MARKETING MODERNISM: ALUMINUM CLADDING AND THE AMERICAN COMMERCIAL LANDSCAPE

BY

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DISSERTATION

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ABSTRACT

In the postwar United States, aluminum became more widely used than any other metal in building construction except for steel. It was first produced in the early nineteenth century, finding architectural uses in the latter part of the century. By the 1960s, it was broadly employed to clad buildings in the form of frames, panels and screens. Because it was a new and extensively useful material, producers believed that its identity must be controlled. Focusing on the marketing mechanisms of Alcoa, Reynolds and Kawneer in the decades surrounding World War II, this dissertation examines the way in which commercial aluminum cladding was marketed as both instrumental in modernization and an image of modernity.

Producers claimed that aluminum possessed properties which they believed underpinned the agency of aluminum to enact specific advantages for buyers. Properties that were identified by promoters, such as its relative lightness, ductility and particular visual characteristics were marketed within the context of capitalism as the ability of aluminum to reduce building cost, increase profit and reflect beauty. In turn, these advantages were promoted as enacting prosperity for the buyer and the commercial districts in which aluminum cladding was deployed.

The promoted advantages of aluminum cladding and its underlying abilities were carried as messages in visual and textual productions. Furthermore, aluminum-clad buildings themselves were employed by promoters as “silent salesmen,” advertising aluminum to potential buyers, and as “machines for selling,” able to attract customers and make merchants profitable.

Reflecting upon the assertions of promoters that aluminum held the ability to modernize the commercial landscape, I argue that for aluminum cladding promoters, modernism – the reactions to modernity in visual, textual and architectural productions – was a marketing project.

The reproduction of aluminum-clad buildings in promotional material constituted a modernism to sell for the merchant, the corporation and the aluminum producer.

To Heidi

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INTRODUCTION

Sell them their dreams, sell them what they longed for and hoped for and almost despair to having. Sell them this hope, and you won't have to worry about selling them goods.

- Hellen Landen Cass

In 1967 the small town of Paola, Kansas, enacted a radical architectural transformation. Every façade facing the town square, on all four sides, was covered in either blue, green, yellow or red aluminum cladding. In response, project leaders declared that the town had finally modernized. The newspaper declared, "Facelift Propels Town Into Space Age"[1] as though this was the attainment of a long-predicted arrival of "the future." Approximately one hundred years earlier, Jules Verne wrote *Journey to the Moon*, predicting the use of aluminum – at the time a shiny, adaptable new material – would be someday used for space travel. Many other writers, manufacturers and architects saw in aluminum a vessel to bring about a bright and prosperous future, a virtual aluminum time machine.

Aluminum was understood by aluminum producers and cladding manufacturers to hold specific properties, in turn marketed as advantages, through which promoters believed aluminum possessed the agency to enact prosperity. With a specific focus on commercial aluminum cladding, this dissertation examines (1) The ways in which aluminum was believed by promoters to possess properties leading to its enactment as an agent of modernization, that is, what aluminum was believed to be able to do; (2) The ways in which aluminum cladding was promoted as an image of modernity. I denote these two concerns as a focus on *instrumentality*

[1] Forrest Hintz, "Facelift Propels Town into Space Age," *Wichita Eagle,* June 15, 1968, 8a.

and *image*. Producers believed that aluminum cladding was *instrumental* because of their intentional engagement with the claimed abilities of aluminum to modernize the commercial landscape – not only by recladding existing buildings with aluminum, but also by cladding new buildings. The *image* of aluminum cladding was carried in visual productions such as photographs and renderings, textual productions in print, descriptions, and by aluminum-clad buildings themselves. Promoters intended for aluminum cladding to convey an image of modernity, arguing that the image and instrumentality of aluminum could enact prosperity. What follows is an analysis of how this dissertation contributes to the state of the field surrounding aluminum cladding, the commercial landscape, and modern architecture. It will summarize the questions and answers that have been asked by previous scholars and show how I build upon existing scholarship by extending new questions and providing new answers. This analysis is underpinned by the central question of this dissertation, which investigates the ways in which commercial aluminum cladding played a role in defining modern architecture. As such, the principal areas of scholarship informing this dissertation examine, at a wider scope, the contextual histories of modern architecture as it developed along with the accretions of consumerism that rose in the twentieth century. Within this wider, historical context, I also focus upon scholarship that studies the institutions and commitments governing the development of aluminum cladding.

Temporally, the span of focus begins with the nascent development of the aluminum industry in the mid-nineteenth century and extends to the widespread application of aluminum cladding in the mid-twentieth century. In this period, industrial production and capitalism expanded as practices within economic systems that have been characterized variously as command economies, markets regulated in coordination with state control, and monopolies permitted to embolden or diminish in accordance with the regulatory machinations of governmental policies. This literature review begins with scholarship that examines the interaction of these larger contexts on architecture and the consumer sphere. I form three categories to frame this review of literature. They are rising consumerism, the industrial production of aluminum, and war, which I will examine in turn. Because these categories are broad, I limit my examination to the literature which is salient to modern architecture and aluminum cladding.

Following the afore-mentioned contextual histories and studies, I will focus on scholarship more closely concerning aluminum and modern architecture. These areas of study examine the conceptual and perceptual spaces of modernism, regimes of image production, and material agency. I will first lay out the ways modernism has been broadly understood by scholars to contextualize how aluminum producers framed the metal as modern and able to modernize the landscape. The next section explores scholarship that asks how image making, the movement of imagery and the assumptions underlying their production shaped twentieth-century architecture. Finally, I will explore theories of materiality and agency that expand agency beyond the human dimension to the material dimension. This scholarship will contextualize and explain the ways in which aluminum promoters assigned agency to aluminum and imagined their own agency as an interaction with the material.

Rising Consumerism

Aluminum producers marketed aluminum cladding to decision makers involved in building construction. Although cladding was not sold as a consumer item, it was sold in the context of rising consumerism that accelerated and became particularly acute after World War II.

Notably, Kawneer capitalized on rising consumerism by arguing that aluminum could help the merchant sell more goods, playing a central role as a visible element of a *machine for selling*. Aluminum was a necessary component, Kawneer maintained, to create an effective machine with the goal of increased prosperity for the merchant and the community. Lizabeth Cohen, in *A Consumers' Republic: The Politics of Mass Consumption*, describes this context, arguing that, in the aftermath of World War II, a foundational shift in the United States took place, which the book denotes as *a Consumer's Republic*. Cohen asks how government and private industry worked as part of a "complex shared commitment" to reconstruct the economy and bolster democratic values by expanding mass consumption. She argues that mass consumption developed in the postwar period through "complex shared commitment(s)" between policymakers, business and labor leaders and civic groups.[2] Thus, it was not solely capitalists, nor solely policymakers, but the interaction between these groups and others, that worked to give rise to the consumer economy. This dissertation examines some of these interactions and proposes they should be understood as *transversal relationships*. These are relationships that reinforce the commitments and goals of the parties involved but also interact in tension. In particular, the interaction between government regulators and aluminum producers through patent law mechanisms enabled a virtual monopoly on a particular aluminum producing process, or a particular configuration of an aluminum product for a specified period, while during the same time, and especially over the course of the first half of the twentieth century, the US government waged a war against industrial monopoly, accusing Alcoa of just that, and facilitated the development of rivals Reynolds Metals Company and Kaiser Aluminum.

[2] Lizabeth Cohen, *A Consumers' Republic: The Politics of Mass Consumption in Postwar America* (New York: Vintage Books, 2004), 11.

While the afore-mentioned transversal relationships bolster Cohen's thesis concerning "complex shared commitments," another argument of this dissertation expands her thesis beyond the suburban realm. Cohen's study links the Consumer's Republic to architecture through the suburbs and shopping centers. Cohen maintains mass consumption, as an engine of renewal, largely took place in the suburbs and regional shopping centers. Cohen argues the suburbs were believed to hold the promise of fostering a democratic society by promoting ownership and engagement with community, despite falling short on these aspirations. Likewise, the new regional shopping centers were promoted by developers as the new civic centers, but fell short in providing the public space found in town squares of the city and smaller towns.

This dissertation examines two of these town square domains — Niles, Michigan and Paola, Kansas — finding that each were envisioned as landscapes to foster mass consumption, yet remained a part of the public sphere, borrowing and sometimes appropriating the public space of sidewalks and town square green spaces. In the case of Niles, Kawneer sought to replicate its aluminum façade and storefront products all along the street front as a means of modernizing the commercial landscape with its products, promoting the endeavor as a mode of generating prosperity for the merchant and the town. This was envisioned as a way of fighting back against the encroachment of regional shopping centers, which was explicitly identified as an existential crisis by the Paola, Kansas Chamber of Commerce. Paola advocates sought to create a shopping center on the square by cladding the entire façades of all four sides of the town square in colored aluminum slipcovers with a continuous, aluminum canopy over the sidewalks, creating a visually cohesive continuity. The aluminum supplier, Fashion Company, Inc., like Kawneer, the supplier of aluminum in Niles, was ready to supply aluminum façades to towns in the United States as a way of first and foremost generating profit for the aluminum supplier, and in conjunction, promising to increased sales and prosperity for the merchant and the town.

The relationship between city centers, town commercial streets and regional shopping centers is explored in *City Center to Regional Mall: Architecture, the Automobile, and Retailing in Los Angeles, 1920-1950*.[3] Richard Longstreth probes the factors that led to the development of regional shopping centers in LA, finding that they are widely applicable as influences on the wider commercial landscape across the United States. Longstreth's contribution in this area of inquiry is significant because it argues there were many explanations, beyond the often-identified automobile, for regional decentralization and concomitant suburbanization. These include changing economic structures, government policy encouraging suburbanization, population growth, lower land cost, and racist social attitudes and practices. Longstreth’s work in this study contextualizes this dissertation's analysis of the spread of aluminum cladding within existing commercial districts. City centers and small towns were sites targeted for sales opportunities by aluminum cladding manufacturers because, in the context of the rising consumerism of the early twentieth century, they experienced periods of commercial expansion or contraction depending upon national economic trends, governmental policies, and the outcome of capitalist production. Richard Longstreth has produced important work examining the interaction of economic trends, consumerism and architecture, particularly concerning the impact of these forces on the development of regional shopping centers. This dissertation magnifies scrutiny of the city center and town commercial spaces that were sites of amelioration in the wake of suburban expansion and the growth of those newer sites of consumption that Longstreth examines in detail.

[3] Richard Longstreth, *City Center to Regional Mall: Architecture, the Automobile, and Retailing in Los Angeles, 1920-1950* (Cambridge: MIT Press, 1997).

Focusing on governmental policy and its influence on architecture, Gabrielle Esperdy studies the street-front commercial domain by concentrating on the Main Street Modernization initiatives promoted by the US government and associated advocacy groups in the 1930s as a way of bringing prosperity to towns in the wake of the Great Depression and deferred maintenance of buildings. Esperdy's research, first a dissertation and later adapted into a book entitled, *Modernizing Main Street: Architecture and Consumer Culture in the New Deal*, argues that such modernization schemes were not a borrowed modernism, but instead were a "fully-realized, everyday modernism."[4] In doing so, Esperdy examines how building material manufacturers influenced the development of an identifiable commercial modernism. My study extends Esperdy's study by examining Main Street modernization efforts into the postwar period. Echoing Esperdy's argument that the modernism of Main Street is not borrowed, I show that such modern architecture sometimes served as the precursor to more widely celebrated works of modern architecture at larger scales. For instance, the often-repeated trope that modernism came to America with Walter Gropius is challenged by the modernism that developed with the all metal and glass store front façades developed by Kawneer in the first decade of the twentieth century. Functionally, these early deployments were focused squarely on increasing commercial activity and mass consumption. Formally they often eschewed ornamentation, favoring large glass windows and minimal-profile resilient metal sash, characteristics on par with the most celebrated modernist works. They were promoted by Kawneer as a modernization of the commercial landscape, and I argue they should be seen, echoing Esperdy, as a fully realized modernism, not a borrowed or backwater modernism.

[4] Gabrielle Esperdy, "Modernizing Main Street: Everyday Architecture and the New Deal" (PhD diss., The City University of New York, 1999), 12.

I also extend Esperdy's scholarship by seeking to render more visible the influence of manufacturers on modern architecture. Esperdy shows that the Pittsburgh Plate Glass Company and Libbey-Owens-Ford Company, through their marketing campaigns, "were largely responsible for, the architectural formulation of the iconic streamlined storefront as it appeared on Main Street in the 1930s."[5] Of material manufacturers, this dissertation focuses primarily on aluminum manufacturers of cladding systems. Like the plate glass manufacturers of Esperdy's research, aluminum manufacturers were influential on the development of modern architecture through their marketing campaigns, but also through the enormous resources, as vast industrial organizations, they were able to martial to develop new aluminum producing processes, design departments, patent applications, manufacturing procedures, and sales distribution networks to spread aluminum cladding and deploy it before decision makers in architecture firms and editors of influential magazines.

Producers and manufacturers have been understudied as influential actors in the development of modern architecture. Instead, as Sarah Williams Goldhagen notes, theories developed to explain the relationship of modernity to modernism have focused largely on the canonical works and the canonical architects. While these agents in the development of modern architecture are crucial to scholarship, Goldhagen asserts this has led to a kind of selection bias which historians and theorists in many disciplines, but particularly in architectural history, have sought to counteract by looking beyond the icons of modernism.[6]

In the history of modern architecture, this dissertation examines the marketing efforts of aluminum producers and manufacturers, which I characterize as a *push* into the market, rather

[5] Ibid., 11.
[6] Sarah Williams Goldhagen, "Something to Talk About: Modernism, Discourse, Style," *Journal of the Society of Architectural Historians* 64 (2005): 149.

than a mere response, or *pull* from the market by those who could be imagined demanding aluminum architectural building and cladding products. Manufacturers asserted that one of their primary endeavors was to make the market for a material that was relatively new and unknown — a material that furthermore held potential for many uses, if only its message could be spread. Indeed, aluminum had to be pushed into the market, because it required enormous monetary and natural resources, including dams on the world's largest rivers, generators of electricity, and plants full of machinery and laborers to produce the shiny, white metal. But the mere existence of an ingot of aluminum would not create demand. Producers and manufacturers engaged in transversal relationships with outside designers, like architects, and simultaneously organized their own design staff. This close relationship between the production of aluminum and the design of cladding products placed producers and manufacturers in an important role defining the shape of modern architecture.

Industrial Production of Aluminum

Scholarship examining the aluminum industry is well developed, counterintuitively because of Alcoa's history of exclusivity. Alcoa had long been accused of monopolistic practices by the United States and competitors. A voluminous archive of documentation has been preserved from the private files of Alcoa in association with lawsuits and court actions during a long period in the first half of the twentieth century. Consequently, much of Alcoa's inner-working`s have been examined, producing a body of scholarship that has focused on the aluminum industry from multiple angles. Into this body of scholarship this dissertation contributes, advancing greater visibility to aluminum in architecture in scholarship that largely explicates monopoly, economics, and industrial enterprise. Research into the history of aluminum in architecture necessarily will draw from this body, exposing leads to archival sources and quotes from interviews otherwise unfound.

Numerous studies have been instrumental in providing an overall view of the aluminum industry, including *Market Control in the Aluminum Industry* by Donald H. Wallace and *Vertical Integration and Joint Ventures in the Aluminum Industry* by John A. Stuckey.[7] These books and many more were foundational to research in this dissertation. However, three studies in particular render a view of the largest and most crucial US aluminum producer, Alcoa, from angles that together show how Alcoa thought of itself, how outsiders evaluated the company's premises and commitments, and how Alcoa tangled with regulators and competitors. Each of the studies are surveyed below. The value of these studies to this dissertation lies in their revelation of the gritty, unglamorous work, legal wrangling, political machinations and managerial procedures imbricated in aluminum production, and by extension, the production of architecture.

In *Alcoa: An American Enterprise*, Charles C. Carr provides what amounts to a defense of Alcoa, considering the negative publicity it received as the government and competitors leveled charges of monopoly against the company.[8] Because Carr was a former director of public relations at Alcoa, however, he had access to company documents not made public. Carr's narrative explains company history, discussing the Alcoa origin story of Charles Martin Hall, a founder of the company, wherein he patented a system of dissolving alumina in a solution, thus obtaining small beads of aluminum metal. Carr also illuminates the reliance upon the legal mechanism of the patent in bringing aluminum to market. Reflecting on the dueling patents and legal battles among the early producers of aluminum, this dissertation frames this entanglement

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[7] Donald H. Wallace, *Market Control in The Aluminum Industry* (Cambridge: Harvard University Press, 1937); John A. Stuckey, *Vertical Integration and Joint Ventures in The Aluminum Industry* (Cambridge: Harvard University Press, 1983).
[8] Carr, *Alcoa: An American Enterprise* (New York: Rinehart & Co., 1952).

as a fundamental, *transversal* relationship. Its tranversality stems from the power of regulators to award a patent, granting a monopoly (for a time) to a particular producer, while at the same time, or soon after, the government directing that regulatory entity discouraged and often regulated in the opposite direction — against monopoly. Yet, these patent holders battled for the singular rights to production processes awarded by regulators who could assign ownership, underpinning the confidence of investors to fund the enormous industrial operation that aluminum required to yield marketable quantities of aluminum. I study these transversal relationships as foundational to the ways aluminum cladding spread in architecture.

Less a defense and more a privileged biography, George David Smith's study, *From Monopoly to Competition: The Transformation of Alcoa, 1888-1986,* affords the reader a well-researched history of the company that emerged when Alcoa sought ways to restructure its corporate management.[9] With help from Alcoa, Smith accessed company records and documents and tells the expected story of monopoly, but also describes the competitive arena in which Alcoa operated. This study asks how the process of vertical integration (the integration of mining to manufacturing) contributed to the outcome of monopoly, and how competitors and regulators challenged that monopoly. One of the ways that Alcoa sought to restructure in confrontation with increased competition from Reynolds and Kaiser was by manufacturing its own end products. This presented a problem, for Alcoa had long claimed to supply aluminum to manufacturers, not compete with them. This is an example of the transversal relationship of intertwined collaboration and competition I maintain characterized the production of aluminum cladding. While Smith has excised and explained the competitive dynamics of Alcoa, this dissertation contributes to the field by showing how aluminum cladding was a product not solely of

[9] George David Smith, *From Monopoly to Competition: The Transformation of Alcoa, 1888-1986* (Cambridge: Cambridge University Press, 1988).

monopoly on the one hand nor some idealized plane of competition on the other hand, but instead was a product of the interaction between the two. I show that in the production of aluminum cladding, producers of aluminum and end manufacturers of products were at once competitors and collaborators. Alcoa supplied aluminum to manufacturers and, at many times throughout its history, beginning with tea kettles in the late 1800s to cladding components in the mid-twentieth century, competed directly with them. Sometimes, the competition was through the manufacture of architectural components, and other times it was more indirect, such as when Alcoa collaborated with recognizable and influential architects to design cladding which could then be replicated as a product on many buildings. This was a mode not of manufacturing the cladding components, but of supplying the aluminum to execute a pre-designed panel such as the identical panels cladding the 99 Park Avenue and 460 Park Avenue buildings in New York.

The third study, *R&D for Industry: A Century of Technical Innovation at Alcoa*, by Margaret B. W. Graham and Bettye H. Pruitt probes how Alcoa's research and development (R&D) enterprise was impacted by company growth, management decisions, and entanglement with government regulators and competitors.[10] Like the previous two studies discussed, this book benefitted from access to Alcoa internal documents. Its difference lies in a focus on R&D — an area Alcoa was keen to reformulate when the book was written. It is a deep study of this enterprise, and this dissertation explicates Alcoa's R&D in comparison with practices at Reynolds and Kawneer in the context of the role R&D played in bringing aluminum cladding to the market for architecture. Graham and Pruitt's study is instrumental in exposing the role R&D played in the company. The relationship of research to development is the third transversal relationship that I argue characterizes the institutional ecology of aluminum cladding production,

[10] Margaret B. W. Graham and Bettye Hobbs Pruitt, *R&D for Industry: A Century of Technical Innovation at Alcoa* (Cambridge: Cambridge University Press, 1990), 20.

manufacturing and marketing. In this dissertation, I show that development and design, and research and design often conceptually overlapped. Where research ended and development began was not always a clearly demarcated boundary. Design, as a practice, took place within each domain, even when a separate design department was established, as in the case of Kawneer. One significance of R&D to aluminum cladding production and marketing lies in its revered position by producers as the foundation of the industrial enterprise. Reynolds declared that a "company without research is dead," and none of the companies this dissertation examines believed R&D was irrelevant.[11] Another significance of R&D to aluminum cladding that this dissertation articulates is the way designers and researchers within R&D departments worked with outside designers to produce aluminum cladding designs. Alcoa, for instance, attributed design authorship of the aluminum cladding on the Alcoa headquarters tower in part to its own designers, even while Harrison & Abramovitz claimed partial authorship, in particular, of the X pattern that characterized each panel. Beyond the cladding, Alcoa researchers and designers were instrumental in inserting aluminum into the design of the headquarters wherever practicable. This aspect of collaboration between designers inside and outside the R&D apparatus at all three companies I examine has been understudied, particularly in the way outside designers like Harrison & Abramovitz with Alcoa, and Ketchum, Gina & Sharp with Kawneer were closely brought into the fold as a strategy of gaining expertise, but also a keen marketing strategy appropriating these architects' existing relationship with magazine editors and wide name recognition.

[11] "They Open New Markets," *Reynolds Review,* May 1960, 2.

War

The horizon of war looms large over the history of aluminum production in the twentieth-century. From a wider perspective of study, war was similarly an inescapable influence on the development of modern architecture. The literature surrounding the entanglement of war on architecture culture is vast, but two studies stand out for their explication of war, its intersection with architecture, and its salience to this dissertation's areas of focus — the way aluminum cladding was produced, marketed and spread.

194x: Architecture, Planning, and Consumer Culture on the American Homefront, by Andrew Shanken, asks how a post-World War II ethos of planning influenced economics, social sciences, and consumer culture, which in turn influenced architecture. Shanken frames this as a "shared temporal imagination" that became a "kind of cultural mantra, repeated endlessly by architects and captains of industry."[12] Beyond identifying and exploring the dimensions of this ethos, Shanken asserts it became a normative mode of thought in architecture culture, extending from urban planning to individual acts at smaller scales. Among many other companies, Shanken lists Alcoa as one that became concerned with planning. This dissertation finds validation in Shanken's thesis that the ethos of planning is crucial to understanding American culture up after World War II. In particular, the marketing initiative begun during the final phases of World War II by Kawneer, entitled, *A Plan for Modernizing Main Street* explicitly borrowed the rhetoric of planning, declaring, "In every city, in every town, responsible and forward-looking groups are replanning their cities for tomorrow."[13] Kawneer went beyond rhetoric, however, and sought to

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[12] Andrew M. Shanken, *194X: Architecture, Planning, and Consumer Culture on the American Homefront* (Minneapolis: University of Minnesota Press, 2009), viii.
[13] *Remodeled Main Street Niles, Michigan*, (Niles, Mich.: The Kawneer Company, 1945), 3.

engage community leaders and civic groups in actual planning for a particular future—one of aluminum cladding on every street front façade.

In light of Shanken's study, this dissertation contributes a nuance to his conclusion about the outcome of planning concerning his assertion that postwar planning is "a story of failure rather than resolution."[14] Failure, of course, is always in reference to a given measure of assessment. Shanken's determination of failure rests on the outcome of private enterprise domination over collectivist, state planning initiatives in the United States, for example in the realm of postwar housing. On other measures, government planning was successfully implemented, especially in the realm of urban renewal, which aluminum promoters held as a successful model for the revitalization of town and city mercantile districts. The particular nuance, perhaps, lies in the lack of resolution of desired outcomes resultant from urban renewal at the large scale, and street front revitalization at the small scale. Close examination of, for instance, Robert Moses' initiatives in New York reveals urban renewal at once tore neighborhoods apart and wrecked the social fabric of spaces, but also enhanced parts of the city with parks or highways alleviating congestion and increasing the flow of goods and capital into and out of the city. Likewise, one might also assess an aluminum cladding project in Paola, Kansas or Niles, Michigan as a failure, because the aluminum façades in both towns were eventually removed. Yet, for several decades they remained and for a time increased commerce in those towns, only later to be understood as the reason commerce waned as time went on. Projects like Kawneer's *A Plan for Modernizing Main Street* were successful on some measures and failed on others. In part, this dissertation aims to illuminate the reasons for those successes and failures by revealing the larger trends with which they were engaged.

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[14] Shanken, *194X,* viii.

A second study also examines postwar planning as part of a larger survey of the way architects engaged with World War II. *Architecture in Uniform: Designing and Building for the Second World War*, by Jean-Louis Cohen advances the field of architectural history by expanding scrutiny of the ways architects tangibly contributed to war fighting, engaging in offensive and defensive building projects, planning, and contributing expertise — a domain of scholarship that Cohen notes is mostly left out in primary surveys of modern architecture.[15] As Cohen notes in the preface, he has produced this scholarship as an entry into an expanded field of research. Such research does not end with World War II, but continues in studies such as this dissertation, which extends Cohen's study to examine how architects and the aluminum industry continued the relationships they had built during the war. The production of aluminum was vastly boosted by the war, dwarfing prewar output. One realization the reader of this dissertation should adopt is that, although the spread of aluminum in the twentieth century is resultant from plants built specifically for war production of aluminum components such as airplanes and munitions, an important distinction should be made. Aluminum cladding was not merely a byproduct of war. Despite any misunderstanding to the contrary, aluminum cladding was already accelerating in use and was used in architecture before World War II. The Rockefeller Center Building (1930-39) is one notable example, which employed thousands of cast aluminum spandrels under windows. Alcoa began a long relationship with the architecture firm Harrison & Abramovitz that accelerated soon after the end of World War II, leading to their most notable collaboration, the aluminum-clad Alcoa Building (1953) in Pittsburgh, the worldwide headquarters of the company for much of the twentieth century. Not only World War II but also previous wars were influential on aluminum production. From the aluminum armor and helmet

[15] Jean-Louis Cohen, *Architecture in Uniform: Designing and Building for the Second World War* (Montréal: Canadian Centre For Architecture, 2011).

made for Napoleon to the aluminum airplane struts made for World War I aircraft, aluminum has been intertwined with war. War is best understood not as the causal primacy of aluminum production, but as an accelerant and booster to production.

Modernity, Modernism, and Modernization

An important consideration of this dissertation is to evaluate the ways in which aluminum promoters operated under assumptions about modernity. Derivatives of the word "modern" were deployed by promoters to sell aluminum. Kawneer claimed to modernize the commercial landscape with aluminum cladding, Alcoa promoted aluminum as an image of modernity and Reynolds heavily promoted its association with modern architects. What they shared, however, was a belief that aluminum was modern because it was an improvement over normative conditions — a superior way of cladding, building and enclosing space. This conception of modernity-as-superiority constitutes a construct that should be placed in context with other epistemologies of modernity because a dialectic of comparison reveals the extent to which promoters thought not about modernity as a social and cultural register, but as a composition of commercial and industrial capitalism. Important notions of modernism explored by scholars that have informed this study's critical investigation of aluminum and modernity are explored below. A review of literature situating modernism is complicated by three limitations. First, the definition of modernism is different among scholars even within the same discipline, and especially between those across disciplines. As Sarah Williams Goldhagen has observed, amongst architectural theorists, "formal criteria continue to set the terms of the debate."[16] Simultaneously, much scholarship within the circle of architectural scholarship does in fact find

[16] Goldhagen, "Something to Talk About," 149.

non-formal epistemes of modernism hold currency. Some of these discourses reflect the theories of scholars extending the construct of modernism into the horizons of class and culture. Second, definitions of modernism have changed over time. New texts have been translated and brought to the attention of scholars, and elsewhere scholars have reflected and advanced understandings constructed in dialogue with scholarship as it is disseminated through visual and textual productions. Third, deploying the word modern is an act of labeling to make more understandable phenomena that are linked in some regard. Discursively, the word *modern* is a heuristic — a label that groups common characteristics. Below, I will explore these characteristics as articulated by scholars who define a historical epistemology of modernity. Their frameworks illuminate the understanding of modernity held by aluminum promoters as imbricated within larger social and cultural regimes.

I have borrowed from a particularization offered by Gwendolyn Wright of three salient words: *modernization, modernity,* and *modernism*. Wright has explained modernization as a process whereby production and consumption shifts away from local market economic primacy to international capitalism; modernity as the experience of an individual immersed in the intensities and fast-paced changes wrought by industrialization and capitalism, felt most acutely in the urban sphere; and modernism as the descriptions about and representations of modernity that for architecture, "appropriated images of standardization, speed, and simple, unadorned volumes." While Wright does describe specific imagery, she also concedes that several formal vocabularies were developed to animate modern economic processes.[17]

This dissertation extends Wright's articulation of modernism to include beliefs, spatial strategies, and visual and textual productions. Circumscribed this way, a block of aluminum-clad

[17] Gwendolyn Wright, *The Politics of Design in French Colonial Urbanism* (Chicago: University of Chicago Press, 1991), 10.

buildings in Niles, Michigan, for instance, is properly described as modernism. However, the aluminum promoters in this study did not label aluminum-clad buildings modernism. They referred to them as agents of modernization or as simply *modern*. Reflecting on those processes or conditions, however, from the vantage point afforded by histories of twentieth-century architecture, bolsters the labeling of such projects as modernism.

Terminological distinctions are important, but greater attention is paid in this study to the ways in which scholars have theorized modernism. And the formulation of those theories has been vast. It is well established among scholars that modernism is not monolithic but is instead a discourse. Despite the disparate theories defining modernism, and despite the differing approaches to its production, certain theories have been instrumental to situating the modernism promoted by aluminum marketers. Marshall Berman provides a productive entry into the study of modernism, especially as his frameworks can be employed to make sense of the ways aluminum promoters understood it. In his study, *All That is Sold Melts Into Air: The Experience of Modernity*, he identifies several theoretical frameworks that have dominated discourse about the subject, and also proposes normative theories describing the way observers should reflect on modernism.[18] I will here examine frameworks Berman identifies to draw a distinction between a perceptual reading of aluminum cladding and the way it was promoted as modern. I will also analyze the way designers and planners substantiated new construction as an ameliorative, showing how both the site of amelioration and the act of amelioration have alternatively been implicated as modernism.

[18] Marshall Berman, *All That is Solid Melts Into Air: The Experience of Modernity* (New York: Penguin Books USA Inc., 1988).

The first framework is the withdrawn tendency, wherein modern literature and visual arts, (Berman referencing Clement Greenberg,) retreats into art for itself. "The medium is the message," and the flatness of surface finds primacy as a "pure, self-referential art object."[19] A visual appraisal of aluminum cladding might, at first glance, be easily classified as a withdrawn modernism. It is often flat, abstract, seemingly referential to its own surface, seeking not to relate to any rhythms of a greater urban context. For instance, the façade of the Alcoa tower is an abstract, repeating X pattern from the top story to the bottom. Yet, a retreat to self-reference is not how the promoters framed aluminum cladding. They claimed for aluminum great beauty and portrayed it as the rightful successor to a long tradition of material from the earth formed into works of useful art. Kawneer, for their part, often marketed aluminum as a producer and enlivener of commerce — an active, agentic aluminum imbricated in the commercial landscape. A second framework is the negative tendency. Here, Berman draws from the reflections of cultural critics to portray a modernism that "seeks the violent overthrow of all our values, and cares little about reconstructing the worlds it destroys."[20] Popular critics of modern architecture are apt to claim that such interventions swung the wrecking ball on the existing urban fabric, sometimes portrayed as old or traditional, and replaced it with stoic, sterile towers, blocks, and highways.

This more superficial critique of modernism and modernity is useful as a preface to a third vision of modernity Berman proposes, which entails those designers and planners who believed they could ameliorate what Berman identifies as "the personal and social dissonances of modern life." Le Corbusier's urban-scale tower and slab proposals figure into this

[19] Ibid., 30.
[20] Ibid.

circumscription, as do Buckminster Fuller and the Futurist Marinetti.[21] This ontology of modernity claims "modern life can be resolved by technological and administrative means," the pivotal factor for which hinges on "leaders with the will to use them."[22] The implication is that the ills of modernity — the dirty, disorganized, dysfunctional streets, for example, could be ameliorated by the Futurist's Manifesto, or Le Corbusier's Functional City — an "ultramodernity that could heal the modern city's wounds," writes Berman.[23]

An immediate complication of the above two frames is that the first, modernism as a deleterious ameliorative, and the second, modernism as a deleterious condition to be ameliorated, cast modernism in opposing, incompatible frames. Once again, we confront the competing claims about modernity and modernism, which reveals the fundamental multivalence of the term *modern* and its derivatives. The word and concept is a way to categorize, make sense of, and communicate an identifiable set of conditions. These conceptual and terminological differences amplify Berman's insightful assertion that "forms of modernist thought and vision may congeal into dogmatic orthodoxies and become archaic" while other "modes of modernism" may ascend to primacy in scholarship examining the history of the twentieth century.[24]

Berman's scholarship, pointing out the fact of multiple, sometimes competing definitions is important to this dissertation because it substantiates and contextualizes the aluminum promoters' distinctive way of conceptualizing what is modern. Their modern was not the deleterious condition to be ameliorated, nor was it the deleterious ameliorative. Instead, they must not have seen the architecture, for instance, of Le Corbusier as deleterious. For example, Kawneer borrowed the very terminology Le Corbusier made famous and redeployed it in the

[21] Ibid., 169.
[22] Ibid.
[23] Ibid.
[24] Ibid., 171.

commercial sphere of main street. Instead of a *machine for living*, Kawneer sought to transform the commercial landscape into a *machine for selling*. Reynolds commissioned a book series, *Aluminum in Modern Architecture*, about uses of aluminum in architecture that included interviews with the luminaires of modern architecture, including Mies van der Rohe. The specific understanding held by aluminum promoters implicated by the term *modern* lies in its use as a synonym for superiority. Aluminum cladding was claimed to be modern because promoters believed it to be, and promoted it as superior in function and beauty. Promoters substantiated the modernity of aluminum as imbedded in its very properties — what it could do. This agency, which I have found more useful to term *instrumentality* so as to put more emphasis on its engagement with human designers and workers rather than idealizing its autonomy, was central to promoters' arguments about why aluminum was modern. Aluminum could modernize, they asserted, because of its very properties, such as its light-weight, resistance to corrosion and claimed beauty. Furthermore, the result of modernization via aluminum cladding, and an extension of the instrumentality of aluminum, they further argued, was its ability to generate profit and bring prosperity to the merchant and the community. The analysis in this dissertation of aluminum cladding production reveals that modernism, for the aluminum promoters Alcoa, Reynolds and Kawneer, was a marketing project. The act of claiming that aluminum was modern and could modernize the commercial landscape was announced in visual and textual advertisements. Producers and manufacturers were not consumed with capturing the *zeitgeist*, or, as William Curtis has argued about the obsessions of early twentieth-century architects, "defining an architectural language appropriate to industrialized society."[25] Instead, Alcoa, Reynolds and Kawneer hoped to spread aluminum cladding across the nation as a profitable

[25] William J. R. Curtis, *Modern Architecture since 1900* (London: Phaidon, 1996), 15.

enterprise. When buildings clad in aluminum, and claimed to be modern, were reproduced in magazines and promotional materials, these buildings themselves and the commercial landscapes they were inscribed within were redeployed as a marketing project.

The Image

Two bodies of scholarship concerning the image inform this dissertation. Because the image of aluminum was so important to promoters, this dissertation is informed by scholarship which elucidates the role of media and its entanglement with modernism. Second, scholarship which historicizes and theorizes materiality is important, especially where such work seeks to delaminate specific meanings from specific materials. I argue that aluminum is not inherently modern, but was instead purposely and repeatedly marketed as such by promoters. Of the scholars who have fostered this dissertation's position on the image of aluminum, two stand out. The first is Beatriz Colomina, whose study, *Privacy and Publicity: Modern Architecture as Mass Media* works to explain how mass media produces modern architecture. Colomina asks, how much of the history of architecture is prompted by the ubiquity of media as a readily available source material? She argues, "modern architecture only becomes modern with its engagement with media," pointing out that we have come to know modern architecture principally through the media, much as photographs of grain elevators in the United States were cited as influential by architects in Europe.[26] Delving deeper into her argument, she asserts that modern architecture is properly understood as a system of overlapping representations.[27] Not only are buildings represented in media, but the buildings themselves are also mechanisms of representation.

[26] Beatriz Colomina, *Privacy and Publicity: Modern Architecture as Mass Media* (Cambridge: MIT Press, 1994), 14.
[27] Ibid., 13.

Colomina offers a germane framework for explaining the interaction between aluminum-clad buildings and marketing material. Two sites of marketing intertwined. The buildings themselves were promoted as *silent salesmen*, representatives of the superiority of aluminum, and sales devices proudly looked upon by aluminum producers and manufacturers. Alcoa's towering headquarters in Pittsburgh and Reynolds Metals Great Lakes Regional Sales Office (1959) in Michigan, were explicit advertisements for aluminum, designed to be admired by passing pedestrians and cars. Kawneer appropriated an entire street front as a sales device, inviting potential purchasers to see aluminum cladding in action in Niles, Michigan, long a site of deployment for Kawneer's aluminum window frames and cladding. But a building was just the first step in the marketing project. These buildings were photographed and featured in news articles and advertisements — an amplification of a message designed to sell more aluminum.

Building on the relationship between modern architecture and media identified by Colomina, I show how aluminum producers and manufacturers not only appropriated the commercial landscape, but also appropriated architects as marketing mediums. I argue that Alcoa, for instance, knew of the reputation held by Harrison & Abramovitz, and benefitted from their reputation as exemplary modern architects and the accompanying exposure they provided to magazines and other circles of influence. Similarly, Reynolds did not collaborate with unknown architects when designing their new regional headquarters buildings. To design the Reynolds Metals Great Lakes Regional Sales Office, they hired Minoru Yamasaki who was a young but respected architect who could echo the message of the advantages of aluminum. Beyond architects, producers collaborated with artists who could similarly echo the advantages of aluminum — one of which producers claimed was the beauty of aluminum. Purchasing art by artists like Picasso, Reynolds made sure to let visitors to their headquarters in Richmond, Virginia, the Reynolds Executive Office Building (1958), know that modern art hung throughout the building, drawing a connection between the aesthetic value of modern art and the promoted advantage of beauty in aluminum. Judging from their cameos in yearly reports, executives seemed to love being photographed with a work of modern art in the background. Elsewhere, Reynolds hired artists to design sculptures of aluminum as awards to architects who designed the winners of the R.S. Reynolds Memorial Award for aluminum in architecture — yet another opportunity to spread the message by latching on to the fame of award winners and the exposure afforded to them in magazines and gala events. This dissertation shows that the modernism of aluminum clad buildings was effectively replicated in multiple mediums of mass media.

Scholarship which historicizes and theorizes the image of materials is important, as I aim to show how the modernity of aluminum was not inherent to the material, but was instead an identity carefully crafted by promoters. Adrian Forty provides an important examination of concrete in the book, *Concrete and Culture: A Material History*, which prefigures this dissertation and its quest to challenge inherent meaning from material.[28] Forty seeks to challenge the way the reader thinks about concrete, asking how negative and positive associations with concrete are formed. He shows that, on the one hand, concrete has had strong associations with modernity, as a product of scientific technology, but on the other hand, it is rooted in manual craft practices, suggesting otherwise. He provides wider analysis of the identity of concrete, but arrives at the conclusion that imagery of concrete, such as the circulation of American concrete grain elevators in Europe in publications like L'Esprit Nouveau helped tip the scale toward associations with *the modern*. Like Colomina, Forty finds that magazines played a defining role

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[28] Adrian Forty, *Concrete and Culture: A Material History* (London: Reaktion, 2012).

in constructing a modern identity, such as *PA Magazine* declaring that "the potential of concrete is untapped," aligning concrete with progress and the future.[29]

The aluminum industry dedicated vast sums and marshalled a huge labor force to cast aluminum as modern, progressive and future-oriented. As Forty explains in the history of concrete, I find that aluminum also was a site of identity construction by industry promoters, advocates and mediums of media. Like concrete, aluminum was vulnerable to identities that could complicate selling it to markets that were not aware of its properties, because it was such a new material to the twentieth century. Historian Robert Friedel reveals that aluminum held a malleable identity from its early days in the nineteenth century, and Eric Schatzberg shows that indeed aluminum was vulnerable to other identities through use as beer cans and cookware.[30] These consumer products were profitable to producers too, thus necessitating a robust marketing project to maintain multiple, sometimes competing identities for aluminum.

Expanding beyond analysis of identity and aluminum, this dissertation aims to engage an alternative material epistemology by suggesting that from the detail to the cultural landscape, there is no inherent meaning imbedded in a particular work of architecture. Assertions to the contrary hold currency in architectural history and theory. For instance, at the level of the detail, Marco Frascari has said details "can be regarded as the minimal units of signification in the architectural production of meanings" suggesting that a given meaning can be embedded within architecture.[31] Inscribed at the scale of building façade, Reinhold Martin has written that the steel

[29] Ibid., 87.
[30] Robert Friedel, "The Psychology of Aluminum," working paper, 1975, Department of Science, Johns Hopkins University, Baltimore, MD., folder 2, box 51, Records of the Aluminum Company of America; Eric Schatzberg, "Symbolic Culture and Technological Change: The Cultural History of Aluminum as an Industrial Material," *Enterprise & Society* 4, no. 2 (2003).
[31] Marco Frascari, "The Tell-The-Tale-Detail," in *Theorizing A New Agenda For Architecture: An Anthology Of Architectural Theory 1965-1995*, ed. Kate Nesbitt (New York: Princeton Architectural Press, 1996), 500.

and glass façades of corporate buildings possess readable messages, such that its "physiognomy is given by the curtain wall, an infinitely repeatable surface designed to mirror the infinitely variable desires of the corporate subject" whereby the façade pattern expressed corporate, organizational logics.[32] At the scale of the visual and ideological landscape, Joan Ockman has written that the second generation of steel and glass international style modernism is a "fully embodied expression of advanced capitalism, corporate bureaucracy and big business."[33] Each of these readings of architecture inscribes a particular, inherent meaning. Imbedded within a circle of critical theory, and inflected by historical realism, wherein that which is understood as real has been marked by social, political, cultural, economic values, an asserted, inherent meaning can be understood as essentially true given the afore-mentioned values, despite the subjectivity of meaning-making. Yet, if the subjectivity of meaning is given primacy rather than an aim to craft narratives of essentialism, wherein a building or material is asserted to possess an inherent meaning, identity is more productively understood as contested, conferring the necessity of promoters of any idea, and particularly to this study the promotion of aluminum as modern by aluminum advocates, to engage in robust identity construction.

Agentic Materiality

Both the constructed meanings and the claimed capacities of materials are important to a multivalent study of aluminum materiality, but the history of twentieth-century scholarship in the latter-part of the century surrounding materiality in architecture has largely sidestepped the

[32] Reinhold Martin, *The Organization Complex*: *Architecture, Media, and Corporate Space* (Cambridge: MIT Press, 2003), 155, 164.
[33] Joan Ockman, "Toward a Theory of Normative Architecture," in *Architecture of the Everyday,* ed. Steven Harris and Deborah Berke (New York: Princeton Architectural Press, 1997), 131.

agency of materials, instead finding concern with meaning, semiotics, image, and causality as a complex of processes, less a complex of things.[34]

Scholars studying aluminum in the context of the global apparatus of production and consumption have explained aluminum principally as a product of direct and sustained human action. Mimi Sheller's study, *Aluminum Dreams: The Making of Light Modernity*, focuses on the on the human dimension as the driving force precipitating the extraction of resources from the earth.[35] This is an important perspective, as aluminum came to fruition in a form isolated from other elements because of human intervention. In this formulation, aluminum is something made subject to the structure of human agency. The human dimension as a causal actor in the spread of aluminum has also been cogently explored by Dennis Doordan in "From Precious to Pervasive: Aluminum and Architecture." This chapter contribution to the exhibition catalog, *Aluminum by Design*, describes the spread of aluminum in postwar architecture as the result of technological momentum propelled by three actors: (1) Aluminum producers competing for, and seeking to develop new markets; (2) Architects seeking materials adaptable to programmatic requirements and their visions of modernity; (3) Inventors who sought to capitalize on the applications of aluminum.[36] In addition to the human actor, this dissertation offers a complementary perspective: The material dimension as a causal actor. Woven throughout the narratives of scholarship about aluminum are references to its remarkable characteristics, such as its light-weight, workability, durability, and resistance to corrosion. In this dissertation, I reveal that aluminum promoters

[34] Recognizing the influence of Marxist perspectives in twentieth-century historical research, Friedrich Engels' words are salient, who attributed to Hegel the consciousness that "the world is not to be comprehended as a complex of readymade things, but of a complex of processes." Friedrich Engels, *Ludwig Feuerbach and the End of Classical German Philosophy*, 1886. English translation accessed August 20, 2017, https://www.marxists.org/archive/marx/works/1886/ludwig-feuerbach/ch04.htm.
[35] Mimi Sheller, *Aluminum Dreams: The Making of Light Modernity* (Cambridge: MIT Press, 2014).
[36] Dennis Doordan, "From Precious to Pervasive: Aluminum and Architecture," in *Aluminum by Design,* ed. Sarah C. Nichols et al. (Pittsburgh: Carnegie Museum of Art, 2000), 110.

believed and framed aluminum to possess causal capacity. This dimension of aluminum production and promotion has not been adequately explored. I argue that the historical forces underpinning the popularity in use of aluminum in a wide spectrum of markets extends the umbrella of causation not only to human agency, but also to the degree of agency possessed by the metal.

Before discussing literature which has helped extend analysis in this dissertation of aluminum as one agent among others, it is useful to summarize the producers' and manufacturers' practices and beliefs about the materiality of aluminum. A key historical perspective in this dissertation entails the way in which aluminum producers, manufacturers and their promoters understood and marketed aluminum. They believed that aluminum had distinct abilities that emanated directly from its properties. These properties were framed by promoters as advantages and marketed to end users in terms that amplified what aluminum could do, underpinned by its advantages. To select a few examples discussed in more detail in this study, Kawneer marketed aluminum as possessing the ability to modernize the landscape and generate prosperity for the merchant and community. Alcoa promoted aluminum as possessing the ability to yield more profitable rents from thinner exterior walls of aluminum. Reynolds touted aesthetic qualities of aluminum, claiming that its properties were the driving force of its "permanent natural beauty." [37] Promoting the abilities of aluminum in terms that suggested autonomy was part of the way producers understood aluminum and marketed the mysterious material to buyers uneducated about the new metal.

The contemporary scholarship discussed below engages theories of material agency. The belief that materials possess a degree of agency, however, is not new. In the arena of

[37] *Reynolds Aluminum and the People Who Make It* (Richmond: Reynolds Aluminum Company, 1970), p. 2, Reynolds Metals Company Collection, series 7, Virginia Historical Society, Richmond.

architectural scholarship, Siegfried Giedion suggested that materials themselves changed the mechanization process.[38] Stan Allen, in 1999 called for an approach that "understands architecture as material practice — as an activity that works in and among the world of things, and not exclusively with meaning and image."[39] Further, a growing body of scholarship in anthropology and Science and Technology Studies, and studies of material culture, philosophy, and architecture ascribe a degree of agency to materials.

Key insights by these scholars help to frame and situate the way aluminum promoters understood material agency. Within such scholarship, a central debate concerns the degree to which non-human, inorganic things possess what is commonly called *agency*. The definition of agency is important, but of more relevance to the historical research in this dissertation is the way agency has been ascribed to the material world. Agency has often been associated with notions of intentionality, creativity, and the ability to make change.[40] Within cultural studies scholarship and sociological theory, agency has historically been understood as socially determined.[41] Yet, within the rubrics of Actor Network Theory, New Materialisms, Object Oriented Ontology and Speculative Realisms, scholars and philosophers have extended agency to the non-human, inorganic realm.

One side of this debate proposes things on the same ontological plane as humans. Jane Bennett's study, *Vibrant Matter: A Political Ecology of Things*, exemplifies this approach. Bennett assigns to matter a certain liveliness which at first glance might be mistaken for anthropomorphizing. But Bennett's theory goes beyond analogy with the human, for she finds

[38] Siegfried Giedion, *Mechanization Takes Command: A Contribution to Anonymous History* (New York: Oxford University Press, 1970), *52*.
[39] Stan Allen, *Points and Lines: Diagrams and Projects for the City* (New York: Princeton Architectural Press, 1999), 52.
[40] Chris Barker and Emma A. Jane, *Cultural Studies: Theory and Practice* (London: SAGE Publications, 2016), 280.
[41] Ibid., 632.

things, notably highlighting at one point metals, hold a "vitality," by which she means, "the capacity of things — edibles, commodities, storms, metals — not only to impede or block the will and designs of humans but also to act as quasi agents or forces with trajectories, propensities, or tendencies of their own."[42] Further, such things have a locus of power, a "thing-power" which "gestures toward the strange ability of ordinary, man-made items to exceed their status as objects and to manifest traces of independence or aliveness."[43] Bennett notably focuses on metals as an exemplar. Drawing from Deleuze and Guattari, she characterizes their description of metal as a thing that "best reveals this quivering effervescence; it is metal, bursting with a life."[44]

Much like Bennett's terminological choices, the aluminum producers and manufacturers in this study, at first glance, seem to simply anthropomorphize the characteristics of aluminum, such as when an Alcoa marketing manager characterized the development of aluminum as a growth from "puny child to a strong young man."[45] But their terminological choices extended deeper than analogy. Their descriptions of aluminum were embedded in a belief about the metal that it was animate, with its own behaviors, needs, abilities and desires. Much as Bennett has popularized metal as a "vital materiality," producers understood and promoted aluminum as possessing a strong degree of agency. Alcoa distributed an article with a section titled, "What aluminum can do."[46] Reynolds produced a handsome two-volume book set, *Aluminum in Modern Architecture*, as well as follow-up publications that celebrated the quotes of architects

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[42] Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham: Duke University Press, 2010), viii.
[43] Ibid., xvi.
[44] Ibid., 55.
[45] *Metal Curtain Walls* (Washington: Building Research Institute, Division of Engineering and Industrial Research, National Academy of Sciences, National Research Council, 1955), 162.
[46] Charles A. Scarlott, "The Bright Picture of Aluminum," *The Westinghouse ENGINEER*, May, 1953, 5. Citations refer to the Aluminum Company of America reprint, box 140, Records of the Aluminum Company of America.

such as Buckminster Fuller and Eliot Noyes discussing aluminum in architecture, claiming for it "behaviors" and the ability to tell the architect "ways of using it right."[47]

The beliefs of aluminum producers reflected a larger belief in material and architectural determinism as part of the wider contours of the social imagination. In the nineteenth century, anxiety about industrialization accompanied anxieties about the potentials of machines. Mary Shelley's *Frankenstein* epitomized this discomfort, defining an image of the non-human and its imagined potentials. The material dimension, especially when defined as an assemblage of machinery, was understood by authors reacting to industrialization to have a degree of autonomy outside of human control, at least to the extent that it made their human masters uncomfortable with such autonomy.

Aluminum cladding promoters did not believe that aluminum was alive in the Frankenstein sense of reifying the terror of machines. Aluminum was promoted as a liberator: it could transcend the past, pull society out of war, and modernize by inducing consumers to consume or increase the rentable floor space in high rise buildings or define a new image of prosperity which would in turn, promoters implied, make capitalists more profitable and consumers happier. Promoters also did not envision that aluminum had any transcendental qualities, such as a soul, that would bolster its aliveness. Western Christian belief, which excludes a soul for the non-human, was evident within the corporate apparatus of Alcoa, Reynolds and Kawneer. Christmas messages repeated year after year in newsletters explaining the important mission of defeating the Nazi's and encouraging reverence to God.

Instead of a living aluminum, marketing projects promoted an agentic aluminum. This was not dissimilar to the stance taken by modernist architects, who widely believed that modern

[47] John Peter, ed., *Aluminum in Modern Architecture'58* (Louisville: Reynolds, 1958), 101.

architecture could "do." The belief that architecture can influence human behavior is no stranger to modernists. Such architectural determinism is reflected in, for instance, Le Corbusier's *machine for living in*, where a house as a machine was believed to possess the ability to make life better for the inhabitants. Architects commenting on aluminum also asserted that aluminum was at least semi-autonomous. When architect Welton Becket said that aluminum "… permits the architect to design with a more airy feeling and gives him an opportunity to vary building faces and spandrels" he was not anthropomorphizing aluminum.[48] These conceptions are deeper than merely borrowing human terms to describe materials as an exercise in analogy. These statements reflect a belief in a mind-independent material reality, not yet challenged by the poststructuralist epistemologies and philosophical idealism to become more widely intellectualized later in the century. Aluminum promoters simultaneously seized upon these beliefs in architecture culture as a marketing strategy. They marketed modernism to modernist architects, appealing to their sense of architectural and material determinism and marketed to end users, promoting aluminum as having the ability to bring financial advantage through increased sales and profit.

If Bennett can be thought of to occupy one side of a debate about the agency of things, from another perspective stands anthropologist Alfred Gell's work, *Art and Agency: An Anthropological Theory*.[49] Proposed in 1998, this study extends agency to objects, but only subject to human agency. Gell does not ascribe full agency to things, writing "'things' cannot, by definition have intentions." However, in an interaction with the human, social sphere, Gell qualifies them as secondary agents, denoted as lacking real agency with intention and will.[50]

[48] Ibid., 240.
[49] Alfred Gell, *Art and Agency: An Anthropological Theory* (Oxford: Clarendon Press, 1998).
[50] Ibid., 20-21.

Likewise, Actor Network Theory authors, such as Bruno Latour, propose agency as an ontology of interactions. Latour might describe aluminum as an actor, in which "there is no other way to define an actor but through its action, and there is no other way to define an action but by asking what other actors are modified, transformed, perturbed, or created by the character that is the focus of attention."[51]

The perspectives afforded by theorists like Gell and Latour confer clarity on the interactions aluminum producers understood existed between their metal and their industrial enterprise. Although producers believed aluminum possessed a strong degree of autonomy with abilities independent of humans, they also were quick to promote their own role in its development into a useful material. "What does aluminum need of man? *Everything*," declared an industry publication.[52] Reynolds found fortuitous opportunities to promote their intentionality, declaring, "the drive, innovation and determination of men in the industry like R.S. Reynolds, Sr., founder of Reynolds Metals Company, have made the mid-Twentieth Century the "Age of Aluminum.""[53]

Because human entanglement with the metal was a crucial element of its history, I often use the term *instrumentality* to suggest aluminum producers did not believe the metal was wholly autonomous or self-precipitating, but engaged in a co-constitutive relationship with the human dimension. Here I draw a distinction from Jane Bennett's formulation. Bennett specifically avoids a hierarchical relationship between the human and non-human, writing, "My hunch is the image of dead or thoroughly instrumentalized matter feeds human hubris." However, upon study of the positions of aluminum producers, manufacturers and their promoters, it is clear they

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51 Bruno Latour, *Pandora's Hope: Essays on The Reality of Science Studies* (Cambridge: Harvard University Press, 1999), 122.
52 *Aluminum: How It's Made and Where It's Used,* 29-30.
53 *Reynolds Aluminum and the People Who Make It*, 2.

believed the reason aluminum spread was an interaction between the properties of aluminum and their efforts to bring raw materials out of the ground, make aluminum products, and push them into a market.

CHAPTER 1: OUT OF THE GROUND AND ONTO THE WORLD STAGE

To borrow the words of economic historian Alfred Chandler, "most histories have to begin before the beginning."[54] Covering the time period of the nineteenth century, this chapter provides a history of the early development of aluminum as a material understood as holding utility and imagined with great potentials. It demonstrates how, through maneuvers to secure intellectual property and in the context of nascent structures of capital investment, ancillary inventions and industrial procedures, aluminum production emerged rapidly as an institutional and industrial ecology marked by the intertwining of both collaborative and competitive forces. Rather than hampering development, these transversal relationships, seemingly at odds, were mutually reinforcing as a defining characteristic of early aluminum production. Furthermore, this odd couple of co-constitutive forces continued to shape the development of aluminum production, and more specifically to this study, the spread of aluminum cladding products well into the postwar period. The theme of simultaneous collaboration and competition as mutually reinforcing vectors will be explored throughout this dissertation.

The Experimental Origins of Aluminum

Promoters and scholars have cast aluminum as a modern material in contemporary and historical scholarship as well as in marketing publications.[55] They have explained aluminum as a

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[54] Alfred D. Chandler, *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, Mass.: Belknap Press, 1977), 13.
[55] For further discussion of this perspective, see Sterling Brubaker, *Trends in The World Aluminum Industry* (Baltimore: Published for *Resources for the Future* by the Johns Hopkins University Press, 1967), 83. Dennis Doordan characterizes aluminum as a "major factor in the material culture of modern design." Doordan, "From Precious to Pervasive," 85.

metal born of science and the technical revolution of the nineteenth century.[56] Yet, aluminum developed not only through the support of institutionally-backed laboratories, but also through amateur experiments by craftsmen investigating its chemical properties and capacities who only later sought capital investment. Claiming that aluminum is modern is to also expose particular values. Close examination reveals the claim of modernity for aluminum was tied to specific claims about its properties.

Alumina is the naturally occurring oxide of aluminum. Although aluminum is more abundant than any other metal in the earth's crust, it was not until the early nineteenth century that it was isolated apart from its chemical bond with other elements.[57] A difficult problem for chemists was the separation of the metal from its oxide. In its natural state, aluminum is tightly bound to oxygen. To isolate it, two processes developed, sometimes deployed in combination, to break this aluminum-oxygen bond. Isolation, or reduction as it is more commonly known, has resulted from chemical processes and electrolytic processes, both of which had been employed to isolate other metals prior to aluminum. Exactly how reduction took place was central to experiments and advancements in aluminum production throughout the nineteenth century industrial era and into the twentieth century. To realize industrial scale production of aluminum, reduction relied on other inventions and processes, some of which would not be developed until the mid-nineteenth century.

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[56] This position is explained in Brubaker, *Trends in the Aluminum Industry,* 83. An article in *Review of Reviews* characterizes this belief: "Of the eight chief metals which support this product of so-called Age of Metals only one is the product of scientific research. This one is aluminum." E. E. Free, "How Research Created the Aluminum Industry," in *Review of Reviews,* ed. Albert Shaw (New York, 1931), box 173, Records of the Aluminum Company of America.
[57] Norman N. Greenwood and Alan Earnshaw, *Chemistry of the Elements* (Oxford: Butterworth-Heinemann, 1997), 217. The Earth's crust contains more aluminum than it does iron or lead. Furthermore, it constitutes about fifteen percent of igneous rocks.

After the invention of the voltaic pile (in 1800), an electric battery which facilitated discharge in controlled experiments, a notable, early electrolyzing experiment with alumina was carried out by British scientist Sir Humphrey Davey in 1807.[58] Although he had been successful in reducing other metals with electric current, he was not successful in reducing aluminum.[59] He did, however, bestow the name 'aluminium' on the metal-concept before it was eventually isolated years later.[60] In 1825, Danish chemist Hans Christian Oersted demonstrated the successful reduction of aluminum using a chemical process. He produced a small mound of aluminum by heating together a potassium amalgam and aluminum chloride. Imbedded in this amalgam was a small bit of the metal. Oersted identified it as "a lump of metal which in color and luster somewhat resemble(s) tin."[61]

From its inception, aluminum was examined for its characteristics and imagined in terms of its potentials. Material analysis was constituent to a process which contributed to the conception of aluminum in terms of specific advantages. One of the earliest analytical measurements of aluminum was carried out by Frederick Wohler in 1845, supported by the University of Gottingen, after which aluminum was declared a lightweight material. Employing potassium in a chemical reduction process similar to that undertaken previously by Oersted, Wohler produced aluminum particles "as big as pinheads" and described their characteristics as

[58] Electrolysis involves passing an electric current through a chemical solution to produce a reduction of elements. Today, it remains the most widely used method of reducing aluminum.
[59] Sir Humphry Davy was earlier successful in isolating potassium and sodium by electrolysis and "…by 1809, established the fact that alumina can be decomposed while fluid in the electric arc…" Donald H. Wallace, *Market Control in the Aluminum Industry* (Cambridge: Harvard University Press, 1937), 503.
[60] For a concise account, see James Ashby, "The Aluminum Legacy: The History of the Metal and Its Role in Architecture," *Construction History* 15 (1999); *Reynolds Aluminum and the People Who Make It*, 2., Reynolds Metals Company Collection, series 7. Davey was preceded by the French chemist Lavoisier, who, "in the late 18th century, was one of the first to believe that alumina, as it was known, was actually the oxide of a metal."
[61] *Aluminum: How It's Made and Where It's Used: Part 1. The Story of Aluminum. Part 2. Uses of Aluminum* (New York: Aluminum Association, 1968), 9.

"light, ductile, stable in air, and can be melted with the heat from a laboratory blowpipe."[62] Although the small size of these particles prevented them from being identified as possessing utility, larger pieces were soon produced in France by Henri St. Claire Deville of the Ecole Normale in Paris that were anticipated by Deville, industrialists and the French government as holding great potential for use. In 1854, Deville was the first to obtain quantities of aluminum which were promoted for commercial use.[63] Substituting sodium for previous methods using potassium, this process produced "lumps the size of marbles" and because sodium was cheaper than potassium, commercial exploitation of aluminum production was feasible.[64] Driven in part by Deville's interest in promoting an aluminum industry,[65] commercial plants employing the process began operating in France by 1855,[66] and an aluminum bar resulting from Deville's technique, produced at the Javel Chemical Works, was exhibited in the 1855 Paris Exhibition.[67] The display consisted of a bar inside a glass case, resting on black velvet, labeled "L'Argent de l'Argile" (the silver from clay).[68] Here can be seen associations of high value but also quotidian origin placed on aluminum. It was at once called silver, referencing value and exclusivity, for it cost $100 a pound.[69] But at the same time the description contrasted with its common origin, clay.

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[62] Ibid., 9.

[63] For a more detailed description of Deville's various experimental methods, see Wallace, *Market Control in the Aluminum Industry,* 505-6. Like others, Deville experimented with potassium and electrolysis techniques, but abandoned them due to the high cost in relation to the sodium technique. With the future development of the Dynamo, however, electrolytic techniques would come to supplant chemical processes.

[64] Ibid., 506.

[65] Ibid., 505. Wallace states, "Deville…was seriously interested in promoting an aluminum industry…."

[66] *Aluminum: How It's Made and Where It's Used,* 9.

[67] *Materials Survey: Aluminum* (Washington: US Business and Defense Services Administration, 1957), II-1.

[68] Joseph W. Richards, "Aluminum—the Metal of the Future," *Cosmopolitan,* January 1892, quoted in *Reynolds Review,* June 1960, 23.

[69] Warren Bishop, "A Fifty-Year Fight for Markets," *The Nation's Business,* January, 1936, 20.

The development of aluminum as a useful material was by no means a linear process, nor was it limited to France, and the web of intersecting inventions and experiments contributing to its development is testament to this point. This is important because it demonstrates that aluminum production, from its inception, was not a localized process, but instead, as shown later in this dissertation, was a global, institutional ecology. Furthermore, as production processes developed that varied only slightly, they were marked by competing interests and claims to intellectual property. In the late nineteenth century, these competing yet often mutually reinforcing processes emerged in Europe and the United States contemporaneously.

In the same year Deville produced usable quantities of aluminum in 1854, another scientist, professor of Chemistry at Heidelberg University, Robert Von Bunsen, also found a way to isolate aluminum with sodium instead of potassium.[70] The result was the clumping of aluminum into larger pieces. Two years later Alfred Monnier of Camden, New Jersey, was reported by *The American Mining Magazine* to have made aluminum in considerable enough quantity that it was displayed at the Franklin Institute in Philadelphia.[71] The simultaneous experimentation with aluminum production in both Europe and the United States marked the beginning of a global industrial apparatus that fostered the spread of aluminum production on both continents and shaped them as the two main centers of power in the aluminum industry.

The production technique that to this day the aluminum industry employs originated with two near-simultaneously developed electrolytic reduction processes —one originating in France and the other originating in the United States. Because of their stark similarity, but also because of the national division between them as patented processes, which enabled them to exist

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[70] Wallace, *Market Control in the Aluminum Industry,* 505. Also like Deville, Bunsen experimented with both sodium and electrolytic techniques around the same period. Wallace maintains that credit for obtaining aluminum by electrolysis belongs to both men.
[71] *The A-B-C's of Aluminum* (Louisville: Reynolds Metals, 1950), 8.

temporally side-by-side without any legal conflict between the two, the last names of the inventors have been combined in nomenclature — the Hall-Héroult Process. These processes were a lower-cost, electrolytic rather than chemical method of separating aluminum from its oxide. Both were developed in 1886. And both were subsequently patented for use on their respective continents — the business interests of Charles Martin Hall holding the patent in the United States and the business interests of Paul Héroult holding the patent in France, with wide influence on the patents in other European nations.[72] The Hall-Héroult process consisted of a bath of molten cryolite (a sodium fluoride mineral) at a temperature of 1800 degrees Fahrenheit,[73] into which alumina is deposited. An electric current is passed through this solution (called an electrolyte) that is contained within a crucible lined with carbon. During the process, oxygen is deposited on carbon anodes held within this solution while metallic aluminum sinks to rest on the bottom of the crucible. In the experiment of Charles Martin Hall, who had been an amateur chemist since childhood and took an interest in chemistry and metallurgy in college, a gasoline burner was employed to heat the solution in the crucible, while electricity was supplied from a galvanic battery, producing a small button of aluminum. [74] How the solution was heated would become important later as patent battles ensued defining who exactly invented what — demarcating boundaries of intellectual property which would contribute to lost court battles but also underpin future fortunes.

Patents played an important role in establishing the legal safety for corporations to share ideas with collaborators, and thus spread aluminum as a material in the commercial landscape.

[72] *Materials Survey: Aluminum,* II-14. Both the Hall and Herault patent holders agreed to reserve home markets for the respective companies (Pittsburgh Reduction Company and Aluminium Industrie A. G. of Switzerland.)
[73] For a practicable summary of the process, see Ashby, "Aluminum Legacy," 19-22. For a more detailed explanation, see Brubaker, *Trends in the World Aluminum Industry,* 83.
[74] Junius Edwards, *The Immortal Woodshed: The Story of the Inventor Who Brought Aluminum to America* (New York: Dodd, Mead, 1955). Edwards captures the legendry behind the founding of Alcoa and the aluminum industry in the United States.

Patents enabled corporations to simultaneously reveal trade secrets in marketing material under the watchful eye of competitors while minimizing the sense that revealing these secrets would lead to the demise of the company through advantages given to competitors. While legal maneuvering surrounding patents was a mainstay of the corporate machinations of aluminum companies, the earliest patent battles defined the major players in the global aluminum industry. Before patents were maneuvered into corporate ownership structures, however, aluminum experimenters intersected with sources of capital that would reinforce the boundaries of intellectual property. Without these funds, experimenters were not well capitalized. Because the chemical reduction process were found to be too expensive for profitable, industrial-scale production, it became critical to determine exactly how the solution (also called the electrolyte) inside the crucible could be heated and the source of electricity for the process of electrolysis. In 1887, Héroult patented an electric furnace – a system of heating not externally, but internally to the electrolyte. Like fellow Frenchman Deville, Héroult too believed aluminum had great profit potential. He sold his patent to Schweizerische Metallurgische Gesellschaft, formed in 1887 by Swiss industrial interests. The patent was subsequently licensed as well, specifically to a corporation formed by Héroult with the aid in turn of another corporation owned by parent company Schweizerische Metallurgische Gesellschaft — making three corporations with rights to the process. Two more entered the fray by 1896, establishing the primary founders of the European aluminum industry.[75] Very soon after the production of aluminum through the electrolytic Hall-Héroult process, investors mobilized to exploit the metal.

[75] Marco Bertilorenzi, "From Patents to Stock Buffering Schemes: The Historical Evolution of the International Aluminum Cartels (1886-1945), *Revue économique* 64 (2013): 1145-69. Schweizerische Metallurgische Gesellschaft was a formation of Swiss steel producer Nehers und Sohne and two electromechanics firms, Escher Weiss and Oerlikon; Wallace, *Market Control in the Aluminum Industry,* 512. Héroult sold his patent to Schweizerische Metallurgische Gesellschaft, which then joined the German firm Allgemeine Elektrizitat

While Héroult was maneuvering capital to protect patents on aluminum production, experimenters in the United States, besides Charles Martin Hall, also found ways to heat the crucible internally with electricity. In 1883, the Cowles brothers, Eugene H. Cowles and Alfred H. Cowles, sons of publisher Edwin Cowles of Cleveland, Ohio, employed an electric furnace they had devised using the current itself to produce heat rather than employing an external heating source to smelt zinc from a New Mexico mine they purchased.[76] Following this, they turned to aluminum. They established two plants to pursue smelting — one in Lockport, New York, and one in Milton, England.[77] Yet, they were unsuccessful in producing the metal in pure form. Their process instead yielded aluminum-copper alloy. Another experimenter in the United States, Charles M. Bradley, also developed a method to use electric current for smelting in 1883, a process recognized as the first in America to achieve internal heating of the electrolyte.[78] These inventions would become entangled in legal challenges, with the Cowles eventually buying, or winning in court, the rights to the patents issued to Bradley.[79]

Patents gave the holder a dominant position in a market for a period of time — a virtual monopoly — that is written into the United States constitution.[80] The entanglement of the Bradley patents for electrically induced internal heating, now in the hands of The Cowles, and the Hall patent's essential invention that "consisted in the discovery that alumina would dissolve

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Gesellschaft to form Aluminum Industrie A.G. at Neuhausen, Switzerland. Another firm, Societe Electro-Metallurgique Francaise was formed with Héroult and Aluminum Industrie A.G. (later known as Alusuisse) to license the patent. In conjunction with two more companies—one employing the Hall patent in France and one employing the Héroult patent in England—these formed the foundation of what would become the European component of the international aluminum cartel.

[76] Wallace, *Market Control in the Aluminum Industry,* 508.

[77] Ibid., 509.

[78] Ibid., 516.

[79] For a discussion of how Bradley's patents came to the Cowles and a discussion of the way in which Bradley's patents were transferred to Cowles through court ruling, see ibid., 531-32.

[80] *United States Constitution,* Article I, Section 8, Clause 8. The constitution grants Congress the power "To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."

freely in cryolite"[81] were essential to the industrial production of aluminum and would not be resolved until the early twentieth century. Sources of capital investment enabled the parties to wage battle in court and eventually wrest control of the aluminum market into the hands of a few corporate titans who competed in a global aluminum market. The dominant corporate entity in the United States began with the investors who collaborated with the young Charles Martin Hall to form a corporation that would eventually be named The Aluminum Company of America — ALCOA.

Start-up Capital and the Launch of the Aluminum Industry

Investors were foundational to the early development of the aluminum industry and were an important impetus to the spread of aluminum. Governments, banks and private individuals constituted the primary classes of investors. For instance, Napoleon III funded Saint-Claire Deville's aluminum experiments in order to develop an aluminum production capacity for France. The German financial institution Gotha funded the Héroult-connected enterprises Allgemeine Elektrizitat Gesellschaft and Aluminum Industrie A.G., which aided the upward and downward integration of the chain of aluminum production for those companies and encouraged formalized managerial structures.[82] In the United States, the Cowles brothers had connections to their father's publishing enterprise, but Charles Martin Hall, just 23 years of age when he patented his aluminum making process, was not initially well-capitalized. After initially failing to obtain investors, he went to work for the Cowles operation. The Cowles had succeeded in producing copper-aluminum alloy, but not a commercially viable pure aluminum as had Hall. He

[81] Wallace, *Market Control in the Aluminum Industry,* 532. See also Charles M. Hall. Process of reducing aluminium from its fluoride salts by electrolysis. US Patent 400,664, filed July 8, 1886; issued April 2, 1889.
[82] Bertilorenzi, "From Patents to Stock Buffering Schemes," 1148.

demonstrated his process to the Cowles at their Cleveland-based Electric Smelting and Aluminum Company, extending an option to them for the purchase of his patent. The Cowles did not exercise this option, and Hall left to seek funding elsewhere.[83] He found that source of capital in Pittsburgh, the center of American steel and iron manufacturing.

In the twentieth century, aluminum would compete directly with steel in the market for architectural cladding products. Its development and spread, however, intertwined with the steel industry from its earliest production through the capitalists who invested in Hall's invention. In the late 1800s, Pittsburgh was a bustling steel town, attracting capital and intellect for the development of iron and steel. Captain Alfred E. Hunt was a metallurgist and businessman who would lead a group of investors to acquire Hall's patent and use it for industrial scale production of aluminum. Educated at Massachusetts Institute of Technology, graduating with a degree in metallurgy in 1876, he moved to Pittsburgh to work in the steel industry and in 1887 bought an engineering testing agency with his business partner, George Hubbard Clapp, a chemist working for another steel company.[84] Hunt himself had tried to reduce aluminum earlier in the 1880s but had failed. An acquaintance of Hunt, Romaine Cole, met Hall in Lockport, Pennsylvania and was aware of his aluminum production process. Cole also knew of Hunt's interest in aluminum reduction and returned to Pittsburgh to try and connect Hall with Hunt. Indeed, Hunt was intrigued, and in 1888 he met with Hall in Pittsburgh. All the men — Hall, Hunt, Clapp and Cole agreed that Hall's process had commercial potential and raised an initial seed of $20,000 to form

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[83] For a discussion of the contentious interaction between the Cowles and Hall, see Wallace, *Market Control in the Aluminum Industry,* 529. For an account of the patent option extended to the Cowles, see ibid., 5-6.
[84] Roy A. Hunt, *The Aluminum Pioneers* (New York: Newcomen Society in North America, 1951), 2. Hunt & Clapp, Pittsburgh Testing Laboratory, founded earlier by business partners William Kent and William F. Zimmermann as "Kent & Zimmermann, Pittsburgh Testing Laboratory, to test the structural characteristics of steel in the laboratory and steel applications such as bridges in the field. Before purchasing the testing agency, Clapp worked for Black Diamond Steel Works and Hunt worked for Bay State Iron works, both of Pittsburgh.

a company and build a pilot plant in Pittsburgh. Their funds were combined with those of investors who were employed in leading positions of steel companies, including Carbon Steel Company and Carnegie Steel Company.[85] The company was formed on September 18, 1888, and was called the Pittsburgh Reduction Company, with the purpose "to exploit commercially the Hall discovery."[86] After the owners of the fledgling company determined that the pilot plant suggested the feasibility of commercial-scale aluminum production, they recognized the need for more funding if they were to go into full commercial production.[87] They found it with the banking family T. Mellon & Sons, under the direction of Andrew W. Mellon. This early investment paid off the company's debt, capitalized expansion of the company and gave the Mellon's a large ownership stake.[88]

With a well-capitalized position, the Pittsburgh Reduction Company engaged in expanding their physical plant and finding buyers for aluminum. But before the company could assert a position of dominance in the market, it needed the legal footing to do so. By design, patents enabled a time-limited monopoly. Such a condition rested on two factors. The monopolist had to hold legal right to the patent, and the monopolist had to exercise his rights to exploit the patent before it opened up to competitors as the patent expired. While the Pittsburgh Reduction Company held the Hall patent, it did not hold those patents controlled by the Cowles

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[85] Ibid., 3-4. Howard Lash, head of Carbon Steel Company and Millard Hunsiker, sales manager for the same, with Robert Scott, mill superintendent with Carnegie Steel Company. W. S. Sample, chief chemist for the Pittsburgh Testing Laboratory also invested; Carr, *Alcoa: An American Enterprise,* 40-41. A later round of funding, in 1891, would include other steel men, H. C. Frick and T. Chalmers Darsie, both in the coke business.
[86] Nathanael H. Engle, Robert Mossé, and Homer Ewart Gregory, *Aluminum, An Industrial Marketing Appraisal* (Chicago: R. D. Irwin, 1944), 121.
[87] Hunt, *Aluminum Pioneers,* 4-5. $4,000 was due to a Pittsburgh bank and the company had just authorized an increase of capital stock to one million dollars.
[88] Carr, *Alcoa: An American Enterprise,* 44-46. In 1920, the Mellons held a 1/3 ownership stake in the company. This would be a point of contention when Andrew W. Mellon held the position of Secretary of State, being accused of holding undue influence while secretary and at the same time a stockholder in the company (Alcoa) that was accused of holding a monopoly in the aluminum industry.

family. The funding obtained by the Pittsburgh Reduction Company was crucial to asserting rights in court over intellectual property to which they believed they were entitled. It enabled them to wage battle in court over patents during the late nineteenth century when the company was attempting to gain a dominant foothold in the aluminum market. Conflict was minimized early between Hall and Héroult. The conflict with the Cowles, however, would not dissipate until the early twentieth century. Believing that the Cowles were infringing on their intellectual property, the Pittsburgh Reduction Company sued them for producing aluminum in an electrolytic process very similar to that protected by the Hall patent.[89] Hall won this lawsuit in 1893. Patent trouble was an existential threat to the company. But because it held legal right to the patent, at least for the next ten years before the Cowles won a counter suit, it was emboldened to establish the capital-intensive operations, from mining to smelting to selling, needed to bring aluminum to customers. It bought or leased exclusive rights to those lands where the raw materials of aluminum were mined, excluding competitors from access. And it forged an international partnership with the nascent European aluminum cartel to dominate the American market. Without legal right to intellectual property, the Cowles were prevented from effective participation in the rapidly growing aluminum market.

Building the World Stage for Aluminum

By the late nineteenth century, the companies that would dominate the twentieth-century aluminum market before World War II were already established. Capital accumulation and intellectual property rights enabled them to seek out the raw materials of aluminum first in Europe and the United States, and later in the Global South. A global corporate-industrial

[89] Wallace, *Market Control in the Aluminum Industry,* 5.

apparatus was marshalled to move bauxite, the raw material from which alumina is most economically extracted, over the ocean or across the rails to strategically located smelters near hydroelectric power sources and then to fabrication plants often in other locales, all controlled by managers in Western centers of finance and industry.

Well before the emergence of industrial aluminum production, the clay-like material named bauxite was first discovered by French Chemist P. Bertheier in 1821 in Le Baux in the south of France.[90] It is a clay-like substance described as "a mixture of hydrated oxides of aluminum containing silica, ferric oxide, and other impurities."[91] At an industrial scale, it was a more economical way of separating the alumina than other sources. In the United States, geologists discovered substances similar to bauxite which yielded alumina at Hermitage, near Rome, Georgia, in 1883.[92] The Pittsburgh Reduction company initially bought partial ownership of an existing company, the Georgia Bauxite and Mining Company and finally purchased it in full.[93] Mining bauxite in the United States began in 1889.[94] Another more capital-intensive source was corundum, which was found in South Carolina. This was the source for the pyramidal cap of the Washington Monument, the first architectural application of aluminum in the United States.[95]

Pausing to reflect on the Washington Monument is beneficial at this point because it shows the cultural and financial value associated with aluminum at the beginning of its widespread production. William Frismuth was a metallurgist in Philadelphia who specialized in

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[90] Junius Edwards, *The Aluminum Industry: Aluminum and its Production* (New York: McGraw-Hill), 63.
[91] Wallace, *Market Control in The Aluminum Industry,* 7.
[92] Carr, *Alcoa: An American Enterprise,* 66.
[93] Ibid., 68.
[94] Ibid., 66.
[95] E. H. Dix Jr., "Aluminum Cap Piece on Washington Monument," *Metal Progress,* December 1934, unpaginated. Citations refer to the Aluminum Company of America reprint.

rare metals. He took an interest in aluminum and by the mid-1870s, had already procured several aluminum patents. He furthermore labeled himself as "the only manufacturer of aluminium and its alloys in the United States and Canada."[96] This notability and expertise attracted the attention of the engineer in charge of the construction of the Washington Monument.

Aluminum was chosen for reasons of function, but the status of aluminum reinforced the decision. In terms of function, the cap was required to serve as an electrical conductor to arrest lighting at the tip. It also necessitated a metal that would not produce streaking from rain on the white stone cladding below, a notorious problem with copper, for instance. The status of aluminum as a novel material intrigued Frismuth, yet he was not fully confident that he could make such a large casting, which would be the largest casting ever made.[97] For this reason, he cast both an aluminum-bronze cap, and a more questionable and difficult pure aluminum cap. Its weight was 100 ounces, and it measured 5.5 inches along each side and the same in height. The pure aluminum cap proved successful, and it was delivered from Frismuth's foundry.

It was not yet ready to find its place at the top, however, because first it required a polishing procedure, and then its status as a rarity was celebrated. It was displayed in Tiffany's window in New York to be admired by passersby and written about by the press. Tiffany's was fitting, as aluminum was still considered too expensive for widespread mass production. That only became possible upon the availability of electricity in sufficient quantities to facilitate a soon to be invented electrolytic method, an improvement upon the chemical method of isolating aluminum that Frismuth had used. Its status was further celebrated because the ore for the cap was sourced not in France, but in the United States, a fitting source for a burgeoning patriotism.

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[96] George J. Binczewski, "The Point of the Monument: A History of the Aluminum Cap of the Washington Monument," *JOM* 47, no. 11 (1995): 20-25; "Washington Monument Correspondence, 1884-1935," ALCOA Records 1888-1990, Records of the Aluminum Company of America.
[97] Dix Jr., "Aluminum Cap Piece on Washington Monument."

On December 6, 1884, the cap was placed by men with a photographer standing on a platform surrounding the cap, with an inscription, reading in part, "This pyramid of pure aluminum was produced from the American ore Corrundum."[98]

Aluminum was shaping up to be an international competition, because if it could be produced in quantity, its properties were believed by promoters to be profitable for the seller and useful in many applications. The most fruitful source of alumina in the United States was found in Arkansas. State geologist John G. Branner found in 1887 the largest deposit of bauxite in the country. This source continued to serve the needs of the Pittsburgh Reduction Company and even its competitors after World War II. These early sources of alumina were commercially exploited under the auspices of the legal and regulatory framework of the laws of counties in North America and Europe. Once again, patent law was a mechanism governing the exploitation of alumina-containing materials. Before the expiration of the Bayer process, discovered in 1888, The Pittsburgh Reduction Company purchased alumina from the Pennsylvania Salt Company and the Merrimac Chemical Company,[99] and also processed its own alumina at its New Kensington, Pennsylvania, plant using a carbon dioxite process.[100] After the Bayer patent expired in 1903, this more economical process was employed in a new alumina processing facility the company established in East St. Louis with convenient access to the Mississippi River.

Even before the Pittsburgh Reduction Company was founded in 1888, bauxite was imported by the Merrimac Chemical Company to the United States for use in the production of aluminum salts, first from Ireland and later from France, where the ore was attainable at a cheaper price.[101] Although cautioning that aluminum firms are indeed subject to their national

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[98] "Aluminum Exhibited," *The Philadelphia Press.*
[99] Engle, Mossé, and Gregory, *Aluminum, An Industrial Marketing Appraisal,* 160.
[100] Carr, *Alcoa: An American Enterprise,* 70.
[101] Ibid., 65.

contexts, John Stuckey, author of *Vertical Integration and Joint Ventures in The Aluminum Industry* argues that aluminum firms of the late-nineteenth and twentieth centuries are best classified "on the basis of their status worldwide, with factors such as their home country or their participation in the aluminum industry of a particular country being of secondary importance. I assume that firms have global strategies, and I consider the markets for aluminum products (to the extent that they exist) to be world markets."[102]

Soon after the Hall and Héroult patents were absorbed by corporate entities, the aluminum market was essentially bifurcated between North America and Europe. The Pittsburgh Reduction Company dominated the aluminum market in the United States and dominated the Canadian market through its Canadian holdings, incorporated as the Northern Aluminum Company, Limited.[103] A cartel of aluminum companies that was known as the Aluminum Association, established in 1901, dominated the European market. These confederations would compete, collude and run afoul of the laws of European countries and the United States until they disbanded after World War II. The Aluminum Association acted as a quasi-governmental agency, unifying policy decisions to one agency that otherwise would be subject to negotiations with government entities. Across the Atlantic, the North American corporate holdings controlled by the Pittsburgh Reduction Company gained a foothold before regulators in the United States reacted in opposition – which they would in varying degrees of influence until they broke up the North American aluminum market in more structural ways following World War II. The two entities, the Pittsburgh Reduction Company and the Aluminum Association controlled access to bauxite, regulated supply and output, limited competitive entrants to the market and, amongst

[102] Stuckey, *Vertical Integration and Joint Ventures in The Aluminum Industry*, 7.
[103] *Materials Survey: Aluminum,* X-I. The Pittsburgh Reduction Company's activities in Canada started in 1900 by building a factory at Shawinigna Falls. The Northern Aluminum Company, Limited, was incorporated in 1902.]

their respective members in either the US or Europe, shared marketing research and materials.[104] These goals were aimed at protecting and expanding market positions and maximizing profit potential, which was closely linked to the price of aluminum on the market.

As private entities, profit was a motivator that underlay the actions taken by member companies. The price of aluminum had a complicated relationship with profit. On the one hand, a higher price of aluminum could yield more income for every unit of aluminum sold. On the other hand, in a field of competitors occupied by other metals such as brass and copper, producers lowered the price of aluminum in order to compete in the market. Employing electrolytic reduction rather than the more expensive chemical reduction was one way producers were able to sell aluminum at a lower price. Moving toward economies of scale by expanding quickly to industrial-scale production was another. Although the mythological origins of Hall's aluminum production method were "the immortal woodshed" near his parent's home,[105] production at scale involved a capital intensive operation in terms of investment capital and human capital and a physical plant to process the raw materials of aluminum into a finished, sellable product. While aluminum production is indeed part of a wider web of relationality to social, economic and political forces, the tangible process of aluminum production, and of those cladding products which come from it, once industrialized became a complex, linear process that began with the dirty physicality of bauxite, moved to smelters and extended through factory production up and down the line of vertical integration. Because of the location of bauxite across the world, and because of the connectedness between the twin-spheres of finance and consumption in Europe

[104] For an overview of the cartel from the perspective of the US government, see *Materials Survey: Aluminum,* II-14. For other analyses of the cartel, see Charlotte Feldman Muller, *Light Metals Monopoly* (New York: Columbia University Press, 1946), 97; Bertilorenzi, "From Patents to Stock Buffering Schemes."
[105] Edwards, *Immortal Woodshed.*

and the United States, the actual process of aluminum production was international soon after it moved out of the woodshed and into the plant.[106] Aluminum production first coordinated only between Europe and the United States. In the twentieth century, it became an expanded global industrial process. An aluminum panel installed in the Midwestern United States in the postwar period might, for instance, have originated with bauxite in Guyana. Furthermore, the exigencies of international trade, pricing and tariffs which influenced the price and availability of aluminum was an interaction between nations and cartels. Aluminum became increasingly global after World War II. But before the turn of the century, the line of industrial aluminum production controlled by the European cartel and the Pittsburgh consortium was centered in two nations — France and the United States.[107] This process began by mining the materials containing alumina and ended with a finished product consisting of near-pure aluminum or an alloy of aluminum and another metal.

Before proceeding further, it is useful at this point to explain in brief the technical process of aluminum production from bauxite to finished product, because it reveals that the industrial process involved was highly complex, requiring great physical and capital resources. The basic steps of aluminum production proceed sequentially.[108] (1) Mine the bauxite (or similar alumina-holding raw material.) The bauxite is transported to milling plants, where it undergoes crushing, washing, drying, pulverizing and calculating — all processes to condition it for alumina extraction. (2) Produce alumina, extracting it from bauxite, employing the Bayer process and/or

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[106] Carr, *Alcoa: An American Enterprise,* 65. For example, the Merrimac Chemical Company imported Bauxite from Europe before the Pittsburgh Reduction Company was formed.
[107] Engle, Mossé, and Gregory, *Aluminum, An Industrial Marketing Appraisal,* 37, 144. In Europe, France was the dominant source from 1873 to 1920s. In the United States before World War I, almost all bauxite was sourced stateside.
[108] For detailed descriptions and diagrams, see *A-B-C's of Aluminum,* 13; Graham and Pruitt, *R&D for Industry,* 20; *Aluminum: How It's Made and Where It's Used,* 13.

the Pedersen process. The Bayer process is a separation process removing other elements from the alumina, such as the accompanying silica, iron oxide and minerals in the bauxite.[109] The Pedersen process is an electrically-intensive process for processing sources of raw material in which alumina is less abundantly available.[110] (3) Produce pig aluminum through the reduction of alumina, whereby an electric current is applied to a molten solution called cryolite contained within a crucible.[111] This process separates the aluminum from its oxide, alumina, allowing the metal to collect at the bottom of the crucible, after which it is poured out and cooled into bars of aluminum (pig). (4) Fabricate aluminum as either castings (using sand, permanent molds, dies) or wrought (mill products: "sheets, plates, foils, extrusions, welded tubes, rolled and continuous-cast rods and bars, bare wire, aluminum cables steel-reinforced, bare cables, forgings and impacts, and powders.)"[112] (5) From these fabrications come manufactured finished aluminum goods, such as aluminum sash, aluminum screens and aluminum cladding.[113]

[109] For a diagram of the Bayer Process, see Engle, Mossé, and Gregory, *Aluminum, An Industrial Marketing Appraisal,* 5; For a written description, see Wallace, *Market Control in the Aluminum Industry,* 7. A US government publication explains it thusly: "The primary function of the Bayer process is to separate pure alumina from the various impurities…" *Materials Survey: Aluminum,* VI-2.

[110] For an explanation of the factors governing the Pedersen Process, see Engle, Mossé, and Gregory, *Aluminum, An Industrial Marketing Appraisal,* 6.

[111] The process of reducing aluminum with cryolite forms the foundation of the Hall process. For details, see Wallace, *Market Control in the Aluminum Industry,* 532.

[112] Stuckey, *Vertical Integration and Joint Ventures in the Aluminum Industry,* 213.

[113] Ibid., 213. Stuckey describes manufactured products as "all products made from fabrications."

CHAPTER 2: REGULATORY FRAMEWORKS SHAPE THE MARKET

The United States government had such an influence on the aluminum industry that any examination of aluminum cladding, the way it developed and was marketed, must take into account the impact of regulatory bodies on the aluminum manufacturing enterprise. Prior to World War II, regulators in both the United Stated government and the International Aluminum Cartel, a group of aluminum producers colluding to regulate aluminum on the world stage, intervened in supply and production. After World War II, the union of aluminum and modern architecture can be easily understood as a corporate modernism, but it is better seen as a public-private partnership. Joan Ockman, writing about postwar modernism in general characterizes the entanglement as "increasingly an accomplice of big business and government"[114] which could also describe the relationship of these entities with aluminum cladding in particular. Government regulations and the influence of World War II shaped aluminum cladding in multivariate ways. It influenced through the enforcement of building codes, federal legislation that regulated supply and demand, patent law, restriction on monopolistic behavior and the facilitation of the creation of competition, giving birth to Reynolds Metals, a viable competitor in the United States for Alcoa.

World War II did not mark the beginning of aluminum cladding in architecture, despite misunderstandings to the contrary. Aluminum cladding for commercial structures and framing for store fronts and windows was employed before the war and was increasing in use. The first use of aluminum in building construction in the United States was the Washington Monument (1884), capped with a small pyramid of aluminum. Cladding of aluminum first gained

[114] Ockman, "Toward a Theory of Normative Architecture," 143.

widespread use as spandrels under windows, with the aluminum panels under the windows of the Chrysler Building (1929) one of the first applications, and others such as Rockefeller Center Building (1930-39) to follow. Then war intervened and shifted all aluminum production in the United States to war production.

Government policy intertwined with the aluminum industry

Postwar architectural modernism has often been examined as an entanglement between government regulations, the Cold War and the corporate sphere. For instance, Greg Castillo examines the role of domestic spaces in the Cold War," and Sarah Williams Goldhagen describes the postwar period as "the spread of democracy and the growth of the welfare state, the cold war, the need to rebuild economies and destroyed cities, decolonialization, and the rapid dissemination of mass culture."[115] This study supports these characterizations and shows the entanglement of government and corporate industry in the mass production of aluminum architectural components. Producers and architects collaborated to confront regulatory barriers, devising ways to work with building codes, and in other schemes, to devise alternatives. The first building discussed in this section is the Equitable Building in Portland, Oregon, by Pietro Belluschi (1948.) This structure shows how the building code restricted Belluschi's aspirations but also enabled a creative and unusual use of aluminum at that time. A second building, the Davenport Works Administration Building, (1949) by Harrison & Abramovitz, reveals the collaboration between Alcoa's researchers and developers, and the architects who aimed to devise an aluminum curtain wall that satisfied the building code. The wall of this building was utilized as a pilot project that could be improved and deployed in cities where Alcoa hoped to

[115] Castillo, *Cold War on the Home Front;* Ockman, "Toward a Normative Theory of Architecture," 143; Goldhagen, "Something to Talk About."

sell aluminum for building cladding. Government held the power to regulate the aluminum industry through law and appeal to patriotism. Patent law, court rulings, tariffs, tax advantages and building code enforcement are ways government regulated the reach and spread of aluminum products like commercial cladding. Through appeals to patriotism and civic duty, government also urged the aluminum industry to participate in war efforts. Commercial aluminum cladding was shaped by government policy that began in the late nineteenth century and continued into the postwar period.

Beginning with the first investments in research and experimentation, producers in the aluminum industry were intertwined with government. At times, producers relied on government for funding and expansion, while at other times producers held a contentious relationship that threatened the collapse of their enterprise. Aluminum cladding is the product of a public-private partnership, not as a formal structure, but as a negotiated construct. In this arrangement, producers provide government with the knowledge and technical skill to accomplish governmental policy goals in defense and economic goals in defining how the US market for aluminum should be structured, and the government exercises control over producers by enforcing those goals and provides the legal and economic foundation upon which producers built the aluminum industry. The most contentious interaction between producers and the US government concerned the degree of market control producers were allowed to hold. On the one hand, monopoly over creative work was protected for a time by the government by virtue of US patent law. On the other hand, the US government discouraged monopoly through laws and court rulings, reduced the power of leading producer Alcoa, induced the formation of viable new producers and increased competition amongst producers vying for a profitable slice of the commercial aluminum market. Government policies both defended existing positions of power held by producers through tariffs and tangible asset transfers, but also aided those same producers' competition through the exercise of court rulings and competing asset transfers.

When examining the role of governments and their influence on aluminum production, it is important to understand that governments did not operate as monolithic entities. Often, factions of the US government disagreed with a course of action in relationship with the aluminum industry. The actions of governments explained herein are instead the policy decisions of particular regulatory bodies within a government, such as the President's office, Congress or an agency. For instance, while the Defense Plant Corporation worked with and benefitted from the industrial activity of Alcoa, the judicial branch and, during the war, the Department of Justice continued investigating Alcoa on accusations of monopoly. The US government's actions for and against Alcoa show the degree to which government was intertwined with aluminum products in the pre– and post–World War II periods. The intertwining of government and the aluminum industry suggests the aluminum market never was a "free-market" economy during the early to mid-twentieth century but was instead a command economy during wartime, in which the government planned and controlled aluminum production, and was a mixed economy at all other times during this period, in which the government leveraged its influence to challenge Alcoa's dominance and facilitate viable competitors.

The United States vs Alcoa

From its founding in 1888 as the Pittsburgh Reduction Company, Alcoa enjoyed monopoly status in the United States, bolstered substantially by the legal protection of its patents.[116] Patents granted a period of time for the Aluminum Company of America (Alcoa) to exploit intellectual property for further development. This fact gave it a jump start and contributed to Alcoa as the dominant producer in the United States until World War II. Two years after the company's founding, however, the U.S. Congress began to frown upon monopoly as a corporate condition. The Sherman Act of July 2, 1890, is described as an act in which: "Congress thus criminalized agreements in restraint of trade, monopolization, attempts to monopolize, and conspiracies to monopolize; authorized the federal government to seek injunctive relief; authorized persons injured in their business and property to sue for treble damages, attorneys' fees, and costs; and then left it to the federal courts to work out the details on a common law basis."[117] The Pittsburgh Reduction Company's (later Alcoa's) important Bradley patent expired in 1909, and by 1910, the US government began investigating the Alcoa.[118] Because Alcoa had been under near-continuous investigation by branches of the US government from this time until the 1950s, [119] volumes of archival material have been retained as mandated by court proceedings.[120] The most impactful charges brought against Alcoa by the

[116] Although it is arguable about the degree to which Alcoa was a monopoly given that viable competitors existed in Europe and Canada, and whereby aluminum competed with other metals, Alcoa was accused of monopoly by the US government and subsequently forced into competition by the government's enabling of viable competitors during World War II. Furthermore, by Alcoa's own admission, "For 40 years [1888-1928] it was the only basic producer in North America" after which a producer affiliated with Alcoa, Aluminum Limited, was formed in Canada. "Competition—A Run for the Money," *The Alcoa News,* October 1957, p. 4, box 152, Records of the Aluminum Company of America.

[117] Spencer Weber Waller, "The Past, Present, and Future of Monopolization Remedies," *Antitrust Law Journal* 76, no. 1 (2009): 14.

[118] For a history of patents and Alcoa, see Carr, *Alcoa: An American Enterprise*. Alcoa was charged by the Justice Department with monopolizing the aluminum industry and restricting trade by engaging in a restrictive covenant with the Pennsylvania Salt Company, excluding other buyers, and participation in the 1908 international aluminum cartel.

[119] Wallace, *Market Control in the Aluminum Industry,* 369.

[120] The bulk of Alcoa's public archive is contained in the Senator John Heinz History Center in Pittsburgh. From the anti-trust case brought against Alcoa starting in 1937, "15 million words of testimony were printed in the transcript. There were nearly 10,000 pages of exhibits alone and the record when published, exclusive of the judge's decision, filled 480 volumes." See "Story of a Trial…," *The Alcoa News,* August 1957, p. 17, box 152, Records of the Aluminum Company of America.

government began in April, 1937 when the Justice Department brought anti-trust charges against the company. The government accused Alcoa of monopoly, excluding competitors by aggressively expanding up and down the chain of production, engaging in exclusive electrical power contracts and participating with the international aluminum cartel in schemes to divide the worldwide aluminum market amongst its members, shutting out competitors.[121] Meanwhile, World War II erupted, and Alcoa began production of aluminum for the war. The Defense Plant Corporation (DPC) was formed in August 1940 to provide the regulatory structure and funding for the construction of aluminum plants across the United States, most of which Alcoa operated.[122] This is emblematic of the aluminum industry's relationship with the government — factions simultaneously cooperating and conflicting — with the stakes set as company survival and industry productivity for the war effort.

The DPC was an enormous apparatus transforming large swaths of the US economy, for a time, into a command economy. Upon its dissolution in 1945, the DPC owned between 10 to 12 percent of the entire industrial capacity of the United States. In approximate terms, it controlled 96 percent of the synthetic rubber industry, 90 percent of magnesium production, 71 percent of aircraft manufacturing and 58 percent of the aluminum industry.[123] Its influence over the aluminum industry was envisioned by the government to effectuate the manufacture of approximately 50,000 planes per year.[124] Alcoa played a significant role in the DFC-directed

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[121] Waller, "Past, Present, and Future of Monopolization Remedies," 16-17.
[122] Gerald T. White, "Financing Industrial Expansion for War: The Origin of the Defense Plant Corporation Leases," *The Journal of Economic History*, 9, no. 2 (1949), 156-83. The Defense Plant Corporation was a subsidiary of the Reconstruction Finance Corporation, a government entity developed from legislation directed to reconstruction from the Great Depression.
[123] Ibid., 158.
[124] Aluminum Company of America, 1942 Annual Report, p. 11, Records of the Aluminum Company of America. In addition to building plants for the DFC that competitors would come to occupy, Alcoa also trained competitors to use facilities in those plants. "Further speeding of the Nation's war production activities has been accomplished by the aid Alcoa has given other companies in helping them to establish aluminum fabricating plants, foundries and

expansion of the aluminum industry. The DFC relied on Alcoa as a fount of expertise in plant construction and aluminum production. Two-thirds of all expenditure for industrial facilities, totaling $25 billion, was financed by the government.[125]

Soon after the DFC initiative was underway, Judge Francis G. Caffey heard the case, which had originated in 1937, and issued his decision in 1941, clearing Alcoa of all charges. Alcoa churned out aluminum for the war, but their legal troubles related to monopoly were not over. A component to the complaints against the company was a petition to dissolve Alcoa, thus precluding its monopoly. Caffey's decision was appealed by the Justice Department and sent to the Supreme Court, which, lacking a quorum, could not hear the case. Congress intervened to send it to a US Circuit Court of Appeals where Judge Learned Hand in 1945 affirmed Caffey's ruling on all findings and conclusions, with the exception of charges of monopoly and price manipulation.[126] Simultaneous events impacted the court, however, and Judge Hand postponed any potential dissolution of Alcoa to end monopoly, realizing that the aluminum plants built with government funds and operated by Alcoa during the war could be transferred after the war to upstart competitors, breaking Alcoa's monopoly. The Justice Department, at war's end, refused to authorize the transfer of the plants Alcoa had built and then leased from the government.

Upon cancelling the leases that Alcoa and the government had agreed to, the government directly engaged in forming the postwar aluminum industry. Several factions of the government agreed with this goal. In 1945, the Attorney General proposed to Congress to "recast" the

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forge shops of their own. This has been done by taking representatives of these companies into Alcoa's plants and training them, and by sending Alcoa's own men into other plants to help those plants."

[125] White, "Financing Industrial Expansion for War," 156.

[126] For a summary of legal proceedings against Alcoa as recounted from the perspective of Alcoa, see "Story of a Trial…," 17-18.

aluminum industry into several competitors, [127] The President of the United States articulated his hope that the plants could be disposed of in a manner that would create competition,[128] and the Surplus Property Act authorized a board of experts to propose ways the plants could be disposed of with the intent of creating competition for Alcoa. The Surplus Property Board maintained that increased competition in the aluminum industry would have several positive effects. Competition was argued in terms of: "greater production, employment…[.] It will promote national security."[129] The keystone of the government-held properties—and one built and leased by Alcoa—was the state-of-the-art Hurricane Creek alumina plant in Arkansas, built in 1942. It held the advantage of close proximity to the leading source of domestic bauxite, was near the government's large stockpile of aluminum and was underpinned by patented processes held by Alcoa.[130] During the war, Alcoa had operated this plant using its proprietary alumina-processing equipment. The Surplus Property Board contended that to create a competitive environment, not only this plant but also the patented processes tied to it should be transferred to a viable competitor. With Alcoa's lease cancelled, the government negotiated with Reynolds to take over this plant and negotiated with Alcoa to release its patents. Under protest from Alcoa executive Arthur Davis, Alcoa did agree to release the patents and Reynolds was granted access to them, taking control of the Hurricane Creek plant. Kaiser Aluminum was the second competitor granted plants from the government. Alcoa, Reynolds and Kaiser were the primary producers that formed the new competitive landscape for aluminum, supported with generous subsidies,

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[127] Robert L. Branyan, "From Monopoly to Oligopoly: The Aluminum Industry after World War II," *The Southwestern Social Science Quarterly* 43, no. 3 (1962): 244.
[128] *New York Times,* October 19, 1945, quoted in ibid., 245.
[129] *Aluminum Plants and Facilities: Report of the Surplus Property Board to the Congress* (Washington, D.C.: US Government Printing Office, 1945), 44-45.
[130] Carr, *Alcoa: An American Enterprise,* 270. Along with three other patents, the "Alcoa Combination Process" was crucial and integral to the plant's operations. It allowed processing of low-grade bauxite ore—important because most of the high-grade ore had been depleted.

key patents freed to competitors and plants distributed across the nation. Reynolds paid $57.6 million for plants and equipment valued at $174 million, paying $3 million in cash. Kaiser paid $43.5 million for plants and equipment valued at $127 million.[131] Alcoa retained use of select plants built with government funds. These assets, the need for new building stock and the collective experience in metal manufacturing held by these corporations positioned them advantageously for the postwar era.

Despite the government's role in creating robust competition in the aluminum industry, the Justice Department continued to seek Alcoa's dissolution. The judge hearing this case in 1950, Judge John C. Knox, ruled against dissolution, but instead ordered that the major shareholders in Alcoa must not also hold shares, as they had, in Aluminum Limited, the Canadian company, because doing so tied these two companies too closely together, in effect forming a conglomerate that was argued could still exercise disproportionate control over Reynolds and Kaiser.[132] Then, the judge extended jurisdiction over Alcoa for another five years—a wait-and-see period to observe whether Alcoa's dominance really would be challenged by the competitive forces of Reynolds and Kaiser.

An American Oligopoly of Competitive Producers on the World Stage

The government had directly compelled a new competitive landscape for the aluminum industry in the United States through favorable tax policies, generous loan and lease agreements, forced patent transfers and the threat of dissolution. The government was driven by the goals of

[131] Merton J. Peck, *Competition in The Aluminum Industry, 1945-1958* (Cambridge: Harvard University Press, 1961), 19.
[132] For a summary of legal proceedings against Alcoa as recounted from the perspective of Alcoa, see "Story of a Trial…," 3,18.

raising employment,[133] fostering competition[134] and, in the words of the Surplus Property Board, promoting "national security."[135] But there was a larger reason for these goals: the competitive position of the United States as an entity on the world stage. American producers were not alone in the world of aluminum. After World War II, Western European producers were joined by Eastern European producers and the industrial apparatus of the Soviet Union. Aluminum was, from the start, an international industry and became global as bauxite was mined in the global South and the Caribbean region. Through government intervention, it defined an American apparatus of industrial production comprising a distributed network of producers.

One important political tool employed by nations in competition with others in aluminum production was the tariff — a tool directed both ways between European and American producers. The French firm Pechiney Compagnie de Produits Chimique et Electrometallurgiques was privileged by government tariffs on international imports,[136] while the Pittsburgh Reduction Company's (Alcoa's) profits, in its first decade and beyond, were aided by tariff protection in the United States,[137] having the effect of suppressing foreign competitors.[138] Producers in the United States kept a close watch on tariffs, attempting where possible to exert influence. As an aggressive new competitor to Alcoa, Reynolds was especially keen on leveraging the tariff against Alcoa. Reynolds protested what it said was a low tariff on Canadian aluminum, given

[133] *Aluminum Plants and Facilities,* 44-45. Employment was articulated as a goal in conclusion #2 of the Surplus Property Board recommendations.
[134] Branyan, "From Monopoly to Oligopoly," 246. Paul Mather, liquidator for the General Services Administration justified the sale of plants to Permanente Metals Corporation (Kaiser) on the grounds of creating competition and providing for defense.
[135] *Aluminum Plants and Facilities,* 44-45. National security was articulated as a goal in conclusion #2 of the Surplus Property Board recommendations.
[136] Brubaker, *Trends in the World Aluminum Industry,* 106.
[137] For an explanation about how tariffs were a barrier to competitor entry, see ibid., 120, 129. For an explanation of the effect of tariffs on Alcoa profits, see Wallace, *Market Control in the Aluminum Industry,* 29.
[138] Adolphe Minet, *The Production of Aluminum and Its Industrial Use*, trans Leonard Waldo. New York: John Wiley and Sons, 1905, 247. Tariffs on foreign imports also allowed The Pittsburgh Reduction Company (Alcoa) a higher degree of control over prices that otherwise would not be possible with greater foreign competition.

that Alcoa had a close relationship through stock ties to the Canadian producer Alcan.[139] Not only was the tariff a tool used against foreign competitors but it also served as a leveraging tool of competition between domestic producers.

The public-private foundation of aluminum cladding

The spread of aluminum cladding in the postwar period was a product of an industry with direct and ample financial support from the government. The aluminum industry was not a "free market" in the most common sense of the phrase. Moving from the domestic monopoly status of a sole US producer to a domestic oligopoly of a few producers, industrialists were supported by production during three twentieth-century wars and by the direct intervention of the government into the aluminum industry. The postwar spread of a corporate-oriented architecture is partly attributable to government intervention transforming a command economy into a circumstance in which control over industry was gradually relinquished to the private sector. When aluminum producers aligned with government goals, government could be highly enabling. Conversely, when producers diverged from government goals, government could, given enough time, end long-established industry plans. Despite the variability in benefit of the aluminum industry's relationship with the government, the United States presented an advantageous environment for aluminum production. The country had a well-developed infrastructure comprising electrical distribution and natural resources such as coal and major rivers which could be, and were, dammed for the enormous amounts of electricity from hydroelectric generators required to power

[139] Branyan, "From Monopoly to Oligopoly," 247-48. Reynolds maintained that Alcoa was capitalizing on the low tariff to "stifle the competition." The company detailed the complaint in two long briefs sent to the US Tariff Commission.

smelting operations.[140] Despite involvement in three major resource-consuming wars, the United States also provided a stable political location. The high-levels of investment required for industrial-scale aluminum production necessitated political stability and a large potential market.[141] The high rate of aluminum-industry expansion in the first half of the twentieth century was facilitated by the involvement of the US government through direct investment, a government policy favoring growth, [142] and a politically stable, growing market for aluminum.

War as an accelerator, not an originator of aluminum production

Modern architecture in the postwar period was markedly influenced by World War II. As Beatriz Colomina writes, "The bright experiments of postwar American architecture are covertly organized by the trauma of war — the trauma of the war that just finished and the trauma of the fact that it had not really finished after all."[143] This trauma overshadows currents in the development of modern architecture that began in the prewar period, only to be brought to a halt as production facilities stopped manufacturing materials for the building industry and instead accelerated production for the war. In the history of aluminum, it is sometimes said that aluminum was not widely used in building before World War II.[144] Widespread use is, of

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[140] Brubaker, *Trends in the World Aluminum Industry,* 104. Alumina smelters in the first half of the twentieth century were primarily driven by hydroelectric power. In the 1960s, thermal energy and coal-based plants were adopted as sources.

[141] Ibid., 98. Brubaker maintains: "Capital intensiveness combined with advantages to scale means that large investments are required and therefore investors are impelled to seek politically secure locations for such expensive works."; "The major firms (and many of the lesser ones as well) generally have been the beneficiaries of state policies that strongly favored their growth." Ibid., 100.

[142] Peck, *Competition in the Aluminum Industry,* 154. Peck's analysis of competition in the aluminum industry finds: "Government aid permitted the private financing of an extremely high rate of expansion" and "perhaps equally obviously, some sort of government assistance was required."

[143] Beatriz Colomina, *Domesticity at War* (Cambridge: MIT Press, 2007), 56.

[144] Marian Bowley, *Innovations in Building Materials: An Economic Study* (London: Duckworth, 1960), 309. See, for example, Bowley's assertion: "Although the characteristics of aluminium have long been known, it was not in fact used to a large extent in building before the second world war."; See also Stephen J. Kelley, who writes: "It took the industrial progress spurred by the armed conflict of World War II to bring this metal to widespread use."

course, a relative assessment. What is clear, however, is that aluminum was, in fact, used in many of the same building applications before World War II as after.

Innovation in building materials such as aluminum was sourced in discoveries about the metal often because of war production. For instance, writes Bowley: "It will be noticed that the introduction of aluminum has increased resources available for building by the discovery of important building properties in a material previously regarded as unsuitable. This discovery was exogenous to the building and building-material industries and must be attributed…to the aircraft industry and engineers aided by the Aluminum Development Association and the government."[145] Development of new uses for aluminum in building occurred before World War II in robust ways. Yet it is true that World War II, and a string of wars preceding it, did play a significant role in the development of the building market for aluminum products. From the earliest days of aluminum production, commanders envisioned the production process as holding potential advantages for war fighting. War, and especially World War II, most certainly was an important influence on the development of architectural aluminum-building products, but it is more useful to see how war acted not as a cause but as an accelerator of aluminum production, extending from new knowledge, procedures and physical infrastructure resulting from the production of war materials. Furthermore, war and its relationship with aluminum production extended beyond World War II, encompassing the Korean conflict and the Cold War.

Stephen J. Kelley, "Conflicts and Challenges in Preserving Curtain Walls," *APT Bulletin Journal of Preservation Technology* 32, no. 1 (2001): 10; cf. Myers: "If there were one root cause beneath all others that forced industry more deeply into architecture and led to the mid-20th century commitment to metal building, it would have to be World War II." Myers, "Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style," 88.

[145] Bowley, *Innovations in Building Materials,* 309, 317.

The earliest intersection between war and aluminum was the funding of 3,000 francs by the French Academy to foster research on aluminum. Napoleon III was the patron for Saint-Claire Deville's aluminum experiments in France. In 1855 Deville commissioned aluminum tableware with a value greater than gold; it is said that he allowed his important guests to use the utensils at the banquet table.[146] In 1857 an aluminum baby rattle was presented by Deville to the infant son of Napoleon III.[147] But Napoleon was not solely interested in trinkets and tableware. Emperor Napoleon III funded Henri St. Claire Deville with the aim of developing an aluminum industry that could produce lightweight but robust military equipment. Aluminum was cast into imperial eagles for French army standards and in 1858 breastplate armor was made for Napoleon. [148] In 1892 the French government ordered torpedo boats made of aluminum.[149] France's leading role in the development of aluminum on an industrial scale afforded the nation advantages that it sought to exploit for military gain. Despite Napoleon's aspirations, it is incorrect to attribute the development of aluminum in France solely as a contribution to war-fighting capability. Deville anticipated its use in the domestic and commercial spheres, predicting it would become more widespread if its price were reduced.[150] Yet, in addition to private investment, funding by governments contributed to the development of aluminum, especially as an instrument of war.

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[146] Ashby, "Aluminum Legacy," 14.
[147] Alcoa, "Down the Years with Aluminum," 1959, box 173, Records of the Aluminum Company of America.
[148] Richards, "Aluminum—the Metal of the Future," 10.
[149] *Aluminum: How It's Made and Where It's Used,* 29.
[150] "Notes and Gossip on the Recent Progress of Science," *Scientific American,* 1, no. 26 (December 24, 1859), 412, quoted in "This was Aluminum—In 1859!," *Reynolds Review,* December 1959, 27.

War, Aluminum and the United States

As another center of industrial aluminum production, the producers and manufacturers in the United States also capitalized on their first-mover advantage and sought out uses for aluminum as a war material.[151] Theodore Roosevelt used an aluminum canteen during the Spanish-American War, and cavalrymen in that war secured their tents with aluminum stakes.[152] As Alcoa historian Charles Carr notes, military uses included “dust for explosives, drop bombs, fuses, flares, hand grenades, heavy ammunition, rifle cartridges, and for airplanes, aeronautical engines, castings.”[153] World War I was a much greater catalyst than previous wars in spurring aluminum production. Alcoa’s production of aluminum grew to 152 million pounds per year in 1917,[154] boosting the growth of Alcoa.[155] Primary aluminum producers and aluminum architectural product manufacturers largely dedicated their facilities to the War effort. By 1917 approximately ninety percent of aluminum production in the US was directed to military requirements. By 1918, capacity of aluminum production rose forty percent over production at the beginning of the war.[156] Kawneer, a manufacturer of metal storefront systems, dedicated its factory to the production of metal aircraft frames for the war, adapting techniques for manufacturing storefront systems to the production of aircraft.[157] Because Kawneer invented a

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[151] War materials are more widely known as strategic materials where they are used not directly in war but are stockpiled for national security. For an example of the use of this designation for national defense, see Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, *Strategic and Critical Materials 2013 Report on Stockpile Requirements,* appendix 1, accessed June 19, 2017, http://www.dla.mil/Portals/104/Documents/StrategicMaterials/2014%20Operations%20Report.pdf.
[152] *Aluminum: How It’s Made and Where It’s Used,* 29.
[153] Carr, *Alcoa: An American Enterprise,* 149.
[154] Myers, “Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style,” 78.
[155] Wallace, *Market Control in the Aluminum Industry,* 117
[156] *Materials Survey: Aluminum,* II-5.
[157] Kawneer Company, *Kawneer: 100 Years of Innovation* (Norcross, GA: Kawneer Company, Inc., 2006), Kawneer File, Niles District Library, Niles, Michigan.

tubular steel strut employed in monoplanes and bi-planes, the company was officially commended by the War Department.[158]

World War I had accelerated aluminum production in several ways. First, the war boosted research into and knowledge of aluminum manufacturing techniques. After the war, aluminum producers set up research laboratories manned by research staffs.[159] Knowledge about effective casting techniques benefitted the market for aluminum car components. Second, knowledge of aluminum and its properties spread more widely amongst the engineering trades. As Donald Wallace's 1937 study of the aluminum industry notes: "…the war accomplished more advertising in two years for this industry than a decade of New York copy could have done."[160] This spreading knowledge was accompanied by an increasing adoption of aluminum over other metals. While all metals increased in use after World War I, aluminum saw faster growth than iron or copper in percentage increase.[161] Lastly, the war repositioned aluminum alliances, enabling the cooperation of producers with regimes outside of established regulatory frameworks. The aluminum cartel of Europe, which was a controlling force over aluminum production since its founding in 1901, dissolved in 1915 (but was reformed after the war) because, as a conglomerate of European aluminum producers, it held as members companies beholden to both the Germans and the Allied Powers. As a result, the respective governments stepped in to regulate the price and production of aluminum.[162] Repositioning extended internationally, and Alcoa merged assets with a French start-up in the United States in 1916.[163]

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[158] "75 Kawneer Years…Only a Beginning," supplement to *Daily Star* (Niles, Mich.) July 29, 1981, 7.
[159] Wallace, *Market Control in the Aluminum Industry,* 46.
[160] Ibid., 46.
[161] Engle, Mossé, and Gregory, *Aluminum: An industrial Marketing Appraisal,* 167.
[162] Louis Marlio, *The Aluminum Cartel* (Washington, D.C.: Brookings Institution, 1947), 19.
[163] Wallace, *Market Control in the Aluminum Industry,* 116.

World War II and the growth of aluminum

Many of the uses for aluminum and the aluminum-industry experiences during World War I were mirrored in World War II but on a larger scale. Contrary to some assertions, World War II did not mark the entry of aluminum into the building market. Before that conflict, the aluminum market was already expanding into industrial, building and domestic applications. In the late 1920s it was widely employed as window extrusions, storefronts and in sheet metal for architectural uses.[164] Kawneer ran a profitable business using aluminum extrusions for storefronts from the late 1920s, and aluminum was firmly established as a leading material in storefront construction by the 1930s. Based on prewar sales, the industry was optimistic about postwar sales.[165] Instead, more than other wars, World War II boosted production quantity, physical infrastructure and knowledge about aluminum. During World War II, production soared as orders arrived at the factory to manufacture military hardware and munitions. Factories produced war-fighting capability in what political scientist Joseph Nye has termed "hard power."[166] Such a power base lies in contrast to "soft power," which is a mechanism of combative influence exercised through culture and policy, explained at length in the sphere of architecture by Greg Castillo in *Cold War on the Homefront: The Soft Power of Midcentury Design*.[167] While soft power operates along vectors of influence such as propaganda, hard power, like wartime aluminum production, directly supplied the war with tangible material. After the war, production continued to increase and the purchase of aluminum products for uses in

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[164] Jamie Clapper Morris and Deborah Slaton, "Modern Metals: Finishes Investigation and Conservation Considerations," *APT Bulletin,* 46, no. 1 (2015): 30.
[165] *Materials Survey: Aluminum,* VII-8.
[166] Joseph Nye, *Soft Power: The Means to Success in World Politics* (New York: Public Affairs, 2004).
[167] Castillo, *Cold War on the Home Front.*

architecture expanded widely. Aluminum manufacturers and scholars examining the field after the war pinned this expansion on a boost given by the war. As Colomina notes, "modern architecture borrowed — or perhaps "recycled" is a more accurate word — the techniques, materials, and ways of doing that were developed for the military."[168] This boost came from knowledge gained about aluminum during the war and expanded factory infrastructure on both sides of the Atlantic.

Aluminum was deemed vital to waging war by the Nazi regime which rose to power in Germany. Rapid increase in aluminum production in Germany prior to the war perhaps signaled the coming conflict to such a degree that the cartel was justified as an early warning mechanism to conflict, and American industrialists argued for the United States to increase production in response to the increase in German aluminum production. In 1934 Germany requested that the cartel rapidly expand production to a level twice the consumption in that year. The cartel president was bound by agreement to comply. While the US Senate later contended that the cartel was complicit in Germany's aggression, the cartel as a mechanism of communication between members who would become the Axis and Allied Powers may have exposed an otherwise-unknown prewar increase in aluminum production.[169] By 1940 Germany dominated in metric tons of aluminum production, only to be surpassed in 1943 by the joint production of US and Canadian producers.[170] American industrialist R. S. Reynolds raised awareness about Germany's consumption of aluminum for airplanes and sounded the alarm in congress and on the radio. By his account, he traveled to Europe in 1939 to seek out suppliers of aluminum for his upstart aluminum concern because Alcoa declined to sell to his company. He could not secure

[168] Colomina, *Domesticity at War,* 12.
[169] This argument is posed in Marlio, *Aluminum Cartel,* 100.
[170] Engle, Mossé, and Gregory, *Aluminum: An industrial Marketing Appraisal,* 184.

supplies of aluminum from England or Germany, but he did claim to discover that Germany was producing aluminum to build thousands of aircraft. This message he took to Congress in an appeal to the US government to loan him the funds necessary to build aluminum plants and to the radio airwaves to garner public support for his grander visions of industrial-scale production of aluminum.[171] He forged relationships with a senator and officials at the Reconstruction Finance Corporation (RFC), a government entity established to fund industrial development for the war, and arranged a loan to build in Alabama his company's first aluminum reduction plant, named after the senator who helped secure the $16 million loan from the RFC, Senator Lister Hill of Alabama.[172] By 1944 Reynolds Metals had control of 40 plants for war production and would rise to be the primary domestic competitor to Alcoa and the second-largest producer in the United States.[173]

At the beginning of the war, the United States was ill-prepared to produce aluminum for aircraft, hardware and the munitions that were deemed necessary to serve the needs of the military. A wider initiative by the US government instituted controls on the economy, including price controls on metals and federal funding directed to the building of factories for the production of aluminum. Factories were built under the mandate of the Reconstruction Finance Corporation, which, in turn, directed a subsidiary, the Defense Plant Corporation (DPC), created in August 1940.[174] The US government engaged in plant construction in three ways. First, it built factories to increase the war arsenal. Second, it influenced the capacity of aluminum production by offering private capital special incentives, including tax amortization. Of the total $8.6 billion

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[171] "R. S. Reynolds Stresses America's Danger in Louisville and Richmond Radio Talks," *Reynolds Review,* January 1960, folder 78, Reynolds Metals Company Collection, series 1.3.
[172] R. S. Reynolds, "Message From: R.S. Reynolds, Founder and Chairman of the Board," *Reynolds Review,* Spring 1951, folder 72, ibid.
[173] R. S. Reynolds, "The Year of Final Test Has Arrived," *Reynolds Review,* January 1944, folder 70, ibid.
[174] Engle, Mossé, and Gregory, *Aluminum: An Industrial Marketing Appraisal,* 134.

invested in new plants privately, the sum of $6.1 billion was granted tax amortization, which allowed producers and manufacturers to depreciate the total cost of new facilities for tax purposes. This mechanism was directed where the government assessed a strong possibility of postwar profitable operation. Third, the DPC invested in the construction of manufacturing facilities. Over the course of the war it dedicated $7 billion to predominantly commercial industrial facilities where risk was excessive due to the possibility that the facilities would not maintain postwar operations in a profitable manner.[175] These actions allowed the government to buy, sell, store and produce aluminum during the war. In comparison with 1939, a sevenfold increase in aluminum capacity accompanied the end of the war.[176]

Aluminum producers and architectural aluminum product manufacturers were integrally engaged in producing hardware and munitions for the war. Research and development efforts established along with and in the wake of World War I were directed away from a commercial focus on, for instance, decorative finishes to military applications such as high-strength alloys and protective treatments.[177] Kawneer was early to military production when the first substantive military airplane parts order was received by the company in 1937, well before the attack on Pearl Harbor.[178] Alcoa similarly engaged early in the war. It began an expansion program in 1938, "…foreseeing then a considerably greater demand for aluminum."[179] By 1944, an Alcoa internal company report revealed a substantial increase in production capacity: "It's forging capacity was 45 times prewar capacity; its castings capacity 7 times; its extruded shapes capacity

[175] White, "Financing Industrial Expansion for War: The Origin of the Defense Plant Corporation," 157.
[176] Engle, Mossé, and Gregory, *Aluminum: An Industrial Marketing Appraisal,* 166.
[177] Ashby, "Aluminum Legacy," 84.
[178] For an account of Kawneer's involvement before World War II, see "75 Kawneer Years…Only a Beginning," 10.
[179] *Aluminum and World War II* (Pittsburgh: Aluminum Company of America, March, 1944), p. 4, box 51, Records of the Aluminum Company of America.

10 times and its tubing 13 times. One Alcoa rolling mill is turning out, monthly, one and one-half times as much high-strength alloy sheet — the kind warplanes use — as the whole country produced in a full year, before the war."[180]

Production for the war

During World War II, factories across the United States were tasked with producing war materials.[181] Among many other applications, for instance, Kawneer made gunner pods for bombers; Alcoa produced propellers; and Reynolds made bombshells.[182] By 1943 Reynolds was supplying the aluminum for 20,000 aircraft per year.[183] In addition to actual production, aluminum manufacturers also were charged with raising funds through war bonds. Like many corporations of the era, Alcoa also participated in bond sale drives.[184] Similarly, Kawneer advertised its fifth war loan drive in 1944, whereby each employee was asked to purchase bonds in addition to funds directed to war bonds through the company's regular payroll savings plan.[185] Additionally, executives in the company's hometown were asked to each raise at least $1000 for the drive.[186] While mandates and incentives spurred corporate participation in supplying material and labor for the war, these corporations were also driven by patriotism. Aluminum manufacturers engaged in the war effort genuinely believed it was their duty and that World War

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[180] Ibid., 2.
[181] For a Discussion of government requirements of the aluminum industry for World War II, see *Materials Survey: Aluminum,* VII-2
[182] For a more comprehensive list of efforts from Kawneer, see "Kawneer Helps Build B-29," *The Kawneer Front,* June 1945, p. 1, Kawneer File; "The Parts You Make Are Vital to This World-Wide Battle Front of the Air!," *The Kawneer Front,* October 1943, ibid. For ways Alcoa engaged in war production, see *Alcoa at War: A Report for the Year 1944* (Pittsburgh: Aluminum Company of America, 1944), 3, box 147, Records of the Aluminum Company of America. For ways Reynolds engaged in war production, see Reynolds Metals Company, c1942 Annual Report, Reynolds Metals Company Collection, series 1.2.
[183] Reynolds Metals Company, 1942 Annual Report.
[184] *Aluminum and World War II,* 5.
[185] "Kawneer Fifth War Loan Drive Quote Set at $70,000," *The Kawneer Front,* June 1944, p. 1, Kawneer File.
[186] "Bond Sales Still Short of Kawneer Quota!," *The Kawneer Front,* February 1944, p. 1, ibid. Those who raised more than $1000 were eligible for a certificate of recognition from the US Treasury Department.

II was a moment that could either be won or lost to tyranny. Reynolds stated: "1944 comes as the supreme challenge to our faith, our fiber and our courage. . . . For three long years you have sweated, you have produced, you have built. . . . The climax of all the dead centuries faces us today. . . . We shall decide forever whether the God or the Beast in man is to rule this war weary world." Kawneer, in a 1943 editorial expounding on the company's production of parts for aircraft, wrote: "our single purpose must be to work hard, every day, every hour, every minute to produce that part."[187]

With aluminum manufacturers humming with activity — laborers working overtime and resources stretched thin — they were not able to simultaneously manufacture architectural components for the consumer market. Kawneer made no storefronts from 1942 through most of 1945.[188] Alcoa sensed an opening to begin fabrication of consumer aluminum again but found war needs too great: "During the latter part of the year [1944], due to an excessive amount of available aluminum, it was hoped that some civilian sales could be inaugurated; but before any programs could be formulated in this connection the war demand for aluminum rose again and at the present time there is no immediate hope that civilian sales can be undertaken at an early date."[189] Although aluminum production was almost exclusively aimed at the war, knowledge of aluminum properties and techniques for its formulation into useful commercial products advanced and perhaps was even amplified.

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[187] "The Big Push Ahead," *Kawneer Front,* November 1943, Kawneer File, Niles District Library, Niles, Michigan.
[188] "75 Kawneer Years…Only a Beginning," 10.
[189] *Alcoa at War: A Report for the Year 1944,* 2-3.

Formation of new knowledge about aluminum

Like the increase in knowledge about aluminum that followed World War I, World War II accelerated this knowledge, increased the expertise and experience of the work force and spread awareness of the material amongst customers. Many new technical processes were developed for the war.[190] Kawneer explained that during wartime production, knowledge was already being gained that would be used in postwar production: "the intensive wartime production of aluminum assemblies has taught us many new things about the fabrication and finishing of aluminum which will be reflected in our postwar products."[191] Reynolds Metals also found the end of the war accompanied a boost in knowledge: "its importance to the aircraft industry has resulted in a greater quantity of theoretical and empirical data than are available for many traditional building materials."[192] In the process, much expertise was gained about the refinement, production and fabrication of aluminum. To answer the question posed by a magazine in 1941, "How can this huge increase in productive capacity be kept at work when the defense emergency is over and military demand dries up?" Alcoa explained that it was "perfecting new uses and products, and storing them away until needed."[193] After six years of manufacturing war materials, Alcoa expressed confidence that experience would prove useful to the commercial sphere: "technical progress resulting from the Company's war effort will be beneficial to these customers in the development of their postwar products."[194] Educators also asserted that experience gained in war production had structural influences on industrial

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[190] For an extensive list of technologies developed during war production, see *Materials Survey: Aluminum,* II-13.
[191] *Report on Two Arch Competitions* (Niles, Mich.: The Kawneer Company, 1943), 31.
[192] Paul Weidlinger, *Aluminum in Modern Architecture Volume II* (Louisville, Ky.: distributed by Reinhold Pub. Corp., New York, 1956), 9.
[193] "New Markets for Post-Defense Days," *Modern Industry*, March 15, 1941, 1-2.
[194] Aluminum Company of America, 1942 Annual Report, 13.

production. Frederick M. Feiker, Dean of the School of Engineering at George Washington University, asserted: "The war has proved beyond doubt that enormous production goals are possible in a short time by the application and refinement of the American principles of simplification, standardization and mass production."[195]

Manufacturing during the war as a mode of education and marketing

New knowledge about aluminum's properties developed along with war production facilitated education about the material for laborers in manufacturing and enabled a virtual marketing medium for end users. The US Business and Defense Services Administration recognized that aluminum laborers had become increasingly skilled in the "handling and working of aluminum" because of the engagement of manufacturers in the war.[196] Alcoa maintained that discoveries and techniques developed for war materials educated both laborers and end users: "the greatly increased use of aluminum provides an education relative to the metal's properties and usefulness for those who were previously unfamiliar with it."[197] Beyond mere education, the war was a way to market the characteristics of aluminum, spreading the message of its virtues through firsthand experience and accounts of its usefulness in the war. Reflecting on the war years, Reynolds wrote: "The output of aircraft and other products of aluminum during 1941–1945 caused many people to come into close contact with aluminum, and they were able to see its important advantages at first hand."[198] Buckminster Fuller was an early employer of this new knowledge. Fuller employed production techniques from an aircraft plant for his Dymaxion Dwelling Machine, producing variant prototypes of this deployable aluminum dwelling. This

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[195] Frederick M. Feiker, "A Postwar Professional Opportunity," *Architectural Record,* February 1944, 54.
[196] *Materials Survey: Aluminum,* II-13.
[197] Aluminum Company of America, 1942 Annual Report, 13.
[198] *A-B-C's of Aluminum,* 29.

type of adaptation was the sort of inventiveness manufacturers hoped would characterize the immediate postwar consumer market.

Dreams of postwar markets emboldened by war production

During World War II, many in the field of construction were planning for a postwar future. As Jean Louis Cohen shows, architects designed buildings anticipating the end of the war and imagined new uses for materials at war's end.[199] Well before the war, aluminum manufacturers framed the marketing of aluminum in terms of the future. World War II amplified these prognostications with a confidence emboldened by up to seven years of accelerated manufacturing. Manufacturers also anticipated a postwar expanding market due to deferred maintenance of existing buildings and projections for the need of new construction. The Magazine *Modern Metals* reported on Kawneer's anticipation: "The men of Kawneer were certain of one thing: Demand for their several lines of well established architectural products would far surpass anything the company had ever known. Four years of building depreciation across the country took care of that."[200] While the war was underway, aluminum manufacturers dreamed of a return to the consumer market, their potential sales emboldened by what they had learned and enabled by the dozens of new plants funded by the US government. Alcoa envisioned new ways of using aluminum, an activity they dubbed "Imagineering."[201] Aluminum manufacturers like Alcoa, Reynolds and Kawneer hoped users would define new uses, but they were ready, facilitated by robust research and design staffs, to either develop new uses or

[199] Cohen, *Architecture in Uniform.*
[200] Fred L. Church, "The New Kawneer," *Modern Metals,* April 1956, p. 2, Kawneer File.
[201] Myers, "Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style," 161.

collaborate with outside designers.[202] Kawneer forecasted a burgeoning market: "Kawneer experience and ability in the fabrication of rustless metal is now contributing developments that speed up certain war work tremendously. Your Kawneer distributor has Kawneer Store Front Construction in his stock. Check with him for materials available. Look for improved Kawneer products when the war is over."[203] Reflecting from the vantage point of 1960 on Billy Reynolds' influence on utilizing knowledge gained during the war, *Reynolds Review* stated: "When the war ended, the aircraft parts division had a vast array of fabricating equipment and a cadre of people with aluminum know-how. Since Reynolds also had, for the first time, great amounts of metal to sell to a peacetime economy, Billy Reynolds quickly began pointing the fabricating operations toward products that held the promise of volume consumption."[204]

Beyond World War II: The Korean War

After a brief return to the commercial sphere, producers once again were subject to government mandates on price, supply and manufacturing. The Korean War became a new outlet for aluminum war components. This engagement shows how, like World War II, wartime policy decisions shaped the aluminum industry. The activities of aluminum producers during the Korean War also demonstrate a reciprocal transfer of knowledge: war benefitted peacetime aluminum production through the creation of new knowledge and techniques, and new knowledge and techniques developed in peacetime benefitted war production.

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[202] Ibid., 162. For a discussion of the promotions of other aluminum companies such as Bohn Aluminum and Brass Company and other metals companies such as Allegheny Ludlum and Detroit steel Products Company. Not only aluminum manufacturers, but also other metal product manufacturers engaged in advertising promoting the advantages war production could have on future uses.

[203] Kawneer Company, 1942 Annual Report, Kawneer File.

[204] "W.G. Reynolds, Executive Vice President Research and Development," *Reynolds Review,* May 1960, 20.

In the wake of World War II, new producers emerged from government action to divest Alcoa of factories the government had built for war production and transferred these assets into the hands of new competitors — namely, Reynolds Metals and Kaiser Aluminum. The government retained some plants at varying levels of operation. Companies that did not obtain these plants petitioned the government to take over the assets to diversify the aluminum market and produce aluminum for the Korean War. Newcomers Harvey and Apex were granted assets, with Harvey gaining a site at Grand River Dam in Oklahoma and Harvey gaining smelting equipment in California, unused since World War II, that they transported for use near Hungry Horse Dam in Montana.[205] These firms, along with industry leader Alcoa, were the major producers of the postwar period. To further aid private industry with production for the Korean War, 1.5 million tons of scrap and virgin aluminum were released by the government to Reynolds and Kaiser from the 1945 stockpile.[206] Beyond the direct transfer of assets, the government also provided tax benefits and allowed purchase contracts with inbuilt risk protection.[207] Corporate taxes were reduced for the first few years of an aluminum producer's investment.[208]

While the Korean War did not completely preclude sales and manufacturing of Kawneer's storefront products, it did reduce the company's capacity for consumer production, due to restrictions placed on aluminum by the government. After the Korean War, the restrictions of access to and use of aluminum were loosened by the government, and manufacturers were once again free to focus on the consumer market. Kawneer's Berkeley, California, factory moved from aircraft parts to storefront products, but Kawneer also leveraged knowledge gained about

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[205] Branyan, "From Monopoly to Oligopoly," 248. Because both firms were not able to secure independent financial backing, they merged with established industrial firms. Harvey merged with Anaconda Copper and Apex merged with Olin Industries. These firms, along with Alcoa, Reynolds and Kaisier, became the leading competitors.
[206] Peck, *Competition in the Aluminum Industry,* 148-50.
[207] Ibid., 145.
[208] Ibid., 148-50.

aluminum and procedures developed for its manufacture during peacetime and directed these insights to war production. Mass-production techniques developed for the manufacture of storefront systems combined with techniques of manufacture developed in previous wars were employed in new plants Kawneer built specifically for national defense products. Kawneer resigned to the belief that defense manufacture would be ongoing. [209] They built a factory in the company's home town of Niles, Michigan, specifically to manufacture aircraft.

Despite the severe restrictions placed upon producers' access to labor, infrastructure and material, they were often adept at leveraging war production to their advantage. Prior to World War II, Reynolds justified arguments for government loans to build their production capacity upon fears that Germany might attain a strategic war-fighting advantage by pointing out Germany's mass production of aluminum aircraft components. After World War II, Reynold's again evoked fear in arguing for access to material, this time citing the Russians. First, in 1947 Reynolds Vice President C. M. Cashie requested that the government release its stockpile of aluminum to enable Reynolds to continue production. Later in 1949 Reynolds wrote to the President of the United States requesting that the government rebuild a stockpile, with the help of Reynolds production lines, for use in a potential war with Russia.[210]

War shaped the industry

War was a catalyst for aluminum production, enabling the physical infrastructure for a greatly expanded production capacity and enabling new knowledge of aluminum to develop new

[209] "75 Kawneer Years…Only a Beginning," 14. Reflecting on 75 years of Kawneer history, a journalist wrote, "It became apparent that, Korea or no Korea, the facts of the cold war left no room for the illusion of an eventual end of production for defense."
[210] Branyan, "From Monopoly to Oligopoly," 247-48.

techniques and expertise for wartime and postwar aluminum building products.[211] Through government action, the aluminum industry was shaped by war policy, facilitating the formation of new industry competitors and regulating supply, price and demand for the metal. As the 1944 publication *Aluminum: An Industrial Marketing Appraisal* noted, "War, has been the 'ill wind' which has 'blown good' to the aluminum industry."[212] Reflecting the hopes of aluminum manufacturers, this assessment of the aluminum industry as the war concluded predicted a bright future for aluminum: "The economic significance of the war to aluminum lies in the wide acquaintance with its use which has been created by war orders. Thousands of business men, engineers, purchasing agents, production men, and workmen have become familiar with its properties and uses. Thus it well may be that the postwar trend of aluminum production will continue for some years at a sharper upward pitch than the general business index or than the production of older materials."[213]

War was such a visible and significant accelerant of aluminum production that it easily can be seen as original cause of the use of aluminum in architecture. Yet products such as aluminum architectural components were already an expanding share of the total aluminum market before both world wars. A survey of window sash manufacturers' trade literature reveals that aluminum was promoted and sold as superior to steel for window frames in the 1920s[214] and Kawneer adapted 75 percent of its product line to aluminum by 1937.[215] Beyond the world wars, armed conflict continued to shape the aluminum market. Reflecting fears of the Cold War and

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[211] Ashby, "Aluminum Legacy," 33. Duralumin was an alloy developed prior to World War I that formulated a stronger, more robust finish for aluminum architectural products. It was originally developed by the German, Alfred Wilm and was used by the German military in World War I.
[212] Engle, Mossé, and Gregory, *Aluminum, An Industrial Marketing Appraisal,* 166.
[213] Ibid., 167.
[214] Morris and Slaton, "Modern Metals," 30. Morris and Slaton show that aluminum had significantly penetrated the architectural products market, finding uses in "window extrusions, storefronts, and sheet metal."
[215] Church, "The New Kawneer," 2.

planning for perpetual war, manufacturers built facilities dedicated to war production and repositioned their manufacturing operations to accommodate simultaneous production of defense and commercial products. War, through government policies mandating and incentivizing aluminum industry participation, temporarily halted but later facilitated the expansion of commercial aluminum cladding.

Standards and Codes Regulate Aluminum Cladding

Both standards organizations and building codes formed the regulatory framework by which aluminum cladding was physically configured for the building-products market. Participation in organizations invested in the creation of standards presented an opportunity for producers to control regulations imposed on the design of aluminum architectural products. These organizations were often non-governmental confederations of tradesmen and leaders of industry with an articulated aim to define common standards agreed upon by participants to establish a common mode of understanding, or language, between producers, manufacturers and consumers. If standards defined by a particular manufacturer were adopted by other industry participants, they could profit through standardizing production, knowing their standardized parts had increased interoperability and acceptance. Manufacturers were incentivized to participate in defining the standards because they were consequently presented with the opportunity to align more widely accepted standards with production techniques with which they were already adept and through which they held an advantage. Building codes, on the other hand, were controlled by regulatory bodies with regional or national jurisdictions. Producers and designers attempted to meet the prescriptive measures of building codes, but they also conducted tests to demonstrate how alternatives to the code might meet prescriptive goals. Building codes were a persistent challenge to fabricator's plans to sell aluminum cladding.

Standards organizations

Standards organizations ranged from international regulatory bodies to regional groups. The largest organization not only defined standards but also acted as a regulatory body with the endorsement of national governments, controlling distribution of resources and defining market territories. This organization, the Aluminum Association, formed in 1901 primarily by European aluminum producers, was more commonly known as the international aluminum cartel. A smaller organization with the same name was formed in the United States with many of the same goals, but it focused not on regulating supply and demand but on promoting aluminum. The European Aluminum Association focused on increasing the profits of its members, aimed to establish standards to reduce the "unsuitable" use of aluminum, and "assist the present manufacturers to eliminate unreasonable competition.[216] Carr, in *Alcoa: An American Enterprise,* quotes one manufacturer: "Too many are at present trying to benefit by the few pioneers who strike out into new fields, and the newcomers, by infringing on the original makers' goods and machinery, hang like a crying kid on the apron of mother who provides food and nourishment."[217] Although the Aluminum Association aimed to protect the dominant positions of its members from outside competitors, it did not mandate conformance to set standards for its members. The Aluminum Association articulated at its second meeting that although standards were an aspiration, it was not mandating standardization of designs, grades and quality.[218] This

[216] Carr, *Alcoa: An American Enterprise,* 116.
[217] Ibid.
[218] Ibid.

position was shared by the US-based Aluminum Association, formed in 1933 and persisting into the postwar period.[219] An Aluminum Association publication outlined this position, stating: "The use of these Standards by any member or non-member of The Aluminum Association is voluntary, and the issuance or existence of these Standards does not in any respect prevent or restrict any member or non-member from manufacturing or supplying products not in conformance with these Standards."[220]

Despite the voluntary nature of the standards, they were increasingly adopted on an industry-wide basis. The cartel's International Research and Development Office was tasked with the "standardization of commercial alloys."[221] As the types of alloys proliferated with new processes and uses, these trade groups sought to standardize their designations. In 1954, the Aluminum Association published a new system of classification for alloys, replacing the competing standards of many other organizations, including the American Section of the International Association for Testing Materials (ASTM), the Society of Automotive Engineers and federal and military designations.[222] Other agencies organized in the late nineteenth and early twentieth centuries also formulated standards, including the American Electroplaters Society, National Association of Metal Finishers, American Society of Testing and Materials, National Bureau of Standards. These organizations worked with producers to develop standards. For instance, in the late 1930s Alcoa designated aluminum finishes as mechanical, chemical, electrolytic oxide, electroplating and paint/laquer/enamel. After the founding of the National

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[219] "The Aluminum Association," *Aluminum News-Letter,* p. 8, February 1936, folder 6, box 173, Records of the Aluminum Company of America. First formed as The Association of Manufacturers in the Aluminum Industry, it dropped its charter purpose of organizing a "code for the industry." The Supreme Court ruled such authority was illegal, whereupon the organization asserted subscription to standards was voluntary.
[220] *Standards for Anodized Architectural Aluminum* (Washington, D.C.: The Association, 1978), back matter.
[221] Marlio, *Aluminum Cartel,* 75.
[222] Weidlinger, *Aluminum in Modern Architecture Volume II,* 23.

Association of Architectural Metal Manufacturers in 1938, the leading producers in the aluminum industry adopted their designations as mechanical (M), chemical (C), anodic (A), electroplated (E), vitreous (V), organic (O), and laminated (L).[223] Standards agencies also acted as information distribution mechanisms, dispensing data about aluminum to potential and current buyers and users. Producers used these as sources of marketing. In the United Kingdom, the Aluminum Development Association was a clearing house for information on aluminum,[224] while Alcoa assisted in organizing the Aluminum Window Manufacturers Association, which incentivized the increase in quality of manufacturers' aluminum products by demanding standards be met to attain a quality-approved label and be listed in brochures distributed to architects.[225]

Labels as such served as a mark of standards met but also could become a marketing tool. As E. Raymond Corey explains in the publication *The Development of Markets for New Materials*, "sometimes end-product manufacturers associated with the producers label for promotion and association with quality."[226] The US-based Aluminum Association developed in the 1960s a logo that was designed as the "Mark of Aluminum" by the association's Public Relations Committee. This logo was applied to end-user products to associate the label with proclaimed characteristics of aluminum, such as lightweight, durable, versatile, and rust-free. Outside of standards for aluminum itself, other standards emerged for the distribution of information about aluminum architectural products that could signal credibility when noted on

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[223] *Metal Finishes Manual* (Chicago: National Association of Architectural Metal Manufacturers, 2006), 1-18; Thomas C. Jester, "Aluminum Finishes in Postwar Architecture," *APT Bulletin: Journal of Preservation Technology* 49, no. 1 (2015), 42.
[224] Bowley, *Innovations in Building Materials,* 311.
[225] Raymond E. Corey, *The Development of Markets for New Materials: A Study of Building New End-product Markets for Aluminum, Fibrous Glass, and the Plastics* (Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1956), 155.
[226] Ibid., 247.

the cover of the trade literature. The American Institute of Architects developed a standard filing system in 1920 to facilitate the filing of trade literature in architecture offices.[227] Literature was marked on the cover with the appropriate American Institute of Architects (AIA) file designation as recommended by the manufacturer. For instance, aluminum was classified into groups for Siding 12-C, or Architectural aluminum 15-J, among others.[228] The AIA was careful to explain that it didn't endorse the products contained in such literature nor did it maintain a central registry or library of literature. Instead, the institute maintained that its system was open to anyone to "premark their literature with the file designation."[229]

Building codes

Over the course of aluminum-cladding development, building codes stood as a factor shaping the formal and functional characteristics of the cladding. Codes were understood as hurdles to overcome or barriers to the use of aluminum as cladding on buildings. While some architects chose alternative materials when confronted with the difficulties of applying aluminum to existing building codes, others sought to use aluminum in novel ways within the confines of the code. Producers worked with architects and testing agencies to demonstrate the applicability of aluminum to the goals of the code, proposing changes to the code where it did not accommodate aluminum for a particular set of goals.

[227] The AIA Standard Filing System attempted to organize trade literature for new architectural products. "From the inception of the A.I.A. Standard Filing System, in 1920, new developments and advances have continued to be made in the materials, appliances, and equipment employed in the various phases of construction and activities which are accessory or related to the same." *AIA Standard Filing System and Alphabetical Index: For Filing Information on the Materials, Appliances and Equipment Employed in Construction and Related Activities* (Washington, D.C.: American Institute of Architects, 1954), 4.
[228] For a full list of designations, see ibid., 27.
[229] Ibid., 4.

A principle objection to aluminum cladding after its commercial development in the postwar period was its apparent incapability as an adequate fire barrier. For this reason, thin wall aluminum cladding, often in the form of non-load bearing curtain wall configurations, was prohibited on commercial structures without some sort of backup wall that met the requirements of the building code. Fire barriers at exterior walls were long a feature of municipal building codes. The 1892 New York City building code mandated a brick wall barrier at least 12 inches with more thickness in four inch increments depending on building height, while the Chicago code mandated 12 inches of masonry over the entire height of the exterior wall.[230] While windows were permitted at the exterior wall, the portion of the wall under the window and extending to the floor line, the spandrel, was mandated as masonry. This seeming incongruity was pointed out by researchers and architects supporting the revision of codes to allow non-load bearing curtain walls of light metal cladding without masonry backup. Director of Research Robert L. Davison and architect Howard T. Fisher, conducting research on fireproof lightweight curtain wall systems recognized the challenge, writing in *Architectural Record* that codes in the late 1940s still required "not only masonry encasement of steel, where the need of protection is real, but heavy masonry spandrels, where the element of fire protection must be considered as wholly imaginary when one recalls that the fire resistance of the adjacent glass is virtually nil, so the total result can scarcely be improved by the fireproof masonry."[231]

Pietro Belluschi designed a notable early aluminum-clad building that reflects a reaction to the fire barrier provision of the Portland, Oregon, building code by negotiating a complete

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[230] Myers, "Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style," 44.

[231] Robert L. Davidson and Howard T. Fisher, "The Wall of Thin Self-Framed Metal Panels," *Architectural Record,* February 1948, 135.

alternative. What started out as a desire for a glass curtain wall was reconceived as an aluminum and glass fascia relying on its combination with concrete, a material that did satisfy requirements of the code.[232] Belluschi practiced for a time in the Northwest, where abundant hydroelectric power was available to power aluminum smelters. Merideth Clausen suggests this environment, in which Belluschi met J. Paul Raver, the head of the Bonneville Dam Administration in the early war years, contributed to his attraction to aluminum as a cladding material.[233] This dam provided the hydroelectric power for Kaiser Aluminum Company. Raver and Belluschi discussed the use of aluminum after the war when plants no longer produced the thousands of aircraft components currently produced. Belluschi was later quoted in promotional material by Reynolds, predicting wide use for aluminum: "Everybody was worrying about what would happen to such expensive plants after the war and how we could expand the use of aluminum. Everybody was thinking at the time perhaps of windows and screens and lighting fixtures, but I could see even then, along with many other architects, the possibilities of using aluminum for its lightness and its durability, lack of maintenance and other properties in all kinds of other ways, such as exterior facing of a building, and structural members."[234]

During the interwar period, commissions were difficult to attain, and competitions and exhibitions gave exposure to architects' ideas.[235] In 1943 Belluschi was invited to submit a proposal to *Architectural Forum* for an office building, in which he proposed the use of aluminum for structural members and exterior cladding. Although this design did incorporate

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[232] The Equitable Building (1948) is profiled as an exemplar of aluminum-cladding in John Peter, *Aluminum in Modern Architecture Volume I,* 24-5.
[233] E. Kimbark MacColl, *The Growth of a City: Power and Politics in Portland, Oregon, 1915-1950* (Portland, Or.: Georgian Press, 1979), 562; Pietro Belluschi interview by Meredeth L. CLausen, *Smithsonian,* 65, quoted in Clausen, "Belluschi and the Equitable Building in History," 112.
[234] Peter, *Aluminum in Modern Architecture Volume I,* 232.
[235] For a discussion of the engagement of architects in a culture of planning for the postwar period, see Cohen, *Architecture in Uniform*.

“several layers of thin aluminum sheets with air space for insulation in between,” it otherwise enjoyed critical distance from oversight by code regulations.[236] When Belluschi began designing the Equitable Building in 1944, however, his design confronted the intractability of the building code. An earlier scheme called for a visual effect in which glass constituted a vertical strip, continuing from floor to ceiling for each floor.[237] The Portland building code, however, required four inches of concrete behind any spandrels.[238] This code provision for spandrels was common amongst urban building regulations and would be a perennial challenge to the use of aluminum cladding, a subject that will be explored in discussing other projects in this study. Belluschi’s solution was to use cast aluminum over the spandrel instead of glass, with four inches of concrete behind it. This aluminum was dark green in color, contrasting with the aluminum sheet which clad the concrete frame of the building. The effect was to emphasize the frame of aluminum and deemphasize the spandrel with a darker, receding tone. Bellushi’s engagement with the building code foreshadows the negotiations in which other architects would engage in the goal of developing aluminum cladding. Architects like Bellushi were often concerned with design affects, but producers were primarily concerned with developing a cladding system that worked with building codes or proposed viable alternatives to sell more aluminum.

Belluschi was a famous architect adept at harnessing media attention, which has contributed to his reputation as a “first.” He attracted an article about the Equitable Building in *The Architectural Forum* before the building was completed by explaining that the competition the magazine organized in which he was an invitee was a precursor to the Equitable Building.[239]

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[236] Clausen, “Belluschi and the Equitable Building in History,” 113.
[237] Ibid., 119.
[238] Ibid.
[239] Clausen, “Belluschi and the Equitable Building in History,” 127. Clausen presents a useful account of Belluschi and the connection of his work to competitions.

This building has been described variously by contemporary scholars as the first curtain wall,[240] or one of the first buildings constructed with an aluminum curtain wall,[241] but to understand the development of aluminum cladding it is better to examine those canonical "firsts" as well as the lesser-known works that contributed to the development of aluminum cladding not as a linear pedigree but more as a web of interconnected influences, ranging from those canonical architects that are deservedly focused upon in history (like Belluschi) to cladding systems and deployments of aluminum by nonarchitects. The development of aluminum was marked by experimentation. The development of aluminum cladding was no different.

To examine this web of contributions to aluminum cladding, it is useful to probe buildings that employed aluminum and, if not the "first," constitute some of the earliest uses of aluminum cladding. Identifying the "first" is often a trap for historians, as evidence may not be available to determine primacy, given archives perhaps lost or never recorded. Also, what constitutes the first is contestable, entailing indefinite definitional boundaries. Yet a brief survey will show that "firsts" were sometimes not designed by celebrated architects but were instead developed through an atypical use of aluminum. A focus on such atypical uses also shows how producers' negotiation of regulations to bring aluminum cladding to a wider market was an experimental endeavor.

The earliest deployments of aluminum cladding can be grouped into two categories: spandrel and panel. Spandrels were easier to deploy because they were smaller individual units not reliant on adjacency to other aluminum panels. These spandrels can be surrounded by brick

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[240] Depending on the definition of "curtain wall," this assertion is contestable. cf. Timothy M. Rohan, "Challenging the Curtain Wall: Paul Rudolph's Blue Cross and Blue Shield Building," *Journal of the Society of Architectural Historians* 66, no. 1 (March, 2007), 85.
[241] Ashby, "Aluminum Legacy," 86.

or stone, for example, because they sit only beneath windows. A letter between the superintendent of the newly built Chrysler Building (1928-1930), by William Van Alen and Alcoa claims the structure to be the first use of aluminum spandrels, yet the claimed primacy was probably a function of the date of installment during construction, as other buildings with aluminum spandrels were under construction concurrently.[242] On the Chrysler Building, the spandrels are cast aluminum, installed just below windows. While the Chrysler Building is notable for its use of stainless steel, especially on the ornamental, oversized Chrysler radiator caps at the projecting corners of the thirtieth story, it also made extensive use of aluminum on window sills, explained by Van Alen as the first use of aluminum for this application, "having been developed by me."[243] Intriguingly, Van Alen wrote in 1929 that the "entire outer shell of (the crowning dome) will be of aluminum buffed to a brilliant polish."[244] This version of the design also called for the finial (the spire) to be aluminum, described as "polished aluminum and crystal."[245] If stainless steel had not been used instead, this design would have been a great spectacle of aluminum. Reflecting an eagerness amongst architects to use the material, Van Alen was accompanied by other architects in imagining its creative use.

Turning now to a brief survey of the early use of aluminum panels, it seems clear that these designs are much more novel because paneling afforded the opportunity to envision the

[242] Frank B. Rogers to R.V. Davies, June 13, 1932, folder 4, box 104, Records of the Aluminum Company of America. For more examples of early aluminum spandrels, see John Peter, *Aluminum in Modern Architecture '58*, 72. For reference to aluminum spandrels on the John Jay High School on Cleveland (1929), see Myers, "Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style," 79. Another early deployment of aluminum spandrels is found on the Koppers Building (1929) in Pittsburgh, said by Alcoa to be the "first large use of aluminum spandrels." See *Let's Look at the Record* (Pittsburgh: William G. Johnston Company, 1944), folder 6, box 129, Records of the Aluminum Company of America.
[243] William Van Alen, "Metal in Modern Architecture," *The Metal Arts,* May 1929. Citations refer to the Aluminum Company of America reprint, folder 60, box 160, Records of the Aluminum Company of America.
[244] Van Alen, "Metal in Modern Architecture."
[245] Ibid.

entire façade covered in aluminum and required the technical prowess to interconnect the panels to other panels. In 1930 Bruce Goff designed but never built a fraternity house to use insulated aluminum panels. Wrote Goff, "At that time I was told that aluminum was for pots and pans, as any fool should know, and that it was not a building material."[246] Goff celebrated the novelty of aluminum, but architects Walker & Weeks designed a highly ornate aluminum cladding surrounding the penthouse of the Federal Reserve Bank, (1931–1933) in Pittsburgh, the hometown of Alcoa, no doubt aided by the culture and expertise of light metals in the city. As Myers describes, these aluminum sheets were attached directly to the steel frame, and backed up by a plaster wall on the interior.[247]

Although this dissertation focuses on the commercial realm of aluminum, I will briefly discuss the Aluminaire House (1931) by Albert Frey and Lawrence Kocher, because its use of aluminum contrasts sharply with the regulatory requirements of commercial aluminum cladding. Although designed by architects, the Aluminaire House was a project of material manufacturers and industrial contractors.[248] They funded it to display their building products to the patrons of the 1931 New York Architectural Exhibition. H. Ward Jandl's research found that Trucson Corporation provided steel floor decking, projecting steel windows, and steel stairs, while Alcoa provided aluminum floor joists and pipe columns.[249] Some dispute exists amongst researchers, as the aluminum panels are variously claimed to have originated from Alcoa or Beschel-Duralton.[250] Despite the disputed provenance of the panels, they were not designed to the

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[246] *Aluminum in Modern Architecture Volume I,* 230.
[247] Myers, "Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style," 81.
[248] H. Ward Jandl, "With Heritage So Shiny: America's First All-Aluminum House," *APT Bulletin: The Journal of Preservation Technology* 23, no. 2 (1991): 39.
[249] Ibid.
[250] Jester claims Alcoa was the source. Jester, "Aluminum Finishes in Postwar Architecture," 43; Cf. Myers, who claims Beschel-Duralton. Myers, "The Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style," 62.

exacting standards of, for instance, the New York City building code precisely because the Aluminaire House was an exhibition piece, and it was envisioned as a prototype home, not a commercial structure. This key distinction guided the development of aluminum curtain wall cladding. Any mass production of cladding had to adhere to regulations or it would not find distribution beyond exhibitions or the domestic sphere.

To conclude a survey of early aluminum cladding applications in architecture, I turn to a discussion of the Department of Public Works building (1930-1931) in Richmond, Virginia. Alcoa found intriguing the design of this aluminum-clad building, designed not by architects but by the department staff, with plans prepared by W. A. Childrey of the Bureau of Surveys and Design.[251] Alcoa promoted it to show how aluminum could be used well before aluminum was deployed as cladding beyond decorative adornments or its more widespread variant, as a spandrel panel.[252] Faced with the prospect of a building that may need to be moved in the future, the staff concluded that the building should be lightweight and easy to tear down and rebuild with minimal waste of materials. The staff identified the following criteria, which led them to select aluminum as the curtain wall and cladding material. "1. Low cost of construction. 2. Occupancy of 5 to 10 years. 3. High salvage value of materials."[253] The structure built was a two-story building, 116' x 50' in length and depth. Attached to a steel structure were interior walls of aluminum sheet and a separate construction of exterior wall of aluminm sheet. Between these was insulation. Aluminum was used in many other applications, including doors and for interior walls of aluminum sheet over wood frame. However, the most notable use was the aforementioned interior and exterior wall assembly. The lack of four-inch concrete or masonry as

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[251] "An All-Metal Office Building in Richmond," *Architectural Record*, February 1932. Citations refer to the Aluminum Company of America reprint, folder 16, box 160, Records of the Aluminum Company of America.
[252] Alcoa's advertisement of this building was included in a promotional brochure. See *Let's Look at the Record.*
[253] "An All-Metal Office Building in Richmond."

part of the wall assembly precluded any application under more stringent urban building codes. Yet Alcoa was intrigued by this building, and at least one former Alcoa promoter, Myers, understood it as “the forerunner(s) of later prefabricated insulated aluminum panels for residential, industrial and commercial buildings.” Alcoa executive H. F. Johnson believed the building to be “probably the first American office building to use insulated metal walls just a few inches thick.”[254] Its status as a forerunner is notable because it did not meet stringent city codes nor was it a unit wall system. Alcoa must have recognized its limited applicability but was interested enough to understand it as forerunner. What gave it this status was the thin-wall characteristic of the wall assembly. Alcoa aimed to develop a wall that could be deployed as a *sandwich,* wherein interior, exterior and insulation were a single unit. Although the public works building was not an assembly of sandwich units, it did approximate the outcome. Alcoa saw this as an experiment to learn from, because the wall assembly induced condensation within the cavity, yielding ineffective insulation over time — a condition that would certainly limit sales. Yet the biggest impediment remained its inapplicability to urban building codes — a project Alcoa sought to address using their own funds on projects in the 1940s.

Alcoa was especially interested in selling aluminum sheet to be fabricated by others into aluminum cladding, and instituted a pilot project — a demonstration building — to advertise aluminum as a cladding product while meeting stringent urban building codes. Alcoa hired the New York City architecture firm of Harrison & Abramovitz to design the administration building for the Davenport, Iowa, Alcoa plant in 1949. Aluminum panels had been widely used as a cladding material in spandrels before the war and as a part of a larger “sandwich” of components after war restrictions were lifted. Notably, H. H. Robertson Company, a steel-siding

[254] Myers, “The Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style,” 80.

manufacturer, sold “Q-Panels” in which metal siding formed the exterior surface of a sandwich wall or roof panel with insulation inside sheets of steel or, after the war, aluminum.[255] On the Davenport plant, H. H. Robertson supplied these aluminum-clad insulation panels for the exterior of the plant walls.[256] However, such panels were not devised to meet the code requirements of urban markets like Pittsburgh or New York. For this reason, the administration building did not comprise premanufactured panels. Instead, Harrison Abramovitz collaborated with Alcoa designers and engineers to develop a wall system that would meet such codes, comprising exterior cast aluminum corrugated panels bolted to the building’s steel frame with four-inch precast panels of lightweight concrete attached inside the steel frame.[257] To discover the fire resistance rating of this assembly, Alcoa employed Underwriters Laboratories (UL) to oversee tests.[258] The wall passed the test for a four-hour fire rating, allowing a theoretical protection from a fire for a duration of four hours. An article about the facility in *Architecture Forum* explained its relevance to building codes: “this wall was designed almost masochistically to conform with the tough building code of New York City, 1,414 miles away.”[259] Alcoa had plans to develop this wall assembly and hoped to expand its use to the lucrative markets in America’s large cities. Davenport was an experiment. Alcoa reflected on this endeavor in a conference concerning the development of metal curtain walls: “…without fanfare or publicity,

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[255] For accounts of an interview concerning this development, see ibid., 86. H. H. Robertson employed surplus aluminum after the war with the shortage of steel—the material used previously by the company.
[256] For details about the construction of the Davenport Works facility, see “Aluminum: New ALCOA Administration Building at the Davenport Plant is a Gleaming Package of the Many Mature Uses of This Metal in Building,” *Architectural Forum,* June 1949, unpaginated.
[257] For a list of contractors and suppliers, see, “New ALCOA Administration Building at the Davenport Plant is a Gleaming Package,” *Architectural Forum,* June 1949. Concrete panels have the trade name of Diacrete, manufactured by Great Lakes Carbon Corporation. The aluminum panels were manufactured by Geo. A. Fuller Co.
[258] Public Relations Department, *1949 Developments in Aluminum* (Pittsburgh: Aluminum Company of America, 1949), p. 5, box 50, Records of the Aluminum Company of America.
[259] “Aluminum: New ALCOA Administration Building at the Davenport Plant is a Gleaming Package ,” 2.
[259] “New ALCOA Administration Building at the Davenport Plant is a Gleaming Package,” 77.

we built a small four-story administration building for our Davenport Works. While this work was going on, we tried to determine what our problems were and what we would ultimately have to solve."[260] Alcoa described it as a "revolutionary type of aluminum curtain wall."[261] Alcoa found an application for this assembly in the Bradford, Pennsylvania, Hospital designed by Thomas K. Hendryx (and constructed in 1951)[262] and, more significantly, a wall assembly inspired by the experiment — Alcoa's own headquarters tower in Pittsburgh, designed by Harrison and Abramovitz (1953).[263] Alcoa declared the Davenport Administration Building as the immediate predecessor to the Alcoa Building: "The Davenport Works administration building was, in effect, a "pilot" skyscraper—built to prove beyond further doubt the economy, durability and architectural versatility of aluminum."[264] The Alcoa Building built upon experiments at Davenport, for in the Alcoa Building, the fire barrier backup wall, a sprayed perlite concrete—like material was described as having "…more than twice the requirements of Pittsburgh's notably stringent building code.[265]

Codes were sometimes portrayed by architects and end-users of aluminum as barriers, but building codes did not completely halt aluminum-cladding development. At the Building Research Institute Metal Curtain Wall conference of 1955, 18.3% of respondent architects to a poll cited code restrictions as a reason metal curtain walls were not specified.[266] One architect at the conference cited as an example the City of Buffalo, New York code, which was suggested for

[260] *Metal Curtain Walls,* 160.
[261] Public Relations Department, *1949 Developments in Aluminum,* 1.
[262] For construction details and a design brief, see *Architectural Achievements: Bradford Hospital* (Pittsburgh: Aluminum Company of America, 1954), folder 3, box 126, Records of the Aluminum Company of America.
[263] For construction details and a design brief, see ibid.
[264] *Aluminum on the Skyline* (Pittsburgh: Aluminum Company of America, 1953), 4.
[265] Ibid., 16.
[266] *Metal Curtain Walls*, 7.

amendment to accept “non-load-bearing panel walls.”[267] Another account at the conference attributed codes as a deterrent on a wide scale: “We know that acceptance of this type of construction in many instances is inhibited by this reason alone.”[268] Noteworthy architects in venues beyond the conference also criticized the positions of building codes concerning aluminum cladding. Commenting on why no Americans had won the $25,000 R.S. Reynolds Memorial Award by 1960, juror Walter Gropius cited, among other problems, excessively restrictive building codes, which he determined necessitated a subsequently promoted student award for aluminum architecture that could propose designs free of code restrictions.[269] Reynolds Aluminum also directly criticized building codes in their widely promoted book *Aluminum in Modern Architecture ‘58,* writing: “The most difficult hurdle which the developers of curtain walls had to pass was and still is, our building code requirement regarding fire resistance of exterior non-bearing walls.” Alcoa did find success in selling aluminum cladding for commercial high rises in the 1950s and 1960s, but rarely were the systems able to shed the separate masonry or concrete backup wall. Declaring at the Building Research Institute Metal Curtain Wall conference that accommodation of the code had been achieved, the Market Development Director of Alcoa said: “For the most part we have Code approval.”[270] Such approval was often achieved by retaining the four-inch backup wall for fire resistance. Significant installations in large American cities such as 99 Park Avenue in New York (1954)[271]

[267] Ibid., 11.
[268] Ibid.,168.
[269] *First Annual Reynolds Aluminum Prize for Architectural Students* (New York: American Institute of Architects, 1961). Explaining why no Americans had won the Reynolds award, and justifying a student award, Gropius cited excessive standardization in the industry, insurance requirements and building codes as conditions endemic to the United States construction market.
[270] *Metal Curtain Walls,* 162.
[271] Architect: Emery Roth & Sons. For wall details and a design brief, see *Architectural Achievements: 99 Park Avenue* (Pittsburgh: Aluminum Company of America, 1954), folder 15, box 126, Records of the Aluminum Company of America.

and the Texas National Bank Building in Houston[272] employed cinder block and four inches of lightweight concrete, respectively. However, Alcoa did publicize one "progressive" variation that allowed an alternative. After selling aluminum for the exterior surface on Republic National Bank in Dallas, (1954), once again collaborating with Harrison Abramovitz, Alcoa publicized it as taking "full advantage of a modern building code with what are possibly the thinnest curtain walls ever employed for a structure of this size."[273] The Dallas building code required the typical concrete (perlite) backup wall on the street side, but other walls were allowed to exclude this, thus permitting aluminum clad curtain wall sandwich panels 1-1/2" thick, without fire-rated concrete backup.

Standardization of aluminum cladding components

In the 1950s Kawneer publicized a slogan that captured its philosophy surrounding standardization of architectural components. "Find out what you can do best, then do it in volume. Keep it simple. Keep it in aluminum."[274] Like many architectural product manufacturers, Kawneer had adopted a stance of standardization in the production, and even the distribution, of its products. As a storefront manufacturer Kawneer had standardized much of its production line well before World War I, producing products consisting of components in standardized members.[275] Its products were advertised in brochures and magazines as customizable by the architect, but in actuality this customization was within limits defined by the

[272] Architect: Kenneth Franzheim. For wall details and a design brief, see *Architectural Achievements: Texas National Bank Building* (Pittsburgh: Aluminum Company of America, 1956), folder 20, box 126, Records of the Aluminum Company of America.
[273] *Architectural Achievements: Republic Bank Building* (Pittsburgh: Aluminum Company of America, 1954), folder 16, box 126, Records of the Aluminum Company of America.
[274] Churc, "The New Kawneer," 1.
[275] *The Kawneer Book of Store Fronts* (Niles, Mich.: The Company, 1936), 29. Kawneer listed standard members: "sash, bars, mouldings, awning bars, transom bars, grilles, thresholds and ventilators."

manufacturer. Standardization was a strategy and practice of capital accumulation which extended from the standardized shapes to the way they were distributed to the market. Furthermore, the practice of standardization defined the structure of Kawneer and even shaped its marketing messages. Architects were often beholden to these standardized components, with only partial latitude for custom design. Architects were caught between, on the one hand, acquiescing to the predefined designs to specify less expensive components, and on the other hand, producing custom designs using components supplied by manufacturers and built to their specifications. Similarly, manufacturers were caught in the middle: In the case of Kawneer, they sometimes pandered to architects, careful not to claim design primacy, while simultaneously promoting the advantages of standardization to architects. Manufacturers sought standardization to increase profit, while architects were confronted with clients who were concerned with the bottom line but also concerned with aesthetics and image.

The production of standardized parts at Kawneer was core to its founding invention — a molding, or frame for windows on street front façades. An advertisement for Kawneer in 1907 places its business in terms of standardized parts, defining their business as "Manufacturers of "Kawneer" System of Store Fronts; "Kawneer" Wall;…Drawn Mouldings; and Metal Finishes."[276] Kawneer was founded in 1905[277] by Francis Plym, an architect who patented[278] a metal frame grip around glass that avoided the problems of wood rot, and allowed "give" and displacement of the window in reaction to lateral loads and differential settlement.[279] As a Kawneer sales catalog from 1912 describes it, "Kawneer was the first — the Original

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[276] Kawneer Company advertisement, *Tried and True,* 1907, p. 12, Kawneer File.
[277] For promotional lore about Kawneer's history, see *The Kawneer Company and Niles, Michigan,* undated, Kawneer File; "75 Kawneer Years…Only a Beginning," 5. Kawneer was incorporated March 10, 1906.
[278] Church, "The New Kawneer," 2.
[279] "75 Kawneer Years…Only a Beginning," 4.

Construction by which a Store Front Glass could be set directly between two metal bearing surfaces, without the assistance of putty, cork, wood or any other cushion substance."[280] This solution did not invent the metal frame, (often called metal sash) around the storefront window, but instead improved it to reduce window breakage as the window moved in the wind against a metal frame, and improved it such that a material affixing the window to the frame that might rot or quickly wear thin, like wood or putty, could be avoided. Kawneer described it as offering "a construction which diverges from the old-time wood construction and its attending evils at every point."[281] The first material employed for this window frame system was copper. The first copper sash products it sold were "cold rolled and drawn mouldings," a product of a standardized, industrial process of drawing the metal through a die at room temperature into elongated shapes. These resultant shapes were given numeric designations, such as "Improved Metal Sash No. 30"[282] or "Metal Sash No. 60,"[283] each with a different shape in section.

Kawneer was not the only US corporation engaged in sash manufacturing, as the British firm Crittal Manufacturing Company, Limited, had been manufacturing steel sashes as standardized components, through a licensing agreement with a US company, having used such components on the Ford Highland Park Plant (1908-1910).[284] New techniques for extrusion of metals though a die (a small opening that "squeezes" metal into a smaller section) was broadened to brass in 1894 and later to other metals by the early 1900s.[285] In the wider industrial market of

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[280] *Kawneer Store Fronts: It Stays and Pays* (Niles, Mich.: Kawneer Manufacturing Company, 1912).
[281] Ibid., 7.
[282] Ibid., 8.
[283] Ibid., 10.
[284] Sara E. Wermiel, "Early Curtain-Wall Buildings and the Higgins Armory Museum in Massachusetts," *APT Bulletin: The Journal of Preservation Technology* 45, no. 1 (2014): 47.
[285] M. Bauser, G. Sauer, and K. Siegert, eds., *Extrusion* (Materials Park, Ohio: ASM International, 2006), 3.

metals, Wrought products such as those produced by metal fabricators by the 1920s included sheet, plate, foil, rod, bar, wire, pipe and structural forms.[286]

Kawneer developed storefront systems initially, claiming to have "founded the metal Store Front business,"[287] selling not only the metal molding but an entire systematized product for storefronts. Its product line proceeded from molding to windows[288] and doors, then the manufacture of whole façade systems for schools and commercial structures.[289] By 1917 it had sold systems for over 50,000 storefronts.[290] All along, its catalogs and brochures stressed the advantages of standardized components, and Kawneer claimed its standardized components had marked an era of store fronts: "This whole era has been fathered by Kawneer. It is the standard metal Store Front Construction…"[291] Yet they also confronted the peculiar conditions of each store renovation project: no two storefronts to be renovated were exactly the same; therefore, the application of standardized components was necessarily a negotiation between the prescribed design and physical dimension of the storefront system components, such as Improved Sash no. 30 and the tangible variability presented by each store site. While Kawneer's sales catalog in 1917 exclaimed, "We believe from 60% to 75% of all the Store Fronts in this country are of the same style — look alike and possess absolutely no individuality. Is that consistent with good business — is that all which should have been accomplished? No!"[292] Kawneer's approach to

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286 Xsusha Flandro and Helen M. Thomas-Haney, "A Survey of Historic Finishes for Architectural Aluminum, 1920-1960," *APT Bulletin: The Journal of Preservation Technology* 46, no. 1 (2015): 14.
287 *Boosting Business with Kawneer Store Fronts* (Niles, Mich.: Kawneer Manufacturing Company, n.d.), p. 10, Kawneer File. This catalog is estimated to have been published either 1916 or 1917 by the Niles District Library.
288 Kawneer Manufacturing Company, advertisement, *Architectural Record,* June 1939, 1. Windows were sold under the brand name Sealair.
289 "75 Kawneer Years…Only a Beginning," 5.
290 *Boosting Business with Kawneer Store Fronts,* 10.
291 *Kawneer Mouldings in Steel, Copper, Brass, Bronze, Aluminum* (Niles, Mich.: Kawneer Manufacturing Company, 1920), p. 62, Kawneer File.
292 *Boosting Business with Kawneer Store Fronts,* 8.

modernizing the commercial landscape was the utilization of standardized components deployed in a uniquely tailored, customized configuration for each application. Kawneer operated within this unstable relationship by approaching design as an expertise held by the company and as a collaborative juncture between their own design staff and outside architects. Yet, Kawneer's attempts to placate any sense of territorial intrusion into the architect's domain did not temper their increasing embrace of standardization of manufactured components.[293]

Kawneer articulated standardization of manufactured components as a way to facilitate capital accumulation and consequently reorganized its product line, manufacturing process, and product sales and distribution processes to align with this practice. For much of the company's history, business was strong and opportunities were plentiful. Employment grew from 18 in 1907 to 80 in 1911, then to 250 in 1914. By 1956, when the company began reorganization to focus on standardization of complete wall systems, it employed over 2,500.[294] An initial growth spurt came in response to the San Francisco earthquake and the subsequent rebuilding opportunities presented to Kawneer salesmen. This territory was far from the home office in Niles, Michigan. Consequently, Kawneer built a factory in Berkeley, California, and by 1912, had 15 sales offices around the country.[295] As the company grew in size, and was driven by an optimistic belief that postwar sales would far surpass prewar sales,[296] it implemented a strategic reassessment after World War II and again in the mid-1950s of its manufacturing and corporate management

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[293] "Kawneer Gears up for Record Sales in '60," *Modern Metals,* November 1959. Citations refer to the Kawneer Company reprint, Kawneer File. This article reveals the arguments posed by Kawneer concerning their claimed sensitivity to the architect's creative agency.
[294] "75 Kawneer Years…Only a Beginning," 7.
[295] Ibid., 7.
[296] Church, "New Kawneer," 2. The men of Kawneer were certain of one thing: Demand for their several lines of well-established architectural products would far surpass anything the company had ever known. Four years of building depreciation across the country took care of that."

operations. Knowledge gained about manufacturing practices during World War II,[297] combined with the company's experience in manufacturing standardized components since 1907, positioned the company favorably to move toward greater standardization of components. As *Modern Metals* stated, "the new Kawneer was born in 1945. The war was over."[298] This was a reflection on the radical changes the company experienced in the wake of the war. The company's management, under the direction of Francis Plym's son, Lawrence,[299] and executive vice president Henry W. Zimmer, developed a plan for the company that included: "Design a complete new line of store fronts and entrances…Eliminate low-volume, low-profit products."[300] In response to this plan, Kawneer developed a new line of store fronts and constituent aluminum sash, called K-47.[301] This product line was meant to move toward increasing standardization, but Kawneer was careful to couch it in terms of customization. In an article reflecting on this new product, *Modern Metals* wrote, "The emphasis was on big volume, adaptability to architects' plans, and crisp, modern design in aluminum. Gone was the idea of custom making anything the architect could draw up. In its place came the concept of mass producing versatile shapes that still enabled the architect to individualize his creations."[302] Kawneer's new line was also purposed with simplifying installation. Announcing the K-47 line in a company newsletter, the

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[297] Feiker, "A Postwar Professional Opportunity," 54. There was a recognition in the building trades that knowledge was transferrable from war production to peacetime production. Frederick M. Feiker, Dean, School of Engineering, George Washington University maintained, "The war has proved beyond doubt that enormous production goals are possible in a short time by the application and refinement of the American Principles of simplification, standardization and mass production."
[298] Church, "The New Kawneer," 2.
[299] Lawrence Plym became president of the company in 1937 after his father's death.
[300] Church, "The New Kawneer," 2. The entire plan was laid out in four points: "1. Design a complete new line of store fronts and entrances. 2. Revitalize sales by reopening branches, increasing number of jobbers, establishing strong service department for jobbers. 3. Sell only one line – Kawneer. 4. Eliminate low-volume, low-profit products."
[301] "New K-47 Line Announced to Trade," *The Kawneer Front,* August 1946, 1.
[302] Church, "The New Kawneer," 5.

company wrote, “The line is designed to obtain a wide variety of custom-styled effects with stock shaped and engineered for modern construction needs to save time of installation.”[303]

Kawneer experienced explosive growth in the 1950s, with 1957 second only to 1959 as the most successful years in its history.[304] In 1956 Kawneer introduced an even more standardized component: the Unit Wall. Shortly after its release, Plym stated, “Our whole concept of the building products industry is different from most others[.]…We are striving to promote greater acceptance of standardized components — more factory fabrication, less job-site fabrication[.]…We welcome the big custom curtain wall jobs, but our research and development work is based on standard units that are ready for installation when they leave our plant.”[305] This move toward even greater standardization was echoed by other executives in the company, envisioning specific building typologies that could be standardized. Irv Seely, the vice president of the Architectural Division in 1956 stated, “There’s no reason in the world why every school building must be custom engineered.”[306] Seeley’s program for the built environment was a prefabricated one of pre-engineered, standardized components that were equally applicable on a school or a high-rise.

Kawneer envisioned standardization as a means to reduce labor costs on site, thus reducing the cost of the building to the owner in hopes it would be made more advantageous for specification by an architect in consultation with his client. The Director of Research and Development explained, “It is conceived as a total wall[.]…Installation will be accomplished with a few tools — a screwdriver, a power drill and perhaps a saw.”[307]

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303 Kawneer Company advertisement, *Architectural Record,* May 1958.
304 “Kawneer Gears up for Record Sales in ’60.”
305 Ibid., 4.
306 Church, “The New Kawneer,” 11.
307 Ibid., 12.

Kawneer also aimed to create a new, vastly expanded sales network, for which this new Unit Wall was a key enabler of its development. Fred L. Church, reporting on Kawneer's activities for *Modern Metals,* wrote, "A second aim is to place limitations on sizes, shapes, etc. so that unit walls can be sold through dealers. 'This way,' explains Seely, 'we would multiply by many times the number of salesmen soliciting business for the unit wall.' When the product is ready to roll, Kawneer will start with a few selected dealers and broaden the distribution as the demand grows."[308]

While Kawneer is just one manufacturer out of dozens that embraced the logics of standardization, because it developed a robust sales mechanism, it exemplifies the way standardization played a role in the spread of aluminum cladding. Kawneer expressed several main goals as outcomes of standardization. They aimed to attain economies of scale by simplifying the production process and reducing the amount of customization work they accepted. Plym noted that they did, indeed, perform custom curtain-wall production, but the aim of the K-47 line and later the Unit Wall was to move away from this line of work. Yet, at the same time, the company was careful not to alienate architects by forcing them into a prescriptive system without room for design agency. Kawneer also sought to reduce jobsite labor. By prefabricating entire walls in the factory, Kawneer argued that labor costs to the builder, and by extension the project owner, could be reduced. This argument was posed in advertisements targeted toward architects and building owners. Finally, Kawneer recognized the importance of marketing and salesmanship in driving the spread of their product. Kawneer's postwar product line was accompanied by a robust marketing drive with advertisements in architectural journals and publications directed to architects, builders and owners. While the company continued to

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[308] Ibid., 12.

develop the Unit Wall in 1956, it was accompanied by a reorganization of the sales distribution network. This radical overhaul moved to an entirely different sales mechanism based on a distributed, rather than centralized, model of control. Kawneer devised a role for the dealer as a quasi-employee but with the advantages offered by their independence. Kawneer did not pay them as salesmen and was not obliged to provide an office for their work. Instead, dealers could be contracted to work with Kawneer around the United States, forming a vast sales network that Kawneer envisioned would multiply the reach of their product from the backwaters of small towns to large projects in major cities. Kawneer's drive toward standardization was facilitated by knowledge they gained during wartime production and the years of storefront and window sash-manufacturing expertise they had gained since the company's founding in 1906. As a private company until 1926, and as a public company thereafter, Kawneer was motivated by capital accumulation driven by the expectations of investors and shareholders. Despite the strictures of a command economy during wartime production, and to a lesser degree during the Korean War, Kawneer operated according to the networks of capitalism, engaged in competition with many other manufacturers vying for the same customers.

The price of aluminum cladding

While free-market competition was more mythological than real, the ability to set prices was not entirely in the control of producers. A given producer or manufacturer of aluminum cladding competed with a host of alternatives, including other metals, materials other than metal, and other producers and manufacturers. The price of aluminum panels, beyond the external factors of economics and manufacturing techniques already discussed, was also contingent upon human factors, such as cost of labor and corporate practice. This competitive landscape shaped the way panels were marketed, underpinning arguments about the advantages of the cladding system and the advantages of aluminum over other alternatives.

Producers and manufacturers of aluminum products were in competition not only with each other but also with other metals in the assembly of aluminum as a cladding product. The price of aluminum positioned it at a disadvantage that marketing material would squarely address. The market price of aluminum was higher in the price of steel for the entire duration of the twentieth century, often by a factor of ten,[309] and this fact weighed on decision makers from building owners to architects when choosing an exterior wall material. To inform decision makers internal and external to the company about their competitors, Alcoa published a series of feature articles discussing competition in *Alcoa News,* identifying the metals it maintained were leading competitors.[310] A list of metals it argued were competitors included “scrap aluminum, imported aluminum, zinc, lead, copper, steel, tin...[.]”[311] For structure, aluminum was rarely used, widely known as both more expensive, but also weaker on measures of structural characteristics. On measures of cubic volume, twice as much steel could be bought for the same price as aluminum.[312] While this was true, Reynolds was quick to point out that the cost of aluminum rose much slower since 1939 than did the prices of steel and other materials.[313]

Aluminum, as a metal among others often deployed as a metal curtain wall, frequently competed with other material assemblies in the building industry. Aluminum was understood by Alcoa as competing with “glass, and even just paper,”[314] where, for instance, in place of a

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309 For a price chart comparing steel and aluminum from 1905 to 1955, see Alfred Cowles, *The True Story of Aluminum,* (Chicago: H. Regnery Co., 1958), 132.
310 “Competition—A Run for the Money,” p. 4, box 152, Records of the Aluminum Company of America.
311 Muller, *Light Metals Monopoly,* 10.
312 Weidlinger, *Aluminum in Modern Architecture Volume II,* 19.
313 Ibid., 20. For the period from 1939 to 1956, “the cost increase of aluminum amounted to only about 12.5 percent, while during the same period the cost of steel increased 103 percent, zinc 154, lead 217, and copper 284.”
314 Muller, *Light Metals Monopoly,* 10.

potential wall of aluminum might be specified a frame of aluminum with glass spandrels and windows. These alternatives were considered based upon function, availability or client preference, among other reasons, but price was also a determining factor in specification. Metal curtain walls were often understood as expensive, and were cited by 44.8 percent of respondent architects in a 1954 survey as a reason to avoid their use on building designs.[315] One steel curtain-wall manufacturer explained, “Although we have been able to devise a panel which is reasonable in cost we have not been able to lick high cost of frame. When this latter is accomplished, we feel sure that panel-wall construction can be universally used.”[316] This assessment held true for aluminum, as it was more expensive than steel.

Although metal curtain walls were said to be too expensive, in comparison with other assemblies, some saw advantages, especially in terms of labor cost. At the Building Research Institute Metal Curtain Wall conference of 1955 architect D. Kenneth Sargent said, “Daily we are finding it necessary to develop and design new construction methods to reduce high costs of labor at the site, and this the cost of buildings to our clients. Certainly metal curtain walls can be and will be developed to provide a solution to this problem for even the low-cost structure.”[317] Especially in comparison with masonry, metal curtain walls were seen as beneficial because of labor cost advantages: “Masonry bearing walls have been pushed aside in the press for economy and for a shorter work day for building tradesmen.”[318] Alcoa believed that this was advantageous but strove to attain a more competitive position. At the conference, the Manager of Market Development said, “…of prime importance, while metal-clad buildings are today economical in

[315] *Metal Curtain Wall*s, 7.
[316] Ibid., 12.
[317] Ibid., 169.
[318] Ibid., 99.

comparison to many other types of construction, our constant aim should be to improve this economy."[319]

The cost of aluminum panel assemblies was also influenced by processes involved in manufacturing aluminum fabrications and metal curtain-wall systems. At the conference, one attendee discussed the high cost of dies used to produce metal fabrications: "If we do not solve this problem we will force curtain wall construction into a high price bracket."[320] An Alcoa executive explained that bringing the cost of curtain wall systems down was more than a function of possessing the right tools or knowhow; it also took financing: "you've got to be on good terms with your banker, as this sort of thing takes money."[321] This Alcoa executive's statement was a recognition that pricing aluminum was a human endeavor that involved the prejudices of people linked to the making, selling and buying of metal-cladding products. Each of these groups made decisions that altered their perception of the value of aluminum in relation to a given price. Internal to the operations of producers were corporate procedures and practices that influenced the development and cost of aluminum cladding. Management theory regulated and organized decisions that could lead to change in operations and influence a company's position in relation to other competitors, especially when such decisions were made at the executive level. In 1960, Frank L. Magee, Chairman at Alcoa believed that the competitive nature of the market, with the addition of new post-World War II producers Reynolds and Kaiser, necessitated the internal reorganization of departments. Centered on this reorganization was the belief that the executive office must have more control over the Research and Development branch, and that the marketing department should be more closely tied to the

[319] Ibid., 162.
[320] Ibid., 46.
[321] Ibid., 163.

Research and Development branch to make operations more profitable and quicker. He explained: "There is no thought of reducing research effort…but emphasis should be placed on confining efforts to projects of major importance that promise to produce dividends in a reasonably short time."[322] The way aluminum-clad components were designed by manufacturer designers also figured into the price. Francis Plym, founder of Kawneer, was trained as an architect and was known to have placed exacting requirements on the design of components the company sold. But design came with a price, in the minds of his sales staff, perhaps justified by their experience in a market competing with similar components from other manufacturers. "He's pricing them out of the market," complained salesmen in response to Plym's design obsession.[323] They drew a correlation between design exactitude and price.

Producers and manufacturers maintained complicated but careful relationships with architects, knowing that architects were, in most cases, the direct point of contact with those who would give final approval for the building systems architects recommended for building designs. Producers and manufacturers also knew that architects often held sway over their client's final decision. For this reason, producers and manufacturers developed specific marketing strategies to communicate with architects. Underlying much of this architect-target marketing material was the producers' and manufacturers' belief that architects, although they benefitted from standardized components such as metal curtain-wall systems, also hoped to retain a degree of design freedom.[324] Alcoa did not believe, by the mid-1950s, that they had yet achieved a low-

[322] Smith, *From Monopoly to Competition,* 333.
[323] "75 Kawneer Years…Only a Beginning," 7.
[324] Church, "The New Kawneer," 7. Kawneer, for instance, wrote, "Some architects object to stock doors because of the lack of individuality. Kawneer has attempted to meet this objection by offering four different types of hardware."; "Kawneer Gears up for Record Sales in '60." Kawneer also gave architects options for standardized components or custom-built curtain wall units.

cost and low-maintenance aluminum-cladding product that granted complete freedom of design by architects.[325] Architects believed that standardized components such as metal curtain walls were affordable on large projects but not on small ones.[326] The extent of custom design that architects hoped for was not seen as attainable on small projects in a manner that would make them affordable for their clients. Max Abramovitz, an architect for many aluminum-clad high-rises with Alcoa-supplied aluminum, found that custom-designed aluminum cladding was affordable on high-rises: "The slight charge for retooling or setting up jigs is so small compared to the entire cost that is infinitesimal."[327] He identified the machinery necessary to shape each aluminum panel was cost effective on large structures, but implied aluminum-cladding was questionable as an affordable material on smaller ones.

Architects were typically much more in contact with clients than were producers and manufacturers. From this position, they recognized the price sensitivity of their clients and this influenced their outlook and design decisions. Felicity Scott reveals one example of an architect who came to realize his relationship with clients revolved around capital. Scott recounts Arthur Drexler discussing Gordon Bunshaft's realization when designing the New York City office tower at 140 Broadway. Drexler exclaimed: "It has to be cheap. The question is how to build this with the simplest, cheapest, smoothest, flattest skin." Reflecting more widely on the architect's position within a capitalist economy, he said, "The particular building problem that the architect was called on to solve was in fact to design a package — a package of rentable space — and he has done precisely that."[328] Architects considering the specification of aluminum cladding knew

325 *Metal Curtain Walls,* 161.
326 One architect at the Metal Curtain Walls conference expressed this sentiment. See ibid., 167. See also Max Abramovitz statement on cost advantages of retooling on large high rises. Ibid., 61.
327 Ibid., 61.
328 Felicity D. Scott, "An Army of Soldiers or a Meadow: The Seagram Building and the Art of Modern Architecture," *Journal of the Society of Architectural Historians* 70, no. 3 (2011): 116-17.

that many clients were price sensitive. Yet, price was not always the determining factor. Abramovitz worked directly for bankers, developers and industrialists, including Alcoa, on aluminum-clad high-rises. Abramovitz found that cost as the primary factor can be overruled by the ego of the owner: "I believe that costs and economies, although they are quite a governing factor in this economic world we live in, are not always the prime considerations behind building a building. As long as we have human beings and egos and personalities, and as long as a great number of buildings are built as monuments to people, we will have people in our society — and I hope they continue to exist — who want something done personally and creatively and completely new."[329] Abramovitz recognized that the price of aluminum cladding was but one of many factors determining whether it was specified.

[329] *Metal Curtain Walls*, 61.

CHAPTER 3: LOGICS OF RESEARCH AND DESIGN

"A company without research is dead." With these words, Reynolds began the first paragraph of an issue of its magazine, *Reynolds Review,* solely dedicated to explicating the company's reverence for the practice of research.[330] Research, as a conscious practice and funded endeavor in departments of aluminum producers and manufacturers was utilized as a justification for decisions made by executives about the way aluminum should be sold. This connection between research and selling was not strictly linear. Instead, research was systematized as a conceptual overlap of disciplines that extended to other departments in the organization both up and down the line of industrial integration — from bauxite to finished product. Research was understood, and sometimes mythologized, as holding a central, foundational position in the corporate apparatus — the *sine qua non* of the industrial economy. As Avigail Sachs reveals, in the postwar period, research was more widely practiced, and was "associated with a multitude of desirable outcomes including security, progress, prosperity, and democracy."[331] Producers sometimes understood research as a secret weapon, facilitating the development of patents to control the legal space of the industry and serving as the origination point for cladding design. Alcoa, for example, gave research and development credit for a successful new aluminum-clad tower in New York: "It was largely through the research and development work Alcoa had done in perfecting aluminum applications for building construction which made the Tishman building possible."[332] Sometimes what researchers were investigating

[330] "They Open New Markets," *Reynolds Review,* May 1960, 2.
[331] Avigail Sachs, "Architects, Users, and the Social Sciences in Postwar America" in *Use Matters: An Alternative History of Architecture,* ed. Kenny Cupers (New York: Routledge, 2013), 71.
[332] "Modern Miracle: New York Skyscraper Covered with Aluminum Skin in 6-1/2 Days," *The Alcoa News*, September 14, 1953, box 152, Records of the Aluminum Company of America.

was marketed as "hush hush,"[333] only to be revealed at the opportune time. Other times researchers were a *behind-the-curtain*[334] entity that was carefully guarded but also viewed as necessitating oversight by management in which, as William Rankin notes, the goal was enablement and autonomy but "could only be the product of adequate direction."[335] Research held an important role in relation to design. The terms were sometimes used interchangeably with conceptual overlap. These relations influenced how the practice of design was conceived — either as a separate act or a unified, mutually co-constitutive endeavor.

Producers ran operations that spanned markets and produced an array of fabrications leading to countless products. Because of the size of the firms, research was often conceptually combined with development and also subdivided. Architectural product design departments were just one division. Sometimes called product development departments, they held a tenuous position in relation to outside designers and architects. Designers were employed by producers and manufacturers to create finished products, but producers and manufacturers sought out relationships with designers and architects outside the organization to develop applications for aluminum. As discussed previously, aluminum product manufacturers had an impulse to standardize components, precluding a certain degree of design agency by architects. While designers were employed by producers and manufacturers from their founding, they increasingly sought out collaborations with outside designers to publicize their association as a form of marketing. Producers and manufacturers did not collaborate with just any architect. Instead, they sought out well-known architects with reputations already developed in their fields. Within the

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[333] Church, "The New Kawneer," 10.

[334] Kawneer wrote an article about their Product Design and Development Lab. See "Behind the Aluminum Curtain," *The Kawneer Front,* August 1950, 3.

[335] Rankin examines the agency imbued in researchers by both their managers and the architecture of laboratories themselves. See William Rankin, "Laboratory Modules and the Subjectivity of the Knowledge Worker" in *Use Matters,* ed. Cupers, 53.

producers' corporate structure, however, research and design was not marketing. It was often at odds with marketing, competing for resources. As practices, research and development were deployed by the firms as offensive tools in competition with other producers, with particular markets, such as construction, as the prize.

Conceiving research as the beginning of end-products

Aluminum has been portrayed as a material borne of science and practices of methodological research. As a *Review of Review* magazine profile of aluminum claimed, "Of the eight chief metals which support this so-called Age of Metals only one is the product of scientific research. This one is aluminum. All the other seven — iron copper lead, tin, zinc, silver, and gold were known in ancient times."[336] Early experimenters with aluminum were often trained as chemists or metallurgists — training attained through formal institutions of education. For instance, Robert von Bunsen discovered how to isolate aluminum by employing sodium,[337] and Alcoa cofounder Alfred Hunt was educated at Massachusetts of Institute of Technology, graduating with a degree in metallurgy.[338] An equally strong argument can be made, however, about aluminum as rooted not in science, but in the knowledge derived from experimentation outside formal institutional structures.[339] It was not the institutional laboratory, but the "Immortal Woodshed" where Hall made his discoveries, "…with the aid of borrowed and homemade

[336] Free, "How Research Created the Aluminum Industry," 1. Citations refer to the Aluminum Company of America reprint, box 173, Records of the Aluminum Company of America.
[337] *A-B-C's of Aluminum,* 8.
[338] Hunt, *Aluminum Pioneers,* 2. The first experimenters with aluminum are often labeled scientist: "famous Dutch scientist Hans Christian Oersted" (1825) or chemist: "Prof. Friedrich Wohler, the famous chemist" (1827). See Free, "How Research Created the Aluminum Industry," 1.
[339] Aluminum Company of America, 1953 Annual Report, p. 28, box 147, Records of the Aluminum Company of America. Alcoa for instance did not organize a formal research apparatus until 1918, thirty years after the founding of the company.

apparatus."[340] Even Alcoa characterizes its seed of origin in quotes, not as a *laboratory,* but as a "*laboratory*."[341] In *A History of Metallography* Cyril Stanley Smith argues that knowledge of metals started with artists and craftsmen, only later to be studied under structures of, and understood as, experimental and theoretical science.[342]

Alloys by research

Whether conceived as craft or science, research as undertaken by producers yielded changes to the characteristics of the material and changes to the way it was made. Alloys were an especially important outcome of research. Because of their structural characteristics, research and development of alloys played a crucial role in war fighting and in architectural applications. In the same way that the additive of one percent of carbon to iron yields characteristics of strength that allow its deployment as steel in structural applications, so too does the addition of other metals to aluminum make it applicable to a wider range of uses.

Just as war has been misunderstood as the primary cause of the commercial aluminum industry,[343] it is also important to understand that the development of alloys took place both outside of, and as part of, the strictures of war. Although it is true that research departments were

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[340] "From Woodshed to Potroom," *Reynolds Review,* January 1961, 1. Mythologized as the origin of aluminum, while Hall did in fact work out of a shed on his parent's property, the process of reduction was the product of many spaces of experimental practice separated by distance and time, including the facilities of allies turned rivals the Cowles brothers, and spaces employed by experimenters whose work informed Hall. As an article about Hall notes, "His workshop was assembled in the annex to the Hall family home in Oberlin, Ohio, a demi-building which has gained fame as the "immortal woodshed."

[341] Alcoa portrays the origin of the company: "Working at night in a "laboratory" he had rigged up in his father's woodshed, Hall set out to find the secret that had eluded all the great scientists up to that time." *Aluminum:Its Story* (Pittsburgh: Aluminum Company of America), p. 8, box 139, Records of the Aluminum Company of America.

[342] Cyril Stanley Smith, *A History of Metallography the Development of Ideas on the Structure of Metals Before 1890* (Chicago: University of Chicago Press, 1960).

[343] See Bowley, *Innovations in Building Materials,* 309; Cf. Kelley, "Conflicts and Challenges in Preserving Curtain Walls," 10.

expanded after World War II,[344] research and development activities and departments had been established by aluminum-industry firms well before World War II.[345] Alcoa, as the leading producer and virtual monopolist in the industry, already had established a research department in 1918, as will be explored in more detail below. Because war looms large on the horizon of Western history, it can overshadow other important prior developments in architectural production. Donald H. Wallace, author of *Market Control in the Aluminum Industry*, referenced the influence of World War I and offered a constructive assessment: "Aluminum had rapidly extended its field of usefulness prior to the war, but that event was the cause of unprecedented interest in its properties, uses, and alloys, principally because of its application in aircraft."[346] Duralumin is an example of an alloy developed before World War II and subsequently employed in that war. Duralumin was an alloy developed by the German Alfred Wilm consisting of copper and aluminum which yielded a heat-treated aluminum alloy widely used by Germany in World War II for aircraft, and which was also produced widely by the industry thereafter. Another pre–World War II alloy was developed in the twenties by Alcoa. As Carr notes, Alloy 25S was the "first strong, heat-treatable aluminum alloy that proved practical for forging, an art which made the aluminum propeller standard equipment for aircraft."[347] Alloy development also took place much earlier in the nineteenth century. Recall the Cowles brothers' inability to attain pure

[344] Wallace notes, "With the resumption of peace the aluminum firms established well-equipped laboratories and research staffs…," Wallace, *Market Control in the Aluminum Industry,* 59.
[345] *Internal Correspondence* (Pittsburgh: Aluminum Company of America, May 17, 1957), p. 1, Records of the Aluminum Company of America (Pittsburgh, PA), MSS#282, Folder 3, Box 117, Library and Archives Division, Senator John Heinz History Center. A corporation in which Alcoa held a stake, the Aluminum Castings Company of Cleveland, Ohio established in 1917 the Lynite Laboratories, claimed by an Alcoa executive, G. D. Welty as "…the first organized commercial research group in this country; or, for that matter in the world; devoted to the investigation of light alloys and to products and processes for their manufacture.
[346] Wallace, *Market Control in the Aluminum Industry,* 47.
[347] Carr, *Alcoa: An American Enterprise,* 140.

aluminum, developing instead an aluminum-copper alloy.[348] Alloys, placed in temporal perspective in relationship with the two world wars, reveals that research was not solely an outcome of war,[349] but was an organized effort well before World War II and was often employed to develop war-fighting capability.[350]

The US government asserted that alloys developed in the 1920s and 1930s were causal in opening up markets to aluminum.[351] Alloys became important in the architectural products market because they could be employed in applications that privileged material strength or provided specific aesthetic effects. Some alloys are more adaptable to methods of working, such as drawing, forging or rolling. Others are more conducive to castings.[352] Architectural products developed from research that produced alloys, such as Alcoa's Alclad 17S sheet, were used extensively in architectural-cladding applications in the postwar period.[353] Other examples include a specific alloy used on Kawneer's 1929 "B" Store Front,[354] and an alloy with designation 6061 for Kawneer's Zourite brand aluminum facing for slipcovers.[355] In addition to material strength, alloys afforded aesthetic affects in a range of grey tones and even colors, which were more or less conducive to accepting particular finishes. As Flandro and Thomas-Haneys' *A Survey of Historic Finishes for Architectural Aluminum* reveals, myriad finishes can

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[348] Wallace, *Market Control in the Aluminum Industry,* 5, 511. Cf. Cowles, *True Story of Aluminum.*
[349] Alcoa developed a new alloy, 75S with "twice the yield strength of alloys available at the outreak of war, and has an ultimate strength exceeding 80,000 pounds per square inch." It was developed during the war which was deployed for use in 1944. *Alcoa at War: A Report for the Year 1944.*
[350] For the ways in which Alcoa was lauded by the government for its help in World War II, see Carr, *Alcoa: An American Enterprise,* 145.
[351] *Materials Survey: Aluminum,* II-5.
[352] Carr, *Alcoa: An American Enterprise,* 141.
[353] Ibid. Carr describes the alloy thusly: "Edgar H. Dix, Jr., of Aluminum Research Laboratories, developed Alclad 17S sheet which has a strong alloy core with thin surface layers of pure aluminum integrally bonded to the core."
[354] Church, "The New Kawneer," 3.
[355] Ibid., 7. Alloys such as 6061 utilize a classification system developed in 1954 by the Aluminum Association, superseding previous classification systems.

be attained from reflective to vibrant or subtle, depending upon the underlying alloy. The cover of the 1947 *Architectural Metal Handbook* declared the aesthetic importance of alloys in terms of freedom: "Freedom of expression is the cornerstone of progress in architecture. The metals of old, supplemented by the alloys of today, provide the strength, utility and permanence, dignity and beauty to make possible that freedom."[356]

Anodizing and research

In addition to the creation of alloys, another research outcome at aluminum companies that was subsequently widely employed in architectural applications was the process of anodizing. This process produced a finish that allowed subtle, reflective or bold color effects. This research directly facilitated colorful metal façades on schools and commercial structures. Anodizing was first used in 1923 as a coating on British Duralumin sea plane components, after which Alcoa in the same year patented a color-anodizing process. Products employing this process were marketed as Alumilite, first commercially produced in 1928.[357] The process involved passing electric current through, typically, an electrolytic solution, yielding an aluminum oxide coating on the surface of aluminum. Reynolds likewise conducted research into "new processes of applying protective coating and color anodizing to aluminum" in 1942,[358] and developed a color-finish product, albeit much later in 1955, employed first on automotive radiator grills.[359] Reynolds described the process for attaining color finishes: "When bright

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[356] Earl P. Baker and Harold S. Langland, *Architectural Metal Handbook* (Washington, D.C.: R. R. Donnelly and Sons, 1947), 34.
[357] Jester, "Aluminum Finishes in Postwar Architecture," 44.
[358] *1943 Annual Report* (Richmond: Reynolds Metals Company, 1943), p. 4, Reynolds Metals Company Collection, series 1.2.
[359] *1955 Annual Report* (Richmond: Reynolds Metals Company, 1943), p. 15, ibid.

surfaces are desired, the parts are chemically brightened in solutions containing various mixtures of hot acids which attack the projections, thus leveling the surface and producing a smoother and more lustrous appearance."[360] Color is an important consideration in the history of aluminum cladding when considering how it fits into an understanding of market demand. Reynolds and Alcoa held a fundamental philosophy that markets are made, and that they must make the market for products. The introduction of color into architectural products was not a one-way function of customers demanding color and industry providing it. Instead, deliberate marketing was undertaken to introduce, and induce, color to the architectural products market, while at the same time architects expressed a desire to employ color as an aesthetic effect. Producers maintained that research, however, was the starting point for the deployment of architectural-cladding products to the market.

If Alcoa, Reynolds and Kawneer understood the route to the architectural products market as a linear path, research was imagined as the origin point. Kawneer explained at their second-annual architectural products sales meeting in 1956 that research and the development of those discoveries created new products: "It took two hours to parade the stream of new products from our super-charged research and development program across the stage. Some are not of a revolutionary nature, but all are highly significant to future trends in the industry."[361] Likewise, Alcoa explained that the endeavors of research were purposed with making "Alcoa's products increasingly acceptable to its customers."[362] Furthermore, Alcoa sought to shorten this line between research and deployment to customers, summarizing their endeavors in 1960 as, "A

[360] Peter, *Aluminum in Modern Architecture '58,* 93.
[361] New Products and Plans Unveiled at Architectural Sales Meeting," *The Kawneer Front,* June 1956, 6, Kawneer File.
[362] *1947 Annual Report* (Pittsburgh: Aluminum Company of America), p. 21, box 147, Records of the Aluminum Company of America.

noteworthy aspect of Alcoa's activities in 1960 was the company's continued effort to shorten the time between development of research findings and their profitable application."[363] Reynolds was the most forthright in proclaiming the link between research and markets. Echoing a bold headline "Research Creates New Markets,"[364] David P. Reynolds, executive vice president in charge of sales, said in 1960, "The creation of new markets almost always requires research and development."[365] A journalist writing about Alcoa's approach to research in 1931 asserted, "Nearly all of the present great uses of the metal have needed to be nursed and nourished by the research laboratory before they could be sent out to stand alone in the industrial world…in skyscrapers … in houses …. How the industry believes in research is attested sufficiently by the new Research Laboratory which the Aluminum Company of America dedicated only a year ago near Pittsburgh."[366]

Insofar as research was understood as a formal, regimented, institutional practice, Alcoa, Reynolds and Kawneer subscribed to the formation of knowledge in such formalized regimes. Alcoa claimed, "The aluminum industry was founded upon research; and research has remained the cornerstone of its progress ever since."[367] Reynolds claimed two types of research informed the discourse of knowledge: "*fundamental research,* the creation of new knowledge" and "*applied research*, the utilization of basic information… "[368] The physical and intellectual capital of research at Alcoa was described as "A large group of skilled scientists and technicians,

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[363] *1960 Alcoa Annual Report* (Pittsburgh: Aluminum Company of America), p. 9, box 148, ibid.
[364] "Research Creates New Markets," *Reynolds Review,* March-April, 1961, p. 3, folder 79, Reynolds Metals Company Collection, series 1.3.
[365] "They Open New Markets," 2.
[366] Free, "How Research Created the Aluminum Industry," 3.
[367] *1953 Annual Report* (Pittsburgh: Aluminum Company of America), p. 28, box 147, Records of the Aluminum Company of America.
[368] "Men and Brains," *Reynolds Review*, May 1960, p. 5. folder 78, Reynolds Metals Company Collection, series 1.3.

working in well-equipped laboratories…"[369] Reynolds in particular clearly articulated an exacting definition of research on the cover of its magazine *Reynolds Review,* read by industry subscribers. "Research: Studious inquiry; usually critical and exhaustive investigation or experimentation having for its aim the revision of accepted conclusions, in the light of newly discovered facts."[370] While not necessarily indicative of deeply critical reflection on this definition, as it was lifted from the Merriam-Webster Dictionary, publication on the cover of the magazine indicates the reverence held by Reynolds for the practice of research and its important place in the corporate structure of the firm. Each of these firms, at points in their history, had well-funded departments dedicated to methodical investigation of the properties of aluminum. Although Alcoa claimed that "The aluminum industry was founded upon research"[371] the company organized a formal research organization in 1918, the Aluminum Research Laboratories. This operation was initially granted a facility at New Kensington, Pennsylvania, but by 1953, with staff growing to 625 men and women, the laboratory branched out to four locations in the United States.[372] Alcoa's research endeavors were focused on four fields: "alloy and product development; process development; investigation of the properties and characteristics of aluminum and chemical products; and development of techniques for inspection and quality control."[373] Alcoa claimed the dominant position in aluminum research: "The company does more than three-quarters of all the research conducted today in the aluminum industry, even though it has less than one-half of total production."[374] Likewise,

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[369] *1953 Annual Report,* 11.
[370] *Reynolds Review,* 1960, front matter.
[371] *1953 Annual Report,* 28.
[372] *A Career for You with Alcoa* (Pittsburgh: Aluminum Company of America, undated), p. 24, box 141, Records of the Aluminum Company of America. Research facilities by the mid-1950s were located at New Kensington, Pennsylvania, Cleveland, Ohio, East St Louis, Illinois and Massena, New York.
[373] Ibid., 20.
[374] Ibid.

Reynolds also maintained a robust research operation. They combined the notion of "Research" with "Development" into a conceptually unified "Research and Development," which was divided into (1) Packaging research operation center. This division serviced Reynolds' original foray into aluminum: providing aluminum foil for cigarette containers. In 1960 it continued to hold the position of "world's leading producer of aluminum packaging."[375] (2) Metallurgical Research Laboratories. Reynolds asserted the main purpose of this division was to "know what aluminum can and cannot do."[376] This division conducted tests and devised new alloys, (3) Alumina Research Department. Confronted with limited high-grade ore deposits in the United States, this division was tasked mainly with "the development of methods which will make possible the use of lower-grade ores."[377] (4) Reduction Research Laboratory. This division was charged with finding ways to improve the reduction process, or develop more efficient and less costly alternatives to it.[378] (5) Product Development Department. The primary mission of this department was the "creation of new aluminum products."[379]

Executives — especially marketing-oriented executives — could also, at times, hold research in suspicion. Where marketing was seen as the important driver in generating income, research and design were made subservient to marketing endeavors — these practices were at the service of marketing, rather than the reciprocal. This orientation reveals one of the fundamental ideologies of the two biggest producers — Alcoa and Reynolds. They believed that markets must be made. To make markets, they employed the researchers and designers to generate new ideas and develop new potential uses of aluminum that could then be forged into use. This is not to say

[375] Reynolds would dominate Alcoa in the packaging business with Reynolds Wrap becoming a household name, while Alcoa Wrap failed to gain significant market penetration.
[376] "Metallurgical," *Reynolds Review*, May 1960, p. 13, folder 78, Reynolds Metals Company Collection, series 1.3.
[377] "Alumina," *Reynolds Review,* May 1960, p. 7, ibid.
[378] "Reduction," *Reynolds Review,* May 1960, p. 9, ibid.
[379] "Product Development," *Reynolds Review*, May 1960, p. 17, ibid.

that they, as producers, never responded to the articulated desires of customers. Yet Reynolds and Alcoa believed that aluminum held such great potential; if only they could educate and inspire the public and potential customers to its applications, the metal could spread in use. For this to happen, the firms had to first facilitate the development new products to sell, either by themselves or aiding others to do so, then engage in a purposeful marketing campaign to push it to the market. As producers engaged in product design, they sometimes were positioned in potential conflict with architects, given that architects protected as endemic to their profession creative agency as design originators.

Executives at Alcoa and Reynolds held the research department in great reverence, lending an urgent, self-assured quality to their communications with investors, employees and in marketing publications: "A company without research is dead."[380] "Research and development are the key to survival."[381] "Reynolds research and development: Men and Brains."[382] An advertisement staged serious men in white lab coats, ostensibly finalizing with exactitude the details of corrugated *Alumalure* siding.[383] Hyperbole of this magnitude was perhaps warranted, as Alcoa and Reynolds were fierce rivals. After the war, they were the number one and number two producers in the United States, each vying for the same markets in a rapidly expanding market for all types of aluminum products. The year 1954 was said to be a "golden age of architectural expression," for metal curtain walls,[384] Alcoa, Reynolds and Kawneer were all three optimistic about the future with record sales in the 1950s, but more and more competitors began entering the aluminum markets, with 20 new significant firms entering from 1955 to 1970.[385]

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380 "They Open New Markets," *Reynolds Review,* May 1960, p. 4, ibid.
381 W. G. Reynolds, "Reynolds Profiles," *Reynolds Review,* May 1960, p. 20, ibid.
382 "Men and Brains," 5.
383 "Now! Plan your building in color with new Alcoa Alumalure," advertisement, *The Alcoa News,* September 1959, box 155, Records of the Aluminum Company of America.
384 *Metal Curtain Walls,* 45-46.
385 Stuckey, *Vertical Integration and Joint Ventures in the Aluminum Industry,* 39.

Alcoa and Reynolds were keenly aware of each other's desire for market dominance, and they treated their research operations as their most crucial center of activity: W. G. "Billy" Reynolds, executive vice president of Research and Development stated, "The company that doesn't keep up is doomed. Research and development are the key to survival, not only for a business firm, but for the nation."[386] Alcoa framed research in terms of competition: "Alcoa's research and development program is regarded as one of the company's chief sources of competitive strength"[387] Alcoa also expressed an urgency: "Research…must be advanced and enlarged to keep pace with, and indeed, ahead of the times."[388] Finally, Reynolds understood competition as a battle: "Our research and development people continually provide our salesmen with the right kind of weapon."[389]

In addition to the urgency of competition, research was seen as an engine of progress. This concept was a fundamental ideology held by Alcoa, Reynolds and Kawneer. Furthermore, this idea of progress was explicitly linked to the architectural products as a strategy of marketing them as modern. But for the producers, the beating heart of progress was research. Stated Alcoa: "It is a basic Alcoa tradition that without research there can be no progress."[390] Reynolds echoed the position: "Reynolds is geared for progress. Led by imaginative, competent research and development men, it is continually moving aluminum into new uses."[391] Progress was promoted as the driving force of research as a practice: "These men believe that the key to progress, both

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386 Reynolds, "Reynolds Profiles," 20.
387 *1962 Annual Report* (Pittsburgh: Aluminum Company of America, 1962), p. 6, box 148, Records of the Aluminum Company of America.
388 *1953 Annual Report* (Pittsburgh: Aluminum Company of America, 1953), p. 28, Box 147, ibid.
389 "They Open New Markets," 4.
390 *1953 Annual Report,* 28; Cf. *1962 Annual Report,* 6. Also see *1962 Annual Report,* p. 6.
This report states, "Alcoa's research and development program is…one of the best ways to promote aluminum progress."
391 "They Open New Markets," 2.

for the company and for civilization, lies in obtaining knowledge…and them putting it to work."[392] Likewise, Kawneer understood their own Research and Development department as the reason for the company's postwar "Progress:" The company conveyed to a reporter that the Research and Development group "can take a good deal of credit for Kawneer's remarkable postwar progress."[393] The idea of progress was a trope more widely shared across industries and across domains of intellect and cultural practice.[394] Actors in the aluminum industry imagined their research departments as the vanguard of progress — an idea no doubt made more urgent after the emergence of the industry, and the world, from the ravages of World War II. From the vantage point of fifteen years after the war, Reynolds reflected on the importance of research to enact "progress" beyond destruction. In an article headlined "Reynolds research and development: Men and Brains," Reynolds wrote, "With his brain, man has changed the face of the world…and discovered the means with which to destroy it. When not contriving to destroy himself, man has used his brain to improve his lot.…These are the men Reynolds has assembled in its research and development groups."[395]

Conceptual slippage between research and design

While these firms had formal, robust departments for research, a degree of slippage characterized the terminology surrounding their terms used to describe the practice. Terms for research, development, design, architecture and engineering were sometimes used

[392] "Men and Brains," 5.
[393] Church, "The New Kawneer," 12.
[394] The widely known "Century of Progress" characterized a cultural stance in the United States; progress as an idea popularized by Turgeot, who puts forward the idea of progress, writing, "the whole human race, through alternate periods of rest and unrest, of weal and woe, goes on advancing, although at a slow pace, towards greater perfection." See Ronald J. Meek, trans., *Turgot on Progress, Sociology and Economics* (Cambridge: Cambridge University Press, 1973), 41.
[395] "Men and Brains," 5.

interchangeably, or differently, depending upon the firm. This interchangeability reflects the inexact disciplinary boundaries between the processes of aluminum product production from research for product delivery to the end user. The boundaries among many of these processes were nebulous. Furthermore, the boundaries between designers internal and external to the firm were similarly indefinite. This merging of design practices internal and external to the companies will be explored in the following section. The work of external designers, such as architects, sometimes overlapped with the work of designers internal to the company. Many aluminum-cladding products were the result of collaboration between departments internal to the firm and external to the firm.

This conceptual overlap between boundaries of practice is exemplified by the Reynolds Product Development Department, because it was descried as a "twin-barreled" organization. Some of its sections are oriented toward particular industries. Other sections focus their attention on the characteristics of the metal."[396] This department was at once a design practice and a research practice. Reynolds adopted this overlap as a strategy: "The fruits of these two realms of effort are combined in creating new ways in which aluminum can be used." This unapologetic stance in which product development was simultaneously a conceptually singular practice and a combined effort with research differed significantly from the approach taken by its rival Alcoa immediately after the war. Alcoa had the larger, more established research apparatus. But Reynolds had a different strategy. Unlike Alcoa, which had long attempted to define a boundary between producing end-products itself and producing only, for instance, aluminum sheet to then sell to fabricators who would manufacture the end-product, Reynolds was much more embracing of an end-product manufacturing role. The company clearly articulated its position: "Reynolds

[396] "Product Development," 17.

realized very early that to be successful it could not merely produce its aluminum pig, put it on the counter and say, in effect, 'Here it is; buy it!'"[397] This approach, Reynolds maintained, was a "new product consciousness": "Starting immediately after World War II, Reynolds initiated, developed and perfected new ways of using aluminum. Scores of new products, from Reynolds Wrap and roofing to bumpers and boats, came from research and development groups. The entire organization, from manufacturing to sales, became new-product conscious."[398] It's important to realize that Reynolds, like Alcoa, produced aluminum for an array of markets, from building products to automobiles to consumer goods. Reynolds found great success in selling Reynold's Wrap, starting in 1947, while Alcoa's product, "Alcoa Wrap," as a second-to-market competitor, never achieved the market penetration that Reynolds Wrap did, and Alcoa withdrew the product.

Reynolds' embrace of departmental, disciplinary overlap extended to other domains: the conceptual merging of marketing and design. Shortly after the war, the company established a package design department to demonstrate appealing ways products could be wrapped or labeled in printed foil, an expertise that company founder R. S. Reynolds had long held.[399] In 1950 the mission of the package design department was expanded to "cover the visual aspect of all aluminum product applications" from advertising and display material to architectural design.[400] In 1956 architectural design specialists were transferred to the Building Products Division, "to make possible more direct coordination between architectural design and architectural products." This combined approach was led by Billy Reynolds, Executive Vice President of Research and Development. He gained experience in the production of finished aluminum products for the

[397] Ibid., 17.
[398] Ibid.
[399] R. S. Reynolds Sr., was the nephew of R. J. Reynolds, president of the tobacco company of the same name. R.S. established a predecessor company to Reynolds Metals Company to wrap cigarettes, first in tin, and then in Aluminum.
[400] "Styling, Designing in Reynolds Aluminum," *Reynolds Review,* March-April, 1956, folder 74, Reynolds Metals Company Collection, series 1.3.

war. Reynolds, from its inception as a vertically integrated producer, concerned itself with both fabrication and the manufacture of finish products, in marked contrast with Alcoa's prewar position — less focused on the production of finished products that could be sold directly to consumers. Before World War II, Alcoa concentrated on producing aluminum fabrications like sheet or extrusions, and then selling those to middle-men manufacturers, like Kawneer, which would make an architectural component to sell to end-users. Reynolds, on the other hand, took the experience it gained making finished products for the war and transferred that technique to the consumer market. Reynolds reflected on Billy's management of wartime production: "When the war ended, the aircraft parts division had a vast array of fabricating equipment and a cadre of people with know-how in aluminum. Since Reynolds also had, for the first time, great amounts of metal to sell to a peacetime economy, Billy quickly began pointing the fabricating operations toward products that held promise of volume consumption. He had two purposes: First, to help sell the company's aluminum capacity, and second, to demonstrate on an actual production basis the practical advantages of aluminum for a wide variety of applications."[401]

Billy Reynolds positioned the company for a burgeoning consumer economy. This strategy of not only producing aluminum but also manufacturing end products fostered "stamped boats, gutters, ribbed siding for commercial buildings, refrigerator components, oil well drilling rigs and automotive trim and grills."[402] For Reynolds, those who were involved in *product development* "conceived, designed, developed or helped produce…"[403] Product development, in turn, was under the aegis of Research and Development.[404] Styling and design, or "'the art

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[401] Reynolds, "Reynolds Profiles," 20.
[402] Ibid.
[403] "Achievement," *Reynolds Review,* May 1960, p. 19, folder 78, Reynolds Metals Company Collection, series 1.3.
[404] "Product Development," 17.

department,' as people outside the department itself are wont to call it,"[405] from 1950 to 1956, included specialists in architectural design, after which these specialists were moved to the Building Products Division "to make possible more direct coordination between architectural design and architectural products."[406]

Alcoa had long preferred to produce aluminum fabrications rather than engage in the manufacture of end-products. In the 1940s Alcoa boldly proclaimed, "We make pigs, not potato mashers."[407] At times throughout its history, however, it did engage in product manufacture, believing that doing so for a time might demonstrate uses of aluminum. Their first mass-produced consumer product, for example, was a tea kettle that, according to the lore of a movie produced about the history of Alcoa, was made to inspire manufacturers to produce their own tea kettles with Alcoa supplying the aluminum. According to the portrayal in the film, after an Alcoa salesman entered Mr. Eli Griswold's office, of the Griswold Manufacturing Company,[408] displaying a one-off aluminum tea kettle and hoping Griswold might be inspired to buy aluminum and manufacture them himself, Griswold said, "Put me down for 2000 kettles." "Wait a minute," replied the Alcoa salesman, "we just sell aluminum, we don't make kettles!" Griswold replied that he would buy only the finished product, "You've got to take the grief in making them." Indeed, Alcoa did enter into the manufacture of kettles, selling them to Griswold. He saw how well they sold, and changed his tune: "Listen…you fella's don't want to monkey with the manufacturing end! Suppose I just buy the raw material from you and make my own aluminum ware….I know that's what you wanted me to buy in the beginning, but I wanted to

[405] "Styling, Designing in Reynolds Aluminum."
[406] Ibid.
[407] Carr, *Alcoa: An American Enterprise,* 131.
[408] For an account of the meeting between a Pittsburgh Reduction Company salesman and Mr. Griswold, see Bishop, "A 50-Year Fight for Markets," 22.

make sure all the bugs were out of it, and I'd rather you be the exterminator than me."[409] This dramatization promoted the image of Alcoa as a producer and a reluctant end-product manufacturer which was just the image they hoped manufacturers, like Kawneer, would see. They wanted manufacturers to buy from them, while at the same time, reserve the right to sell end products. This reserved right they exercised much less before the war than after.

Alcoa increasingly embraced the manufacture of end-products after the war, with vast new infrastructures of management processes, skilled workers, plants, machinery and stocks of aluminum to draw upon. For instance, it manufactured cast aluminum exterior wall panels, derived, as it stated in a 1948 advertisement, "By coordinating design specification and production facilities."[410] It should be noted that Alcoa did produce some end-products before the war, yet it was largely engaged in a support role of outside designers and product developers. In the realm of architecture, it was quick to work with famous architects, such as Harrison & Abramovitz, to demonstrate end-use products so that it could sell more aluminum to end-product manufacturers.[411] This was an approach aimed more toward *process development* than *product development*. This approach persisted into the postwar period, even while the company also began limited manufacturing of their own products. While product development entails designing and manufacturing the end-product itself, process development entails, as a mid-century recruitment brochure explains, helping "industry to work out solutions to their problems in welding, brazing, finishing and forming — in fact, all phases of making products from

[409] "Aluminium—Alcoa: A History of Aluminium Co of America—Mining, Ingots, Marketing 1880s to 1950s," YouTube video, 29:22, posted by Historia – Bel99TV, December 15, 2013, accessed December 21, 2016, https://www.youtube.com/watch?v=gt5uUOM-_m8&t=1129s.
[410] "Alcoa Economy Castings for Exterior Wall Panels," advertisement, *Architectural Record,* September 1948, 159.
[411] Harrison and Abramovitz collaborated with Alcoa first on the Davenport Works Administration building, and later designed Alcoa's new headquarters tower in Pittsburgh. The firm also designed several aluminum-clad skyscrapers in the 1950s.

aluminum."[412] Alcoa saw process development as a crucial strategy, because "The tremendous growth of the aluminum market has been the result of finding new uses for aluminum mill products."[413] Despite accusations of monopoly, part of Alcoa's enterprise was enabling manufacturers to discover and develop uses for its aluminum produced.[414] Competition *and* collaboration characterized the firm's approach to capital accumulation.

Through the 1950s and 1960s, Alcoa increasingly embraced product development in-house, stating, "Though Alcoa always has stressed the importance of innovation in products and processes, this entire sphere of exploration is being given much greater emphasis than ever before."[415] Alcoa established the Development Department, which was subdivided into three major areas: Product Development, Equipment Development and Process Development. In the same way Reynolds envisioned nebulous boundaries between research, development and design domains, so too did Alcoa envision these three development domains as conjoined: "The names of these three areas suggest three separate but interrelated concerns of Alcoa: to develop new products for the market place; to develop equipment that will enable us to make those products economically; and to develop new processes for the continued improvement of those products."[416] While the Development Department did not utilize the moniker "Research," there did exist an executive position that combined these domains: the Vice President in Charge of Research and Development.[417]

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[412] *A Career for You with Alcoa, 25.*
[413] Ibid.
[414] Alcoa stated that it wanted to "cooperate with one another for the good of the industry and the good of ourselves. *Metal Curtain Walls,* 160
[415] *A Career for you with Alcoa,* 25.
[416] Ibid.
[417] Aluminum Company of America, 1961 Annual Report, Records of the Aluminum Company of America.

Kawneer, as a manufacturer, had much less physical capital to dedicate toward research and development endeavors. It did share with both Alcoa and Reynolds, however, the legacy of wartime physical and intellectual capital available for exploitation after the war. Like the producers, Kawneer conceptually overlapped these domains, referring to staff engaged in such endeavors as "research and development engineers and architects."[418] Groups organized at Kawneer in the postwar 1940s included Product Engineering, Industrial Engineering and Research & Development.[419] Like Reynolds and Alcoa, research and development were conceptually combined.

The manufacturing orientation of Kawneer placed organizational emphasis on the connection between engineering, research and development. Developing an end-product involved myriad details that, at Kawneer, the engineer addressed — from preparing engineering drawings of product configuration to selecting the best alloy for a given end-product. Engineering was articulated as subservient, playing a support role to the designers in the development domain: "Product Engineering basically serves production which represents a difference between this and Research & Development people."[420] Kawneer indicated that while engineering was a supportive role, Research and Development "people" were equals. This relationship reveals the way the wider structure of aluminum manufacturing operated not as a strictly linear development, but as an overlapping lines of professional and disciplinary domains. Kawneer characterized professional overlap: "Frequently Product Engineering, Industrial Engineering and Research & Development people are required to work very closely on many projects and problems."[421]

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[418] *The Kawneer Front,* August 1955, p. 3, Kawneer File.
[419] "Know Your Company," *The Kawneer Front,* April 1955, ibid.
[420] Ibid.
[421] Ibid.

Industry relationship with the architectural profession

One of the transversal relationships examined in this study is that between designers inside of the manufacturer's enterprise and those on the outside. Inside the organizations, Alcoa, Reynolds and Kawneer developed a complex managerial apparatus that coordinated the work of researchers and designers. They also sought out designers outside the organization, such as Harrison & Abramovitz (Alcoa), Minoru Yamasaki (Reynolds) and Morris Ketchum (Kawneer). These architects lent crucial expertise, designing components that became the prototype for future products, but they were also part of a marketing strategy. For instance, association with these firms provided an entry into magazines, helping to develop showpiece works of architecture that could garner media attention. Alcoa and Reynolds and Kawneer developed architecture awards chaired by famous architects, serving as yet another medium for proselytizing aluminum.

The conceptualization of "development" as a conjunction of overlapping disciplines extended outside the boundary of the corporate domain into spheres of private architectural practice. In the same way that producers' activities sometimes overlapped with manufacturers', whereby they entered into competition in the manufacture of end-products while simultaneously providing fabricated aluminum, the design activity of producers and manufacturers overlapped with the design activity of architects. Producers and manufacturers were aware of disciplinary boundaries, knowing that architects were a crucial connection to potential customers. As this section explains, Kawneer overtly attempted to exhibit respect for boundaries and not appear to take away the design agency of the architect, lest he seek out a competitor's product that would allow creative freedom. Outside designers were given a degree of latitude to produce custom designs but wider design agency was inhibited by the manufacturer's ambitions for standardized components that could be replicated. Because minimization of production cost was a leading consideration, designers were embraced, but kept at arm's length.

An underlying outcome of the marketing projects by Alcoa, Reynolds and Kawneer was the appropriation of the architect as a medium of marketing. By collaborating with architects, aluminum-component manufacturers were able to spread awareness and use of the product. Manufacturers selected well-known architects with whom to collaborate. In answering the question, "Who designed the aluminum cladding components?" the act must be understood as a collaborative effort, with designers inside and outside the company overlapping, thus challenging the notion of sole authorship of a building by an architect. Designers inside the company often played a significant role in the design of architectural cladding.

Kawneer's designers and disciplinary boundaries

In 1945 Kawneer published the pictures of eight men under the banner headline "Introducing our Designers" to the company in its monthly magazine, *The Kawneer Front.*[422] In this first revelation of a new organizational structure — the Kawneer Design Department — the company took pains to stress in the first two paragraphs that the architect was not being replaced. Explaining that the "chief functions of this department is to create and develop, through research and design, modern ideas in stores," the article continued, "these ideas are guides to architects, distributors, and designers and increase the public interest in good design and good materials." To further assuage misunderstanding, the article asserted that "the Design Department is not primarily a service department, but rather a creative and suggestive organization."[423]

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[422] "Introducing Our Designers," *The Kawneer Front,* November 1946, ibid.
[423] Ibid.

Central to Kawneer's skirting of the issue of creative agency was the debate about standardization. As explained earlier in this study, standardization was a mode of expanding the firm's capital accumulation through economies of scale and the repetition of expertise, exemplified by Lawrence Plym's slogan, "Find out what you can do best, then do it in volume. Keep it simple. Keep it in aluminum." Although standardization of production and design at Kawneer increased in intensity in the 1950s, Kawneer had long engaged standardization through components it manufactured for storefront systems after it was incorporated as a company in 1906. Kawneer's marketing endeavors for these components initially were exclusively targeted toward architects: "His [Plym's] first instinct was to sell architects….They resulted in sales, for progressive architects liked the new approach to store fronts….But an architect serves a client, and in time Plym found the best results came from going directly to the client….The results were astonishing. Selling the merchants directly, along with the architects and contractors, became the cornerstone of Kawneer sales policy. Thus began that change of the face of Main Street, U.S.A. that Kawneer pioneered."[424] From the start of Kawneer's sales policy, the architect was not excluded from consultation, but a backchannel persisted, direct to the end-user. This dual approach allowed Kawneer to work with architects to produce a storefront design, and also gave them the opportunity to initiate design, if they chose to exercise that route, before consulting an architect. Kawneer exploited both paths.

Kawneer promotes architects' design leadership

Some publications were directed toward architects, or "the Technical Man." A 1912 catalog reminded the "Technical Man" that Kawneer's product was a comprehensive approach:

[424] "75 Kawneer Years…Only a Beginning," 7.

"… please take particular note that Kawneer is complete — not simply a Corner and Division Bar, but complete from side walk to I-beam."[425] The catalog continued, "… each part designed in harmony with every other."[426] Kawneer stood ready to supply a complete street-level façade. Such a reminder was surely meant to aid selling more product but was also meant to explain that the entire storefront could be designed by this "Technical Man" in close coordination with Kawneer. This document explained Kawneer as an assistant to design, not necessarily the lead: "We … sincerely believe we are in a position to serve and co-operate with you on all matters…. It has been our object from the beginning to produce a construction that fulfills your every requirement …"[427] Kawneer's position articulated as an assistant to design continued in the interwar period, with Kawneer's business advantaged by the interwar Modernize Main Street initiative of the Federal Housing Authority, in which "low-interest loans (were) made for the modernization of existing residential and nonresidential buildings."[428] Exposed to this slogan, merchants seeking to "modernize" their storefronts were suggested by Kawneer to seek out the expertise of an architect: "Here the architect creates the design," after which "plants are completed, specifications drawn up" by the architect, working with Kawneer.[429]

In the same way Kawneer recommended to merchants that they seek out the expertise of architects, so too did Kawneer make overtures to architects directly when preparing to launch their new K-47 line in 1945-1946. When Kawneer announced the new product to architects and engineers, it stressed that architects themselves aided in the design of this standardized storefront

[425] *Kawneer Store Fronts: It Stays and Pays,* 5.
[426] Ibid., 7.
[427] Ibid., 5.
[428] Esperdy, *Modernizing Main Street: Architecture and Consumer Culture in the New Deal* (Chicago: University of Chicago Press, 2008), 7.
[429] *Kawneer Book of Store Fronts,* 54, 55.

framing component: "It was pointed out to the architects and builders that the new K-47 line is the result of research conducted among them, plus Kawneer's specialized experience and 'know how' in the store front industry."[430] In the company's newsletter, architects were reported by Kawneer to love it: "The architects' and distributors' reactions are all that we could want…. The only complaint we have had from the architects so far is that they would have liked to have had it a year earlier."[431] After launch of the line, in 1946 Kawneer exhibited it at the Architecture League in New York City in an exhibition, "The Trend of Modern Store Architecture."[432] Characterizing the response, Kawneer maintained it was received with "great interest" by New York architects.

Many architects in the profession had expressed an interest in the standardized components being offered by manufacturers, but also maintained that architects still had something to offer in terms of design. *Pencil Points* magazine in 1931 issued a study titled, "A Symposium on Better Cooperation Between the Architectural Profession and the Manufacturer of Building Materials," that sought to address what was understood as a problem: how to exchange information between the eight thousand architects "who must select the various materials and items of equipment going into their buildings from this army of approximately seven thousand producers." [433] One architect addressed the professional boundaries between architects and producers: "…the manufacturer knows a lot of things about his material which he wants to tell to the architect. Sometimes, however, the architect knows something about that

[430] "New K-47 Line Announced to Trade," 1.
[431] "Good Reception for K-47 Line on West Coast," *The Kawneer Front,* November 1946, p. 1, Kawneer File.
[432] "Kawneer Exhibition Interests New York Architects," *The Kawneer Front,* February 1946, p. 3, ibid.
[433] "A Symposium on Better Cooperation," *Pencil Points,* June 1931, 3. Citations refer to the Aluminum Company of America reprint, box 130, Records of the Aluminum Company of America.

material that the manufacturer does not know …. If they can get these two sets of information together in some way, we will be on our way towards the ideal."[434]

Following up on their earlier efforts to reach out to architects when designing the K-47 line, Kawneer's launch of The Unit Wall also incorporated architects in an advisory role. The catch-phrase "Demand-Designed" was promoted as an encapsulation of the practice in which Kawneer hired architects on their staff, worked with architect-advisors on the development of new products, and distributed a survey to architects to solicit their opinions. A two-page article/advertisement written by Kawneer appeared in the February 1956 issue of *Architectural Record,* stressing that Kawneer has involved architects in product design since their founding.[435] The article, "The Kawneer touch…The Result of 50 Years of Architectural Cooperation" begins by stressing that the founder himself was an architect. It then recounts the ways the "consultant architect and the Kawneer staff" worked together: They first eliminated "useless ornamentation, or "rococo" ornamentation from façades in favor of "simple functional metal design." Collaboration on the K-47 line yielded a "professional character, yet can be purchased out of stock." After World War II, architects designed the profile of aluminum "slipcover" cladding, while the Kawneer engineers devised the finishes. For the production of Kawneer's postwar line of metal wall systems, Kawneer publicized architects' role as "formal working agreements with architectural firms. They help in specifying the desired features, functions, size and modular requirements. Throughout the development period, the solutions to these requirements are reviewed by practicing architects." Lastly, Kawneer distributed surveys to architects around the country. From these surveys, Kawneer claimed that any products they produced were "Demand-

[434] Ibid., 3.
[435] "The Kawneer Touch…The Result of 50 Years of Architectural Cooperation," advertisement, *Architectural Record,* February 1956, 304.

Driven," the design sourced in the demands of architects themselves. "After 50 years of close cooperation with architects, Kawneer can truthfully claim to have always been in 'touch' with the profession and construction industry."[436] By transforming architects into consultants, and publicizing their role as such in publications from 1917 to the postwar period, Kawneer attempted to advance ahead of potential objections architects might raise against standardization. After all, standardized components were sourced in the architects themselves, claimed Kawneer. Simultaneously, Kawneer directed publications straight to the merchants and to architects in architectural journals, publicizing Kawneer's expertise in design as a "Kawneer Touch."

The Kawneer "Touch" of design

Here was an industrially produced architecture of standardized components being produced, led by a manufacturer, promoted as developed in consultation with architects. Kawneer would consistently embrace the term "modern" to market the outcome of this relationship. While Kawneer stressed collaboration with architects, written into marketing material, and discussed in company newsletters, Kawneer also stressed the agency of their own designers as underlying the spread of modern storefronts.

Because Kawneer found success in approaching merchants directly, rather than strictly marketing to architects in hopes they would then approach end-users, Kawneer appealed to merchants in a 1917 Kawneer publication, *Portfolio of Designs,* inviting them to send their own hand sketches directly to Kawneer. Instructions were: "It will be necessary for you to give us as much information as possible regarding your old front, together with the height of the present front measured from the sidewalk to the I-beam, also the total width between the brick walls. In

[436] Ibid., 305.

order to make us more familiar with the existent conditions, please draw a rough sketch — don't be afraid we won't understand it — we will."[437] Kawneer claimed in this publication to be specialists in the "designing of up-to-date, sales-producing Kawneer Store Fronts."[438] The publication included detailed plates of what the company titled, "Kawneer Designs" and invited store owners to work directly with Kawneer on developing a design for their store: "…call up our nearest branch office…and ask them to develop a store front for you along that line.[439]

"Modern" as a marketing term appeared in a 1920 publication to describe the storefronts Kawneer claimed to "father."[440] Claiming design origination of the "era" of "standard Store Front Construction,"[441] Kawneer wrote, "every new idea that has developed in the construction of modern Store Fronts, since Kawneer was conceived, has originated with Kawneer." Although the publication did, in fact, assert that architects would appreciate the ideas presented by Kawneer in the catalog, thus paying homage to the architect in some capacity, the company amply claimed design primacy for the entire era of modern storefronts. Kawneer did not advocate complete removal of the architect from the design act. As the previous section has shown, architects were praised by Kawneer. A 1916 publication especially reified the profession: "much credit is due to the Architects and Contractors for the finished Kawneer Store Fronts that now stand." However, their relationship with architects was couched in terms of helping them by standardizing design. "Yearly we spend thousands of dollars in raising the standard of Store

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[437] *Portfolio of Designs* (Niles, Mich.: The Kawneer Company, undated), 4. Archivist claims the date of this document to be 1917 or 1918.
[438] Ibid., 1.
[439] Ibid., 4.
[440] *Kawneer Mouldings in Steel, Copper, Brass, Bronze, Aluminum,* 62.
[441] Ibid.

Fronts…and that this results in a great good for the Architects and Contractors cannot be contradicted."[442]

Immediately after World War II, designers at Kawneer took on an increasingly important role with the establishment of the Kawneer Design Department. While this department was articulated as a "creative and suggestive organization,"[443] its initial task included complete example designs of example storefronts employing Kawneer aluminum framing and facing products.[444] Kawneer declared these designers "the best in the business," and wrote an exposé of their inner workings in an article, "Behind the Aluminum Curtain" in the August 1950 issue of *The Kawneer Front.* "Have you ever wondered what goes on behind the locked doors of the Product Design and Development Lab?" asked the article. Pulling back the curtain revealed that the designers were intimately involved with creation: "Actually, the work of the men and women in this department can be summed up in three words—creation, development, and application."[445] Kawneer attempted to portray the relationship of designers internal to the company and external to the company in overlapping roles: architects were described as "consultants" to the company designers, while company designers were described as a "suggestive organization."

These company designers were marketed as the design prowess of the company — "The Kawneer Touch."[446] The touch extended to collaboration with architects, "in constant touch with Architects," and a touch of design excellence when developing new Kawneer products. Both the overlapping roles of designers internal and external to the company, and the double-definition of

442 *Boosting Business with Kawneer Store Fronts,* 26.
443 "Introducing Our Designers."
444 *Machines for Selling: Modern Store Designs by Kawneer* (Niles, Mich.: Kawneer Company, 1946).
445 "Behind the Aluminum Curtain," 3.
446 "The Kawneer Touch…The Result of 50 Years of Architectural Cooperation," 304.

“the Kawneer touch” are perhaps exemplified in the most comprehensive design project Kawneer had undertaken: entire exterior walls in which architects were given a limited range of design choice to exercise within the framework of a larger assemblage designed by Kawneer.

Boxing in the Architect

With the introduction of the Kawneer Unit Wall, a comprehensive wall and window system that could be factory-built and rapidly erected in the field, Kawneer was in a leading design position regarding the total façade of a building. While the system was still being designed, Director of Research and Development Jack Roehm explained, “It is conceived as a total wall.”[447] Debuted at a meeting for Kawneer salesmen, its rapid erection was stressed, as it was “assembled on the stage by three mechanics in less than three minutes in a convincing presentation of Unit Wall construction.”[448] Yet, Kawneer was aware still that the architect was an important point of contact with the end-user, and the strategy with the Unit Wall was to allow the architect a degree of design freedom, still within the limits of a standardized system: “Using standardized components, we can achieve great flexibility of design, including color, for a complete wall system.” The architect could specify the spacing of the supports, the color of the infill panels, the anodized color of the supports, and, within a limited palette, select the material of the infill panels. The Unit Wall was thus a framework regulating the architects design — marrying a standardized system of production with a degree of design agency by the architect. Standardization was a means of capital accumulation. An article in *Modern Metals* discussed Kawneer’s forecast of profit: “A brand new product that will bolster sales and earnings is a new

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[447] Church, “The New Kawneer,” 12.
[448] “New Products and Plans Unveiled at Architectural Sales Meeting,” *The Kawneer Front,* June 1956, p. 6, Kawneer File.

type of metal wall created by Kawneer's Research and Development Department."[449] The Unit Wall put the architects' influence in a box confined to the infill panel. Kawneer promoted this as creativity and flexibility: "The Kawneer Unit Wall is a creative tool for the architect…. Yes, gentlemen, the new Kawneer Unit Wall is a system offering complete flexibility of design treatment through a wide selection of color, unit types, unit sizes and a choice of proportions within the units themselves."[450]

Following the Unit Wall launch in 1956, the company expanded the concept into four price categories — from fully standardized walls to custom-built curtain wall units, particularly on larger buildings. Kawneer representatives explained the company preferred full standardization but could accommodate, in some cases, the desire for custom walls: "We are striving to promote greater acceptance of standardized components, more factory fabrication, less job-site fabrication…. We welcome the big custom curtain wall jobs, but our research and development work is based on standard units that are ready for installation when they leave our plant." Plym announced that the standardized walls can still accommodate the architect: "He can still juggle them around, and regardless of the design he comes up with, he will benefit by basic engineering principles embodied in them."[451]

Kawneer framed the architect's design agency within a predefined panel, then framed the message about that agency as offering the architect as a creative tool and complete flexibility. This suited Kawneer's drive for increasing standardization of design and production — an endeavor they could control because the company's primary business was the manufacture of aluminum end-products. This fact was a main differentiator between Kawneer and Alcoa.

[449] Church, "The New Kawneer," 9.
[450] The Kawneer Company advertisement, *Architectural Record,* November 1956.
[451] "Kawneer Gears up for Record Sales in '60," 3.

Alcoa collaborates with architects

While Kawneer's profit potential depended on manufacture, Alcoa's did not. Alcoa was focused primarily on fabricating aluminum that could be sold to manufacturers like Kawneer. While Alcoa did engage in limited production of end-products after World War II,[452] given greatly expanded production capacity and in response to competition with Reynolds, their articulated position was a support role, perhaps best encapsulated by Alcoa's memorable slogan, "We make pigs, not potato mashers."[453] In 1955, Alcoa's manager of market development said the architect should lead**:** "I believe that the aesthetics of metal-clad buildings must be left to the architect and I have every confidence that he will solve this problem if we furnish the tools. These tools must come from good, sound engineering….They must come from the research laboratories and the development divisions of the many companies who are to participate in the progressiveness of this industry.[454] Reflecting on the development of aluminum cladding from the vantage point of 1955, Alcoa payed homage to collaborators: "I would be remiss if I didn't pay tribute to the architectural metal fabricators and to the manufacturers of sandwich panels, as well as a number of progressive architects, all of whom have worked closely with our industry and many of whom contributed generously of their time and money."[455]

Alcoa's relationship with the architecture firm Harrison Abramovitz reveals the way the company collaborated with design expertise but also utilized them as an advertising medium. This is not to say that Harrison Abramovitz did not benefit greatly, for they did, with a long relationship over many decades. The firm benefited from the commission and from the status of

[452] Most pertinent to the following section is Alcoa's manufacture of cast spandrels and wall panels in 1948. For an example of these products, see "Alcoa Economy Castings for Exterior Wall Panels," advertisement, *Architectural Record,* September 1948, 159.
[453] Carr, *Alcoa: An American Enterprise,* 131.
[454] *Metal Curtain Walls,* 160. At the conference, an Alcoa representative stated the architect should have **"**complete freedom of design including color."
[455] Ibid., 162.

working with an international client. Engaging in research and design in conjunction with the research arm of Alcoa boosted the firm's credentials, not unlike the status conferred, as Abigail Sachs shows, on architecture firms in the postwar period who worked not under aesthetic preconceptions, but instead claimed to work from first principles rooted in their theories of environmental behavior.[456] Yet, the relationship with Harrison and Abramovitz facilitated Alcoa's very identity, where the architect's designs helped Alcoa develop a new category of aluminum product — the aluminum-clad curtain wall, and the transfer into a celebrated new, gleaming aluminum tower in Pittsburgh, designed by the architects. Harrison Abramovitz became virtual salesmen for Alcoa, designing a "silent salesman" — the Alcoa Building (1953). Alcoa held the goal of developing a thin, aluminum wall at least since 1932. In their publication of that year, *Aluminum in Architecture,* Alcoa forecasted that one day, a 10-inch wall might be built as a 3-1/2-inch wall with the help of an aluminum exterior wall. A potential benefit achieved, Alcoa speculated, was increased rental income for a building owner due to increased floor space afforded by the thinner wall.[457] Inspired by an early application of thin-wall cladding of aluminum on the Department of Public Works Building in Richmond, Virginia (designed by W. A. Childrey of the Department's staff and constructed during 1930–1931)[458] and aware that an engineering firm conducted tests of the façade and determined the wall to possess favorable

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[456] Sachs dissertation research focuses on those architects and their design and teaching pedagogies that eschewed the International Style, instead centering on architectural research immersed in environmental behavior studies. Sachs maintains this stance was biased toward freedom from aesthetic preferences and preconceptions. See Sachs, "Research for Architecture: Building a Discipline and Modernizing the Profession." (PhD diss., University of California, Berkeley, 2009).
[457] Myers, "The Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style," 81.
[458] Ibid., 80.

"sound, light, and heat properties," Alcoa was inspired by the potentials of "all-metal wall construction."[459]

Wallace Harrison was considered an ideal candidate to assist Alcoa in the development of such a thin-aluminum wall when an architectural sales meeting in 1945 at Seaview Country Club in Absecon, New Jersey was held to consider ways of promoting the sales of spandrels and metal-clad curtain walls.[460] Minutes before the meeting stated, "The opinion of all present was that Alcoa should select two outstanding architects to study and develop details as to how such an idea as cast aluminum panels backed up with "Vermiculite" or other back up materials would be applicable to multi-story building, not only for spandrels but for the entire façade. Mr. Wallace Harrison of New York, who incidentally is the Rockefeller architect, and Mr. Albert Shaw of Chicago, both well-known, highly respected architects were suggested. The Pittsburgh Architectural Division proposed to take this matter up with Management and encourage such a procedure to go ahead immediately…. If Mr. Harrison and Mr. Shaw were retained to do the work on this metal clad building, we would expect that they would have the close cooperation of the Research Laboratories, the Development Division and the Engineering Division here at Pittsburgh in the designing of the wall panels, anchorage, joining, etc."[461]

Perhaps Harrison's name emerged because he was well known by Alcoa as a leading architect on the Rockefeller Center Building, constructed between 1930 and 1939, with Raymond Hood as principal architect. The architects specified 4488 cast aluminum spandrels for

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459 *Aluminum as an Architectural Metal* (Pittsburgh: Aluminum Company of America), p. 7, box 104, Records of the Aluminum Company of America.
460 The meeting was held March 12-14, 1945.
461 *Summary of the Minutes of the Architectural Sales Meeting* (Pittsburgh: Aluminum Company of America, March 12-14, 1945), pp. 12-13, folder 1, box 117, Records of the Aluminum Company of America.

this building.[462] Victoria Newhouse writes of Alcoa's first encounter with Harrison, recounting Alcoa's New York City salesman Fritz Close's successful sale for Alcoa of aluminum for this project. The co-founder of Alcoa, Arthur Vining Davis Jr. had approached John D. Rockefeller Jr. about the prospect for using aluminum on the proposed high-rise. Davis was rebuffed, and ordered Fritz Close to try another way. Newhouse interviewed Close, who explained that he went to Harrison's waiting room and waited for his opportunity to approach Harrison as he walked through the lobby on his way to work in the morning.[463] Close got his meeting with Harrison, and after the owner's representatives approved, he sold 3 million pounds of aluminum for the Rockefeller Center Project.[464]

Soon after the sales meeting at Seaview Country Club, it was announced that Alcoa hired Harrison for a dramatic new project. Wallace Harrison, by 1941 working with Max Abramovitz, produced designs for a project that was never built — a new aluminum-clad sales office building in New York City. The *New York-Herald Tribune* announced in April 1946 that it "will be the first building in the world…to employ a new type of construction embodying an aluminum-faced curtain wall….Plans announced for the structure, designed as a dramatic demonstration of all the proved architectural applications of aluminum, have already stirred considerable comment in architectural circles, which believe it may exert a profound influence on future construction."[465]

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[462] *Design Considerations & Installation Practices for Spandrels* (Pittsburgh: Aluminum Company of America), p. 5, folder 11, box 1130, ibid.

[463] Fritz Close, February 2, 1982, cited in Victoria Newhouse, *Wallace K. Harrison, Architect* (New York: Rizzoli, 1989), 146-47.

[464] Smith, *From Monopoly to Competition,* 337. The decision to use aluminum spandrels was ultimately approved by John D. Rockefeller Jr. after Todd & Brown, Managers for the Rockefeller Center development hired "professors and metallurgists" to "carefully examine existing aluminum installations to render a report on the advisability of using aluminum." See C. E. Magill, Aluminum Company of America, to Zantzinger, Borie & Medary, Architects, July 9, 1932, p. 5, folder 4, box 104, Records of the Aluminum Company of America.

[465] Harrison & Abramovitz also worked with their structural engineer, Oscar F. Wiggins. See "Alcoa Outlines Plan for Tower on Park Avenue," *New York Herald Tribune,* April 14, 1946.

While the New York City tower was squarely in the spotlight of publicity, another opportunity emerged in the 1940s for Alcoa to "work out the bugs"[466] of an exterior aluminum-cladding system that was applicable to use on a high-rise. In 1955, at a symposium on metal curtain walls, an Alcoa executive reflected on a such an opportunity: "…without fanfare or publicity, we built a small four-story administration building for our Davenport Works. While this work was going on, we tried to determine what our problems were and what we would ultimately have to solve."[467] Well before construction commenced on the Davenport Works Administration Building (1949), Alcoa had tested an aluminum wall assembly with Underwriters Laboratories (UL), anticipating full approval on February 8, 1945, for a cast aluminum wall panel assembly with Vermiculite backup, granting approval for a four-hour fire rating.[468] As discussed in the previous section, *Standards and Codes Regulate Aluminum Cladding,* this was a crucial milestone on the route to employing aluminum cladding on high rises in the context of strict fire barrier code regulations in US cities. While Alcoa knew that the use of Vermiculite behind an aluminum panel would pass the UL test, it was not deemed ready for use on buildings. This was an experimental assembly, not a deployable system.[469] The firm of Harrison &

466 "Work out the bugs," a phrase used in Alcoa's *Unfinished Rainbows* promotional TV drama, constitutes the mythology of Alcoa's burden to marshal resources to solve problems for downstream manufacturers. As Stuckey explains, "…during the aluminum industry's first fifty or so years of large-scale operation, the primary producers integrated downstream as a means of finding new applications for the metal and to demonstrate to potential user industries that such applications were economical." See Stuckey, *Vertical Integration and Joint Ventures in the Aluminum Industry,* 216. More broadly in the materials markets, Corey finds producer development of end-use products as a service to manufacturers is not uncommon: "…it follows that the materials producer will undertake, when it is practical to do so, to complete in his own research laboratories all the technical work on the new product and on the process by which it is made." See Corey, *Development of Market for New Materials,* 238.

467 *Metal Curtain Walls,* 160.

468 *Summary of the Minutes of the Architectural Sales Meeting,* 11.

469 Alcoa maintained that a commercially viable system would need both approval of Underwriters Laboratories and be deemed "acceptable to the various A.F. of L. Unions" (American Federation of Labor Unions.) See Ibid., 12.

Abramovitz was hired in 1946[470] to study this problem and commissioned in 1948[471] to design the Davenport Works Administration building — part of a larger rolling mill complex covering 47 acres,[472] to roll large plates of flattened aluminum.[473]

Reflecting on his involvement with the project, Max Abramovitz, in a speech to the Detroit Chapter of the American Institute of Architects, acknowledged that the aluminum wall on Davenport's administration building was not the first use of aluminum in this form, referencing iron and steel predecessors, as well as "the more recent use of metal panels in shop fronts."[474] Undertaking a study of these past uses, "of metal in buildings, airplanes, ships and railroad cars" Abramovitz said, "Our research was extensive."[475] In effect, the firm of Harrison & Abramovitz became a research and development arm of Alcoa. But, it was research and development undertaken by an outside design firm, exemplifying the disciplinary overlap that characterized the enterprise of aluminum product development.

The panels were not solely devised by the architects. As noted in the minutes of the 1945 sales meeting at Seaview Country Club, Alcoa planned to work with the architects, who "would have the close cooperation of the Research Laboratories, the Development Division and the Engineering Division…in the designing of the wall panels, anchorage, joining, etc."[476] Alcoa had expertise in the casting process in which aluminum is poured into a mould of sand, preshaped to

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[470] John Harwood and Janet Parks, *The Troubled Search* (New York: Miriam and Ira D. Wallach Art Gallery, Columbia University, 2004), 46.
[471] Ibid., 48.
[472] "Aluminum: New ALCOA Administration Building at the Davenport Plant is a Gleaming Package of the Many Mature Uses of this Metal in Building," *Architectural Forum,* June 1949.
[473] Aluminum Company of America Public Relations Department, *1949 Developments in Aluminum*, p. 1, folder 2, box 50, Records of the Aluminum Company of America.
[474] Max Abramovitz, "Of UN, Alcoa Bldg. and Davenport," (lecture, Detroit Chapter of the American Institute of Architects, February 9, 1954) p. 4, folder 23, box 6, Max Abramovitz Architectural Records and Papers Collection (Department of Drawings and Archives, Avery Architectural and Fine Arts Library, Columbia University, New York, N.Y.).
[475] Ibid., 5.
[476] *Summary of the Minutes of the Architectural Sales Meeting,* 13.

the corrugated pattern that would be employed on the wall panel. Harrison & Abramovitz explained that they had several goals for the panels: "(1) it was dry, (2) it was light, (3) it was a large unit (4) it contained fewer joints, (5) it was prefabricated, and (6) it eliminated scaffolds." Abramovitz reported that all the goal were met by "a large panel two men could handle with all connecting flanges cast thereon which could be anchored to the wall from inside the building without any exterior scaffolding and need only be bolted in place."[477] Installed on the building were 962 cast aluminum panels, with a dimension of 4'x7' and "weighing a mere 162 pounds each."[478] Summarized Abramovitz, "The solution was simple. . . . The building was successful and functions well."[479] Following the UL test of a previous iteration, these panels, as prefabricated, mass-producible products conducive to selling, were subject to a UL test,[480] and found to exceed the four-hour fire barrier test as was the requirement for most city building codes — the market Alcoa aimed to penetrate for aluminum cladding.

Harrison & Abramovitz as a vector to the marketing of aluminum cladding

The architects brought to the collaboration not only their research and design expertise, both functional and aesthetic, but also knowledge of the architectural process and important social and professional connections to advertising mediums and potential clients. Harrison & Abramovitz became a vector of aluminum cladding development for Alcoa, by which the firm gained commissions in which they specified aluminum cladding derived from Alcoa's smelters. In addition to functional characteristics, the architecture firm and Alcoa had aesthetic

[477] Abramovitz, "Of UN, Alcoa Bldg. and Davenport," 6.
[478] *1949 Developments in Aluminum,* 2.
[479] Abramovitz, "Of UN, Alcoa Bldg. and Davenport," 7.
[480] *1949 Developments in Aluminum,* 5.

requirements. Abramovitz said that the aluminum panels provided “limitless possibilities for aesthetic treatment.”[481] Architecture journals, always keen to report the activities of well-known architects, but also keen on reporting new developments in building technology, wrote articles bringing the “Davenport Story” to the broader community of architects and builders. Photos of the finished building commissioned by Harrison & Abramovitz appeared in an *Architectural Forum* article in 1949 in which the title of the article cast the project in aesthetic terms: “New ALCOA administration building at the Davenport plant is a gleaming package of the many mature uses of this metal in building.”[482] The article described the technical and functional details of the panels as well as the aesthetic qualities: “These cast panels were ball-burnished, then the protruding faces were highlighted on a polishing belt, so when the recessed portions do weather to a darker tone, the outstanding strips will be in some contrast.”[483] An attractive aesthetic was important to Alcoa as a benefit of aluminum, reflected in the company’s publicity statement about the wall, describing the panels as “a highly decorative, curtain wall.”[484] As with many publications that covered Alcoa, the company purchased reprint and distribution rights to the article. Combined with public releases by the Public Relations Department, in which the project was promoted as a “new and revolutionary type of aluminum curtain wall construction for office and institutional buildings,”[485] publicity about the building was spread to a wider audience.

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[481] Abramovitz, “Of UN, Alcoa Bldg. and Davenport,” 7.
[482] “Aluminum: New ALCOA Administration Building at the Davenport Plant is a Gleaming Package of the Many Mature Uses of this Metal in Building.”
[483] Ibid., 3.
[484] *1949 Developments in Aluminum,* 1.
[485] Ibid.

Both the architect and Alcoa benefitted from the publicity. Yet exactly who devised the wall was portrayed in different terms. Alcoa's direct publicity declared it was a project "Developed by Alcoa in collaboration with leading architects and builders,"[486] while *Architectural Forum* placed design agency squarely with the architect, declaring, "This wall is Harrison & Abramovitz's venture into prophecy." The prophecy that Harrison & Abramovitz were hired by Alcoa to fulfill was the use of aluminum cladding on high-rise office towers, "hailed as the forerunner of a new and economical building trend,"[487] as promoted by Alcoa, hoping for an outlet to sell aluminum measured in tons. As the Davenport project was nearing completion, Alcoa began publicizing its collaboration with architects on the production of aluminum cladding. A 1948 advertisement frames the introduction of Alcoa's Wall Panels in terms of aesthetics and economy: "Now you can improve appearance and reduce construction costs…"[488] A 1949 advertisement in Architectural record states, "It (an illustrated aluminum wall) was designed with the assistance of one of America's leading architects."[489] Alcoa portrayed this design collaboration as their research project: "This is one of many Alcoa research projects now under way in the building field."[490] As far as Max Abramovitz was concerned, however, Alcoa approached his firm to do the research: "But with the end of World War II we were asked to make a study of the potential of metal buildings by the Aluminum Company of America."[491] Abramovitz explained in 1955 at the metal curtain walls conference why he was open to engaging in collaborative research with manufacturers: "The architect has been an ally in this research because he cannot shut his eyes to the world around him. We are all different. We

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486 Ibid.
487 Ibid., 2.
488 "Alcoa Economy Castings for Exterior Wall Panels," 159.
489 "Fact supporting wall under construction," advertisement, *Architectural Record,* April 1949.
490 Ibid.
491 Abramovitz, "Of UN, Alcoa Bldg. and Davenport," 5.

do the kinds of things we do because we enjoy them. Some of us like to build, some like to do new things, and some of us like to express our own personalities. I think the architect in this picture is probably just another egoists (sic) who wants to express himself in some satisfying way."[492] Abramovitz was an advocate for the influence of the architect over the increasing standardization of architectural components. He was well aware of the fabrication processes that produced standardized components and the debate at the symposium about the prohibitive cost of producing custom dies to stamp out panels on smaller jobs, while larger jobs, because of the number of panels and the amount of aluminum used, found the manufacture of metal panels more affordable. But he was also optimistic that the architect could influence the manufacturers: "I think there is opportunity here for someone to give those companies a shaking up so that we can get more than we have today. We architects will always be looking for something better and more attractive with which we can do our work."[493] Neither Alcoa nor Harrison & Abramovitz exhibited any skirmishes over research territory. The casting of research in different manners without conflict over territory by both sides reveals how both benefitted from the relationship.

Aluminum cladding conceived as a linear evolution

Alcoa's connection to the architects bore fruit when Harrison leveraged his social and professional connections to the Rockefeller family, who bequeathed the land to New York City upon which the headquarters for the United Nations Secretariat (1948-52) would be built. Max Abramovitz described the UN building as constituent with a linear evolution of the aluminum curtain wall, in which, as a collaborator with Alcoa, "they wanted us to do a compatible solution

[492] *Metal Curtain Walls,* 44.
[493] *Metal Curtain Walls*, 46.

with less metal,"[494] exploring how aluminum could be deployed in the more popular glass and metal-frame curtain wall. Abramovitz described the discoveries made on the Davenport project informed the curtain wall of the UN building: "We used some of our previous knowledge — (1) we minimized scaffolding and worked from inside the steel skeleton, (2) we pushed the size of the panel," as he described, to span from floor to floor, rather than as a wall-spandrel, as it had been deployed in Davenport. Once again, speed was stressed. Abramovitz wrote, "Speed of erection was remarkable. We closed in the building 3 months ahead of schedule."[495]

Pushing further: The Alcoa Building and stamped-aluminum

Alcoa soon found an outlet upon which to deploy the Davenport wall on the Bradford Hospital (1951), designed by Thomas K. Hendryx, transferring the wall assembly details that enabled fire resistance, but publicizing its selection by the hospital board "because of its modern beauty and easy maintenance."[496] This theme, aesthetics and economy, was intimately tied to aluminum as constituent to its properties in much of the widely distributed marketing materials in many domains by both Alcoa and Reynolds. Abramovitz described the linear evolution of aluminum cladding as moving to fulfill these two purposes. He first discussed economy: "Now, ALCOA came back to us and satisfied with their first experiment in a low office building, we were asked to push further in the panel construction field on a tall office building they were planning for their own use….This time we settled on the thin sheet and the stamping idea. This naturally received the encouragement of ALCOA for it would certainly be a more economical

[494] Abramovitz, "Of UN, Alcoa Bldg. and Davenport," 7.
[495] Ibid., 9.
[496] *Architectural Achievements: Bradford Hospital.*

use of the metal and this might lead to a more economical method of producing the final wall."[497] He then described aesthetics: "We treated the aluminum for tone value, we shaped the stampings with an inverted pyramid pattern for strength and appearance…"[498] It should be noted that aesthetics were often paired with functional outcomes in marketing material. Abramovitz certainly made the excuse for aesthetics in terms of function — the panels' structural characteristics.

While the Davenport building and the Bradford Hospital had employed cast aluminum panels, for purposes of aesthetics and economy, Alcoa and Harrison & Abramovitz sought use of stamped-aluminum sheets in the design for a new tower headquarters Alcoa planed for downtown Pittsburgh. Less aluminum would be consumed per panel, while covering the same amount of area. To develop the structural and tonal value, as with cast aluminum, engineering and technical expertise was led by Alcoa staff. The diamond pattern as it was called, but actually resembling an X shape, however, seems to have originated in the architect's office. In an interview conducted by Victoria Newhouse, author of *Wallace K. Harrison, Architect,* Harrison explained that an architect of his office, Oscar Nitzchke had designed it. Interviewing Nitzchke, Newhouse writes, "Nitzchke recalled that the diamond design he developed for the Alcoa Building came from a drawing he had done while he was enrolled as a student at the Ecole des Beaux-Arts in the 1920s. It was to be executed in panels roughly six feet wide and twelve feet high (one floor), stamped from aluminum sheets one-eighth of an inch thick."[499] Explaining the pattern, Harrison & Abramovitz once again justified aesthetics in terms of functional needs: "The panels, anodized gray, are stamped with an inverted diamond pattern which gives them added

[497] Abramovitz, "Of UN, Alcoa Bldg. and Davenport," 9.
[498] Abramovitz, "Of UN, Alcoa Bldg. and Davenport," 10.
[499] Oscar Nitzchke interview, quoted in Newhouse, *Wallace K. Harrison, Architect,* 146-47.

strength and also makes them self-cleaning. The pattern makes for a rich, textured wall, an overall visual effect which changes as the observer or the sun does."[500]

Who exactly designed what element of the overall panels seems to be lost in the collaborative mix of the architects and engineers assigned to the task by Alcoa. Yet, many collaborators had a hand in the development of the panel. While the architects designed the pattern, mindful of structural characteristics and applying to the panel previous knowledge gained from experience working with aluminum, Abramovitz wrote that Alcoa "developed"[501] the panel into mechanically stamped sheets.

Harrison & Abramovitz were not the only collaborators with Alcoa in the development of the panels. Promotional material for the Alcoa Building explained that such panels, spanning from floor to floor as one stamped sheet, were larger than had been previously attempted. Alcoa's "designers talked with production men" employed at the Pullman Standard Car Manufacturing Company, in Hammond, Indiana.[502] Pullman developed customized equipment and produced prototypes. Alcoa summarizes, "Alcoa's distinctive lightweight curtain wall was the result."[503] Another collaborator was the Stolle Corporation, of Sidney, Ohio. Added to the stamped panels was an electrochemical finish, to develop a protective, oxide coating over the surface. Added to this was a "silicone bearing alloy liner in the sheet itself," combined with the electrochemical finish (anodizing) yielded the "tone value" as described by Abramovitz, or the

[500] Description of significant firm projects, p. 10, folder 3, box 1, Abramovitz Architectural Records and Papers Collection.
[501] Abramovitz, "Of UN, Alcoa Bldg. and Davenport," 9.
[502] *Aluminum on the Skyline,* 9.
[503] Ibid.

"permanently iridescent gray color," in the words of Alcoa.[504] Alcoa would later market this color as "Alcoa Architectural Gray 2020."[505]

Alcoa's collaboration with Harrison & Abramovitz to design panels for the Alcoa tower led to standardization of design into a derivative panel that could be selected out of a catalog and which underpinned future designs by Harrison & Abramovitz. These architects went on to design several panels with the ornamental, creased-aluminum treatment. They envisioned the panels as a standardized component, where design creativity was boxed inside a particular panel, but the panel itself was one of hundreds to cloak a building.

Probing deeply the development process of the Alcoa Building panels reveals that their distinctive appearance was undoubtedly the outcome of a collaborative effort. Design agency did not lie primarily with the architect. The standardized components that gained widespread use in the postwar period, as exemplified by the development of the panels on the Alcoa Building, were a result of transversal relationships entailing overlapping fields of expertise, indeterminate boundaries between disciplinary domains such as research and design, and often the input of multiple collaborators.

The question of who designed panels is important because it challenges the conventional notion of authorship of a building. Certainly, the architect has historically taken the lead on building design in the twentieth century. Architects are often given wide latitude in setting the overall design scheme, and are sometimes given the opportunity to design details down to the furniture and doorknobs. But architects, in practice, widely select building systems, cladding systems, predefined finishes and colors out of a catalog.

[504] Ibid.
[505] *Architectural Achievements: Alcoa Building* (Pittsburgh: Aluminum Company of America, 1954), folder 1, box 126, Records of the Aluminum Company of America.

The marketing initiatives of aluminum producers and manufacturers were multifaceted, spanning from simple ads in magazines to more complex initiatives deploying salesmen and dealer networks. The collaboration between producers or manufacturers like Kawneer and Alcoa show that they were eager to publicize these collaborations as yet another marketing initiative. Examining the history of aluminum cladding shows that manufacturers and their design and development teams have had great influence on twentieth-century architecture and played a crucial role in the development of architectural modernism.

CHAPTER 4: MARKETING PROPERTIES AS ADVANTAGES

Alcoa, Reynolds and Kawneer all believed that aluminum possessed immensely advantageous properties bestowing utility to the material, therefore granting it great profit potential. As companies responsible to stockholders, they were driven by capital accumulation. Within a context of capitalism, and, after World War II, an increasingly consumer-based economy in the United States, these companies marketed the properties of aluminum in terms resonant with a capitalism. "Lightweight," as a declared property of aluminum, was for instance translated into a benefit: easier to handle, therefore cheaper and faster to erect as cladding. "Resistance to corrosion," for example, was translated to longer-lasting, therefore, although more expensive than steel, cheaper over the long-term because it does not rust. The term used in the previous sentence — "although" — is important because aluminum did have disadvantages in the context of capitalism. Pound for pound it was more expensive than steel, often by a factor of ten, throughout much of the twentieth century. Aluminum also has the "disadvantage" of being gray — and only gray. Or, perhaps it was an advantage. Marketing and manufacturing manipulated the aesthetics of aluminum into an advantage in the context of a consumer-oriented, postwar society — sometimes by anodizing or painting color over the top of an aluminum surface, and sometimes by simply reframing gray-as-beautiful.

Underpinning these company's belief that aluminum had advantages was the belief that aluminum possessed agency, or the ability to "do."[506] Architects commenting on this new material available to them often took a mystical approach, claiming aluminum as holding an ability to "speak," that it has a "spirit," or "behaviors." Alcoa, Reynolds and Kawneer, on the

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[506] *Reynolds Aluminum and the People Who Make It*, 2. As an example, Reynolds stated that aluminum held "potential applications" due to its inherent properties. Also see Scarlott, "The Bright Picture of Aluminum," 5.

other hand, persistently articulated that aluminum possessed the ability to modernize — that through its very properties, it could modernize the commercial landscape at large. Underpinned by these beliefs, Alcoa, Reynolds and Kawneer devised marketing programs that promoted aluminum as modern, progressive and portending a great future, while characterizing the age from which aluminum emerged, and the material itself, as modern.

The properties of aluminum

When producers declared aluminum as lightweight, they understood it in relationship to other metals. By their measurements, steel was heavy, aluminum was light. Scholars and reporters writing about aluminum, and promotional materials explaining the properties of aluminum, working within the epistemological regimes of material science, have attempted to escape the value-judgement conundrum by describing it in terms of *specific gravity*. Aluminum has a specific gravity of 2.7. This becomes meaningful when understood in relationship with the specific gravity of steel, for instance, which is 7.8.[507] One of the first descriptions of the metal was recorded by Frederick Wohler in 1845. While working at the University of Gottingen, he measured the aluminum he had succeeded in producing as, “big as pinheads.” He further described the metal as “light, stable in air, and can be melted with heat from a laboratory blowpipe.”[508]

In literature published about aluminum or by aluminum producers, the metal is variously described most often using the terms “properties,” “qualities,” or “characteristics.” For instance, a 1938 report from the Statistical Department of a brokerage firm analyzing Alcoa used the word

[507] For comparison, the specific gravtity of the following metals: 7.1 for zinc, 8.9 for copper, and 11.3 for lead. Bowley, *Innovations in Building Materials,* 308.
[508] *Aluminum: How It’s Made and Where It’s Used,* 9.

“properties,”[509] while Reynolds conceived of aluminum having “qualities.”[510] Walter Gropius also used this descriptor, saying the architect “should be made familiar also with the specific qualities of aluminum."[511] Choosing a form of “characteristics,” combined with “properties,” the US government explained that “aluminum is characterized by lightness, corrosion resistance, good thermal and electrical conductivity, good reflection of light and radiant energy, and nontoxicity, and by nonmagnetic and nonsparking properties.”[512]

Other bodies of literature have described aluminum in terms of its microscopic configuration. In *A History of Metallography*, Cyril Stanley Smith describes metals in general as “polycrystalline in nature, that is, they consist of hosts of very tiny crystals packed together to fill space.”[513] An article in *Review of Reviews* examining the role of research in the aluminum industry explains the microscopic structure of aluminum in analogous terms, “Like virtually all metals, pure aluminum consists of a great mass of microscopic crystals matted together and interwoven like wool fibers in field or like the grains of minerals in granite.”[514] Whether understood as crystals, or fibers or grains, through comparison with other metals or through the rhetorical device of analogy, aluminum was understood and communicated to readers in publications about aluminum always in relationship to a referent. Producers understood such referents as underlying a more-marketable construct — advantages.

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[509] Statistical Department, A *Study of Aluminum and the Aluminum Industry,* (New York: Shearson, Hammill & Co.), p. 7, folder 5, box 51, Records of the Aluminum Company of America.
[510] *Reynolds Aluminum and the People Who Make,* 2.
[511] Peter, *Aluminum in Modern Architecture Volume I,* 228.
[512] *Materials Survey: Aluminum,* VI-11.
[513] Cyril Stanley Smith, “Texture of Matter,” quoted in Bennett, *Vibrant Matter,* 58. Bennett understands the polycrystalline topology wherein “a metallic vitality…can be seen in the quivering of these free atoms at the edges between the grains of the polycrystalline edifice.”
[514] Free, “How Research Created the Aluminum Industry,” 5.

The claimed advantages of aluminum

While Reynolds promoted aluminum as holding qualities, they also promoted aluminum as possessing a marketable condition which they called "advantages." Reynolds understood the epistemology of aluminum in terms of layers.[515] At the bottom was the material itself, locked away in the earth, simultaneously more abundant than any other metal, but inaccessible to man "throughout all the centuries."[516] After "scientists" isolated the metal from its position bound to the earth, the next layer of the epistemology, its "remarkable qualities" were revealed. These qualities were listed: Lightweight, strong, non-toxic, waterproof, resistant to corrosion, highly conductive and non-magnetic, malleable, and "permanent natural beauty."[517]

The next layer in the hierarchy consists of aluminum's advantages. Here is where the material, formerly locked away in clay, meets "reality." Aluminum held "potentials" and Reynold's brought them forth: "The imagination and foresight of research teams at Reynolds and other companies have consistently turned potential application of aluminum into reality." Emerging into reality, these "remarkable qualities" became advantages only when combined with "the drive, innovation and determination of men in the industry," making "the mid-Twentieth Century the 'Age of Aluminum.'"[518] The advantages of aluminum cladding were promoted as (1) Weight saving. (2) Floor space saving, because of thinner walls. (3) Speed of erection.[519]

Finally, the top layer in the hierarchy is aluminum's value. "It may be modern man's most valuable metal."[520] Thus, from qualities, to advantages, to value, aluminum was understood

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[515] *Reynolds Aluminum and the People Who Make It,* 2. Reynolds employed the layer metaphor in the statement, "Behind these advantages lie the remarkable qualities of the metal itself."
[516] Ibid.
[517] Ibid., 3.
[518] Ibid., 2.
[519] Peter, *Aluminum in Modern Architecture '58,* 72.
[520] *Reynolds Aluminum and the People Who Make It,* 3.

as important, and valuable because it was useful in the context of capitalism, and especially, as Reynolds understood, "in the highly competitive world of consumer marketing," the world of an expanding consumer-oriented economy in the postwar United States.

Value derived from advantages in the context of capitalism

Producers such as Reynolds understood that aluminum must be made appealing and that in the context of capitalism, such appeal rested on its perceived value. Value, as Georg Simmel has noted, is not an inherent property of objects, it is instead a judgement made about them.[521] Value was an idea they could attempt to portray, and they claimed aluminum had value in three main ways. They promoted aluminum in terms of (1) up-front cost relative to other competing materials and aluminum assemblages, such as aluminum cladding, (2) long term cost of aluminum cladding when accounting for other variables, (3) "intangible benefits," such as aesthetics. The arguments they posed to support each of these value propositions were then aligned with ideologies producers held about the agentic capacity of aluminum.

Value derived from short-term costs

Producers, manufacturers as well as third parties asserted that aluminum could be, under given circumstances, advantageous in reducing immediate costs expended on the construction of a building. These are variously known as up-front costs or short-term costs. Arguments about the virtues of prefabrication entered into the calculus of the value perceived from costs immediately reduced in comparison with alternative modes of construction. Max Abramovitz defended prefabrication of metal wall panel systems, saying, "We will get more construction for our

[521] Georg Simmel, *The Philosophy of Money* (London: Routledge & Kegan Paul, 1978), 73.

money,”[522] while the US Government identified the conductivity of aluminum to being fabricated off-site as one if its virtues.[523] Kawneer claimed to dominate the store front market because cheaper cost of components afforded by prefabrication and standardization was valued, “because architects and builders have discovered that our door gives them a quality installation at a lower cost.”[524] Prefabrication also shifted some of the labor to other sites, or, being replaced by mechanical processes, eliminated it altogether, thus precluding payment of wage labor in those instances. Scaffolding was precluded in the Davenport wall and replicated as a process in all aluminum clad high rises following. Eliminating scaffolding meant eliminating the labor required for its erection and disassembly. In comparison with other metals such as steel, aluminum was also promoted by Reynolds as easily workable allowing ease of bending, neater sheet metal work, less wear on tools, and better operation in applications.[525] all functions that were endorsed as labor-saving. Metal curtain walls were compared with masonry, pointing out the labor required by masons as a disadvantage. With metal curtain walls, "No time is lost because of cumbersome procedures, such as usually prevail in elevating heavy materials in small units. It is not necessary to allow time out for mortar to set; nor is it necessary to protect from freezing the metal and glass the gaskets and putty."[526]

Another argument posed about its advantages centered on speed of erection. Industry promoters as well as architects and builders maintained metal curtain wall systems were faster to erect than other cladding systems, even on entire building façades.[527] Promoting this speed was a

[522] *Metal Curtain Walls,* 45.
[523] *Materials Survey: Aluminum*, VIII-9.
[524] Church, “The New Kawneer,” 7.
[525] *A-B-C’s of Aluminum*, 31-54.
[526] *Metal Curtain Walls,* 100.
[527] *Metal Curtain Walls,* 149. “It is our opinion that erection time can be saves on most buildings by the use of curtain wall construction.”

staple of promotional material in 1953: "Modern Miracle: New York Skyscraper Covered With Aluminum Skin in 6-1/2 Days."[528] This feat was dramatically surpassed in 1954: "Building Completely Sheathed With Aluminum Panels in 9-1/2 Hours"[529] This speed was enacted by forty men, aided by the elimination of scaffolding, the use of a lifting system to raise each panel, and the attachment mechanisms devised for each prefabricated panel that allowed each panel to be bolted to the building frame. Alcoa summarized it thusly, "It was all possible because of Alcoa aluminum."[530]

In addition to speed, the relative light weight of aluminum in comparison with other materials such as steel, masonry walls or stone walls was promoted as an advantage. Advertisements and promotional brochures exclaimed the virtues of aluminum in place of an imagined alternative: ""If the Alcoa Building had used conventional construction, it would have weighed in at an additional 10,340 tons!"[531] Reynolds echoed the assessment, explaining that because it is light, it cuts structural steel requirements by as much as 40 to 50 percent in comparison with heavier cladding systems that might put a heavier burden on the frame, thus necessitating larger steel members.[532] Such weight savings was translated directly in to economic terms, as Bowley writes, "It is claimed, for instance, that the use of aluminum cladding instead of stone for the Laurentien Hotel in Montreal resulted in a saving of $30 thousand, owing to reduction in weight of the structure."[533]

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[528] "Modern Miracle." Building referenced is the 99 Park Avenue Building (1954), New York, Emery Roth & Sons, architect.
[529] "Building Completely Sheathed with Aluminum Panels in 9-1/2 Hours," *The Alcoa News,* September 14, 1953, p. 4, folder 5, box 152, Records of the Aluminum Company of America. Building referenced is the 460 Park Avenue Building (1954), New York, Emery Roth & Sons, architect.
[530] Ibid., 5.
[531] *Aluminum on the Skyline,* 16.
[532] Peter, *Aluminum in Modern Architecture Volume I,* 136.
[533] Bowley, *Innovations in Building Materials,* 309.

It wasn't just economic advantages that were admired, for architects saw potential for new design effects. Bruce Goff, Richard Neutra, Carl Koch and Welton Becket, in a series of interviews funded and facilitated by Reynolds, lauded the opportunities for expression afforded by the lightness of aluminum. They anticipated freedom from the burden of heavy materials. Neutra believed lightness was "descriptive of our endeavor in architecture,"[534] echoed by Goff who said, "I think it is much the same difference between an elephant and a dragonfly where we think of architecture of the past being more of a weighty matter and today's as being light."[535] Welton Becket analyzed the virtues of aluminum in more ephemeral terms, stating that the elimination of weight "permits the architect to design with a more airy feeling and gives him an opportunity to vary building faces and spandrels."[536]

Value based on long-term costs

An economic reality confronted by producers was the relative expense of aluminum in comparison with alternatives, whether they be steel, wood or masonry. For this reason, producers were quick to focus less on the cost of aluminum, but more on how it yielded savings over time. They argued for its virtues, given enough time, by claiming it required less maintenance, and allowed more rental income because the exterior wall could be thinner. Each of these arguments were positioned relative to the economic conditions that set masonry, despite its weight disadvantage, and despite yielding a thicker wall, as the wall of cheaper initial cost than aluminum cladding. Wrote the author of a Reynolds-funded retrospective of aluminum architecture of the 1950s, "It is clear that all the…advantages…must express themselves in terms

[534] Peter, *Aluminum in Modern Architecture Volume I,* 228.
[535] Ibid., 230.
[536] Ibid., 240.

of lower costs, in order to justify the application of these metal walls. The fact is, that at the present time metal curtain walls are costlier than masonry walls."[537] In response, producers promoted the lower maintenance costs of aluminum, no matter the material. In comparison with wood walls, Reynolds declared, "The first cost of the installation is the last cost…because aluminum requires no protective coating, it is fireproof, rustproof and impervious to rot, vermin and termites."[538] Reynolds and Alcoa put forth another argument which focused less on saving money, and more on making money. This was the prospect of increased rental income for a building owner who installs aluminum cladding, rather than masonry. Alcoa devised an equation to claim empirical proof of this prospect, providing an example:

"I = (A).33x(P)400x(N)30x(R)$5.00 = $19,800.00 Additional rental income."[539] This was, of course, a hypothetical scenario, which was echoed in claims associated with a proposed apartment tower profiled in a 1930 Architectural Record article, "The First All-Metal Apartment Building," which claimed, if it were built, aluminum sheathing would yield savings of "14% of the net rentable area" in comparison with brick walls.[540]

Value based on aesthetics

Aesthetic consideration was given, as a priority, to the diamond X pattern on panels cladding the Alcoa Building, where careful consideration was given to the resultant tone of gray: An "iridescent gray color"[541] in which the oxidized surface contributes to the opinion of many

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[537] Peter, *Aluminum in Modern Architecture '58,* 72.
[538] Henry L. Charlton interview, "Invite Public to Display by Reynolds Here," *Herald,* April 1947, Kawneer File.
[539] *Architectural Achievements: Republic National Bank Building* (Pittsburgh: Aluminum Company of America), folder 16, box 126, Records of the Aluminum Company of America. Where I = Additional yearly rental income (dollars); A = Unit area added to net rentable floor area by thin wall construction (sq ft); P = Perimeter of each floor (lin ft); N = Number of floors (units) R=Rental Rate (dollars per sq ft per year.)
[540] Robert L. Davidson, "The First All-Metal Apartment Building," *Architectural Record,* July 1930, 3-9.
[541] *Aluminum on the Skyline,* 9.

architects, according to Alcoa, of being “one of the most beautiful” office buildings.[542] Alcoa marketed this as a product: “Alcoa Architectural Gray 2020.”[543] Paul Weidlinger, a contributing author in the Reynolds-sponsored *Aluminum in Modern Architecture ’58,* maintained that the aesthetics of aluminum yield publicity value for the owner. If the building is attractive enough, employing aluminum, it can become a “silent salesman” for the owner — a representative selling the product or ideology of the owner or occupants, without uttering a word. Weidlinger wrote, “In the American economy a considerable dollar value is assigned to the intangible benefits which arise out of the favorable publicity gained by the pleasing and in a few instances aesthetically highly satisfactory appearance of these new types of construction.”[544] Such intangible benefits in the form of aesthetics were a leading characteristic promoted by Alcoa, Reynolds and Kawneer. Elaborate marketing schemes were developed to promote the aesthetic qualities of aluminum and aluminum cladding products, even while they promoted the products as imminently modern. For these companies, aesthetic quality, even decorative treatment, were not at odds with modernism. Where gray was exposed, it was promoted as beautiful. Reynolds wrote that it held an “inherent beauty” with a “sheen-like surface texture…it is the metal itself.”[545] In addition, anodizing and ceramic coatings allowed bright, vivid colors to be applied over the aluminum, which, after the process was understood to hold potential for mass-production, Alcoa, Reynolds and Kawneer began at once to market the advantages of color. As an advantage, color was described as easy to apply, durable and beautiful.[546]

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[542] Aluminum Company of America, 1953 Annual Report, March 1, 1954, p. 32, box 147, Records of the Aluminum Company of America.
[543] *Architectural Achievements: Alcoa Building* (Pittsburgh: Aluminum Company of America), folder 1, box 126, Records of the Aluminum Company of America.
[544] Peter, *Aluminum in Modern Architecture ’58,* 77.
[545] *Reynolds Aluminum: Its Important Role in Architecture,* (Richmond: Reynolds Metals Company, 1946), p. 2, box 50, Reynolds Metals Company Collection, series 3.1.2..
[546] *Aluminum: How It’s Made and Where It’s Used,* 38.

Beauty in particular was persistently hailed as an advantage in aluminum cladding applications. An aluminum modernism did not eschew ornamental treatment as is often claimed about postwar commercial modern architecture. Instead, "beauty" was promoted as an advantage of the metal in the way that it could attract customers and provide a public face for the merchant or corporation. Gabriel Esperdy, in her study of government funded "Main Street Modernization" programs during the 1930s, reveals the way store front renovation marketers adopted beauty regime n terminology to analogize the face of store fronts as a "face lift," among other terms.[547] These analogies were continued by marketers in the postwar period, revealing a modernism that emerged from Main Street that was marketed in aesthetic terms as an argument to sell aluminum – an appeal in which beauty was believed to be profitable.

Ornament justified in terms of function

Producers promoted aluminum as simultaneously modern and holding an aesthetic quality. Sometimes this aesthetic quality was explained as beauty, and sometimes it was explained as being carried by decoration or ornament. They promoted this confluence as a condition of aluminum screens, cladding, and store front products. However, aesthetic value in aluminum was consistently justified in terms of function.

Any aesthetic value of aluminum screens was justified in terms of its potential to serve a function. The South Bay Bank was clad with a screen of aluminum, described as "decorative grilles" which "gives the building an air of lightness both during the day and at night." The architect rationalized the decorative nature by asserting it allows "the imaginative control of illumination, both natural and artificial."[548] The Calcasieu Marine Bank, another building clad in

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[547] Esperdy "Modernizing Main Street: Everyday Architecture and the New Deal," 362.
[548] John Peter, ed., *Aluminum in Modern Architecture'60* (Richmond: Reynolds Metals Company, 1960), 46.

aluminum screen aimed for an aesthetic treatment and was justified, again, in terms of sun control, but an ancillary functional role was allowed for analogy: “"He chose gold anodized aluminum…because it would sparkle in the sunlight and bring to mind the associations of gold and silver with banking…By careful arrangement of the overhangs over the roof and use of porcelain aluminum panels, tinted glass and aluminum sunscreens, the sun is eliminated from all working areas during all working hours."[549] The design jury for an R.S. Reynolds Memorial Award was careful to bracket praise for the ornamental quality of an award-winning building in terms of function. The jury commented that “aluminum was not used as an ornament ‘but as an intrinsic element of shelter and acoustic reinforcement.’”[550]

Decorative joints and patterns

When referring to joints or patterns on aluminum cladding, any claimed aesthetic value of aluminum was likewise consistently justified in terms of function. The promotional emphasis on the Alcoa Building, however, was placed more on its aesthetic qualities than functional qualities. The Alcoa Building diamond X pattern was promoted as holding an aesthetic quality, but only in association with function. As Alcoa described it, “While providing some rigidity to the aluminum skin, the pyramid design was mainly specified for aesthetic reasons, since the panel, if desired, could have been fabricated in almost flat form to save six or more inches of wall thickness.”[551] Alcoa didn’t only think of the patterns in aluminum in terms of a more neutral description of aesthetics, implied as open to interpretation. Alcoa understood aluminum as holding potential for a decorative quality. Describing the simple striated pattern on the

[549] Ibid., 59.
[550] *Architecture in the News* (Washington, D.C.: The American Institute of Architects, 1959), 2.
[551] *Aluminum on the Skyline,* 9.

Davenport building, the panels were understood as part of a “highly decorative, curtain wall principle.”[552] As designer, Abramovitz agreed, declaring “"this type of casting provides limitless possibilities for aesthetic treatment."[553] In the same way Alcoa praised the decorative qualities of simple, striated aluminum, so too did Kawneer describe five variations on simple, linear patterns of extruded aluminum facing material. A magazine advertisement announced, “You can create new decorative effects with these new Kawneer interchangeable mouldings.”[554]

Predictably, Max Abramovitz, as architect for the Alcoa Building, expressed admiration for decoration in service to the building joint. Commenting at the Metal Curtain Wall Proceedings, he stated, "I feel that the joint can and will and should, in many cases, become very decorative. I don't see why it isn't as much an element of decoration and expression as the deformation of a panel. It can do many things that we, ourselves, have made it do purposely. We have exaggerated the joint, played with it to catch light and shadow. It can give you horizontal, vertical, or variable patterns. It should not be ignored as a possible element for improving or enhancing the appearance of a building. It has many, many possibilities."[555]

Kawneer also promoted aluminum in terms of aesthetics. Commenting on the San Francisco Equitable building, the panels, designed by W.B. Glynn and A.J. Loubet, successors to W.D. Peugh, architect, the building, “Making prominent use of stainless steel and aluminum,” provided “a refreshing dignity of design of design …. Offering the ultimate in aesthetic treatment.”[556]

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[552] *1949 Developments in Aluminum,* 1.
[553] Abramovitz, “Of UN, Alcoa Bldg. and Davenport,” 7.
[554] Kawneer Company advertisement, *Architectural Record,* September 1950.
[555] *Metal Curtain Walls*, 62.
[556] “Exterior Window-Wall Panels Withstand Man-Made Hurricane,” *Kawneer Front,* August 1954, p. 5, Kawneer File.

Not all in attendance at the proceedings, however, agreed. Victor Gruen criticized patterns, which he defined as ornamentation: "We have recently witnessed the introduction of ornamentation into metal curtain walls. This happens usually when the desire for more rigidity of metal plate can be met by stamping the metal into patterns. The results are buildings which give the appearance that they suffer from a skin disease, with large pimples, or structures which resemble sardine cans. It is, as if the old pressed sheet metal ceiling of the 5 & 10 cent store were moved into a vertical position and applies to the outside of structures. This utilitarian approach will not lead to a revival of richer building surfaces. Only if enrichment is the result of creative process, only if it has a spiritual basis, only if it is organically conceived will it celebrate its rightful return.[557]

Art as marketing medium for aluminum

Aluminum was promoted as possessing inherent properties, which were marketed as advantages.[558] One of these advantages were promoted as the aesthetic qualities of aluminum, often qualified as "beauty."[559] The aesthetic project of aluminum producers was a mode of controlling the image of aluminum in marketing material. One way in which aluminum producers marketed aluminum was by associating it with art. Art was associated with aluminum in advertising and marketing campaigns, to promote the aesthetic dimension of aluminum. Art was used to convey messages about corporate identity, and artists were commissioned to produce

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557 Peter, *Aluminum in Modern Architecture '58,* 99-100

558 *A-B-C's of Aluminum,* 27. Reynolds elaborated on inherent properties: "…consumption of aluminum is beginning to expand rapidly because its many natural advantages can now be given proper consideration when selecting a material."

559 *Reynolds Aluminum and the People Who Make It,* 3. Reynolds characterizes aluminum as holding "permanent natural beauty." Baker and Langland, *Architectural Metal Handbook,* 34. "The metals of old, supplemented by the alloys of today, provide the strength, utility and permanence, dignity and beauty to make possible that freedom." Kawneer Company advertisement, *Architectural Forum,* December 1935, 62. Kawneer Co. was proud of the upkeep savings and "modern beauty" its narrow-framed bronze and aluminum windows bestowed.

original works to be directly associated with aluminum products and works of architecture made with aluminum. Art was also conjoined with landscape, where landscapes were appropriated as marketing landscapes for aluminum.

Associating art with aluminum and architecture at Reynolds headquarters

With the opening of the Reynolds Executive Office Building (1958), Reynolds published a brochure that included references to the extensive art collection the executives had selected, starting soon after completion of the building with works such as "The Faun" by Picasso, along with "14 original paintings in (the) executive office collection."[560] The collection grew to 82 painting with a fair-market value of 4.6 million (in 2016 dollars.) As an art assessors report from 1990 stated, Picasso "Le Faune (1946) "hangs in the private office of R.S. Reynolds, Jr., Chairman of the Board of the company;" Taureau I (Bull #1) by Charles Edouard Jeanneret Le Corbusier (1952) "hangs in the Board of Directors meeting room;" Homage to the Square: Star Blue, Josef Albers (1958) "hangs in the hallway near the entrance to the company's dining area."[561] Although the most valuable works hung in the executive suite, (Picasso "Le Faun" was appraised for $844,000 in 2016 dollars) paintings were hung throughout the building from the Executive Board Room to the Employee Lobby. These works of art were not just expressions of personal taste. By hanging on the wall of a "silent salesman," the Executive Office Building, they were sales tools, explicitly associated with aluminum in photographs, group tours, a

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[560] *A Few Facts about This Building and Reynolds Metals Company,* 9, Reynolds Metals Company Collection, series 7.
[561] R. E. Crawford & Associates, Inc., *Appraisal,* Reynolds Metals Company, Richmond, Va., 1990, 1, folder 32, Reynolds Metals Company Collection, series 1.1.

promotional brochure, and photographs including the paintings were included in messages to investors.

The Reynolds Headquarters was described as, “an important sales tool,”[562] and the paintings were a part of the building as a marketing platform. The executive offices favored modernist works, in alignment with the company’s project to market aluminum and its deployment in architecture as modern. Imagery of the paintings was replicated in brochures promoting the headquarters building.[563] The modernist paintings formed the background to portraits of the executives that were widely distributed to shareholders in the company’s Annual Reports. Corbusier’s “Le Faune” (1946) framed Jos. H. McConnell, president,[564] while in another portrait he sat with “Composition 3182” (1954) by Jean-Paul Riopelle to his immediate right.[565]

Sculpture carries the message of aluminum to architecture

Echoing the persistently promoted advantages of aluminum as beautiful and modern, Reynolds employed works of art as a vehicle to carry the message of beauty and modernity for aluminum, from 1957 to 1991 through an annual architecture award. When Reynolds inaugurated the R.S. Reynolds Memorial Award for architecture in 1957, each winner was to receive a $25,000 award and an original work of sculpture in aluminum. Each year from 1957 until 1991, a different sculptor was selected to produce a new work. After promotional material was generated about the sculpture that visually paired the sculpture with the award-winning work

[562] R. S. Reynolds, Jr., “From the President’s Desk,” *Reynolds Review,* September 1958, folder 70, Reynolds Metals Company Collection, series 1.3.
[563] For illustrations of the artwork, see *A Few Facts about This Building and Reynolds Metals,* 9.
[564] Reynolds Metals Company, 1963 Annual Report, February 20, 1964, Reynolds Metals Company Collection, series 1.2.
[565] Reynolds Metals Company, 1969 Annual Report, February 18, 1970, folder 62, ibid.

of aluminum architecture, it was gifted to the architect who won the corresponding year's award. Promotional material photographed the sculpture and profiled the artist, often revealing his creative impulses and their relationship with the materiality of aluminum. When the architecture award was retired in 1991, Reynolds summarized the body of work proclaiming, "Each probes, in a unique and personal way, the meaning of the human spirit."[566] The sculptures often were photographed for the Annual Reports, such as "Cube" by Jarry Bertoia, (1962) for the cover of the 1965 report.

The sculptors were invited to make statements for the promotional material and sometimes they were then appropriated by Reynolds to align with messages about the advantages of aluminum. The future was eluded to, and the advantageous properties of aluminum were hinted at by the statement of Theodore Roszak, the first sculptor, who said, ""We haven't really tapped the resources of aluminum…the potential of the metal has not yet been realized."[567] Reynolds aligned this statement with their goals of growth for the aluminum market. Explaining the sculptor's work, Reynolds wrote, "The essence of Roszak's entire body of sculpture is that of transition and change, of metamorphosis as the only enduring reality."[568]

Art to forecast the future for Alcoa

Eager to control the image of aluminum, Alcoa instituted a three-year marketing initiative called Alcoa Forecast in 1956. The stated purpose was, "to project a new image for aluminum,

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[566] *Visions of Man* (Reynolds Metals Company, 1991), p. 2, folder 25, Reynolds Metals Company Collection, series 1.1.
[567] "Noted Sculptor Chosen to Design Award Emblem," *Reynolds Review,* April 1957, p. 13, folder 75, Reynolds Metals Company Collection, series 1.3.
[568] Ibid., 13.

both to their colleagues and to the public at large."[569] "Colleagues" in this statement referred to the designers who were invited by Alcoa to craft a new, functional[570] object. Alcoa believed a marketing initiative was necessary because "the average consumer and many designers were still likely to picture aluminum as a light, white metal that's good for pots and airplanes."[571] Alcoa marshalled their enormous resources and spent 3 million dollars on a management program that was ""designed" from the concept of the product to its appearance in a full page ad in the nation's slickest magazines."[572]

The Forecast initiative hired designers and artists to produce a range of designed objects and works of art, hoping to stimulate "original design in aluminum by making these great designers aware of the metal's unique properties." Most of the designed objects were home-consumer focused, "in the fields of home planning and building, home furnishings, recreation, and children's toys." However, the company's manager of market development, Fritz (F.J.) Close, who had been a key decision maker on the design of the Alcoa Tower and a salesman in the architectural products realm ever since pursuing Harrison to sell aluminum to the Rockefeller Center,[573] hoped to find that the Forecast initiative would stimulate awareness of aluminum's potential for aesthetic effect in architecture. He stated, "Emphasis of the designer's work will be on the creations for comfortable living and aesthetic design."[574]

Designers commissioned to produce objects in the initiative were charged with conjoining aesthetics and function, in the same way aluminum building products were widely

[569] "Alcoa Ventures a Forecast," *Industrial Design,* July, 1957, 1. Citations refer to the Aluminum Company of America reprint, folder 8, box 162, Records of the Aluminum Company of America.
[570] The Solar Do-Nothing Machine, a 1957 collaboration with Charles and Ray Eames, overtly complicated the "functional" label. See Daniel Barber, "The World Solar Energy Project," *Grey Room* 51 (2013), 64-93.
[571] "Alcoa Ventures a Forecast," 1.
[572] Ibid.
[573] Ibid.
[574] Ibid.

marketed as embodying these two "advantages." Ilonka Karasz produced a wall mosaic of aluminum. Similarly, decoration was often justified by producers if paired with a function, Karasz's wall mosaic was foreseen as a "foil wall that will heat the home of tomorrow."[575] Isamu Noguchi devised an interlocking set of hexagonal tables which utilized the same color coating treatment Alcoa developed for architectural cladding applications, whereby each table unit could "be colored by anodizing or enameling…"[576]

The Forecast initiative claims landscape as a marketing space

The Forecast marketing initiative intersected with landscape architecture as well, through the commission of aluminum sculptures and landscape elements. Sculptor Keith Monroe designed "Reeds" to stand in a low pool of water, and Sculptor Robert B. Howard designed "Hydro-Gyro," both at the International Business Machines Corporation, San Jose, California. Sculptor Gurdon Woods designed an aluminum sculpture, "Effervescence of Champaign," a 67-foot-tall sculpture to stand in a pool in front of the Paul Masson Champagne Cellars, Saratoga, California. A feature article in Alcoa Aluminum News-Letter exclaimed, "Aluminum is playing a starring role in traditionally appealing aspects of landscape design — water pools and ponds." Always quick to pair function with aesthetics, the article continued, "Both practical and aesthetically pleasing, the metal appears in the form of fountains and sculptures."[577]

Alcoa pursued relationships with landscape architects as well to market the aesthetic and functional advantages of aluminum. Claiming landscape as a marketing space, Alcoa worked with Garrett Eckbo, who created "aluminum garden architecture designed for Alcoa from

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[575] Ibid.
[576] "Alcoa Ventures a Forecast."
[577] "Water Sculptures of Aluminum," *Alcoa Aluminum News-Letter,* November 1962, p. 7, box 155, Records of the Aluminum Company of America.

standard warehouse stocks." This garden appeared in an advertisement, ending with, "For a list of aluminum products in this garden, write to Aluminum Company of America, Pittsburgh, Pa."[578] Alcoa sought to stimulate new ideas and uses for aluminum by demonstrating its potential in many spheres, yet, chose specific scenarios to demonstrate potential applications. A new screen device, designed by Herbert Bayer, was photographed in one ad as a wall element between interior spaces and also a wall element in the landscape, screening neighbors from a backyard pool. Screens, used widely in architectural applications, were being advertised to the domestic market, as the ad stated, "…where screens of aluminum as bright as a peacock will grace patio, pool, garden and store…enclose or divide space with the joyous beauty of an everlasting rainbow."[579]

Forecast series and architects

The Forecast series, blending art, sculpture and landscape architecture, also sought to appeal directly to architects, inviting architects to design a structure for the series. Harrison & Abramovitz was commissioned by Alcoa to design a structure which the firm turned into an internal competition amongst its staff. The result was a "house" that resembled an "eight-point star." Never to let an opportunity for promotion go to waste, Alcoa introduced the structure at the Macy's store in a summer aluminum promotion utilizing a ¼ scale model. [580] Another small structure was designed by John Matthias. Called an "aluminum view box," it was featured in a wooded setting, providing to the occupant views into the landscape, advertised as taking

[578] "Forecast," *Alcoa Aluminum News-Letter,* May 1960, box 155, ibid.

[579] "Forecast," *Alcoa Aluminum News-Letter,* November 1958, ibid.
[580] "Alcoa Ventures a Forecast."

advantage of the lightweight advantages of aluminum, “as portable as the tents of the Arabs.”[581] The Forecast series echoed wider associations between aluminum with the future, declaring, “Forecast: There’s a world of aluminum in the wonderful world of tomorrow.”[582]

Producers alloy advantages with ideology

Producers imagined aluminum in superlative terms, not as an ordinary metal, but as an extraordinary metal — a metal that possessed not only aesthetic qualities, but a host of characteristics that made it far superior to other metals and, furthermore, positioned the metal as uncannily belonging to a bright, prosperous future. This was a future that promoters believed aluminum could transport to the present, and this extraordinary ability was understood, and marketed, as inherent to the qualities of aluminum. The problem was, the metal was unknown to the wider world. Producers saw the potential and had the vision; if only the rest of the world could find out! Inherent to aluminum, they believed, were extraordinary abilities that, unactivated, were mere properties. But when activated, they became advantages and producers promoted aluminum as holding the agency to usher in the future, and modernize the world. Modernism, to the producers, was a marketing project.

Alcoa, Reynolds and Kawneer held beliefs about aluminum in terms of its characteristics and its agency. Combined, these formed an ideology about aluminum that was deployed in marketing material. Through its characteristics, they argued, aluminum had the ability to modernize the landscape, move the world progressively forward and bring about a bright future.

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[581] “Forecast,” *Alcoa Aluminum News-Letter,* December 1959, box 155, Records of the Aluminum Company of America.

[582] “Forecast,” *Alcoa Aluminum News-Letter,* December 1959.

The agency of aluminum

Aluminum in the early to mid-twentieth century was understood by producers to hold agentic capacity, as though it held, as New Materialism scholar Jane Bennett has popularized, a "vital materiality."[583] Aluminum was said to be a "vital material;" it "needs of man…everything;" it has "unique behaviors," and possesses a "sprightly spirit." An article about the various dimensions of aluminum in *The Westinghouse Engineer* begins by stating, "Aluminum has spent most of its young life suffering from growing pains," and continues a detailed reportage with the title, "What Aluminum Can Do."[584] Aluminum was written about and promoted as having a life of its own. In a publication funded by Reynolds, Buckminster Fuller was especially descriptive, stating, "…What you are then prone to look upon, when you ask me about aluminum, is its unique behaviors, to which there is no competition whatsoever.…Every element, even though it has unique behaviors, has those unique behaviors as part of a complex of behaviors, so there will also be associated behaviors. No one behavior can be separated out or isolated or really monopolized. Therefore you will always have to take its preferential behaviors along with its non-preferential behaviors."[585]

Architects quoted in the Reynold's funded publication were especially descriptive of aluminum as a quasi-living being. Echoing a common trope amongst architects — that one must let go of his or her own design will and follow what the site or material wants — architect Eliot Noyes said, "If you scrutinize the nature of the problem — the nature of the material — it

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[583] Jane Bennett's formulation of vital materiality, as a "creative materiality with incipient tendencies and propensities, which are variably enacted depending on the other forces, affects, or bodies with which they come into close contact with," closely articulates the way in which aluminum was promoted and understood by producers. See Bennett, *Vibrant Matter,* 56. Bennett draws, in part, from Deleuze and Felix Guattari's proposal of metal as possessing a vital materiality, "the prodigious idea of a Nonorganic Life." See Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (Minneapolis: University Of Minnesota Press, 1987), 411.
[584] Scarlott, "The Bright Picture of Aluminum," 5..
[585] Peter, *Aluminum in Modern Architecture Volume I, 236,* 237.

suggests ways of using it right. This is the area where the designer or architect has to be sensitive to these qualities and use it appropriately, and avoid the inappropriate uses."[586] Likewise, architect Ralphael Soriano commented, “You must listen to the materials. You must always respect what the materials have to say.”[587] These positions eluding to the life of aluminum were derived from a series of interviews commissioned by Reynolds to promote aluminum in the architectural, academic and scholarly communities.

This life that aluminum was portrayed as having was described as though it was a young prodigy with great potential, destined for greatness and able to define the modern age.[588] From “puny child to a strong young man” was the characterization given aluminum by an Alcoa Manager of Marketing Development at the 1955 Metal Curtain Walls conference held by the Building Research Institute.[589] “It is a youthful metal,” said architect Donald Barthelme, “and it serves to set a sprightly spirit throughout the building.”[590] As though it held incipient potential, the book, *Aluminum: How it’s Made and Where it’s Used* explains the needs of aluminum: “"what does aluminum need of man? *Everything*." "it needs skilled geologists to track it down…it needs mining engineers to plan best…it needs ingenious mechanical engineers…it especially needs scientists and metallurgists to explore…it needs chemists…process engineers…industrial designers…product engineers…electrical engineers."[591] This description suggests that to exercise its agency, aluminum needs interaction with humans.

[586] Peter, *Aluminum in Modern Architecture’58,* 101.
[587] Peter, *Aluminum in Modern Architecture Volume I,* 245.
[588] *Aluminum:…Its Story,* foreword. Alcoa describes the life of aluminum: “Aluminum was just one of the “younger brothers” in the family of metals…healthy, vigorous, and ‘filling out fast’, but still a ‘junior; when compared with the older, heavier ‘grown-ups’ like iron and steel, copper and zinc.”
[589] *Metal Curtain Walls,* 162.
[590] Peter, *Aluminum in Modern Architecture Volume I,* 246.
[591] *Aluminum: How It’s Made and Where It’s Used,* 29-30.

Reynolds understood the agency of aluminum as rooted in its properties, as well as its very "nature,"[592] but to realize its potential, and perhaps its destiny, it must be combined in force with men like the men of Reynolds: "The remarkable qualities of aluminum, and the drive, innovation and determination of men in the industry like R.S. Reynolds, Sr., founder of Reynolds Metals Company, have made the mid-Twentieth Century the "Age of Aluminum."[593]

Promoted as possessing agentic capacity, and also understood as being activated by humans, especially as it comes into being as an assemblage of components in a store front, for instance, aluminum was said to possess the capacity to boost sales for merchants, and modernize the commercial landscape. The 1936 *Kawner Book of Store Fronts* illustrated a truck arriving with "Kawneer Rustless Metal, captioned, "Materials arrive on the job," followed by an illustration of a full aluminum-clad storefront, captioned, "The new front stimulates sales."[594] The last sentence of the book leaves the reader with this message, "Decide now to stimulate your business with the most effective sales tool ever developed — the modern Kawneer Rustless Metal Store Front."[595] Yet, aluminum wasn't promoted as being able to modernize by itself. For that, once again, it took human interaction with the "young" metal.

Aluminum was promoted as modern

Underlying the way aluminum was promoted as having the ability to modernize was its conception as a thoroughly modern material. The widely distributed two-volume Reynolds publication, *Aluminum in Modern Architecture* claimed it as a "modern metal,"[596] because it was

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[592] *A-B-C's of Aluminum,* 27. Reynolds asserted the agency of its nature: "…consumption of aluminum is beginning to expand rapidly because its many natural advantages can now be given proper consideration when selecting a material."
[593] *Reynolds Aluminum and the People Who Make It,* 2.
[594] *Kawneer Book of Store Fronts,* 55.
[595] Ibid.
[596] Peter, *Aluminum in Modern Architecture Volume I,* 9.

derived of an electrolytic process developed only seventy years prior to publication (1886.) The very inclusion of a host of contemporary architects widely considered to practice modern architecture, such as Noyes, Fuller, and Yamasaki were an associative gesture with modernism. Reynolds believed the evidence of the modernity of aluminum was clear, but that interviews with modern architects would boost its credentials: "While this volume does provide incontrovertible evidence of the accelerated acceptance of aluminum as a material of modern building, it falls so short of demonstrating the full place of aluminum in modern architecture that the editors traveled some twelve thousand miles for the candid" interviews of important architects of the day.[597] A video documentary about aluminum produced by Reynolds, *Aluminum on the March,* distributed Reynolds' message about the modernity of aluminum to a wider audience, proclaiming, "In today's architecture, aluminum has become synonymous with modern design."[598] Reynolds leadership seemed not only to want to portray aluminum as modern, but to believe it themselves. R.S. Reynolds, Jr. positioned "aluminum as a basic fact in modern engineering and design."[599]

Alcoa's proclamations and promotions suggested the producer believed aluminum was superior to the "old ways." An Alcoa executive drew contrasts with the aluminum of today and the ways of the past, writing of their need to promote aluminum with the old guard, "…and expand our advertising and promotional efforts to achieve wider acceptance for this type of structure (aluminum curtain walls), particularly among the decision-making people who may have spent too many years in the gas light era."[600] "Traditional design limitation are no more,"

[597] Ibid., 11.
[598] Reynolds Metals Company, "History of Aluminum Production – Aluminum on the March (1956)," Youtube video, 27:43, posted by Charlie Dean Archives, January 11, 2013, accessed December 20, 2016, https://youtu.be/KJRD2Q7i624?list=WL&t=774.
[599] Heather Erin Massler, "The World with the Silver Lining: Architecture, Advertising & Reynolds Metals Company 1935-2000," (MA Thesis, University of Virginia, 2004), 45.
[600] *Metal Curtain Walls,* 162.

declared another Alcoa ad, making reference to a modern façade treatment.[601] Myers describes Alcoa's portrayal of aluminum as modern, writing that Alcoa's ads, such as one claiming aluminum gave "full expression to the modern tempo" were an attempt to link the material with ideas associated with modernism, such as progressiveness and practicality.[602]

Aluminum was promoted as progress

Aluminum was portrayed as being both able to bring about progress, and as being a symbol of progress. Progress also was said to have characterized the aluminum industry. Its capacity to bring about progress was a function of the union between its properties and its activation by the producers. "Progress is being made more rapidly than at any other time in history," exclaimed The Aluminum Association.[603] Progress was implied by the analogy between aluminum and human development, as exemplified by the characterization of aluminum, and the metal wall cladding industry it was a part of, as moving "from puny child to a strong young man."[604] Users too believed aluminum could make progress. A flier distributed in the small Kansas town of Paola implored merchants to accept the complete cladding of every existing brick façade around the downtown square with colored aluminum by distributing a flier asking, "Progress? The horseless carriage and consumer are keeping up-to-date. Are we? The choice is yours."[605]

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[601] Myers, "The Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style," 148.
[602] Aluminum Company of America advertisement *Architecture Forum,* May 1936, p. 76, quoted in ibid., 160.
[603] *Aluminum: How It's Made and Where It's Used,* 29.
[604] *Metal Curtain Walls,* 162.
[605] Niles Chamber of Commerce, *Progress?* Aluminum façades file (Miami County Historical Museum, Paola, KS), unpaginated.

In addition to its capacity to bring about progress, aluminum was marketed as symbolic of progress. Alcoa captioned one aluminum-clad courthouse with the words, "…symbol of a progressive community,"[606] while Reynolds Headquarters (), Richmond, Virginia, was explained as exemplifying progress: "The straight, clean lines of the exterior blend aluminum and glass to present a striking appearance that suggests efficiency and progress in an aesthetically pleasing way."[607] Perhaps accustomed to the word, but also no doubt exposed to the association between progress and aluminum, the architecture journal *Progressive Architecture* reported on Pietro Belluschi's 1939 design for a Northwest Airlines Ticket Office store front in Portland, Oregon, in which "a progressive image was needed," which the aluminum cladding designed by Belluschi fulfilled.[608]

The "Age of Aluminum"

In 1939, Life Magazine wrote, "Light, strong and versatile, aluminum is by all odds the theme metal of the 20th Century."[609] Alcoa must have been pleased with the proclamation, because they included it in a promotional brochure produced about the "story" of aluminum. It also was a marketing theme they had advanced, and constituted a belief they held about the metal. Over and over, aluminum, and variously "light metals" was promoted as a metal for the age. One Alcoa publication was titled, "Aluminum, the twentieth century metal"[610] R.S. Reynolds Jr. said "we are only on the threshold of the Age of Aluminum…"[611] When those

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[606] "Aluminum-clad Courthouse," *Alcoa Aluminum Newsletter*, June 1957, box 155, Records of the Aluminum Company of America.
[607] *A Few Facts about This Building and Reynolds Metals Company,* 7.
[608] Clausen, "Belluschi and the Equitable Building in History," 115.
[609] *Aluminum:…Its Story,* front matter.
[610] *Aluminum: The Twentieth Century Metal. Fundamentals of its Metallurgy* (Pittsburgh: Aluminum Company of America, 1959), folder 14, box 123, Records of the Aluminum Company of America.
[611] Massler, "The World with the Silver Lining," 45.

words were uttered, it had apparently been the age of aluminum for quite some time, because magazines in the late nineteenth century had declared as such.[612]

In addition to producers and magazines, even architects declared the age for aluminum: "…this relatively new material, if not about to herald an age that will be known by future generations by its metallurgical titles — and ranking in the history of the world with stone, iron, bronze, steel and concrete — has shown itself remarkably accommodating over a very wide field of building problems."[613] Max Abramovitz summarized his beliefs about his involvement with aluminum at the Building Research Institute's Metal Curtain Wall conference in 1955 , announcing, "…we are really in a Metal Age…"[614]

Much of this talk about the age of aluminum was constituent to the framing of periods in time as a *zeitgeist*, or a "spirit of the age."[615] Reynolds believed in some form of the *zeitgeist*, writing, "Architecture expresses the way of life of an epoch in terms of materials and building methods….Similarly today, to be creative, we must express our way of life in terms of our advanced technology."[616] For producers like Alcoa and Reynolds, linked to the present — this age of aluminum — was a vision that extended this age deep into the future. Reynolds wrote, "Certainly the age of light metals has only begun."[617] There was a postwar optimism in the aluminum industry, bolstered by periods of record sales extending into the 1960s.[618]

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[612]The 1893 *Spectator Magazine* declared it the 'age of aluminum." Cited in ibid., 7; Also see "Next, the Aluminum Age," *New York Sun*, August 1896, cited in Carr, *Alcoa: An American Enterprise,* 116.
[613] *A Symposium on Aluminium in Building* (London: Aluminium Development Association, 1960), 13.
[614] *Metal Curtain Walls,* 60
[615] Contemporary scholarship also sometimes understands "the spirit of the age" as a useful construct to frame the characterization of aluminum. Ashby writes, "During the interwar years, aluminium and the white metals were amongst the new building materials that came to characterise the spirit of the age." See Ashby, "Aluminum Legacy," 84.
[616] Weidlinger, *Aluminum in Modern Architecture Volume II,* 181.
[617] Ibid., 227.
[618] Kawneer experienced between 1946 and 1956 a six-fold growth in sales. See Church, "The New Kawneer," front matter.

Aluminum and the future

Producers like Alcoa and Reynolds were optimistic about the future. They had much reason to be, with well-developed aluminum production capacity after the war and persistent periods of increasing sales. An Alcoa executive expressed this position, painting a picture of a world not only better for producers and consumers, but also better for America: "…our children's children are very likely going to look upon a far different type of America insofar as buildings are concerned, an America that will be a much more exciting place in which to live."[619] Central to this vision of the future was an imagined position of aluminum as playing a leading role in effectuating this bright, shining future, with an Alcoa executive expressing that his company "dream(s) of the day when we have metalized the world…"[620] Alcoa's marketing strongly pushed this ideology that aluminum could bring about the future. The entire Alcoa Forecast marketing initiative "promises to give the world a glimpse of tomorrow."[621]

Kawneer promoted the belief that a radically improved future, brought about by aluminum and its assemblage in store front components, was merely a few years away, and with aluminum, the commercial sphere could bring the future to the present. It undertook a new marketing initiative in 1943 in preparation for the end of the war, hoping to shift immediately to the commercial market upon the end of hostilities. Part of the marketing initiative was a competition called the "Storefronts of Tomorrow" jointly administered by *Pencil Points*, with prominent architects serving as judges, such as Mies Van der Rohe and Morris Ketchum.[622] The future was near.

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[619] *Metal Curtain Walls,* 163.
[620] Ibid.
[621] "There's a world of aluminum in the wonderful world of tomorrow," *Alcoa Aluminum News-Letter,* February 1957, box 155, Records of the Aluminum Company of America.
[622] *Report on Two Arch Competitions.*

Reynolds saw threads of the future in the present, as evidenced by the use of aluminum. Referencing the title of a book, *Brave New World*, Reynolds promoted the idea that it was researchers, letting "their imaginations roam" that, in conjunction with the properties of aluminum, would usher in a "Brave New (Aluminum) World." Reynolds also promoted the idea that reflecting upon the many aluminum buildings profiled in their book series, *Aluminum in Modern Architecture*, a thread of the future existed in the present: ""The hundred and one buildings pictured on the preceding pages evidence an impressive start. As a matter of fact, they even provide some pretty clear clues to the architectural future."[623]

When Pietro Belluschi designed the Equitable Building in Portland, Oregon, (1946-48) he was no stranger to aluminum. Having previously designed aluminum cladding on the Northwest Airlines store front, engaged in discussions with Alcoa about aluminum upon learning of Harrison & Abramovitz's unrealized New York Alcoa tower,[624] and having proposed other aluminum-clad designs that never came to fruition,[625] he believed aluminum was an important material for modern architecture. as Clausen reports, Belluschi held an "inner conviction" that the design of the building, clad in aluminum and glass, was about the future and a representative of the great characteristics of the modern era. Belluschi wrote that the design was "fundamentally an expression of faith in a great future for our civilization" reflecting a faith born out of a conviction that from our modern techniques, materials, and understanding of present-day architectural problems, we are able to create not only more useful buildings, but also a new kind

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[623] Peter, *Aluminum in Modern Architecture*, *Volume I,* 227.
[624] Clausen, "Belluschi and the Equitable Building in History," 126.
[625] Ibid., 113.

of beauty-a beauty which is not borrowed from the past but is our own-clean, strong, and straightforward."[626]

These companies and architects portrayed aluminum as representative of the future, able to bring about the future…but also as the medium that brought the future to the present.[627] Their marketing material often casts the present as moving so fast, that the future is not only right around the corner, it is practically here, now. Discussing the end of the war in a brochure titled, *Aluminum…Its Story*, Alcoa wrote, "all of a sudden, they were in the new age they had heard about. *The Light Metal Age!*"[628]

All three manufacturers of aluminum cladding examined in this study associated aluminum with the future. "With an eye to the future," wrote Alcoa, as a 1936 advertisement headline. "We haven't really tapped the resources of aluminum," said the first Reynolds Memorial Award sculptor, Theodore Roszak. "The potential of the metal has not yet been realized." Kawneer titled an interwar marketing initiative "Storefronts of Tomorrow," while Alcoa's own marketing initiative was called "The Wonderful World of Tomorrow." There was much "tomorrow-talk" in American culture before, during and after World War II. As Andrew Shankin notes in *194X: Architecture, Planning, and Consumer Culture on the American Homefront*, such references to the future were, in part, bound up with a culture of planning –

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[626] Ibid., 117.

[627] Similarly to the producers' belief that aluminum could bring the future to the present, architectural historian William Jordy maintains that when the early modernists of the 1920s denoted "the future" they actually meant now. "To the most important architects of the twenties, l'esprit nouveau was not in the future. Both buildings and propaganda proclaim that the future is now. The architect did not need to conjure the fantastic. He had only to open his eyes to the laconic facts of modern existence around him, as Le Corbusier admonished through three famous chapters of Vers une architecture. In Le Corbusier's phrase, 'These are things that move us.' They exist in our typical, everyday experience as techno- logical facts specifically pertinent to modern life. It is this urgent presentism of Le Corbusier's tract which makes it so much more exciting than the visionary futurism of Sant'Elia's cities or of Mendelsohn's Observatory." See William H. Jordy, "The Symbolic Essence of Modern European Architecture of the Twenties and Its Continuing Influence," *Journal of the Society of Architectural Historians* 22, no. 3 (1963): 179-80.

[628] *Aluminum:…Its Story,* forward.

planning for postwar economic growth, the renewal of urban environments and planning as a practice for architects still underemployed from the depression years. Beyond associations with planning, the future had long been associated with modernism as an anticipation concerning the changes brought by industrialization, finding an overt voice, for example, in the "Futurists" art and architecture movement announced by the *Manifesto of Futurism.* (1909). The future was no stranger to modernism, and aluminum producers quickly seized upon the idea in marketing materials.

In various reflections upon this association, the future has been written about as always promised, but never attained — a failure of aluminum to fulfill its promise. For instance, Business Week wrote in 1967 that aluminum had been "hailed as a metal of the future for 81 years," but according to the title of the article, "Metal of the Future is Getting There," it still had not quite gotten there.[629] Eric Shatzberg, writing about the image of aluminum, argues that the age of aluminum never came because statistics show that it lags in use behind other materials.[630] Statistically, this is true. Yet, for aluminum promoters, in claiming that *aluminum* was about the future, their *argument* never was actually about the future. Instead, promoters meant that aluminum could bring the future to the present — a virtual aluminum time machine. Promoters painted a picture of a prosperous future, out of the drudgery of the past, beyond the pain of World War II and previously, the Great Depression. Aluminum wasn't about launching the buyer into the future, it was about bringing the future to the buyer in the here and now. This was a compelling, emotion laden argument to buyers who were impacted directly by war or its threatening menace. In every city, young men went off to war, never to return. Rations were imposed. Business was hampered. Consumption was reduced. Impact was felt far and wide.

[629] "Metal of the Future is Getting There," *Business Week,* June 24, 1967, 116-123.
[630] Schatzberg, "Symbolic Culture and Technological Change."

Aluminum, it was implied, could liberate. Alcoa wrote, "Alcoa Aluminum is of today and for the future ... (it) gives full expression to the modern tempo."[631] Reflecting upon Belluschi's claim that the aluminum-clad Equitable Building was "an expression of faith in a great future," Belluschi conveyed the future as the present. [632] Kawneer's "Storefronts of Tomorrow" implied the future, but upon the close of the war, promoted immediate implementation as a way of selling aluminum to street front merchants, modernizing the commercial landscape.

The reciprocal of this claimed ability of aluminum to bring the future to the present was its ability to increase the sense of distance between the present and the past. This was the idea of progress that like the future, had been long associated with modernism. Promoters at Reynolds claimed that the new Reynolds Metals Company International Headquarters, (1955-1958, Gordon Bunshaft of Skidmore, Owings and Merrill) and even the company logo represented progress. The headquarters building "suggests efficiency and progress" and the logo "quickly became a familiar symbol of progress in aluminum … this spirit of progress remains a vital force at Reynolds …"[633] The ideas that the future could be now and the past could be far away was compelling. It promised instant gratification — no need to wait. The future never had to arrive. Purchase aluminum and the prosperity of a world beyond war and of celebrated abundance was now.

Superlatives about the position of aluminum as an age defining metal,[634] as its ability to bring about a bright future and bring that idea of the future to the present,[635] and about its agency

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[631] Alcoa Advertisement *Architecture Forum,* May 1936, p. 76, quoted in Eugene Russell Myers "The Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style," 160.
[632] Pietro Belluschi, "Notes on the New Equitable Building," typescript, January 10, 1946, in Meredith L. Clausen, "Belluschi and the Equitable Building in History," *Journal of the Society of Architectural Historians* 50, no. 2 (1991): 117.
[633] *A Few Facts about This Building and Reynolds Metals Company,* pp. 10, 23.
[634] Massler, "The World with the Silver Lining," 45.
[635] *Metal Curtain Walls,* 163.

to effectuate these changes[636] were the shared ideology of the aluminum industry and constituted leading messages in marketing initiatives undertaken by Alcoa, Reynolds and Kawneer to sell aluminum cladding in the twentieth century. Reynolds understood marketing as facilitating the proper expression of the age**:** "By educating its merchandisers as well as the public, the aluminum industry can speed up the simultaneous development of new methods and their proper expression."[637] As Raymond Corey has asserted in *The Development of Markets for New Materials,* "a logical first step in 'market positioning' is the detailed listing of the new product's characteristics."[638]

A persistently deployed message in marketing material combined the advantages of aluminum with the ideologies about aluminum previously discussed. These ideologies painted an optimistic view about the future, a future that could be had now and that promised prosperity for the businesses of those who bought aluminum, and also for their children and the nation.

[636] *Reynolds Aluminum and the People Who Make It,* 2-3.
[637] Weidlinger, *Aluminum in Modern Architecture Volume II,* 182.
[638] Corey, *Development of Markets for New Materials,* 245.

CHAPTER 5: MODERNISM AS A MARKETING PROJECT

Alcoa, Reynolds and Kawneer understood aluminum as a new metal, for which its image must be controlled. Aluminum is a dynamic material, facilitating many uses, and indeed, it was used in many applications of varying success. Because aluminum was perceived as new, they sought to carefully craft its identity — to assign it an identity, because it was widely unknown. They also held fundamental beliefs about aluminum, including the belief that aluminum had a strong degree of agency that when combined with the expertise of research and development, had the ability to solve a great many of the pressing problems that producers articulated could be solved.

As public companies, Alcoa, Reynolds and Kawneer were driven by capital accumulation, answerable to their shareholders. While the use of aluminum as architectural cladding emerged before World War II, production and manufacturing infrastructure, built with government subsidies, accelerated the production of aluminum cladding products after the war. These companies, driven by the potential of profit, set as a priority the turn again to commercial markets and crafted messages about aluminum which combined the claimed advantages, rooted in the characteristics of aluminum, with defined ideological advantages: *The future*: the agency of aluminum to provide immediate results by bringing the future to the present — the age of aluminum; *Progress*: the agency of aluminum to move the buyer from the dread of the depression and war to prosperity; *Modernization*: the agency of aluminum to boost sales and bring prosperity to business owners, their children and the nation.

These messages were deployed by delivering them through communication mediums such as print, radio and television, and also by appropriating physical and intellectual capital, associating these domains with their message. Architects and artists became conveyors of marketing through mutually beneficial arrangements, a cooperative model that, despite accusations of industrial monopoly, and despite fierce competition, actually permeated the marketing strategies of the industry. To sell, you must share. Producers shared with manufacturers, and they both openly shared their secrets of construction and assembly technique with architects, knowing full well competing producers and manufacturers were keeping watch.

Buildings themselves became "silent salesmen," whether they were the headquarters for the companies themselves, or were projects controlled by buyers of aluminum cladding, photographed and profiled by aluminum promoters through communications mediums as representative of the advantages yielded by aluminum. Buildings clad in aluminum were persistently hailed as modern. Art made from aluminum was hailed as modern. Architects designing with aluminum were hailed as modern. Labeled as modern, these domains constituted a modernity, marketed as modernism. For Alcoa, Reynolds and Kawneer, modernism was a marketing project that if successful, could lead to capital accumulation.

This consumer economy forms the context for the spread of aluminum cladding. A popular understanding of consumer markets is that first the consumer develops a demand, a need or desire, and then a product developer responds with a solution. The economics of aluminum did not work this way. From its very beginning, marketing was required to convince buyers that aluminum was a worthy material for widespread use.

Markets must be made

Aluminum manufacturers were not alone in believing their role to be market makers. Historian David Hounshell has shown that concerning the earliest manufacturing enterprises, including Singer Manufacturing Company and the McCormick Harvesting Machine Company, marketing more than their advanced production technology was a leading cause for their success.[639] Daniel Pope, in *The Making of Modern Advertising* argues that it was manufacturers themselves which precipitated modern advertising.[640] Reflecting on rising consumerism in the early twentieth century, the journalist Samuel Strauss (1870-1953), wrote in the *Atlantic Monthly* in 1924 about "consumptionism," which he defined as "the science of compelling men to use more and more things."[641] As a subject of heavy marketing, aluminum cladding was much less a *pull* from buyers and much more a *push* into the market by promoters. Certainly, there had to be some demand for the product. Moreover, it has proven to be successful in many arenas of application. But aluminum producers backed up their belief that markets are made with robust marketing. A *push* into the market through marketing initiatives including publications, the appropriation of designers and of space itself as carriers of marketing messages shows that aluminum manufacturers played a dominant role in making architectural modernism.

Two reasons aluminum was difficult to sell in the nineteenth and early twentieth centuries was that it was unknown to most outside the aluminum-producing industry and it was perceived as expensive.[642] For these reasons, producers believed they must engage in wide-ranging, protracted and deliberate marketing to spread the word and induce consumption. Such an undertaking, combined with the expense of aluminum production, necessarily made the companies beholden to investors. Aluminum production and marketing was a capital-intensive

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[639] David A. Hounshell, *From the American System to Mass Production, 1800-1932: The Development of Manufacturing Technology in The United States* (Baltimore: Johns Hopkins University Press, 1983), 5.
[640] Daniel Pope, *The Making of Modern Advertising* (New York: Basic Books, 1983), 5.
[641] Samuel Strauss, "Things Are in the Saddle," *Atlantic Monthly,* November 1924, 577.
[642] *A-B-C's of Aluminum,* 26. Reynolds Metals explains the reasons for the increasing spread of aluminum in the postwar period: "There are three primary reasons why aluminum is being used in increasingly greater quantities today…an expanded and assured supply is now available; its cost has gone down greatly while cost of other metals has gone up; more people are becoming acquainted with the natural advantages of aluminum and are learning how to use it effectively."

endeavor. The largest producers and manufacturers were well capitalized. The smaller ones, however, often were not able to market products they had developed with aluminum purchased from Alcoa or Reynolds. For this reason, the producers sometimes engaged in marketing on behalf of the whole industry, despite inadvertently advantaging competitors. It also should be noted that the aluminum products industry was, and is to this day, a vast collection of many markets. Most often, promotional efforts in these markets were separate marketing endeavors. However, in one instance, Reynolds undertook a design-as-marketing approach which aimed to produce residual benefits in the building products market by advertising, for instance, aluminum foil to housewives on television.

These companies approached marketing as a mode teaching and inspiring. Teaching was directed to users of aluminum fabrications and end-products, such as technicians, builders and architects. Other marketing initiatives were directed towards inspiring users to believe the advantages of aluminum and purchase aluminum and assemblages for their building project. All of the marketing initiatives shared the foundational belief that aluminum was an exceptional metal, but even so, despite all its great advantages, it still required marketing, not only to spread the word, but also convince end-users it was superior to competing products.

The unknown metal

Henri St. Claire Deville, as the first man to produce quantities of aluminum which were promoted for commercial use in 1854,[643] lamented the great difficulty in selling aluminum. He

[643] For a more detailed description of Deville's various experimental methods, see Wallace, *Market Control in the Aluminum Industry,* 505-6. Like others, Deville experimented with potassium and electrolysis techniques, but abandoned them due to the high cost in relation to the sodium technique. With the future development of the Dynamo, however, electrolytic techniques would come to supplant chemical processes.

began a chapter of his treatise, *De L'Aluminum* with these words: "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."[644] Concomitant with this problem was the cost of the metal to produce, which Deville also understood as a barrier to acceptance: "As to the place aluminum may occupy in our daily life, that will depend on the public's estimation of it and its commercial price….The introduction of a new metal into the usages of man's life is an operation of extreme difficulty."[645] While cost was understood as a barrier, DeVille also believed that even if the price to the buyer were low, there still might be difficulty in selling. Buyer's might not believe it holds utility value, and just as importantly, buyers might have already formed opinions about it, made associations with it, that could prevent them from believing its utility value. Deville believed the image of aluminum as useful, but also accessible, was important. With a price set higher than gold, and Napoleon's reported use of it for his important guests, it held potential to become understood as a precious metal. Wrote Deville, "At first aluminum was spoken of too highly in some publication which made it out to be a precious metal, but later these estimates have depreciated even to the point of considering it attackable by pure water."[646] Here is suggested the importance producers ascribed to controlling the image of aluminum. As a great unknown, it could be a marvel or an object of derision.

Well into the late 1880's aluminum was still not widely known as a potential building product. A newspaper reporting on the first use of aluminum in an architectural application, the

[644] Henri Sainte-Claire Deville, *De l'Aluminium: Ses Proprietes, sa Fabrication et ses Applications* (Paris: Mallet-Bachelier, 1859), 140, quoted in Robert Friedel, "The Psychology of Aluminum," p. 5.
[645] Ibid., 7.
[646] Ibid.

cap of the Washington Monument (1884), called it a “strange metal.”[647] Reflecting on the difficulty in selling aluminum in the early days of Alcoa, Arthur Vining Davis Jr., co-founder of Alcoa, said it “took a lot of selling to get anybody to use aluminum for anything.”[648] Alcoa did engage in selling, necessitating the manufacture of end products, initially cooking utensils,[649] in addition to continuing to develop its position as a leading producer on the world stage. Use of aluminum for the production of end products expanded, and was predicted, in an 1892 *Cosmopolitan Magazine* article, “Aluminum — the metal of the future,” to “revolutionize the manufacture” of consumer products including field glasses, surgical instruments, cooking utensils and, “if aerial navigation ever attains practical success, these strong, light alloys will be the most important factors in solving the problem.”[650] To spread the use of aluminum, producers believed they must engage the market directly, by selling.

Return on investment urges marketing

The need to forge a market for aluminum wasn’t only an innate desire for the enterprise of doing so, it was an activity demanded by investors who had provided the great sums of money necessary to fund the startup of industrial production. In the absence of a ready and willing buyer, producers sought to pay back investors and keep laborers employed. As Bertilorenzi noted, "Despite the necessity to run scale productions, there were no ready markets for this amount of metal. Furthermore, the electrolysis technology was (and is) very difficult to adapt to market conditions. When cells are stopped, new heavy investments are demanded before their re-

[647] “Aluminum Exhibited,” *The Philadelphia Press,* November 28, 1884. Forged by Col. William Frishmuth, in his operating foundry at Rush and Amber Street, Philadelphia.
[648] Carr, *Alcoa: An American Enterprise,* 109.
[649] Bishop, “A Fifty-Year Fight for Markets,” 22.
[650] Richards, “Aluminum—the Metal of the Future,” quoted in *Reynolds Review,* June 1960, 23.

starting. Consequently, the more rational choice in this industry is to reach a scale production and to keep it as much stable as possible."[651] To maintain industrial scale production in a context of capitalism, a robust market of buyers was sought by producers.

The necessity of desire

Leaders of the aluminum industry did not have confidence that buyers would exercise extremes to select aluminum over a competing product, especially if it was a new metal that was less known than competing metals. The Aluminum Association, an American trade group established to represent the concerns of aluminum producers, exclaimed that to ameliorate ignorance of its advantages, aluminum must be marketed: "Despite all the good things that have been said about it here, aluminum still needs to be *sold.* It is new enough that many potential users still do not know how to handle it most profitably; and, frequently, it must be sold over the obstacles of customary usage, ingrained conservatism, or allegiance to older, more traditional materials."[652] Reynolds envisioned their role, despite coming to the industry well after Alcoa was established, as a leader in creating demand. They sought to build a strong position in the postwar economy, and their publications were not reticent about declaring their hand in expanding the market for aluminum products. Reflecting on their role, Reynolds in 1960 wrote, “The underlying reason for the almost unbelievable acceptance of aluminum in the past two decades is, of course, the remarkable qualities of the light, bright metal. Just because aluminum has easy workability, light weight, strength, resistance to corrosion, a shiny surface and many other desirable qualities, however, is no guarantee it will be eagerly sought and put into use. People usually resist change. Someone must lead the way, create an awareness, and acceptance and a

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[651] Bertilorenzi, “From Patents to Stock Buffering Schemes,” 1149.
[652] *Aluminum: How It’s Made and Where It’s Used,* 30.

demand."[653] From the perspective of 1960, Reynolds believed it was they who were leaders in the aluminum industry in not merely responding to demand, but creating it.

Masters of the market

Exactly how much of the market for aluminum that Reynolds created, in comparison with the efforts of Alcoa and other enterprises inside and outside the aluminum industry, is disputable. Indeed, Reynolds did constitute a competitive force in the market, as a newly-minted competitor after World War II. Reynolds claimed to have influenced the reduction in price of aluminum, "30% below prewar,"[654] but they also claimed to have made the market robust: "For the enterprise of Reynolds made aluminum competitive and abundant…thereby turning a new base metal into *business gold.*"[655] Reynolds was nothing if not aggressive. The logo of the upstart company featured a sword-bearing Saint George, England's patron saint, patterned after Raphael's famous "Saint George and the Dragon," riding a horse and bearing a shield with the letter "R," slashing at a dragon below the horse's hooves.[656] Reynold's was known for its aggressive marketing campaigns, with an article in *Industrial Marketing* declaring, "The intensive marketing and merchandising program of Reynolds, Metals Co., whose spectacular rise as one of the leading producers of aluminum in an astonishingly short period has made it the talk of the nation,"[657] who's leader, R.S. Reynolds, had a "flair for the dramatic, and the inherent belief in advertising and promotion…"[658]

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653 "Product Development," 17.
654 Reynolds Metals Company advertisement, *Business Week,* April 17, 1948, folder 19, Reynolds Metals Company Collection, series 1.1.
655 Ibid.
656 *A Few Facts about This Building and Reynolds Metals Company,* 23.
657 "The Reynolds Story," *Industrial Marketing,* October 1955, 1. Citations refer to the Reynolds Metals Company reprint, folder 65, box 4, Reynolds Metals Company Collection, series 7.4.
658 Ibid., 1.

"Aluminum Markets are Made, Not Born," declared an article in the April 1959 issue of *Reynolds Review.* Reynolds believed that the process entailed producers making "known what aluminum has to offer. Nobody else is going to do it for them."[659] This is not to say that Reynolds ignored the endeavor of discovering customer needs. Wrote Reynolds, "The very first step towards creating a new market is discovering and understanding the need of the potential customer."[660] This suggests that Reynolds imagined a consumer landscape wherein customers held needs, that Reynolds then discovered, and subsequently organized them into a "market." Yet, Reynolds maintained they held a strong degree of influence over the customers in the market: "All of these markets have similar beginnings: the industry planted and cultivated the idea that aluminum could satisfy a particular need better than the material which had been traditionally used for that purpose. Trace any major use of aluminum back to its birth and it becomes clear that there is no "chicken and egg" riddle about who came first, seller or buyer. The seller came first in almost every case and by a very wide margin." Reynolds asserted it is clear that, despite beliefs that markets merely respond to customers, instead, they were in control; they made the market; they understood themselves as, in effect, masters over the consumer landscape of aluminum.

Reynolds beliefs were in good company, as the wider sphere of metals production held similar positions. Making markets was a conscious effort by other material producers too, and it was a slow process. As E. Raymond Corey writes, "to develop the markets for materials, the materials producer has found it necessary to undertake marketing programs of great breadth and complexity at two market levels. He has had to work extensively with his immediate customers,

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[659] Irving Lipkowitz, "The Aluminum Story," *Reynolds Review,* April 1959, p. 10, folder 78, Reynolds Metals Company Collection, series 1.3.
[660] Ibid.

the end-product fabricators, to build an industry which will make and supply the new product to end users. In addition, he has had to undertake long-range promotional programs in the end-product market to create demand for the product among consumers and industrial purchasers."[661] Within the aluminum industry itself, and in addition to Reynolds, this position held true. In *Competition in the Aluminum Industry*, Peck maintains, "products are not simply accepted on their merits, but must be merchandised aggressively."[662]

Kawneer, as a manufacturer, not a producer, was in a more narrowly-defined market. They sold products primarily to the building industry, and — a legacy of war production — manufactured aluminum components for national defense. What they shared with producers, however, was the belief that markets were an entity they must create. When the company launched the K-47 line of aluminum store front components in 1946[663] they did not forsee that it would find a ready market. Instead, a company biographer maintained, they believed "it would take some creative selling to get it going."[664] The launch of this new product was concurrent with a front end and a back end reformulation of selling at Kawnner. On the back end, the company reorganized their product lines, eliminating the nameplate of non-Kawneer-branded products (they had sold a product named after a former rival they had bought out, Zouri) and pitting multiple dealers who occupied a single city against each other, now all selling the K-47 line. On the front end, the company rolled out a unified marketing message in the postwar period, the "Machine for selling," a nod to Le Corbusier's "Machine for Living" in which Kawneer claimed the ability, through aluminum, to modernize the commercial landscape.[665]

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[661] Corey, *Development of Markets for New Materials,* 234. For reference to Corey's study with specific application to the aluminum industry, see Stuckey, *Vertical Integration and Joint Ventures in the Aluminum Industry,* 217.
[662] Peck, *Competition in the Aluminum Industry,* 122.
[663] "New K-47 Line Announced to Trade," 1.
[664] "75 Kawneer Years…Only a Beginning," 13.
[665] *Machines for Selling: Modern Store Designs by Kawneer.*

Marketing through architectural competitions

Although architectural competitions sponsored by Reynolds and Kawneer bestowed significant advantages to the architects who won, these competitions functioned as a mechanism to promote aluminum cladding to a wide audience of architects, builders, and potential buyers of aluminum cladding. Associating the name Kawneer or Reynolds with what was judged to be the best architecture or overseen by famous architects was a way of promoting aluminum cladding through a vector which held great respect. These competitions sought to control the image of aluminum, further solidifying its credentials as a modern material. Both Kawneer and Reynolds' competitions yielded initiatives that claimed communities as a marketing landscape. Competitions held by Kawneer led to a company program to claim street fronts as a market for aluminum, while the Reynolds competition inspired a spin off to award significant community architecture.

Kawneer competition as precursor to Main Street as a marketing landscape

Corporate sponsored architecture competitions were held much earlier than those of Reynolds and Kawneer. In 1909 Brickbuilder held a terra cotta house competition, and the Pittsburgh Glass Institute in 1937 held a competition to spur innovative use of glass, just to name a few.[666] The Kawneer company utilized competitions to directly develop new products which expanded to propositions to clad entire streetscapes in aluminum. Kawneer held a competition called the Store fronts of Tomorrow in 1943 in coordination with Pencil Points, the magazine that would help to spread the results of the competition to their audience. Kawneer explicitly stated it held "the purpose of keeping the name Kawneer before the profession, with an eye on

[666] Massler, "The World with the Silver Lining," 41.

post-war work." An eminent jury helped spread the publicity, too, consisting of Roland Wank, Morris Ketchum, Jr., (chairman), Samuel E. Lunden, Frederick Bigger, Mies Van Der Rohe, William Lescaze as professional advisor. This competition was titled, "Store Fronts of Tomorrow" and was singularly focused on the commercial sphere. This was a competition to envision what Kawneer said merchants wanted, "…they are anxious to secure a 'functional architecture' that will help them sell."[667]

As the end of the war approached, Kawneer anticipated the commencement once again of commercial aluminum cladding and store front products. The competition envisioned the store front of tomorrow, which Kawneer launched as "a machine for selling." As is covered in more detail in the *silent salesmen* section, the "machine for selling" concept expanded to engulf entire street fronts. Kawneer launched "A Plan for Modernizing Main Street." This plan sought to cover entire façades in aluminum, not one building at a time, but, "one block at a time."[668] This marketing campaign was bolstered by an ideology of planning that grew in influence after the war, and was argued as necessary because "group planning can solve many problems which are difficult to solve individually."[669] This was a marketing project that hoped to take the "store fronts of tomorrow" to a unified deployment on a community-wide scale.

R.S. Reynolds Memorial Award

In the same way Kawneer positioned the Store Fronts of Tomorrow competition as squarely a marketing initiative, so too did Reynolds envision an architectural competition, that was named in honor of the company founder who had recently passed away. In 1957, Reynolds

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[667] *Report on Two Arch Competitions,* 3.
[668] *A Plan for Modernizing Main Street* (Niles, Mich.: Kawneer Company), p. 11, Kawneer File.
[669] Ibid., 7.

established the R.S. Reynolds Memorial Award to attempt to control the image of aluminum. Reflecting on the success of this endeavor, a Reynolds executive wrote in an internal company memo, "The image created by the Program for the Reynolds Organization is truly remarkable. Whenever the name 'Reynolds' is heard within the Architectural Profession it immediately indicates two things: First, aluminum. Second, the Reynolds Prize…"[670] This memo reveals that company executives were first and foremost concerned with promoting the image of aluminum to the architectural community. To accomplish this, they established the largest monetary award for an architecture prize up to that point in history, an award of $25,000 in 1957, or an equivalent of approximately $214,000 in 2016 dollars. $25,000 was the price Reynolds was willing to pay for promotion in this capacity, on a yearly basis for the next thirty-four years, until the competition ceased in 1991.

Outwardly, Reynolds was more altruistic in tone, stating that while the award was strictly for architecture that used aluminum, it was for the influence architecture could have on society. The flier distributed by the AIA, the administrator or the award, stated, "The Award is conferred annually on an architect who, in the judgement of his profession, has designed a significant work of architecture, in the creation of which aluminum has been an important contributing factor. Prime consideration is given to the creative value of the architect's contribution to the use of aluminum, and its potential influence on the architecture of our times, rather than the size or type of structure."[671]

[670] Donald B. McCammond to R. S. Reynolds Jr., 3 May 1966, Folder 4092, Reynolds Metals Company Collection, series 4.24.
[671] *The R.S. Reynolds Memorial Award 1959,* folder 25, Reynolds Metals Company Collection, series 1.1.

Beauty and function: the persistent message for Reynolds

Reflective of Reynolds persistent marketing message about the advantages of aluminum, the award was conferred for aesthetic quality and function: "The Award will be made annually to an architect who, in the judgement of his profession, has made a most significant contribution to the use of aluminum, aesthetically or structurally, in the building field."[672] The 1958 award was conferred for these reasons. The jury report stated, "We chose the Brussels World Fair Transportation Pavilion… esthetically because of its total conception and structurally because of its total dependence on aluminum as a chief construction material."[673]

Likewise, the second award was praised for its beauty and functional excellence. Yuncken, Freeman Brothers, Griffiths and Simpson of Melbourne designed the award-winning project, the Sidney Myer Music Bowl (1959). The AIA said of the project, "The Music Bowl is acoustically perfect and it is beautiful." The jury was careful to couch its praise of beauty in terms of function, however. The jury emphasized, "aluminum was not used as an ornament 'but as an intrinsic element of shelter and acoustic reinforcement."[674] While this assertion followed the popular "form follows function" trope, it also aligned with the marketing message so often repeated by Reynolds as constituent advantages of aluminum — its qualities making it eminently functional such as its light weight characteristics, and its "natural" beauty.[675]

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[672] Ibid.
[673] American Institute of Architects, News Release, May 20, 1958, p. 1, ibid.
[674] Ibid., 2.
[675] *Reynolds Aluminum and the People Who Make It,* 2. Reynolds denoted aluminum as possessing "permanent natural beauty."

Critique of standardization

For several years, the prize was awarded to architects, but none of them were American. This worried Reynolds and the AIA. Various theories were promoted as to why, but the leading theory was that Americans were ever prevented by overly restrictive building codes and regulations — conditions which, according to this belief, the Europeans and Australians were not subject to. Another theory put forth was that there was too much standardization of architectural components in the US, a condition Reynolds and manufacturers to whom they supplied aluminum must not have been happy to hear. Walter Gropius was a champion of these arguments. The jury he led stated, "the Jury assumes that the lack of imaginative use and sensitive detail in some U.S. entries may reflect the ready availability of standard and pre-engineered building components in the United States and the restraints imposed by U.S. building codes and insurance requirements."[676]

In response, Reynolds established in 1961 the Reynolds Aluminum Prize for Architectural Students "to encourage creativity and inventiveness in architectural design, and to stimulate the interest of America's future architects in the design potential of aluminum."[677] This prize was hoped to yield designs of a less standardized and less restrained configuration. While Reynolds played a role in standardization, here it found an opportunity to market aluminum as not only conducive to standardized production, but also, because of its "natural" properties, and its very abilities, could be combined with the creative agency of students who are not restricted by building codes and standardized components.

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[676] *First Annual Reynolds Aluminum Prize for Architectural Students 1961* (New York: The American Institute of Architects), p. 3, folder 26, Reynolds Metals Company Collection, series 1.1.
[677] Ibid., 1.

The Silent Salesmen

With arguments based on the instrumentality and image of aluminum, promoters built a message that aluminum could bring prosperity through progress and a future orientation. Aluminum was marketed as modernism. The way it was claimed to bring prosperity, however, was its ability to modernize old buildings or commercial landscapes, or create a condition of modernity for a new building. A building had modernized, or was modern, when it was efficient as a "machine for selling," in the words of Kawneer, or could produce profit for the owner.[678] Sometimes, however, promoters claimed for aluminum a role in societal improvement. Yet, behind claims to improve society lay the corporate profit and growth project. These two projects, profit and social good were not understood as contradictory. Instead, it was through profit and growth that social good was believed to be enacted.

Two main building typologies form the main subjects of study. These are the office building and the commercial store front. The office building is studied as new construction and the store front is studied as a renovation, or the more often-used term, revitalization. In each case aluminum was promoted as advantaging the buyer. Yet, the manufacturer also hoped to be advantaged. Promoters worked to define aluminum as an advertisement for aluminum itself. As will be explored in more detail, the efforts of Kawneer in their hometown of Niles, Michigan, shows that Kawneer aimed to modernize the landscape and simultaneously define a marketing landscape for their own products. Niles was the test, and the company hoped to replicate aluminum landscapes along street fronts all across the country. Building upon research by Gabrielle Esperdy, who examines the role of manufacturers of structural glass in the production of 1930s store fronts as a "fully-realized, everyday modernism,"[679] this dissertation continues the

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[678] *Machines for Selling: Modern Store Designs by Kawneer*.
[679] Esperdy, "Modernizing Main Street: Everyday Architecture and the New Deal," 12.

focus on this domain into the postwar period through Kawneer and aluminum, bolstering the argument that architectural modernism was not just a European import, a notion popularized by interpreters of the 1932 MOMA exhibition, *Modern Architecture: International Exhibition.* Extending this argument further, I maintain that the modernism of small town Main Streets was influential in the development of postwar, commercial modernism on high rises, countering the notion that a stylistic modernism merely trickled down from the architectural elite, finding its way to the backwaters of America. This is not to deny the influence of stylistic modernism, as the aluminum cladding in Niles should be understood in part as an emulation of dominant forms. However, what manufacturers learned about the use of aluminum and buyers' acceptance of it was not specific to conceptions of "high" or "low." They sought to sell aluminum cladding and framing components anywhere it could make a sale, from the small town to the big city. Accordingly, manufacturers were a vector of modernism as an agent independent of, but often entangled with architects and other practitioners of modernism.

The second building type studied herein, the office building, was also the intended target for promoters of aluminum. The Alcoa Building (1953) will be analyzed because it stands as an exemplar of aluminum cladding with multiple uses of aluminum inside and outside. The implementation of cladding on this building, however, was informed by a purposeful effort of research and design by Alcoa in collaboration with the architecture firm Harrison & Abramovitz. Having worked with Alcoa beginning with the Rockefeller Center Building (1930-39) through Wallace Harrison, the firm had subsequently been hired soon after the war to aid in developing an aluminum cladding system for a precursor project, the Davenport Works factory Administration Building (1949). What was learned on this "pilot project," as Alcoa termed it, was implemented on many other projects in the ensuing years.

Alcoa collaborated with Harrison & Abramovitz on several high rise towers for which the architects took the lead on the design of ornamental, patterned aluminum panels in the shape of stars or diamonds. Consonant with aluminum manufacturers' promotion of aluminum as beautiful, these ornamental patterns did not shy away from purposeful aesthetic treatment. Yet, always accompanying a justification for ornamentation was function. The diamond shape was justified as an ameliorative to "oil canning," wherein a flat sheet of metal warps in the sun, bulging like an oil can in the heat and ever so slightly changing shape in cooler temperatures. An aluminum panel creased into a pattern could minimize this effect. Modernism is often equated with absence of ornamentation, but these panels show that postwar architectural modernism was not monolithic in rejection of ornamentation.

Three buildings examined in this study were overtly promoted as advertising mediums. These are the Alcoa Building, The Reynolds Metals Executive Office Building and the Reynolds Metals Great Lakes Regional Sales Office. In the same way that Kawneer sought to employ aluminum as part of a "machine for selling," these buildings were "silent salesmen" for aluminum. They were modernism as a marketing project. All three employed aluminum throughout, from furniture to mechanical equipment to the visible face, the aluminum cladding. The cladding was the element most visibly photographed and replicated in marketing material and magazine articles. This feedback loop was in service to selling aluminum. The buildings were advertisements for aluminum in overt and subtle ways, from feature articles in national magazines to small logos attached to the kick plate at the bottom of entry doors.

Alcoa announced their new Alcoa Building (1953) as, “Literally a thirty-story ‘showcase’ of aluminum construction innovations.”[680] Reynolds described their new headquarters as “an aluminum showcase in a Virginia garden setting.”[681] Kawneer described every store front designed according to their “Machines for Selling” criteria as a “silent salesman, day and night.”[682] These buildings and commercial landscapes constituted spaces of marketing, and within this marketing apparatus, each were publicized as modern. The headquarters’ and sales offices, in bearing the names of their respective corporations — Alcoa, Reynolds or Kawneer, are the most overt sales agents, directly tied to visual and textual productions distributed to architects and potential customers of aluminum cladding and other aluminum architectural products.

Other landscapes appropriated as marketed spaces are more covert. These are the thousands of store fronts manufactured by Kawneer across the country. Kawneer understood store fronts as playing a dual-agent salesman role. They are simultaneously sales agents for Kawneer, bearing labels, for instance, on door kick plates, impotent as marketing tools to all except those who might stoop down to notice. However, when these buildings are replicated in promotional brochures and distributed to potential customers, they become the silent salesmen Kawneer desired. The second sales agent in the dual-agent role played by store fronts is the marketing role Kawneer promoted that these aluminum-bearing store fronts could manifest a “silent salesman” for the merchant within. Kawneer marketed their aluminum store fronts as possessing the ability to convert the store into an efficient sales machine, often covering over old “outdated” façades.

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680 *Aluminum on the Skyline*, 3.
681 *A Few Facts about This Building and Reynolds Metals Company*, 3.
682 *Machines for Selling: Modern Store Designs by Kawneer.*

Kawneer is notable because it used the entire downtown of its hometown, Niles, Michigan, as a commercial, marketing landscape for Kawneer products. Famous architects were asked to collaborate on store front designs in Niles, the street front façades were featured in promotional material, and finally much of the street front was clad in brown aluminum in 1972, later to be removed in the "Big Brown Take Down" in 2003.

Not unlike the aluminum clad-street in Niles, a similar story unfolded in the small town of Paola, Kansas. In 1967, every façade facing the town square was clad in blue, red, green and yellow aluminum. Upon completion, the town newspaper declared that the town had finally "modernized. This section examines the notion of a building as a marketing medium for aluminum. After first examining the headquarters of Alcoa, Reynolds, and buildings related to these two through aluminum cladding design, Niles and Paola are explored as two cases of aluminum cladding whole commercial landscapes, revealing how space was appropriated for marketing aluminum.

Any building, it is true, could be understood as a silent salesman, doing the marketing work for not only its owner but also the building component manufacturers whose products constitute the building. Trade magazines and websites commonly advertise buildings in association with various marketing promotions. The headquarters and sales offices of Alcoa and Reynolds, however, are notable for being designed specifically as images of modernity, employed as standing advertisements for aluminum.

Architecture, harnessed as a marketing medium for building product manufacturers, gained publicity with their association with fairs and with the development of photographic reproduction in the late nineteenth century. For instance, Peter Behrens designed the

Delmenhorst Linoleum Pavilion (1906) as a promotional device,[683] and Bruno Taut designed the Steel Pavilion (1913) at the Leipzig Fair and the Glass House at the Cologne Exposition of 1914 for the German glass industry.[684] One of the first multistory buildings to be enclosed with a glass curtain wall in the United States, the Higgens Armory Museum in Worcester, Massachusetts (1929-1930) was designed in part, as Wermeil shows, "to show that steel products could be beautiful, as well as functional."[685] A large, postwar example of building as marketing medium was the U.S. Steel Headquarters in Pittsburgh (1949-51) by Harrison & Abramovitz. This building was notable as a display of steel building products, including stainless steel metal facing and "15 miles of steel wainscot, washroom walls and toilet partitions, elevators and lobby to assure an impressive exposition of stainless and porcelain enameled steel in architecture."[686]

Harrison & Abramovitz had also been a favorite of Alcoa, having designed the Davenport Works Administration building (1949) in Davenport, Iowa as a "pilot" skyscraper for an as-yet to be named future exercise in aluminum, the Alcoa Building (1953). Alcoa hired Harrison & Abramovitz again for this exercise in aluminum as its headquarters in Pittsburgh, a "thirty story 'showcase' of aluminum construction innovations." The building was replete with aluminum, from the remarkable aluminum skin, to doors and window frames, ceiling tiles, ventilation carrying equipment, plumbing and furniture throughout. While the building was remarkable for its wide-ranging use of aluminum in all manner of applications, it also was remarkable for the way in which it was planned to be replicated across the country. Alcoa certainly hoped that buyers of aluminum building components would be inspired by individual components, such as

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[683] Massler, *The World with the Silver Lining,* 17.
[684] Newhouse, *Wallace K. Harrison, Architect,* 146. See also William J. R. Curtis, *Modern Architecture since 1900* (London: Phaidon, 1996), p. 106, quoted in Massler, *The World with the Silver Lining,* 17.
[685] Wermiel, "Early Curtain-Wall Buildings and the Higgins Armory Museum in Massachusetts," 43-44.
[686] Myers, "The Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style," 99-100.

all aluminum light fixtures. Alcoa's larger vision for the building, however, was as a prototype in full, a new type, an aluminum skyscraper. As Alcoa's glossy publication about the building, *Aluminum on the Skyline* explained, "In these pages you have followed the planning and creation of an office building that is new, startling, and remarkably rich in promise for the future. This structure introduces concepts of design, engineering, and erection that may well change the architectural face of America in the next half-century."[687] The tower was hoped to begin a cascade of aluminum high rises that at best, made full use of aluminum inside and out, and at worst, replicated at least one of the categories of "design, engineering" or "erection" in future buildings.

The cladding, as the most visible constituent of the building, was the element that most readily contributed to the tower as the "silent salesman." It was easily photographed. It's "diamond" pattern, (more readable as an X,) was replicated on the *Aluminum on the Skyline* brochure, and, perhaps for future researchers to discover possible links, the X pattern would become replicated in many designs for Alcoa products and design proposals, including even the company's logo. As previously explained, the cladding was designed as a collaboration between Alcoa's Research Laboratories, the Development Division and the Engineering Divisions, and the architecture firm of Harrison & Abramovitz. Fulfilling one of Alcoa's objectives to see the building replicate in concept, the fundamental configuration of this cladding as a stamped panel with a geometric pattern was employed on several other buildings in the 1950s.

Alcoa understood the Alcoa Building as playing a formative role in the spread of aluminum cladding in use on buildings, despite the causality of many factors. In 1956, Alcoa printed an ad declaring success in the venture of replication. Illustrating a perspective of the

[687] *Aluminum on the Skyline,* 39.

Alcoa Building, the ad was headlined, “A New Kind of Architecture Was Born Here”. The ad continued, “Several years ago, Alcoa dared a venture into architecture’s never-never land….Result: hundreds of aluminum-skinned buildings have been completed or are under construction…Everything we predicted for aluminum as a basic building material has come true…our architectural consultation service is at your disposal.”[688]

Bolstering Alcoa’s claim that the Alcoa Building helped unleash a cascade of aluminum-skinned buildings across the United States was an account of a building owner switching from masonry construction to aluminum for a planned high rise in New York. As Alcoa explains the conceptual transformation of the 99 Park Avenue building (1954) (architects Emery Roth & Sons), “…after seeing the new Alcoa Building and its gleaming aluminum curtain wall, the builders[689] decided to switch to a similar construction….Instead of a conventionally erected masonry façade, the giant air-conditioned office building was swiftly enclosed with a curtain wall of about 1800 prefabricated, die-pressed aluminum wall and window panels.” The building was strikingly similar in appearance and the panels shared similar erection and installation techniques as those employed on the Alcoa Building. The panels on 99 Park Avenue modified the X pattern with a vertical fold, a sort of “upright and upside down” Y pattern merged together. The aesthetic finish replicated the Alcoa Building: “External metallic reflection has been mellowed by a gunmetal gray finish.”[690]

Other factors undoubtedly figure into the causality of the rapid spread in the postwar period besides the “never-never land” effect of the Alcoa Building. Many influences have been

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[688] “A New Kind of Architecture was Born Here,” advertisement, 1956, “Advertisement, Alcoa, 1956,” exhibit display in the Senator John Heinz History Center, Records of the Aluminum Company of America.
[689] *Architectural Achievements: 99 Park Avenue* (Pittsburgh: Aluminum Company of America, 1954), folder 15, box 126, ibid. The builders and owners were Tishman Realty & Construction Company.
[690] Ibid.

examined in this study, including the infrastructure available after the war, the entry of new competitors, government-mandated transfer of patented processes and newly exploited bauxite sources in the global south. Myers, author of the dissertation "The Development of Mid-20th-Century American Metal-And-Glass Architecture in the Curtain Wall Style", and a former Alcoa employee in the advertising department, discussed the postwar spread of aluminum cladding with an Alcoa executive during his tenure with Alcoa. He writes, "H.F. Johnson of Alcoa once estimated that those covered with his metal alone jumped from about 100 buildings in 1953 to over 1,000 by 1958."[691] Myers phrase, "his metal alone" leaves unclear the deployment configuration of aluminum construction. Was this in the form of stamped-aluminum cladding, or glass and aluminum frame curtain walls, or other configurations? Further details are not given. Glass and metal curtain walls were a ubiquitous deployment of the material throughout the 1950s and 1960s, and to a lesser degree, the stamped-aluminum curtain wall.

Another example of the stamped-aluminum configuration sourced from Alcoa-produced aluminum was strikingly similar to the 99 Park Avenue building. 460 Park Avenue (1954), a building also built and commissioned by Tishman Realty & Construction, employed the same panels as the 99 Park Avenue building, and was lauded for being clad in 9-1/2 hours. Utilizing stamped-aluminum panels in a less strikingly all-over aluminum shell configuration is the Bell Telephone Building (1957),[692] by Press Dowler and William Dowler, architects. The façade consists of stamped-aluminum panels that resemble previously developed techniques of utilizing aluminum at the spandrel only, yet are actually unified spandrel and window units like the preceding examples.

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691 Myers, "The Development of Mid-20th-Century American Metal-and-Glass Architecture in the Curtain Wall Style," 115.
692 Ibid., 185.

Domains of expertise and the spread of stamped-aluminum cladding: fabricators

While the marketing mechanisms of Alcoa constituted one medium through which stamped-aluminum cladding spread, other mediums were the associated bodies of expertise involved in the design and construction of buildings. Fabricators who developed expertise working with one metal found transferrable that knowledge into aluminum, which quickly grew to overtake other metals such as iron, bronze and copper in architectural uses. General Bronze Corporation, Garden City, New York, despite its namesake, was the subcontractor for the aluminum panels on the Alcoa Building.[693] As such, their job was to fabricate the panels by pressing the panels in "press dies," thus forming a sheet of aluminum by shaping, cutting, and fitting to prescribed dimensions and specifications.[694] Having developed this expertise, they were subsequently employed by the contractor to fabricate the panels on the 99 Park Avenue Building. General Bronze fabricated them on assembly lines, after which they were transported to the building site and "stacked on the floors they were to enclose."[695] Following this building, General Bronze fabricated the stamped-aluminum cladding for many buildings, including the 261 Madison Avenue Building (1954) by architect Sylvan Bien,[696] Alcoa's own District Sales Office Building (1954), by Paul Schell, architect, the Porter Building in Pittsburgh (1958), by

[693] "Aluminum: New ALCOA Administration Building at the Davenport Plant is a Gleaming Package of the Many Mature Uses of this Metal in Building." General Bronze Corporation pivoted to embrace aluminum fabrication of end-products, including work on the Davenport Administration building, such as extruded aluminum sash for windows.
[694] The Flour City Ornamental Iron Company, advertisement, *Architectural Record,* April 1954. Although this process is outlined by Flour City Ornamental Iron Company, the procedure was the similarly undertaken General Bronze Corporation.
[695] *Architectural Achievements: 99 Park Avenue*.
[696] *Architectural Achievements: 261 Madison Avenue* (Pittsburgh: Aluminum Company of America, 1954), folder 3, box 126, Records of the Aluminum Company of America.

Harrison & Abramovitz, and the Fashion Institute of Technology (1959) by architects DeYoung, Moskowitz & Rosenberg.[697]

A second fabricator that was hired to make stamped-aluminum panels was Flour City Ornamental Iron Company, Minneapolis, Minnesota. Founded as a blacksmith shop and foundry in 1893, and advertising itself as "artisans in all metals,"[698] it embraced the production of aluminum components for World War II. Following expertise gained in such production, the company was hired as the subcontractor for two banks in Texas, clad in Alcoa-derived aluminum. The first was the Republic National Bank Building (1954), Dallas, Texas, by Harrison & Abramovitz. Flour City facilitated mass production of the stamped-aluminum: "Complete forming, preassembling and finishing were economically accomplished by mass production methods at the plant of the aluminum subcontractor."[699] A second bank was the Texas National Bank Building (1955), Houston, Texas, by architect Kenneth Franzheim. Employing a similar "upright and upside down" Y pattern as in earlier buildings such as 99 Park Avenue Building, these panels replicated the Alcoa Architectural Gray 2020 finish employed on the Alcoa Building.

Domains of expertise and the spread of stamped-aluminum cladding: architects

The architects of Harrison & Abramovitz had long intersected with Alcoa, beginning with Wallace Harrison's work on the Rockefeller Center and continuing into the 1950s with their

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[697] General Bronze Corporation advertisement.
[698] Flour City Ornamental Iron Company advertisement.
[699] *Architectural Achievements: Republic National Bank Building*.

contribution to the development of the stamped-aluminum curtain wall, as well as glass and aluminum curtain walls.[700]

A significant commission won by Harrison & Abramovitz after the Alcoa Building was the Republic National Bank Building (not to be confused with the afore-mentioned Texas National Bank), Dallas, Texas, in collaboration with Gill & Harrell, Architects.[701] With its striking, simultaneously concave and convex diamond pattern, described in superlatives by Alcoa as "one of the largest and most impressive aluminum-clad skyscrapers in the nation,"[702] the aluminum panels were promoted by Alcoa as simultaneously functional and decorative: "Panels were impressed with a distinctive prismatic design which stiffens as well as decorates the sheet."[703] The aesthetics of the bank panels were justified in terms of function, in the same way the Alcoa Building panels were lauded for their functional characteristics and aesthetics: "A concave prismatic design stamped into each panel gives added strength as well as architectural interest through the light and shade patterns produced." Max Abramovitz may have revealed his position concerning the negotiation between the architect's design agency and the manufacturers' desires for increased standardization when he co-authored[704] an article for Architectural Record titled, "Fenestration." The article states, "…the skyscraper, America's distinctive contribution to architecture, is not now, if it ever was, a standardized package. For all of the inventiveness already poured into its progress, there is room still for a great deal of

[700] A building designed by Harrison & Abramovitz which exemplifies their experience and interest with glass curtain walls is the 717 Fifth Avenue Building, also known as the Corning Glass Building (1957-59), New York City.

[701] Flour City Ornamental Iron Company advertisement.

[702] *Architectural Achievements: Republic National Bank Building*.

[703] *Architectural Achievements: Republic National Bank Building.*

[704] "Fenestration," *Architectural Record,* April 1955, 199. The article labels his involvement as "Fenestration thus becomes the theme of this Building Types Study, prepared with the assistance of Max Abramovitz, of Harrison & Abramovitz, acting as mentor and master of ceremonies…"

cleverness, to fit that inventiveness to the changing needs of big business and its big and little people."[705] While Abramovitz embraced standardization, he also sought ways to exercise design agency, understanding standardization to both limit and enable design. Answering a question at the Metal Curtain Wall conference, he stated, "Well, I wouldn't be content to be limited to standard designs… There will be a great number, I am sure, of standard designs developed that can be arranged with flexibility, with a great deal of creative energy, and that also will allow for cost improvement. There will be certain areas where you will have work done on a job basis."[706] Abramovitz believed that retooling was not cost prohibitive on large buildings such as the Alcoa Building and the Republic National Bank Building, and he also believed that he could exercise "a great deal of creative energy," arranging standardized components to incorporate his design. He exercised this design in both aesthetic treatment and in the functional design of the components themselves.

The panels on the Republic National Bank Building exemplify Abramovitz's simultaneous embrace of standardization and creative agency. The panels won praise in Architectural Forum, with one "Professor Thrugg," glowingly writing, "…a fine new aluminum curtain wall, the contribution of its architects, carrying forward a new kind of design exploration. It glitters handsomely in the sun far across the cotton lands, and on gray days depends on its repeat pattern of embossed squares, like a fancy waistcoat."[707] The panels were also praised for their "advance" ahead of the Alcoa Building in an Architectural Forum article: "Anodize aluminum panels that fit over fireproofed spandrel beams are more advanced than those used on the Alcoa Building. Like the Alcoa panels, they have a pattern impressed on them to increase

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[705] Ibid., 199.
[706] *Metal Curtain Walls,* 61.
[707] "Buildings in Review: Schizophrenic Building," *Architectural Forum,* February 1955, 126.

rigidity and prevent oil-canning. But where the Alcoa panels are simply sheets of 1/8" aluminum, the Republic panels are complete sections in themselves." This article referred to the 1-1/2" approximate thickness of the exterior wall panels – a sandwich of a thin sheet of aluminum on the exterior onto which was bound 1-1/2" of rigid insulation, a wall advantaged by the building code of Dallas which precluded the backup wall required in other cities such as New York. These authors saw the Republic Bank Building as an antecedent to the Alcoa Building, just as Alcoa desired. Of course, the hundreds of aluminum and glass clad buildings that emerged in the 1950s do not all fit into a neat, linear Alcoa-derived narrative because they were influenced by other architects, manufacturers and forces beyond Alcoa. But the perception of linear influence was important to Alcoa, because linear influence could be traced, in this case, back to a source — Alcoa aluminum.

Aluminum cladding spurs competition with stainless steel

While Alcoa envisioned a burgeoning market for aluminum cladding, the steel industry envisioned the same for stainless steel. Even though Harrison & Abramovitz had closely allied themselves with Alcoa, they still were, and behaved as, an independent entity. Harrison & Abramovitz carried expertise developed through collaboration with Alcoa into the field of stainless steel. As an architecture firm independent of Alcoa, they exercised freedom to jump independently between steel and aluminum. Although they were hired to collaborate on an aluminum wall at the Alcoa Davenport Administration Building (1949,) the firm carried out dozens of projects, some of which included commissions benefitting steel companies. The 525 William Penn Place building (1951), occupied by the Mellon National Bank and the U.S. Steel

Corporation predated the aluminum-clad Alcoa Building (1953), followed several years later by the stainless steel-clad Socony-Mobile building (1956) in New York City.

Overtures of cooperation were publicly on display between Alcoa and the steel industry in reference to the curtain wall market, but they also kept a keen watch on each other's product development. At the Metal Curtain Wall conference, Alcoa acknowledged the qualities of stainless steel, but defended aluminum as ultimately superior. Said Frederick (Fritz) J. Close, Manager of Market Development for Alcoa, "Stainless steel is an excellent material. My meat and potatoes is aluminum. I think aluminum is a better material. Porcelain enamel on steel is an excellent product. I think porcelain enamel on aluminum is a better product. I believe I could defend this on the merits of aluminum." Perhaps to soften any emergence of a public quarrel, he followed up with, "Let's develop the market and we will all profit — of that I am sure. And let's stop quarrelling with our kin, or even our real competitors, and build that better mouse trap."[708] Reynolds, for their part, also defended aluminum against stainless steel, asserting that despite widespread belief, it does in fact rust and aluminum is three times lighter.[709] Aluminum also enjoyed a price advantage over stainless steel. Yet, the aluminum industry held some anxiety about competition with the steel industry. One Alcoa executive stated, "…and while we dream of the day when we have metalized the world insofar as construction is concerned, it would be folly for us not to realize that competitive materials are not going to stand by and watch us steal their market.[710] Executives overseeing the development of stainless steel envisioned for it a greater role in architecture. They got their chance to develop a rival "silent salesman" when stainless steel was selected as the exterior cladding on the Socony-Mobile Building (1956) by Harrison &

[708] *Metal Curtain Walls,* 163.
[709] *A-B-C's of Aluminum,* 36.
[710] *Metal Curtain Walls*, 163.

Abramovitz with John B. Peterkin,, celebrated by the Committee of Stainless Steel Producers of the American Iron and Steel Institute as "the largest metal-clad building in the world"[711]

Executives in the steel industry wanted a showcase competitor to the aluminum-clad buildings built in New York and other cities.[712] Their friendship with building developers in New York City gave them the chance. The firm Harrison & Abramovitz would facilitate the opportunity. As was often the case with the origin story of aluminum-clad high rises, the Socony-Mobil building began in design as a masonry-clad structure. However, as reported in Architectural Forum, Harrison & Abramovitz, upon hearing this, "instantly suggested a review of later advances in building materials even though brick was used as a low-cost material in setting a budget figure."[713] The building's developer operated two buildings associated with the steel industry, maintaining contact and friendship with steel industry executives.[714] As Architectural Forum reported, "He found that his friends in steel, alarmed by the amount of publicity that the aluminum industry had been getting through a succession of aluminum skin buildings, very much wanted this major building to have a steel skin and a showcase for the industry." Adding to the unfolding drama, the article continued, "And what about the cost?" asked Harrison and Horr. Would not a stainless steel skin cost half again as much as brick? But the steel industry wanted the building, and cost was not going to prevent them from getting it. To meet the competition, they were willing to write off any price differential as the cost of promoting steel.

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[711] "More Facts and Figures about the Stainless Steel Skyscraper (New York: The Committee of Stainless Steel Producers, American Iron and Steel Institute, undated), p. 2, folder 96, Abramovitz Architectural Records and Papers Collection.
[712] "New York's Biggest Building in 25 Years," *Architectural Forum,* January 1955, 91.
[713] Ibid., 91.
[714] Ibid. One of the developers, John Galbreath, operated the 525 Penn Place building in Pittsburgh, referred to as the "steel" building, and Fairless Town for US Steel Corporation.

The design for the pattern on the stainless steel cladding was entrusted to Harrison & Abramovitz. Referencing the Alcoa building, the "steel people are hopeful that Harrison will define their material for curtain wall use as dramatically as he did in aluminum."[715] The firm produced "hundreds" of variations for the stamped pattern, narrowing down to five, and selecting the final to avoid any "horizontals with the soiling and streaking they would bring in New York."[716] As in aluminum applications, the decorative pattern was justified in terms of functional requirements: "This small pattern was developed from the limitations of the material and the available stamping equipment to overcome the blistering caused by the temperature-change expansion and contraction…"[717] The Socony Mobil Oil Company occupied the largest portion of the building, the American Iron and Steel Institute took a floor,[718] the New York Times placed a rendering of the building on a cover of a special report on "Manhattan's Newest Landmark,"[719] and the steel industry got their "silent salesman."

Reynolds and the aluminum showcase in a Virginia garden

While the Alcoa Building was designed as an advertisement for Alcoa in an urban setting, Reynolds chose a different context for their new headquarters — a verdant, open landscape at the edge of Richmond, Virginia. This contrast exemplified the differing strategies of the two showpieces. While Alcoa was a tower meant to be replicated, Reynolds' headquarters was meant to be a elegant original. Both, however, were conceive as marketing mediums. The Reynolds Metals Company International Headquarters, (1955-1958) building was designed by

[715] Ibid., 88.
[716] Ibid.
[717] Ibid., 93.
[718] *The Socony Mobil Building* (New York: Socony Mobil Oil Company, undated,) 12-13, folder 96, Abramovitz Architectural Records and Papers Collection.This document provides a floor occupancy diagram.
[719] "Manhattan's Newest Landmark," *New York Times,* August 19, 1956, cover page, ibid. This document provides a floor occupancy diagram.

Gordon Bunshaft of Skidmore, Owings and Merrill and the landscape was designed by Charles F. Gillette. The site was chosen, in part, as a visible contrast with the glistening modernity of aluminum, setting the building apart in the landscape. Louise Mozingo, in *Pastoral Capitalism: A History of Suburban Corporate Landscapes,* reveals the way in which many corporations were attracted to the amenities of verdant settings. She cites General Foods, for instance, which urged employees to move "out of the city…and into the trees." Reflecting on their new setting, they wrote, "[T]he move has brought many changes…like a chance to stroll on tree-lined paths at noon."[720] Unlike the many corporate headquarters profiled by Mozingo, in which corporations sought exodus from the city and the economic and social disadvantages they perceived, Reynolds' selection of this pastoral landscape was based on adjacency to a small city which had been their home since 1938, and a desire to inspirationally demonstrate to customers the myriad uses of aluminum. R.S. Reynolds, Jr., defined the goals for the design, mandating modernism: "The building will be of the most modem type, utilizing aluminum buildings materials to the greatest extent possible. The company expects the building to constitute a showplace illustrating what can be done with aluminum in modern construction."[721] It certainly made an impression with the architectural community, as it was selected as "the most significant structure built in Virginia since Thomas Jefferson completed the University of Virginia in 1832."[722] This was quite an endorsement, especially due to the esteemed jury, including architect Pietro Belluschi, Walter Creese, President of the Society of Architectural Historians, and Mies Vander Rohe, to

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[720] Louise A. Mozingo, *Pastoral Capitalism: A History of Suburban Corporate Landscapes* (Cambridge: MIT Press), 27.
[721] Reynolds Metals Company, Commemorative Calendar, 1998, cited in Mary Harding Sadler and Peter McDearmon Witt, *National Register of Historic Places Registration Form, Reynolds Metals Company International Headquarters,* accessed June 26, 2017, http://www.dhr.virginia.gov/registers/Counties/Henrico/043-0242_Reynolds_Metals_Co_Intl_Headquarters_2000_Final_Nomination.pdf.
[722] *Reynolds Review,* October 1958, p. 11, folder 75, Reynolds Metals Company Collection, series 1.3.

name a few.[723] This was exactly the type of attention the producer hoped the building would generate. They wanted to capture the attention of building products consumers. Reynolds loved the attention. It likely stroked the ego of the founder, R.S. Reynolds, Sr., who began a color brochure publicizing the headquarters with a poem he wrote, including these lines, "We defy precedent. We prove the impossible. We are God's answer to the commonplace. Unbroken, untamed, and unafraid."[724] Gordon Bunshaft was charged with incorporating aluminum into the building, visible from the exterior and interior. He interpreted aluminum-as-advertisement in a visually subtler way than did Harrison & Abramovitz for the Alcoa Building, with generous use of glass on the exterior instead of complete aluminum cladding. Gordon Bunshaft remarked on the restraint, "But aluminum is used only where appropriate," while softening what could be interpreted, perhaps, as a tamed approach, with a nod to Reynolds' desire to make the building an advertisement, "and all aluminum items used are available today to any builder."[725]

The design presented to Reynolds executives, when resultant as a building, was said to encapsulate what Reynolds described as the "most apt" description of the many tributes paid: "gracious and efficient." This condition was understood as manifest from "broad use of aluminum, tasteful use of other materials, and a design that is functional and strikingly modern, yet not afraid to borrow from tradition."[726] A design "unafraid," echoing R.S. Reynold's poem. A design that borrows from tradition, or as R.S. Reynolds might say, defying "precedent." If precedent was a gleaming, urban, aluminum tower, Reynolds went low, broad and pastoral. If precedent was asymmetry and alienating abstract-patterns, Reynolds embraced an "over-all

[723] Ibid., 11.
[724] *A Few Facts about This Building and Reynolds Metals Company,* 2.
[725] "Our New General Office," *Reynolds Review,* September 1958, 4.
[726] *A Few Facts about This Building and Reynolds Metals Company,* 4.

symmetry of design," and the familiar, with "Southern tradition, in the Williamsburg brick floor."[727] While it harkened back to tradition, the building was simultaneously understood as representative of progress and unabashed modernism: "The straight, clean lines of the exterior blend aluminum and glass to present a striking appearance that suggest efficiency and progress in an aesthetically pleasing way."[728]

The Reynolds Executive Office Building, or EXO as it was called by the company, was not meant to be replicated, as was the spirit of the Alcoa Building. It was elegant, a "one-off," unique and designed for its setting with harmonious reflecting pools and verdant lawns designed by local landscape architect Charles F. Gillette. Modern art by modern masters adorned the walls, the executives possessing a taste for original works by Picasso, Le Corbusier and Albers, three of the 14 original paintings in the executive office collection.[729] Taking the opposite tack from Alcoa, it was meant to inspire through its originality with a clearly defined purpose. It was promoted as "more than a building. It is many things. To begin with, our new main office becomes an important sales tool. As a showcase of versatility, beauty and usefulness of aluminum, it offers specific applications of our products to our potential customers."[730]

Jewel on stilts: Reynolds Great Lakes Regional Sales Office

The Reynolds Executive Office Building was designed to be unique and modern. These became mandates for a second showpiece of aluminum, yet to these requirements were added another. Rather than sit protected and isolated by a vast landscape, it was "designed to attract

[727] Ibid., 5.
[728] Ibid., 7.
[729] R. E. Crawford & Associates, Inc., *Appraisal,* 1.
[730] Reynolds Jr., "From the President's Desk," 1.

maximum attention,"[731] fishing for aluminum customers from Detroit's population teeming with automobile company executives — each a potential customer leading to work in the growing and important automobile market. The Reynolds Great Lakes Regional Sales Office (1959) was designed by Minoru Yamasaki. Described as a "Jewel on Stilts" by the architect, it placed emphasis on aesthetics as a mode of marketing. Reynolds described its ornamental qualities through the analogy of a gem: "The Great Lakes Sales Region Headquarters Building,[732] designed to demonstrate the beauty and utility of aluminum, has been described as a modern architectural gem. The building, a sparkling example of Yamasaki's "architecture of delight", is a jewel on stilts, designed to catch the eye of the passerby in the heavily trafficked northwest area of Detroit."[733]

This building was understood by Yamasaki as simultaneously modern and ornamental. Neither Reynolds, nor Yamasaki saw these positions as antithetical. Yamasaki offered his opinion on ornamentation in modern architecture: "the other thing that I have been interested in is that buildings should have ornament. But at the same time I think that the ornament cannot be carved by hand. It can't be handicraft because obviously this is solving nothing. If we do, we are just being somewhat sentimental and proving nothing. But if we can produce really lovely ornaments through machine — machine made ornament — then we are proving something because then again another element in architecture becomes a part of our technological building."[734] The building did in fact feature a machine-made gold-annodized aluminum screen

[731] "New Detroit Sales Office," *Reynolds Review,* November 1959, p. 3, folder 75, Reynolds Metals Company Collection, series 1.3.
[732] The building is variously called the "Regional Headquarters building" or "Regional Sales Office"
[733] Peter, *Aluminum in Modern Architecture'60,* 73.
[734] Peter, *Aluminum in Modern Architecture'58,* 110.

that Yamasaki called a “delight” in its treatment of transparency, depth and shadow.[735] The architect eagerly promoted this “jewel on stilts,” with a gold anodized screen of rings glistening in the sun while screening out direct sunlight from striking the glass façade underneath.[736] The mandate of function, however, was held conceptually close. A jewel was permissible, but only in service to the glass box.

Reynolds hiring Yamasaki and enthusiastically endorsing his comments, publishing them widely in *Aluminum in Modern Architecture* and other promotional material was a clear endorsement of modern architecture as inclusive of ornamentation, with the Yamasaki-designed building an exemplar of this fusion. This position supported their ideology of, and portrayal of aluminum in aesthetic terms. Recall that Reynolds understood raw aluminum holding an “inherent beauty” with a “sheen-like surface texture…it is the metal itself,”[737] and described that eminent representative of aluminum, the Reynolds EXO, as a “showcase for the versatility, beauty and usefulness of aluminum,”[738] publicizing it as “suggesting efficiency and progress in an aesthetically pleasing way.”[739] Reynolds summarized Yamasaki’s “jewel on stilts” as dramatically combining “both beauty and function.”[740] For Reynolds, ornament was fully compatible with modernism.

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735 Grace Ong Yan, “Wrapping: The Mutable Life of Aluminum through Reynolds Metals’ Marketing,” paper presented at the Life of New Materials, Hagley Museum, and Chemical Heritage Foundation, Wilmington, Del. and Philadelphia, 2011, 18.
736 “New Detroit Sales Office,” *Reynolds Review*.
737 *Reynolds Aluminum: Its Important Role in Architecture,* 2.
738 Reynolds Jr., “From the President’s Desk,” 1.
739 *A Few Facts About this Building and Reynolds Metals Company,* 7.
740 Reynolds Metals Company, 1959 Annual Report, March 1, 1960, back matter, folder 60, Reynolds Metals Company Collection, series 1.2.

Appropriating Niles, Michigan as a marketing landscape

Kawneer understood World War II as causing a "complete break with the past"[741] that necessitated a whole new line of store fronts for the postwar period. They initiated planning for this new "Store Front of Tomorrow"[742] along with a competition open to students and professionals in 1943. Tomorrow couldn't come soon enough for Kawneer, at which time, they promised, "you will see Kawneer leadership more vigorously reasserted than at any time."[743] When Kawneer publicized "tomorrow," they meant the moment the war ended. They aimed to be ready, which is why they began planning for tomorrow in the middle of the war. Kawneer began by studying how the individual store front itself could be "modernized," later to be conceived as a "machine for selling." By 1945, they aimed to modernize the entire commercial landscape, one town at a time. The town they began with was their own hometown of Niles, Michigan. When they were finished, every façade along Main Street would be covered in brown or gray aluminum.

Front Street in Niles was appropriated by Kawneer as a marketing landscape for aluminum. It became a living showcase of aluminum products for the company. The appropriation happened slowly, at first, beginning in the 'teens. Today, one can walk along Front Street in Niles and observe the legacy of Kawneer products, from prewar copper sash to remnants of vast expanses of brown aluminum cladding.

Kawneer promoted that aluminum, as part of an assemblage in a store front system, was able to modernize. A store became modernized when it became a "machine for selling." Modernization wasn't just about a look, but it was that. Similarly, modernization wasn't just

[741] *Report on Two Arch Competitions*, 32.
[742] Ibid., 3.
[743] Ibid., 32.

about reorganizing the interior of the store, but it was that too. Kawneer promoted modernization as a comprehensive reformulation of the store, and in the postwar period, aluminum was the medium through which modernization was achieved. Kawneer didn't advocate stopping the modernization project with one store. They advocated that a town "take one block at a time." As the "pilot study," the first block began with Niles.

Kawneer and the modernization of store fronts before World War II

Kawneer publicized that it had developed the "first truly modern store front," in Holdredge, Nebraska, in 1906.[744] An advertisement captioned the photo with, "The first truly modern store front with large display windows in Kawneer resilient sash."[745] Although it didn't state directly what made the store front modern, it implied it had something to do with the large display window and the sash. A slogan from 1912 provides a hint about the pecuniary characteristic of the store front, proclaiming, "It Stays and Pays."[746] A catalog from 1917 may provide additional clarity. In an article titled, "Another Small Town Success," Kawneer implored the reader, "If you are located in a small town do not put off modernizing your Store Front, believing that only the large city Store can profit by such an investment. People of the smaller towns, as well as those in the rural districts, demand modern retailing — many times travel miles to trade under modern conditions."[747] The success story in this article was George Hollecker who, after installing a Kawneer store front, found the store front's ability "to make show windows pay dividends." *Boosting Business* was the title of this brochure. This brochure makes clear that by modern, Kawneer meant that the store was a profitable enterprise.

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[744] Kawneer Company, "The Kawneer Touch…The Result of 50 Years of Architectural Cooperation," 305.
[745] Ibid.
[746] *Kawneer Store Fronts: It Stays and Pays,* front matter.
[747] *Boosting Business with Kawneer Storefronts,* 19.

Kawneer also believed modern did not imply inexpensive. Instead, modern implied expensive in the short term, but cheap in the long term. "The High Price of Paying Less" explains that "You can install a wood or iron Store Front for somewhat less money than it will cost you to put up a first-class, modern Kawneer Front." The wood, however, will rot, as Kawneer asserted, but installing a Kawneer Front means "putting off today that which lays a good foundation for your business tomorrow."

The emergence of modern architecture in small-town United States has been derided as "Drugstore Modern" by the notable definer of modern architecture, Henry-Russel Hitchcock, claiming that it was a mere "parodying of its more obvious aspects," referring to what Hitchcock believed to be a more authentic architectural modernism.[748] Hitchcock posed a defense of modern architecture on ideological grounds that store front architecture did not meet certain standards. Kawneer, however, was less concerned about ascribing to the international style, although it did feature dozens of European store fronts in a 1936 catalog extoling the virtues of store fronts that could easily pass the International Style test. Kawneer was more concerned about capital accumulation and believed the way to profit was to market store fronts as profitable investments and opportunities for good design. This same 1936 catalog reveals a modification of the 1917 strategy of arguing that customers want to shop in modern retail contexts. Where the 1917 argument explained that "people…demand modern retailing," the 1936 argument shifts to assert that people also demand "better design. Sensible, modern design."[749] This 1936 catalog illustrated examples of Kawneer-designed stark, minimalist fronts completely clad in aluminum. These photographs were included, Kawneer explained, to "furnish striking evidence of the

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[748] Henry-Russell Hitchcock and Philip Johnson, *The International Style, 1932* (1932; New York: The Norton Library, 1966), 255. Within this book and for more context about "drugstore modern," see "Introduction: The Idea of Style," and Appendix: "The International Style Twenty Years After."
[749] *Kawneer Book of Store Fronts*, 2.

world-wide movement to employ better design and greater variety in the merchants' most practical sales tool — the modern store front."

These brochures show that Kawneer understood *modern* to possess a dual meaning. It meant both to make a better retail condition, and paired with the word *design*, implied a specific design condition: "Better design. Sensible, modern design. Honest design for the purpose intended. People today respond to its appeal. They like its simplicity, its directness. They are attracted, interested and sold by its power."[750] These two senses of modern — a better retailing condition and a better design condition, they maintained and deployed as a marketing strategy in the postwar period. Modernism, for Kawneer, was a marketing project.

Joan Ockman argues in "Toward a Theory of Normative Architecture", that modern architecture became normative when it was embraced by corporate America, while David Smiley argues in "Pedestrian Modern: Shopping, Modern Architecture and the American Metropolis, 1935-1955" that the shopping center widely spread modern architectural tenets in the built environment through architect's designs. Here on the Main Streets of the United States, modern architecture was normalized as an image. If a building is to be understood in this way, it must have a corresponding message to communicate. For Kawneer, the message was that aluminum could modernize by improving the performative characteristics of the façade (limiting upkeep and maintenance), attract customers and make a merchant more profitable. This is a message of instrumentality. But Kawneer also sought to promote that their aluminum store front systems could resemble already-established conceptions of modern architecture. This was a message about image. Richard Longstreth examining the emergence of the department store as a building type, shows that "the image of modernism (was) a tool to revive and sustain prosperity."[751] As

[750] Ibid.
[751] Longstreth, *American Department Store Transformed, 1920-1960,* 59.

will be seen in the following sections, emulation of the image of regional shopping centers was an overt goal of modernization proponents after the war. Following Longstreth's argument, image played a dual role. It sought to both represent prosperity and other images of prosperity. That is, in reference to Kawneers publicity, they claimed aluminum store front systems provide an image of prosperity by emulating extant forms of modern architecture, and provide an image of prosperity by associating aluminum store front systems, in their publicity material, with modernization.

Kawneer and the modernization of store fronts after World War II

Aluminum first advertised by Kawneer as a material that customers could select as early as 1912,[752] making Kawneer one of the first manufacturers to use aluminum in architectural products. By 1937, Kawneer declared themselves "the largest American user of aluminum for architectural purposes,[753] with fully 75 percent of their applications in store fronts employing aluminum.[754] During the war, Kawneer produced no store fronts, yet they began planning for a future of store front work, with aluminum a key component: "War work today… Store front, Aluminum Doors and Windows Tomorrow."[755] The company sponsored a competition in coordination, "The Store Front of Tomorrow" with *Pencil Points* in 1943, featuring notable architects as advisors and judges.

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752 *Kawneer Store Fronts: It Stays and Pays,* 30, 40
753 "75 Kawneer Years…Only a Beginning," 10; Church, "The New Kawneer," 3.
754 "75 Kawneer Years…Only a Beginning," 10.
755 David Smiley, "Pedestrian Modern: Shopping, Modern Architecture and the American Metropolis, 1935-1955" (PhD Diss., Princeton University, 2006), 100.

In January 1945, Kawneer organized a formal “Design Department.”[756] While Kawneer had employed designers before as product developers, these men were charged with speculative design. Their chief function was to “to create and develop, through research and design, modern ideas in stores.”[757] Their largest project of 1945 was to immediately prepare a “Design Portfolio of fifty-three basic designs to which our customers can refer for ideas in developing individual and distinctive stores.”[758] Out of this program, came a nationwide marketing campaign, called “Machines for Selling.”

Kawneer’s “Machines for Selling” program was a major, nationwide undertaking, with Kawneer claiming to have reached “hundreds of thousands of retail merchants, associations, chains and civic groups.”[759] The product was a comprehensive approach, in which the tangible materials, aluminum and glass, deployed as an assembled store front and sometime, slipcover over the upper stories, enacted a transformation of the store into a machine. Kawneer promoted it as a comprehensive transformation. A Machine for selling was the “Store-front, interior and all the hidden gears and levers of trade…from sidewalk to service alley.” To be such a machine, Kawneer promoted aesthetics as critical, but ever tied to function: “To function efficiently, ‘Machines for Selling’ must not only work well, but look their best.” This included lighting, product placement in the store and in the window, color texture and a critical component, the store front as advertisement with three components: “Whatever form it takes, the store-front has a definite advertising job to do. First, it must *catch the eye* and convey character, price range and type of goods or services on sale….Second, it must serve as a stage set, not only for showing

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756 “Introducing Our Designers,” unpaginated.
757 Ibid.
758 Ibid.
759 *Kawneer Store-fronts: “Machines for Selling,”* (Niles, Mich.: The Kawneer Company, 1945), unpaginated, Kawneer File.

merchandise but for dramatizing it and creating the urge to buy. Third, the store-front must pull people into the store. The design of the front should invite the sidewalk shopper to come inside.

The design of store fronts exhibited in the "Machines for Selling" portfolio of 53 examples focused on two elements. First, the sidewalk level. This consisted of generous amounts of glazing held firmly in place by aluminum frame. Second, the upper stories, where aluminum was recommended, "from top to bottom." Such cladding came to be known as a slipcover, and had been employed in the US and Europe before the war where the materials manufacturers, such as masonry, ceramic or steel promoted it as a means of "modernization."

The emergence of the windowless façade as a slipcover has been explained by scholars as an emulation of shopping centers,[760] which were increasingly threatening downtown commerce as centers were constructed often at the edges of towns and cities. They have also been explained as a response to the automobile,[761] necessitating a large billboard to catch the eye of the fast-moving automobile's driver,[762] although story-height signage on buildings was nothing new, having long been an advertising strategy of merchants with ownership or rights to place a sign on the façade.[763] They have been understood as resultant from the desire for improved control over air conditioning, precluding operable exterior windows.[764] Kawneer justified it due to demand

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[760] Longstreth, *American Department Store Transformed,* 155. Longstreth attributes the windowless façade, in part, to precedents set by shopping centers. He writes, "such external plainness was possible, of course, only because the windowless store pioneered by Sears in the 1930s was now widely accepted."

[761] Referencing the movement in an automobile from airport to Las Vegas strip, the authors of *Learning from Las Vegas* write, "impressions are scaled to the car rented at the airport. Here is the unraveling of the famous Strip itself." Robert Venturi, Denise Scott Brown, and Steven Izenour, *Learning From Las Vegas* (Cambridge: MIT Press, 1972), 20.

[762] A study of a department store asserts, "the entire wall serves as a billboard." See "For a Rural Center Near the Big City," *Architectural Record,* November 1944, 99.

[763] For examples of building-height billboards and signs covering existing street-front façades in New York's Union Square, see "Long-Term Credit for Urban Redevelopment," *Architectural Record,* February 1944, 62.

[764] Longstreth, *American Department Store Transformed,* 56. Longstreth asserts Fred Lazarus in 1948 contributed to the minimalist, façade modernization trend in which windows were "covered to improve the control of heating and air conditioning."

for modernization resultant from three years of war.[765] Aluminum, porcelain-steel, and stone-cladding dealers were also influential all over the United States in selling the idea of the necessity of the slipcover. Reynolds sold aluminum cladding as slipcovers, arguing, "Aluminum has become synonymous with modern design, not only in new buildings, but to face-lift dingy, old exteriors, and transform them into colorful new fronts in tune with the times."[766] Reynolds portrayed aluminum slipcovers as a means to modernizing, but also ameliorating an "outdated look." About a slipcover, aluminum screen installed over a bank, Reynolds wrote, "…the modernization required no alteration of the original façade…The…bank is a straightforward example of how aluminum cladding is being used today for low cost modernization of buildings that have an outdated appearance but a structure that is still sound."[767] Here is yet another argument, that the slipcover facilitated changing the appearance, ostensibly "modernizing," without altering the building façade substantially underneath, and without disrupting operations. This was an appeal to aesthetics, but also to the merchant's pocketbook.

Kawneer's approach was to portray aluminum slipcover as part of a package of modernization strategies, the "machine for selling," which would *make* the merchant money, not just save money. The marketing efforts of Kawneer were effective in cladding the entire street front of Niles, Michigan in brown aluminum over the upper floors, as a "machine for selling," which will be explored more below. Kawneer promoted the slipcover as a means to modernization. In the "Machines for Selling" portfolio, Kawneer labeled this the "modernization problem." Juxtaposing a photograph of an existing brick façade with a color rendering of the same façade covered in aluminum, Kawneer argued, "The complicated architectural style of the

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[765] Kawneer claimed a prosperous opportunity awaits in modernization of store front façades, when "Service men and women return to assume their places in home activities once more." See *A Plan for Modernizing Main Street,* 5.
[766] Reynolds Metals Company, "History of Aluminum Production—Aluminum on the March (1956)."
[767] Peter, *Aluminum in Modern Architecture '58,* 51.

upper stories has long since ceased to be an advertising asset….To bring this building up to date and to insure that it will be an asset to its landlord and to its tenants for many years to come, it is clearly indicated the entire façade should be modernized from top to bottom." Another example reveals Kawneer's argument that the slipcover will not only make the merchant money, but also save him money, by simply covering up a façade in need of repair: "Modernization Problem: … the upper floors, equally undistinguished, have overlarge windows in bad repair, and an outmoded decorative treatment that distracts attention from the advertising and display features of the store-front." Kawneer promoted a simple, clean-lined "modern" façade that rather than "competing with the products," instead complements them, allowing the shoppers eye to fall not on building ornamentation, but on the product.

In 1945, along with the "Machines for Selling" campaign, Kawneer also engaged in, perhaps justified — scare tactics, warning of future encroachment of shopping centers: "NEW COMPETITION is entering many fields — new kinds of stores are in the offing — both chain and independent. PLANS are being made in many quarters which will effect retailing operations everywhere…. merchants will demand better stores in order to maintain their position in the competitive picture."[768] This threat painted a picture of entire assemblages of stores, perhaps five, six or seven wide, emerging at the town's doorstep, stealing customers away. But Kawneer envisioned towns competing with this threat, and aluminum was a key weapon.

Marketing the commercial landscape: A town becomes a prototype

[768] *The Architect and "Machines for Selling!,"* (Niles, Mich.: The Kawneer Company, 1945), p. 9, Kawneer File.

Along with the "Machines for Selling" marketing project, Kawneer launched a simultaneous marketing initiative that sought to transform the entire commercial landscape into a marketing landscape, not only for merchants to compete with shopping centers, but also for Kawneer to appropriate as a marketing platform. Kawneer promoted modernization of not one store at a time, but an entire block at a time, and the company proposed, and eventually won, the full length of Front Street in Niles, Michigan, its hometown, as a prototype, modernized, commercial landscape. "A Plan for Modernizing Main Street" was the initiative, and it took a district approach: "As a city or town is a "Machine for Living," so is it business district a "Machine for Selling." The trend, explained Kawneer, was towards Planning: "In every city, in every town, responsible and forward-looking groups are replanning their cities for tomorrow….Retail merchants, industrial management, city planning commissions, individual citizens…the thought is in every mind — what can we do, what can I do to make this a better place in which to live, to work, to shop, to play, to go to school, to carry on daily affairs?" To these questions, Kawneer had an answer: glass and aluminum storefronts, with aluminum slipcovers above.

The architecture firm of Ketchum, Gina & Sharp was hired to "convert a block of outdated storefronts into a modern shopping center without sacrificing individuality…..Niles, the home of the Kawneer Company, was selected for the pilot study not because of any spectacular deficiencies, but because it is a typical American community."[769] The architects superimposed elevations drawings of aluminum façades over existing photographs of the street fronts, in a before and after format. Every store was covered with aluminum. Some received aluminum slipcover treatment above, while all were bestowed with a design for a new glass and aluminum-

[769] *Remodeled Main Street Niles, Michigan*, p. 3.

frame storefront below. The architects sought to create variety, despite the unity of materials. (more details here)

Kawneer's nationwide, "Machines for Selling" campaign, by some measures, found success. A Kawneer Front article stated, "In 1947 the full effect of the Sales Promotion Program, "Machines for Selling," was realized and plans were made for a 5-year building expansion program to accommodate the ever-growing production requirements."[770] The trade name for the aluminum slipcover was Zourite. A Modern Metals article reported in 1956 the product had found a successful outlet: "The big market for Zourite is in remodeling — covering the face of an old store to make it look new."[771] The article quoted Dave Miller, Vice President in charge of Architectural Sales, "Although Zourite's acceptance has far exceeded all our expectations, we now believe it is just getting started."[772]

Cladding the commercial landscape

Beyond Niles, no towns had accepted the full make-over with Kawneer's product, as the company had hoped. Slipcovers were sold all over the United States in a variety of materials and sold by many competing product providers, but rare was the incidence of whole-block cladding of façades at once. Despite the wider prevalence of a piecemeal approach, wherein cladding was applied one merchant at a time, two towns are examined here that did clad entire blocks at once. The first is Niles, clad with Kawneer aluminum and the second is Paola, Kansas, clad with aluminum sold by Fashion Company, Inc.

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[770] "Know Your Company: 40th Anniversary—Berkeley, California Plant," *The Kawneer Front,* May 1954, p. 6, ibid.
[771] Church, "The New Kawneer," 6.
[772] Ibid.

Together, these examples show how aluminum was sold as an *image* of modernity and also sold as *instrumental* in solving problems confronting the towns. These examples also bolster the indeterminacy of any essential identity for aluminum. In the 1960s and 1970s it was promoted as modern to these two towns. However, by the 1980s it was increasingly understood as conveying an unwanted identity. Towns people worked to remove the cladding using the same arguments against aluminum as had been used to promote its sale to begin with. These arguments were about its ability or lack thereof in producing prosperity.

Covered in Kawneer

It took decades of trying, but Kawneer finally achieved the goal of whole-block aluminum cladding in 1972. In fact, the cladding stretched several blocks all along Main Street from Front Street to Fifth Street, covered with brown corrugated aluminum. Although the specific aluminum cladding product was called Shadowform, a writer for the town newspaper simply referred to it by the company name, saying that the street is "completely covered in Kawneer."[773]. Store front by store front, from the 'teens to the 1970s, Kawneer's building products had been used in Niles. In short order the image in total was Kawneer.

Two reasons were given for the cladding project. First identified was the condition of the existing brick store front façades. Aluminum was promoted as the solution to the perennial problem of building façade maintenance. A Kawneer representative said, "The buildings looked terrible. Bricks were falling out, and some of them had broken windows."[774] Kawneer promoted aluminum as robust and able to withstand decades of weathering, defining a path to eliminate long-term maintenance. Aluminum also was promoted for short-term advantage, allowing the

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[773] Bryan LaViolette, "Boyd Leading Effort to Honor Niles' Kawneer," *Niles Daily Star,* October 20, 1993.
[774] Lou Mumford, "Kawneer Hits Century Mark," *South Bend Tribune,* May 14, 2006.

building owner to forego immediate maintenance. In lieu of repairing the façades, sometimes brick by brick, a sheet of aluminum could protect the underlying façade from further decay.

A second main reason for the cladding project was a purported need to modernize. Modernization was said to provide a new image – long promoted by Kawneer as an advantage to commerce – and to act as a defense against competition from regional shopping centers. The Chamber of Commerce played a role in promoting business and defended down town merchants. The Four Flags Area Chamber of Commerce encouraged the downtown merchants to compete with the new, modern shopping malls through emulation.[775] Their fears were not unfounded. As Lizabeth Cohen has shown, new regional shopping centers were promoted as civic centers helpful to the community, but instead often "crippled existing market centers."[776] Shopping centers often had an identifiable aesthetic. The blank, unadorned façade resultant from Shadowform in Niles was not foreign to the regional shopping malls that had emerged as a new building type in the postwar period. As Richard Longstreth has explained, "The huge, windowless mass not only created an imposing presence amid the forest of higher buildings, it also gave the store a distinct identity, emphasizing the great scale of retail distribution it manifested and dramatically setting it apart from all other building types."[777] The blank façade also afforded the opportunity to emulate the shopping center's mode of signage. Large-letter signs deployed as an advertising and identity strategy were easily positioned on unadorned façades.

Beyond reasons given, the erection of cladding also reflected changing technologies. Prior to the implementation of electric lighting, large windows were necessary to admit light

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[775] Ibid.
[776] Cohen, *A Consumers' Republic,* 14.
[777] Longstreth, *American Department Store Transformed, 1920-1960,* 51-52.

deep into the store. At the ground floor, plate glass afforded the deeper reflection of natural light, while also facilitating the display of merchandise. The upper floors were sometimes built as apartments, but often used for storage of stock goods and supplies. Large windows admitted daylight, but for the purpose of storage they were essentially unneeded. Incandescent lighting and the much brighter fluorescent lighting precluded the need for windows. Covering over windows with aluminum did not impact the level of illumination needed for storage.

Fluorescent lighting was often paired with a new drop ceiling. Such a ceiling is built several feet below the existing ceiling and provides two advantages. The first is to create a smaller space to heat and cool. The lower ceiling reduces the volume of air in the space. Second, it allows the mounting of lighting closer to the floor. Where drop ceilings have been installed, tall windows were bifurcated. The top half of the window was above the new ceiling, and the lower half was below. Sometimes, building owners clad over the top half leaving the lower half of the window exposed. With aluminum facing, the obsolete window could be completely forgotten.

Questioning the legitimacy of aluminum slipcovers

In the 1980s, town leaders began to question the legitimacy of the aluminum cladding on several fronts. Towns across the United States received Urban development Action Grants through a program initiated in 1977 by the Carter Administration to aid in downtown revitalization. An ethic of preservation was reinforced by the availability of these grants. Earlier in the century, a series of congressional acts had been passed, notably the Historic Sites Act of 1935 and the National Historic Preservation Act of 1966, that focused the attention of policymakers on preservation and renovation. In 1980, the National Main Street Center of the

National Trust for Historic Preservation was formed to support downtown revitalization. Funds were available to renovate street front façades, but Niles was a Kawneer town. The director of the City of Niles History Department wrote in favor of preserving the aluminum façades. In a letter to the editor of the newspaper, he said, "As a historian, it seems to me that a valid argument can be made for the recognition and preservation of the Kawneer fronts in Niles, because of the company's impact on commercial architecture in the country and because of its local significance."[778] The brown aluminum remained, but they would be challenged again.

The Big Brown Take Down

In 2002, town leaders and merchants organized to remove the brown aluminum. The Main Street revitalization Project was formed. The South Bend Tribune described the aluminum as having "stole much of the charm from originally ornate buildings." It also questioned why the aluminum was ever erected in the first place. Speculating that it was because "there was some thought in the 1960s that a more modern and uniform look was necessary," the newspaper concluded, "In hindsight, the decision was flawed."[779] One merchant agreed, saying "They need to fix this town up, and make it look like it did at the turn of the century….people would see this town for the first time."[780] Local leaders, merchants and state officials collaborated to effectuate a grand revitalization effort which they called the Big Brown Take Down.

Grant funds were available and the city pursued them. The Michigan Economic Development Corporation (MEDC), in coordination with the National Main Street Center of the National Trust for Historic Preservation had already issued 44 block grants to assist

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[778] D. Wayne Stiles, Director, City of Niles History Department and Fort St. Joseph Museum to Editor, Old House Journal, 12 June 1986, Niles History Center, Niles, Michigan.
[779] Lou Mumford, "Big Brown Takedown," *South Bend Tribune*, June 18, 2003, D2.
[780] Erica Sagon, "Reviving Downtown," ibid., May 21, 2002, A5.

communities, and Niles was on their list of potential grantees. An MEDC spokesperson said their mission, through the grants, was to create jobs: “We want to help create jobs in the communities…we do a lot with infrastructure.”[781] The MEDC believed the aluminum was in the way of jobs. The spokesperson said, “In Niles, they (have) an ugly aluminum façade over their buildings. Our team is helping them bring it back to the original brick façade.”[782] Project leaders applied for and won a Community Development Block Grant. A second source was private grants. In a supreme irony, the Kawneer founder’s own legacy, The Plym Foundation, donated to the effort. The remainder of the funding came from the City of Niles and private investment.[783] A total of 2.5 million in state and local funds were invested in the project.[784]

To drum up broader support, city officials voiced arguments against the aluminum. Niles Community Development Director proclaimed, “who do you know that still wears their pants from 1972?”[785] His ire was directed to the brown aluminum, as though the look was old and out of style. Then, in a twist, he used the same modernization argument as a reason for removing the aluminum as Kawneer and project advocates had used to support the erection of the aluminum façades decades prior: “The downtown is out of style. We’re modernizing it but we’re modernizing it in a way to make it look older.” In the Development Director’s argument can be seen a conception of modernism not linked to “the new” but linked to the “old.” However, his comment discriminates age as a relative factor. He was not in favor of old “pants from 1972,” but he was in favor of old building façades from the turn of the century. Ironically, his statement reflected a conception of modernism that was similar to that of the aluminum promoters, namely,

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[781] Jessica Hulett, “Main Street Program Helping out in Places like Niles,” ibid., November 6, 2002.
[782] Ibid.
[783] Jan Griffey, “Grant Money Aimed at Kawneer Front Removal,” *Niles Daily Star,* May 21, 2002.
[784] Debra Haight, “Aluminum Removal Near Completion, *The Herald-Palladium,* July 4, 2004, 2C.
[785] Lou Mumford, “Downtown Niles Getting Face Lift,” *South Bend Tribune,* June 17, 2003, A5.

that underlying modernism is a belief that to be modern means to be superior. In this case, to produce a condition of superiority was to remove the old brown aluminum and preserve and revitalize the older brick façades.

Despite the appeal for the project by merchants and community leaders, removal was not a unanimous aspiration. A few vocal preservationists defended the cladding. The same historian who defended the façades in a 1986 letter to the editor this time voiced caution in their removal. Describing himself as a historical preservationist, he said, "…One can legitimately argue a case for historic preservation in some way of the storefronts in Niles as a bona fide historic landmarks of American architectural history."[786] At least one merchant supported designation of the downtown as a state historic district, and advocated celebrating the aluminum façades as a "fitting tribute to honor (Francis Plym)."[787] More support was garnered for removal than preservation. Furthermore, project leaders understood preservation as an act associated with removal rather than retention of the aluminum cladding. To preserve was to remove aluminum and expose the old brick beneath.

Kawneer's had long claimed that the "machines for selling" packages and individual storefront components could generate revenue for merchants. Kawneer argued that both the instrumentality and the image of their systems could maintain a vital economy of consumption down town. In contrast, with the new push to remove the cladding, city leaders believed the aluminum did only the opposite, driving customers away and defining a problematic image. Lisa Croteau, director of the Niles Downtown Development Authority predicted that the underlying brick façades would be "aesthetically charming." Imagining the absence of the aluminum and the visual impact of the revealed underlying façades, she said "It makes people who wouldn't want

[786] LaViolette, "Boyd Leading Effort to Honor Niles' Kawneer."
[787] Ibid.

to stop want to stop." Merchants envisioned a downtown without aluminum: "It brings back that small-town feeling."[788]

In June of 2003, the Big Brown Take Down commenced. Tearing down the aluminum was described by the newspaper as a "face lift."[789] Citizens and city officials gathered across the street to watch as the first strips of aluminum were torn away. The newspaper captured the moment, writing that the "undamaged façade, revealed for the first time in more than 30 years, was met by squeals of joy." Hugs were exchanged. "I'm speechless" said the Community Development Director. Gazing up with admiration at the newly revealed brick, the building owner said, "This really was a beautiful building…It makes me want to cry."[790]

In 2005, Niles received the Governor's Award for Historic Preservation in honor for the result of the project. As of my visit in 2015, all brown aluminum cladding was removed except for a few merchants in town that elected to keep the cladding. The legacy of decades of storefront system purchases can be seen on many of the stores, with old Kawneer name plates, copper sash and aluminum cladding scattered about. The shifting identity of aluminum between conceptions of old and new, a subject of preservation or removal makes two points. The first is that materials are fundamentally without inherent identity. Only the human dimension assigns identity and it can and does shift with values and context. The second point is that, for the aluminum promoters and at least one City of Niles representative, modernism was more about superiority than it was about "the new" or "the old." In the minds of Kawneer promoters, Main Street could become modern if the aluminum was erected. In the minds of the city official, Main street could become modern if it were removed.

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[788] Sagon, "Reviving Downtown," A5.
[789] Debra Haight, "Storefront Removal Will Begin in Spring," *The Herald-Palladium,* November 1, 2002.
[790] Mumford, "Big Brown Takedown."

An Aluminum Town Square

Kawneer was successful in appropriating the commercial landscape in Niles as a marketing landscape. This was in part because Niles was so strongly associated with Kawneer, and also in part because Kawneer often referenced Niles in marketing publications, portraying the town as a living catalog. In addition, a much subtler form of appropriating the commercial landscape was by placing their nameplate on the architecture. Doors, for instance, are usually labeled Kawneer if one looks closely, acting as little advertisements scattered on thousands of buildings across the country. In contrast, although Paola also was a site of extensive aluminum cladding, it was not widely associated with a particular company. Kawneer was a market leader, but Paola project leaders selected a local contractor to provide the aluminum through a Kansas City firm called Fashion Company, Inc. The erection of aluminum façades in Paola reveals that project advocates saw aluminum as possessing the ability to define an image of modernity. Echoing aluminum promoters for Aloca, Reynolds and Kawneer products, Paola's project leaders believed that aluminum cladding could bring prosperity to the town. Like the Niles leadership, they believed it could defend against the possible encroachment of regional shopping centers.

In 1967, a grand celebration and parade commenced in the small town of Paola, Kansas. Dignitaries from across the state gathered to extol the virtues of a new, modernized downtown. Merchants took out full page advertisements beaming with pride at the new downtown look. Businessmen and politicians gathered at the local country club to toast the success of the modernization effort, and envision a future of comfortable commerce. The jubilant activity on this day, dubbed the "Parade of Progress," celebrated a striking architectural intervention: the complete and total cladding of every façade facing the town square in green, blue, red, and yellow aluminum.

It was a radical departure from the previous visual character of the town, and it was implemented for a specific purpose. An idea hatched by collaboration between business groups, boosters, merchants and politicians, this new aluminum town square was meant to save merchants from changing modes of consumption and shifting demographics. It was their answer to a perceived existential crisis—a negotiation with national trends that extended far beyond the boundary of this small town. Although the façade cladding project borrowed the modern aesthetics of minimalism, it was not a completely appropriated modernism. Instead, it was a mix of emulation and innovation that rapidly developed and was initially celebrated, but over time became derided and blamed as the very condition leading to the decline of commerce downtown. Many merchants in downtowns across the United States installed aluminum façades for their buildings, yet Paola's history with the intervention is important as an extreme case of transformation.

A Vision of Main Street Modernization

Paola is a charming town, and the square is a tranquil setting. It has a gazebo, benches, decorations, and a swing set for children. Paola is still a small town of around 5,000 people, in which an agricultural economy emerged in the nineteenth century. It is also a bedroom community for Kansas City, forty minutes to the north. The idea to modernize the town square of Paola can be traced to a program outlined by the chamber of commerce president, Melvin Stockwell. In 1964, four years before the official dedication of the newly clad town square, the chamber developed a bold vision titled, "A Pattern of Progress" that defined the chamber's new mission. Stockwell announced, "From this point on, all activities of the Chamber will be geared to this action program…the entire structure of the chamber will be built upon this program of work."[791] Of the six focus areas developed by this new mission, several were aimed at spurring increased commercial activity by installing "Paola's 'image' as a commercial and cultural center." The chamber's vision was forward looking and would ultimately be expansive. Launching the program, Stockwell summarized, "this year must set the pattern for the years to come, and the pattern must be one of progress."[792]

Boosterism of public and private modernization in the United States

The chamber's vision for the town was underpinned by the idea of progress, which was also a central concept upon which previous main street modernization programs had been founded. Paola's modernization effort was by no means the first. Efforts to modernize downtown Main Streets in the United States can be traced far earlier and far outside of Paola, beginning in the New Deal era. In the wake of the Great Depression, nearly three-fourths of the nation's commercial structures fell into disrepair from deferred maintenance.[793] As a part of New Deal initiatives, low-interest federal loans were consequently made available to renovate or rebuild business properties. Although the Federal Housing Administration (FHA) traditionally addressed only housing issues, in this critical period it was also a key tool in mobilizing Main Street modernization. It encouraged architects, builders and salesmen to "go after this main street business" and "sell the store owner" on the idea of store renovation and modernization.[794]

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[791] "President Announces New Work Plans of Chamber," *The Western Spirit,* September 10, 1964.
[792] Ibid.
[793] For a detailed study of modernization schemes after the Great Depression, see Esperdy, *Modernizing Main Street: Architecture and Consumer Culture in the New Deal.*
[794] Ibid., 82.

In addition to New Deal Era government boosterism, numerous private entities promoted commercial modernization. One architectural competition was held by Libbey-Owens-Ford Glass Company in conjunction with Architectural Record magazine in 1935, after which the Chairman of the jury remarked, "[N]one of the designs selected is extravagant, simplicity being one of the qualities required by the jury."[795]

Keeping small town retail establishments fresh and relevant was seen as important due to several economic and demographic trends in the mid-twentieth century. Years after recovering from the Great Depression, downtown businesses were challenged by additional economic forces that drew customers away from small town centers, pulling them to suburban and regional shopping centers. These shopping malls put additional pressure on the survival of small town retail businesses. Shopper's World (1950) in Framingham, Massachusetts by architect Morris Ketchum was an early example of this developing force. It established the Dumbell Configuration whereby a string of developer-built retail shops were anchored on either end by larger department stores. Although Shopper's World was an outdoor shopping center, indoor malls proliferated soon after. Southdale Center (1956) in Minneapolis, Minnesota by Architect Victor Gruen can be seen as an indoor street along which retail businesses were organized in a unified space for consumption.

Twentieth-century demographic trends also weighed heavily on diminishing retail opportunities in small towns. Rural to urban migration and migration from the Northeast and Midwest to the West shifted people out of small towns and into cities or growing regions elsewhere during the latter-half of the twentieth century. Mechanization replaced labor in decreasingly available agricultural jobs and many young people left for economic opportunities

[795] Libbey-Owens-Ford Glass Company, *52 Designs to Modernize Main Street with Glass* (Toledo: Libbey-Owens-Ford Glass Company, 1935).

in urban areas. While rural America grew slightly as a whole between 1930 and 1970 due to more births than deaths, the important demographic of young, working age people was the key engine of out-migration. [796] Competing for increasingly limited customers made paramount retail establishments' appeal to shoppers. Such appeal necessarily included selling consumer goods that people wanted and needed, but retailers also perceived the importance of attracting customers under increasingly difficult circumstances.

Negotiating the Image of Modernity in the Commercial Sphere

During the New Deal era, the government, architects and façade cladding manufacturers placed emphasis on appealing to customers' aesthetic sensibilities. The objectives of the 1935 Libbey-Owens-Ford Glass Company Main Street modernization competition were to create designs which would "attract the public, display goods to the best advantage, and provide space, convenience, and light so that purchasing is a pleasure." The competition chairman concluded that as a result of the competition, "it will be gratifying to see the gospel of good design and good taste permeating through the thousands of Main Streets all over the country."[797] The competition organizers believed the fifty-two winning designs would give merchants and façade dealers "a guide as to what an intelligent public taste will demand." The judges asserted that the winning designers were "forced to analyze both the actions and reactions of purchasers, and the psychology, methods and routine of selling." This suggested that the jury held that the designs were reflective of research and observation.

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[796] Kenneth Johnson, *Demographic Trends in Rural and Small Town America* (Durham: Carsey Institute, University of New Hampshire, 2006).
[797] Libbey-Owens-Ford Glass Company, *52 Designs to Modernize Main Street with Glass,* 1.

What did the winning designers theorize was an effective design to attract customers? No evidence of research by the designers is provided by the publication. However, other researchers, authors and the government itself believed that what attracted customers in the post-depression era was the "new"—which is a continuously moving target. During the FHA's campaign promoting the modernization of Main Street in the 1930s, the public relations division aligned modernization with consumer's desire for the new: "The buying public demand the new and the different in merchandise…They are no longer interested in the old stores, unless the old stores feel the urge to newness and the call of a new day. When prosperity dawns after depression, we suddenly realize how utterly tired we are of the fashions of yesterday… We tire of old architectural forms."[798]

This view was foreshadowed by Christine Frederick, author of *Selling Mrs. Consumer* (1929). Frederick maintained that consumers "are eager and willing to take hold of anything new either in the shape of a new invention or new designs or styles or ways of living."[799] Retailers aligned with this reasoning as well.

This aesthetic of newness in retail façades has been found to draw on many sources, including metaphoric notions of beauty, the consumer items sold in the stores and the developing paradigm of modern architecture. Gabrielle Esperdy finds that an analog was formed between new building façades and plastic surgery in an advertisement selling building cladding by Republic Steel Corporation. The ad reads, "There's a lot of plastic surgery going on all over the country today. Old buildings are having their faces lifted…emerging again in a few days with a new metallic face that draws business like a magnet." Vitrolite, another cladding manufacturer, claimed their product offered "ageless beauty" for which "a damp cloth is the only facial

[798] Esperdy, *Modernizing Main Street: Architecture and Consumer Culture in the New Deal,* 158.
[799] Ibid., 156.

treatment Vitrolite ever needs." These advertisements claim the new is also the beautiful and the ageless.

Re-Imaging the Square in Paola

Like previous modernization programs in the 1930s New Deal Era, the Paola Chamber of Commerce outlined a commercially progressive agenda, entailing notions of "the new" and envisioning a thriving commercial landscape. However, unlike programs to modernize Main Street in the 1930s, Paola's effort was neither led nor funded by the federal government. Eschewing federal funding was a matter of pride for many of Paola's businessmen and residents. Years earlier, residents of the town built Lake Miola in order to counteract what had been a history of water shortages in the 1950s. This project was asserted to be "paid for completely by the community through use of general obligation bonds", and was celebrated as paving "the way for future self-help community developments."[800]

Instead of seeking federal funds, the Chamber led what would become a consortium of private interests, given support and legitimacy by the town's elected leaders, with the goal to gain buy-in from the public, and critically, buy-in from building owners and retailers around the town square. The Chamber's first step was to establish a planning council in 1964, composed of area businessmen, to plan wide-ranging future economic programs for Paola. The goals of the eight-man Paola Economic Policy Council was to "map Chamber strategy in areas of industrial acquisition, industrial services, agri-industry, community analysis and development of facilities and resources, and to create within the Chamber of commerce a full-scale economic development

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[800] The City of Paola, *The Paola Spirit* (Paola, Kansas, 1967), Aluminum Façades File, Miami County Historical Museum, Paola, Kansas.

program for Paola."[801] The Chamber's planning council was followed the next year by a city committee. In 1965, Mayor Rex Kiser appointed a ten-member Mayor's Advisory Committee, consisting of businessmen and professionals from Paola. The committee was characterized by the local newspaper as being charged with "studying the possible ways the downtown core area could be modernized as a trade center at a minimum cost with maximum convenience and eye appeal to the customers."[802]

Identifying Crisis, Winning Support

According to the committee's own documents, in addition to its focus on planning a modernized downtown, it also sought to gain buy-in for the idea from the public and from merchants. To this end, it enacted a three-step process. First, it interviewed several companies to propose a design and produce renderings of modernized façades. The committee chose Fashion Company Incorporated, because they had a local authorized dealer (Sharp Improvement Company) for their aluminum facing product. Second, Fashion Company produced color renderings of the aluminum clad façades (informally called slipcovers), which were then displayed at Messer's Drug Company and Asher's Pharmacy, two businesses located around the town square which were frequented by town residents. Lastly, the Mayor's Advisory Committee produced a brochure designed to convince downtown merchants of the necessity to modernize. Photographs in the brochure juxtaposed the aluminum façades of the rendering against photographs of the same streets, taken in 1931, asserting the imperative to change. In reference to the portrayal of the downtown as having remained aesthetically the same in the 1960s as it was in the 1930s, it sarcastically asked, "Progress? The horseless carriage and consumer are

[801] "Industrial Development Target of Paola's New Chamber Council," *The Western Spirit*, September 31, 1964.
[802] "Unveils Plans for Beautifying Downtown Paola," *The Western Spirit,* May 8, 1966.

keeping up-to-date. Are we?" After suggesting that the town square was deficient and outdated, it announced, "the choice is yours."

The committee appealed to both what the merchants stand to gain if they act, as well as what they stand to lose should they not. It explained how it could yield greater profits and customers, but also suggested an alternate future, where shoppers are lost to competing interests outside of the downtown core shopping area.

In addition to the Chamber's leadership and the Mayor's Advisory Committee, community civic organizations also perceived a pressing need to improve Paola. The Friendship Committee of Human Relations met in 1966 to make plans for city beautification. This committee included the Presbyterian Women's Guild, Methodist WSCS, St. James AME Women's Missionary Society, Holy Trinity Altar society and the Business and Professional Women Organization. They sought opinions from many stakeholders, including town residents and public officials. The Friendship Committee developed questionnaires that were distributed to cover all the streets of Paola's residents, and plans were set to meet with city and county officials to consult on the beautification of Paola. Additionally, their meetings were open to anyone interested in the improvement and beautification of Paola.

Innovation and Emulation

Inside the Mayor's advisory committee brochure, the committee elucidated its arguments in favor of the aluminum façades.[803] Among its arguments, it asserted the need to meet consumer demand for "modern, attractive and convenient surroundings" and "create a Park Square shopping center effect." Important elements of this effect not only entailed appropriation of the

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[803] Niles Chamber of Commerce, *Progress?*, unpaginated.

minimalist aesthetics of new shopping malls developing across the country, but also a covered sidewalk that wrapped the square. Here, the project emulated new shopping centers, but instead of proposing a new development on the town's periphery with enclosed circulation, Paola proposed a shopping configuration that borrowed existing infrastructure, protected shoppers from weather elements and intersected with public space.

Innovation, Infrastructure, and Public Space

Paola's vision for a shopping center was not the first, nor the only proposal for an exterior circulation configuration. Recall that Shopper's World utilized outdoor circulation. The plans for Paola's town square renovation, however, were innovative in that they proposed combating the threat of new shopping centers by renovating an existing shopping area. Paola's plans called for the provision of "all-weather shopping regardless of season"[804] In addition to new aluminum façades, a covered canopy was proposed to ring the square, allowing merchandise to spill out onto the sidewalk.

Paola's shopping center project utilized the existing infrastructure of streets, utilities and buildings extant to the square. As such, it posed an alternative to the dominant configuration of new shopping centers. Rather than sprawling outside the town, shopping was hoped to become reinvigorated in the heart of town. In many ways, Paola's shopping center fulfilled Victor Gruen's vision that shopping malls serve as community centers. Instead, as architectural historian Richard Longstreth asserts, shopping malls were primarily spheres of mercantilism.[805] These malls had a private ownership structure discouraging, and often prohibiting, public use of mall space outside of strictly controlled events. Paola's vision, on the other hand, would set the

[804] Ibid.
[805] See Longstreth's study on the growth of regional shopping malls, Longstreth, *City Center to Regional Mall*.

town square at the core of the new shopping venue, anchoring public space in the center, extending under covered sidewalks right up to the door of each store.

Aesthetic and Functional Emulation

Slipcover façades were not original to Paola, having been installed in other towns and cities, notably Niles, Michigan, the former home of Kawneer. Neither was the minimalist commercial aesthetic endemic to Paola—Kawneer's Machines for Selling proposed dozens of minimalist façade designs, and Federated Department Store's president, Fred Lazarus, added fuel to the minimalist trend in shopping retail architecture with his endorsement of such façades for department stores.[806] As Longstreth argues, by the 1950s, "little question seems to have existed that the building as a giant unadorned box was the favored symbol of the department store's continuance as a motor force in retailing."[807]

Functionally, the slipcovers proposed for Paola were a way to reduce heating and cooling of second story spaces. Windows were blocked off or reduced in height on many street front façades across the country as electric lighting systems developed to provide ample lighting without windows and ceiling heights were lowered with the advent of drop ceiling systems. Such justification was cited even for large department stores. The minimalist, blank façade design of Foley's department store (1945–1947) was justified, in part, by the savings it would produce in heating and cooling cost (Longstreth 2010, 51). Paola's project emulated these functional and aesthetic considerations, while simultaneously yielding an innovative retail space that embraced the public sphere.

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806 Longstreth, *American Department Store Transformed,* 56.
807 Ibid., 55.

A New Town Square

Over the course of the year in 1967, aluminum façades were under construction or being prepared. The mayor's committee found success in effectuating aluminum cladding of buildings facing the town square on all four sides. Drew McLaughlin, the president of the publishing company controlling the town newspaper, The Western Spirit, explained how the mayor's committee, the Chamber of Commerce and civic groups managed to persuade all business owners around the square to erect the aluminum façades. He stated, "It took a lot of meetings, a lot of persuasion and, in some instances, a pressure to get it done, but it was worth all the effort."[808] Ted McIntire, a member of one of the planning committees, explained the process is a bit more detail. "We sold the idea to a few of the more interested ones first…then we started spreading it to the rest. In a few instances, it took a lot of persuading. There were a couple of instances where we thought we would be completely out of luck, so we said nothing to them."[809] The additional pressures and persuasions that were enacted against the disagreeable merchants were not mentioned further by members of the committee. However, by late spring of 1968, all four sides of the square were aluminum clad. During this time, the city began planning the "Parade of Progress," a grand celebration and official dedication of the façades to be held in the early summer of that year.

Near the completion of the project, it began attracting attention from national competitions. In late 1967, while it was still under way, the project won an improvement award sponsored by the Kansas Engineering Society for new downtown improvements.[810] In early

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[808] Hintz, "Facelift Propels Town into Space Age," *Wichita Eagle*, June 15, 1968, 8A.
[809] Ibid.
[810] Ibid.

1968, the recently completed project was entered into a competition sponsored by Look Magazine's All American Cities contest.[811]

Celebrating Commercial Progressivism and Local Independence

Such publicity aligned with the much wider attention the project would receive over the course of its dedication at the official full-week celebration in June 1967: The Parade of Progress. This celebration included four days of events, beginning with dinners honoring merchants, businessmen and dignitaries, leading to a celebration of agriculture and the crowning of the dairy princess, a square dance, free bar-b-que, a parade of marching bands and floats and finally culminating in a closing speech by the state governor.

Throughout the four-day celebration, and in the build up to the event itself, three themes emerged which were touted repeatedly through official proclamations, newspaper stories and advertisements. First, the town of Paola was portrayed as beaming with pride at the new project, which was furthermore asserted to have registered a shift in public attitude. Newspaper headlines and articles captured Paola's proud spirit. "Paola to Celebrate Face-Lifting With Self Esteem;" "Paola Kansas, Proud of New Look." Local contractor Ted McIntire reflected on the town's shift in mentality, proclaiming, "The really big change has been the town's attitude. I've been here 21 years, and until this happened, merchants were fighting each other. Now they're working together because they realize what helps one helps all of them."[812]

Second, this pride was underpinned by the project's independence of federal aid. At the dedication ceremony, Kansas state governor Robert Docking declared to the gathered townspeople, "Rather than asking for a hand out, you have extended a helping hand—one to

[811] "Invite Paola to Enter Look Cities Contest," *The Western Spirit*, May 8, 1968.
[812] Hintz, "Facelift Propels Town into Space Age," 8A.

another and together you are literally building a new town within a town." Newspaper copy echoed the refrain, writing, "Using their initiative and financial resources, city officials, civic and business leaders, spurn(ed) any idea of federal aid…" Another article captured the aversion to perceived government bureaucracy. The publisher of the local newspaper explained, "The first thought was federal funds, of course, but there was too much red tape involved. We were going to have to hire planners, submit the plans and wait five or ten years for results. We decided we knew what we needed and that we could do it a lot faster and a lot cheaper." Advertisements placed in the newspaper by merchants during the Parade of Progress also announced their pride in eschewing federal support. Sherar's Men's Clothing wrote, "The skeptics said it couldn't be done without aid from the federal government but it was done through splendid community effort by those who believed Paola is on the go!"

The third, and most loudly proclaimed theme, is a word that was used consistently from the very seeds of the project, through its completion: progress. Recalling the chamber president's vision, titled, "A Pattern for Progress," everything from the name of the final celebration to congratulatory messages in the newspaper echoed this theme. A press release distributed by project leaders was subtitled, "The Paola Spirit: An inspiring account of a small city making such giant strides of progress, that it continues to amaze even itself."[813] The idea of progress seeped through the capillaries of the town in both spoken and printed word. Concomitant with this dogma of progress was a belief that now, with the shiny new aluminum façades, new red painted sidewalks, and aluminum awning covering the sidewalk, the town had modernized.

These three themes of pride, independence and progress were deftly tied to the idea of modernity by the projects promoters. James Sullinger, writer for the Kansas City Star, when

[813] The City of Paola, *The Paola Spirit.*

interviewing the city manager, wrote that, “Now, the stores around the square look like a modern shopping center with the addition of new store facings, constructed at owner’s expense.”[814] A congratulating advertisement by Hayes Quarries concrete company pronounced, “We are as proud as we can be with our new modern ‘shopping center—on the square!”[815] The city manager believed in an architectural determinism in which the new modern project was a direct influencer on the town’s identity. Before the aluminum project, he maintained the “town’s physical deterioration was reflected in a decay of civic pride among Paola’s citizens.” However, after the project, he said, “this project…has given us a real sense of community pride.”[816]

Faith in Modernization as a Rescue

There was a belief espoused in newspaper reports and by the views of project promoters that this modernizing project was only the beginning—a catalyst for a continued upward trend in the commercial prosperity of the town. The seven page city press release, which constituted the official narrative of the project, proclaimed, “Important too, is the fact that leaders in the community consider this only ‘stage one’ with much more improvement and progress for the near future…in other words, this story is the beginning—not the ending. Progress and improvements are like the measles, it’s catching.”[817]

The narrative next asserted that after the new downtown modernization project, crisis had been averted. It claimed, “There is no more talk of downtown business owners joining with outside interests to form a suburban shopping center. The core area is now a shopping center itself.” City leaders were utterly optimistic, drawing contrasts with Paola’s previous, imagined

[814] James Sullinger, “Paola, Kansas Proud of New Look,” *The Kansas City Star,* June 13, 1968.
[815] Hayes Quarries advertisement, *The Western Spirit,* June 10, 1968.
[816] Sullinger, “Paola, Kansas Proud of New Look.”
[817] The City of Paola, *The Paola Spirit.*

dystopian future, with its new utopian future. Mayor Rex J. Kiser, who at one point was called the "Aluminum King" said, "It was simply a matter of saving our town…most small towns are losing their core areas, and we didn't want that to happen here. We decided it was up to us to work out our own salvation." In contrast, reflecting on the completed aluminum town square, he exclaimed that in less than two years, the town has "moved from the Model T era to the Space Age."[818]

Deconstructing the Image of Modernity in Paola

The Space Age didn't last in Paola. Outmigration of people from rural areas to cities continued, shopping centers outside of core areas proliferated, and downtowns continued to lose prosperity. A slow trickle of outmigration reflected national trends for rural areas. The revitalized downtown did not stop the development of shopping centers on the edges of Paola. Ten years after the Parade of Progress, Wal-Mart chose a site at the edge of town near the highway, and a year later, a big box grocery store, Price Chopper, opened as well. The Paola Wal-Mart would in 1987 receive accolades and a congratulatory visit by Sam Walton himself for being—on some measures—the most successful Wal-Mart in the country.[819] Today, the square is not at full occupancy, yet it does have businesses, many of which are professional and non-retail in nature.

Over time, the aluminum façades themselves proved to be problematic. By 1979, it wasn't the measles that was catching, but instead, it was fear of other diseases being spread by the façades. The screens covering windows and the interstitial space between the old brick

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[818] Hintz, "Facelift Propels Town into Space Age."
[819] The Miami County Historical Society, *Paola, Kansas, A 150 Year History* (Paola, Kansas: The Miami County Historical Society, 2006), 313.

façades and the aluminum façades were reported in the newspaper as popular roosting locales for pigeons. The resultant droppings and association with disease were frustrating merchants. The county health nurse, Linda Neal, said that "histoplasmosis, torulosis and psittacosis all could be contracted (by humans) from contact with pigeons or their droppings."[820]

By 1986, the downtown again was seen as in need of revitalization. A city meeting with area business owners and citizens asserted that despite the "apparent shifting of the city's trade area to the outskirts of town," a collaboration between the city and the private sector could enhance the image of the downtown as a "neighborhood" retail center. The meeting concluded that the "building(s) reflect not only the community's history, but also its culture." Architecture students from the University of Kansas and Kansas State University were invited to develop proposals for downtown revitalization.[821] Two years following this, one downtown building owner completely removed the aluminum façade and canopy. The exposed brick once again saw the light of day, and before sandblasting and painting it, they dealt with the pigeon problem. "We had about six inches of pigeon stuff piled up out here…we filled about a third of our truck bed with it," the owner said.[822]

Over the years, other events would precipitate the removal of the aluminum façades. In 1993, an ice storm caused some aluminum cladding to crash down, bringing with it some of the original brick façade of one building. Later that year, some of the same banks that provided loans to building owners financing the aluminum façades in 1967, now provided grants to business owners for the façade's removal. In conjunction with Paola's downtown revitalization group,

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[820] "Roosting Window," *The Western Spirit*, December 12, 1979.
[821] Miami County Historical Society, *Paola, Kansas, A 150 Year History*, 312.
[822] "Square Business Sheds Its Front," *The Western Spirit*, April 19, 1989.

grants up to $5,000 were given to eligible building owners around the square. Today, all aluminum façades are gone.

Paola's modernizing project consciously emulated what promoters believed to be the benefits of new shopping malls, while simultaneously innovating modern modes of shopping by appropriating existing infrastructure and superimposing on it an image of modernity associated with the newest shopping malls emerging across the country. Many towns are still dotted with slipcovers of aluminum and other materials. Yet, few if any embraced a completely new aesthetic as did Paola's town square. The lessons of Paola show that their solution was a quickly implemented architectural intervention once championed and hailed as a savior that quickly fell out of favor. Regional shopping venues and big box retailers proliferated throughout the twentieth century, changing patterns of consumption on Main Street. Despite their pride in independence, Paola's challenges were a negotiation with trends outside of their control which the cosmetics of aluminum could not solve.

EPILOGUE

The production of aluminum today is a global-scale enterprise to a much greater degree than the organization of the aluminum industry in the twentieth century. Chinese corporations dominate the landscape of production, dwarfing aluminum output in other nations. National producers have merged into multinational conglomerates, reducing any singular national orientation, while corporate entities organized in disparate countries reorganized into global entities. The two largest producers in the United States, Alcoa and Reynolds, merged in 1999 upon the purchase of the latter by the former. Kawneer was also merged into Alcoa, and in 2016, Alcoa split into two companies — Arconic as an aluminum manufacturer, and a separate company retaining the historic name was formed as Alcoa Corporation, operating as a producer.

Although corporate structures and names have changed, threads from the past have persisted. An homage to Reynolds, two products sold by Arconic, called Reynobond and Reynolux, carry a reference to the former rival on new, aluminum-clad buildings. As a smaller collaborator and sometimes-competitor to Alcoa in the mid-century period, the Kawneer name has been retained for an entire subsidiary company of Arconic, continuing to manufacture aluminum cladding products. Kawneer and Reynolds have been delaminated from their former independent, corporate structures and redeployed with accompanying name recognition to buyers still specifying aluminum, the most abundant metal from the earth's crust.

The relationships of these corporate entities over the duration of the twentieth century are tangled and complicated, regulated by legal frameworks and driven to pursue shareholder profit by expanding, reorganizing and competing to control sales territories and resource territories too, such as the world's largest rivers for hydropower, land for mining, regulatory environments agreeable to profitable operation, wherever on the globe these resources may be. The wider-scope of analysis offered in the first two chapters of this study has shown the way in which twentieth-century architecture has been materially produced, often out of sight, by a global apparatus of industrial capitalism — a view that is often physically masked in the industrial zones of cities or the erased spaces of indigenous peoples once occupying lands sold or leased to aluminum producers wherever bauxite was found to be extracted economically. Yet, there is another hidden aspect, and that is the mask of authorship — the mythology of the genius architect so celebrated in Ayn Rand's *The Fountainhead.* Rand eludes to an industrial production underpinning architecture when Howard Roark works in and visits a rock quarry, but it is his genius of authorship that retains the focus.

The authorship of modern architecture is complicated by the producer-manufacturer enterprise. This study has explained the relationships engaged in the spread and use of aluminum cladding as *transversal*, and these relationships suggest that authorship and disciplinary boundaries are quite subjective. Regulatory entities both enabled and disabled corporate and production goals. Collaborators were sometimes competitors. Research and development (R&D), and the positionality of design as a practice both within the R&D structure and outside its structure in the offices of architects or other designers, was not a clear boundary. Naming an author is exposed as a contractual exercise in the manufacture of aluminum cladding. The cladding systems employing Alcoa-produced aluminum that became widespread in the 1950s and 1960s were designed by collaborations between researchers, designers and architects both inside and outside Alcoa. Further, later aluminum cladding components benefitted from the trials, errors and discoveries afforded by previous iterations. While a building is more than its constituent parts, and the architect rightfully deserves a note of authorship, manufacturers played a crucial role in the production of modern architecture.

A multivalent historical perspective, informed by the transversal modes of relationality in aluminum cladding production, suggests increased scrutiny of modern architecture as an outcome of profit-seeking industrial enterprise, in addition to the creative capacities of architects and any quest for formal representation of the age. What other materials and building components might be scrutinized to discern the way underlying logics of production have shaped modern architecture? The role of materials and components has long been claimed to be among the historical forces underpinning the development of modern architecture. Reductionists might point to steel, or the elevator, or more broad conceptualizations of technology as the historical determinants. Instead, this study advocates spotlighting transversal relationships between the human and material domains where they are dislocated, distributed and countervailing as a productive methodology.

Aluminum cladding producers and manufacturers held beliefs, in turn deployed as arguments in marketing materials, that aluminum held certain capacities, or the agency to enact prosperity. Believing that a material holds agentic capacity is a specific epistemology of materiality, not articulated as such by promoters, but instead held as a reality. Recent scholarship of philosophy has claimed a return to, or an increased consciousness of an ontology of *realism*. Other theories have developed which examine the relationality between things as a network. These agendas have emerged as one of several claims about materiality and more broadly "the object," with intellectual inquiry subsumed under the constructs of Actor Network Theory, Speculative Realism, Object Oriented Ontology and New Materialism(s). These theoretical registers pose questions about the essence of objects — seeking to delimit the degree to which a thing has an essential being — and pose questions about agency — probing the agentic capacity of things, or for the materialists within this domain, the capacities of materials to figure as an actor.

Each of these scholarly domains extend their own theories with ontological and disciplinary boundaries. For example, Graham Harman claims for an object an essence that is never fully accessible to either people or other objects, while Manuel DeLanda disputes the ontology of essences, instead advocating processes of becoming, such as affect. Despite their differences, what unites them, along with other scholars such as Karen Barad, Jane Bennett, and Bruno Latour, is a scholarly focus on things, less a world defined by meanings, symbolism or representations. DeLanda has criticized the primacy of linguistics and semiotics in scholarship, which he asserts, "leads you to an absolute relativism in which the objective world just disappears and all that exists is just the subjective worlds created by different languages."[823] For example, geographer David Matless has asserted that "representations, images, knowledges, fantasies are . . . not to be regarded as merely reflective or distortive of the world . . . but as constitutive, as what the world is made of, really."[824]

Finding a confederation with a focus on materiality, or more specifically, to borrow a term from Karen Barad, the "material-discursive," I ask how philosophical theory can be applicable to architectural history. [825] An examination of the past need not sacrifice the discursive lens for the material lens. In the words of Manuel DeLanda, it is not a concern of "Matter vs. Meaning." The promoters of aluminum cladding present a potent subject of study at which to

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[823] DeLanda, "Subjectivity and Thought in Gilles Deleuze 2009 1/11."
[824] David Matless, "An Occasion for Geography: Landscape, Representation, and Foucault's Corpus," *Environment and Planning D: Society and Space* 10 (1992): 44.
[825] Karen Barad, "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter," *Signs: Journal of Women in Culture and Society* 28 (2003): 810.

aim this lens of the material-discursive. Their promotional efforts, and their beliefs, combined the instrumentality and image of aluminum as a material ontology and a mode of marketing aluminum cladding. They believed that from the properties of aluminum — its light weight, resistance to corrosion, malleability, and "beauty," among others, that aluminum conferred special advantages which promoters marketed as such in promotional materials. These advantages were marketed as the ability of aluminum to reduce cost, modernize, and bring prosperity to the building owner, merchant, and the community at large. Their aluminum materiality was not outside of the human domain, however. They believed that it was in interaction with the human domain that it found its full potential. They were quick to promote their own intentionality, exhuming raw materials from the earth and through industrial processes, unlocking aluminum and bringing to the world this shiny metal. They believed the agency of aluminum could only become fully realized as far as they instrumentalized it for use.

Although aluminum was for the promoters an agentic material, it was not understood to be a mere body to be represented. It was for them a material reality with definitive abilities, but importantly, an indeterminate identity. Discursive frameworks do not productively explain their epistemology. Henri Lefebvre has written, "In modern space, the body no longer has a presence; it is only *represented*, in a spatial environment reduced to its optical components."[826] Lefebvre offers only one-half of an important analytical framework. In the marketing operation activating both *Instrumentality* and *Image*, a study only of representation is inadequate. To the aluminum advocates, the body had both a presence and a need to be represented. The latter was especially crucial in their formulation, as aluminum was a site which could, and did, take on multiple, sometimes competing identities. Claiming no inherent meaning for aluminum reflects Arjun

[826] Henri Lefebvre, *The Urban Revolution* (Minneapolis: University of Minnesota Press, 2003), 234.

Appadurai's conception of matter, wherein, "things have no meanings apart from those that human transactions, attributions, and motivations endow them with."[827] Aluminum became categorized as modern largely through the purposeful work of marketers.

Maintaining that aluminum is indeterminate also suggests a particular viewpoint about matter, namely, that it withdraws from full understanding, never fully accessible. This theory, which we find elucidated IN Graham Harman's approach to Object Oriented Ontology, is applicable to aluminum as a cogent explanation of promoters work to shape the identity of aluminum.[828] It was new to the nineteenth-century eye and susceptible to misunderstanding, or worse for the promoter, conducive to the formation of beliefs that discouraged its sale to buyers. On the one hand, if it were believed to be more valuable than silver, justified by its high price in the nineteenth century, then a utilitarian identity and widespread use was complicated. On the other hand, if it were believed to be ersatz, as the historian of technology Robert Friedel has revealed about its malleable nineteenth-century identity, this belief could exclude it from consideration where prestige is important.[829] What producers wanted was the widest use of aluminum possible, while simultaneously guarding its identity. They wanted to sell aluminum tea kettles, but also implements of war. They wanted to sell aluminum foil to a domestic market, but also commercial aluminum cladding. They believed that a multidimensional marketing project was a way to assign identity to aluminum, a material which was fundamentally indeterminate in identity.

[827] Arjun Appadurai, *The Social Life of Things: Commodities in Cultural Perspective* (Cambridge: Cambridge University Press, 1986), 5.
[828] For an explanation of Harman's theory of the withdrawn object, see Graham Harman, *Immaterialism: Objects and Social Theory* (Cambridge: Polity Press, 2016).
[829] Robert Friedel, "The Psychology of Aluminum," working paper, 1975, Department of Science, Johns Hopkins University, Baltimore, MD., folder 2, box 51, Records of the Aluminum Company of America

Reflecting on the image of aluminum, the words of Beatriz Colomina come to mind, as she has written "to think about modern architecture must be to pass back and forth between the question of space and the question of representation."[830] By examining the dialectic between instrumentality and image, this study brings increased scrutiny to an epistemology of material agency as an underlying assumption of modern architecture. Modernist architects were no stranger to architectural determinism. For the aluminum promoters, the claimed ability of architecture to enact prosperity, as a "machine for selling," for instance, was underpinned by their belief in the agency of materials. Extending this study by recalling that modern architecture is sometimes situated as a break from the past, comparative analysis might illuminate the attitudes concerning agency shared between aluminum advocates and advocates of other materials prefiguring its development. Rather than a break from the past, a shared assumption about the agentic capacity of materials might show distinct continuities. How might productive historical perspectives be formulated which analyze shared assumptions about agency across what have traditionally been cast as disparate, even discontinuous eras? This study suggests material agency as a productive analytical lens.

The visual, cultural and ideological landscape of the historical antecedent to the twentieth century and the period examined in this study has been characterized by intellectuals as an epoch of social and cultural change so rapid, the subjects of this condition of change struggled to engage successfully. Baudelaire characterized the modern condition as transient and fleeting, historian Carl Schorske identified modernity as a "ruthless centrifuge," and Marshall Berman's analysis of modernity explained a "maelstrom of perpetual disintegration and renewal, of

[830] Colomina, *Privacy and Publicity,* 13-14.

struggle and contradiction, of ambiguity and anguish."[831] In contrast, aluminum cladding promoters had specific and quite contrary views of what it means to be modern in the twentieth century. Theirs was an optimistic modernism, aligned with progress, the future and emancipation. Modernity for the aluminum promoter was to relax in a position of comparative advantage and prosperity — the modern subject having been granted this position by electing to modernize his environment.

Rectifying these oppositional assertions is to engage in an analysis of perspective. Marxists afford a view of disruption wrought by capitalism and a corporate hegemony, as David Harvey has characterized, "in a society where a corporate capitalist version of the Enlightenment project of development for progress and human emancipation held sway as a political-economic determinant."[832] Rather than engage in the debate of ideological perspective, this study explains modernism as a mode of characterization. For the aluminum promoters, modernism — the visual, textual and ideological productions of modernity — was a specific, well-funded characterization. It was a marketing project. Claims that modernization with aluminum could bring prosperity was more than the snake-oil of slick salesmen. These were their beliefs, their modernism, that aluminum could bring a bright and shining future to the present. Although they believed this to be true, they professed this modernism as a meticulously-planned marketing project that entailed distributable forms of communication, including print, presentation, associations with famous designers, and dramatically the aluminum-clad buildings themselves. Cladding the landscape was modernization, and the result was a modernism they invited

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[831] Charles Baudelaire, quoted in David Harvey, *The Condition of Postmodernity* (Cambridge: Blackwell Publishers, 1992), 10; Carl E. Schorske, *Fin-de-siáecle Vienna: Politics and Culture* (New York: Vintage Books, 1981), xix; Berman, *All That is Solid Melts Into Air*, 15. Berman articulates many versions of modernism, but supports most the one that asserts that to be modern is to make one's self at home in the chaos, or the "maelstrom"
[832] Harvey, *The Condition of Postmodernity*, 35.

prospective buyers to witness in person or admire in advertisements and feature articles, thus producing a cyclical loop of marketing.

As a framework of characterization, how different is Berman's modernism? This study advances as productive an analytical framework whereby Berman's modernism and the aluminum producer's modernism are equally a mode of characterization. Both advance a specific agenda, and both seek to sway perceptions of an audience. The corporate capitalist version of modernism might be conveyed as liberation, while a Marxist version of modernism might be conveyed as oppression. Reflecting upon such perspectival relativism, this dissertation thus contributes to debates questioning the efficacy of terminologically distinguishing the twentieth century as a modern era. This is a question of historiography that has yet to be settled.

Now that aluminum cladding has been removed in Niles and Paola, and furthermore, aluminum slipcovers have been removed across the United States, it is tempting to try to write a postscript to aluminum cladding, leaning on evidence of cheap aluminum cans, shoddy residential aluminum siding and shady salesmen as the new image of aluminum leading to it downfall. However, commercial aluminum cladding is still widely used in the twenty-first century. Arconic and a host of competitors continue to sell cladding. Often designed today as a "rain screen," its functional performance has been improved to allow rain to purposely slip behind the outer wall layer of aluminum and subsequently take a path of exit down and out, preventing water intrusion into the inner-wall cavity. The overall market for aluminum is strong.

As Eric Schatzberg points out, some applications of aluminum have indeed ceased because of limits to its appropriate and successful use. Aluminum household wiring has been claimed to be dangerous, and thus finds little domestic use. Perhaps some negative associations have been formed in buyers' imagination, as Schatzberg notes, "in part through its associations with mundane artifacts like beer cans and cheap cookware."[833] If it is true that some buyers eschew aluminum for these reasons, we can recognize that aluminum continues to be used across a spectrum of markets. The very indeterminacy of any essential meaning engaged with promoters to form multiple, concurrent identities for aluminum.

[833] Schatzberg, "Symbolic Culture and Technological Change," 233.

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