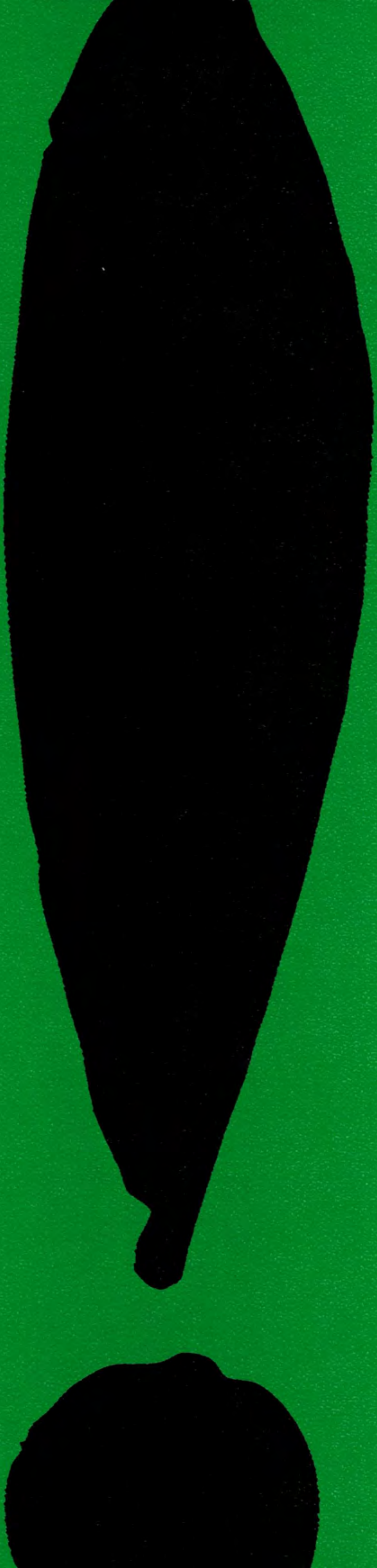
ONUS



Perspecta 53

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In the Shadow of Information

Michael Young

The surfaces of our environments are scanned, stored, monitored, cross-referenced and monetized. This is done by governments, militaries, corporations and you. It is done by satellite imaging, LIDAR scans, Google Street View, Bluetooth beacons and what was formerly known as photography. Knowledge of this monitoring produces an unavoidable dystopian anxiety, the fear of constant surveillance and the disappointment in knowing that everywhere will soon be transformed into information. Yet all technologies of mediation produce residual effects. In the case of our digitally mediated environments, this excess is the very real space lost between and behind the discrete instances of scanned points. This loss manifests as shadows – gaps where scans skip and stutter, struggling toward fidelity. These shadows also open zones for occupation; they are inherently political.

There is a concept that relates to these hidden zones, emerging initially in the late fifteenth century as a graphic abstraction in architectural representation. This chapter argues that the shadows that hide behind and between the scanned imaging of the environment can be understood as a transformation of the concept known as *poché*. The way in which architecture understands these gaps as alternative possibilities for inhabitation is a pressing issue, given that reality is increasingly mediated through the digital image.

Image as Information

Our cameras are not cameras anymore. Data scanners, photon collectors, discrete energy arrangers: these are more apt names. Not everyone has noticed. Though we still treat the images that our digital cameras reproduce as if they are photographs, our digital cameras do not index light as a chemical interaction with film emulsion. Instead, they capture, translate and store arrays of energy intensity as information.[1] As John May articulates, "In our lives, imaging is a form of photon detection. Unlike photographs, in which scenic light is made visible during chemical exposure, all imaging today is a process of detecting energy emitted by an environment and chopping it into discrete, measurable electrical charges called signals, which are stored, calculated, managed, and manipulated through various statistical methods."[2]

Display screens are performance spaces where captured information is transformed into luminous pixels, pulses of energy that human eyes evaluate as images. These images are typically engaged through the conventions of previous visual arts, such as painting and photography, which offer important avenues for understanding such loaded concepts as realism and abstraction. Yet these aesthetic categories take on different aspects when mediated through technologies of reproduction, where concerns are less interpretive questions of representational resemblance than the disinterested record of scanned points. How these differences manifest discursively is a key question. Let us begin with *resolution*.

Resolution is the product of a technological, economic and aesthetic negotiation. The discretization of the environment into bits of information begins with the

1
John May, "Everything Is Already an Image," *Log* 40 (Spring/Summer 2017): 12.

2
John May, *Signal, Image, Architecture* (New York: Columbia Books on Architecture and the City, 2019), 45.

technology of capture and carries on into storage, display and transmission. As higher resolutions take longer to process, requiring faster and more expensive computational power, image information is compressed in order to be manipulated, transmitted and consumed. There is a constant struggle in the appearance of digital images between the fidelity of the resolution and the econometrics of attention and distribution. Resolution is a valuation made through digital information, an exchange between competing priorities.

If our eyes perceive the pixels of the discrete array, we call the image "low-res"; if they don't, we call it "high-res." These terms may feel quantitative and objective; after all, we key specific numbers for PPI (pixels per inch) in Photoshop. But the difference between what is "high" and "low" is ultimately subjective, a differentiation made based on human perception. Gaps between points of scanned data are often discussed with a sense of mourning, a nostalgia for a lost analog richness of reality. This sentiment reflects an aesthetic judgment of realism in its guise as mimetic resemblance, comparing the sense of vision to the representational artifice. However, a digital image does not operate within the realm of representation, it is a mediation, and thus the aesthetic questions are different. Representations are constructed through cultural conventions and require knowledge regarding the manners through which specific disciplines regulate interpretation. Mediations attempt to record everything without an imposed bias. The gaps, noise, errors that occur in "the attempt to record everything" are terms used to describe aspects presented by mediations that lie outside familiar sensation, affects that have not yet been culturally valued. These are aesthetic responses and when coupled with techniques of manipulation and modes of performance-display particular to the mediation, become key features for working with these technologies. Yet, as important as these aspects are, they elide a crucial fact: digital images are also information captured by machines for machines.

Trevor Paglen reminds us, "The image doesn't need to be turned into human-readable form in order for a machine to do something with it."[3] In this context, resolution is little concerned with the human eye, yet the quantity and density of data contained in an image will determine how it will be analyzed, filtered, and combined with other data sets. For a machine exchanging information with another machine, gaps are a given as digital information is and always has been discrete. This discretization structures how it is processed in relation to other information and then acted on by very real forces in the world. In their study of how scanning, computation and visualization are expanding into political, ecological, legal and cultural realities, Eyal and Ines Weizman write, "The exclusion of people from representation is thus complemented by their gradual exclusion from the increasingly automated process of viewing and also . . . from the algorithmic process of data interpretation."[4] Digital images are used today to determine the reality of everything from human rights violations to the quantified extent of glacier retreat to

3
Trevor Paglen, "Invisible Images (Your Pictures Are Looking at You)," *New Inquiry*, December 8, 2016, https://thenewinquiry.com/invisible-images-your-pictures-are-looking-at-you.

4
Eyal and Ines Weizman, *Before and After* (Moscow: Strelka, 2013), 38.

Detail of Room portrait, by Veronica Skeppe, Cecilia Lundbäck and Ulrika Karlsson 2019, from Interiors Matter: A Live Interior.

This study of the domestic interiors combines the measured LIDAR point scan with coordinated photos at each pulse. The shadows appear as white areas behind objects. The overlapped shadow gaps of three scanning passes can be seen behind the flower vase. The reflective material of the lamp stand is missing altogether, unable to be registered by the sensors.

potential military targets. Furthermore, as they are evaluated by machines using criteria foreign to humans, every digital image also redistributes the background of reality. In this, the gaps between points are real, only this reality means very different things depending on who, or what, is engaging the mediation.

Blind Pockets

Information carried through electromagnetic radiation generally cares very little for the built environment it passes through. Only a small specific range of energy is reflected off surfaces and detected by human vision. It is this range that digital cameras simulate. The question of "seeing" the world through digital mediation in a manner similar to vision takes on a different implication when expanded to technologies that uses images to build three-dimensional models. The information captured, stored and processed through lidar and photogrammetry is not only trying hard to *see* as many qualities of environmental surfaces as possible, it is also trying to give them spatial depth, it is trying to *touch*.[5]

The representation of depth is a fundamental question for all visual media, especially for drawing, painting, photography and digital images, which all occur on a flat plane. Lidar and photogrammetry appear to have resolved it through automation. Depth is computed as part of image capture itself.

The image no longer signifies depth through representation but instead measures space as an inherent component of its computation. Our environment, our objects and ourselves are being collected as three-dimensional digital bodies. These scanned approximations of the environment determine what is stored, cross-referenced and distributed, which aspects are "real" for the valuations of digital exchanges and how that in turn alters our occupation of the world. A loss of information or a lowering of resolution literally changes the shape of reality.

The scanning of the environment is also its surveillance. Liam Young has made a series of films that explore the narrative possibilities of a world known through LIDAR scans. *Where the City Can't See* (2016), codirected by Tim Maughan, looks at the potential for inhabitation in relation to the scanning technology of our urban environments: "Set in a futuristic Detroit that has become heavily surveilled, . . . it tells the story of teenagers organizing illegal parties while hiding themselves — and even whole buildings — by wearing clothes made from 'deflection fabrics.' These materials, the patterns of which are designed to deflect and diffuse the LIDAR's laser scans, make them invisible to the eyes of automated vehicles."[6] These zones hidden from the scan become spaces for occupation. Young and Maughan suggest that these spaces open possibilities for human activities that require freedom from surveillance. Architecture can create these gaps through a kind of camouflage that intervenes and "deflects" the capture of surface location as energetic information. Or, to put this another way, the decoration of surfaces alters the information that is collected in a digital scan, all objects in the environment can potentially intervene in its energetic capture.

5
Lucia Allais, "Rendering: On Experience and Experiments", *Design Technics: Archaeologies of Architectural Practice*, Zeynep Celik Alexander and John May ed. (Minneapolis, MN: University of Minnesota Press, 2019), 60.

6
Tim Maughan, "No One's Driving," in *Machine Landscapes: Architectures of the Post-Anthropocene*, ed. Liam Young (Oxford: John Wiley & Sons, 2019), 96.

Such blind zones can also be described as shadows, *sciographias*, invisible to data collection, dark pockets looming on the other side of the scan.[7] Shadows are an occlusion of light, and there is a long history in architectural representation that entwines optics, perspective projection, and shadow drawing.[8] In its attempts to record surfaces, scanning technology does not differentiate between the articulated layers of decoration (*mosaïque*); transitory objects such as people, cars, furniture and vegetation (*entourage*); or the solidity of architectural mass (*poché*).[9] These are all smushed together into a thin glitchy body of surface topology floating in three-dimensional space absent of thickness and solidity. The differences between lidar and photogrammetry will be discussed later. For now, it is important to note that both have linear relations between the capturing source and the first surface struck, occluding all that exists behind that instance of reflected energy. The intersected line of sight, or ray of light, connects art and mathematics through projection as formulated by painters, surveyors, and stonecutters in order to represent visual depth on a two-dimensional plane. Architectural representation was born of this exchange between the metric computation and visual image of the environment, and it is the history of this entanglement that allows architecture to engage these questions in significant ways.

These relations to projection, optics, and photography, tends to classify lidar and photogrammetry within ocular and visual media. But this is only part of how they operate. What is imaged in a three-dimensional scan is an interference between matter and energy. Scanning passes over things evenly, distractedly, objectively; it is as tactile as it is visual, its mediation is a point not a line, and the gaps consist of what is skipped as much as what hides behind.

Poché emerged through the representational technologies of the Northern Italian Renaissance and was codified in the pedagogy of the French Academies and the École des Beaux-Arts during the eighteenth and nineteenth centuries.[10] According to the most common architectural understanding, *poché* is the representational convention of using graphic hatch or colored fill to denote cut material in plan and section drawings. But this definition of the term is complicated by other associations, such as "pocket," "hidden" and "swollen."[11] *Poché* presents contradictory issues simultaneously. First, it renders figure-ground relations, where spatial voids become aesthetically sensible and conceptually legible. Second, in the abstraction of notation, it conceals all information regarding material, construction, assembly and building systems. When a drawing is rendered with *poché*, it is concerned not with

7
Sciographia is derived from *scio-*, "shadow" and *graphy-*, writing or inscription.

8
Thomas Kaufmann, "The Perspective of Shadows: The History of the Theory of Shadow Projection," *Journal of the Warburg and Courtland Institutes* 38 (1975): 258–87.

9
"A good plan sustained a depth and transparency achieved through the dessin techniques of entourage, *poché*, and *mosaïque*—graphic codes that made the plan legible to an architectural audience." Hyungmin Pai, *The Portfolio and the Diagram* (Cambridge, MA: MIT Press, 2002), 52.

10
Michael Young, "Paradigms in the Poché," *Proceedings of the ACSA Annual Meeting* (Washington, DC: Association of Collegiate Schools of Architecture, 2019), 190–95.

11
Wiktionary, s.v. "poché," accessed June 1, 2020, https://www.en.wiktionary.org/wiki/poché.

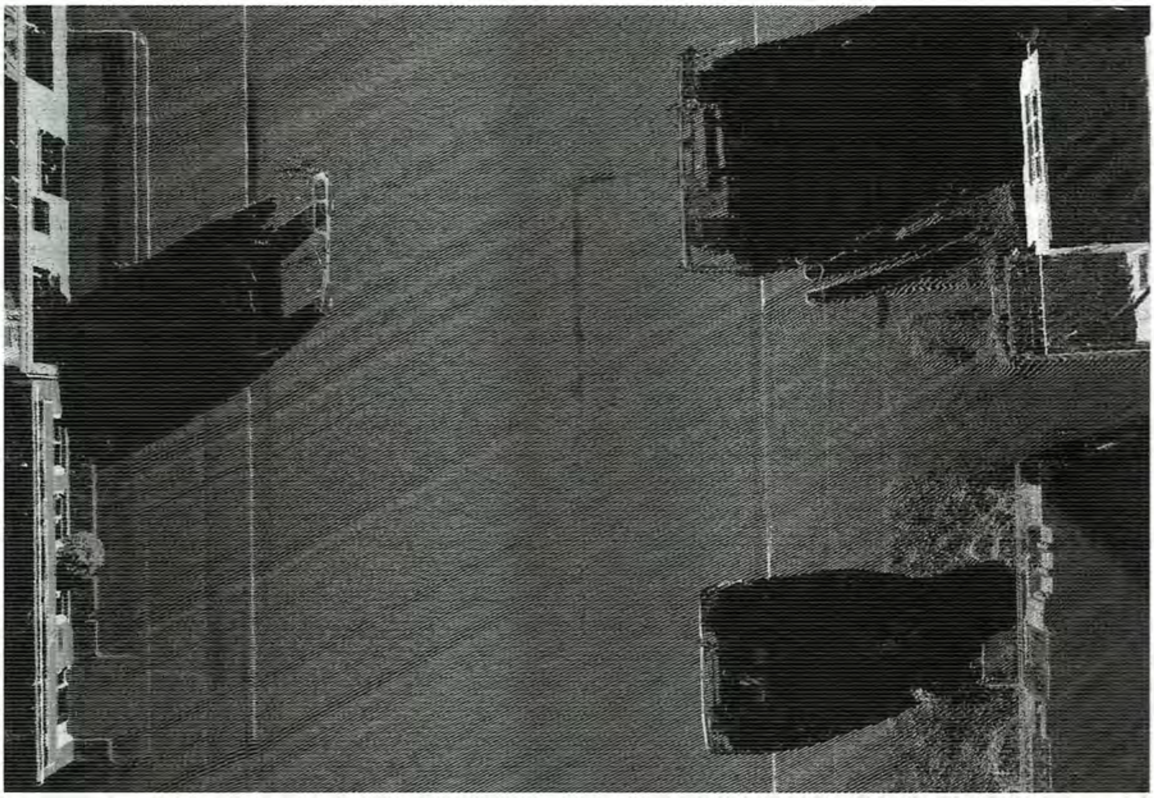


Photo taken using the Snoopy Highway Mapper LIDAR System, 2019.

In this study, the LIDAR sensor is mounted to the roof of a car travelling down a street. This is an aerial top view of a captured moment, where the directionality of the laser pulses is clearly noticeable in the data shadows, occluded by cars and other street objects.

conveying how to build the design but instead with imaging architecture in a way that exists as representation, for an audience that will evaluate the spaces through imaginary projection. *Poché* exchanges construction labor for intellectual labor, material assembly for spatial conceptualization. It is economic; one reality withdraws to allow another to become sensible.

Services of Surveillance

The pockets of space that exist between the interior and the exterior; the basements, attics, back stairs, passages, plenums, shafts and cavities are not empty, they are filled with services, both human and nonhuman. These residual spaces are purposefully hidden to keep them from disrupting the cohesive visual image of the environment. As Mark Wigley explicates:

> No building form is as complex as the systems that service it or the activities it services. Architecture is an act of simplification or of veiling complexity. It is dedicated to the skin more than it can ever acknowledge. Perhaps nothing can be as thin as architecture, the art of suspending perforated surfaces within a myriad of flows to paradoxically represent seamless solidity.[12]

Energetic pulses captured on cellphones relay through floors and walls, in route from phone to satellite to server to database. These wireless networks determine much of what currently defines the background of our daily interactions.[13] We have come to depend on and expect connectivity at the same time that we increasingly feel the need to escape this constant surveillance. Broadband connectivity is legally an infrastructural public utility.[14] Like water and electricity, it is expected to be continuously available, thus backgrounded and blackboxed; its operations withdrawn from human attention.[15] We notice it only when it provides faulty service. Wireless media not only provide access to information; they produce information by monitoring user interactions. In this exchange, both sides prefer its operations to be invisible. The consumer wants digital information at the highest fidelity possible, in real time, and constantly accessible everywhere. The provider of these services wants the consumer to use them habitually as a normal everyday interaction with the world. This integration into the background of the environment is important, for it is the unconscious behaviors of daily life that are the most easily monetized. This agreement is also the foundation of contemporary surveillance.

The temptation is to locate surveillance entirely in the technology of internet, but what turns these networks into apparatuses of control is not just computational

12
Mark Wigley, *Buckminster Fuller Inc. Architecture in the Age of Radio* (Zurich, CH: Lars Muller, 2015), 77.

13
Mark Wigley, *Buckminster Fuller Inc. Architecture in the Age of Radio* (Zurich, CH: Lars Muller, 2015).

14
Cecilia Kang, "Court Backs Rules Treating Internet as Utility, Not Luxury," *New York Times*, June 15, 2016, https://www.nytimes.com/2016/06/15/technology/net-neutrality-fcc-appeals-court-ruling.html.

15
This combination of "blackboxing" and "withdrawal" owes a significant debt to Bruno Latour and Graham Harman and will be explored in greater detail in other writing.

algorithms; it is the way they have been naturalized as part of the environment. Which brings us to architecture. What is withdrawn in the *poché* is not removed from knowledge. It is simply removed from attention, yet nonetheless continuously produces the environment as a distraction for consumption. We know that our walls and floors are full of pipes, insulation, structure, wires, ducts, membranes, and fasteners running all over the place and connecting "somewhere" to an "outside." The internet is an extra-planetary piece of infrastructure hidden outside the atmosphere, beneath the crust of the earth, below our city's streets, and within our building's shafts. Hiding "the internet" in the pockets of the *poché* allows us to behave as if our environments are material, solid, real enclosures, and information is an ephemeral cloud-like flow of data.

Surveillance means to "keep watch", it is an idea based in sight. Jeremey Bentham's panopticon, with its single, all-seeing watchtower at its center has played a paradigmatic role within the cultural discourse of ocular centric surveillance at least since Michel Foucault noted its architecture of control and discipline.[16] Within this model, inhabitants of the periphery behave as if watched, even if there is no one watching inside the tower. Extending the panoptic model into the internet seems to make sense as all users become increasingly subject to constant surveillance by a handful of powerful private companies. But aspects of this paradigm do not seem accurate in describing internet monitoring. For instance, we all know we are being watched, we just typically ignore it. Furthermore, we are not really being "watched", we are being recorded and exchanged, scanned and statistically filtered. This should still instill anxiety, if not more so given that all interactions on the internet are searchable and stored forever regardless of their importance, but it is exactly this constant tracing of meaningless data noise that seems to undermine the ocular-centric control of vision. Petra Gehring has challenged the extension of the panopticon into internet surveillance. "It may well be that the presence of mass-media pictorial rhetoric is overestimated. Other techniques penetrate deeper, techniques that include knowledge of automatic registration and the permanent possibility of processing the traces that I leave."[17] Gehring continues on monitoring technologies, "...in their core they are post-panoptic. They rely on registration that is performed out of sight and on data acquisition procedures that run unawares—and which thus as a rule do not merely result in behavioral discipline, but rather lead to a fundamental subjective disquiet."[18]

Poché offers a potential paradigm for the type of monitoring that operates in contemporary society—one more apt, perhaps, than the panopticon. Our actions are n longer watched from an analogical, geometrical or diagrammatic center but instead from a zone hidden within and behind the screens and surfaces of our environmenta background. Monitoring occurs below the threshold of

16
Giorgio Agamben, "What Is a Paradigm?" in *The Signature of All Things* (New York: Zone Books, 2009).

17
Petra Gehring, "The Inverted Eye. Panopticon and Panopticism, Revisited", *Foucault Studies*, No. 23, August 2017, 60.

18
Petra Gehring, "The Inverted Eye. Panopticon and Panopticism, Revisited", *Foucault Studies*, No. 23, August 2017, 62.

attention not at a focal center. "Image" is simply a visual metaphor for the sound, light, heat, movement, time, attention, and currency exchanges that service our desires and monitor our behavior. What hides in the *poché* is the hum and hiss of the infrastructure, recording, mixing, and filtering reality.

Capture and Process

Though the historical development of LIDAR and photogrammetry are closely related, there are some important differences to emphasize regarding how each captures and processes environmental surface data to build spatial models. LIDAR works by measuring distances in the environment, photogrammetry calculates depth through images. What is hidden, then, depends on how the environment is sensed, stored, and processed.

LIDAR (light detection and ranging) uses lasers to scan the environment. An electromagnetic pulse is sent out and bounces back to the imaging source, and a measurement of the time it takes for the signal to return allows distance to be calculated.[19] This is considered an active sensor, as it emits energy. Every point is an individual measurement in *x-y-z* coordinate space, independent of ambient environmental lighting, color, texture, and pattern. The type of material (concrete, tree foliage), its reflectivity (glazing, wet) and the distance from the scan source all affect the return of the signal and can produce noise, irregularities and other errors in the scan.

Photogrammetry, on the other hand, measures depth by comparing two photos. Photogrammetry has been in use as long as we have had photography for surveying, most often in engineering and military contexts.[20] The transformation that has occurred, thanks to computational technologies, is that huge sets of "photos" can be rapidly processed to produce spatial models. The identification of surface edges and detail depends on pixel comparison, which relies on the resolution and intensity of energy captured in the initial photographs.[21]

A ground-based lidar scan can be created from a single sensor origin, however this will have large areas of occlusion. In order to get a more complete dimensional model of the space measured, scans from multiple origins are necessary. Photogrammetry, by contrast, requires more than one scanning position to produce any spatial information. The calculation is done through differences between two images of a single object, that is through motion.[22] The movement of scanning is wedded into the computation of spatial depth.

19
Todd Neff, "Lidar History Timeline," online supplement to *The Laser That's Changing the World: The Amazing Stories behind Lidar, from 3D Mapping to Self-Driving Cars* (Amherst, NY: Prometheus Books, 2018), https://toddneff.com/books/lidarhistory/extras/lidarhistory-timeline.

20
Helen Wickstead, "Drawing on Photographs: Aerial Photogrammetry and Virtual Mapping 1865 to 1900" from *Royal Anthropological Institute Conference*, British Museum 28th, May 2014.

21
Methods of pixel comparison are fundamental for machine vision, CNNs, GANs and image search algorithms; i.e. facial recognition, atmospheric pollution emissions, traffic patterns, etc.

22
Matthew Magnani and Matthew Douglass, "Photogrammetry and Stereophotogrammetry," *The SAS Encyclopedia of Archaeological Sciences*, ed. Sandra L. Lopez Varela (New York: John Wiley & Sons, 2019).

Edges in scanned models are jumps between points representing different surface planes. Edge in this context is thus not the geometric intersection traditionally represented and controlled through the graphic drawing of a line. Edges in three-dimensional scans often look funny; they smudge and fray, sometimes drifting into the shadowy void behind. Multiple scans increase the model's definition and tighten its corners. When a model is lowered in resolution in order to be manipulated or transmitted, one of the first places distortions appear is at the edges and corners.

The number of points determines the level of detail. Lower resolution scans or increased distance from the object produces less accurate mapping of the surfaces. For photogrammetry, color and brightness of reflected surface energy can produce data capture confusion also resulting in loss of surface detail. Resolution in capture extends into the performance of the model as a point cloud. From a distance, these models can have a somewhat disturbingly high degree of realism. As one zooms in, the point cloud disintegrates: points spread, gaps open and eventually the surface dissolves entirely. In this, the difference between realism and abstraction is but a matter of degree, or literally a matter of zoom.

The shadows of occluded information are reduced by having multiple scans, but there will always be pockets the scanner cannot access. Gaps in LIDAR scans are caused by occluded lines of sight and resolution, which are a function of the number of scanning passes. Gaps in photogrammetry, on the other hand, are dependent on the electromagnetic range that is captured by the sensing technology, in simpler terms, the color and resolution of the initial digital images. What is missing and how those gaps are accounted for is different for each technology. In both cases, however, the most "successful" models work to complete the surfaces as they are seen from certain privileged views, which are different depending on the industry for which the model is intended. "View" should not be equated with vision; it is as likely to be an aerial drone or a satellite image as it is to be the height of a human eye. In the efforts to fill the gaps, an interesting side effect is produced: the scan turns images into objects.

Image-Objects

All digital models are double. They consist of an interior surface model floating inside an exterior surface model. Though this is true of all digital modeling, it is rarely commented on, perhaps because most digital models are developed as a single surface that is then offset, making one surface the result of the other. This offset does not produce "thickness," however, and all digital models that develop both their interior volume and exterior mass are objects inside of objects, connected by funnels called "apertures." A modeled building's interior volume is independent of its exterior mass and is made sensible as a figured void, appearing as a solid object. In his book *Baroque Topologies*, Andrew Saunders writes,

> Although not technically able to see through external surfaces to the underlying hidden layers of composite structure, 3D scanned point clouds produce a novel effect of transparency on the thin membrane surface of enclosure due to the spacing of points. This enables a unique topological vantage point to view the spatial envelope of the interior from the "outside" as well as from the "inside" simultaneously. It is as if the entire internal poché of the churches has been completely

drew Saunders, LIDAR scan of San Lorenzo, Tornio, 2019.

point-cloud model seen here is the product of multiple scans from different origins. a good example of the diaphanous veil-like appearance of point-cloud models, the metric objectification of interiors, and the strange effect of being able to see through faces that are closer to the viewpoint.

> removed to reveal only a thin spatial residue of the interior shell volume, a view never before imagined. To view the inside from the outside and the inside turned out paints a completely new understanding of the total working of the interior volume as a whole. The interior becomes a manifold body providing an unprecedented representation of the complete spatial capacity of Baroque interior.[23]

The digital model, as captured by three-dimensional scans and imaged as a point cloud, reveals this "volume as object" aspect. As Saunders points out, the technology of capturing these surfaces, as points mapping surfaces rather than lines representing edges, is not only a more accurate model but is also a novel mode of representation and visualization. Point-cloud models render the interior volume as a coherent whole, a "figured void" (a phrase that comes very close to ideas—such as "detached lining," "spatial nest," "space within a space" and "things in things"—developed by Robert Venturi in his efforts to describe qualities of *poché*[24]). In a way, all three-dimensionally scanned environments are interior volumes, even the exterior spaces of streets, parks, and public squares. The scan is a discrete-point registration of a bounding volume of the surfaces surrounding the sensor-camera. This capturing origin is *within* the space; it records all that surrounds it and manifests the information as a model of discrete points. When the model is then displayed—and especially when it is viewed from locations that humans do not typically inhabit—the gaps created by resolution and occlusion are revealed. In other words, to "see" the missing spatial information requires a disembodied eye, or more accurately, the acknowledgment that the model is a thin liminal layer of something not quite an image, an object or a volume. The *poché* lies within, behind, and between the non-dimensional surface of points.

Our environments are assumed to be continuous. This quality is part of how we define reality: there are no holes, no gaps. Energetic scans of the environment attempt to collect this continuity. But because electronic storage and transmission requires signals, the environment must be cut into discrete bits of energetic information that can be processed.[25] This discretization produces gaps, frays, and tears in the mediated surface. As Hito Steyerl points out, these models are never fully two-dimensional or three-dimensional:

> 3D technologies don't only render the parts that are actually captured as locational measurements by a lidar scanner, but also the parts that are missing from 2D images: the shadowed, covered or cut parts of the image. The missing data are assigned a volume or a body. The shadows and blind spots are not off frame, masked or cut off as they might be in a 2D shot, but treated as equal parts of the information. What emerges is not the image of a body, but the body of an image that itself presents information on a thin surface or differentiation, shaped by different natural, technological or political forces.[26]

23
Andrew Saunders, *Baroque Topologies* (Modena: Palombieditori, 2018).

24
Robert Venturi, *Complexity and Contradiction in Architecture* (New York: Museum of Modern Art, 1966), 71–86.

25
Friedrich Kittler, *Optical Media: The Berlin Lectures* (1999; Cambridge: Polity Press, 2010), 26

26
Hito Steyerl, *Duty Free Art* (London: Verso, 2017), 197.

There is a mistaken belief that to resolve the "glitches" and errors in the scanning of the environment, all that is required is a more advanced, higher-resolution, faster-processing technology. This line of thinking misses the point, for all technologies of mediation substitute abstractions for reality. It is the tensions and frictions that give each medium its aesthetic characteristic. In the case of the three-dimensional scan these are; the point cloud as energetic interference, the edge as fray of resolution, and the data shadow as *poché*.

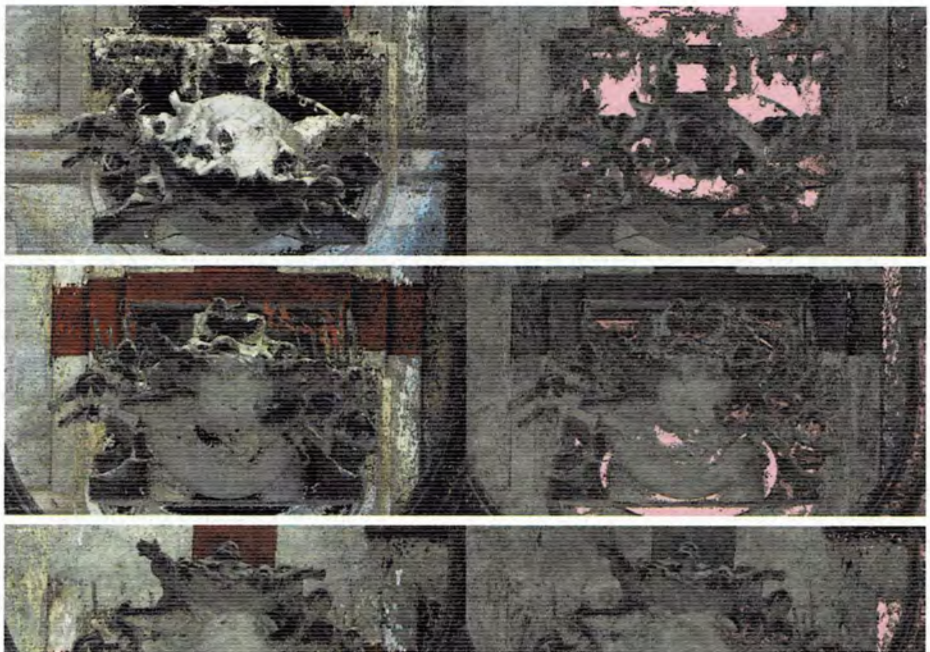
The Electromagnetic Threshold

In the history of urban representation, poché is most often associated with the "Nuova Pianta di Roma" by Giovanni Battista Nolli (1748). Commonly known as the "Nolli map," this engraving abstracts the city into figure and ground; roads and squares, as well as the quasi-public space of civic-religious interiors are left blank, while the mass of the rest of the built fabric is hatched black. The Nolli map makes legible the infrastructure of movement, the economics of private ownership, and the shared zones of public exchange. It is still popular because as a representation it allows people to analyze, interpret, and act on the city though a mode of abstraction. It is also a highly problematic representation that reduces urbanism to a private-public, figure-ground dichotomy.

The differentiation of figure from ground, solid building from empty space, becomes irrelevant when edges no longer constitute linear bounding contours but instead the falloff at energetic thresholds. The point-cloud model highlights this variability. It is no longer a hard edge, no longer a figure on a ground, determined by drawing a line, but instead a diaphanous fray of marks in a matrix. Edges scatter, scumble, and jump between surfaces. Since all objects have an equal opportunity to interfere with the electromagnetic spectrum, the traditional hierarchies between object, architecture, and landscape flatten into a background environment of reflection and interference. The city is modeled as a ground of variable energy intensities with gaps, rips and tears from lossy resolution and surface occlusion.

The desire to map the physical world with energetic pulses appeals to governments, militaries, mining industries, archeologists, agriculture conglomerates, advertising agencies, traffic planners, ecologists and architects. Each of these industries, corporations, bureaucracies, and disciplines wants this digital double not only because it "looks like" the world but also because an environment modeled as information can be combined, compared, filtered and augmented to allow it to be understood, controlled, exploited, and manipulated in ever new ways. The expansion of electromagnetic scanning into the infrared and thermal has, since World War II, been part of the development of photogrammetry, used to create images that can be analyzed in ways foreign to human perception. This has been applied to everything from the extraction of "landscape features" for ballistic targeting to ecological studies that cross-reference heat maps with moisture models.[27] Furthermore, the environment, modeled as information, can be combined and cross-referenced with other sets of information. Data is meaningless in its raw

27
John May, "Sensing: Preliminary Notes on the Emergence of Statistical-Mechanical Geographic Vision," *Perspecta* 40 (2008).



These images are point clouds generated through a photogrammetry scan of Giovanni Battista Piranesi's altar in Santa Maria del Priorato. The model is seen from above and rotating towards the rear of the church. The pink "fill" on the right set highlights the poché of missing information. Some areas are inside the sculpture; some are outside the image collection. For instance, the face of St. Basil is seen through the top of his head in the lowest image. All images by author, 2019.

state but gains value when combined with other data to become interpretable as a statistically legible pattern of behaviors.

For industries with an interest in rendering the environment as an augmented three-dimensional model, the gaps, errors, and tensions between energetic scans and the physical world become problematic. For instance, as the movement of commodities are mapped for the purposes of storage logistics, on-demand delivery, and location-information accrual, the zones of absent information appear as lost capital or the mismanagement of services. Furthermore, a misregistered depth or fraying edges present significant problems for all applications using machine vision, such as; self-driving cars, facial-recognition software and drone-missile targeting; technologies that exceed but also extend "capital services."

The digitally scanned environment is not a simple doubling, however. Technologies of mediation store, transmit, and process information.[28] Mediations are models of reality. The question is not which one is closer to the "real", but how these models alter human and nonhuman engagement with the world. As Shannon Mattern reminds us, "We inhabit a data space defined by various levels of intersecting protocols that direct our connections, facilitate or close off access, and thus subtly shape the geographies — both informational and physical — we are then able to explore."[29] For the discipline of architecture seeking to occupy the city in alternative modes, knowledge of how the environment is scanned is indeed essential, but it is not enough to simply locate and identify the errors or gaps in these scans.

28
See Kittler, *Optical Media*.

29
Shannon Mattern, "Ether and Ore: An Archeology of Urban Intelligences," in *Ways of Knowing Cities*, ed. Laura Kurgan and Dare Brawley (New York: Columbia Books on Architecture and the City, 2019), 125.

The Aesthetics of the Unregistered

Poché has always been residual. It now includes the unregistered zones produced through interferences in the electromagnetic spectrum. This is an extension and mutation of the traditional concept of *poché*. As residual, information shadows are an entanglement of the material with the energetic, an aesthetic redistribution that shifts away from the sharp distinction between figure and ground into the scumbled lacunae located behind, between and within the image-objects of clustered points.

Scanning mediates this background, both in terms of how machines capture and store the environment, and how our lives are ever more defined by the data trails we excrete and inhabit. In this, resolution is a cultural-economic negotiation between information and visualization, a political zone that entangles humans and nonhumans in the computational mediation of the environment.

Framing transformations in technologies of mediation within the disciplinary history of architectural representation is crucial for the development of discourse. Every new technology is initially posited as being more faithful, more accurate, more "real" than the previous. Tracing the relationships between concepts and aesthetics challenges the assumption that each new technology is a revolution in the representation of reality. It is important to remember that no mediation has a privileged access to the real. Each produces its own aesthetic and conceptual traits, which come to define its qualities. The digitally surveilled world runs parallel to the material world, but also intersects and is entangled with it as well. If we assume authenticity is something to be found only in one or the other, we let an imbalance of political power be given over to technology, economy, ecology, or the institutional entities that enforce, police and monetize how reality appears. For architecture, the complexity of these issues will require a transformation and expansion its disciplinary concepts to engage, occupy, and subvert these mediations.