Technology, Context and Science in Architecture

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Digitally enhanced design processes and digital fabrication technologies have significantly expanded spatial and structural possibilities in architecture. Design and fabrication based on measurable input allow the digital processing of designs that are powerful in comparison to previously imagined spatial and material applications. However, this focus on data also limits designs by excluding social, economic, and ecological values that are related to cultural concerns central to architecture discourse and its built manifestations. Significantly, a sole focus on data that can be translated and processed results in the exclusion of information related to context from design considerations. Architectural discourse and practices must consider broad sets of references as guiding parameters; scientific developments that affect building methods and strategies therefore have to be associated to context-specific influences. While much is gained from engaging with contemporary design and fabrication technologies, architecture has to be conscious of references that exist outside of the numerical.
1. INTRODUCTION

The Naramata Roof Structure explores distinctions between the conceptual and spatial potential of digital design and fabrication technologies and their actual application in design, fabrication, assembly, and construction. While limited in scale, the project constitutes a context-specific application of media and fabrication technologies. It illustrates how design processes that incorporate digital media and fabrication technologies can promote designs reflective of their surroundings and the process of making. The project is guided by scientific parameters that affect digital modeling and fabrication while remaining open to and affected by cultural values specific to its design context. The design-build project suggests that design and building projects can both engage with contemporary scientific and technological developments and incorporating contextual parameters. The project integrates digital modeling and parametric design methods and shows how architecture based on contemporary design and building methods can be similarly responsive to local parameters such as material quality, work habits, and local building traditions. Based on contemporary developments in materiality, structure and spatial assemblies, the project is not limited to repetition and standardization but combines the richness of spatial opportunities provided through technological advances with local specificity.

The design is a result of context specific factors. Other projects by Barkow Leibinger Architects and Achim Menges, for example, also focus on aspects of design that can bring about revised spatial conditions. These projects serve as examples for a transition to more scientifically grounded investigations as a basis for spatial conditions. They also reveal shortcomings of a scientifically derived design process.

Achim Menges focuses on “discussions of form through material articulation of double-curved and other geometrically complex surfaces” [1]. His work explores detailed material aspects of wood as a basis for architectural conditions. Menges’s research—that begins with an understanding of “elemental properties and generative rules” and focuses on designs based on “information that derives form as a dynamic system” [2]—investigates material configurations and often leads to sculptural interventions or temporary buildings that explore structural and related spatial aspects. In his Metapatch project (Figure 1), for example, “formation and materialization processes are ... inherently and inseparably related” [3]. The project “promotes an understanding of form, materials and structure not as separate elements ...” [4]
Barkow Leibinger Architects is an American-German architecture practice based in Berlin, Germany. Their architectural research focuses on the advancement of knowledge and technology by combining digital and analog fabrication techniques. The work of the office includes research on new materials and building technologies (Figure 2) and their applications.

The brief descriptions of the focus of these research and design practices relates to what Scott Marble describes as “new digital capacities” that “are restructuring the organization and hierarchy of design” [5]. New project organizations not only change approaches to design but equally affects the identity of architects, he suggests.
While both research practices referred to here make significant contributions to today’s understanding and use of materials and technologies in architecture, applications are usually limited to sculptural installations or temporary architectures. This is consistent with Frank Barkow’s assessment that new knowledge and its applications is usually limited to small-scale interventions such as “structures that are essentially follies or demonstration projects that lack the functional complexity that would test the suitability of algorithmic form-finding and production.” [6] This assessment is confirmed by the scale of Barkow Leibinger Architect’s and Achim Menges projects that explore material characteristics and technologically-advanced building technologies. Barkow Leibinger Architects’ Gatehouse might serve as an example: here application of digital fabrication technology is directly associated with structural explorations and spatial performance. The laser cutting of stainless-steel cantilevers components relates to structural capacity of the roof; aesthetics are directly related to structural performance.

Scientific understandings of building materials and technologies are commonly limited in the scale of applications. Barkow Leibinger Architects and Achim Menges applications of advanced material and technological research are contrary to Nick Dunn’s assessment that conceptual and practical developments in digital technologies offer new avenues of “holistic design production ... for architectural designers.” [7] Neri Oxman’s work, as another example, also “points to a new direction for future architecture that tightly couples material research with digital form-finding processes.” [8] So far, we may suggest that material and technological research and explorations can inform design and building in significant ways but current applications are usually not only limited in scope but also in focus. They are limited to material and technological concerns and don’t address other issues such as site or social conditions as significant references for architectural interventions.

However, projects such as the Naramata Roof Structure project offer ways to escape what Neil Postman described as *scientism* by illustrating a possible combination of current scientific advances and site-specific parameters in architecture. “Scientism”, as suggested by Neil Postman, describes the extension of scientific categories into unscientific realms of research and knowledge such as the social sciences and design. An architecture project parallels research in the social sciences in that it has to “confront problems posed by ... culture” [9]. Architecture has to incorporate scientific knowledge but also reach beyond science to be meaningful as it is “bound by time, by situation, and above all by cultural prejudices” [10] of its participants. Following Postman’s assertion that “diversity, complexity and ambiguity of human judgment are enemies of technique” [11], we can identify distinctions between science and architecture with architecture also addressing parameters outside of
scientific thought, qualification and quantification. Rather, then to transform architecture into science we need to develop an approach to architecture that is open to scientific developments and knowledge—in regards to materiality and structural opportunities, for example—and to broader cultural parameters such as work habits and building traditions that help shape architectural investigations and interventions in a specific context. The design-build project for the Naramata Roof Structure illustrates ways to engage in rational, data based processes while responding to parameters specific to the cultural contexts of its location. By exploring digital media and fabrication technologies and related design and building methods, the project focuses on current data-driven design approaches while incorporating contextual references into the design and building process.

The Naramata Roof Structure project illustrates how contextual references can be equally significant for a design process than computational aspects. Both categories figure into the design process and influence the resulting roof. The capacity of digital media and fabrication technologies to respond to complex conditions corresponds to the conceptualization of the surroundings as constituted by a diverse set of interrelated influences. This understanding of space is itself an extension of the perception “of the configuration of cultural forms in today’s world as fundamentally fractal, that is, as possessing no Euclidean boundaries, structures, or regularities” [12]. While these assumptions put designs at odds with a purely science-based approach to building, they coincide with a conceptual shift from a static assumption of form to architecture as an integral part of dynamic systems. This responsive architecture “should perform rather than simply form; structurally, environmentally, economically, programmatically, (and) contextually” [13]. Explorations of materiality, for example, are central to understanding a structure's performance. In this context, Achim Menges’ design research serves as a reference. In his work, a detailed understanding of material properties informs the design explorations.

Design and fabrication based on data and measurable input allow the digital processing of designs that are powerful in comparison to previously unimagined spatial and material applications. However, this focus on data also limits designs by excluding social, economic, and ecological values that are related to cultural concerns central to architecture discourse and its built manifestations. Significantly, a sole focus on data that can be translated and processed results in the exclusion of information that is part of the cultural and environmental context from design considerations. Architectural discourse and practices must consider broad sets of references as guiding parameters; scientific developments that affect building methods and design strategies, therefore, have to be associated to context-specific influences.
2. SCIENTIFIC REFERENCES IN ARCHITECTURE TODAY

In recent discourse on digital design and fabrication in architecture, the list of references for design and building has been expanded to include factors that are not easily incorporated into digital design and fabrication processes. This list of factors includes parameters such as the skill level of participants, their work habits, specific setups of available fabrication technology with varying tool arrangements, quality and species of materials available for fabrication and building, and influences of traditions. In part due to developments in building materials and structural systems, references now include materiality as well as context specific parameters such as social, economic, and environmental considerations. Theoretical frameworks continue to build on deconstructivist thought, which has broadened the list of design references in architecture beyond immediate site conditions and fixed temporal references to, for example, notions of folding and related explorations. While digital design and building methods are more easily associated with scientific considerations, facts, and data due to their logic and processability, other factors and values that figure into architecture cannot be directly incorporated into a digital design and building process. Openness to cultural values requires a negotiation of logic-based digital processes that reference scientific thought with other influences during the design and building process.

Modernist influences led to an idea of architecture as easily integrated into scientific understandings. Responses such as concepts of Critical Regionalism expanded the set of references while maintaining an affinity to modernist thought. Explorations related to digital design and fabrication indicate conceptual and practical opportunities to reintegrate values not easily incorporated into logic-based systems. Early influences of scientific approaches on design can be related to modernist production methods and the categorizations of aspects of life and work with building separated into individual tasks and categories that could be designed to perform efficiently. An architecture based on satisfying and combining functionally distinct criteria was inspired by Frederick Winslow Taylor’s concept of Scientific Management, which sought to isolate individual aspects of human labor in order to increase productivity of the work force. Individual categories could then be addressed through functional separation. In architecture, performance criteria can also be addressed through discrete responses. As a more recent discussion, scientific developments in architecture that include a better understanding of material properties, structural performance, and the ability to describe and control dynamic relationships of spatial conditions coincide with the integration of digital design and fabrication technologies into architecture. However, turning information into data that can be incorporated into digital design and fabrication processes favors quantifiable information. Following this logic, references outside
quantifiable—and with that processable—data have been excluded from design considerations. As much as social consideration figured into modernist designs, the desire and need to standardize resulted in fixed solutions that would not respond to needs of individuals and to changing conditions. As a result, modernist architecture—and more recent digitally generated design—has often resulted in object-like interventions seemingly disconnected from their surroundings.

Kenneth Frampton’s definition of Critical Regionalism seeks to combine modernist building and approaches with regional influences. As he suggests, Critical Regionalism’s negotiation of modernist developments in architecture and regionally specific cultures “provides the fundamental basis from which to cultivate a ‘critical’ architecture. This affords, above all, a hybrid situation in which rationalized production (even partially industrialized production) may be combined with time-honoured craft practices” [14]. Frampton’s notion of Critical Regionalism is reminiscent of Alexander Tzonis and Liane Lafaivre’s definition suggesting that “the critical regionalist approach to design and the architecture of identity, recognizes the value of the singular, circumscribes projects within the physical, social and cultural constraints of the particular, aiming at sustaining diversity while benefiting from universality” [15]. Consequently, definitions of Critical Regionalism negotiate universal and scientific values of modernist thought with context specific considerations. They do not, however, escape Postman’s concerns regarding “scientism.” They only soften its generalizing impact by considering contextual specificities or program-specific aspects. Jørn Uzon’s Bagsvard Church referenced by Frampton can serve as an example of a combination of a modern building system and a program-specific space and experience related to and created by an inner ‘shell’ with its own construction system and logic.

3. DIGITAL FABRICATION: SCIENTIFIC THINKING AND BEYOND

Conditions for modern architecture and its engagement with science are grounded in developments from the end of the 19th and the early 20th century. Independent of the interpretation, the conditions used to describe the development of modernism in architecture are distinct from contemporary conditions; a direct relationship between architecture and scientific thinking does not exist anymore. More recent philosophical references and concepts guide the discourse on contemporary architecture, where technical and material developments support spatial and structural opportunities that are not limited to repetition and product standardization.

While in the past the “the common denominator … was the influence exerted by engineering and scientific management in the process of education and professionalization of architects” [16], developments in digital media and digital fabrication in the last decades have promoted a return of a
scientification of architecture. The focus on parameters that can be integrated into digital design and building concepts and processes has implications for the conception and realization of designs. While spatial and material possibilities have been much expanded upon with significant developments in structural and spatial applications, the need to translate references for design and building into data that can subsequently be integrated into digital design and fabrication procedures limits the range of cultural parameters that figure into recent design and building explorations. Focus has been on the integration of information into digitally driven design processes rather than on the responsiveness of design and building to broader cultural concerns. However, “architecture is more than the optimization of parameters” [17]. With this statement Matthias Kohler responds to the reduction of architectural references to quantifiable parameters in the design discourse in recent years. His comments suggest reintegrating architecture into its cultural context by considering references outside of processable data. Fabio Gramazio and Matthias Kohler’s term digital materiality promotes the coexistence of design data and material properties as significant references for design and building where “material is enriched by information; material becomes ‘informed’” [18]. By incorporating material properties that are inconsistent, design references change from static assumptions to “a dynamic set of rules” [19]. Further, by expanding the range of guiding factors to concerns regarding material properties—and one might also add social, economic and ecological references—“designing architecture is not an activity that can be reduced to performance optimization.” [20] Designing and building is part of a cultural production.

Neri Oxman also refers to broader cultural references outside of digital media and design that are significant for architecture using digital design and fabrication methods. Asserting the problem of performance as identified with analysis rather than synthesis, she critiques architectural production understood strictly within a scientific paradigm that is limited to parameters that allow integration into digital design and fabrication processes. While a conception of performance that can be analyzed assumes the ability to break down all aspects of the design process into components that can be quantified and, therefore, incorporated into a digital design process—as is necessary in digitization and digital fabrication—a synthetic understanding of design references does not assume the integration of all influencing factors into a single matrix. Thus, a range of factors can be accepted as design references even if not all parameters allow translation into data. By shifting away from architecture based solely on a logic of digitization in the design and building process, Oxman suggests expanding the references for the generation and evaluation of architecture and to “conceive of performance as something that is negotiated” [21]. Moving beyond a limited functional understanding of architecture’s accomplishments, she proposes the
evaluation of design proposals by their “multi-performance” [22], i.e. the
design’s capacity to respond to a range of criteria it needs to negotiate
within a specific context.

Guiseppa Di Cristina insinuates that when looking at designs based on
measurable factors only, a “viscous space that is capable of complex
deformations”—through modifications of parameters inherent to its
configuration—“has the capacity to change in response to heterogeneous
and differentiated contexts” [23]. An examination of the broader contextual
references for architecture responsive to its surroundings, however, suggests
limitations. Despite the potential of architecture to address “an
interconnected series of factors (form, technology, functional programme,
physical and cultural context ...)” [24] design references here remain limited
to factors that can be converted into data. As a limitation, the relatively
recent opening of architecture to scientific influences encouraged by the
integration of digital media and fabrication technology into architecture
simultaneously reduces the number of overall references that figure into
architectural design. While Di Cristina’s descriptions refer to topological
architecture with particular formal qualities that are often dominated by
fluid spatial conditions, her comments can also serve as a description of
architecture responsive to context in general with particular social,
ecological and environmental conditions as shaping references.

Other limitations of topology-based architecture also need to be
addressed. Built architecture, as a product, is not inherently flexible, but
fixed. This has conceptual and literal consequences for the performance of a
design. Most built structures are not pliable. “When built, architectural forms
can at best only represent, symbolize or somehow evoke the continuity of
change and motion” [25]. Greg Lynn, however, makes a distinction between
static and stable architecture, between fixed architecture and architecture
that implies movement. In building, fluidity and dynamism of the formation
process that result from many, constantly changing parameters is arrested in
order to build a usually static architectural intervention. Unless built
architecture is literally adjustable and flexible through its materiality and
structural assembly, buildings are not physically responsive and cannot be
easily converted. Thus, architecture loses its adherence to concepts of
topology in realization. Patrick Schumacher’s concept of parametricism is—
despite these concerns—a recent attempt to bring together spatial aspects
of design manifest in its inherent structural and material logic with
contextual references. In his approach, extensively described in The
Autopoiesis of Architecture, “all elements of architecture have become
parametrically malleable” [26]. Drawing on Niklas Luhmann’s social system
text, Schumacher develops an approach to design that focuses on “the
intensification of relations both internally, within a project, a building, and
externally, with its context and surroundings” [27].

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Responsiveness of design—through parametric relationships—needs to become a conceptual and practical guideline for the entire design and building process in order to incorporate multiple and constantly shifting parameters that include participants, their habits and skills as much as economic and ecological conditions in flux. This can be in part achieved through technological means and digitally driven design and building processes. In parallel with the incorporation of digital design and fabrication technology into design and building, however, concepts of architecture also need to remain open to factors that cannot be directly integrated into digital design processes. To conceptualize and generate architecture that negotiates multiple references, a parallel approach to design and building that is informed by recent technological developments and that is open to a range of cultural values and references is required. The integration of broader cultural references into the design process as described by Schumacher in his concept of parametricism is a central part of the project illustrated in this essay.

4. DESIGN AND BUILDING: TECHNOLOGY IN CONTEXT

Parallel to influences of technology, designs and building processes are also affected by the cultural background, knowledge and assumptions of project participants, ecological conditions of a project context, and the economy of their surroundings. This range of factors guides the formation process of design-build projects. Contributors influence the project in all phases, from design and fabrication to assembly. How consultants, fabricators, and builders—students or professionals—influence the decision making and realization of projects during design, fabrication, and assembly is not only dependent on skill levels but also on assumptions formed by previous experiences. In a similar way, work habits and ability of participants to collaborate influences interdisciplinary projects.

Ecological conditions of a project context are related to available materials. Tree species grow and are available as lumber for construction dependent on topography, soil conditions, and weather. Regionally specific building methods and types and with that the knowledge of local participants are influenced by predominant climates and experiences. Properties of available materials affect design, fabrication and assembly. Material properties of differing wood species also affect the structural performance, required dimensions, and the spatial configuration of a design. As well, economic conditions and available funding influence material availability, preparation, and quality, support for design, fabrication, and building. These factors contribute to the scope, duration, and quality of a project. Design-build projects are particularly open to influences on design, fabrication and assembly; they foreground the significance of outside influences on the design and building process.
The “idea of technology as a social arbiter” [28] provided a productive basis for early Modernism in architecture. While today technology still serves as an indicator of relevant architectural approaches, its interrelationship with the “laws of science” [29], rational thought, method, and standardization are not characteristics that relate to the current state of technological and conceptual developments. Designing and building does not relate to scientific approaches in isolated form because architecture—in its generation and as a product—does not exist outside cultural contexts that implicate design and building; economic, environmental, social, and cultural aspects have consequences for design and building at a particular location while developments in design, fabrication, and building technologies allow responding to contemporary social, economic and environmental conditions.

“Culture can … be summarized as the complex of values, customs, beliefs and practices which constitute the way of life” [30] that project participants bring to a project. These values and assumptions are also inherent in software and fabrication tools used in a design. They affect the design and building process through available materials, the numerous participants, and their habits and skills. Overall, “context is not a passive medium but a dynamic counterpart” [31] in a project. The contributions of people, limitations and possibilities provided by traditions, climates, and available materials play a major role in the design and building of projects.

Tool-specific and context-specific parameters influence the design and building process. Software and fabrication devices are designed based on cultural assumptions. These predispositions have to be understood and anticipated in the process of design and building in order to take best advantage of available tool support rather than to be limited by assumptions built into software and tools. For example, wood fabrication programs are often based on building traditions familiar to the designers of software and fabrication tools. Software for digital wood fabrication that is developed in Northern Europe incorporates wood building traditions specific to its region. Spatial, structural, and material possibilities and limitations of the software and fabrication devices reflect building traditions. When designing and building using digital design media and fabrication technology designers have to consider that projects will be mediated by possibilities inherent to technologies they use. “Every technology … is a product of a particular economic and political context and with it a program, an agenda, and philosophy” [32]. Similar ‘translation’ requirements apply to all phases of the design and fabrication process that includes technology, software or hardware.

5. THE NARAMATA ROOF STRUCTURE

The Naramata Roof Structure explores digital design and fabrication processes in wood construction. The project illustrates engagement with
digital design processes and indicates necessary openness of the design and building process to factors outside of the digital realm. The design-build project that was realized in Western Canada integrates contextual references. Its final configuration is a result of the multiple factors that have influenced the projects during design, fabrication, and assembly. The project benefits from contemporary approaches to structural engineering, use of wood materials, and digital design and fabrication technologies. The roof structure developed and realized as part of the Master of Architecture program curriculum at the University of British Columbia School of Architecture and Landscape Architecture. As an interdisciplinary project within and beyond the university, the design was developed and realized in collaboration with structural engineers, wood scientists, fabricators, material suppliers and clients.

Design-build projects by their nature engage with the multiple parameters that affect the generation and realization of architecture. Engaging in a field of parameters related to operating in a context in flux, the project is exposed to the realities of its surroundings. It incorporates a range of social, ecological, and economic conditions in which the project has to exist.

The Naramata Roof Structure (Figure 3) is located on a farm on the east side of Lake Okanagan, north of Naramata, British Columbia, Canada. The project explores CNC wood fabrication technologies for the design, fabrication, and assembly of a small roof structure for farm use. The wood roof that is built on existing foundations offers a protected meeting and workspace for the farm community.

The project focuses on the translation of the design concept developed using digital modeling and wood fabrication software into a built structure (Figure 4). The potential of digital modeling with variations of joints and roof configuration is translated with the quality of the available building materials, sequence of assembly, and level of craft as guiding factors in the design and building process. While the exchange with engineering and wood fabrication consultants throughout the research and design phase helped to anticipate issues arising during fabrication and construction, the assembly of the roof
structure at the site highlighted distinctions between the spatial potential of digital modeling and fabrication techniques and the translation of design concepts into a built structure. Material tolerances, assembly sequences, and the accuracy of the digital fabrication process as well as the limitations of manual construction methods under site conditions constitute guiding factors for the project. As such, the roof project explores distinctions between conceptual and spatial potential of digital design and fabrication technologies and the actual application in design, fabrication, assembly, and construction considering material and site conditions. Mass-customization processes using digital design media and wood fabrication technology allow for the material- and time-efficient translation of spatially complex designs. Variations of joints and building configurations that respond to the site, program requirements, and available materials could be generated without compromising the efficiency of the fabrication process.

The work on the Naramata Roof Project includes the use of a variety of media, fabrication, and construction methods. While highlighting the potential of digital wood fabrication technologies for the design and fabrication of context specific projects, the research illustrates effects of the translation from digital design media to building and, therefore, also addresses limits in the translation of concepts of complexity and contexts in
flux. During the design and building process, the particular conditions for
the use of digital design media, wood fabrication software, wood fabrication
technology, and for the assembly of the structure at the site all contribute
to the built project. Through adaptation of the design concepts and methods
to the consecutive phases of the project, the potential and limitation of each
stage became apparent. Efficiency of design particular to the locale and
responsiveness of the design and building process to the specific conditions
of the project are explored and reviewed.

The particular context of the Naramata Roof Project includes the
conditions at the site, program requirements, available design and fabrication
methods, building materials, and methods of assembly. As a design-build
project at a university, exchange and interaction between members of the
research, design, and assembly team were also central contributing factors.
In addition, quality of design and building depend directly on the availability
of materials, ecological considerations, and on the skills of each participant.
Coordination of abilities and interests was an important factor of
collaboration. Ultimately, the use of technology and materials and the quality
of the execution of the design and building phases depend on the ability to
coordinate and incorporate available resources.

6. CONCLUSION

Architectural interventions must be based on an understanding of cultural,
economic, and environmental processes. Similarly, architecture’s “expression
must grow out of the situation” [33]. These context-specific aspects of
design are subject to change as ecologies are constantly evolving. Design
specific to context has to be sensitive to ongoing cultural developments and
changing influences. Consequently, designs and buildings become context
specific through their engagement with a context in flux rather than as a
result of preconceived formal characteristics. The Naramata Roof Structure
project negotiates interrelationships of digital media and wood fabrication
technologies, material characteristics, environmental performance and spatial
configurations. This approach is consistent with a move toward “a
heterogeneous space wrought from the interaction of spatial arrangement,
material and climate” [34].

Contemporary designs and building methods benefit from scientific and
 technological developments. Barkow Leibinger Architects’ research projects
(Figure 5) and Achim Menges’ work serve as examples for approaches to
design influenced by scientific and technological developments and
understanding.
However, technological capacities need to be combined with an engagement in context to generate relevant architectural responses. By using technology’s potential to engage with context it is possible to avoid Scientism. Architecture is increasingly understood as a product of a complex set of interrelated factors that negotiate social, cultural, environmental and economic conditions. Architecture as part of a field of dynamic relationships responds to a context in flux. This context needs to be seen not as fixed but as “information drawn from all resources of science and technology” [35] as well as changing cultural references. Considering the diverse parameters that influence the conception and realization of designs at a specific location, design solutions have to be a result of a comprehensive approach that requires the coordination of a range of participants. “Mass customization,” as the Naramata Roof structure project illustrates, “is about cultural production” [36]. By using contemporary digital design and fabrication technology, architecture can continue to play the social and ethical role that was predicted at the beginning of the 20th century in modernist discourse. Modernist social vision and aesthetic understanding was thoroughly grounded in a scientific view of the world. Today’s scientific and technological developments are equally central in the conceptualization and generation of architecture. However, they now have to be reviewed and
explored in a context defined by conditions in flux rather than a static set of references.

The evolution from modern mass-production to contemporary mass-customization procedures is central to the reevaluation of technology’s contribution to design and building. A redefinition of regionally specific architecture described for the illustrated design-build project is grounded in an understanding of technology that moves beyond assumptions about the negative influence of technology and technological developments in response to the effects of modernization. From a force that dissolves local particularities such as climate, site relationships, and culturally specific types, technology today has evolved to facilitate regionally specific and ecological responses. In order to fully embrace “the bottom-up approach to design, that recognizes the value of the identity of a physical, social and cultural situation” [37], influences of technology on the design and building process have to be considered. Technology is both central to the conceptual underpinnings and to the design and building process. The Naramata Roof Structure project is an example of architecture as a direct result of the employed design and building methods. Equally a critical mediation of globally available digital fabrication technology and of local culture, the project exemplify the potential of digital fabrication technology to respond to context specific circumstances. Rather than based on a “synthetic contradiction” [38], the Naramata Roof Structure project incorporates digital fabrication technology as one of the central aspects that constitute the complex conditions within which architectural design exists. It is a project responsive to its context. As an interdisciplinary design-build project, the Naramata Roof Structure offers a way to engage with the complex set of references for design and building and highlight a productive combination of scientific influences and local parameters.

ACKNOWLEDGEMENTS: PROJECT TEAMS AND COLLABORATORS

Naramata Roof Structure (2007):
REFERENCES


4. Ibid, 79.


10. Ibid, 154.

11. Ibid, 158.


19. Ibid, 10.

20. Ibid, 11.


22. Ibid, 150.


27. Ibid, 72.


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