

*Eero Saarinen, Eduardo Catalano and  
the Influence of Matthew Nowicki:  
A Challenge to Form and Function*

**Abstract.** Matthew Nowicki befriended Eero Saarinen at the Cranbrook Academy and was succeeded as Chair of the School of Design at North Carolina College of Design by Eduardo Catalano. Nowicki's influence is evident in subsequent work of these two architects. Themes of function, structure and humanism resonated differently in each. All three of these interconnected individuals were engaged in the same intellectual milieu, each manifesting his own architecture in a unique yet contextual way. Taken as a whole, their endeavors stand as evidence of the shifting understanding of what modern architecture was about.

*Introduction*

In the years following World War II, modern architecture was facing a cross-roads.<sup>1</sup> Many architects were skeptical of the ability of the dominant "International Style"<sup>2</sup> to respond to social, humanistic demands – a sentiment magnified by the loss of life during the war – and were searching for a new direction forward. The self-justified rational architecture did not engage the richness of human experience. Multiple calls for "expression" and "monumentality" in architecture revealed a need for more human engagement than the International Style was providing [Barr 1948].

Thus post-war modernist architects had to make a choice: maintain the rigid obedience to "functionalist" architecture, or search for a new means of expression. They were consciously engaged in re-thinking what architecture should be, interested in recasting modern architecture to suit an altered social landscape; they wanted to make architecture more appealing, but didn't want to abandon industrial efficiency. They sought to re-place architecture in the minds of citizens, but felt the "immaturity of modern architecture", and the need to "grow up".<sup>3</sup> Modernism had not failed, but it needed revision.

One architect who engaged in this discussion and would prove influential in altering its course was Matthew Nowicki. His untimely death in an airplane crash in the fall of 1950 cut his budding career short, but not before he had written a few influential articles and designed one seminal work, the Livestock Pavilion in Raleigh, North Carolina. Nowicki's work suggested a new direction for architecture in the post-war world – ideas that would fatefully remain unrealized by him, but would be picked up and extended other like-minded architects.

During his life, he befriended the architect Eero Saarinen at the Cranbrook Academy and was succeeded as Chair of the School of Design at North Carolina College of Design by Eduardo Catalano.<sup>4</sup> Through the subsequent work of these two men, Nowicki's influence – his personality, his inventiveness, his ideas about architecture – can be seen. Themes of function, structure and humanism resonated differently in each man, striking different chords in their work. Together, these three interconnected individuals, with

great similarities and vast differences, were engaged in the same intellectual milieu, each manifesting his own architecture in a unique yet contextual way. Their combined endeavors, physical and intellectual, stand as evidence of the shifting understanding of what modern architecture was about.

### ***Matthew Nowicki***

Matthew Nowicki was born in 1910, into a Polish noble family, the son of a politically active Consul to the Polish State. He traveled extensively as a child, spending much time in Chicago, and learning English before enrolling in architectural studies at the Warsaw Polytechnic in 1928. Here he quickly demonstrated an incredible drawing ability, a talent that would provide his most lasting legacy in his striking sketches that remain. Instruction at the Polytechnic also strove to “teach him to see things as structures. To this end a drawing was built, with skeletons of structural lines exposed” [Mumford 1954a: 142]. Drawing for Nowicki was not just symbolic representation, but an intellectual process of architectural and structural synthesis. Engineering and geometry would always go hand-in-hand with his formal, architectural explorations. Nowicki also met his wife, Sasha, while in school; a fellow architecture student, she was by all measures his equal in drawing and design.

Inspired by Le Corbusier and Wright, Nowicki began his own professional practice in Warsaw after graduation, also accepting a position as associate professor at the Polytechnic. He built a number of churches, homes and sports arenas in Poland before the German invasion in September 1939. The darkness of the war descended on Warsaw as the mass destruction increased, and Nowicki and his family were forced to escape to the distant mountain regions. After the war, Nowicki was involved in the planning to rebuild Warsaw, but when the Polish government was taken over by Communist powers, he decided to come to the United States [Brook 2005: 37]. He served as Cultural Attache to the Polish Consulate in Chicago, was a visiting critic at the Pratt Institute, and served a formative role as the Polish representative to the committee for the United Nations Building.<sup>5</sup>

The wartime experience drastically effected Nowicki’s outlook on life, and revised his approach toward architecture. After the war he wrote:

The study of the well-being of contemporary man, which has been introduced into the language of architecture, continues to be the inspiration for our work but this time the quality is differently analyzed. It is no longer ‘the machine to live in’ that stirs our imagination. It is the eternal feeling of a shelter to which we subordinate our creative ideas [Mumford 1954: 148].

Nowicki invokes a more humanist approach to architecture, one that is sensitive to emotional feelings as well as function.

His technical education at the Warsaw Polytechnic also rooted his architectural theories in structural realities. Advancing technologies, as they changed over time, were a crucial part of creating effective architecture. He stated:

...we now rely in our expression of the potentialities of materials and structures. This interest in structure and material may find within the building medium decorative qualities of ornament that are much too involved for the purist of yesterday. The symbolic meaning of a support

has been rediscovered, and a steel column is frankly used as a symbol of structure, even when it is not part of the structure itself [Nowicki 1951: 279].

For Nowicki, structure had become expression and he embraced the new potential that emerging technologies suggest.<sup>6</sup> A new type of expression was emerging from an awareness of material and structure, one that was not rooted in a singular, formal prescription but rather encouraged multiple investigations. He states, “Art may be one, but it has a thousand aspects. We must face the dangers of the crystalizing style... trying to enrich its scope by opening new roads for investigation and future refinement” [Nowicki 1951: 279].

In an article titled “Origins and Trends in Modern Architecture,” Nowicki clearly stated what many architects had begun to feel regarding functionalist architecture:

In the growing maturity and self-consciousness of our century, we can not avoid the recognition ... that the overwhelming majority of modern design form follows *form* and not *function*. And even when a form results from a functional analysis, this analysis follows a pattern that leads to a discover of the same function, whether in a factory or a museum [Nowicki 1951: 273].

Striking to the heart of the proclaimed objectivity of pre-war modern architecture, Nowicki’s statements resonated with many architects of his generation. From Paul Rudolph [1986: 153] to Colin Rowe [1976: 130], Nowicki’s statements provided a springboard for a new line of architectural thinking, causing, in 1962, the critic Allan Temko to call Nowicki the “spokesman for young Modernists” [Temko 1963: 43]. For the emerging generation of architects, function influenced but did not dictate form. For Nowicki, Catalano and Saarinen, post-war architecture would engage the mutual dependence of function and form.

Nowicki’s theories can be seen in his sketches for the State Fair Livestock Judging Pavilion (later the Dorton Arena) in Raleigh, North Carolina. His death during the design process left architect William Henley Deitrick, working with engineers Severud-Elsted-Kreuger, to complete the project. Despite the intent to do everything “as Matthew would have wanted it” [Parabolic Pavilion 1952: 137], substantial design changes due to budget and construction issues altered the building to the point where some questioned if Nowicki would have been pleased with it (North Carolina Dean Henry Kamphoefner quoted in [A radical settles down in Raleigh, NC 1980]). But Nowicki’s intent is evidenced through his sketches, and is indicated in the built work.

The sketches (and the building itself; fig. 1) are structurally bold, consisting of two intersecting parabolic arches. The sweeping, mathematically-driven forms are angled to the horizon, and on this account, trace the plan of the arena in the area between them. The roof consists of draped cables strung between the two arches. The cables’ dependence on the geometry of the arches, coupled with their own catenary behavior, creates a warped roof surface displaying a curvature in both lateral and longitudinal directions. This is clearly a geometrical investigation of shapes in space, a mixing of elevation and plan, but it is also underlined by a structural logic.

The two parabolic arches were made of concrete, and act in pure compression, with the roof cables hung in pure tension. The force-imbalance of the canted arches was to be ideally counteracted by the thrust of the roof cables, freeing up the curtain wall below to provide only stability. In the final building, construction methods had not advanced

enough to support these intentions, and the exterior curtain wall became load bearing. These structural innovations have been widely cited by people such as Frei Otto [1954] as innovative and suggesting a new field of architectural form. The Livestock Pavilion displayed a material logic employed through the mathematics of complex geometry.



Fig. 1. Matthew Nowicki's State Fair Livestock Judging Pavilion (later the Dorton Arena) in Raleigh, North Carolina. Photograph by Yoshito Isono, reproduced courtesy of Nicholas Janberg and Structurae

These structural forms also provided an expression of the function of the building and shaped the space within. As a “single great room” the livestock show floor and surrounding grandstands mirror the structure above, providing axially and a center of focus (Paul Rudolph quoted in [The great Livestock Pavilion complete 1954]). *Architectural Forum* stated:

Nowicki was seeking first of all not for a unique structure but for a unique space. The remarkable warping of the space upward, the exact reverse of a dome, would guarantee maximum daylight admitted from the two sides to the central arena. This labile kind of curvature of enclosed space marks a new epoch in architecture [Parabolic Pavilion 1952].

The innovative, three-dimensional aspects of the Pavilion indicated a different means of enclosing human experience, a new spatial relationship within architecture. The roof provided shelter and also engaged the questioning mind.

Nowicki's theories of humanist expression through structure are in play here. He is demonstrating a navigated position between the human experience, structural rationality and the functional demands of the building. Although not without shortcomings,<sup>7</sup> in this single work he has embodied many different strands of the architectural discourse of the time. Paul Rudolph described a sublime experience, and stated that this new space “helped man forget something of his troubles.” He also claimed that it satisfied “our need for more expressiveness to emphasize our places of worship, meeting places of governing bodies, and centers of recreation” [The Great Livestock Pavilion Complete 1954: 132]. It embodied a “basic soundness and high spirited boldness” that indicated a new direction for modern architecture [The Great Livestock Pavilion Complete 1954: 134].

## *Eduardo Catalano*

After Nowicki's death, his position as chair of the North Carolina State College, School of Design was soon filled by Dean Henry Kamphoefner, with Eduardo Catalano. Catalano, an Argentinian-born architect who trained at both the University of Pennsylvania and under Walter Gropius at the Harvard Graduate School of Design, was keenly interested in advanced geometrical forms in architecture. Prior to coming to North Carolina, he had co-written a book on the mathematics of geometrical forms and the use of perspective [Crivelli, Nery and Catalano 1940]. His un-built auditorium project in Buenos Aires used a thin shell structure to enhance acoustics, and he entered several competitions for pre-fabricated housing solutions, utilizing a modular approach to building [Arts and Architecture's Second Annual Competition 1945].

But it all appears to come together for Catalano once he arrives in Raleigh. Along with the continuing construction of the Livestock Pavilion, Nowicki's presence was still felt through the curriculum and education system he had initiated. His pedagogical approach to teaching architecture emphasized a merge of the technical requirements with a humanistic awareness. Influenced by Le Corbusier's "Modulor", Nowicki emphasized designing around "Man" as the "unchanging module of of scale and proportion" and the role of technology and structure as a means to satisfy changing human demands [Mumford 1954b]. This legacy is digested and synthesized by Catalano, filtered through his own experiences and disposition, in a unique way.

Catalano's work focused on geometrically advanced forms, investigating new means of spanning space. He worked primarily with hyperbolic paraboloids, investigating geometrical surfaces with curvature in two longitudinal directions (e.g., saddle shapes) – forms like Nowicki's Livestock Pavilion roof. But Catalano extended this form, coming up with a modular system to create these shapes using individual, linear elements. Drawing on his experience with advanced geometry, Catalano developed a system where new shapes could be generated by simply modifying parameters of the design. His project *Structures of Warped Surfaces* explored various combinations of hyperbolic paraboloid forms with a variety of supports, searching for new ways to provide an over-head surface [Catalano Gubitosi Izzo 1978: 55-70]. In 1953, three years after Nowicki's death, Catalano was quoted stating:

Following the research begun by Nowicki, our work at North Carolina has gone far beyond the Raleigh Pavilion in the study of both space structures and repetitive spatial structural systems ... these have led to interesting structures (comment by Eduardo Catalano, in [Is this Tomorrow's Structure? 1953: 160]).

Catalano also utilized war-related technologies of aluminum and plywood in experiments with these forms, stressing innovation tied to industrial production.

His work at North Carolina State College culminated in the construction of his own house in the woods outside Raleigh. Known simply as the "Catalano House" (1953-55, fig. 2) it consisted of a single hyperbolic paraboloid, made up of three layers of laminated timber. Spanning 90 feet between supports with a total thickness just over two inches, this house was celebrated as "a structure that is all skin and no bones," reflecting "the most advanced engineering know-how" of the time "[Why are People Talking about this House? 1955]. The functions of house take place then beneath the shell, with full height glass curtain walls defining the interior space.



Fig. 2. Eduardo Catalano's Catalano House

But Catalano's house was recognized as an experiment, an attempt to utilize advancing "skin technology in architecture" "[Why are People Talking about this House? 1955]. Given his approach to design, he was faced with the awkward challenge of fitting an architectural function to the forms he had developed through mathematics. The majority of his "warped surface" sketches contain no indicator of relation to the human scale, nor to which functions or building types they would be most suited. Nowicki's work clearly influenced his explorations, but Catalano has placed new emphasis on geometrical "purity" and advancement in structural engineering without direct ties to a specific architectural program [Catalano 2009]. His "warped plane roof" became famous with both "avant-garde aestheticians and building technicians" "[A New Way to Span Space 1955]. It is a shape like a potato chip but is also mathematical, geometrical, and analytical: a universal shape for covering.

### ***Eero Saarinen***

The parallel work of Eero Saarinen reveals a different aspect of Nowicki's influence. Saarinen and Nowicki met at a symposium in February 1948, and in the summer of 1949, Nowicki was appointed Visiting Professor at the Cranbrook Academy.<sup>8</sup> United by a propensity for drawing, the two were fast friends and shared a fruitful summer designing the campus plan for Brandeis University [Merkel 2005: 105]. Their sketches show heavily sculptural forms, with undulating walls and domed spaces, which, though not without precedent, mark a formalistic departure from Saarinen's previous work, like the GM Technical Center. With Nowicki by his side, Saarinen is able to merge his sculptural interests developed in furniture with the architectural humanism of Nowicki. Though their plan for Brandeis went unrealized, their sketches reveal many hints of Saarinen's future work.

Saarinen would later acknowledge the influence of their brief time together, which lasted only a few months. In a letter, he declared Matthew Nowicki to be the third most significant influence on him after his father, Eliel, and his life-long collaborator Charles Eames [Saarinen Pelkonen and Albrecht 2006: 332]. In Nowicki's obituary in *Architectural Forum*, Saarinen stated: "If time had allowed his genius to spread its wings in full, this poet-philosopher of form would have influenced the whole course of

architecture as profoundly as he inspired his friends” [Mumford 1950]. Through these statements, we can see that Nowicki had a profoundly different effect on Saarinen than on Catalano.

After his experience with Nowicki, Saarinen’s work is defined by his formal expression, in such work as the MIT Chapel and Kresge Auditorium, and the TWA Flight Center and Dulles Airport Terminals [Serraino Saarinen and Gössel 2005]. The structural logic of his architecture is often complicated by his attempts to create a meaningful form, one that communicates as well as functions [Pelkonen 2006]. Inspired by seeing Nowicki as a poet-philosopher of form, Saarinen was not interested in pure structure or engineering, like Catalano, but in linking architectural form to context and broader, humanist theories. Geometry alone was not enough; it needed energizing if it “was to serve the spatial-structural-spiritual totality” that he wished to express [Temko 1962: 43]. This is architecture that engages Nowicki’s ideas of the multiplicity of art.



Fig. 3. Eero Saarinen’s David S. Ingalls Ice Rink at Yale University, New Haven, CT. Photograph by Yoshito Isono, reproduced courtesy of Nicholas Janberg and Structurae

Nowicki’s influence is most clearly seen at Saarinen’s Ingalls Ice Rink (fig. 3). With a program similar to the Livestock Pavilion, Saarinen gives expression to the Ice Rink as a “single room” with a central rink surrounded by grandstand seating. A single, long concrete arch swoops over the long axis of the rink, with catenary cables running perpendicular to either side, forming the roof surface. But in an artistic and functional move, Saarinen does not terminate the main arch at its support, but reverses its curvature and cantilevers an additional portion to serve as an awning over the building entrance. This extended curve gives the building an undulating quality, making it a graceful active presence on the north side of the Yale University campus [Yale’s Hockey Rink 1958]. Exposed on the interior, the smooth concrete arch contrasts with the wood plank finish of the roof, coming to its peak over the hockey rink below. Commonly called the “dinosaur” or likened to a Viking ship [Yale’s Viking Vessel 1958], the building has “personality” and engages people spatially and intellectually.

Not only did Saarinen use a structural system similar to that of the Livestock Pavilion (as well as hiring the same engineer) but he captured a similar dynamic movement that can be seen in Nowicki's sketches. His structure dominates the form, serving the purpose of providing enclosure and supporting function, but clearly standing as a unique, artistic creation. The Ice Rink was criticized as not "sensible" because it spanned the arch over the long dimension (rather than the short axis) but it highlights the fact that Saarinen was not interested in a prescribed, "logical" approach to structure; the central spine served more than just a structural purpose.<sup>9</sup> He was not interested in the geometrical warping of overhead space as an isolated experiment, but in its inclusion, modification and distortion in the overall architectural experience.

## *Conclusion*

The work of Eduardo Catalano and Eero Saarinen reveals different themes in post-war architecture. Ranging from systematic, geometrical form-finding to expressive, artistic architecture, these architects display different directions following their experience with Matthew Nowicki. The sketches, writings, and built work of one man were simultaneously described as the investigation of spatial structures, and the work of a poet-philosopher, spawning different yet related directions in post-war architecture. This study indicates the nature of modern architectural discourse - as the action of neither isolated, autonomous individuals nor a unified group. Nowicki's influence does not at all indicate a lack of originality or innovation on the part of either architect, but serves to show how architectural discovery is often contextual and interrelated to broader discourses. By discussing the milieu of theories and shapes, functions and forms, this comparative study reveals the changing landscape of ideas about how to design modern architecture in the post-war period.

Lewis Mumford's comments following Nowicki's death in 1950 appear prophetic yet misleading. A friend and proponent, he stated that Nowicki

bore within him the seed of a new age. In his designs, spontaneity and discipline, power and love, form and function, mechanical structure and symbol, were united. What he left undone through his death must now call forth the creative efforts of a whole generation [Mumford 1950: 201, 206-207].

Not simply completing Nowicki's work, Catalano and Saarinen forged their own ways forward, inevitably leaning on their own experiences and influences, on the paths to creating their own unique architecture.

## *Notes*

1. For a much longer discussion of the post-war architectural scene, see [Goldhagen and Legault 2000].
2. The title of a 1932 Exhibition at the Museum of Modern Art, followed by the publication [Hitchcock and Johnson 1932].
3. Lewis Mumford used the terms "immaturity" and "grow-up" during the 1948 symposium "What is Happening to Modern Architecture" [Barr 1948].
4. Nowicki was returning from a trip to Chandigarh, India where he was designing a new capital complex with Albert Meyer. This project would be later taken up by Le Corbusier.
5. Nowicki is credited, along with Le Corbusier and W. K. Harrison, as having a significant impact on the UN design. See [UN General Assembly 1952: 141].
6. These ideas are very similar to Louis Kahn's claims in his article "Monumentality" [1944].
7. Problems with the acoustics and waterproofing of the Pavilion proved difficult to solve.



8. They were both invited to the “What Is Happening to Modern Architecture” symposium at the Museum of Modern Art, organized by Alfred H. Barr and Henry-Russell Hitchcock. Cranbrook position cited in [Nowicki and Schafer 1973: xi].
9. Quote from Robert Venturi in “Appreciations by Former Collaborators Panel Discussion” in [Saarinen, Pelkonen, Albrecht 2006: 361].

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