Aerial Viscosity

The Architecture of Drone Photography

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Aerial Overview

Eyes in the sky are practically everywhere. Indeed, drone imaging is starting to infiltrate all phases of architecture, from site reconnaissance to construction supervision.[1] Thesis students are speculating on the urban implications of delivery drone hives; architects like Jennifer Bonner are deploying drones for groundbreaking design projects; and architectural photographers such as Iwan Baan and Fernando Guerra are conducting pioneering experiments with unmanned flight systems.[2] Some of these new aerial images almost seem to realize the longstanding anti-gravitational teleology of Modernism with its floating eye-in-the-sky projections and omniscient (virtual) vantage points. Of course, less lofty imaging also abounds. Homemade quadcopter videos increasingly populate media platforms such as Facebook, Instagram, Vimeo, and YouTube. From amateur enthusiasts and wedding photographers to performance

1. I presented an early version of this chapter in the "After Analog: New Perspectives on Photography and Architecture" session chaired by Hugh Campbell and Mary N. Woods at the Society of Architectural Historians 68th Annual International Conference in Chicago, Illinois (April 15–19, 2015). I also organized the "Photo-Graphic Architecture" symposium at the Akron Art Museum and Kent State University College of Architecture and Environmental Design (April 14–15, 2022): https://www.photo-graphic-architecture.com.
2. Bonner used quadcopters to scan the brick elevations of Haus Lange and Haus Esters, two adjacent houses in Krefeld, Germany, designed by Ludwig Mies van der Rohe (1928–30). She installed this research as an exhibition titled "Haus Scallop, Haus Sawtooth" in Kent State University's Armstrong Gallery from November 18, 2019–January 15, 2020: https://jenniferbonner.com/05-Haus-Scallop-Haus-Sawtooth.

artists and social media influencers to development companies and real estate marketplaces, the future of commercial imaging seems to float. Drones are now poised to claim the low-altitude layer of a geocentric aerial imaging matrix whose outer spheres are patrolled by satellites and interplanetary rovers and telescopes.

Based on original research with images in the Julius Shulman Archive at the Getty Research Institute and the author's own aerial photography, this chapter contrasts Shulman's accomplished analog perspectives with parabolic aerial photos and videos produced with a GoPro digital camera mounted on DJI Phantom 2 and 4 quadcopter drones. Whereas the drone photography of architecture would construe drone imaging as a limpid lens through which to see buildings, the architecture of drone photography draws attention to the intricacies of the aerial apparatus itself. As Robin Evans always emphasized, no medium or representational system can be purely transparent. His conception of the viscosity or refraction of architectural projection is therefore instructive.[3] In Evans's terms, drone photography presents at least two distinctly viscous or refractive valances: 1) the hardware/software system of quadcopter camera and video editing platform; and 2) the literally viscous atmospheric environments of wind, sun, clouds, precipitation, GPS satellites, etc. Following a brief historical survey of aerial imaging, this chapter poses two main questions: how do variously viscous drone images help to reframe architectural environments and/or subjects that we think we already firmly understand? And what architectural logics does drone photography expose, or even produce, through its sometimes-surprising synchronous architectural operations?

Although the widespread use of unmanned flight systems is new, drone photography already has a long architectural history. One might frame it as part of a history of aerial vantage points dating from the Renaissance. Just as Roland Barthes suggested that the Eiffel Tower materialized the earlier aerial imagination of literature, the arrival of aerial photography

3. Robin Evans, "Architectural Projection," in *Architecture and Its Image: Four Centuries of Architectural Representation, Works from the Collection of the Canadian Centre for Architecture*, eds. Eve Blau and Edward Kaufman (Montreal: Canadian Centre for Architecture, 1989), 25.

seemed to realize Renaissance speculations on the shapes of cities from above, which often took the form of impressively detailed engravings of oblique aerial views. These speculative maps proliferated for hundreds of years before Gaspard-Féliz Tournachon, otherwise known as Nadar, made the first aerial photographs from a balloon in France in 1858. In 1906, George R. Lawrence famously documented the aftermath of the San Francisco earthquake in a 160-degree panorama (see image 7.1).

Image 7.1. *Photo by George R. Lawrence, San Francisco in Ruins, 1906. Library of Congress.*

For this photo, titled *San Francisco in Ruins*, Lawrence used a forty-nine-pound camera tethered to a series of kites 2,000 feet above San Francisco Bay. And in 1919, shortly after the end of World War I and the official formation of Britain's Royal Air Force, pilot and photographer Captain Gordon H.G. Holt celebrated low altitude, bird's-eye photography in an article for *The Architectural Review*. He wrote, "Characteristic details, anomalous or unusual effects, which with the spectator on the ground would perforce escape attention, reveal themselves instantly."[4] Holt's use of wartime technology for peacetime cultural pursuits was no anomaly. World War II aerial photography, for example, inspired naval officer Charlton Hinman's invention of a collator for literary manuscripts. And the Cold War space race famously enabled the crew of Apollo 17 to pho-

4. Gordon H.G. Holt, "Architecture and Aerial Photography," *The Architectural Review*, no. 45 (1919): 3–9.

tograph Earth as "The Blue Marble" in 1972. The popular appeal of these and other wartime creations tends to normalize the military-industrial complex, suggesting "that civilian applications are the benign destiny of military technologies."[5]

Images from above are rarely innocent, however. As Paul Virilio and Manuel DeLanda have demonstrated, the histories of aerial photography are intimately bound up with developments in military visualization.[6] From Lockheed's U-2 and SR-71 reconnaissance aircraft of the 1950s and 60s to the Stealth technologies of the Reagan era to the daily satellite updates of Russia's 2022 invasion of Ukraine, the military basis of aerial imaging is obvious. Witness the aptly named *Predator* and *Reaper* drones (MQ-1 and MQ-9) that notoriously emerged as part of the U.S. Air Force's controversial "Hunter-Killer" program. Activist critiques of remote warfare understandably tend to focus on issues of desensitization, the assumption that drone pilots—like video gamers—become detached from the horrific results of their destructive actions on the ground.[7] Drone flight is often more viscerally engaging than this model suggests, however. Even in civilian quadcopter navigation, the grainy images on controller or smartphone screens usually lack the resolution of final photos and videos. And a continual sightline toggling between the drone's position in the air and the camera angle on screen demands persistent mental immersion and physical exertion.[8] Military drone navigation also requires visceral involvement. Geographer Derek Gregory notes that drone pilots in distant locations are not as removed from the violent implications of their actions as the desensitization myths surrounding remote aerial warfare assume. Pilots are often in high-stress audio communication with

5. Paul K. Saint-Amour, "War, Optics, Fiction," *Novel: A Forum on Fiction* 43, no. 1 (Spring 2010): 93–94.
6. Paul Virilio, *The Aesthetics of Disappearance*, trans. Philip Beitchman (New York: Semiotext(e), 1991); Paul Virilio, *War and Cinema: The Logistics of Perception*, trans. Patrick Camiller (London & New York: Verso, 1989); and Manuel DeLanda, *War in the Age of Intelligent Machines* (New York: Zone Books, 1991).
7. See, for example, https://notabugsplat.com.
8. This is one reason Hollywood now usually divides drone shoot duties between two different operators: a pilot who flies the drone and a photographer who controls the camera.

troops in forward areas, which heightens urgency and produces what Gregory terms a "peculiarly new form of intimacy" that blurs the "techno-cultural distinction between 'their' space and 'our' space, between the eye and the target."[9]

This intensified intimacy, however, somehow coexists alongside drone pilots' notoriously dehumanizing identification of "bug splat" targets. During the twenty-year War in Afghanistan, anti-drone activists routinely staged "die-ins" to simulate the human devastation of the U.S. and British governments' drone programs. In 2013, a peace activist was arrested and sentenced to one year in prison for participating in a protest outside Hancock Field Air National Guard Base in Syracuse, New York. Mary Anne Grady Flores reportedly violated an order of protection by stepping into the driveway leading to the base to take photos with an iPhone. One of DeWitt Town Court Judge David Gideon's five principal arguments for Grady Flores's one-year sentence included a critique of her photographic approach. "To this court, if the defendant was there only to take pictures," Gideon wrote, "she could have adequately done so across the street using a zoom or otherwise. She obviously chose not to."[10] In other words, had Grady Flores employed remote surveillance techniques—possibly even her own drone photography—she would have been in compliance with the order of protection and might have avoided jail time. Of course, drone no-fly zones—including airspace surrounding military bases, stadiums, and government buildings—are also increasingly common. But aside from certain state registration rules and private property trespassing laws, the recreational use of drones remains largely unregulated below navigable airspace. The Federal Aviation Administration has been threatening to tighten regulations, however, so we might be coming to the end of the golden era of free-range drone photography.

9. Derek Gregory, "From a View to a Kill: Drones and Late Modern War," *Theory, Culture & Society* 28, no. 7–8 (December 2011): 206. I thank Hugh Campbell for this reference.
10. Jeff Stein, "Criminal or Martyr? Inside the Political Formation of Ithaca's Jailed Grandmother," *The Ithaca Voice*, July 15, 2014, http://ithacavoice.com/2014/07/criminal-martyr-inside-political-formation-ithacas-jailed-grandmother/.

From Object to Field

Architects famously love aerial vantage points. From ecstatic Futurist fantasies of flight to Le Corbusier's airplane revelry in *Towards a New Architecture* to Neil Denari's early training at Aerospatiale in Paris, many architects owe direct design debts to aerial apparatuses. We not only prize the synoptic quality of the bird's-eye view, we value the geo-spatial freedom, or what Marshall McLuhan called the "utmost discontinuity in spatial organization," provided by air travel.[11] In 1957, Roland Barthes' post-humanist "Jet-Man" seemed to have been inspired by Le Corbusier's "machine for living" Modernism. Barthes described a jet-pilot who is a member of a "new race in aviation, nearer to the robot than to the hero."[12] For the jet-man, the rumbling, motor-driven tactility of the rail-, sea- and road-bound vehicles of terrestrial humanism was replaced with the smooth, seemingly motionless condition of high-altitude observation. The parallax effect practically evaporates at the high altitudes and speeds of jet flight, suggesting that the earthbound effects we associate with bodily experience might be only one aspect of an expanding matrix of possible phenomena. In this respect, drone visualizations also seem sympathetic with the cinematic sensibilities of the *promenade architecturale*, and even the subversive potentials of Situationist *dérives* and parkour transgressions. The creative (mis)use of aerial imaging for illicit boundary crossing and guerilla occupation of public space and infrastructure seems practically inevitable.

Drone photography relocates our vantage point, de-emphasizing property lines while exposing surprising geo-physical patterns and continuities. But here, again, the synoptic view is nothing new. As Mitchell Schwarzer argues, "Aerial perception can make the routine seem unexpected, extraordinary." He suggests that the opening scene of *West Side Story* (1961), which was filmed from a helicopter, shifted the architectural

11. Marshall McLuhan, *Understanding Media: The Extensions of Man* (Cambridge, MA: The MIT Press, 2001 [1964]), 36.
12. Roland Barthes, "The Jet-Man," in *Mythologies*, trans. Annette Lavers (New York: Hill and Wang, 1972 [1957]), 71–73.

focus from elevation to plan.[13] Whereas this flight over New York City drew attention to extruded building plans, aerial perspectives can also de-emphasize the sanctity of building boundaries. This was Colin Rowe and Fred Koetter's focus in *Collage City*. As John Macarthur explains, "The Nolli plans and aerial photographs in *Collage City* have the appearance of late modernist painting, characterized by flatness, pattern and an 'all-over-ness,' that imply the painting is not a composition of elements, but an expanse which continues out of view or off the edge of the canvas."[14]

Other architects and scholars have also seen opportunities in this shift from terrestrial to aerial vision. As Stan Allen might point out, elevated vantage points can help shift our attention from object to field. Barthes famously argued that the Eiffel Tower's viewpoint "corresponds to a new sensibility of vision" that transforms the urban terrain of Paris into a "new nature" characterized by "concrete abstraction."[15] And according to Elisa Dainese, "the aerial view gives us back the dimension of landscape, filling the gap between nature's domestication and human destruction."[16] This is certainly the case with many aerial photographs that transgress terrestrial borders to expose the natural, industrial, or suburban sublime. Examples include William Garnett's aerial photos of Lakewood in Los Angeles and David Maisel's *Black Maps* series taken from airplanes and helicopters.[17] According to photographer Michael Light, the "politics of transgressing private property in a capitalist society" is an important

13. Mitchell Schwarzer, *Zoomscape: Architecture in Motion and Media* (New York: Princeton Architectural Press, 2004), 123.
14. John Macarthur, "The Figure from Above: On the Obliqueness of the Plan in Urbanism and Architecture," in *Seeing from Above: The Aerial View in Visual Culture*, eds. Mark Dorrian and Frédéric Pousin (London & New York: I.B. Tauris, 2013), 202–203.
15. Roland Barthes, *The Eiffel Tower and Other Mythologies*, trans. Richard Howard (New York: Hill and Wang, 1979), 9. I thank Mary N. Woods for this reference.
16. Elisa Dainese, "Le Corbusier, Marcel Griaule, and the Modern Movement: Exploring the Habitat from the Airplane," in *EAEA-11: Envisioning Architecture: Design, Evaluation, Communication*, eds. Eugenio Morello and Barbara E.A. Piga (Rome: Edizioni Nuova Cultura, 2013), 417.
17. William Garnett, *William Garnett, Aerial Photographs* (Berkeley: University of California Press, 1994); D.J. Waldie, "Beautiful and Terrible: Aeriality and the Image of Suburbia," *Places* (February 2013): https://placesjournal.org/article/beautiful-and-terrible-aeriality-and-the-image-of-suburbia/; and David Maisel, *Oblivion* (Portland, OR: Nazraeli Press, 2006).

aspect of his aerial photography. "That homeowners' association, or that world created by developers, wants total control over its narrative, and, in general, they have it," he insists. "They exclude anyone who wants to tell a different story."[18]

Highlighting this type of exclusion—or "expulsion," to use Saskia Sassen's term—is one of the most exciting transgressive potentials of aerial photography.[19] It promises to break territories out of what Sassen calls their "nation-state cages" through abstraction and critical distance.[20] So it is hardly surprising that landscapes are some of the most common environments for drone photography. The necessary distance from obstacles—trees, buildings, people, power lines—and the resulting openness seems to invite aerial images. Gliding views of glaciers and waterfalls; soaring shots of scenic gorges and mountain valleys; and aerial perspectives of archaeological ruins are a few common examples. Like the virtual cameras of digital flythroughs and first-person video games, these views usually adopt oblique angles in order to maximize dynamism within the frame. As Macarthur notes, "While the vertical view can provide a dimensionally accurate depiction of area, the oblique view adds an impression of depth, which, while it is unable to be dimensioned, is essential to the understanding of the architect and planner."[21] Light also emphasizes the vantage point provided by low altitude flight as an alternative to Google Earth's top-down images. He celebrates the ability of oblique photos to activate what he calls a "relational tableau."[22]

18. Michael Light, "Air America: The Dramatic Aerial Photography of Michael Light," interview by Geoff Manaugh and Nicola Twilley, *The Atlantic*, October 15, 2013, http://www.theatlantic.com/technology/archive/2013/10/air-america-the-dramatic-aerial-photography-of-michael-light/280345/.
19. Saskia Sassen, *Expulsions: Brutality and Complexity in the Global Economy* (Cambridge, MA: Belknap Press, 2014).
20. Sassen celebrates abstraction and critical distance in the black and white images of social documentary photographer Sebastião Salgado: "Color photography of actual settings," on the other hand, "overwhelms with its specificity and leaves little room for distance and thereby for theory." See Saskia Sassen, "Black and White Photography as Theorizing: Seeing What the Eye Cannot See," *Sociological Forum* 26, no. 2 (June 2011): 438.
21. Macarthur, "The Figure from Above," 190.
22. Michael Light, "Spatial Delirium: An Interview with Michael Light," interview by Geoff Manaugh *BLDG/BLOG*, October 7, 2013, http://bldgblog.blogspot.com/2013/10/spatial-delirium-interview-with-michael.html.

This non-dimensional yet relational perspective also approximates what Svetlana Alpers famously describes as the mapping impulse in seventeenth-century Dutch landscape painting.[23] Martin Jay insightfully identifies the faux floating views of these paintings as one alternative to the "scopic regime" of Cartesian perspectivalism.[24] The three-dimensional grid—with its attendant planimetric, sectional, elevational, and perspectival logics—does indeed tend to get lost from above. Still, wasn't the Cartesian grid the matrix within which many of the anti-gravitational ambitions of Modernism were explored, especially in Los Angeles? Just think of the steel and glass projects of John Entenza's Case Study House Program. Some of them almost seem to float because of the photographic perspective. Pierre Koenig and Richard Neutra's use of repeated linear structures and flat surfaces reinforced the rectilinear framing of black and white photos on the monochromatic pages of *Arts & Architecture* magazine (see image 7.2).

23. Svetlana Alpers, "The Mapping Impulse in Dutch Art," in *The Art of Describing: Dutch Art in the Seventeenth Century* (Chicago: University of Chicago Press, 1983), 119–168.
24. Martin Jay, "Scopic Regimes of Modernity," in *Vision and Visuality*, ed. Hal Foster (Seattle: Bay Press and Dia Art Foundation, 1988), 3–23.

Image 7.2. *Photo by Julius Shulman (1960). Richard Neutra, Singleton House, Los Angeles, 1959. © J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10).*

In fact, the format of the magazine and the format of the Case Study Houses were utterly synchronized. The Case Study Houses—as the brainchildren of a publisher—were designed for publication.

Aerial Perspective

Julius Shulman's one-point perspective photos famously popularized Entenza's program. In many of Shulman's images, the Cartesian grid conspires with the logics of perspective to produce a floating, seemingly levitational position within the egalitarian ether of three-dimensional space. This mode of visualization has had a profound effect on architecture. As Schwarzer explains, "The experience of seeing the world reduced to the intensities of light and dark affected the perception—and the history—of architecture, encouraging the modernist aesthetic of expansive

glazing and flat white walls."[25] This viewpoint/vanishing point logic often requires a static snapshot frame. When one moves through and around the steel and glass spaces of the Case Study Houses, however, the perspectival illusion is destroyed. As Yve-Alain Bois argues, "if the spectator leaves the standpoint demanded by the perspective construction, the space of representation collapses like a house of cards."[26]

This is especially true for aerial photography. Upon leaving the frame of the house and taking to the air, the conceit of the Cartesian grid not only collapses, but seems to disappear altogether. The grid that seemed infinite from within the frame of perspective is exposed as a shrinking envelope of objecthood. For contemporary architectural photographers the challenge is reframed. If Shulman was concerned with furniture and camera placement within mid-century Modern spaces, Baan and Guerra shifted their attention to social and climatic phenomena. Technical problems are easily solved, and timing is everything. Guerra explains that his work is about "that perfect photo that cannot be repeated." It can be extremely difficult to capture ideal meteorological moments using drones with thirty-minute batteries. At the same time, he admits, the view from above is often "what moves the work from boring to interesting."[27] Of course, the architectural subject matter is also a major factor in the compositional equation. Landscape-scale complexes with sinuous forms, like Zaha Hadid's Galaxy Soho in Beijing and Alvaro Siza's Building on the Water in Jiangsu Province, seem to invite aerial imaging (see image 7.3).

25. Schwarzer, *Zoomscape*, 174.
26. Yve-Alain Bois, "Metamorphosis of Axonometry," *Daidalos* 1 (September 1981): 41–58.
27. Fernando Guerra, e-mail message to author, January 20, 2015.

Image 7.3. *Photo by Fernando Guerra. Alvaro Siza, Building on the Water, Jiangsu, China, 2014. FG SG.*

Case Study Houses like the Eames House (CSH #8) and Stahl House (CSH #22) present different challenges for drones. Given the utopian Jet Age rhetoric of mid-century Modernism, aerial imaging might seem like an ideal vantage point for photographing Modern houses.[28] Think of Ralph Rapson's iconic rendering of his unbuilt Greenbelt House (CSH #4) from 1945 (see image 7.4).

28. See, for example, Vanessa R. Schwartz, *Jet Age Aesthetic: The Glamour of Media in Motion* (New Haven & London: Yale University Press, 2020).

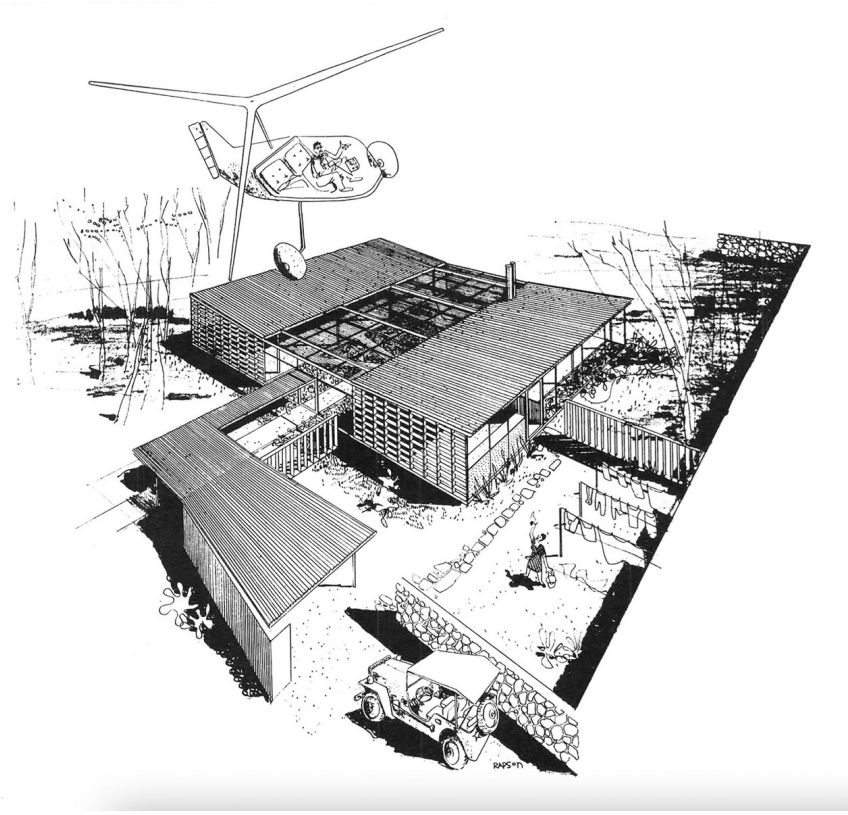

Image 7.4. *Ralph Rapson, Case Study House #4, 1945 (unbuilt). Arts & Architecture, August 1945.*

The project is sometimes discussed in terms of unbalanced gender roles that construed freedom for men and domestic servitude for women.[29] But it also presents a view of a personal flying machine from a personal flying machine. Rapson detailed the slender steel frame and butterfly roof to look light; the house almost appears to hover. At the same time, the house also seems curiously hermetic and introverted. It was designed for an urban lot, but Rapson conveniently omitted neighboring properties from the rendering. Is this because he knew neighbors might object to being surveilled from the air? This desire for privacy is one common rea-

29. See, for example, Dolores Hayden, "Model Houses for the Millions: Architects' Dreams, Builders' Boasts, Residents' Dilemmas," in *Blueprints for Modern Living: History and Legacy of the Case Study Houses*, ed. Elizabeth A.T. Smith (Los Angeles: The Museum of Contemporary Art; Cambridge, MA: The MIT Press, 1989), 197–211; and Lucinda Kaukas Havenhand, "Looking through the Lens of Gender: A Postmodern Critique of a Modern Housing Paradigm," *Journal of Interior Design* 28, no. 2 (2002): 1–14.

son for restricting drone photography at Case Study Houses.[30] Less obvious obstacles also abound. Orthogonal geometries can be ill-suited to the fluid flight paths of drones; glass walls are easier to see through than to fly through; and small interiors provide inadequate space for aerial maneuvers. Traditional architectural photography often relies on the camera to overcome these spatial limitations, imbuing lines and surfaces with the impression of infinite extension through careful cropping.

From Walkthrough to Flythrough

The houses designed by Los Angeles architect John Lautner tell a different story. Their spacious interiors and broad fenestration provide plenty of room for flying and viewing, and their curvaceous geometries sometimes seem more synchronized with the smooth flight of quadcopters and the parabolic lenses of GoPro cameras than with the parallactic POV pathways of first-person video games. Some of Lautner's houses even display vehicular—or "dromoscopic"—logics themselves.[31] His Sheats/Goldstein and Reiner "Silvertop" Houses from 1963 have both been repeatedly described as ships that seem to float. This is no accident. In his own travel photography, Lautner often adopted aerial and nautical points of view from planes, ships, and helicopters. His free-flowing interior spaces therefore seem better suited for flythroughs than walkthroughs. They sometimes even create their own atmospheric perspectives. Alan Hess accurately describes the "high, featureless interior surface" of the shallow arched concrete shell at Silvertop, observing that it "gives the ceiling little more presence than a cloud cover."[32] In one particularly effective photograph, Shulman used floodlights to visually mottle the smooth concrete ceiling and mimic the dramatic tonal shifts of sky (see image 7.5).[33]

30. The owners of the Eames House and Stahl House have both denied my requests to conduct drone photography on multiple occasions. The Eames House staff explained that roof repairs were under way, so aerial photos were not allowed. Both owners expressed concern about the privacy of their neighbors. When drones are involved, NIMBY (not in my backyard) becomes NIMBA (not in my back airspace).
31. Paul Virilio, "Dromoscopy, or The Ecstasy of Enormities," trans. Edward R. O'Neill, *Wide Angle* 20, no. 3 (July 1998): 11–22.
32. Alan Hess, "The Redoubtable Mr. Lautner," *L.A. Style* (October 1986): 83.
33. Julius Shulman, *Image 5802-12,* Julius Shulman Archive, Getty Research Institute (GRI) Special Collections.

Image 7.5. *Photo by Julius Shulman (1980). John Lautner, Reiner House "Silvertop," Los Angeles, 1963. © J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10).*

Lautner's buildings have also been frequently compared to caves. The glare produced by the radically different lighting levels of his shadowy interiors and bright exteriors poses serious problems for photographers. In Shulman's photograph of the Sheats House, the interior disappears into what seems like a cavernous interior of shadow.[34] This is the case even though viewers can see all the way through the main living space to the hillside behind the house. In an exterior photo of Silvertop, Shulman cleverly solved this problem—but also denied the viewer's ability to explore the dark interior of the enclosed space—by screening it with the faceted floor-to-ceiling glass of the main living area (see image 7.6).

34. Julius Shulman, *Image 3494-02,* Julius Shulman Archive, GRI Special Collections.

Image 7.6. *Photo by Julius Shulman. John Lautner, Reiner House "Silvertop," Los Angeles, 1963. © J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10).*

This created a mirrored effect that vertically bifurcates an otherwise horizontal composition. The house's interior is effectively absent. Instead of penetrating the glass wall, the viewer's eye receives the reflected vista of Silver Lake in the opposite direction, an effect that instantiates the distant landscape as a surrogate for the house's interior.[35]

One might assume that the vectoral video advantage of drones—the ability to float freely from dark to light and vice versa—might eliminate the problem of glare. But even the expansive interiors of Silvertop and the Sheats/Goldstein House can be difficult to navigate with drones. Quadcopter chassis threaten to mar wall surfaces and damage artwork, and propeller gusts threaten to scatter papers and spill drinks. These interiors, it seems, provide better parkour for human eyes than for quadcopter

35. Julius Shulman, *Image 3583-1-3,* Julius Shulman Archive, GRI Special Collections.

cameras. Of course, the problem disappears for virtual cameras and exterior shots.[36] In photos made from the hillsides below Lautner's houses, Shulman produced an intriguing series of portraits that depict the buildings as creatures about to take flight (see image 7.7).

Image 7.7. *Photo by Julius Shulman (1975). John Lautner, Garcia "Rainbow" House, Los Angeles, 1962. © J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10).*

They seem like subjects, even from below. This is one of the surprising roles buildings sometimes play in the construction of aerial images: they can be cast in intersubjective relationships with drones. As performative building skins, biomorphic blobs, and the lively organisms of object-oriented ontology seem to suggest, buildings are no longer merely seen as inanimate reifications of ideological regimes. Like drones, they are beginning to be seen as intentional beings.

36. Lautner's Malin House "Chemosphere" (1960) in Los Angeles has famously appeared in many types of media, including the video game *Grand Theft Auto: San Andreas* (Rockstar Games, 2004).

Kino-Eye in the Sky

This new subjecthood surpasses the post-humanist decentering potentials of cinema. Architects have long focused on kino-eye's supposed ability to displace the humanist subject through montage, parallax, and other machine effects. When turning our attention to media and representation, we tend to say and write things such as "the camera pans," "the camera zooms," and "the camera glides," seemingly forgetting that expert cinematographers initiate and control dolly shots, long shots, close-ups, slow-motion, panning, time-lapse, and many other types of moving images. Film phenomenologist Vivian Sobchack argues, however, that cinematic experiences are inherently intersubjective—that moviegoers engage with onscreen images as though they are active agents.[37] These cinematic relationships closely resemble those construed by drone photography. Whether wide-angle or conventional frame, the impressive smoothness of GoPro video can approximate aerial Steadicam shots. The sensitive gimbal mount of a GPS-stabilized drone can produce oddly—even eerily—smooth axial movements in depth. It is as though the "motionless crisis of bodily consciousness," which Barthes described as a unique aspect of high-altitude flight, has descended into the thickened ether of terrestrial vision.[38]

These viscous drone movements are both impossibly smooth and often non-orthogonal; their organic pathways of fluid flight replace the straight lines of the Cartesian grid.[39] Silvertop, for example, with its curving panoramic forms, photographs beautifully from above (see image 7.8).

37. Vivian Sobchack, *Address of the Eye: A Phenomenology of Film Experience* (Princeton, NJ: Princeton University Press, 1992).
38. Barthes, "The Jet-man," 71.
39. See Gilles Deleuze and Félix Guattari's famous distinction between subversive smooth space and hegemonic striated space in Deleuze and Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1987).

Image 7.8. *Photo by Jon Yoder (2015). John Lautner, Reiner House "Silvertop," Los Angeles, 1963.*

The house almost seems to grow as the camera glides. The curving distortions produced by the camera's parabolic lens mesh with Lautner's own curvilinear deformations to make Silvertop seem indigenous and the surrounding conventional houses look like boxy intruders.[40] Still, if drone imaging sometimes construes intersubjective relationships between earthbound and aerial subjects, not all curves are created photographically equal. Lautner's Harpel House #2 (1966) in Anchorage, Alaska,—whose main living space employs a precisely circular plan—also looks like an alien from the air.[41] But its Platonic geometry is too perfect for the rotational and circumambulatory movements of quadcopter cameras. Ironically, geometrical purity on the ground and excessive speed in the air—two of architects favorite things—sometimes present problems for drone imaging. Quadcopters can rotate so fast that panning shots induce vertigo. Indeed, objects sometimes appear and disappear so quickly within the frame that the notorious parallactic overload of digital flythroughs seems to emerge in physical space. Unlike the gradual movements of conventional Steadicams, whose size and weight limit rotational velocity, the high-speed aerial rotation of drones resembles the frenzied

40. Here I thank architect Barbara Bestor and her associate Stacey Thomas for facilitating my drone photography of Lautner's Reiner House "Silvertop" in Los Angeles on February 7, 2015.
41. Here I thank homeowners Kathryn and David Cuddy for facilitating my drone photography of Lautner's Harpel House #2 in Anchorage on August 6, 2018.

animations of POV walkthroughs and first-person video games. Lautner's angular Sheats/Goldstein House, on the other hand, introduces differently viscous conditions. The GoPro camera's parabolic lens visibly warps the house's straight lines (see image 7.9).

Image 7.9. *Photo by Jon Yoder (2014). John Lautner, Sheats/Goldstein House, Beverly Hills, 1963/89.*

But orthogonal fidelity is not an issue. Lautner did not design this peculiar project according to the logics of Cartesian perspective. In a sense, its acute and oblique geometries had already been distorted from the rectilinear norm before quadcopter cameras exposed the visual viscosity of this massive concrete house from the air.[42]

Escape Velocity

Michael Light describes hiring a helicopter for aerial photography as a dangerously precipitous proposition: "Drive to Van Nuys, get into this tiny little dragonfly of a machine, a flying motorcycle with a seat belt, doors come off . . ."[43] It is a visceral and viscous experience that lacks the presumed safety and comfort ostensibly provided by both virtual cam-

42. Here I thank homeowner James Goldstein and his assistant Roberta Leighton for facilitating my drone photography of Lautner's Sheats/Goldstein House in Beverly Hills on October 19, 2014.
43. Michael Light, "Michael Light in Conversation with Lawrence Weschler," interview by Lawrence Weschler, *The Believer*, November/December 2010, https://believermag.com/a-conversation-with-micahel-light/.

eras and drones. "I think it's through my own selfishness that I would not want to send a drone up to transgress over a site when I could do it, instead," Light explains. "I could just sit at my computer screen and kick back in my chair—but we spend enough time in chairs as it is. It's more that I am putting my butt on the line; I'm breaking no laws, but there is the experience of physical exploration that I would be denied by using drones."[44] While he observantly notes the weight and turbulence involved with conventional flying machines and insightfully predicts the imminent proliferation of personal drones, will our eyes actually "be able to go anywhere and everywhere without our bodies," as he claims?[45] Assumptions of gravity-free visual omniscience like these recycle the naive teleological assumptions of Modernism. After all, the drones-eye view is not simply a three-dimensional displacement of a z-axis vantage point; it conditions and constructs vision in different ways than Modernist myths often assume.

This has long been true for the aerial view. Vittoria Di Palma explains that pioneers of ballooning stressed the visual expansion of ascension. "Many stressed that an airborne perspective enabled them to see more," she explains. "But it is not so much a question of seeing more, as of seeing differently."[46] Indeed, differences expose the impossibility of making essentializing claims about the drone's-eye view. Scholars continue to emphasize the insidious implications of eye-in-the-sky technologies while artists like Addie Wagenknecht make action paintings using quadcopters.[47] According to drone artists Yael Messer and Gilad Reich, "You can see the view from above, which is traditionally a view of power, of state power, of corporate power, a view we were educated to think of as a perspective of control, of obedience, is now suddenly being reappropri-

44. Light, "Spatial Delirium."
45. Light, "Air America."
46. Vittoria Di Palma, "Zoom: Google Earth and Global Intimacy," in *Intimate Metropolis: Urban Subjects in the Modern City*, eds. Vittoria Di Palma, Diana Periton, and Marina Lathouri (New York: Routledge, 2009), 243.
47. Wagenknecht creates "Black Hawk" action paintings using Parrot drones and smaller hobby store quadcopters. See Addie Wagenknecht's website: https://www.placesiveneverbeen.com/works/black-hawk-paint.

ated by activists for different reasons."[48] In 1994, Diller + Scofidio created *Overexposed*, a 28-minute video performance that slowly pans horizontally and vertically across the curtain wall of Gordon Bunshaft's Pepsi-Cola Corporation World Headquarters, constructing a deadpan narrative of everyday office occupation. According to Diller + Scofidio, "The transparency of the curtain wall, along with other, more insidious forms of surveillance, may have created an overexposed world, leaving few shadow zones of privacy."[49] Had they used drone photography, it might have shifted the focus of the project from the planar Cartesian surface to different (transformative) pathways of flight.

Just as it is neither entirely innocent nor entirely sinister, drone photography relates differently to different environments. It often seems synchronized with large-scale landscapes, and its different lenses respond differently to different geometries. With Walter Benjamin, we might still celebrate the camera's ability to penetrate deeply into the "web of reality."[50] With drone photography, however, the malleability of an outdated concept like "reality" is exposed. As drone imaging transfers the digital flythroughs of virtual cameras to the arena of physical space, the ostensibly liberating drone apparatus reveals a surprisingly viscous aerial architecture. Instead of bypassing geo-climatic considerations, drone systems bring the paradoxical weight of aerial maneuvers to the fore.[51] Old dyads such as real/virtual, static/dynamic, and optical/tactile lose significance once lightness is revealed to have heft and virtual refraction is seen as a viable starting point for cultural production. The gravity of both physics and politics within specific environments becomes palpable. And, impor-

48. Gilad Reich, "A Conversation with High & Low Bureau," interview by Arthur Holland Michel, The Center for the Study of the Drone at Bard College, October 6, 2014, http://dronecenter.bard.edu/high-low-bureau/.
49. Diller Scofidio + Renfro, *Overexposed,* 1994, https://dsrny.com/project/overexposed.
50. Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction," in *Illuminations*, ed. Hannah Arendt, trans. Harry Zohn (New York: Schocken Books, 1968), 217–251.
51. All media have weight. For my discussion of the gravity of comics, see Jon Yoder (The Inventor), "Atlas of Graphic Novel Tectonics," *Flat Out* 2 (Spring 2017): 2, 13–15.

tantly, longstanding myths about the nature of architectural vision cease to serve as adequate frameworks for understanding the smooth, curvaceous, and levitational potentials of this rapidly proliferating aerial architecture.

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