Future-Proofing and Panarchy

Adaptive Cycles and Managed Change for the Historic Built Environment

by

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Figure 1: UW Guggenheim Hall, completed by Mr. Rich for Bassetti Architects, 2008, is an example of a thorough rehabilitation that is sensitive to major character defining features. The project restored the cast stone and brick exterior, replaced the windows with new ones sensitive to the historic character of the original windows, restored the entry lobby and auditorium. Photo by Brian Rich, 2016.

1.0 Abstract

Change is inevitable in all forms of the environment. Our built environments are going through a process of change, that, if recognized as a cyclical process, can be managed in a manner that reduces or eliminates the severe impacts and suddenness of the change.

Panarchy, the process by which ecological and social systems grow, adapt, transform, and, ultimately, collapse over extended periods of time, is an adaptive cycle framework that can be used to understand and manage change. The 4 phases of the adaptive cycle include: entrepreneurial exploitation (r), organizational consolidation (K), creative destruction or "release" (Ω), and re- or de-structuring (α). The "release" phase can be broken down into abrupt, destructive change, incremental change, and transformational, learning change.

Applying the Principles of Future-Proofing to historic built environments guide the development of thoughtful interventions that minimize the destructive potential of the "release" phase of the adaptive cycle. The Principles of Future-Proofing are a broader understanding of resilient buildings and a useful tool for evaluating the resilience of historic buildings. The goal is to develop interventions that respect the historic character of our buildings while adapting them to a new and different and preventing abrupt, destructive change and slow erosion of integrity through incremental changes.

This paper will discuss the application of Panarchy and adaptive cycles to the historic built environment and the development of the Principles of Future-Proofing as tools to understand and manage change in the historic built environment. This paper presents several examples of future-proofing and recent projects completed by the author and demonstrate ways in which they are future-proof and demonstrate a controlled release phase which permits a building to continue to be in service.

Figure 2: Building 47 at the Sand Point Naval Station in Seattle, Washington, is an example of adaptive re-use of a vaudeville theatre originally used for movies and USO-style entertainment has been adapted to use as a theatre for musical productions. It is proposed to have a new leaseholder and the use may change again - and continue its legacy. Credit: Brian Rich, 2019.

2.0 Author Biography

Brian D. Rich, AIA, LEED BD+C, CCCA, PMP, sUAS, is a LEED Accredited Historic Preservation Architect and Principal of Richaven Architecture and Preservation. Brian has over 25 years of professional experience in architecture, historic preservation, and construction management. Brian has completed over 90 renovations of existing buildings, including 34 designated or eligible landmarks, 19 phased projects and 48 occupied-facility projects, garnering over 20 personal and project awards. Brian earned his bachelor's degree, cum laude, from the University of Notre Dame, and is completing his master's degree in Architecture and Certificate in Historic Preservation at the UW. His thesis work focuses on future-proofing historic buildings.

Throughout his career, Brian has served in multiple volunteer roles. Currently, Brian serves on the Redmond Landmarks Commission, is President of APT Northwest, member of the Washington State Heritage Barn Advisory Committee, Board Member at the historic University Heights Community Center, and past chair of the King County Landmarks Commission. Brian has also served on the APTI Technical Committee on Sustainable Preservation, as a Peer Reviewer for the APTI Bulletin, on the 4Culture Historic Preservation Advisory Committee, and on the AIA Seattle Historic Resources Committee.

Brian was invited to the 2015 AIA Resilience Summit as a subject matter expert and is a subject matter expert for the USGBC's Resilience Working Group. Brian is also an inaugural member of the UW Alumni Association's GOLD Council, an inaugural recipient of the Husky 100 Award, and coach of the 2012 Masons and 2013 Fischer Plumbing championship teams for the Northwest Little League.

Brian has published several articles and presented at several conferences on sustainable preservation and future-proofing across the US and Canada. Brian has been interviewed about future-proofing and will be featured in an upcoming webinar about future-proofing on the Catalyzing Business Agility website.

Figure 3: The 1931 Medical Arts Building in Tacoma Washington has been successfully converted from medical offices to offices for the City of Tacoma. This sensitive adaptive re-use of the building has enabled the historic character of the cast stone facade, windows, lobbies, elevator doorways to be retained. The character of the building has been well balanced with the need to change the building for new uses. Now called the Tacoma Municipal Building, it will continue to serve our community for the indefinite future. Credit: Brian Rich, 2019.

3.0 Introduction

"History" usually isn't recognized or acknowledged in the instant that it happens, except on rare occasions. "Real-time" focuses on the events of the moment and those moments are placed in context later. In the heyday of a building or a site's life span, we don't focus on the future or on it's place in the past. We focus on the thriving success and vivacity of it. For example, Figure 4 shows New York in the Roaring 20s - but it's unlikely that even historians of the day recognized the significance of this period of time in the history of the United States - or other larger contexts.

Figure 4: Times Square near 42nd Street in New York City, in the 1920s. During the "Roaring 20's," people weren't focused on the importance of the period. As historians and historic preservation architects, we look back over time and identify significant times, places,people, movements, etc. Source: https://news.wbfo.org/post/sounds-new-york-city-circa-1920.

As historians and historic preservation architects, we document the significant aspects of our past. We are the ones that look back through the lens of historic context to identify important moments, events, people, and artifacts. This temporal distance from an event, place, or person allows us to see the impact that they had on our communities, to see what the consequences of certain actions are.

Even with this distant perspective, we don't necessarily focus on the cycles of transformation that occur over time to these buildings and sites. We often note subsequent events and actions that are caused by an event. From this point-of-view, it is often hard to understand the cycles through which our built environment go through and recognize when a building or a community is in a certain phase of what is called an adaptive cycle. Panarchy, an adaptive cycle framework shows us 4 phases of an adaptive cycle and helps us to understand when and where we can intervene to prevent destruction of a part of our built environment that we value.

Once we recognize the "release" phase, which potentially puts a piece of built cultural heritage at risk, we can apply the Principles of Future-proofing to guide us to sensitive rehabilitations which prevent the loss. Future-proofing is concept that guides decisions about how to continue the use and respect the value of an historic building. Many examples of sensitive rehabilitations are available - three will be discussed in this paper.

4.0 Panarchy and Adaptive Cycles

To be sure, there is a cycle in the built environment. In the context of the historic built environment, there is a cycle to the regular change we see in our communities that can be described by the concept of Panarchy and adaptive cycles. Panarchy is an adaptive cycle framework that can be used to understand and manage change in ecological environments, but it can be applied to the built environment too. This framework of Panarchy helped to understand the change in ecological environments and how they were resilient to the impacts of environmental changes. Adaptive cycles are evident in both large and small cycles, from day to day activities to larger events in the history of humanity and the rise and fall of civilizations. Adaptive cycles in different scales of time, space, and speed overlap and reinforce each other.

The concept of adaptive cycles and panarchy was first developed to describe natural ecological systems in the 1970's and 1980's by CS Holling, a Canadian ecologist and Professor in Ecological Sciences at the University of Florida, and Lance Gunderson, amongst many other ecologists. The built environment, as part of an ecosystem for humans, can have the same theories applied. Central to understanding panarchy is the adaptive cycle process and the four ecosystem functions within it. The concept of panarchy is described by a figure eight mobius strip with entry and exit points at certain phases, as seen in Figure 1. The 4 phases include: entrepreneurial exploitation (r), organizational consolidation (K), creative destruction (Ω), and re- or de-structuring (α). Gotts describes the 4 phases of the adaptive cycle: In the r phase, potential and connectedness are low, but resilience is high; in K, resilience decreases while the other values increase. Eventually, some internal or external event triggers the Ω phase, in which potential crashes; finally, in α, resilience and potential grow,

Panarchy is the "process by which ecological and social systems grow, adapt, transform, and, ultimately, collapse over extended periods of time" (Holling, 2004).

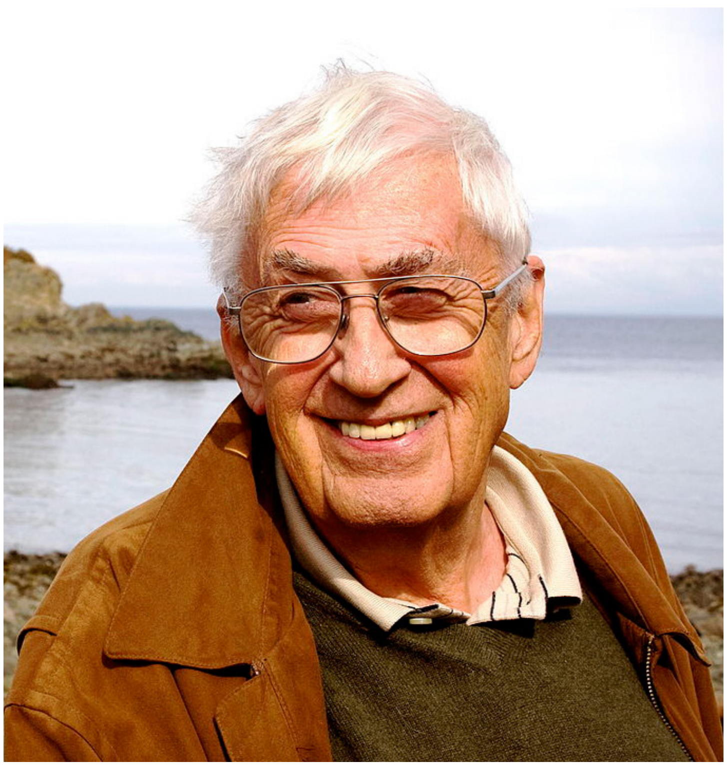

Figure 5: CS Holling in 2008. Photo courtesy of https://en.wikipedia.org/wiki/C._S._Holling and Simon Fraser University Public Affairs and Media Relations

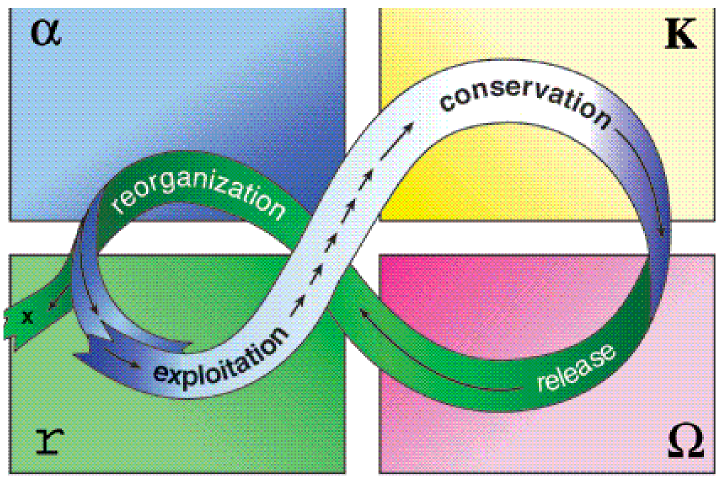

Figure 6: The basic adaptive cycle diagram as developed by Holling and Gunderson, 2002. The 4 phases include: entrepreneurial exploitation (r), organizational consolidation (K), creative destruction (Ω), and re- or destructuring (α). Credit: CS Holling, From Complex Regions to Complex Worlds, 2004.

4.0 Panarchy and Adaptive Cycles

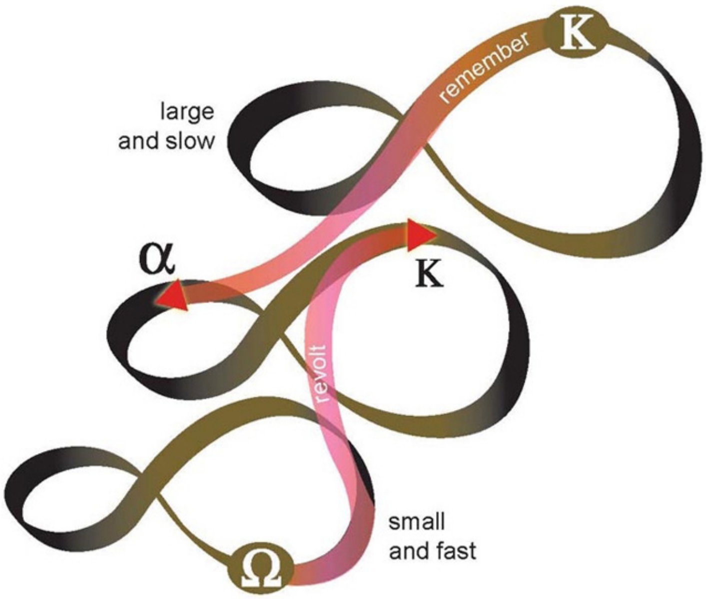

Figure 7: Adaptive cycles at multiple scales impact each other through remembrance and revolt. Systems are subject to large impacts due to small changes at the release (Ω) and reorganization (α) phases. Credit: Garmestani and Benson, A Framework for Resilience based Governance of Socio-Ecological Systems, 2013.

connectedness falls, unpredictability peaks, and new system entrants can establish themselves (Gotts, 2007).

The adaptive cycles described by Hollings, et al, are also evident at multiple different scales, from cells to ecosystems to societies to cultures. Similarly, adaptive cycles can be applied to different scales of the built environment, from buildings to neighborhoods to cities and regions, different scales of time, from days to years to millennia to epochs, and speeds of cycles, from slow to fast (Holling, 2004). Adaptive cycles can also be additive, similar to the increase in amplitude of sound waves when they overlap. The exposure to vulnerability is significantly greater when a set of adaptive cycles align and peak at the same time and the collapse significantly more extreme (Homer-Dixon, 2006). Such cumulative effects often shift an ecosystem over a threshold and into a new state of equilibrium, or metastable regime (Gotts, 2007).

"Human systems with foresight and adaptive methods… …stabilize variability and exploit opportunity" in ways that natural ecosystems cannot, giving the illusion of permanence (Gunderson and Holling, 2002, 53). Holling, et al, describe three potential types of change: (1) incremental changes in the r and K phases which are smooth and fairly predictable, (2) abrupt change in the transitions from K through Omega and alpha, and (3) transformational learning, meaning change involving several panarchical levels and interaction between different sets of labile variables (Gotts, 2007). It is the potential for destructive change that we seek to moderate with human ingenuity and manufactured stability. Is there a way to mitigate or stop the cycle of destruction and rebirth? Despite human efforts toward stable environments, seemingly stable and artificially stabilized systems will eventually change. Deterioration is inevitable from the moment of creation. For example, immediate painting is required for steel that has just been blast cleaned to prevent immediate oxidation (called "flash rust") of the exposed metal surface.

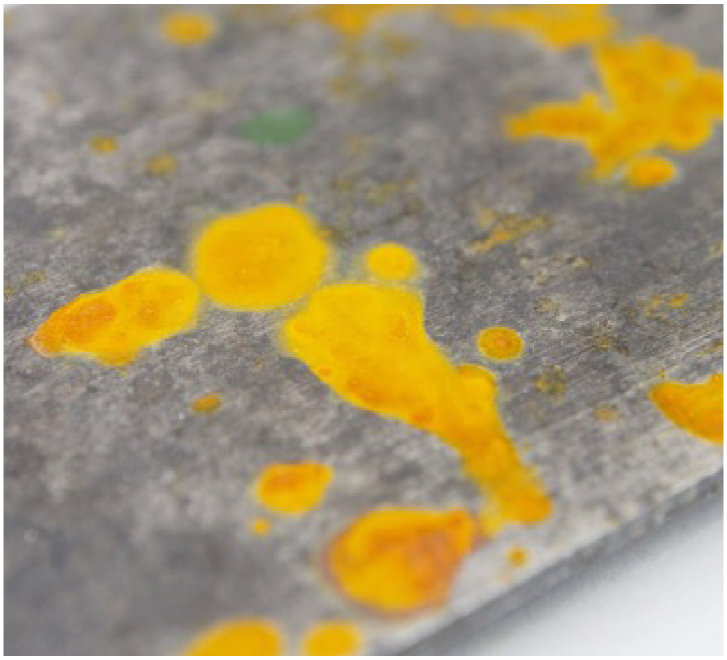

Figure 8: An example of flash rust after blast cleaning steel. Photo courtesy of Graco (https://www.graco.com/us/en/contractor/solutions/articles/how-to-prevent-flash-rust-when-wet-blasting.html)

4.0 Panarchy and Adaptive Cycles

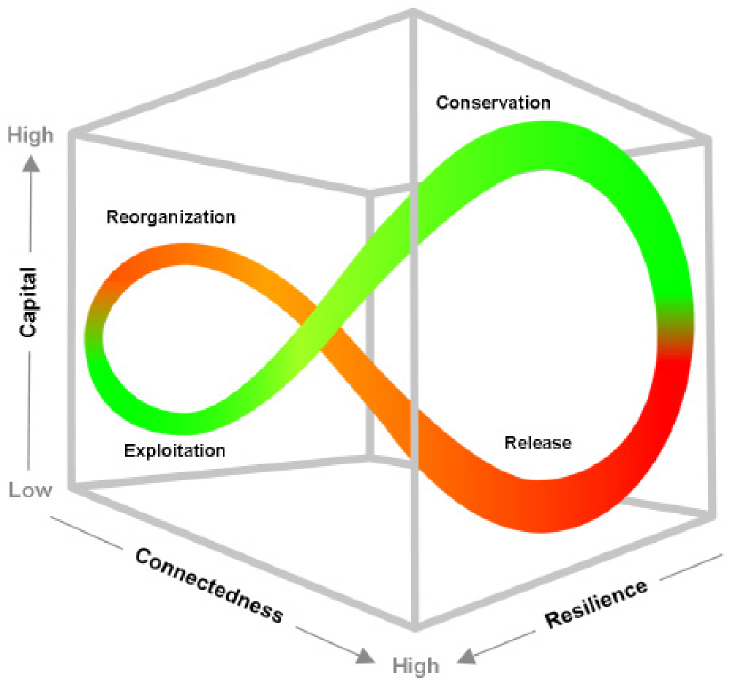

Figure 9: The Adaptive Cycle with the dimensions of Capital, Connectedness, and resilience. Image from Panarchy: Understanding Transformations in Human and Natural Systems, Lance Gunderson and CS Holling.

The question becomes one of how we can best control the release phase of the adaptive cycle. We can extend the conservation phase, control or soften the release phase, and help support the reorganization phase of the adaptive cycle. One important aspect of the conservation phase is the resilience or future-proof capacity of a building or site. There are three essential properties of the adaptive cycle, as described by Holling: Potential sets limits to what is possible – it determines the number of options possible options for the future. Connectedness determines the degree to which a system can control its own destiny, as distinct from being caught by the whims of external variability. Resilience determines how vulnerable a system is to unexpected disturbances and surprises that can exceed or break that control (Holling, 2002, 62).

Within the system of panarchy, two types of resilience are described: engineering resilience and ecological resilience. "Engineering resilience" is a term used by Holling and his colleagues to describe a more traditional "equilibrium steady state, where resistance to disturbance and speed of return to the equilibrium are used to measure the property" (Gunderson and Holling, 2002, 27). Engineering resilience is often how the built environment is perceived – steady, unchanging, and always present. Indeed, our societal and psychological stability is often founded on the permanence of certain structures. This is, partially, why the destruction of the World Trade Center in 2001 was so disturbing to many people. The second definition of resilience is "ecosystem resilience" and is "measured by the magnitude of the disturbance that can be absorbed before the system changes its structure" (Gunderson and Holling, 2002, 28). This second definition is the focus of the discussion of adaptive cycles, panarchy, and resilience that are discussed by Gunderson and Holling. However, when applied to the built environment, both understandings of resilience are important. A future-proof built environment wants to embrace "'the two opposites: growth and stability on one hand, change and variety on the other'" (Homer-Dixon, 2006).

In describing the concept of panarchy and adaptive cycles, Gunderson and Holling (2002, 31) state that there is no such thing as a "highly resilient natural system." In such a system, there would be no fundamental change and thus a loss of diversity. Holling and Gunderson further suggest that resilience is never infinite, and every system is, eventually, replaced by something else. This is important to the understanding of how future-proofing applies to the built environment because it suggests that nothing should be planned to be in a permanent state of stasis. The built environment should, it seems, be able to be flexible and adaptable to new circumstances. "Resilience of the system must be a dynamic and changing quantity that generates and sustains both options and novelty, providing a shifting balance between vulnerability and persistence" (Gunderson, 2002, 32).

5.0 Future-Proofing

The concept of resilience is derived from ecology and is becoming better developed for application to the built environment. The Resilience Institute and Resilient Design Institute focus on the ability of a system to adapt to changing circumstances and are not focused on sustainable design the same way as sustainable design rating systems (Institute 2013). In addition, these resilient design approaches do not address the issues of historic built environments and social and cultural heritage capital.

"Resiliency" is a term increasingly used within the United States, whereas "future-proofing" is a concept found largely outside the United States. Both are found in a variety of industries. While "future-proofing" is a term that is regularly used in journal articles and other writing, it is rarely defined well in those articles. The term's use, however, provides contextual clues about the writer's intent and can be synthesized into a complete definition of the concept. Further, when the concepts of future-proofing, expressed in multiple industries and disciplines, and resiliency are brought together, certain attributes were repeated often and found to be in common.

Formally, future-proofing is the process of anticipating the future and developing methods of minimizing the negative effects while taking advantage of the positive effects of shocks and stresses due to future events. At its essence, future-proofing is balancing respect for and acknowledgment of the cultural heritage value of an existing building while balancing modifications that allow the building to be used continually into the future. It is a broader and more inclusive understanding of resilience that accounts for many more potential causes of a building's demise. "Future-proofing" pro-actively endeavors to extend the service life of the historic built environment through the development of sensitive, thoughtful interventions.

One of the core thought behind future-proofing is characterized in a saying developed by this author in 2014: A building lived in, is a building loved, is a building lasting. The intent of this saying is that if one uses, or "lives in" a building, one will care for the building. When one cares about the building, one will inherently want to take care of it.

> ***A building lived in...***
> ***Is a building loved...***
> ***Is a building lasting...***
> *Brian Rich, 2014*

Buildings serve several societal needs – primarily as shelter from weather, security, living space, privacy, to store belongings, and to comfortably live and work. In addition, buildings provide places for social interactions, psychological security, expressions of artistic thought, scientific development, and a multitude of other purposes. For all these reasons it makes sense for us to protect the single most significant investment we make in our lives: the buildings we live, work, and play in.

Developed as a response to in appropriate interventions in historic buildings and growing out of the attributes of future-proof items found through extensive literature review, the Principles of Future-Proofing seek to codify and clarify what future-proofing is and provide guidance for appropriate, sensitive interventions in historic buildings. After developing these principles, it became clear that they could also be applied to any existing or new building and to other industries. Indeed, since the principles were published, they have been used by students in the Philippines for design projects, they have been adopted by business agility thought leaders, and other industries. These oft repeated attributes became specific guiding concepts that form the basis of the Principles of Future-Proofing. The Principles have developed in to 12 specific guiding concepts, as illustrated below.

5.0 Future-Proofing

1. Prevent decay.

Promote durable building materials and methods of construction that prevent premature deterioration of our built environment rather than accelerate deterioration. Interventions should use building materials of equal or greater durability than existing building fabric or design for disassembly and replacement.

2. Stimulate flexibility and adaptability.

Flexibility and adaptability of our built environment and our attitudes toward it are essential to retention of our built environment in a disposable society.

3. Extend service life.

Extend the service life of our built environment through regular inspections and maintenance so it may continue to contribute to our economy, culture, and sustainable society.

4. Fortify!

Build engineered resilience by fortifying our built environment against climate change, extreme weather and natural hazards, and shortages of materials and energy.

5. Increase redundancy.

Redundant systems provide backup in the event that a primary system fails and allow a building to continue to function.

6. Reduce obsolescence.

Don't accept planned obsolescence. Take a proactive approach to preventing physical, functional, aesthetic, and sustainable obsolescence.

7. Plan Ahead.

Prevent demolition of existing building fabric by using optimum materials, construction phasing, and scalability through long range planning.

8. Diversify.

Allow for multiple stable states, like ecologically resilient systems. Include different sources, uses, capabilities, and economic models rather than one dominant trait.

9. Be local and healthy.

Incorporate non-toxic, renewable, local materials, parts, and labor into our built environment to ensure materials and manufacturing capabilities will be readily available in the future for efficient repairs.

10. Consider life cycle benefits.

Consider the long-term life cycle benefits of interventions in our built environment as opposed to demolition and disposal of existing historic building fabric.

11. Take advantage of cultural heritage policy documents.

Typically applied during the design phases of a project, cultural heritage policy documents provide excellent guidance for the long-term retention of an historic building.

12. Promote understanding.

Renovation, rehabilitation and other types of alterations to existing buildings should allow for understanding of the built environment and its place in our built heritage through minimal interventions that remain distinguishable from the original structure. Construction should respect historic fabric and seek to protect it.

Based on the saying above, there may be an additional principle:

13. Use it!

"A building lived in, is a building loved, is a building lasting" (Brian Rich, 2014). Buildings that are not used are neglected and fall into further deteriorated states, eventually resulting in the loss of the building.

It is helpful to illustrate how some of the Principles are applied to buildings. To that end, three examples of how the Principles may be applied follow. At the Arctic Building in Seattle, I looked at the principles of preventing decay, extending service life, reducing obsolescence, and other principles.

Future-Proofing the Arctic Building

The Arctic Building was designed and built in 1917. Originally, it was the home of the Arctic Club and stood as the finest example of a multi-colored matte glazed decorative terra cotta building in the Northwest (Davis, 13; DeCoster). It was originally use as offices for the Club, leasable offices, private rooms, and flexibility for the tenants. Adaptively re-used through the mid-20th century as offices for the City of Seattle. Eventually, it was sold to the City of Seattle in 1988 (Kreisman, 157; Davis, 21).

Figure 10: View of the exterior of the Arctic Building from the intersection of Third Avenue and Cherry Street. The walrus heads at the third floor. Credit: Brian Rich 2013

The design of the walrus heads could be considered problematic from the start. The original mild steel rod anchors for the terra cotta tusks corroded over time and the tusks cracked and fell on the sidewalks and adjacent roofs after having shattered due to rust jacking (Slaton

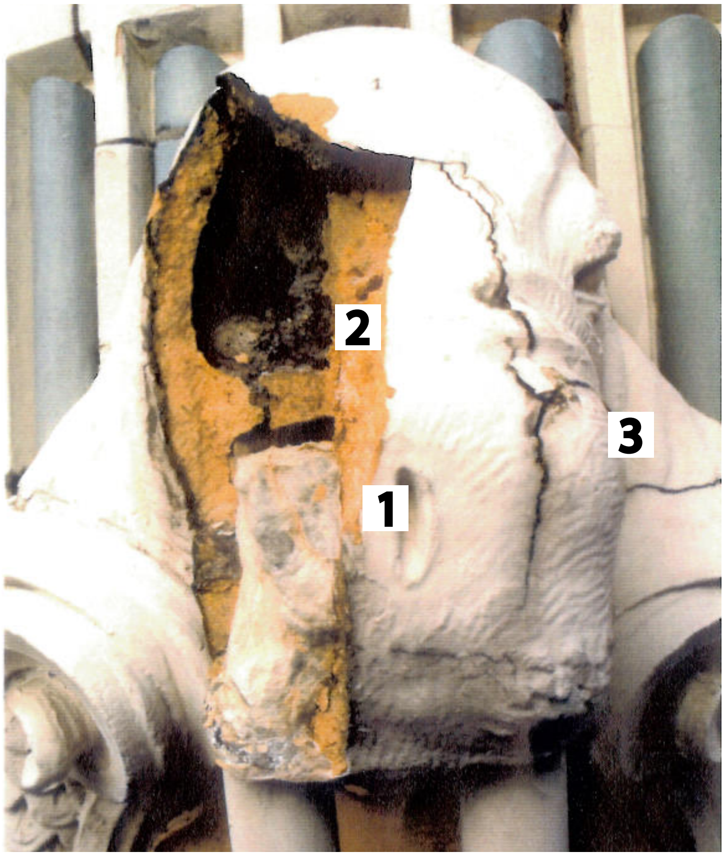

Figure 11: 1996 inspection photo of walrus head S-1. Note the white grout sections filling the sinus cavity area of the walrus head (1). This meant there was no space left for the grout to expand into when the gypsum got wet. Note also the crack in the internal webbing (2). The damage to the internal structure of the head was so severe that this head had to be replaced. Note the cracks radiating from the dot on the top right of the walrus snout (3). This dot is the injection point for the 1982 grout installation and created a weak point in the terra cotta. Credit: Slaton & Morden, WJE

and Morden, 2). The original tusks were replaced with cast urethane tusks by Architectural Reproductions of Portland, Oregon (Morden).

Repairs in 1982, shown in the inset detail, made the situation worse by installing moisture sensitive grout and grout fill holes exposed to the rain. In addition, the voids within the walrus heads were excessively filled with grout leaving no room for expansion. More damage in the form of cracking and spalling of the walrus heads began almost immediately due to expansive grout and over-filling of the void space. By 1995, the degradation of the walrus heads had proceeded to the point where the ornamental terra cotta units were wrapped with chicken wire and duct tape to hold the pieces together until repairs could be made. (Slaton and Morden, 1)

Figure 12: The walrus heads on the southwest corner of the Arctic Building after 1996 restoration. Credit: Brian Rich, 2014.

Material analysis found that the grout consisted of 32% deleterious sulfate compounds. These compounds were in the form of gypsum (calcium sulfate hydrate) and ettringite (calcium sulfoaluminate hydrate). These compounds indicated that the grout had been made using a combination of gypsum and Portland cement (Backus). The analysis concluded that the gypsum and ettringite indicated an expansive chemical reaction of the gypsum when exposed to water (Slaton & Morden).

Further repairs in 1996 developed a future-proof solution with stainless steel anchors and no grout. For other walrus heads, a combination of grout removal, helical anchors, sawcut and mortar filled cracks, and breathable coatings repairs were employed to retain as much historic building fabric as possible. Still, 17 of the 28 original walrus heads were lost to damage and had to be replaced. The lost walrus heads were replaced with replica terra cotta pieces carved to match the originals, but the historic building fabric was already lost. The replica cast urethane tusks were reinstalled on the new and repaired walrus heads (Slaton & Morden).

With regards to the future-proof nature of the work on the walrus heads, there are three potential time periods to consider. The original installation followed standard practices of the day for reinforcing decorative terra cotta. Ultimately, this design was not future-proof because the mild steel anchor rods corroded and damaged the tusks. The 1982 repairs sought to be sensitive to the existing historic fabric of the building, but were flawed from the beginning, as evidenced by the almost immediate appearance of cracks in the walrus heads.

The 1996 repairs are considered future-proof, however, because they have arrested the damage, returned the aesthetic and functionals integrity of the facade, and extended the service life of the building. While the 1996 intervention was more invasive, it respected the historic building fabric while updating the decorative terra cotta to meet current standards and thinking for this type of construction.

Life Cycle Analysis and Future-Proofing

The principle of durability may also be examined through the lens of life cycle analysis. Investigating the environmental impacts of more durable buildings and comparing them to multiple less durable replacement structures reveals the value in maintaining and preserving historic structures. The figure below compares the Life Cycle impacts over a 200 year period for multiple different gym construction methods.

Gym A and A1, includes full replacement, operations, and maintenance of the wood framed gym every 40 years. Gym D includes Operations and Maintenance for an existing gym for 200 years.

What's clear from this analysis is that Gym types B and C (green and purple) had significantly higher environmental impacts. It seems like Gym A and A1 are the winners in terms of environmental impacts, until the economic impact to build a new gym every 40 years is considered. The loss of cultural heritage and first cost of reconstructing a wood gym even twice in 100 years would exceed the cost of more durable construction.

When the full picture is considered, including cost, Gym D, the more durably constructed gym, appears to have among the least impacts overall, not to mention conserving embodied energy, avoiding the social and cultural impacts, and least first cost.

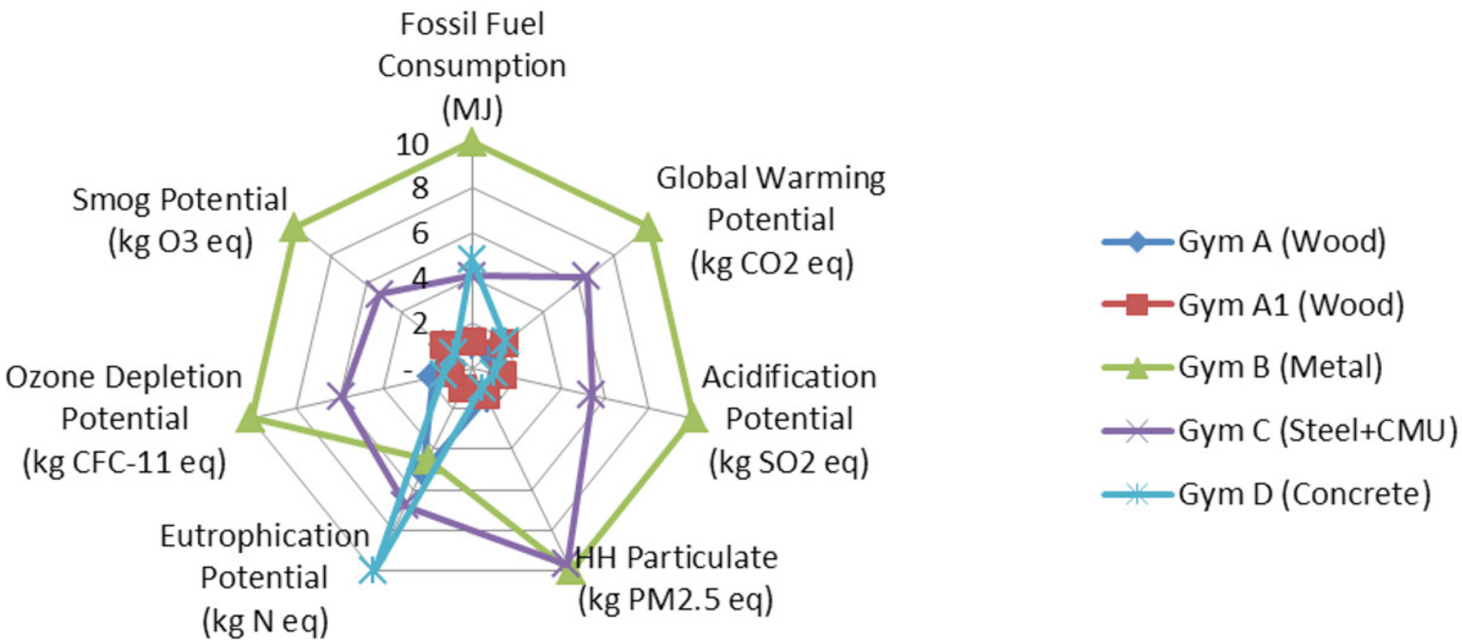

Figure 13: 200 year comparison of total environmental impacts, normalized on a scale of 10. This answers the question: If I am considering a new Gym, should I build a new wood gym or continue to maintain my existing concrete or masonry one? Note that there are many respects in which Gym A and A1 have lower impacts, Gym D has moderate impacts, and Gym B and C have the largest impacts. Credit: Brian Rich, 2014.

6.0 Sensitive Adaptations & Faustian Bargains

Future-proofing is one way to guide the conception and execution of interventions in the built environment such that destructive change is decreased or eliminated. How does the framework of panarchy and adaptive cycles inform the concept of future-proofing? The most important aspect is to understand that future-proofing should not be conceived as holding a built environment, or portion of it, in a fixed configuration forever. In fact, future-proofing endorses change through flexibility and adaptation of a building to the different conditions in which it exists. Such adaptation is the only way for the service life of a structure to be extended. However, the principles of future-proofing would also suggest that a system build upon its existing attributes by strengthening (preventing decay, fortifying, and increasing durability and redundancy) or replacing its weaknesses (extending service life and reducing obsolescence).

What in the world do the concepts of Panarchy and Future-proofing have to do with this conference? The theme of this conference is sensitive adaptations and Faustian bargains and interventions in declining historic buildings and sites. This conference is about renovations, rehabilitations, adaptive re-use, and perhaps even curated deterioration of our cultural heritage such as managed ruins, such as the Birch Creek charcoal kilns in Nicholia, Idaho.

The Faustian Bargain is an attempt to save some aspect of a cultural heritage site while sacrificing other attributes and features. A Faustian Bargain, also known as a deal with the devil, is "an agreement with Evil, in the form of the Devil, often (as in the story of Faust) with the paradoxical intention of achieving a higher Good that is otherwise obstructed" (Faust.com). In the context of the historic built environment, a Faustian bargain may include a more destructive intervention or "release" phase of an adaptive cycle. The goal is often to attempt to save and rehabilitate parts of a building thought to be the character defining features and avoid total demolition. Similar to adaptive reuse, a Faustian Bargain seeks to create a new use of a building, but does so at the loss of the key character of the building.

One example of the Faustian Bargain is facadism (or façade-ectomy) as illustrated by the CSAV Headquarters in Valparaiso, Chile. Here, the historic building has been completely gutted and only the facade remains. The void in the center is in-filled with a new glass skyscraper tower that is at complete odds with the aesthetic of the historic building. While complying with the Secretary's Standard to differentiate the new construction from the historic, the building loses the feeling embodied in the original building.

Figure 14: The CSAV Headquarters in Valparaiso, Chile. Image source: www.modernheritage.com.au

6.0 Sensitive Adaptations & Faustian Bargains

The goal of the Principles of Future-Proofing is to guide design decisions toward more sensitive interventions in our cultural heritage. This can slow and even arrest destructive "release" of the significant resources, economic, cultural, social, and psychological value accumulated in our existing buildings. Carefully designed adaptive re-use of historic buildings can extend their service lives.

University Heights Community Center

One example is the University Heights Community Center in Seattle, WA which transformed from a public school to a community center that provides below-market leases for music, arts, and theatre programs as well as two schools and daycare facilities. UHeights Elementary School began as an 8 classroom template floor plan developed for the Seattle School District in 1902. The Mission Revival design elements were added to give the individual character to the building. By 1907, the area had grown so rapidly it was expanded to a 20 classroom school, again, based on a template floor plan. It remained a school until 1989 when it was closed by the District closed it due to decreasing attendance.


Figure 15: University Heights Community Center Condition Assessment, Code Analysis & Master Planning. Richaven Architecture & Preservation. Photo by Brian Rich, 2018.

University Heights was sold the to University Heights Community Club and re-opened in 1991 as a community center. In addition to leasing below-market rate space, UHeights also runs several of their own programs and classes, such as law clinics and Zumba, and collaborates with other organizations to bring productions into the Center, such as Jet City Improv and the Reptile Man. Over the last 28 years, UHeights has grown in popularity into a unique home for low income and non-profit organizations.

The adaptive re-use of UHeights is an excellent example of giving a building new purpose and exemplifies the future-proofing principles of flexibility, adaptability, and diversification as well as the concept of "loose fit, long life." At UHeights, both the community center staff and the tenants adapt their programs to the building space that is available while balancing careful modifications that support the programs and pursuing ongoing projects to preserve the building.

Once a building has undergone a sensitive rehabilitation, it can exploit its advantages, become lived in, loved, and lasting. Rehabilitation projects often include structural and building envelope upgrades that fortify the building against seismic events and weather and include redundant systems for life safety systems and long term preservation of the building. A rehabilitation or adaptive re-use of an existing building reduces it's obsolescence by enabling it to meet current functional needs for the new occupants, renews it's aesthetic appeal, and is a sustainable approach to the built environment because it reduces greenhouse gas emissions by re-using existing building materials. Key to a successful renaissance of an historic building, however, is ongoing sensitive and

6.0 Sensitive Adaptations & Faustian Bargains

appreciative maintenance. The staff that take care of UHeights learn about the building materials and systems that they care for so that they provide appropriate cleaning and daily maintenance. There is a regular member of the Board of Directors that is an historic preservation expert that is consulted for everything from maintenance operations to major capital projects to ensure that interventions do not further damage the building.

Rehabilitations and adaptive re-use of historic buildings are a controlled "release" and move a building or site directly through the "reorganization" phase. The goal of a controlled release is to avoid a catastrophic release that results in economic, aesthetic, cultural, and social loss of an important part of our community. Avoiding destructive events such as the fires in the Brazil National Museum where "the loss to Brazilian science, history and culture was incalculable" (Phillips) or the recent fire at Notre Dame Cathedral in Paris where witnesses saw the "embodiment of the permanence of a nation burn and its spire collapse [was] profoundly shocking to any French person" (Astier) are high priorities. Such losses are shocking to people around the globe.

Figure 16: Guggenheim Hall at the University of Washington completed a future-proof renovation in 2008. Mr. Rich completed the project with Bassetti Architects. Credit: Brian Rich, 2013.

Guggenheim Hall Rehabilitation

The renovation of Guggenheim Hall at the University of Washington is an example of a sensitive rehabilitation that extended the life of a 1928 Collegiate Gothic building on campus as part of the Restore the Core Program.

Guggenheim Hall was originally built to house the Department of Aeronautical Engineering. Designed by John Graham, the $290,000 grant from the Guggenheim Fund for the Advancement of Aeronautics resulted in several state of the art systems for the time, including a lectern that gave professors control over water, gas, and electricity used for experiments and a screen projector that permitted students to learn from "talkies." The building occupies a prominent location on the central campus facing Drumheller Fountain and Rainier Vista; one of the most notable open spaces in the region and a remnant of the Alaska-Yukon Exposition. The rehabilitation enables more interdisciplinary coordination that will lead to improvements in safety and efficiency in air travel.

The $22 million rehabilitation of the 57,000 square foot building completely updated the building on both the interior and exterior. The exterior of the building was cleaned, cast stone and brick masonry were anchored and reinforced against seismic events, and the windows were replaced with new windows matching the original ones as close as possible. Wood work at the original doors and decorative trim was restored to protect it against weather and wear and tear.

While it may not look like it, the interior was completely renovated and restored. The main lobby and hallways were cleaned and restored. New ceilings and light fixtures were installed that blended with the historic

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Figure 17: The Main Lobby at Guggenheim Hall at the University of Washington. Credit: Brian Rich, 2013.

building fabric that was retained. Interior stone and terrazzo flooring were restored and refinished. In the 355 seat auditorium, the historic plaster was restored. While the configuration was retained, it was updated with new seating, acoustical panels, paint, sound and lighting systems. The entire mechanical, electrical, plumbing, and fire alarm systems were replaced. To achieve this, the previously unused attic space was converted into mechanical space with access of the exterior by way of a concealed roof well hidden by the original slate roof. By designing this sensitive approach to the mechanical, electrical, and plumbing systems, the building retained its historic appearance from all sides. The building also received a full upgrade for seismic code compliance with the use of shotcrete walls inside the opaque wall sections.

In addition to the material changes to the building, design changes to the configuration of most interior spaces were required to make them functional for the current uses of the building. The main corridors were kept in their original configuration, but labs, classrooms, machine shops, office, and support spaces were updated to meet the current needs of the students and faculty. New interior spaces were added for communications systems, recycling, mail, an elevator and mechanical, electrical, and plumbing systems.

The sensitive rehabilitation of Guggenheim Hall exemplifies the future-proof principles of durability of the existing building systems, increased redundancy, decreased obsolescence, and fortifying. The building's durability was increased through the seismic upgrades, new historically sensitive windows, repairs to the historic slate roof, and new roofing systems. Seismic upgrades also help to fortify the building against the lateral movement of earthquakes. These systems also provide redundant protections to the interior of the building by incorporating multiple layers of weather resistance.

Almost all of the obsolete systems in Guggenheim Hall were replaced giving the building a new future-proof lease on life. The new mechanical, electrical, and plumbing systems reduced functional obsolescence and enable the building to serve it's academic population far into the future. Functional obsolescence was also reduced by providing universal access to the building with a new elevator and providing accessible features throughout the building. Aesthetic obsolescence was reduced through cleaning the exterior and replacing the windows. Physical obsolescence was reduced through repairs and replacements of other deteriorated exterior materials, including roofing, sealants, windows, roofing materials and other building systems.

Oriental Theatre Rehabilitation

Prior to it's sensitive rehabilitation in 1998, the Oriental Theatre in Chicago had been abandoned for more than 16 years. The Oriental is a 1924 vaudeville theatre that

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was originally designed by George and Cornelius Rapp and was part of the Balaban and Katz theatre circuit. The building was designed as a multi-purpose project which housed the theatre with Masonic Lodge and drill halls above and an office building. The extravagant Asian-influenced decorative plaster in the theatre resembled visions from a hashish-inspired dream. The theatre was a preeminent entertainment destination in Chicago's Loop area and featured vaudeville shows that traveled the country. It soon began to offer "talkies" and news reels and premier movies. It slowly descended in popularity and was running B-movies before it closed in 1981.

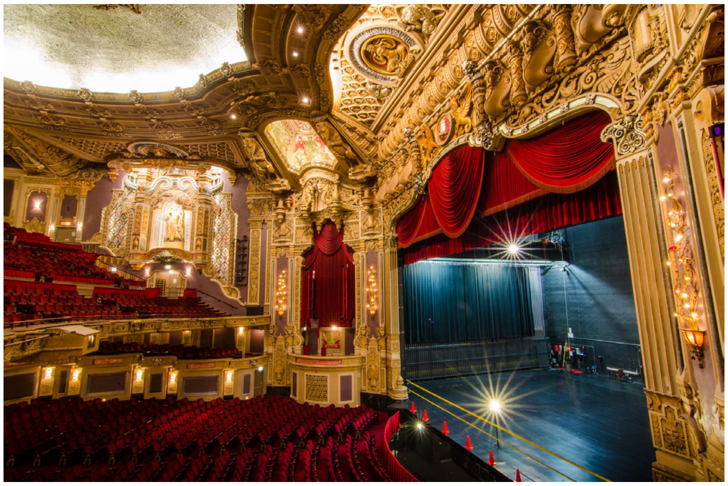

Figure 18: The main auditorium at the Oriental Theatre, Chicago, IL. Credit: Eric Allix Rogers, 2011

In the 1990's, this author led the team to rehabilitate the theatre and adapt it for Broadway productions. The sensitive rehabilitation completely updated the building while respecting the historic character that gave it it's allure. This rehabilitation included expanded stage areas, incorporation of modern lighting, rigging, and sound systems, and new and expanded patron amenities without compromising the character of the space.

With minimal exterior exposure, exterior interventions were limited. Restoration of the exterior terra cotta was a key part of the project, but more noticeable was the design and installation of a new marquee and vertical sign replicating historic signs on the building. In addition, the Oliver Typewriter Building, which stood directly behind the stage, was restored. The Oliver Building's windows, doors, decorative cast iron, and masonry were carefully repaired.

Inside the theatre, the rehabilitation was a careful balance of incorporating new theatre technologies and patron amenities while respecting the decorative plaster, scagliola columns, and other historic building materials. Major moves included extending the stage into the Oliver Building for a 60 foot deep stage, removing columns at stage left to allow free flow of performers, props, and stage sets, removing columns at two other basement spaces for rehearsal spaces and a dance studio. These back of house spaces received completely new construction to meet the needs of the theatre productions.

In the main auditorium, however, a more careful balance was achieved. The ornate decorative plaster was cleaned and restored while small penetrations were permitted to anchor lighting racks and drop cables through the ceiling without damaging the plaster. Historic theatre seats were restored and re-upholstered.

Figure 19: the lobby of the Oriental Theatre in Chicago, IL. Mr. Rich completed the project for Daniel P. Coffey & Associates in 1998. Credit: Eric Allix Rogers, 2011

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New mechanical, electrical, and plumbing systems were also incorporated, but carefully concealed behind the decorative plaster.

In the lobbies, the rehabilitation included new construction to replace the burned out hulk of the mezzanine lobby where a fire had claimed the original building fabric. In addition, restoration of decorative plaster, historic bronze and crystal chandeliers, gold leaf, and scagliola columns brightened the lobbies while new concessions and expanded restroom facilities were tucked into void spaces behind the decorative plaster.

The Oriental Theatre is now a lived in, loved and lasting space at the heart of Chicago's Theatre District. 20 years after it's rehabilitation, it is still going strong as the home to concerts, Broadway musicals, and other theatrical events. This sensitive, future-proof rehabilitation of the theatre has extended it's service life far into the future. While significant structural interventions were functionally necessary, the building was not seismically upgraded because it was not required at the time.

The Principle of "reduce obsolescence" was the hallmark of this project. It was converted from an obsolete, non-functional, abandoned space into a vital, thriving asset to the city. Functional upgrades abound in theatre rigging, lighting, and sound systems and mechanical, electrical, and plumbing systems. Exterior envelope components were repaired and restored, including decorative terra cotta, brick, cast iron facade elements, and many other items. As a vaudeville theatre or showing short news reels, the audience came and went throughout the day, putting minimal stress on the restrooms. However, with a change to scheduled shows, definite start and end times, and limited intermissions, the demand for restrooms significantly increased. Functional obsolescence was also addressed for the patrons by providing more bathrooms necessary to serve the 2100 person audience with limited intermissions.

Figure 20: A decorative plaster detail at the Oriental theatre in Chicago, IL. Credit: unknown, 2015.

Physical obsolescence was also a significant problem for the theatre prior to the rehabilitation. All of the theatre systems were deteriorated and non-functional. Doors, windows, seats, and mechanical, electrical, and plumbing systems did not function properly, if at all. The rehabilitation addressed all of these issues and more to ensure that the theatre was ready to continue serving audiences. Aesthetic obsolescence was also addressed through cleaning and repair of the exterior and interior of the building, as described above.

This project exemplifies other future-proof principles as well, including stimulating flexibility and adaptability, preventing decay, extending service life, planning ahead, promoting understanding of the historic building.

Conclusion

Panarchy is a framework through which to understand adaptive cycles. It is equally able to be applied to ecological environments and the built environment. The 4 phases of the adaptive cycle start with entrepreneurial exploitation (r), organizational consolidation (K), creative destruction or release (Ω), and re- or destructuring (α). Each phase has dimensions of capital investment, connectedness, and resilience.

Future-proofing is a broader understanding of resilience that embraces multiple different aspects of resiliency and additional characteristics. It is a lens through which we can explore and understand interventions in the built environment, especially historic buildings and develop sensitive rehabilitations that avoid the potential destructive aspects of the release phase of adaptive cycles. By respecting the historic character of buildings and making the most of their positive attributes while adapting them to meet the needs of current and future uses and occupants, we can ensure their place in the long term future and make the most of our investment in them.

The tools available to us through future-proofing guide us to sensitive rehabilitations, avoid Faustian Bargains, and breathe new life into our historic built environment. The adaptive re-use of University Heights Community Center in Seattle, rehabilitation of Guggenheim Hall at the University of Washington, and the Oriental Theatre in Chicago are examples of ways in which existing and historic buildings can be rehabilitated to continue to serve our communities - and enhance their historic character. These projects enable the ongoing development of the cultural heritage embodied by these buildings.

Figure 21: Richaven is serving as the Preservation Architectect for the Old Woodinville School rehabilitation which will convert it into a Food Hall. Credit: Brian Rich, 2017.

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