

Moral language and reasoning about perversity permeate architectural theories on building materials. Exposing them allows illuminating the important role culture plays in determining material uses.

## Material nature or perversion: the case of aluminium

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The idea that building materials have a particular ‘nature’ and that design reveals, complements, or contradicts that nature has long dominated architectural discourse. Often addressed in this context are traditional materials, which are found in nature but applied to buildings through means of craft and skillful workmanship.<sup>1</sup> Dwelling on the dialogue between resistant matter and the forces applied to it,<sup>2</sup> many novel architectural examples show that material nature is not a singular quality but can be expressed across various norms.<sup>3</sup> For modern materials that are increasingly industrially produced, however, can the same viewpoint be valid? Following the industrial revolution, discussions regarding the nature of new materials have been wide ranging, yet their applications are aligned with the fabrication and mass production systems. Beyond their use as a predetermined and prescribed end product, is there still a role for conceiving of the nature of modern materials? In this article, we will elaborate on this topic through examining aluminium; an industrially produced material that is conceptually malleable. In less than one hundred years, aluminium rapidly transubstantiated its identity from a rare metal to, by the mid-twentieth century, the most common metal of everyday life – cans, cosmetics, and building materials.<sup>4</sup> Celebrated as the dream material of modernity, we wonder does aluminium have a nature and how might it be revealed in architectural design?

The binary opposition of nature and human culture, as rooted in Western understanding, also follows other constructed binary oppositions and aligns them with each other, like matter and form or female and male. Renaissance architect Filarete (Antonio Averlino) famously identifies the patron with the father and the architect with the pregnant mother, giving birth to a design as a scaled drawing or model. This reflects the premodern view that the father provides the child’s form while the mother provides the material (still present in the shared roots of words such as matter and maternal).<sup>5</sup> This hierarchised approach, as well known, favours male over female, form over matter and fosters Western culture’s dominance over nature. The environmental

crisis we are facing today is rightly argued as a result of this approach. However, even during the early architecture ecology discussions after the Second World War, the conditions distinguished as natural were already present integrally with the cultural. As David Leatherbarrow and Richard Wesley convincingly argue, architecture could never fully take a side in such binary oppositions.<sup>6</sup> In this article, we also argue for acknowledging the importance of both aspects of nature and culture in their inevitable intertwining for theorising building materials. Unfortunately, the still-prevailing dualism usually results in repressed cultural meaning hidden within a narrow emphasis on physical facts assuming technology alone is sufficient to address increasingly important environmental concerns.

Nature and human culture combine together to make building materials. Modern observers mostly divide these elements into two distinct categories such as properties vs qualities or matter vs materiality.<sup>7</sup> Material properties are objective and quantifiable entities that are described by scientists, whereas material qualities are those that are to be revealed by design.<sup>8</sup> In premodern times, under the aegis of natural philosophy, the categories of fact, meaning, and value were not separate; they were interconnected. Books known as bestiaries described all known animals, both actual and imaginary, identifying their biological traits intermixed with myths. The same was true of early books on plants, stones, and metals.<sup>9</sup> While this odd mixture confusing modern categories of knowledge is comical today, we will see that architects’ approach to theorising building materials in many ways continues the same tradition.<sup>10</sup> Rather than dismissing these mixtures as categorial errors, however, it illuminates the important coexistence of these ways of knowing building materials.

A key aspect demonstrating the intermingling of nature and culture is architects’ theorisation of building materials, with its widespread presence of moral reasoning and language embedded within this discourse, even when it is presented as factual. In making ethical pronouncements, it often seems easiest to articulate what should be avoided rather

than what ought to be. Similarly, in writing about building materials, the moral language of perversion – how materials ought *not* to be used – is extremely prevalent. ‘To pervert’ derives from Latin *pervetere*, meaning ‘to turn around’ or ‘to turn upside down’. By revealing the hidden presence of the moral language of perversion at the heart of architectural dialogues on materials, we enable better understanding of the complex mixture of culture and technology that needs to be addressed together for positive development towards a sustainable circular economy of building.

Approaching the multifaceted question of material in architecture through the lens of perversion allows us to theorise on the ‘nature’ of aluminium as a constantly discovered quality that can be established through design. Aluminium, an alloy material product of human culture, is attained through destructive processes and made available only as end products to consumers. For the building industry’s use of aluminium, architects perform the role of customers. As David Pye argues, since workmanship vanishes in the production of industrial materials, what may be the nature of these materials is lost in the modes of their production.<sup>11</sup> Among its many possibilities of use, in this article we will trace how a normalised way of using aluminium emerged, and how the angle of perversion can help architects to break through that restriction and incorporate it into their material imagination for design.

#### **Perversion: against nature or norm**

Approaches to architecture often oppose form against material while emphasising form. In 1624, Sir Henry Wotton, who penned the famous English version of the Vitruvian triad as ‘firmness, commodity and delight’, also wrote that ‘the glory of the architect consists more in the Design and *Idea* of the whole *Work*, and his truest ambition should be to make the *Form*, which is the nobler Part triumph over the *Matter*.’<sup>12</sup> This still-widespread view prioritises form above matter. Today’s normative architecture practice begins initial schematic design with emphasis on form as shape and size, while only the later construction document phase identifies materials and their assembly.<sup>13</sup> This ‘triumph over matter’ acknowledges the enormous malleability of materials when subject to the imposition of form determined by what are deemed higher motivations, whether for practical or aesthetic values.

Indeed, materials can be used and treated architecturally in a remarkably, almost inexhaustible, variety of ways. Yet, more reflective architects have long voiced that the formal desires of the architect must be tempered by the nature of building materials. Italian architect Vincenzo Scamozzi, who completed many of Palladio’s projects after his death, writing in 1615 cautions that, ‘it is neither good nor commendable for the architect to attempt, as it were, to offer violence to matter, and think that he may always reduce to his will those things which are created by Nature, to give them any such forms as he pleases.’<sup>14</sup> Scamozzi,

following Aristotle, goes on to explain that the matter of building materials has *potential* according to its particular abilities. Yet, while ‘every matter is not apt to receive every kind of form’ it is also ‘true that the form is not found truly or essentially in the matter, but only superficially, because if it were so, the same matter could receive but one form’.<sup>15</sup> Building materials cannot be made to do absolutely anything, but neither are they entirely determining of how they must be used. In other words, the relationship between form and matter in architecture is contingent; specific materials have certain properties that make them more or less appropriate for particular uses. In the modern era, Louis Kahn exemplifies this understanding with his famous fable of brick telling the architect, ‘I like an arch.’ Kahn’s fairy tale of a talking brick tells us at least three things: (1) that the resistance of materials ‘demands the respect’ of architects to listen or attend to them, (2) that by the brick saying ‘I like...’ it acknowledges that materials can be used in many different ways even while there are better or worse choices, and (3) that design should elevate the material’s ‘nature’.<sup>16</sup>

The recurring references in architectural writing to the nature of material follows the moral language of goodness being natural whereas any violation is violent or unnatural. Among the most influential of premodern attempts to define morality and its perversion was that of medieval ecclesiastical scholar Thomas Aquinas (1225–74) who reasoned perversity to be that which is ‘contrary to nature’.<sup>17</sup> A central concept Aquinas adapted from Aristotelian philosophy is his notion of ‘natural law’.<sup>18</sup> These fundamental truths, like Euclidean geometry’s basic axioms, are shared truths among people, which provide a bedrock for moral practice and discourse. If particular acts violate natural law, then they are perverse. Aquinas held that any sexual act from which procreation cannot follow is perverse. According to Aquinas, natural law can be almost entirely lost through perversion but is not destroyed.

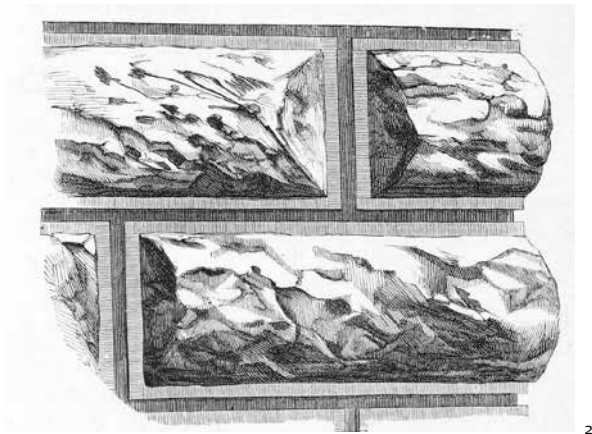
The idea of perversion as unnatural is widespread across time. Many discussions following the idea of perversion as against nature, attempt to articulate rules as to what acts are perverted based upon what is judged unnatural, especially regarding the human body.<sup>19</sup> This is exemplified in physician John Bulwer’s popularly successful 1650 book *Anthropometamorphosis*, which describes – as part of the lengthy subtitle explains – ‘*The Fashioning & Altering [of our] Bodies from the Mold intended by Nature*’ [1]. Assuming his own English practices to be natural, Bulwer describes other cultures from around the world through a mix of fact and fiction who ‘purposefully pervert’ their bodies with alterations such as tattooing and bodily mutilations and attributes any English perversions to the malign influence of foreign fashion.<sup>20</sup> This illustrates that judgements of what is unnatural can be highly influenced by one’s own cultural situation. Moreover, it demonstrates the difficulty of seeing beyond, or without, cultural influence.



1 Frontispiece, John Bulwer, *Anthropometamorphosis: Man Transformed or the Artificial Changeling*.

Approaching perversion as unnatural lies deep within numerous architectural judgments about the proper use of building materials. Andrea Palladio in his *Four Books on Architecture* (1570), immediately after discussing the orders and their ornaments in the first book, titles the next chapter 'On Abuses' to 'alert the reader to the many abuses imported by the barbarians'.<sup>21</sup> Abuses result when architecture 'endures anything that alienates and distances it from what nature herself permits'. Drawing upon Vitruvius' claim that stone temples derived from timber buildings, Palladio explains that a column should, like a tree, taper towards the top.<sup>22</sup> Palladio goes on to identify a number of common abuses that we should 'curse' because they 'depart from the natural order of things'. Revealingly, Palladio commits some of the very abuses in his projects to

which he objects.<sup>23</sup> Another example admired by Palladio of the ancients' respect for nature are mouldings such as the torus, which by curving outwards 'appear to be crushed by the weight above'. However, the opposite judgement is made by German architect Gottfried Semper in the middle of the nineteenth century. Describing a stone's compressive strength as its 'most significant attribute', Semper advocates a stone wall's surface projecting with rustication or diamond ashlar because it 'expresses the crystalline-mineral law active in masonry in a way that is artful yet conforms to natural laws'. Unlike Palladio, however, he strongly rejects the 'fake and stuffy bombast of modern cushion ashlar' where outward curving of the stone incorrectly suggests that 'the stone is yielding [under weight] like a cushion.'<sup>24</sup> Here,



2 'Ashlar on the Dresden Museum'. Gottfried Semper, *Der Stil in den technischen und tektonischen Künsten oder praktische Ästhetik* [*Style in the Technical and Tectonic Arts, Or, Practical Aesthetics*].

Semper deems cut diagonal projections in the face of a block of stone as natural while the same projection with a curving profile is an unnatural perversion of the material [2]. Despite this, Semper used cushion ashlar in his designs. As between Palladio and Semper, the identification of perversions is contradictory, even when ostensibly basing their judgements solely on the physical nature of materials. The idea of nature operative in writing about architecture cannot be inherent within things.

In the modern world, Aquinas's idea of an inherent nature defining proper human action was rejected in favour of describing mores as the behaviour that is predominantly accepted. Freud importantly held that perversion was not a moral judgement, rather anyone's behaviour that is outside of socially accepted norms, making perversity statistical.<sup>25</sup> Freud's position is further nuanced by his notion of 'polymorphous perversity' occurring in everyone as young children: a general, undefined, overall sexual interest that only with puberty becomes a unified genital-focused sex drive. Freud explains perversion as the continuation of some aspects of that original state into adulthood.<sup>26</sup> In this sense, everyone is born perverse but only a minority behave perversely as adults.

This shift from nature to norm within the history of architecture is already introduced in the thought of French Enlightenment architect Claude Perrault (1613–88). In his early effort to modernise architectural thought, he reconceives Palladio's architectural abuses from being unnatural to abnormal. Perrault's *Ordonnance* dictates rules for proper use of the orders based upon what we are accustomed to expect. He increases Palladio's four abuses to ten and redefines them as 'comparable to rules of grammar, authorised by usage rather than absolute correctness.' Perrault's normalisation by use goes so far that he writes, 'some abuses custom

has rendered not only acceptable but even necessary.'<sup>27</sup> With Perrault's division between positive and arbitrary beauty, only the former highly restricted category is absolutely tied to nature. The latter primary category of architectural design provides norms that ought to be followed. It should be noted that 'nature' has been a predominately adopted theme in the terminology of all the normative provinces of Western thought.<sup>28</sup> In this way, norms are appropriated and reabsorbed into our language by now using 'nature' for norms that confuse aesthetic terminology with another meaning. For building materials, the appropriation of the word nature is applied to the norms for design practices that are varying in individual and cultural interpretations. Thus, while nature and norm are two distinctly different concepts, nature is used to describe both.

### Changing norms and nature of aluminium

Attitudes to perversity and materials take an anxious turn during the nineteenth century with the introduction of new materials into architectural design. Ideas about truth and perversion in the use of building materials were developed by John Ruskin, exercising his particularly acute moral sensitivity.<sup>29</sup> Ruskin's *Lamp of Truth* proclaims that no material is to be deceptively represented.<sup>30</sup> Use of plaster on a brick wall is acceptable, for example, unless the plaster is treated to look like stone. Later, Adolf Loos following Ruskin's material morality, posited his own '*Principle of Cladding*'.<sup>31</sup> He reasoned that 'each and every material has its own vocabulary of forms and no material can appropriate the forms of another. Forms develop out of the way a particular material is produced and the ways in which it can be worked, they develop with and out of the material.'<sup>32</sup> Showing that it is easier to identify the perverse than the proper, Loos's 'law' – that 'there should be no possibility of confusing cladding with the material it covers' – allows for 'any' approach except for the imitation of another material.

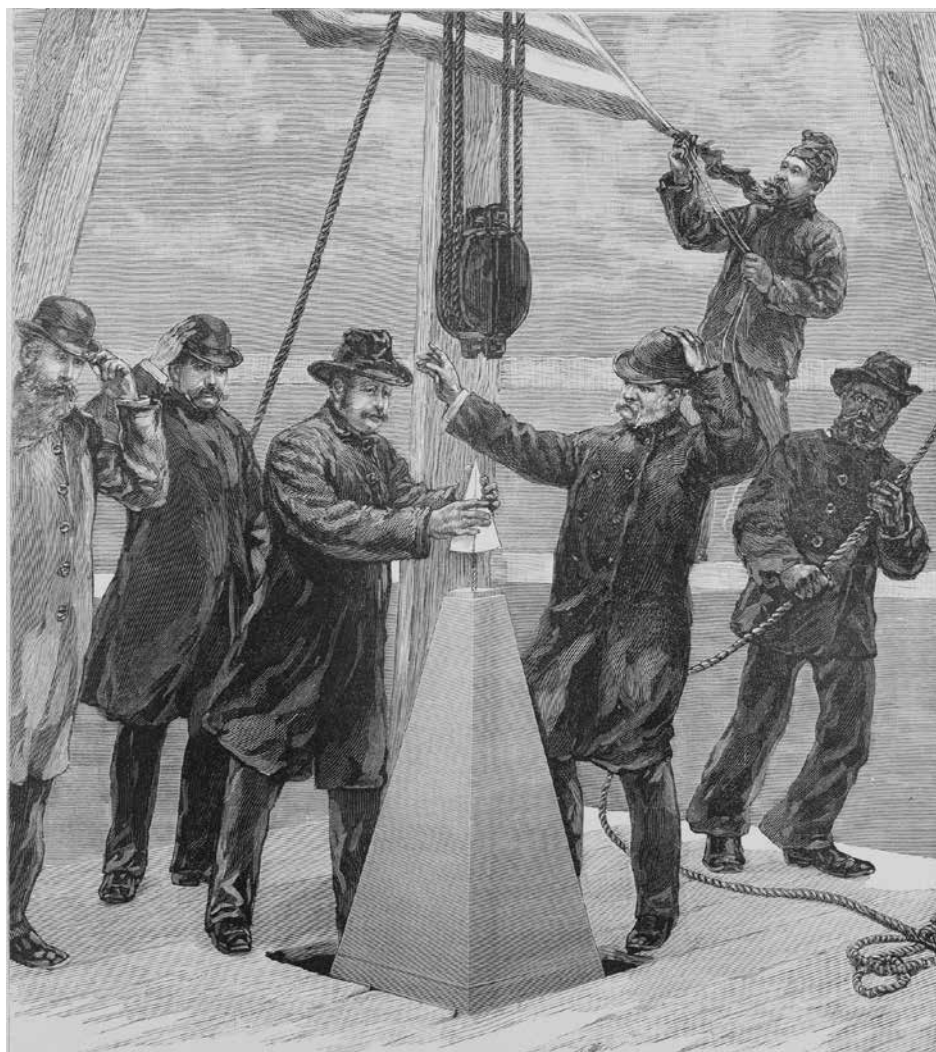
Ruskin's principle of not using one material to imitate another was applied to sheet metal even before the appearance of industrial aluminium alloys. Aluminium is naturally widespread, the third most abundant element on the earth's crust after oxygen and silicon but is contained in very stable compounds so it proved extremely difficult to extract.<sup>33</sup> By the middle of the nineteenth century, extraction processes using chemicals were able to create modest amounts of pure aluminium. An ingot of aluminium was displayed beside the French crown jewels at the 1855 Paris Exposition and described as 'silver from clay'.<sup>34</sup> The metal was extremely expensive (more valuable than gold) and used for small ornamental items such as jewellery. It was thought of as similar to silver in that it is easily worked, but like gold, it doesn't tarnish. The first architectural use of aluminium may be in 1884, when the tip of the Washington Memorial in Washington, DC was capped with an 8.9-inch tall pyramid cast of one hundred ounces of pure

aluminium [3]. This use of aluminium recalled the pyramids or caps of Ancient Egyptian obelisks that were originally covered in gold, showing aluminium was perceived as a rare metal at the time. Prior to its installation, the coveted aluminium casting had been on display at Tiffany's in New York. The material was a subject of wonder rather than utility and its cultural meaning directly impacted the use of aluminium in the late nineteenth century.

The importance of the normative perception of materials was acknowledged by Henri Saint-Claire Deville who developed a more commercial approach to manufacturing aluminium in the 1850s. In his 1859 book *De l'aluminium* he mused that 'nothing is more difficult than to admit into the customs of life and introduce into the habits of men a new material, however great may be its utility.'<sup>35</sup> More challenging than technical advancement is cultural acceptance. With the discovery of how to produce pure aluminium relatively inexpensively by employing very large amounts of electricity, the architectural applications of aluminium alloys slowly expanded, primarily as a substitute for other materials.<sup>36</sup> Aluminium was by then conceived as an intermediate metal that was neither as common as iron nor as rare as gold.

Through the two World Wars, aluminium became modernism's metal.<sup>37</sup> Important in airplane manufacture, it was proclaimed in 1936 that 'aluminium has become the *speed metal* of a new and faster age.'<sup>38</sup> The 1930 Aluminaire house by Albert Frey and A. Lawrence Kocher was created for an exhibition as 'A House for Contemporary Life' and would later be purchased by the lead architect of Alcoa Company (Aluminium Company of America) headquarters, Wallace Harrison, and re-erected as his weekend house.<sup>39</sup> The first all-metal house to be constructed in America, it was raised off the ground on six 5-inch aluminium pipe columns and clad in thin aluminium sheathing.<sup>40</sup> R. Buckminster Fuller's Dymaxion house and car (1933) were both made of aluminium. These visions of a futuristic aluminium lifestyle aroused curiosity but were not broadly adopted.<sup>41</sup> Privileging speed, lightness, and mobility, aluminium materialises a technological sublime that is manifest in numerous futuristic projects but its shiny sleekness failed to be widely accepted as homelike and suitable for domestic use.

Aluminium was more enthusiastically utilised for office buildings. The Empire State Building (1932) used aluminium for its spandrel panels and also used more notably in its iconic spire for mooring airships (which were also made of lightweight



3 '572 feet high – Setting the Aluminium Cap-stone on the Washington Monument'. 6 December 1884. *Harper's Weekly* (20 December 1884), p. 839.

aluminium frames).<sup>42</sup> In 1953, the Pittsburgh headquarters of the Alcoa Company, by the architectural firm of Wallace Harrison and Max Abramovitz, was an aluminium showcase. The modern thirty-storey Alcoa headquarters has a skin of stamped aluminium only 1/8 inch thick, making it the lightest building of its size [4]. The 6-foot by



12-foot aluminium panels were ‘stamped out like cookies by a hydraulic press’ [5]. Assembly also took place at a remarkable speed of one floor per day. The ceilings, windows, sashes and frames, heating and ventilating ducts, water piping and electrical wiring system and some of the structure were all made of aluminium. Even carpets and draperies were woven from aluminium fibers. Aluminium’s startling lightness even while retaining significant strength, inspires many of its architectural uses. Over a relatively brief period of time, less than a century, the perception and acceptable uses of aluminium changed dramatically. This demonstrates the key role of normative perceptions of materials along with their changeability.

The 1956 Reynolds Metal Company’s publication *Aluminium in Modern Architecture* celebrated the connection of the aluminium industry with architectural design. The company president’s introduction highlights the ‘fresh ideas’, ‘new approaches’, and ‘new beauty’ that would be achieved via ‘thinking in aluminium’.<sup>43</sup> Such thinking would be established in the triad of fabrication, application, and appreciation, which unfolds in a fluid dialogue between producers, designers, and users without any certain causal order.<sup>44</sup> While many emphasised the prefabricated aspect of this industrial material, occasionally design came first, such as the louvre system Richard Neutra designed for the Kaufmann Desert House with moveable vertical aluminium blades, which was later commercially mass-produced.<sup>45</sup> Although ‘fresh and new’, nevertheless the dominant industrial production established ‘norms’ for aluminium products to be ready-made and then applied to buildings. Architect L. L. Rado was more critical:

*I feel our biggest problem today is the creative use of our new materials [...] that applies to metals as well as to*



4 Harrison & Abramovitz architects, Alcoa building (1953); Henry Hornbostel architect, aluminium spire of Smithfield Church (1927), Pittsburgh.

5 Workers installing the first aluminium panel on the Alcoa Building (1950–3), Harrison & Abramovitz architects, Pittsburgh.

*synthetic materials as opposed to natural materials. Stone and wood are close to nature, and their use is somehow governed by conserving the natural, inherent character of the material. There was a certain imperfection of natural materials that lent beauty and charm. Now with our new materials, it's perfection that is the feature and we don't know as yet what to do with perfection and get a human result.*<sup>46</sup>

Industrial norms are established based on a unity of plan, direction of work, and the given purpose of the material as used in construction.<sup>47</sup> The norm established for prefabricated materials aligned with modern architecture's quest for achieving perfection, that neglected the labour that went into its fabrication.<sup>48</sup> Photography was the medium used to promote this perfection. Rado is likely pointing at the removal of the tension between material and design that led to a lack of prefabricated materials more creative use that could still be explored within the imperfection of natural materials. In the dichotomy of perfection and human result, the question of the nature of aluminium, as well, lies.

The nature of aluminium, on one hand, was becoming established based on how it was seen in relation to traditional materials. On the other, it was being associated with expressions generally identified with the modern movement. For example, Frank Lloyd Wright's Greek Orthodox Church (1956) in Milwaukee, Wisconsin includes aluminium brackets cantilevering out from the fascia to provide a sunscreen. According to architect and critic Terry Patterson these projecting 'lance-like' brackets are cut at an acute angle to reflect the 'sharpness' of the 'spirit of aluminium and metals in general'. While he approves of Wright's use of knife edges in aluminium, in another project – Marin County Civic Center (1957) – where Wright uses aluminium to form decorative spheres and curving pipe rails, Patterson judges it as failing to respect aluminium's metallic nature.<sup>49</sup> Appeals to the inherent nature of things to determine their perversity reveals that the use of both nature and norm as conceptual criteria for judgement of propriety is highly variable and inevitably subject to cultural associations.

### **Perverse natures of aluminium**

Premanufactured building materials and sophisticated industrial products already prescribe the use of aluminium as commodified mass-produced articles selected for a predefined purpose. They often arrive at the construction site prepackaged and wrapped to reinforce their fetishistic commodification. This approach is inherited in architectural design. In our image-driven world, what is most often considered during design has become a photograph of materials, which are then applied through photorealistic wallpaper renderings onto building forms. The material itself, its physical and symbolic qualities that can be realised and transformed through the architect's imagination, is being ignored in favour of a palette of material choices as given in catalogues, that are 'applied' to surfaces. Even in the case of sleek modern aluminium panels, the aluminium is merely

representing aluminium on its surface, just as it may represent wood or stone material. The desire to elevate the material itself is suffocated by the ambition of achieving a unique and stimulating image. This is true not only of normative commercial architecture practices, but also among many innovative architecture firms who select unusual materials such as aluminium foam but then merely apply them to building façades.<sup>50</sup> As already predicted in a warning by Walter Gropius, the shift towards a 'variety of appearances' rather than thinking with or through material, is perpetuated by market forces.<sup>51</sup>

A building with a unique use of aluminium provides further insight into designing with material and the contingent approach to perversion. The Markel Insurance Corporation headquarters built in 1962 in Richmond, Virginia was designed by architect Haigh Jamgochian (1924–2006) [6].<sup>52</sup> It is a distinctive three-storey tapering circular office building raised on twelve columns. Between continuous bands of deep-set tinted windows are 9-foot wide spandrels, angling downward at 15 degrees to allow more light under the building. The spandrel was planned to be concrete. Then, according to Jamgochian, during an American Institute of Architects awards dinner, the architect was served a hot baked potato wrapped in aluminium foil, and he was inspired to redesign covering the spandrel of the circular office building with a continuous roll of aluminium.<sup>53</sup> Primarily because of the reduction in weight, the aluminium finish was much less expensive than concrete. He specified one 9-foot wide, 700-foot long continuous roll of 0.032-inch thick aluminium.<sup>54</sup> Rather than using conventionally joined panels, he created a free-form textured pattern while staying within the project budget. Jamgochian designed its installation on a revolving deck so that as the spool unrolled, workers could use aluminium screw nails to secure it at the top and bottom at the rate of three feet per minute [7]. At the same time, other workers would dent the aluminium to give it a crinkled finish. After the architect experimented with a full-size mock-up, they began the installation.<sup>55</sup> But Jamgochian recalls that 'the workmen refused to dent it, saying it had never been done before.' Trying to convince them this was not deviant behaviour, Jamgochian climbed to the top of the building with an 11-pound sledge hammer and 'started banging' [8].<sup>56</sup> The free-form crumpling anticipates the behaviour of sheet aluminium, which requires elaborate steps to prevent what is usually considered unattractive waviness known as oil canning.<sup>57</sup> The entrance lobby's elevator shaft wall was adorned with the same crumpled metal so 'curious visitors are encouraged to enjoy the tactile experience which the building visually promises.'<sup>58</sup>

The architect understood the aluminium building sheathing as a sort of foil, explaining the crinkled aluminium 'lends vitality to the exterior'.<sup>59</sup> Although it had not been previously tried, he judged the results to be 'natural', writing 'any housewife who has used aluminium foil knows that it is the nature

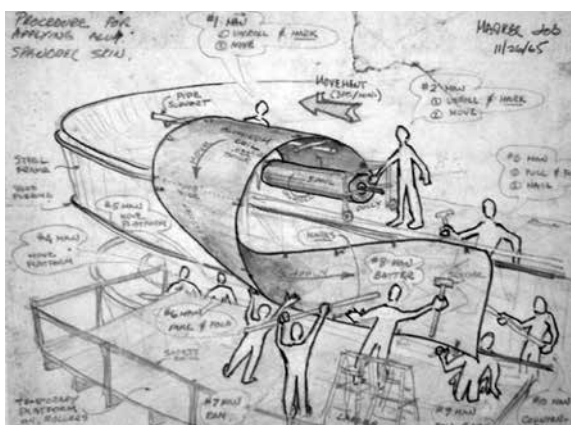


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6 Markel Building (1953). Haig Jamgochian architect, Richmond, Virginia.

7 Sketch for installation of aluminium spandrel for the Markel Building by Haig Jamgochian.

8 Haig Jamgochian denting aluminium spandrel on the Markel Building with a sledgehammer.



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of the material to wrinkle'. Jamgochian explains his conception of aluminium's character:

*Aluminium has the property of lightness of weight. I believe that in modern architecture we are striving more and more for the light and athletic feeling rather than the heavy, cumbersome work of the past where weight was the main consideration and design was obtained by massiveness and effect of light on mass and material. I would say that aluminium is the lightest material which has entered the architectural mind. The idea of making a building extremely light, is to make it in keeping with our fast-moving civilization.<sup>60</sup>*

The wrinkles not only sparkle and reflect colour but also permit the aluminium to expand and contract, eliminating the need for seams necessary in conventional flat panelling.<sup>61</sup> Jamgochian concludes that, 'One must always be the master of the material, not vice-versa. The architect must project his sense of design and creativity upon the material, but never to the point where the innate strength and vitality is sacrificed.'<sup>62</sup> In the architect's rationale, we again find the moral tropes of perversion applied to building material.

When Haig Jamgochian directed builders to pound hammers against the aluminium skin of the building façade to make dents, was this a sadistic act of violence against the material or part of revealing its peculiar, hidden nature? Slavoj Žižek, interpreting

Lacan, suggests that perversion is best understood as contingent; that propriety is determined neither by an inherent nature nor by socially accepted norms, but rather based upon the particular situation. Perhaps architects should follow psychologists who are now using the word 'paraphilia' to replace perversion in an effort to reduce hidden assumptions of latent moral rules.<sup>63</sup> This contingency for architectural building materials is determined by the world of the individual building – not some absolute set of natural or normative rules.<sup>64</sup> The architect who swung a sledge hammer against the aluminium sheathing on the office building to make it look crinkled like the aluminium foil around a baked potato was creating a particular world within which those actions were fitting.

By accepting Freudian polymorphous perversity as the initial human disposition, as introduced above, then perversion is nothing but an uninhibited



continuation of normal human sexual drives. Perversity, then, is no longer a deviation from normality. As psychologist and psychoanalyst Dany Nobus writes, ‘the real Freudian question would be: “Why and how does anyone ever become sexually normal?”’.<sup>65</sup> As the construction industry determines the norms for building, our means for thinking in aluminium increasingly complies with standardised construction methods and materials, reaching towards the ‘perfection’ to which Rado alludes. Architectural prefabrication has a parallel in Marcel Duchamp’s innovation of the readymade art object; bringing attention not to artistic labour, but conception and selection. In 1916, Duchamp even considered making the Woolworth Building in New York, then the tallest building in the world, into a readymade, showing his understanding of building becoming increasingly the result of assembly of readymade elements.<sup>66</sup>

Jacques Lacan developed a third approach to defining perversion that was fundamentally different from the unnatural or abnormal. Instead of focusing on particular behaviours, he considered perversity through the form or structure of behaviour.<sup>67</sup> Explaining perversion as the inversion of fantasy, Lacan writes that the pervert surrenders his/her own viewpoint in order to adopt that of the big Other, acting as its instrument.<sup>68</sup> Authority, technical production or fashionable novelty can operate as the architect’s big Other to demand certain sorts of materials and finishes for particular

kinds of buildings. For Lacan, a pervert does something for reasons outside of him/herself. Like totalitarianism, the pervert desires to achieve more than he could alone, yet realises far less.<sup>69</sup> When the architect identifies with the big Other he/she becomes its instrument for the will-to-enjoy. These perversions can appear both among commercial practices and trend-setting stylistic leaders in architecture such as the recent use of foamed aluminium for its visual appearance and treating it like any other cladding without considering how foamed aluminium itself might suggest another sort of wall assembly. Applying Lacan’s view (that the perverted approach is to follow controlling opinions and practices) to architecture, we conclude that the truly original experimental architect undoes the inversion of fantasy and reclaims a fantasy world through the moral imagination that creates fitting uses for new forms or finishes for buildings.<sup>70</sup>

From this definition of perversion, the widespread ersatz use of aluminium to create ‘wood’ house siding and ‘stone’ classical ornament is what is truly perverse [9, 10]. While these uses have been deemed desirable by a wide spectrum of authorities, they are the most perverse by Lacanian theory. Long propagated as the material of the future, aluminium was reprocessed in various formal appearances in order to accustom itself to expected and known forms. As Dennis Doordan rightly observed: ‘The true aluminium house of the second half of the twentieth century is more than likely a Colonial Revival design



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9 Wood grain aluminium siding.

10 Extruded aluminium classical elements on a full-size wall mock-up at a housing construction site in Alexandria, Virginia (2017).



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with aluminium siding, window sashes, gutters and downspouts.<sup>71</sup> Frank Lloyd Wright lamented the ‘imitation in metal of a wood paneled door’ that was ‘grained to complete the ruse’. Instead, he sought use of ‘sheet metal as a fine material for its own sake’.<sup>72</sup> Thinking with a material, understanding its potential and transforming it, also means challenging the confined framework of its pre-established use.

Aluminium can be found in many forms, from various building products to banal objects of everyday life. We interact with aluminium in all its forms as an end product already determined by the industry. The conceptual malleability of the material is already governed in its production, leaving little room for the architect’s imagination to conceive it as a raw material to be incorporated into buildings in an innovative way. Yet the question is far from settled. Is it innovative to reveal the wrinkling nature of aluminium through hammering, like Jamgochian did, or to present aluminium as a stone moulding where one material perfectly mimics another with ease of installation? Both can be seen as perverted acts within the nature of this material.

Grounding judgements – whether they are about what is proper or what is perverted – of the use of a building material within the context of its particular situation reinforces the importance of the environment, both physical and cultural, in architecture. In order for design to be elevated, materials should be used in ways that are consistent

within the work.<sup>73</sup> Even the most advanced material matrix can be reconceived as a raw material awaiting transmutation into the philosopher’s stone. Designing with material allows certain of its properties to emerge in ways that are relevant to the particular conditions of the project. In the *Ethical Function of Architecture*, philosopher Karsten Harries writes, ‘Buildings that deserve to be called works of architecture invite us to attend to their materials in a very different way’. He cites Martin Heidegger writing that art and architecture causes material to come forth as if for the first time into the ‘Open of the work’s world.’ This is not an essentialist definition of a material’s nature, rather quite differently it is the way material is manifest in relation to its particular artwork. Harries concludes, ‘Such revelation requires that materials are worked in a way that invites us to step back from our usual involvement with things.’<sup>74</sup> Louis Kahn concludes his story of the brick by admonishing the architect to ‘put [the brick] into absolute glory, that is the only position that it deserves.’<sup>75</sup> The measure of its ‘glory’ is how the material is situated within its particular project. By exposing the moral language and reasoning in discourse on building materials as we have presented here, and becoming more aware of how it shapes our understandings of materials, architects can make more clear decisions in the exercise of their own moral imagination,<sup>76</sup> acknowledging the intimate interconnections between material and culture.

## Notes

1. David Pye, *The Nature and Art of Workmanship* (London: Studio Vista, 1971). For a discussion on the medieval and Renaissance approaches to the ‘nature’ of materials, and techniques to enhance their qualities for building, see: Paul Emmons, *Drawing, Imagining Building: Embodiment in Architectural Design Practices* (New York, NY: Routledge, 2019), p. 55.
2. Antoine Picon, *The Materiality of Architecture* (Minneapolis, MN: University of Minnesota Press, 2020), p. 3.
3. Richard Weston, *Materials Form and Architecture* (New Haven, CT: Yale University Press, 2003), p. 41.
4. Mimi Sheller, *Aluminium Dreams: The Making of Light Modernity* (Cambridge, MA: MIT Press, 2014), p. 1.
5. Berrin Terim, ‘Filarete’s Body: Unpacking the Pregnancy Analogy in the Renaissance Patronage Context’ (PhD dissertation, Virginia Tech, 2021).
6. David Leatherbarrow and Richard Wesley, *Three Cultural Ecologies* (London: Routledge, 2018), p. 8.
7. The authors propose conceptually uniting culture and nature as ‘cultural ecology’, p. 10.
7. Picon, *The Materiality of Architecture*; Pye, *The Nature and Art of Workmanship*, pp. 45–7.
8. Pye, *The Nature and Art of Workmanship*, p. 88.
9. Ulyssis Aldrovandi, *Museum Metallicum [Metal Museum]* (Bologna: Bononie, 1648).
10. *Beasts and Birds of the Middle Ages: The Bestiary and its Legacy*, ed. by Willene Clark and Meredith McMund (Philadelphia, PA: University of Pennsylvania Press, 1991); Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (New York, NY: Vintage, 1994), p. xv.
11. Pye, *The Nature and Art of Workmanship*, p. 88.
12. Sir Henry Wotton, *The Elements of Architecture* (London: John Bill, 1624; repr. Charlottesville: University Press of Virginia, 1968), p. 21 (sic 12). Spelling modernised, but italics and capitalisation are original.
13. *The Architect’s Handbook of Professional Practice*, ed. by Joseph Demkin, student edn (New York, 2002), p. 435; Paul Emmons, ‘Architectural Encounters between Material and Idea’, in *The Material Imagination: Reveries on Architecture and Matter*, ed. by Matthew Mindrup (Farnham: Ashgate, 2015), pp. 89–106.
14. English translation in handwritten manuscript interleaved with Vincenzo Scamozzi, *L’idea della architettura universal* (Venice, 1615), *The Idea of Universal Architecture of Vincenzo Scamozzi, A Venetian Architect*, into English (c. 1670), Vol. II, p. 174. Soane Museum Library (AL45c).
15. Ibid.
16. For two of Kahn’s versions of the tale, see: John Lobell, *Between Silence and Light: Spirit in the Architecture of Louis I. Kahn* (Boulder, CO: Shambhala, 1979), p. 40; Louis Kahn, *Louis I. Kahn: Writings, Lectures, Interviews*, ed. by Alessandra Latour (New York, NY: Rizzoli), p. 288, reprinted from Louis Kahn, ‘I Love Beginnings’, *Architecture and Urbanism*, Special Issue: Louis I. Kahn (1975), pp. 278–86.
17. Thomas Aquinas, *On the Truth of the Catholic Faith [Summa contra gentiles]* bk. 3, Providence, pt. 2

- (1956), 'The Reasons why Simple Fornication is a Sin according to Divine Law, and that Matrimony is Natural', trans. by V. J. Bourke, ch. 22, p. 146.
18. Ralph McInerney, 'Ethics', in *Cambridge Companion to Aquinas*, ed. by Norman Kretzmann and Eleonore Stump (Cambridge: Cambridge University Press, 1993), pp. 196–217, 208–12.
  19. Donald Levy, 'Perversion and the Unnatural as Moral Categories', *Ethics*, 90:2 (January 1980), pp. 191–202. Foucault distinguished the sin of sodomy, which was an act, from the modern idea of homosexuality, which purports to define a person's nature. Michel Foucault, *The History of Sexuality*, Volume I: An Introduction, trans. by Robert Hurley (New York, NY: Vintage, 1980).
  20. John Bulwer, *Anthropometamorphosis* (London: William Hunt, 1650), p. 254.
  21. Andrea Palladio, *The Four Books On Architecture*, trans. by Robert Tavernor and Richard Schofield (1570; repr. Cambridge, MA: MIT Press, 1997), I. XX, p. 55.
  22. Vitruvius, 4.2. By citing Vitruvius's discussion of ancient temple ornament in stone deriving from when they were previously made of wood, Palladio implies that it is not the physical nature of material that is controlling, rather its cultural association with a different material.
  23. Palladio writes, for example, that 'building tympanums split in the middle' for openings are 'diametrically opposed to the laws of nature' (p. 56) while at Villa Barbaro he omits the centre of the pediment entablature for a window arch. He also asserts that columns should be 'complete and robust' but in Palazzo Chiericati he 'coupled the columns at the corners' (p. 81). His late Loggia del Capitano (1571) commits most of the abuses Palladio identified.
  24. Gottfried Semper, *Style in the Technical and Tectonic Arts*, trans. by Harry Francis Mallgrave (1860, 1863; repr. Santa Monica, CA: Getty, 2004), pp. 727–32. Semper also writes that a stone block with a sunken face 'would be stylistic nonsense'.
  25. Sigmund Freud, *Three Essays on the Theory of Sexuality* (1905), SE VII, p. 125. Freud begins the *Three Essays with Sexual Aberrations* on the topic of perversion.
  26. Donald Levy, 'Perversion and the Unnatural as Moral Categories', *Ethics*, 90:2 (January 1980), pp. 191–202 (p. 195).
  27. Claude Perrault, *Ordonnance for the Five Kinds of Columns after the Method of the Ancients* (Santa Monica, CA: Getty Center for the History of Art and the Humanities, 1993), p. 166.
  28. Arthur O. Lovejoy, "'Nature" as Aesthetic Norm', *Modern Language Notes*, 42:7 (November 1927), pp. 444–50.
  29. Ruskin was divorced by his wife Effie for not consummating their marriage, which according to Aquinas is a sin.
  30. John Ruskin, *The Seven Lamps of Architecture* (1880; repr. New York, NY: Dover), pp. 34, 46.
  31. Loos's own private struggles with perversion and young girls led to his arrest and move abroad to Paris. Christopher Long, *Adolf Loos on Trial* (Prague: Kant, 2017).
  32. Adolf Loos, 'Principle of Cladding (1898)', in *On Architecture* (Riverside, CA: Ariadne, 2002), pp. 42–7.
  33. Hugues Wilquin, *Aluminium Architecture: Construction and Details* (Basel: Birkhauser, 2001), p. 24. Pliny describes the use of alum as an antiperspirant. Pliny the Elder, *Natural History*, 35, p. 185. Recent studies show that a compound with aluminium gives certain ancient Roman concrete, as described by Vitruvius, its strength. Marie Jackson and others, 'Unlocking the Secrets of Al-tobermorite in Roman Seawater Concrete', *American Mineralogist* (1 October 2013) <<https://pubs.geoscienceworld.org/msa/ammin/article/98/10/1669/45726/Unlocking-the-secrets-of-Al-tobermorite-in-Roman>> [accessed 16 February 2023].
  34. American Chemical Society, *Commercialization of Aluminum* (Pittsburgh, PA, 2001), p. 2; Wilquin, p. 204, cited in Sheller, *Aluminium Dreams: The Making of Light Modernity*, p. 37.
  35. Henri Saint-Claire Deville, *De l'aluminium* (Paris: Mallet-Bachelier, 1859), p. 140, trans. in Robert Friedel, 'A New Metal! Aluminium in its 19<sup>th</sup> Century Context', in *Aluminium by Design*, ed. by Sarah Nichols (New York, NY: Carnegie Museum of Art with Harry Abrams, 2000), p. 63.
  36. John Peter, *Aluminium in Modern Architecture*, Vols I and II (New York, NY: Reynolds Metals Company with Reinhold, 1956).
  37. Mumford characterised aluminium as the metal of the Neotechnic era. Lewis Mumford, *Technics and Civilization* (New York, NY: Harcourt, Brace & Company, 1934), pp. 229–30.
  38. Aluminium Newsletter (1936) quoted in Sheller, *Aluminium Dreams: The Making of Light Modernity*, p. 236. Already in 1865, Jules Verne's story *From the Earth to the Moon*, describes a spacecraft made of aluminium.
  39. H. Ward Jandl, 'With Heritage so Shiny: America's First All-Aluminium House', *APT Bulletin: The Journal of Preservation Technology*, 23:2 (1991), 38–43.
  40. Joseph Rosa, *Albert Frey, Architect* (New York, NY: Princeton Architectural Press, 1999), p. 23f. Other early efforts to create prefabricated aluminium houses include those by Jean Prouvé in France, Consolidated Vultee House by Henry Dreyfuss and Edward L. Barnes, and National Homes by Charles Goodman. John Peter, *Aluminium in Modern Architecture*, Vol. 1 (New York, NY: Reinhold and Reynolds Metals, 1956).
  41. Perhaps the most successful was the AIROH (Aircraft Industries Research Organisation on Housing) aluminium prefabricated postwar house in the UK. Made from surplus aircraft material, about 70,000 AIROH homes were constructed with government backing. Brian Finnimore, 'The A.I.R.O.H. House: Industrial Diversification and State Building Policy', *Construction History*, 1 (1985), 60–71; Nicholas Bullock, *Building the Post-war World: Modern Architecture and Reconstruction in Britain* (London: Psychology Press, 2002), p. 173.
  42. Dennis Doordan, 'From Precious to Pervasive: Aluminium and Architecture', in *Aluminium by Design*, ed. by Nichols, p. 103.
  43. John Peter, *Aluminium in Modern Architecture* (Louisville, KY: Reynolds Metals Company, 1956), p. 3.
  44. Denis Doordan, 'On Materials', *Design Issues*, 19:4 (autumn 2003), pp. 3–8.
  45. Matthias Brunner, 'Richard Neutra's Ambiguous Relationship to Luxury', *Arts*, 7:4 (2018), p. 75 <<https://doi.org/10.3390/arts7040075>> [accessed 15 July 2022].
  46. L. L. Rado, 'The Future of Aluminium in Modern Architecture', in Peter, *Aluminium in Modern Architecture*, p. 241.
  47. Georges Canguilhem, *On the Normal and the Pathological*, trans. by Carolyn R. Fawcett (Boston, MA: D. Reidel Publishing Company, 1978), p. 150.
  48. Jeremy Till, *Architecture Demands* (Cambridge, MA: The MIT Press, 2009), p. 77.

49. Terry Patterson, *Frank Lloyd Wright and the Meaning of Materials* (New York, NY: Van Nostrand Reinhold, 1994), pp. 162–3.
50. The Prada Foundation Podium gallery building by OMA is clad in what one reviewer calls ‘exquisite’ aluminium foam. Blaine Brownell in his *Transmaterial* book series provides a catalog of photos of innovative architectural materials such as foamed aluminium and foamed polyurethane that is used in Prada retail spaces. In both cases, the material is treated as an image, without material qualities or detailing that is derived from it. See *Transmaterial: A Catalogue of Materials that Redefine our Physical Environment* (New York, NY: Princeton Architectural Press, 2006), pp. 12, 111.
51. Walter Gropius, ‘The Future of Aluminium in Modern Architecture’, in Peter, *Aluminium in Modern Architecture*, p. 229.
52. Haigh Jamgochian (1924–2006), son of Armenian immigrants, studied architecture first at Virginia Tech and later at Princeton University. A Guide to the Haigh Jamgochian Papers, c. 1930–2006, the Library of Virginia, Accession number 41492, Box 12, Folder 9, ‘How Does Aluminium Fit In With Architecture?’ by Haigh Jamgochian, n.d., Box 12, Folder 13, ‘The Markel Building By Haigh Jamgochian, Architect, 1965’, by Ginny Ross, 2001, Box 12, Folder 14 [On The Markel Building project by Haigh Jamgochian], c. 1965, Box 15, Folders 2–8, Markel Building.
53. This story is also recorded on a government historical marker or sign erected outside the building at Jamgochian’s insistence. Haigh Jamgochian papers, Library of Virginia, Box 15, Folder 8, Project Records Markel Building, Historic Marker Dedication (14 June 2006).
54. Haigh Jamgochian papers, Library of Virginia, Box 15, Folder 7: Project Records Markel Building.
55. Haigh Jamgochian papers, Library of Virginia, Box 15, Folder 5, Markel Building Project Records, Letter to Mr. Crowell, 4 November 1966 from H. J.
56. Haigh Jamgochian papers, Library of Virginia, Box 29, Folder 3, Project Records, Clippings: Markel Building, Washington Business Journal, 7 July 1986.
57. Haigh Jamgochian papers, Library of Virginia, Box 12, Folder 4, Barbara Ross Luck, The Architecture of Haigh Jamgochian (MA thesis, Virginia Commonwealth University, 1970), p. 27.
58. *Ibid.*, p. 28.
59. Haigh Jamgochian papers, Library of Virginia, Box 12, Folder 1, n.d., ‘The American Architect ... Today’, typescript, p. 4.
60. Haigh Jamgochian papers, Library of Virginia, Box 12, Folder 9, ‘How Does Aluminium Fit in With Architecture?’, by H. J., n.d., typescript.
61. Haigh Jamgochian papers, Library of Virginia, Box 15, Folder 6, Markel Building Project Records, Reynolds Aluminium Progress, March 1967, p. 3.
62. Haigh Jamgochian papers, Library of Virginia, Box 12, Folder 1, n.d., ‘The American Architect ... Today’, typescript, p. 3.
63. Dany Nobis, ‘Locating Perversion, Dislocating Psychoanalysis’, *European Journal of Psychoanalysis*, 3:1 (2017), 1–10 (p. 4) <<https://www.journal-psychoanalysis.eu/articles/locating-perversion-dislocating-psychoanalysis/>> [accessed 23 February 2023].
64. Slavoj Žižek, ‘The Fundamental Perversion: Lacan, Dostoyevsky, Bouyeri’, *Lacanian ink*, 27 (spring 2006), 114–29.
65. Dany Nobus quoted in Stephanie Swales, *Perversion: A Lacanian Psychoanalytic Approach to the Subject* (New York, NY: Routledge, 2012), p. 4.
66. In 1916, Duchamp jotted a note to himself: ‘find inscription for Woolworth Bldg as readymade’. In the Infinitive (À l’infinitif) (The White Box), 1966. Philadelphia Museum of Art, Accession Number: 1969-96-1.
67. Dylan Evans, ‘Perversion’, in *An Introductory Dictionary of Lacanian Psychoanalysis* (London: Routledge, 1996), p. 138.
68. Žižek, ‘The Fundamental Perversion: Lacan, Dostoyevsky, Bouyeri’.
69. Slavoj Žižek, *Looking Awry: An Introduction to Jacques Lacan through Popular Culture* (Cambridge, MA: MIT Press, 1992), p. 108.
70. See also Joseph Rykwert, ‘The Necessity of Artifice’, in *The Necessity of Artifice* (London: Academy Editions, 1982), pp. 58–9.
71. NA, ‘From Precious to Pervasive: Aluminium and Architecture’, in *Aluminium by Design*, ed. by Sarah Nichols (New York, NY: Carnegie Museum of Art with Harry Abrams, 2000), p. 101.
72. Frank Lloyd Wright, ‘In the Cause of Architecture, VIII: Sheet Metal and a Modern Instance’, in *Architectural Record* (October 1928), p. 334.
73. Victoria Ballard Bell and Patrick Rand, *Materials for Design 2* (New York, NY: Princeton Architectural Press, 2014), p. 9.
74. Karsten Harries, *The Ethical Function of Architecture* (Cambridge, MA: MIT Press, 1997), p. 121, quoting Martin Heidegger, ‘The Origin of the Work of Art’, in *Poetry, Language, Thought*, trans. by Albert Hofstadter (New York, NY: Harper, 1971), p. 46.
75. Kahn, *Writings*, p. 288.
76. Jane Collier, ‘Moral Imagination and the Practice of Architecture’, in *Architecture and its Ethical Dilemmas*, ed. by Nicholas Ray (London: Taylor & Francis, 2005), pp. 89–100.

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#### Competing interests

The authors declare none.

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