

# GUGGENHEIM BILBAO

## Built Score, Performance Core

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*You have the principles, and then you have their effects.*

Richard Serra<sup>1</sup>

The idea of architecture is in a state of constant relocation. Beyond obvious analogies in other disciplines, such as the scaffolding of references in a critical essay, structures in software programming, or plot building in film, it is not controversial to speak of the architecture of matter or to find building principles in weather phenomena.<sup>2</sup> This is certainly not a new practice,<sup>3</sup> but in a world ironically divided between anthropomorphism and the posthuman condition, we find ourselves all too often speaking about the architecture of everything. We may even say that tectonics—any structural relationship of assembled elements<sup>4</sup>—has become a priori *architectonics*, and that architecture is a dominating notion for understanding any constructed object as part of a situation, any situation as the manifestation of a construction process, any process insofar as time always *constructs*. Architecture would be any form of *programmed* construction, and construction in this broad sense would seem to be the main sign of, and condition for, intelligent life. Greg Lynn has spoken about “total design” in reference to such an architectural continuity of everything. This phenomenon is related to the contemporary dominance of surfaces in all areas of form-oriented thinking, at least “on the level of tools.”<sup>5</sup> Shared design techniques allow architecture to “migrate into other disciplines,” which inevitably results in other disciplines being “carried back into architecture.”<sup>6</sup>

But Lynn’s comparison between the traditional architectural object (say, the house) and the object of contemporary design (athletic footwear, for instance) is

pertinent not only because of the ever-increasing “designedness” of the world, but also because of its implicit emphasis on performance. Performance—that is, behavior conscious or induced—is the deductive effect of construction. Architecture, as the traditional art of programmed construction, has come to emblemize performance in a utopian manner, or better, to emblemize unattainable levels of performance. In fact, it is by means of the idea of performance that architecture transcends any tectonic, structural or building-oriented, definition. Human edifices—factories, museums, parliaments, theaters, hospitals, anything—are, from this perspective, not so much functional objects as they are self-motivational machines—their own proposed heroes. Discussing the question of performative architecture one decade ago, Branko Kolarevic stated: “In performative architecture, the emphasis shifts from building’s appearances to processes of formation grounded in imagined performances, indeterminate patterns and dynamics of use, and poetics of spatial and temporal change. The role of architects and engineers is less to predict, pre-program or represent the building’s performances than it is to instigate, embed, diversify, and multiply their effects *in material* and *in time*.”<sup>7</sup> Kolarevic pointed at the formal non-correspondence between a building and its effects, however much its performance may be planned or fantasized over. Furthermore, he emphasized a second yet crucial meaning of the notion of *project* as also a moment in a conceptual-causal chain. “At the urban scale, architecture operates between the opposing poles of ‘smooth’ urban space (by blending in) and urban landmarks (that stand out). Contemporary avant-garde architecture advances the latter towards architecture as performance art, which takes the urban setting as a stage on which it literally and actively *performs*.”<sup>8</sup> It is hard to imagine architecture that, having no specific iconic qualities, remains efficient in the performative sense. Meanwhile, perhaps we should blame the difficulty of distinguishing building performance from sheer socioeconomic results for the numerous failed attempts to replicate the Bilbao effect.<sup>9</sup> In Bilbao’s paradigm-setting form of architectural success, we can see the re-inauguration of a certain kind of superstition. After 1997, museum buildings have turned back into something close to ritual shrines upon which public officials formulate their prayers for wealth and good weather. Miracles—that is, effects without causes—are now systematically expected, though they must come as automatically as the results of calculation. The Bilbao effect set a new standard in architecture’s performance, by which the connection

between building and magic was rebooted. The operation blends ritual with urban-economic engineering and cultural planning in a scheme that is not very different from placing minerals at certain corners of a house—a form of geomancy.

As Kolarevic has indicated, the performative in architecture occurs beyond functional and utilitarian goals, but also beyond the mere aesthetic domain. As a metanarrative, performative architecture opens up a new sphere of interpretive work where all aspects of life, rather than just meaning, crossfire. If architecture performs, it is not in the field of architecture but in the biopolitical space of cultural emergence.<sup>10</sup> It is clear that discussions on performative architecture are beyond the dichotomy of structure versus façade, function versus appearance, icon versus shelter, or, to use Hal Foster's formula, "formal duck versus decorated shed."<sup>11</sup> For it is neither on the utilitarian nor on the aesthetic level that architecture's performance originates, nor in the friendly collaboration of the two. Instead, we may assume performativity is another *aspect* of architecture, besides form and function, which could allow us to read a certain continuity of formal and nonformal, tectonic and nontectonic concerns. To respond to Kenneth Frampton's influential terminology, the performative allows us to fathom a supplement to site, type, and tectonic—that is, the "three converging vectors" of "the built."<sup>12</sup> Performative thinking may therefore appear as a critique of edifice-based conceptions of architecture and of any disciplinary isolationism.

Technical analyses of the Bilbao effect make the *skin* of Frank Gehry's building a key acting component of the Guggenheim Museum Bilbao's efficacy.<sup>13</sup> In the aforementioned text—published in 2000—Lynn also located the production of "special effects" on the level of architectural surface.<sup>14</sup> This is not far from what Gottfried Semper—a most crucial reference for the modern rethinking of the tectonic arts—had already envisioned when he emphasized the importance of "cladding" (*kleiden, Bekleidung*) as a dynamizing strategy in ancient Greek architectural forms.<sup>15</sup> As H. F. Malgrave has pointed out, the idea of *Bekleidung* has to be connected with Semper's conception of temple architecture, according to which the building was both a means to know the divine (*theoria*) and an object for viewing (*theatron*).<sup>16</sup> We may attempt to describe the contemporary building's role in the city as fourfold: analogous with the votive object in the domestic environment or the temple, with a button in a control

panel,<sup>17</sup> with a performing stage, and with a performer on stage. The proactive—or even hyperactive—building works by triggering, commanding, hosting, and enacting performance. Through performative construction, the physical archaism of temple architecture is actualized twice: as an emblem of mighty engineering technology and as a receptive, visionary crystal of future cultural trends.

Architecture *moves* not only in the sense of a building's own formal dance, but also in terms of its capacity to induce behavior, and—which might be synonymous—to thrill. All emotion is motion. As manifold as the idea of a building's performance is that of its dynamism, a concept that goes well beyond sheer materiality. The anthropomorphic conception of a building as an heroic body to be experienced by other perceptive bodies in movement has been present in architecture since ancient times. Juan Antonio Ramírez has pertinently analyzed the conceptions of architecture as a container and conductor of bodily *pathos*, both from an external (formal) and an internal (metabolic) perspective: not only as a symbolic design, but also in its digestion-like treatment of visitors and dwellers, social processes, and political and cultural climate.<sup>18</sup> A similar line of analysis was already suggested by Joseph Rykwert in *The Dancing Column*, probably the most important study on architectural anthropomorphism of recent times, despite its primarily classical concern.<sup>19</sup> The definition of architecture as *frozen music*, popularly attributed to Goethe, allows for a perception of time not only as external but also as internal to the apparent stillness of construction. Time is in the erosion of materials, but also in the observer's perception of the edifice—in this sense, experiential time is form's form. Commenting on this notion in his contribution to *Performative Architecture: Beyond Instrumentality*, David Leatherbarrow pointed out: "Compared to dance and musical expression, the building seems to be resolutely . . . inert and inactive; *frozen* music indeed. . . . One suspects there must be something more to it because if it were only the consequence of an inhabitant's intentions, it would be impossible to understand why we often feel the need to habituate ourselves to buildings, and also why they can alternately depress and delight us." He adds, "The building's approximate disequilibrium animates a life and a history of ever-new performances."<sup>20</sup> An ephemeral figuration, however reductive, of these performances may have been found in Tino Sehgal's "choreography" of models of Gehry's most famous buildings—including the Guggenheim Museum Bilbao and the Guggenheim Abu

Dhabi, the Walt Disney Concert Hall, and the Facebook headquarters. The strange spectacle unfolded intermittently during an exhibition to celebrate the ground breaking of the Luma Foundation facilities in Arles, France, also designed by Gehry.<sup>21</sup> Dance has indeed been an obsession for the architect, and he has made explicit choreographic references in many of his works.<sup>22</sup> The sight of relatively large-scale building models rhythmically moving through an exhibition space, accompanied by the music of Pierre Boulez, playfully manifests an aspiration in his work rather than a simple affinity. In the best cases, such as the Vitra Design Museum and Guggenheim Museum Bilbao, Gehry's work may be defined as *frozen dance*. Not an imitation or a representation of dance, but an articulation of architectural form that turns explicitly "kinetic" when perceived by a human body. The observer-visitor-dweller is the physical destination of a gesture that starts with the architect's expressive drawing and is transformed into building with the collaboration of a computer program.

Using the phrase "frozen light" to evoke Gehry's work, Michael Sorkin has addressed the relationship between the viewer's movement and architecture's kineticism from the perspective of film and, in a broader sense, animation. As he pointed out, "If the classic modernist building embraced the metaphor of the ship, sailing along its long axis, Gehry has managed to disperse this sense of movement, to make a more general condition of animation. . . . The idea is the opposite of Muybridge's and seeks not to observe by retardation but by acceleration, in the kinds of time-lapse photography that—by speeding up the succession of images—makes the opening of a flower or the construction of a building freshly accessible."<sup>23</sup> The accelerated splicing and recomposition of frames, defining an imaginary silent explosive rotation of the building along various axes simultaneously, stresses the connection between film history as image-movement and the volumetric rendition of architectural drawings by means of computer software in Gehry's design process. "The computer becomes a means of cinematizing architecture without building and may . . . harbinger its eventual annihilation."<sup>24</sup> In their most histrionic figurativeness, Gehry's buildings simulate this annihilation and perhaps play it in reverse, at multiple imaginary speeds.

A closer look at the articulation of hand drawing and computer-powered design seems crucial at this point. Once again, Gehry's work appears to be the

unavoidable reference in these operations, signaling the transition to the digital age of architecture. As Bruce Lindsey has observed in his study of Gehry's digital practice, "Gehry sees the project through the continuous line of the drawing," where "gesture [is a] formal strategy. . . . ' Gestures are always intensely curvilinear. Curvilinearity signifies the principled deformation of a line while organizing many disparate elements continuously . . . Gestures . . . are highly principled flexible connective networks.'"<sup>25</sup> As Lindsey explains, establishing correspondences between physical points in a model and virtual points in a computer rendering is key to the digitizing process. The FARO digitizer, used in Gehry's crucial late-1990s transition to computer-assisted design, surprisingly resembles a pantograph, a nineteenth-century device used to reproduce drawings as well as physical objects.<sup>26</sup> Though considering its capabilities to convert a two-dimensional form into a three-dimensional one, the FARO may rather evoke another experimental procedure, photoplastigraphy, patented by Antoine Claudet in 1865.<sup>27</sup> By means of digital instruments, an uncanny articulation—if not an exhilarating aberration—of two predigital practices from the nineteenth century thus appears to structure a digital design dynamic. On the one hand, Eadweard Muybridge's zoopraxiscope allowed the viewing of photographs in rapid succession, thus emulating and dissecting physical movement in a somewhat forensic manner. On the other hand, photoplastigraphy and its related inventions (Claudet's, but also others with similar ambition in regard to images and objects<sup>28</sup>) enabled the three-dimensional expansion of photography. In digital architecture, the object resulting from this composite operation is what we may call an irreversible translation of animation and three-dimensional image conversion into building. Though Gehry's edifices, in their exceeding complexity, would not lend themselves to be translated back into images. They thus provide a quantitative measure of their value as original *things*.

We may look at the recent work of artist Oliver Laric as an implicit take on these issues, particularly mutations in animated design. His viral, open-form video essay *Versions* (2009–2012) skillfully forces an observation of radical contingency in the constructed world of images. There is certainly an architectonic of design strategies, as there is a tectonic of animation as a craft. Laric's *Betweenness* (2017) presents, in the form of an automated ballad, the frail carpentry of lines in cartoon figures, but what we are really looking at is the

design of animated life, a biopolitical dynamic through the lens of image making. Uncannily, Laric's animation also evokes what Rykwert called "an ultra-Cartesian exercise" of illustration of the passions—Charles Le Brun's drawings of hybrid animal-human forms from the mid-seventeenth century.<sup>29</sup> In Le Brun's striking aberrations—the "Owl Man," the "Camel Man"—human passions appear as analogical principles for the fluid transformation of species. We cannot but look at them today as models for the fluctuating, animated morphologies of contemporary design.

Centripetal, decompositional, a hybrid arrested in the midst of exploding-rotating, a dancing mass around an empty atrium, Gehry's buildings perform thanks to their quasi-figurativeness. But their wreck-like appearance can only reinforce the necessity of a reliable, strong armature that preserves the entire structure from collapsing. Lindsey states: "This laborious process [of digitization] must resolve the points into a form that 'closes,' or in the language of another modeling software, becomes a 'well-formed object.'"<sup>30</sup> The closing or resolution of a form is a condition for its execution as architecture, while the stabilization of all structural aspects is also a condition for the building to operate on the performative level. This performative level is intrinsically open and cannot be defined in terms of specific instructions given to users—in other words, buildings do not communicate with the public sphere by means of readable and univocal commands. Highly dynamic, seemingly moving forms such as Gehry's thus appear as allegorical of the building's invitation for the public to perform—that is, to (produce) experience in an open manner. The fact that contemporary experience happens generally through the eye of a telephone camera is not trivial—the camera functions as a tool for certifying the occurrence of a performance.<sup>31</sup> Besides acknowledging an apparently irresistible condition of present life, the design is fully aware of this iconic fate.

According to Foster, digital design helped Gehry not only to focus on shape and skin above all else, but also to collapse the two categories of duck and shed. "The chief effect of this combination . . . is the promotion of the quasi-abstract building as Pop sign or media logo."<sup>32</sup> However, the success of this formula is not purely based on architecture's efficacy as advertisement, at least as traditional one-directional advertisement where we know who promotes what and to whom. On the contrary, there is a reason for the building to work beyond its existence as

mere image for an audience, and to produce ever-increasing *physical* visitation numbers. The building offers itself as a platform for visitors to take part in an advertisement where their own experience is featured. The representation of the building is always a form of visitor self-representation. The visit appeals only if it offers the opportunity of being told—that is, the chance for the visitor to perform as a storyteller. Experience is storytelling, and storytelling is no longer an oral flow but a visual thread. The way in which colorful signals appear on a tactile screen and respond to physical movements and gestures may give us the double measure of postdigital experience and performance.

Architecture turns performative when its uses are gestural rather than functional. In the absence of a utilitarian set of explicit instructions, the performative building stands as a massive physical algorithm to be executed by its users. We can see the algorithm as a compression of the real, its synthesis as an executable command, and then understand the sense of “algorithmic compressibility” in digital design.<sup>33</sup> The notion of performative architecture and that of architecture’s algorithmic function are related. In a study about “imagination in the age of computing,” Ed Finn bases the efficacy of algorithms on the ancient practice of performative language (considering the Book of Genesis as first linguistic command, by which the light was turned on in the cosmos).<sup>34</sup> It is the performative function that makes language magical, and the esoteric idea that *signs do things* has persisted until today. The magic of the Bilbao effect is deeply connected with the performance of a building as sign. The post-digital world is one where understanding reality is impossible without the notions of algorithm and interface.<sup>35</sup> Algorithms inform the world’s behavior on the physical, symbolic, and emotional levels, though, as Finn asserts, the implementation of algorithms is never only code, but an entire ecosystem within which code can operate.

As digital architecture demonstrates, not only is form computable, but computation also makes new forms possible—even if we simply want to understand “new form” in a quantitative manner, as previously unattained degrees of formal complexity. Following a negative dialectic, the search for new form turns toward highly random, residual operations whose algorithms are not knowable. Formal intentionality is taken backward, as in artist Nina Canell’s salvaged underwater fiber optic cable sheaths, which exemplify constructive formlessness precisely in the physical membrane of global Internet



transmissions. These residual objects can indeed be considered as contemporary tokens of a subjectless sculpture. Surprise as a matter of probability, formal innovation, shall come from the areas that conscious imagination cannot reach. Gehry's fast, almost compulsive, curvilinear hand drawings on napkins represent the exact opposite of this logic. They produce complexity rather than recognize it. In fact, the blurring of quantitative and qualitative criteria is a major characteristic of the computing age.

If algorithms imply an abstraction—that of their own urge to be executed<sup>36</sup>—we can say buildings do as much with the behavioral and experiential forms they induce. Architecture is a synthesis of social form. Only in this context can the building's skin gain so much prominence. However, the *skinization* of architecture has other effects, as it implies an intensification of its resemblance with sculpture. Like the building, sculpture performs and conditions experience and perception. The key event in sculpture's history was the removal of the pedestal, which, as Richard Serra has pointed out, restored the continuity with the viewer's "behavioral space."<sup>37</sup> This shift—sculpture-as-monument turned site; the physical obstacle becomes, as it were, a spatial fable—was certainly identified in the mid-1960s by artists such as Carl Andre<sup>38</sup>. Though Serra's work since the 1980s offers, as Foster has emphasized, a perfect context to understand the recent transformations of the tectonic arts. Serra's aggressive use of ground and gravity, the massiveness and noncompositeness of his sculptural units, made his work be seen not as an interlocutor of architecture but a competitor. When asked by Foster on the eve of the unveiling of *The Matter of Time* (2005) in Bilbao, Serra emphasized the importance of effect over tectonics: "What is the effect of a structure whose wall is punctured in a way that illuminates the volume so it can hold as palpable space? It might be how the light comes in, it might be scale or how the walls curve. There are many formal aspects that articulate space . . . it's not only tectonics."<sup>39</sup> The key concepts of *skin*, *software*, and *speed* appear closely connected in their conversation. Serra agrees that "there's a fetishization of the abstract skin," but counters, "I'm still interested in the skin turning into the volume, in the skin returning you to the space of the void. I want to hold the field by using the speed of the skin."<sup>40</sup> Semiotic surfaces go faster than the ones not bearing signs or not acting like them. Architecture can behave as sign and not be figurative, but the contrary is more difficult. Sculptural volume

becomes architectural when, rejecting figuration, it operates at the scale of inhabitable form.

The idea of the building-as-sign needs to be reconsidered from the performative angle in order to be understood. Likewise, the idea of performative architecture gains some clarity when approached from the algorithmic perspective.

Paraphrasing Alexander Galloway, we will say that to interpret a building is to interpret its algorithm.<sup>41</sup> To experience a sculpture like Serra's is to execute its experiential script in space, to *perform* the work. Performative architecture's resemblance to performative sculpture does not require the mediation of language—form is score. We can appreciate an intensified awareness of these matters in the work of contemporary architects such as Frida Escobedo, whose Civic Stage (presented at the Lisbon Architecture Triennale in 2013) teases social action and movement by means of a highly inviting platform working as a square—an open plaza—within an existing, open square (Lisbon's Praça da Figueira). The activation of Escobedo's piece, when installed, requires specific public programming as a tactical solution to make events visible and structured, but events would happen on it continually, even if not programmed. The stage naturally and unrelentingly operates on a full-time schedule. It is immediately recognized as a tool by passersby—a tool for what, they might not know—who become users of the work as they recognize themselves as citizens. Another relevant example appears in 6 m Floating Columns, a project by Barcelona-based firm MAIO that was first presented at the 2015 Chicago Architectural Biennale. These long inflatable forms, certainly evocative of Rykwert's idea of the "dancing column," do not support a building physically, nor are they supported by it. By means of small loudspeakers, the columns emit commentaries about their surroundings in a parasitical way, like party gossips. This is sycophantic architecture at its best, or sculpture with the theme of speculative or fake functionality. Its relationship to the main building recalls the way domotic (or home automation) technology inscribes itself in the space of the home. Claiming to be useful, it ends up luring the dweller into a pseudofunctional scheme. In the work of artist and architect Didier Fiúza Faustino, the tension between sculpture and design becomes the plot of a crisis materialized as objects. *Love Me Tender* (2000), *Temps sauvages et incertains* (2007), and *Delete Yourself* (2016) are moderately unfit for use or contemplation. Faustino's numerous models of

anomalous chairs certainly recall modern sculpture's furniture obsession. But chairs are just as performative as walls, corridors, stairs, windows, forks, railings...

To speak about performative buildings, algorithmic objects, and spatial commands does not imply, as we pointed out, the mediation of a univocal script in any case. Serra's expression, "there are no open sequences," is applicable to this entire domain of study.<sup>42</sup> In the space of a performative object, the distinctions between sculpture, architecture, and performance as genres are irrelevant. To enter that space is already, inevitably, a performative act. Serra's sculptures, for instance, cannot not be performed—that was certainly the triumph of his *Tilted Arc* (1981–89). It would be insufficient to merely say that, in the performative space, the object triggers an open sequence of experiences. Things exist as happenings, or as Leatherbarrow has beautifully put it: "We do not so much enter rooms, but rooms . . . happen to us."<sup>43</sup> The undefinable nature of the event—an event is always incommunicable—leads him to claim the unscripted nature of performative architecture.<sup>44</sup> But while it is true that an open sequence cannot be transcribed, openness itself can as a matter of fact be scripted, and many examples are found in the history of contemporary music.<sup>45</sup> Perhaps the most notable and pertinent to our discussion would be Iannis Xenakis's score for *Metastaseis* (1955), a graphic work that bears important correspondences with Xenakis's own architectural design for the Philips Pavilion in Brussels (1958) as part of his collaboration with Le Corbusier. In his analysis of Xenakis's work, David Lieberman considers "architecture as a performing art, not a fine art," understanding "its composition and intent" as a "continually evolving and eroding condition as perceived through the tenancy and occupancy of its use." Lieberman has proposed envisioning buildings as large-scale musical instruments, but he has also acknowledged architecture's broader scope: "architecture is not frozen music / at its best, it is not unlike a score / spare and precise."<sup>46</sup> As a work of architecture, the building finds its score in the form of drawings (or algorithms), but as a performative instrument the building itself is algorithmic—a score, to be executed by living bodies. Comparing contemporary graphic scores—from Earle Brown to Cornelius Cardew—and architectural sketches brings forth an undeniable kinship. Again, this idea might not be so new, if we believe the mystical interpretations of Catalan gothic cathedrals proposed by musicologist Marius Schneider in the 1940s, according to which a cloister should be read and performed as a musical score.<sup>47</sup> At any rate, and as

Franck Leibovici would point out, the performative encounter with architecture (or any art) could not be a performative act without being an interpretive one.<sup>48</sup> A building certainly can be danced or translated into music as much as it can be depicted on a canvas or photographed. The same principle would thus apply to the experience of painting, sculpture, or an actual piece of music. The ultimate responsibility of a viewer-performer might not be just to respond, but to preserve the unpredictability of experience, the openness of effects.

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<sup>1</sup> Richard Serra: *The Matter of Time*, exh. cat. (Bilbao and Göttingen: Guggenheim Museum Bilbao and Steidl, 2005), p. 35.

<sup>2</sup> I refer here to Stephen Toulmin's classic *The Architecture of Matter* (New York: Harper & Row, 1962); as well as Diller Scofidio + Renfro's Blur Building at Swiss Expo in 2002, a project certainly owing to Fujiko Nakaya's fog sculptures and, particularly, her contribution to the Pepsi Pavilion at Osaka '70.

<sup>3</sup> See, for instance, Hassanaly Ladha, "Hegel's *Werkmeister*: Architecture, Architectonics, and the Theory of History" *October* 139 (Winter 2012), pp. 15–38.

<sup>4</sup> Gottfried Semper, for whom weaving and carpentry had a historical prevalence over architecture, defined tectonics as "the art of assembling stiff, planklike elements into a rigid system." His *Style in the Technical and Tectonic Arts; Or, Practical Aesthetics* (1860–62; Los Angeles: Getty Publications, 2004) remains a central reference in this debate. Hal Foster's *The Art-Architecture Complex* (New York: Verso, 2011), partially discussed below, refers to Semper via his reading of Kenneth Frampton (also referenced in this essay). More recently, an interview of Frank Gehry by critic Julian Rose bore the title "Tectonic Arts," although it did not discuss the sense of tectonics in Gehry's work or elsewhere. See Rose, "Tectonic Arts: Frank Gehry talks with Julian Rose," *Artforum* 56, no. 9 (May 2018), pp. 204–215.

<sup>5</sup> Greg Lynn, "Surface Effects," in Cynthia Davidson, ed., *Anymore* (Cambridge, MA: MIT Press, 2000), p. 232.

<sup>6</sup> *Ibid.*

<sup>7</sup> Branko Kolarevic, "Towards the Performative in Architecture," in Branko Kolarevic and Ali M. Malkawi, eds., *Performative Architecture: Beyond Instrumentality* (New York and London: Spon Press, 2005), p. 212.

<sup>8</sup> *Ibid.*, p. 205.

<sup>9</sup> *Ibid.*, p. 209.

<sup>10</sup> *Ibid.*, p. 212.

<sup>11</sup> Foster, *The Art-Architecture Complex*, pp. 18–19, borrows this formula from Robert Venturi, Denise Scott Brown, and Steven Izenour, *Learning from Las Vegas* (1972; Cambridge, MA: MIT Press, 2017).

<sup>12</sup> Kenneth Frampton, *Studies in Tectonic Culture* (Cambridge, MA: MIT Press, 1995), p. 2.

<sup>13</sup> Kolarevic, "Towards the Performative in Architecture," p. 207.

<sup>14</sup> Lynn, "Surface Effects," p. 234.

<sup>15</sup> See Semper, *Style in the Technical and Tectonic Arts*, p. 379, as well as H. F. Malgrave's introduction, p. 50. My reading of the latter differs from the ontological one proposed by Frampton.

<sup>16</sup> *Ibid.*

<sup>17</sup> On the importance of the control panel in the imaginary of 1960s architecture, see Hans Ibelings, *Supermodernism* (Rotterdam: NAI Publishers, 1998), p. 43.

<sup>18</sup> Juan Antonio Ramírez, *Edificios-cuerpo* (Madrid: Siruela, 2003).

<sup>19</sup> Joseph Rykwert, *The Dancing Column* (Cambridge, MA: MIT Press, 1996), esp. pp. 56–67.

<sup>20</sup> David Leatherbarrow, "Architecture's Unscripted Performance," in *Performative Architecture*, pp. 9–10, 17.

<sup>21</sup> The exhibition, titled *Solaris Chronicles*, took place from April to September 2014 at LUMA Foundation, Arles, and was curated by Liam Gillick, Hans Ulrich Obrist, and Philippe Parreno.

<sup>22</sup> See Frank O. Gehry and Vlado Milunić, *Dancing Building* (Prague and Rotterdam: Zlaty Rez and Prototype Editions, 2003)

<sup>23</sup> Michael Sorkin, "Frozen Light," in Mildred Friedman, ed., *Gehry Talks* (London: Thames & Hudson, 1999), p. 36.

<sup>24</sup> *Ibid.*, p. 33.

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- <sup>25</sup> Bruce Lindsey, *Digital Gehry: Material Resistance, Digital Construction* (Basel: Birkhäuser, 2001), p. 53. In the last two sentences, Lindsey quotes engineer Greg Lynn.
- <sup>26</sup> *Ibid.*, p. 65.
- <sup>27</sup> For an illuminating chronology of photosculptural technologies, see Oliver Laric, *Photoplastik* (Vienna: Secession, 2016), pp. 121–51.
- <sup>28</sup> *Ibid.*
- <sup>29</sup> Rykwert, *The Dancing Column*, pp. 46–51.
- <sup>30</sup> *Ibid.*, p. 68.
- <sup>31</sup> The term “amateur photography” is, on the other hand, already a meaningless archaism.
- <sup>32</sup> Foster, *The Art-Architecture Complex*, pp. 30–31.
- <sup>33</sup> “Algorithmic Compressibility, a concept in computer programming, describes the ability for information to be represented in ways that are shorter than the original.” Lindsey, *Digital Gehry*, pp. 38–39.
- <sup>34</sup> Ed Finn, *What Algorithms Want: Imagination in the Age of Computing* (Cambridge, MA: MIT Press, 2017). I consulted the Spanish edition, *La búsqueda del algoritmo* (Barcelona: Alpha Decay, 2018), pp. 13–15.
- <sup>35</sup> *Ibid.*, p. 47.
- <sup>36</sup> *Ibid.*, p. 53.
- <sup>37</sup> Richard Serra, *Writings/Interviews* (Chicago: University of Chicago Press, 1994), p. 171.
- <sup>38</sup> See Frank O. Gehry / Kurt W. Forster (Ostfildern-Ruit: Cantz Verlag, 1999), pp. 62 ss.
- <sup>39</sup> Richard Serra: *The Matter of Time*, pp. 35–36; see the final edited version in Foster, *The Art-Architecture Complex*, pp. 285–87.
- <sup>40</sup> *Ibid.*
- <sup>41</sup> Cited by Finn, *What Algorithms Want*, p. 221.
- <sup>42</sup> Serra, *Writings/Interviews*, p. 40.
- <sup>43</sup> Leatherbarrow, “Architecture’s Unscripted Performance,” p. 10.
- <sup>44</sup> Leatherbarrow quotes Jean Baudrillard: “I think that in every building, every street, there is something that creates an event, and whatever creates an event, is unintelligible.” *Ibid.*, p. 7.
- <sup>45</sup> According to Franck Leibovici, “experience is opaque; we cannot know what it will produce before we have experienced it. In the contrary case, it would be useless and thus reducible to its linguistic utterance.” See Leibovici, “On Scores,” in Mathieu Copeland, ed., *Choreographing Exhibitions* (Paris: Les Presses du Réel, 2013), p. 59.
- <sup>46</sup> David Lieberman, “The Performativity of Space—Architecture as the Production of Sound and Light,” in Sharon Kanach, ed., *Xenakis Matters: Contexts, Processes, Applications* (New York: Pendragon Press, 2012).
- <sup>47</sup> Marius Schneider, *El origen musical de los animales-símbolos en la mitología y la escultura antiguas* (1946; Barcelona: Siruela, 2010).
- <sup>48</sup> Leibovici, “On Scores,” p. 59.