid geometry. This is not to say that it is impossible – Mark Klink[29] highlights that the .OBJ file type has this capacity. However, the .OBJ is an AASCI format and as such the information is read by the algorithm as its literal textual interpretation; in other words, a point's Cartesian coordinates are exactly written in the file as their 'x', 'y' and 'z' values. A further issue is that the operations of manipulating a .OBJ file cannot distort the topology of the geometry, thus making it equivalent to algorithmic distortions available within modelling software.[30] Linear perspective carries with it the issue of literal interpolation. As a mechanism that deals with the 'void (of meaning)'[31] created by such a drawing, it is likely to confuse architecture with its image. This is strongly highlighted by !Mediengruppe Bitnik's H3333333k, in which the façade of a building is literally transformed to resemble the glitched image. Instead, for the sake of clarity, an exploration of the orthographic offers more jarring and difficult questions for architectural drawing in the digital age.

The most prolific and understood form of glitching is the process identified by Davis[32] as 'data bending'. Data bending is the act of transforming a file's linear sequence representations, which in turn causes a visual effect. This is frequently done through binary-numeric code, hexadecimal or even AASCI structural representations. An attribute that Broeckmann highlights is that "malfunction and failure are not signs of improper production. On the contrary, they indicate the active production of the 'accidental potential' in any product".[33] Virilio says that "the innovation of the ship already entailed the innovation of the shipwreck. The invention of the steam engine, the locomotive, also entailed the invention of derailment, the rail disaster".[34] The invention of new technology also implies its modes of failure. In the same vein, the file format implies how it renders its failures. It is impossible to give an exhaustive list of data bending as technologies and algorithms shift and change and file formats are invented, popularised and fall out of use. The way technologies glitch is *unique* to each medium. Nevertheless, there has already been a study done on how differing image formats glitch.[35] What is of interest here is how digital-architectural production can reconcile such transformations and interpret them spatially.

From the figures opposite, several things are now evident. The first, as mentioned previously, is that the figure of the plan is distorted in drastically different ways depending upon what file type is chosen to be glitched. The second is that the distortion is fundamentally at odds with the coherent surface that the pixel array of the digital-drawing attempts to present. The third is that some transformations may distort the drawing's structural representation to such a point that the figural analogy of the object that the drawing claims to represent is lost. Fourthly, the inherent RGB structure of an image is revealed, as greyscale values may break into their constituent parts. Finally, all these pixel array images introduce elements that are at odds with the notational conventions and internal relationships of what they originally represented. The glitched drawing *resists* the drawing's material and spatial notions to be decoded via the allographic rules of the drawing.[36] Thus, what spatial or generative properties does this resistance offer architecture?

The lack of a clear and singular interpretation of the glitched drawing forces the architect to reconfigure and re-evaluate what these drawings mean spatially. These re-evaluations are not spatially unique. For example, the top-left corner of Fig. 4 acts as an illusion, allowing it to be viewed as a plan with portions skewed or as an axonometric (Fig. 5), where the skewed moments in the drawing are vertical projections – however, what the marks on the now-folded surface imply is still unclear. Just as the traditional drawing attempts to narrow the number of valid spatial interpretations through the application of known disciplinary conventions – a property maintained by the surface of traditional digital drawing – glitch drawing disrupts the viewers' assumed allography of the images, forcing them to either reject the validity of the image or, more interestingly,

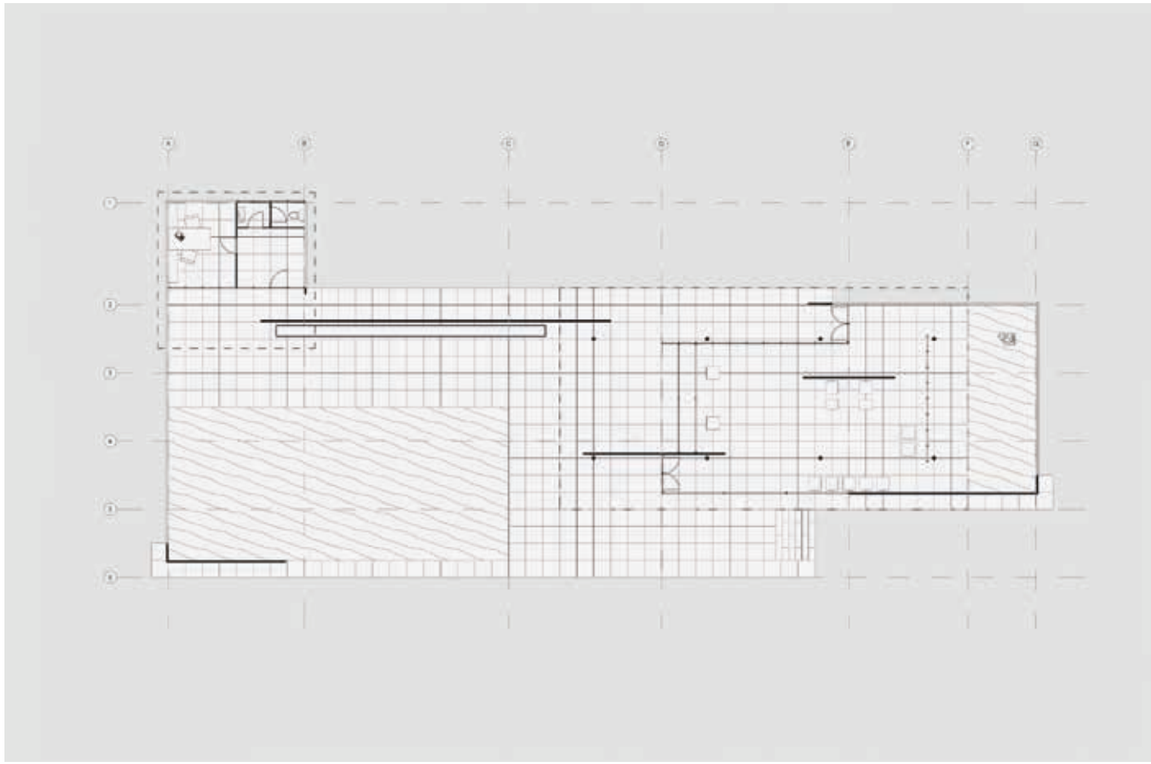


Fig. 3: A redrawing of the Barcelona Pavilion by Kieran Patrick.

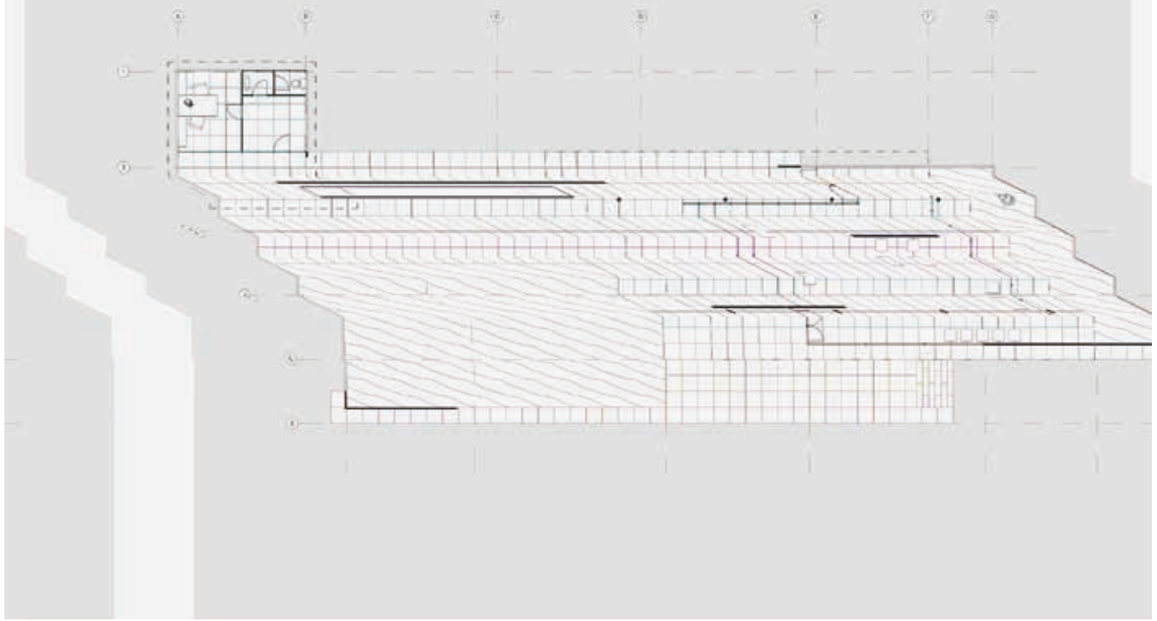


Fig. 4: A study matrix of how the same figure of the plan reconfigures itself depending upon binary-numeric transformations of the plan.

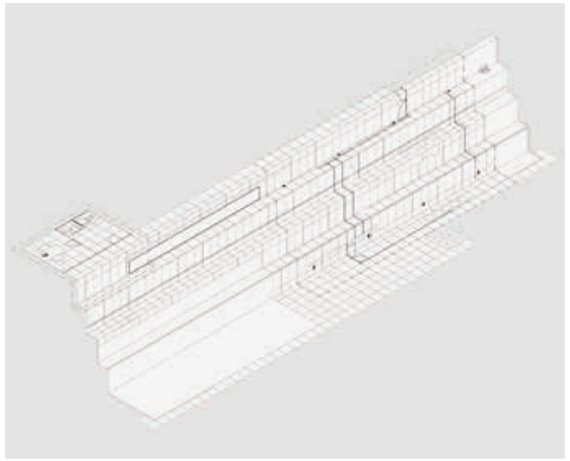


Fig. 5: Three-dimensional reworking of a valid interpretation of the data-bent image of the plan of the Barcelona Pavilion.

attempt to spatially reconcile what the bizarre, uncanny and jarring elements introduced by these processes mean. The glitch drawing forces distance between the spatial condition it purports to represent and the drawing's author. In the same way Eisenman used drawing as a method to deny himself spatial clarity,[37] the glitch has the potential to remove spatial clarity from *any* digital drawing. This is evidenced by Atwood's[38] 'Possible Table', in which otherwise ordinary computational objects are distorted in their projection to the pixel array, which in turn requires further investigation to reconcile what object the resultant projection represents if we assume the distortion had not taken place. The notational nature of drawing means that the glitch transforms it from "a work that is yet to be realised" to a work that cannot be realised without a reworking of what the drawing represents.

The glitched drawing is jarring due to the unconventional nature of its transformations – just as Hansen notes that Lazzarini skews objects, a technique that only makes sense within virtual worlds and computer logics.[39] Here, the glitch replaces translation, rotation and scale as the fundamental operations of geometric manipulation with alien techniques like skewing, fragmentation, interleaving, channel mixing, sliding and colour shifting – and whatever errors are associated with each particular mode of information storage. What does, for example, an interleaving of the Barcelona Pavilion mean spatially? The rotation, translation and scaling of a line or a drawing represents a clear architectural act, as these elements are analogous to an architectural proposition. However, the pixel array represents a line, in as much as its pixels' RGB values maintain enough contrast with the surrounding pixels and the pixels maintain their position in the array. Because glitch techniques work at the structural level of the image, the extension of the analogy of a line being maintained is *not* guaranteed. Although these techniques are new in the context of architectural production and an exhaustive investigation would be required to understand the value and nuances specific to each individual one, their value is that they all *resist* the very thing the drawing purports to represent.

It is evident that the glitching of a plan requires a complete reconsideration of the vertical nature of the result, and in turn the glitching of an elevation requires a reunderstanding of the plan. In fact, the glitch not only resists architectural convention, but also disrupts the relationship between architecture's different modes of representation. Further to this, architecture's other modes of representation (such as video) constitute a difference in technology and thus glitch in a fundamentally different way. The glitch has the potential to disrupt architecture at any point within its production to force a complete reworking of what the architectural drawing intends to represent.

Where traditional modes of digital drawing shift the line as the predominant organising structure of the drawing to the pixel,[40] the glitch shifts it from the pixel array to the unfamiliarity of non-visual representation. The drawing's hidden binary-numeric nature and polymorphism unite with the nature of digital media to offer architecture the capacity to resist its own disciplinary conventions. In this sense, the glitch of a drawing demands a reimagining of the grammatical assumptions of our representations. Instead of attempting to close down the interpretation of the drawing into a single unique spatial condition, the glitch denies the viewer this opportunity and is therefore dependent upon the individual's capacity to interpret and spatially reconcile a reworking of the surface representation of what the surface of the drawing originally represented.

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