2025 ACSA/AIA INTERSECTIONS
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NEW HOUSING PARADIGMS

ABSTRACT BOOK

2025 ACSA/AIA Intersections Research Conference: New Housing Paradigms

January 9 -11, 2025 | Austin, Texas

ABSTRACT BOOK

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Equitable Communities: Local Cultures
Friday, January 10, 2025, 9:00am-10:30am

Emerging Design-Build Technologies for Resilient Housing in Navajo Nation: Research and Pedagogical Outlook

Asma Mehan, Sina Mostafavi & Ali Nejat, Texas Tech University

The Navajo Nation faces pressing challenges in providing resilient, sustainable housing that respects its cultural heritage while addressing socio-economic disparities and environmental vulnerabilities. The dispersed population, limited infrastructure, and harsh climate conditions necessitate innovative housing solutions that integrate sustainable practices with traditional Navajo values. This research explores the potential of emerging design-build technologies to offer such solutions, aligning with the Navajo Nation's unique environmental, cultural, and socio-economic context. The study adopts a dual-method approach, combining a systematic literature review (SLR) of current practices in resilient housing with a studio-based methodology where architectural students collaborate with community members to co-design and prototype adaptive housing models. The literature review identifies key advancements in sustainable building technologies, emphasizing off-grid power systems, alternative materials, and participatory design processes. These technologies are critical in remote areas like the Navajo Nation, where traditional infrastructure development is limited due to vast distances, complex land ownership patterns, and a shortage of resources. Off-grid power systems, such as solar panels and wind turbines, provide clean energy solutions that reduce reliance on non-renewable sources, while alternative building materials, including locally sourced adobe, rammed earth, and recycled materials, lower costs and carbon footprints. These materials are particularly suited to the arid environment of the Navajo Nation, offering thermal mass benefits that help maintain indoor comfort levels with minimal energy use. Additionally, the review highlights the importance of participatory design processes that engage local communities in the creation of housing solutions (Especially the design of hogans). By integrating traditional Navajo architectural principles — such as circular or rounded forms in contrast to sharp edges, earth materials, and spatial orientations that respect cultural beliefs — with modern innovations, these processes ensure that the resulting housing designs are culturally appropriate, environmentally sustainable, and socially equitable. This approach not only enhances the resilience of the housing stock but also empowers communities by involving them directly in the decision-making and construction processes, fostering a sense of ownership and stewardship over the built environment.The studio-based component of this research involves students in hands-on projects that engage them in designing and constructing housing prototypes that meet local needs, embrace cultural practices, and adapt to environmental constraints. This pedagogical approach bridges academic learning with real-world application, allowing students to gain practical experience in sustainable design and construction while collaborating closely with Navajo community members. These projects offer students a valuable opportunity to learn the complexities of designing for diverse communities while applying their skills with both technical expertise and cultural sensitivity. By adopting a dual-method approach, this study contributes to the development of an educational framework that emphasizes interdisciplinary collaboration, and community engagement. The outcomes of this research aim to enrich the broader discourse on equitable housing for Indigenous and rural communities by offering replicable models grounded in both technological innovation and cultural resilience. Furthermore, the study's findings are intended to inform policymaking and funding decisions for housing development in Native American territories, advocating for a shift from conventional, one-size-fits-all approaches to more localized, culturally informed solutions.

Socio-Spatial Disparities in Italian Housing: A Typo-Morphological Analysis of Naples' Post-War Urban Expansion.
Pasquale De Paola, Louisiana Tech University

This paper delves into a key area of research in architecture and urban design: the ongoing socio-economic disparity between central urban areas and their surrounding outskirts. Aligned with the conference's theme of examining housing as a political process and a product defined by typological and morphological analysis, it specifically focuses on the peripheral growth of Naples from the end of World War II through the 1990s. Moving beyond viewing buildings as mere stylistic artifacts, this study employs a typo-morphological approach to critically examine planning inconsistencies and uncover specific morphological patterns in urban and social development that contribute to socioeconomic inequalities. Typo-morphology classifies urban elements based on their typological and formal characteristics, enabling a comprehensive analysis of how buildings and cities evolve over time while influencing human behavior and interactions. Grounded in the work of Italian architect Saverio Muratori, this framework employs concepts such as type, fabric, organism, and territory to establish city-specific typologies, reacting to the massive demolitions of the Fascist Era and the post-war period. Within this framework, this paper applies typo-morphological analysis to address equity and affordability in urban planning, advocating for inclusive design practices to foster equitable communities seamlessly integrated with urban peripheries, which often lack the high-quality spaces and architecture of pre-industrial city cores. Naples, with its unique urban characteristics, provides a valuable case study. As Italy's third-largest city, Naples experienced significant urban growth, expanding beyond its historical core to include 30 municipalities due to rapid post-war population growth and urbanization. However, planning efforts often lacked typological and morphological coherence, resulting in inadequate infrastructure, services, and amenities for these new residential areas. The social and political upheavals of the 1960s and 1970s further influenced urban development and resource distribution, leading to pronounced social and economic disparities in outlying neighborhoods. Within this contextual framework, this paper ultimately offers a detailed typo-morphological analysis of specific areas in Naples, including the neighborhoods of Barra, Scampia, and Ponticelli. In these regions, peripheral CIAM-based housing interventions, initially designed to address the needs of displaced families, evolved into underserved enclaves with little to no integration with the existing and adjacent urban fabric, highlighting the complex interplay between architecture, urban planning, and organized crime (image 2). Did certain typo-morphological architectural interventions/methodologies contribute to social destabilization and the emergence of socioeconomic inequalities? Instead of advocating for a tabula rasa approach—where existing buildings and neighborhoods are demolished without considering their historical and contextual significance—this paper supports using typo-morphology to identify, isolate, and redesign problematic urban housing and social patterns. By exposing how these patterns contribute to socioeconomic issues, the paper argues for a framework that integrates and renovates existing structures rather than discarding them. The solution to the issues found in peripheral housing interventions lies in acknowledging their presence and planning for collective housing renewal, not neglect or demolition. If architecture can contribute to disparities, it can also offer solutions and empower communities.

What We Learned in Bethlehem Alleys: Reimagining Local Housing Types Through Community Coalition Building

Wesley Hiatt, Lehigh University

The Alley House Program is a research, design, and planning initiative that conceives of novel social and political processes for community-led land use change in small American cities. The Program is a collaboration between municipal, university, neighborhood, and non-profit partners to revive a historic housing type native to Bethlehem, Pennsylvania – colloquially called the "Alley House."1 During the 19th-century boom years of Bethlehem Steel (formerly one of the world's largest steel manufacturers), Alley Houses were an infill housing solution for thousands of migrants and immigrants seeking work in Bethlehem. The majority of these houses are still lived in today. Built on the alley-facing side of existing residential parcels, Alley Houses share qualities with contemporary accessory dwelling units (ADUs), but have different sizes, tenancy, and relationships to context. Like other historic types of "second units," new Alley Houses were rendered illegal through single-family down-zoning.   This paper will detail the ongoing work between resident stakeholders, municipal and non-profit partners, architects, planners, and students to revive the Alley House type to increase housing availability and affordability in Bethlehem. The Program is building trust and consensus within Bethlehem neighborhoods, envisioning how policy reform can unlock housing supply within the city's existing residential typology. Existing conditions surveys, oral histories, walking tours, neighborhood organizing, and design exercises directly inform recommendations for zoning reform and the construction of five pilot Alley House units. This community-led model contrasts with both state-led preemptions of local land use and the consultant-led pre-packaged solutions (with tokenized "community engagement" exercises) typically used by smaller, under-resourced cities. Instead, The Alley House Program partners create a channel for Bethlehem neighborhoods to imagine change while taking incremental, actionable steps towards creating more equitable communities together.2 Importantly, the Program involved undergraduate students at each point of the project's critical path, providing opportunities to practice the civic processes necessary for zoning reform and housing creation. Over 60 students from 12 majors participated in the Program's research, engagement, design, and construction efforts. Students surveyed 50 miles of alleyscape, documented 919 existing Alley Houses, conducted resident interviews, navigated zoning variances with city officials, and are constructing the first Alley House pilot unit in partnership with a local community development corporation. The Program's pedagogy emphasizes the importance of mutually-beneficial (instead of extractive) outcomes and outputs when learning within communities. Through community-listening, skill-sharing, and knowledge exchange (working together to better understand existing housing types and contemporary land use), the Program is helping mend a strained "town-gown" relationship common in many American cities. As ADU ordinances are used to increase housing supply in cities across the country, the Alley House Program offers a pathway to overcome perennial social and political barriers to land use reform and housing production. Through place-based design research and community coalition building, other municipalities can translate this model to envision hyper-local housing solutions.3 As more cities look for housing solutions beyond ADUs and move towards the elimination of single-family zoning, this community-led approach is increasingly necessary to build consensus around new housing types and ways of living together.

EnLIVEning Color ReVITALized Hilltop
Kate Smith, SMR Architects

Yet another historically Black community has been impacted by redlining, lack of resources, and gentrification, a story we know all too well. Hilltop residents wanted the power to revive their neighborhood so the community would continue to thrive. Led by Fab-5, #DesignTheHill was born to "reclaim physical, economic, civic and cultural space to abolish displacement, transform vacancy and waste into agency and opportunity, and redistribute power in community development and city planning."1   Known for our inclusive and community-focused design process, our team was formed to create affordable, family-focused apartments and inclusionary space for local businesses. The development is comprised of two sites across the street from one another. Between the two buildings there are 231 units of family housing, 89 structured parking spaces, and on-grade and elevated open spaces. A local BIPOC youth performing arts center will occupy 10,000 sf in a ground floor commercial space and four incubator commercial spaces are incorporated into the building design to accommodate local BIPOC businesses. We successfully listened to the community through multiple outreach opportunities, used the #DesignTheHill Community Development Framework Plan2 as our design guidelines and fully integrated two neighborhood artists as part of our design team. We are not residents of Hilltop, so we sought out the two artists to design the facades of the buildings to reflect their memories and future vision of their community. While we wanted the process to be thoughtful, we also wanted it to be fast and cost-effective. Enter progressive design-build. Even before we knew the Owner would embrace the design-build concept, we started building a trusting relationship between the Contractor. Despite this being our first endeavor in the design-build realm, not as common in affordable housing, we jumped in feet first and committed to the partnership, roles and accelerated schedule. With less than a year spent from concept to permit in hand, knowledge was flying between the Artists, Contractor, Architects and Consultants, creating a truly integrated design. We met several times a week, constantly checked our lanes, and learned about each other's professions. Although permitted as two separate projects, the two sites were designed as a single project which allowed for efficiency and consistency in the building layouts, detailing and right-of-way improvements. Our "unusual" relationship with the permitting department allowed us to maintain our schedule. We met monthly to keep all parties accountable and were granted an accelerated permit review timeline. Despite the challenges faced during the pandemic, ongoing cost control management, and tracking supply chains allowed the development to be delivered earlier than anticipated. Construction went smoothly due to the coordination and program management during the design phase.   We are continuing to explore the same design-build process with other Owners with proof that it does expedite the design, permitting and construction processes, maintains construction costs, and results in high quality living environments reflective of their community. Today, the buildings are being leased, residents are moving in, and the colors are reviving Hilltop.

RE-imagining RE-pairing RE-building: Sustainable and Equitable Development In Historic Inner-city Neighborhood

Pamela Harwood, Ball State University

In this strategic urban agenda, we are creating ecologically sustainable and socially equitable housing to foster greater capacity within the Old West End (OWE) neighborhood for self-directed development. OWE Development Alliance, a group of non-profit stakeholders including a community land bank, non-profit youth build organization, sustainable development financer, and the university are working with interdisciplinary design students to identify and secure contiguous vacant lots for design and construction of new urban infill housing in the historic inner-city neighborhood. As a National Register Historic District, the OWE is the city's oldest residential neighborhood, including 27 blocks of historic homes in a variety of architectural styles dating from the 1886-1910 "gas boom" era. In recent decades, disinvestment and widespread vacancy and abandonment has left OWE desperately in need of revitalization. Currently, 37% of the neighborhood stands vacant. Responsively we ask: how can we design high quality, sustainable, affordable housing typologies to rebuild this historic neighborhood and engage its diverse constituents? Through community-engaged activities such as porch conversations, block parties, and community charettes, we developed a housing profile, assessed housing needs expanding the choices for households of one and two people, and developed neighborhood goals and objectives to inform future redevelopment. Students identified the need to create dense, sustainable, community-centric workforce housing that can contribute to the economic prosperity of local economies. How sustainable and equitable design connect to facilitate change in this historic neighborhood was the center of our conversation. Student teams explored programs of scalar, attached, mass timber and light wood frame hybrid housing within block-level strategies of urban infill. We worked with the city planning office to create planned unit development (PUD) in the contiguous vacant lots acquired. This allowed rezoning patterns oriented towards missing middle scale developments that foster new relationships and opportunities for community living. Students erased the division of the street, alley, side yard, front yard, and back yard to prioritize relationship building and foster a new vision of community. We framed the studio to consider the OWE development through three lenses. 1. We asked students to explore missing middle housing typologies with shared domestic spaces and a wide variety of scalar living types to engage the diversity of the historic neighborhood. 2. We expanded measures of affordability through multiple avenues of leasing and explored methods of modular and component off-site construction to economize the process. 3. We engaged sustainable approaches that included renewable energy for net-zero homes, low operational and embodied carbon embracing mass timber and other bio-based products, and high-performance housing design. The community-centered housing designs with shared commons, garden spaces, and livable-sized porch rooms involved cutting-edge technologies such as frost-protected shallow foundations, energy recovery ventilation, and mass timber and advanced framing off-site panelized wall, floor, and roof components. Leveraging the architectural charm, historical value, and engaged community positioned our interdisciplinary design studio perfectly to re-imagine sustainable, affordable, community-centered housing typologies in OWE. Finally, our collaboration builds healthy community with an ambition to use this project as a model for future interventions in other neighborhoods.

Pedagogy: Data Tools for Research & Learning
Friday, January 10, 2025, 9:00am-10:30am

Circular Housing: Transforming the Housing Life Cycle through Digitalization

Naomi Keena, Avi Friedman, Daniel Rondinel-Oviedo & Chinmay Satbhai, McGill University
Mojtaba Parsaee, Indiana State University

In the face of escalating climate change impacts and widening social inequities, this paper introduces a transformative web application designed to fundamentally change how we approach housing through the integration of circular economy (CE) principles [1,2]. The focal point of this innovation is the 'Housing Passport' (HP), a groundbreaking tool that redefines residential construction and management by offering a standardized digital profile for each house [3]. This profile functions similarly to a nutritional label, providing a clear, uniform representation of housing data that enables meaningful comparisons and supports informed decision-making processes. The HP is a core feature of our web application, which addresses the urgent need for sustainable housing solutions by consolidating diverse data sources related to construction practices, material reuse, recycling, and housing affordability. This application is designed to integrate and visualize data concerning construction waste, energy consumption, housing affordability, and the environmental impact of building materials. By doing so, it presents a comprehensive and actionable framework that enhances our understanding of housing sustainability and informs decisions related to affordability, environmental performance, and resource management. One of the application's most significant innovations is its ability to transform complex and fragmented data into a cohesive, user-friendly format. The literature shows the need for digitalization to support a CE in buildings [4,5]. The HP generates standardized metrics on various aspects of housing performance, including energy efficiency, material lifecycle impacts, and waste management practices. This standardization facilitates direct comparisons between different housing options, providing a clear basis for evaluating and selecting housing solutions based on quantifiable criteria. Such data transparency is crucial for stakeholders including builders, architects, policymakers, and financial institutions [6], who can use this information to drive forward more sustainable and equitable housing practices. Through this paper the methodology employed in developing digitalizing the housing life cycle is outlined, focusing on the integration of digital tools such as Geographic Information Systems (GIS), Building Information Modeling (BIM), Urban Energy Modeling and Life Cycle Assessment that underpin the HP. We explore the potential impact of the application on the housing sector, and its role in promoting the principles of a CE. By offering a transparent representation of housing data, the HP introduces a novel approach to managing housing sustainability, addressing critical challenges such as climate change and resource depletion. It presents a new paradigm for data-driven decision-making, simplifying the complex landscape of housing data and fostering greater transparency, accountability, and innovation. This application is poised to drive significant changes in housing practices by making sustainability metrics more accessible and actionable. The anticipated outcomes of this research demonstrate how the HP can catalyze substantial improvements in housing sustainability and social equity. By digitalizing housing data, the application not only enhances decision-making but also contributes to the broader goal of fostering a circular economy in housing. This paper offers an in-depth exploration of the development process, expected impacts, and transformative potential of the HP, positioning it as a crucial element in advancing sustainable and equitable housing solutions in the face of contemporary challenges.

An AI Analysis of the Evolution of Housing Design Issues

Kutay Guler, Kansas State University

Since humanity first sought shelter in caves, the issues surrounding housing design have been continuously evolving, reflecting the changing needs, values, and resources of those sheltered. However, the pace of change has become increasingly pronounced in recent years, particularly in the aftermath of the COVID-19 pandemic (Pawson et al., 2022; Peters & Halleran, 2021). Developing a comprehensive understanding of the current evolution of housing design is crucial for addressing emerging challenges and seizing opportunities. In this regard, recent developments in artificial intelligence (AI) offer a unique prospect.   Methodology – Large Language Models (LLMs), which are predictive tools capable of understanding and generating natural language, have proven to be useful in the accurate qualitative analysis of textual data with a high degree of reliability (Tai et al., 2024). By leveraging LLM technology, this study presents an analysis of 1,470 housing design publications spanning the past two decades. The publications are identified in the Web of Science (WoS) Core Collection database, using the following search phrase: "House*+Design AND/OR Residen* Design." The analysis system was developed in Python, which automated the process and organized the output data. To refine prompts and ensure precise analysis, three housing design experts were recruited during the development stage to evaluate the generated outputs and provide feedback. After expert analysis, AntropicAI Sonnet was determined to be the most accurate and consistent LLM model for the purposes of this study. The analysis of each publication was based on the title, keywords, and abstract: First, the major contributions of the publication to housing design were identified; second, the major housing design themes covered were identified; third, secondary housing design themes were identified; fourth, the relevance of each theme was scored; finally, the analysis output was recorded in tabulated format for further processing.   Findings – The most striking finding is the significant surge in housing design focused publications following COVID-19, particularly concerning issues directly influenced by the pandemic: well-being, affordability, demographics, and accessibility. In the realm of sustainability, a traditionally dominant focus in housing design, there has been a noteworthy shift from technical solutions toward a greater emphasis on user well-being and experience. Research on housing needs has also renewed attention to affordability, particularly in light of evolving perspectives on the amount of living space required for both work and daily life. Additionally, the rise in studies addressing accessibility, well-being, and demographic changes underscores the growing concern for the aging population and the associated challenges. Furthermore, the influence of adaptability, flexibility, and modularity is found to be extensive, affecting almost every major housing design theme. It is anticipated that the findings of this research will deepen the understanding of the current landscape of housing design and its evolutionary trajectory, with significant potential to influence education and future research. Moreover, the methodology highlights the potential of AI-driven analysis and has the capacity to inspire future research.

30 Housing Cards: An Interactive Approach for Selecting and Promoting Affordable Housing Precedents

Emmanuel Osorno, Northeastern University

The study of precedents in architectural pedagogy is a ubiquitous practice.[1] As part of the design process, precedent analysis allows us to identify formal and organizational patterns that help us categorize projects into types, which we can use to teach historical references as well as to catalyze the design of new architectural forms.[2] And while several methodologies for using precedents have been developed over the years, none seem to address the process of selecting a precedent.[3] Despite their commonplace use, selecting precedents suitable for a project feels like an arbitrary and opportunistic endeavor. This is particularly difficult for housing design given the seemingly inexhaustible list of projects to choose from. After all, what makes a project more valuable and worthy of close examination than another? Presented here is an approach for selecting, analyzing, and comparing affordable housing projects that builds upon existing methods of precedent analysis by measuring and comparing a series of indexes relevant to housing design. These indexes – namely privacy, collectivity, density, efficiency, outdoor access, and daylight access – assign numeric values to qualitative data that would otherwise remain subjective. Developed as an experimental project within a graduate research studio, the data produced was compiled as a set of 30 Housing Cards, whose ease of handling and portability support an interactive and objective process of precedent selection. The process began with a comprehensive list of built housing projects that offer a myriad of approaches for addressing the housing affordability crisis. Ranging from low-cost construction systems to spatial speculations on the way we live, the projects represent each continent, aiming to provide an image of affordable housing that encapsulates different cultures, regions, and climates. Each project was carefully analyzed and drawn to capture its image (façade) and building block (unit floor plan), aiming to showcase the perceptual qualities and spatial organization of the building via perspectival and orthographic projections, respectively. The drawings were then measured to yield relevant values needed for calculating the indexes. While most indexes are simple ratios whose formulas are clearly defined (i.e., density is the number of units per acre), others, such as the privacy index, were generated through the synthesis of complex factors such as size of windows, number of units per floor, and the proximity to neighboring units. The data obtained was normalized to facilitate comparison, and then depicted diagrammatically as bar graphs and polygonal plots on both sides of the cards to facilitate sorting of the cards in any way the user sees fit. The benefit to the students involved in this process is two-fold: first, they learn heuristically from the in-depth analysis of their precedents, and second, they share and compare their cards with one another, leading them reassess their precedent selection to one that more closely aligns with their design goals. The public, on the other hand, can use the cards to learn about different approaches to housing across geographic regions, cultures, scales, and forms of inhabitation.

Additive Architecture: Redefining Construction Practices and Materials with 3D Concrete Printing

Sara Codarin & Karl Daubmann, Lawrence Technological University
Pedro Guillen, Centrepolis Accelerator

Introduction This contribution discusses ongoing research on large-scale 3D concrete printing carried out by a multidisciplinary team of academics and architecture practitioners. The focus is on exploring new design possibilities at the intersection of material science, additive manufacturing, parametric design, and digital fabrication for residential housing construction. The design-to-manufacturing process utilizes a gantry system controlled by custom-designed slicers within a Rhino-Grasshopper software environment. This system extrudes a specially formulated material blend that replicates mortar sand, incorporating reclaimed aggregates suitable for 3D printing wall segments or custom cladding systems. Background The construction industry is challenged by a need for affordable, sustainable housing solutions and a workforce that is slow to adopt new technologies. With the average construction worker nearing retirement age, there's an urgent need to train the next generation in advanced digital construction methods to meet the demand for affordable, high-quality housing. Transforming how we design and build is no longer an R&D ambition; it has become a necessity for practice innovation and industry-wide change. Additive manufacturing continues to emerge as a promising solution to these pressing issues, enabling a digital continuum from design to construction. This technology relies on a growing network of research that is continuously refining best practices aimed at developing durable and resilient built environments. Elements of innovation The research uses a single-family home designed for the city of Detroit as a test case to compare the cost and life cycle analysis of 3D concrete printing with traditional construction methods. The study focuses on a custom material developed through a series of lab tests, highlighting the potential of using a mix that includes recycled granite dust aggregates for extrusion. This mixture consists of 60% fully recycled content by volume. Granite dust, often considered waste from cutting granite or marble, is easy to collect in factories and has uniform characteristics, making it suitable for reuse and incorporation into other manufacturing processes as a by-product. Preliminary evaluations indicate that using this stone byproduct requires about 35% less energy for production compared to traditional materials. This innovation is particularly relevant in the context of global efforts to reduce the construction industry's carbon footprint by utilizing waste materials. The UN Global Status Report for Buildings and Construction consistently highlights that the building sector is responsible for 34% of global energy demand and 37% of energy and process-related carbon dioxide emissions, with construction and demolition waste making up 30% of all waste produced globally. Discussion 3D concrete printing streamlines the process from computational design to fabrication, creating new opportunities for both curriculum and professional development while transforming traditional construction jobs into technology-informed knowledge practices. The research emphasizes the shift from conventional construction methods to technology-driven workflows that experiment with form and materials. Additive processes enable the use of upcycled materials and recycled aggregates, promoting sustainable and resilient construction practices. This approach helps develop reliable, durable, and low-carbon building solutions.

Radical Solutions: Radical Assemblies
Friday, January 10, 2025, 9:00am-10:30am

Made in Redacted: 3D Printing Rural Affordable Housing
Shelby Doyle, Iowa State University

This paper summarizes three years of research evaluating the feasibility 3D printed concrete for rural affordable housing and documents the construction of 150 SF demonstration project. Research results include new construction details, material research, and building strategies. As well as accompanying work to acclimate the public, discipline, and profession to additive construction through interdisciplinary grants, publications, university courses, public exhibitions, and industry collaborations. This body of work emerged in response to the urgent need to address the affordable rural housing shortage during a time of rapid climate change. In 2021, there were twenty climate disaster events in the United States with losses exceeding $1 billion each. In <redacted>, a single disaster event, the 2020 derecho resulted in severe damage to crops, homes, businesses, and vehicles totaling $11.8 billion dollars. Climate research indicates that similar disaster events will increase in quantity and frequency, necessitating more resilient methods of building. After each climate disaster, federal funding for recovery and reinvestment was released and administered by the <redacted>. A portion of that funding was granted to the <redacted> to evaluate whether additive construction (3D Printing) concrete, or more accurately cementitious materials, could be an effective method for sustainable, structurally resilient, and affordable rural housing. Research and industry groups are positioning 3D printed concrete houses as a disaster resilient and affordable option for housing construction in rural areas. Concrete construction is structurally resilient to residential storm damage when compared to common wood frame construction but also costlier to build. When compared to standard concrete construction, 3D concrete printing can reduce costs by eliminating formwork and automating labor to dramatically reduce construction time. Presently, the high embodied carbon of concrete and the low energy performance of 3D printed buildings remain largely unaddressed. Cement is responsible for 8% of the total carbon emissions globally, but the demand for cement is expected to increase by more than 50% by the end of this decade. Is it possible to develop a cheap, locally sourced, low-carbon, storm resilient, R-50, and 3D printable material – ideally eliminating cement? This paper describes the context of <redacted> affordable housing needs and the challenges of existing codes and conventions coupled with a rural construction labor shortage. A primary goal of this paper is to share the experiential knowledge gained through the research and construction process and to disseminate efforts to ground truth industry claims of additive construction as low-labor, cheap, and sustainable. Conclusions are shared regarding the myths, challenges, and opportunities of integrating additive manufacturing into the ecosystem of affordable housing options.

Radical Concrete Solutions for Cross Border Housing: 3D-Printed Homes in Nacajuca, Mexico and Austin, Texas

Franca Trubiano & Patricia Kusumah, University of Pennsylvania

Can innovative forms of technology solve our housing problems in the United States and across the border in Mexico? Can the deployment of large-scaled robots accelerate the building process, reduce waste, and transform a building industry which has hardly updated its material and labor practices in over 100 years? In response, this paper offers a comprehensive analysis of two case studies of 3D-printed concrete housing communities built by ICON®, a U.S.-based firm specializing in on-site robotic fabrication using proprietary technology and materials. It offers evidence and evaluates the aspirations, challenges, and benefits of extruding dozens of large-scale 3D printed homes in Nacajuca, Mexico and Austin, Texas. Using a patented concrete mixture and deposition system, the fabrication of both projects sought to catalyze significant transformations in the housing industry including the need for fewer on-site building trades and laborers. To critically assess such claims, the paper's principal research methodology involved conducting in-depth primary-source interviews with an architect from ICON® involved in the US project, and a housing production manager who collaborated with ICON ® in Mexico. The company architect considered the project's scope as well as the technological capabilities made possible by highly digitized site-tools, detailed specifications for the wall layer buildout, tooling intricacies involved in the printing process, and the complexities of coordinating traditional construction with the 3D printed robots.(1) Conversely, the housing production manager discussed the contextual, in-situ constraints of practically deploying the same technology in Mexico.(2) This included consideration of local, community perspectives, a comparative analysis of using robotic fabrication against existing construction trades, as well as examining underlying motivations driving the project's execution. As the number of 3D-printed housing projects increase, this technology is poised to transform the housing industry, even as scaling robotic fabrication from individual housing units to entire communities introduces complex technological and project delivery challenges that have yet to be thoroughly examined. Notwithstanding the limited number of completed projects in 2024 and the lack of published precedents, both interviewees argue for greater market adoption and considerable benefits when using 3D printing technologies. Considered, for the most part, far too experimental by most design architects, they assert that scaling 3D-printed housing to a community level can significantly optimize construction efficiency, achieving a 20% reduction in construction time and a notable decrease in material waste. Widespread adoption hinges, however, on several critical factors, including the optimized deployment and assembly of the printing apparatus, precise wall layer composition, and effective coordination throughout the printing process. Drawing insights from the challenges encountered by ICON ® both in Mexico and in Texas —including the necessity for early resolution of connection construction details and early engagement of contractors with specialized knowledge in regional construction practices—this paper shares key findings of the radical potential of printing in place housing communities of the future.

The Role of "Offsite" Construction in the Delivery of Housing

Alfredo Andia, Florida International University

The United States faces a growing housing affordability crisis, with a shortage of 4 to 7 million homes, exacerbated by stagnant productivity in the construction industry over the past 60 years. Offsite construction is emerging as a promising solution to this challenge. This method involves designing and fabricating building components in factories before assembling them on-site. Offsite construction mirrors innovations seen in the automotive and aerospace industries, where modular assembly and "chunking" have significantly boosted production efficiency. This approach offers multiple benefits, including addressing labor shortages, meeting tight deadlines, and improving cost margins.   While full automation on construction sites is not yet feasible, today's "offsite" construction is creating more structured environments, paving the way for future automation. Since 2015, numerous start-ups in the U.S. have embraced this method. Companies such as Blu Homes, Project Frog, FullStack Modular, Prescient, BLOX, and Entekra have gained traction in the construction sector, some attracting significant venture capital investment, though others, like Katerra, have faced challenges and failed.   Sweden is a global leader in offsite wood construction, where 85% of detached single-family homes use prefabricated elements, compared to just 5% in the U.S., U.K., and Australia. Swedish companies like Randek are pioneers in using advanced robotic assembly lines to automate the production of walls, roofs, and floors. Lindbäcks Bygg, a leading Swedish home manufacturer, can produce walls with windows and insulation in just 15-17 minutes using this technology. Although offsite construction dominates single-family homes in Sweden, only 10% of new apartment buildings use timber. However, the use of wood in multi-story buildings is growing, with a projected 8,000 wood apartments by 2020. Despite the use of automation, Sweden maintains architectural variety in its offsite construction, particularly in single-family homes and increasingly in multi-story apartments. In the paper, three basic types of offsite construction are identified: (1) Temporary Offsite Facility, (2) Offsite Element Prefabrication, and (3) Offsite Volume Manufacturing. These methods are still largely manual and far from achieving the levels of automation seen in other industries. The real benefits of offsite construction will only be realized when volume manufacturing transforms the entire supply chain. The paper draws parallels between offsite construction and the "car platform" approach in the automotive industry, where standardized platforms reduce costs and improve efficiency. In car manufacturing, platforms allow companies to share designs and components, such as chassis, across different models and brands. For example, the Toyota Camry and Lexus ES share the same platform but differ in styling. Similarly, offsite construction could standardize certain processes, streamlining production. However, modularization and customization remain challenges, particularly in architectural design, as offsite construction moves towards greater automation and efficiency. In conclusion, while offsite construction is still evolving, its potential to transform the construction industry by adopting methods from other manufacturing sectors is clear. The challenge lies in balancing efficiency with the customization needs of architectural design.

Appreciating Value: Reassessing the Potential of Manufactured Housing

Reese Greenlee, Kansas State University
Emma Silverblatt, Cornell University

As the largest source of unsubsidized affordable housing in the United States today, manufactured home communities (MHC) offer invaluable, if overlooked, tools to combat the housing crisis. With the cost per square foot of a manufactured home (MH) averaging just over half that of a site-built house[1], this typology provides a promising pathway to homeownership, community stability, and financial mobility, and demands further study and acknowledgement in the academic environment. Despite providing essential affordable housing for over twenty million people, MHs have been consistently relegated to the periphery of architectural and societal consideration.[2] Classified as personal property rather than real property, MHs inhabit a legal and cultural liminality that undermines their residents' stability and perpetuates their marginalization.[3] Exclusionary zoning practices and land-use policies have further isolated these communities, reinforcing a socio-spatial stigma that frames them as undesirable and inferior.[4] This marginalization is not only evident in the legal and regulatory frameworks that govern MHCs but also in the broader cultural narratives that dismiss them as impermanent and insignificant. Concepts for mass-producible, mobile housing have persisted at the fringe of architecture since the rise of automation, and often present the most idealistic and radical solutions for sustainable, accessible habitation.[5] Prefabricated and environmentally-conscious prototypes continue to chart a path of architectural innovation, without acknowledgement of factory-produced contemporaries. The unfortunate result of this silo is that MHs suffer from a lack of design-thinking, with spatial and material disadvantages that come at the cost of the inhabitant.[6] The connection between architecture and the socio-spatial stigma surrounding MHs is based in an architectural history focused on how things stay still. The author's research seminar considered the alternative: architecture and the mobility of images, ideas, and physical things.[7] The MHC served as the primary site of research for understanding how property, legal, and social precarity intersect. This paper will also present results from the author's studio, which partnered with non-profit ownership and residents of a local manufactured home community to investigate the qualities of life most valuable to those who live there. Following on-site community visioning exercises, which resulted in design-build public space amenities, students created prototypes for affordable, low-rise, rural developments, studying the best aspects of the MHC through systematic housing solutions. These course examples provide clear demonstrations of successful integration of manufactured homes into architectural education, supporting earnest engagement with this form of affordable housing and those who live there. To acknowledge MHs in academia is to confront the limitations of architectural pedagogy and practice. These communities are not anomalies, but rather critical sites where architecture's social, economic, and material dimensions converge to solve affordable housing issues. Incorporating MHCs into architectural history and education is a radical act that compels architects, historians, and students to grapple with the complexities of space-making in a manner that is both inclusive and reflective of broader societal dynamics. In doing so, the discipline can begin to reconcile its past omissions and contribute to a more equitable future for housing and the built environment.

Permanent Temporalities: Place and Belonging in Refugee Housing
Rana Abudayyeh, University of Tennessee-Knoxville

The protracted nature of global displacement, particularly the Syrian refugee crisis, has exposed the limitations of conventional refugee housing solutions. Traditional approaches often prioritize speed and efficiency at the expense of human agency, cultural continuity, and adaptability. This research advocates for a shift toward more responsive and empowering refugee housing—one that centers on the concept of interiority and addresses the evolving needs of displaced populations.[1] In the context of displacement, interiority refers to the design and experience of interior spaces that meet both the practical and psychological needs of displaced individuals. Drawing from extensive fieldwork in refugee camps such as Al Zaatari and Al Azraq in Jordan, this study examines how modular interior architecture systems can be tailored to the daily practices and cultural identities of refugee families.[2] The research focuses on developing a customizable "kit of parts" that allows for personalization and multifunctionality within standardized prefabricated shelter units.[3] This approach demonstrates the potential for adaptive environments to enhance well-being, social cohesion, and resilience among displaced populations. By positioning interiority as essential not only to providing basic shelter but also to preserving dignity and agency, this study emphasizes how displaced individuals can reclaim ownership of their spaces and futures. In a humanitarian field where design solutions often default to containerized, one-size-fits-all models,[4] this research advocates for a more nuanced engagement with the lived experiences and aspirations of refugees. Flexible interior spaces—enhanced by innovative material strategies and community-driven practices—can create environments that are not only functional but also emotionally resonant. Understanding refugee housing as a process, product, and place calls for a shift toward dynamic design actions that address the evolving needs of displaced populations while recognizing their agency within the built environment. Broadly, this research situates itself within a larger discourse on how the built environment can address the complexities of a world in perpetual motion. By framing refugee housing within the context of Permanent Temporalities—a concept that highlights the need for spaces to be adaptable yet lasting in the face of constant change—the study calls for innovative design strategies that can evolve alongside global migration patterns, ensuring that housing remains relevant over time. The findings underscore the importance of creating spaces that transcend mere functionality to offer displaced populations a sense of belonging and permanence, even in temporary settings. As such, this research contributes to ongoing discussions about housing's role in global crises, challenging top-down paradigms and advocating for an ethical, human-centered approach that integrates interiority into humanitarian responses.[5] By focusing on how interior environments can foster a sense of belonging, identity, and dignity for those uprooted from their homes, this study highlights design interventions that promote well-being, community, and resilience within the Permanent Temporalities of crisis environments. Ultimately, the outcomes emphasize the need for collaborative, interdisciplinary solutions that move beyond temporary fixes and engage with the complexities of displacement, identity, and place-making.

Hospitable Spaces for Displaced People in Cali, Colombia

Liliana Clavijo, Universidad del Valle
Felipe Hernandez, University of Cambridge

According to the Internal Displacement Monitoring Centre, Colombia's internally displaced population exceeds five million people, and this figure refers only to displacement caused by conflict and violence. An additional three million people have been displaced by natural disasters. As such, 16% of the country's population lives in conditions of displacement. Most internally displaced people (IDP) in Colombia are Afro-descendant from the Pacific coastal areas whose way of inhabiting the city differs greatly from the dominant forms of habitation adopted (and promoted) by the white-mestizo elite. This later social group dictates housing policy and controls the financial mechanisms to build. Thus, they determine the way people live in cities. The Housing Design Research Collaborative (HDRC) explores the conditions of internal displacement in Colombia to propose innovative forms of urban habitation for displaced populations. It challenges the rigid boundaries set by current housing legislation and market-driven residential architecture. As such, the HDRC challenges the very notion of housing exclusively as a place of residence: an approach that hinders the 'need' (and not simply the possibility) to conceive the house as a refuge, as a site of productivity, or even as an income generating device which is constantly being extended and adapted to meet constantly changing conditions. At the first international Summer School 2024, with students and professors from UV (Colombia) and UC (United Kingdom), we studied the specific conditions of displaced people in Cali and confirmed that current housing policies do not respond to the specific conditions of IDP in Colombia. An IDP spokesperson offered a compelling account highlighting the inadequacy of housing units offered to them, which not only are small and dysfunctional, but are also conceived as private property for individual households, a conceptualisation which does not correspond with the socio-cultural characteristics of Afro-descendant, Indigenous and other minority groups who make up the majority of IDP in Colombia. Evidently, current architectural approaches to housing are uncapable of meeting the demands of rapidly changing heterogeneous urban landscapes characterised by immense socio-economic inequality, violence, racism, xenophobia and fear of change. Hence, attending to the specific housing needs of a large DPI population in Colombia is not only a humanitarian obligation, but also an urban and architectural challenge: to create more hospitable spaces to guarantee the well-being of people who join 'the city' in some of the most vulnerable circumstances. The Summer School generated various proposals for housing and community building, including a House Prototype: a structure that enables adaptation of all internal spaces, incremental growth and, more importantly, could help to generate an income for residents from the get-go. In this paper we will articulate the design research methods and pedagogical approaches of the HDRC, along with the findings of our first international meeting in search for new housing paradigms in Colombia.

Migrant Housing Prototypes: Repurposing NYC's Unutilized Properties as a Continuum of Private and Community Life

Sharon Egretta Sutton, University of Washington
Chenyi Jhon & Anirudh Anand, Parsons School of Design

New York's migrant crisis presented an opportunity for twelve graduate architecture students at The New School (TNS) to rethink the city's approach to housing migrant and other displaced populations. Students worked in teams to develop two linked prototypes that demonstrate how the city could use its many unutilized properties to create housing that is sustainable, economical, and acceptable to the host neighborhood. Students began by conducting archival research—on global displacement patterns, NYC housing policies, and migrant-serving community-based organizations (MS-CBOs)—and they also conducted field work, participating in a two-day summit at TNS' Zohlberg Institute on Mobility and Migration, being participant observers at a MS-CBO holiday celebration, and observing the CBOs, hotels, shelters, and fields that serve as NYC's ad hoc shelter system. From their research, they conceptualized migration as a process involving (1) journey, (2) entry, (3) survival, (4) integration, and (5) sustainability. Because NYC's shelter system exclusively addresses survival, they concluded that their prototypes would address integration and sustainability and further that they needed to deconstruct the conventional unit approach to residential design and explore, instead, activity-based spatial configurations. Accordingly, they set out to reimagine housing as a dynamic, flexible environment that offers multiple living arrangements and also links residents with the surrounding neighborhood. With this approach clarified, students contacted the Mayor's Office of Immigrant Affairs to propose developing migrant housing prototypes on unutilized city-owned sites. After encountering an impenetrable bureaucracy, they decided to proceed independently, using a RFP the city had already developed for two of its vacant properties in order to program the sites to meet neighborhood needs. Their designs drew inspiration from the co-living practices already emerging among migrants, who have repurposed unconventional spaces such as attics and basements to meet their needs despite legal restrictions. The designs also acknowledged the shifting dynamics of displaced communities' lives, which often involve spontaneous relationships that extend well beyond traditional family structures. Their prototypes legitimized these organic ways of living by organizing space around universal activities (e.g., dining, resting, cooking, and playing). Furthermore, together the two prototypes offered a continuum of housing options, as well as social service, community, and commercial space for neighborhood use. The integration prototype—Bergen Haven, a reuse/expansion of a vacant building—included emergency and tiny residential spaces with offices for a MS-CBO and its service providers, and a neighborhood café and laundromat. The sustainability prototype—Mosaic, new construction on a vacant lot—included transitional and long-term support housing, a tiny branch library, and a community garden/farmers' market. Residential space throughout accommodated varied living arrangements e.g., communal friend groups, single-parent households, aged-out teens, and multigenerational families. Based upon an expert review of the prototypes, students concluded that migrant housing models must ambitiously redefine what constitutes a family and include uses that serve migrants as well as the host neighborhood. Moreover, they should deploy individualized prefabricated construction systems in the existing space of vacant buildings, which can be scaled up over time into an expanded facility. The next steps would involve constructing a single module of each proposed housing prototype.

Mi Casa, Mi Futuro: Reimagining Housing Models to Addressing Immigrant Needs

Laura Wainer, City College of New York

Housing inequality exacerbates social and economic disparities, particularly within immigrant communities in the U.S. (Rognlie, 2018; Steil et al., 2018). In New York City's housing crisis, the perspectives of young immigrants remain marginalized, perpetuating intergenerational poverty (Aiken et al., 2021; Chinchilla et al., 2022). Architecture students at the [name of the school]—predominantly BIPOC immigrants and first-generation Americans—seek to challenge this exclusion by acquiring the knowledge and skills necessary to lead their communities toward accessible housing solutions. In the face of these challenges, this paper reflects on the pedagogical outcomes of "Mi Casa, Mi Futuro," a two-year collaboration between [name of the school] and Make The Road New York (MRNY), New York's largest immigrant advocacy organization. We found that bridging the gap between academia, communities, and architectural practice in multifaceted housing issues not only demands expanding knowledge and methods to situate design within broader financial, organizational, and sociological frameworks but also requires reconsidering the very notion of the "project" beyond the boundaries of traditional understandings of architecture. We began the collaboration with the hypothesis that design can play a primary role in developing alternative and innovative housing models for families marginalized by both the real estate market and housing policies (Steil et al., 2018). Students were required to address issues such as lack of credit, lack of access to affordable land, intergenerational housing challenges, and institutional discrimination faced by immigrant families. Through research on the neighborhood's living conditions, the housing challenges faced by immigrants, and the personal stories of MRNY members and students themselves, studio participants were compelled to reconsider the traditional unit of design to be delivered to the community. Rather than treating architecture as an isolated discipline, this studio proposed an integral approach where architectural design should correlate with an organizational model (of ownership, management, and living) and economic feasibility (income, finance, and subsidy). Our commitment with the community into delivering inspiring advocacy and alternative solutions engaged students with alternative models of densification, collective action, and production, incorporating ideas of intergenerational living, circular economies, community trusts, and networks of care incorporated into the design rationalities of the projects.In expanding the notion of the project to design-driven solutions encompassing economic and organizational proposals, the process became a vehicle for civic capacity-building, enabling students to engage in broader discussions of equitable and sustainable development in their communities. "Mi Casa, Mi Futuro" collaboration empowered students to critically engage with the complexities of housing public discussion while working alongside MRNY to identify the precise advocacy strategies necessary to position housing at the center of immigrant communities' political agendas. We suggest that this approach –and its challenges-- are particularly important to explore as they center design as a catalyst for those who are currently marginalized in all the spectrum of the housing system (market, public, affordable, supportive). Despite the progress, significant pedagogical challenges remain in terms of research methods for design practice to strengthen the skills of future architects engaged in social well-being and housing justice.

Teaching Ethics and Empathy: Housing Design for the Unhoused
Alexis Gregory, Mississippi State University

This paper will review the pedagogical structure used for a 3rd year design studio for mixed-use multi-family housing that incorporates ethics and empathy to teach students how to design for the unhoused in communities where affordable housing is unavailable. The studio is in its third year and has utilized various class exercises to better understand the needs of the unhoused and the organizations that work to get people into permanent housing. The studio starts off with a smaller scale project for a Housing Resource Center with a local non-profit that is working to help residents of our university town who are both food and housing insecure. Students read "Housing for Everyone" and "Homes for the Roofless," chapters from Democratic Architecture: Practical Solutions to Today's Housing Crisis by Donald McDonald to start thinking about the current housing crisis and how architects can help alleviate the issue and support the right to housing. The program for the project includes a food pantry, transitional housing, and offices and meeting spaces for the non-profit. The students also visit another, similar project in the Hospitality Hub, where they see the ability of design to create spaces for healing and support for those struggling with housing insecurity. (Image 1) The students work in teams and design the Housing Resource Center and participate in workshops conducted by the local non-profit to better understand the struggles residents go through to get affordable housing which helps promote empathy with those struggles. (Image 2 and 3) The students present their final designs to the client and then think about what they learned to carry forward to their larger project for the rest of the semester. (Image 4) Once the students conduct site analysis they move into precedent studies of existing affordable housing projects that were awarded AIA Housing awards and show the students that affordable housing can be beautiful and well designed, even on a budget. The students study the client base for the projects, the services those clients need, and how the architects designed and detailed the projects. The various clients from these projects include the elderly, indigenous populations, veterans, at-risk youth, single-parent families, people struggling with mental illness, and people struggling with addiction. Students select one of these clients and then design their mixed-use multi-family project based on the needs of that client group using the precedent research. Once the students have their client selected we conduct empathy exercises using Daniel Pink's A Whole New Mind: Why Right-Brainers Will Rule the Future. We use the "Story" chapter and exercises that have students create protagonists for the building they will be designing. This helps the students decenter themselves and instead focus on others and their needs in their designs. (Image 5) The students create conceptual design ideas that are then carried through the project from site development to building form, and finally detailing. The final projects are presented to the local non-profit as well as architects from regional firms who focus on affordable housing, such as David Baker Architects.

Non-Human Housing: Radical Empathy as Design Pedagogy
Benjamin Akhavan, Morgan State University

The mediation of human and non-human relationships can be fodder for reconciling diminishing regard between nature, buildings, humans, and non-humans. This becomes apparent when one recognizes housing, habitats, and nature are constructed. Through a studio brief and the resulting projects, this paper posits that designing for non-humans can lead future architects to become more empathetic designers, as well as produce more speculative yet inclusive housing.   In a five-week introduction to architecture course titled Artificial, You, Skyscraper, Zoo, students explored empathy through the lens of non-humans by designing housing on a complex site in New York City. Although most professional projects are not designed for non-humans, introducing architecture to students in this manner prompted them to empathize and become more sensitive to the needs of others. Questions of different bodies, prosthetics, and living in urban environments allowed students to design for their selected non-human.   The course's structure required students to design prosthetics and skyscrapers. The design of a "prosthetic" allowed students to mediate one's experience of a sense, thereby allowing them to to empathize with other, non-human experiences. This allowed for the transcendental exploration of different bodies and empathy as they relate to the site. Designing skyscrapers allowed students to translate animal habitats to a different scale—the scale of housing—on site.   Students identified ways of augmenting empathy with an emphasis on seeking arguably less valued experiences to produce novel results. Each student approached the site with different focuses and brought their their own experiences to their designs. For example, one student designed for giraffes and humans, mediating their experiences through different sized elevators and balconies. Another designed the New York Rat Society, a satirical yet compelling proposal for non-human housing in the city.   This paper explores the course framing and student projects to understand the relationship between designing for non-humans and becoming more empathetic designers. Additionally, through the students' descriptions of their own projects and their course reflections, it is evident that they understood the benefit of designing for non-humans, as a pedagogical exercise. However, the research is also aware of the limitations of the designs proposed by students and seeks to propose revisions to the brief.   This research paves the way for more innovative designs which address the needs of others while proposing idiosyncratic housing paradigms in urban environments, potentially revolutionizing the way we teach future architects about inclusive housing. The studio is thought-provoking and brings the profession—through pedagogy—one step closer to a more empathetic built environment.

A Taxonomy of Housing Design Studio Responses

Ting Chin & Claudia Hernandez-Feiks, New York City College of Technology

In architectural pedagogy, a significant area of discussion revolves around the approaches educators employ to teach students to navigate the design process and bridge the gap between concept development and the physical articulation of architecture. Design studio prompts are crafted to challenge and inspire students to innovate, engage with contemporary discourse, and develop meaningful solutions to architectural problems. The breadth of ways to approach design are limitless but are often informed by current trends in architectural form-making or theory, socio-political priorities, emerging technologies, or individual agendas. Our ongoing body of research analyzes project briefs from design studios across a wide range of architectural institutions throughout the United States, to catalog and develop a taxonomy matrix of pedagogical approaches that deciphers prevalent trajectories in design education giving insight into trends in the practice of architecture. This paper focuses specifically on an analysis of housing studio project briefs, both past and present, to better understand the history and evolution of housing design pedagogy. We aim to understand how we, as educators, approach the teaching of housing design, situate these methods within the theoretical and practical contexts of their time, and reflect on the current state of housing design education.   Housing, as an architectural typology, is deeply embedded in cultural, social, and economic contexts, and provides a unique opportunity to explore how design pedagogy balances the intersection of form and culture and teaches students to negotiate between formal creativity and the practical and ethical demands of designing for diverse populations and contexts. Our taxonomy matrix offers a lens for categorizing the methodologies used in housing design studios and becomes a tool for understanding how we teach students to design housing and prepare them to critically engage with the complexities of architectural practice.   This research is part of a broader project that systematically catalogs design studio briefs to document and contextualize the variety of pedagogical practices in architectural education. The categories were initially informed by our own observations, but we have discovered our findings to be situated within the complex relationship between formalism and contextualism and by the historical forces shaping architectural education. Michael Hays's essay 'Critical Architecture: Between Culture and Form,' where he argues that architecture exists in a dialectical relationship between cultural forces and formal expression, and Joan Ockman's Architecture School: Three Centuries of Educating Architects in North America, have provided the framework for positioning our analyses within the broader context of architectural theory and history.   This current iteration of our research serves as a mechanism for understanding the diverse methodologies employed in housing design pedagogy. As housing remains a pivotal issue in both social and architectural discourse, this work explores how we equip future architects with the skills to navigate the intricate balance between formal innovation and socio-cultural responsibility. Our research does not advocate for any specific design approach but is intended to be a resource for educators and students alike, offering insights into pedagogical practices and the evolution of housing design education, and encouraging critical reflection on our own ideologies.

Process, Product, and Place: The Housing Design Studio as Collaborative Practice

Michael Harpster University of Nebraska-Lincoln

This paper discusses the outcomes of a fourth-year housing studio that addressed the legal, juridical, and political contingencies of contemporary housing and placed a specific emphasis on fostering student agency through a process of critical collaboration with local government officials. Students were encouraged to explore alternative settlement forms through direct engagement with various forms of housing regulation, including a critical examination of municipal zoning ordinances and collective ownership structures. With a history of supporting alternative housing models, the legal structure of a Community Land Trust (CLT) served as a primary emphasis for the studio. The paper provides a brief history of CLTs within the United States, compares the CLT model with normative subdivision or individual ownership models, and demonstrates how students explored both the formal and the social impacts implementing unique, hybridized CLT models within the urban environment. As part of this investigation, students had the opportunity to engage with local planning and development review officials. This collaborative process allowed students to identify key aspects of local zoning policies that posed specific challenges to the implementation of alternative housing models, and it provided a platform for students to subsequently illustrate feasible solutions derived from the careful reconsideration of such policies. The studio encouraged students to move beyond general advocacy for reduced housing regulation or broad zoning reform, ultimately enabling them to develop specific, well-researched proposals for the actual implementation of alternative housing models. One notable outcome of the studio was an infill housing proposal that did not actually require any policy reform at all but, instead, utilized a novel combination of existing zoning mechanisms to realize unexpected results. This project leveraged a Community Land Trust in conjunction with a specialized zoning overlay district to create an infill housing development that achieved significantly higher density compared to the surrounding area while still maintaining compatibility with the neighborhood through its use of low-rise building typologies. In addition to its use of stealth density to introduce a greater quantity of units, the project's unique regulatory and ownership structure also allowed it to introduce a greater diversity of housing types into a predominantly single-family neighborhood and to ensure long-term affordability for these units. In the end, the project was able to illustrate an attainable model for infill development within the city that appropriately addressed issues of housing equity, affordability, and sustainability– all without the need to enact broader zoning reforms. Looking ahead, the paper will also discuss plans for a new round of collaborative design and engagement with city officials scheduled for the spring of 2025. In this upcoming studio, students will assess the feasibility of implementing hybrid policy and ownership models along key neighborhoods "edges" as outlined in the city's 2050 comprehensive plan. Ultimately, this paper aims to demonstrate how involving students in the analysis and exploration of the regulatory and political context of their work can bridge architectural practice and social change, fostering collaboration with a range of stakeholders to co-create more affordable and equitable realities for contemporary housing within the United States.

Radical Solutions: Construction & Deconstruction
Friday, January 10, 2025, 11:00am-12:30pm

Mid-Century Divide: Contextualizing Twentieth-Century Red River Métis "Housing" and "Home"

Sarah Hourie, University of Manitoba

Red River Métis have experienced settler colonial violence as a result of their grounded relationality to their homelands. Following settler encroachment in the West, they proposed and formalized legislation that led to the confederation of Manitoba in Canada, in attempts to protect their Nationhood (Teillet 2019). Throughout this extensive and nuanced history, my Red River Métis family retained their territoriality into the twenty-first century; however, following my great-grandfather's return from service overseas, he challenged his inherited stability through choosing to live in unconventional spaces, such as hotels. My grandfather embodied similar patterns, as he too lived in hotels, with friends, within a Hutterite community, and was houseless prior to returning to social housing before his death. My proposed paper engages theorizations of the uncanny (Freud 1955) and haunting (Gordon 2006) to investigate Red River Métis spatial understandings of housing, home, and homelands. I intend to use these concepts to examine an intergenerational unconscious desire to return to place and to contextualize the inherited effects of settler colonialism within my family. My familial narrative is central to my research as my self-location as an urban Red River Métis woman who was raised middle-class in Winnipeg's South End contrasts with the hardships of my dad's upbringing as an urban, working-class Red River Métis man in Winnipeg's North End. Thus, my research necessitates active story- and memory-work (Hubbard 2008) to uncover and rediscover my family's histories in ways that challenge concepts of belonging within the Nationhood/Peoplehood matrix (Andersen 2021). In retracing my relatives' landedness (LaRocque 2024) prior to and during the settler colonial regime that necessitated violent changes to the landscapes in both Winnipeg and Portage la Prairie, Manitoba, I consider the relationality of this matrix within place. My proposed paper engages with local and national sovereignties to position my relatives within nation/world building (Vowel 2022). It encourages a return home that strengthens my family's mobility across time and space by re/connecting with kin. Through tracing my family's experiences with housing in voters' lists and the Henderson Directories, and mapping these findings using ArcGIS, my proposed paper seeks to dismantle the overarching structural considerations of what it means to be "at home." Here, I will interrogate how both twentieth century urban planning and the procedural environment refused to acknowledge Indigenous Peoples' brilliance through their grounded understandings of their landedness (Simpson 2017; Ferland 2020). As both my great-grandfather and grandfather chose to be unhoused, I will unpack the term "houselessness," and its many definitions (Peters and Andersen 2013), to better situate and identify gaps within the structural and procedural environment, as they were always at home, regardless of the ways they chose to house themselves. Lastly, I will consider a re/reading of settler colonial histories concerning the development of the places we call home today to better understand my family's ongoing relationships with their homelands.

Hemp-Lime ADUs: A Pathway to Carbon-Smart Housing Through Design for Disassembly

Arta Yazdanseta & Lonn Combs, Rensselaer Polytechnic Institute

This paper presents findings from an Undergraduate Research Program (URP) exploring a low-tech, hemp-lime (HL) prefab panelized housing system incorporating Design for Disassembly (DfD) principles. The U.S. faces a significant shortage of 3.8 million entry-level housing units [1]. In response, many states and cities have relaxed zoning regulations to encourage Accessory Dwelling Units (ADUs) as a solution [2]. However, while addressing this demand, the construction industry must also reduce embodied carbon emissions to meet the 1.5°C climate target by 2050. Research emphasizes that our built environment must function as a carbon sink to reach this goal [3]. Biogenic materials act as carbon sinks through photosynthesis and play a key role in reducing embodied carbon emissions [4]. Among various technologies, HL construction is fast maturing. HL, a composite of hemp hurd, lime binder, and water, enhances building performance through its thermal and hygrothermal properties [5]. Thanks to enacted policies supporting the bio-circular economy, biogenic materials in the construction industry are predicted to be the fastest-growing technology. The Bio-Circular Economy (BCE) leverages biogenic materials to create construction practices that are not only environmentally sustainable but also economically viable [6–8]. DfD, grounded in BCE principles, ensures buildings are designed for efficient disassembly, allowing materials to be recovered and reused. This approach reduces waste, preserves resources, and supports a regenerative economic system [9,10]. By aligning with BCE, DfD enhances the sustainability of structures by extending material lifecycles. This paper links ADU as a housing solution with these concepts, offering a preliminary investigation from a URP into a low-tech HL prefab panel incorporating DfD principles. The URP begins by introducing students to the principles of BCE and DfD alongside precedents that exemplify DfD principles using prefabricated, panelized wood construction. Students then explore additional precedents, conducting initial reviews to map the application of BCE and DfD principles in both the provided examples and those they discover. Following this, students select one precedent for a detailed analysis, creating interpretive and innovative drawings. Concurrently, they engage in hands-on work with HL, gaining practical insights into its construction techniques and properties. The process continues with students developing rapid prototypes of critical details and components of their selected precedent at a half-inch scale, refining these models to incorporate HL construction requirements. In the final stage, students collaborate to build a single component full-scale prototype of a selected detail. This prototype is supported by a series of drawings that illustrate how HL panelized systems can be integrated with DfD principles, demonstrating the potential for sustainable, adaptable housing solutions.

The Kind of a Problem a House is
Rusty Smith & Mackenzie Stagg, Auburn University

In "the kind of problem a city is," the final chapter of "The Death and Life of Great American Cities," Jane Jacobs argues that when facing a complex challenge, it is perhaps more important to understand what kind of a problem is posed, rather than just what the problem is "…for all problems cannot be thought about in the same way. Which avenues of thinking are apt to be useful and to help yield the truth depends not on how we might prefer to think about a subject, but rather inherent in the subject itself." [Jacobs] Jacobs leans heavily on the (then) newly emerging science of "organized complexity," and insists that it is imperative to understand cities (and perhaps more importantly how to THINK about cities) as both part of a complex system and a complex system in-and-of themselves. Over half a century later, there is a lot we can say about Jacobs' seminal work, but it remains as important as ever to consider a) the kind of a problem a problem is, b) the mental methods (i.e. how we think about a problem) and c) it's impact on our understanding of the problem itself. Today, the science of organized complexity has developed into a more unified theory of "Complex Adaptive Systems," and can still guide us in our thinking about the kind of a problem a city—or in this case a house—might, in fact, be. This paper proposes that the problem of a house is not one simply of form or function, but instead it is a complex adaptive system that combines and amplifies capital, wealth, safety, health, comfort, and social structures across time and generations. In this framework, a house is a problem simultaneously decontextualized and hyper-contextualized by the physical, social, cultural, historical, economic, and temporal networks in which it is situated. The paper will describe and analyze the mechanisms and methods of a housing affordability program working across the Southeast United States in intentionally disinvested, overburdened, and disaster-prone communities. Harnessing the breadth of university resources, (including design-build teaching and learning, student-engaged research and development, community outreach, capacity-building technical assistance, and land grant extension services) combined with external national industry partners in the primary and secondary mortgage and insurance markets and along with various federal agencies and policy makers, the program works across the entire ecosystem of housing procurement to provide a more integrated and synthetic approach to equitable housing access and affordability.The challenges of equitable and affordable housing access cannot be addressed through bricks and mortar alone. Houses—and the larger system of housing—are complex, adaptive systems. Working to educate the next generation of housers to innately understand that the design and construction of the built environment is simply their medium for making these invisible systems visible is instrumental in working together to imagine alternate potential futures for those in our community that need it the most but can afford it the least.

The Mass Plywood Flatpack Home: Prototyping Advanced Manufacturing with New Wood Products to Rethink Housing

Mark Fretz, Judith Sheine, Jason Stenson & Dale Northcutt, University of Oregon

Our society is facing a set of converging challenges. Climate change, ecosystem collapse, social inequality, social isolation, inadequate healthcare, unaffordable housing and homelessness, are all impacting the health of individuals, communities and the planet. The scale and interconnected complexity of converging challenges requires a systematic approach to rethinking solutions. Many state and municipal agencies have begun rethinking residential zoning and some have removed single-family zoning to stimulate creative new models for America's future communities, while attempting to incentivize development of "missing middle" or "workforce housing" aimed at affordability for households at 80% -120% of area median income (AMI). One such model, "cottage cluster," which increases land intensity by congregating multiple smaller homes around a common courtyard, is particularly promising in that it can increase opportunities for community and human interaction, peer-to-peer renewable energy sharing, centralized district and heating and cooling, and environmentally friendly design while lowering per unit land and infrastructure costs. At the same time, new engineered wood products, including mass timber and wood fiber insulation, are creating opportunities for strengthening urban-rural collaborations and economies by stimulating a market for small-diameter low value logs sourced from healthy forest initiatives, while reducing the overall ecological impact of housing. We focused on designing a prototypical high efficiency 2-bedroom, 1.5 bath missing middle home that would spatially optimize land use derived from new cottage cluster and ADU infill housing zoning code, while also being well-suited for individual rural fire prone regions, with a high utilization efficiency of wood fiber from mass timber panels (up to 95%) using advance manufacturing practices. Thus, the design employed mass plywood panel due to its availability in thin 2" (51mm) and 3" (76mm) sections, which reduced panel thickness and total fiber volume to 19.9 m3 (exterior walls, interior partitions, doors, casework), machined into a kit of parts for flat pack transportation. Leaving wood exposed as surface finish reduced embodied material impacts and associated labor, while offering natural biophilic and hygroscopic benefits. We tested design assumptions, structural connections, manufacturing and assembly workflows in a full-scale prototype assembled in a laboratory space. The full-scale prototypes were used to resolve design, construction, cost and logistical issues, which included: panel orientation for shipping, constructability and labor efficiency; platform versus ballon framing of mass timber panels; how to handle window and door openings, either cut outs from solid panels or additive panel openings; connection details, either interior connections for pre-assembled modular panels or simplified exterior connections for a parts house. Lessons learned are currently being applied to an updated second prototype iteration that will be tested full-scale outdoors and constructed by a commercial contractor for improved cost and constructability data. This second prototype will be instrumented to assess acoustics, moisture, vibration, and energy performance. After the prototyping study period concludes, drawings and documentation will be made available for pilot project adoption and implementation in permanent housing solutions.

Equitable Communities: Systems & Policies
Friday, January 10, 2025, 2:30pm-4:00pm

A Gentrification Tax: How to Fund Good-quality, Deeply Affordable Housing

Adrian Blackwell University of Waterloo
Ali Shamas Qadeer, Ontario College of Art and Design University

Tenants in large cities are commonly displaced by gentrification as landlords use all means possible to raise their rents, or replace them with higher paying, more affluent residents. Through this process landlords profit from an "unearned increment"–the value embedded in real estate that is not created by a private owner, but by Indigenous people, local cultures, tenants, neighborhood and community organizations, publicly funded infrastructure, and non-human biotic and abiotic ecologies. How could a tax capture this value that is extracted when corporate and individual home owners sell their property, and channel it into the production of good quality and deeply affordable housing? Gentrification Tax Action, a collective of artists, designers and academics based in Toronto, Canada has proposed a tax on gentrification in which capital gains on property will be taxed when sold, at a percentage that decreases as the time elapsed since purchase increases, in order to disincentivize flipping. The tax would be hypothecated (or earmarked), so that revenue is dedicated to funding housing secured in community land trusts operating in the neighborhood from which the revenue was collected. This tax would collect a new magnitude of sustainable funding for housing. In the face of increased immigration and the polarization of cities between renters and owners, a new income stream for housing affordability is the only way to create a truly sustainable and equitable city. By ensuring the construction, renovation, and maintenance of affordable housing in the neighbourhoods most at risk of gentrification, this tax would enable the creation of land trust cities. This case study presentation on the work of Gentrification Tax Action will explain the tax mechanism and illustrate how it could physically change the fabric of the City of Toronto.

Ending Homelessness: A Systemic Approach
John Dwyer, Thomas Jefferson University

In recent years, Housing First has emerged as the strongest solution for preventing homelessness, treating the causes and effects of homelessness, and permanently transitioning people out of homelessness. [1] To achieve this, we need more housing. [2] This, however, is not simply a problem of quantity. It requires our discipline to discover new geographies and typologies of housing with the capacity to systemically end homelessness.   SYSTEMS Homelessness is a flowing system with three parts: inflow, actively homeless, and outflow. [3] Ending it cannot be achieved by simply housing those who are actively homeless at a point in time. It requires us to redesign our urban systems to decrease inflow and increase outflow. Functional Zero is the goal, where the inflow rate is less than the outflow rate, making episodes of homelessness rare and brief. [4]   GEOGRAPHIES To achieve this, we must understand where the system operates, to discover where housing might be effective. In most cities, the geographies of homelessness are defined by their proximity to essential services. Rather than depending on housing to provide all services, discovering geographies within our cities where services exist can allow us to develop housing that plugs in to established systems. Possibilities for housing can be conceived in ways that fill the systemic gaps within a specific geography.   FORMS OF HOUSING We can categorize these possibilities based on the system itself: inflow and outflow. Housing that decreases inflow requires a focus on prevention while housing that increases outflow focuses on transitioning those who are actively homeless.   ON-CAMPUS STUDENT HOUSING: AN INFLOW SOLUTION Youth homelessness is significantly undercounted and widely accepted as the greatest contributor to the inflow rate of homelessness. [5] This persists among students enrolled in institutions of higher education. [6] On-campus student housing provides all the services needed to transition youth out of homelessness permanently: shelter, meals, security, education, financial aid, and a diverse range of student services from work study to governance. The problem is lack of access. Currently, there is only enough on-campus housing to support 22% of all students nationwide. [7] Admissions criteria are also a significant barrier for high school students experiencing homelessness and open enrollment institutions are often restricted from providing any housing at all. New admissions criteria, new student housing typologies, and expanding student housing at open enrollment institutions hold great possibilities for increasing access.   MEDICAL RESPITE HOUSING: AN OUTFLOW SOLUTION Emergency rooms serve many homeless individuals at a cost that is significantly higher than any other form of shelter. This increases health care costs and access to emergency medical care for all. [8] Medical respite is a form of housing intended to transition people with varying disabilities out of homelessness. [9] An ER patient can be immediately discharged to medical respite where they can stay for months before transitioning to permanent housing. Despite its systemic strength, medical respite is rarely utilized. [10] There is a great opportunity to significantly expand the quantity and efficiency of medical respite through direct association with emergency rooms.

Finding a Middle Ground: A Case Study in Incentivizing Equitable Housing
Sharon Haar, Ellie Abrons, Meredith Miller & Lan Deng, University of Michigan

"If you want to know what the housing crisis for middle-income Americans looks like in 2024, spend some time in Michigan. The surplus-to-shortage whipsaw here is a mitten-shaped miniature of what the entire country has gone through." -Conor Dougherty, "What Kalamazoo (Yes, Kalamazoo) Reveals About the Nation's Housing Crisis," The New York Times, August 22, 2024 This case study illustrates dilemmas at the heart of producing affordable, equitable housing in the Midwest. It focuses on Benton Harbor, Michigan, a Justice 40 community on Lake Michigan halfway between Chicago and Detroit.(1) Once a critical junction for shipping, manufacturing, and food processing, its population peaked at 20,000 in the 1960s and has been declining ever since due to deindustrialization and suburban outmigration. Despite new post-industrial job opportunities, and a location with ample fresh water and a temperate climate, Benton Harbor struggles to keep existing residents or attract new households due to the age and scarcity of the existing housing stock.   With a large number of vacant parcels held by the city, an aging housing stock, and household incomes well below area median income in the metro area, at first glance Benton Harbor appears to be a microcosm of Detroit, three hours due east on I-94. Its smaller size, however, offers a unique chance to explore both the opportunities and the limitations of Missing Middle housing typologies. In a Preliminary Housing Study produced by our ABC design research group at XYZ University, we worked with the City's recently completed Community Plan to detail the regulatory, financial, typological, and morphological complexities of incentivizing new "workforce" infill housing within two distinct neighborhoods. Our study, not unlike a meta-analysis in medicine, aggregates (largely) existing midwestern case studies. We explore the potential for pattern book homes, missing middle zoning, and community land trusts for their applicability within the Benton Harbor context. In studying where these prototypical examples have succeeded, as well as where they have stumbled, we identify how they must be brought together to accomplish Benton Harbor's goal of increasing middle-income housing supply to expand its tax base while producing a "Gentrification-Proof City." The study concludes with schematic massing diagrams for two neighborhoods that explore potential new housing typologies on vacant, city-owned properties, the regulatory reforms to enable such developments, and other efforts to rebuild the housing ecosystem in the city. Produced by an interdisciplinary team of architects and urban planners, this case study has relevance throughout the Midwest, particularly in former industrial communities interspersed among and threatened by the growing vacation/tourist zones of the Great Lakes.   Fig. 1 Benton Harbor, Michigan Fig. 2 Vacant Land in case study focus areas Fig. 3 Schematic multi-family massing options Fig. 4 Focus Area 1 schematic block Fig. 5 Focus Area 2 schematic block.

Research-Based Affordable Housing Design Praxis

Nadia Anderson, University of North Carolina at Charlotte

As an architect it is tempting to immediately rethink affordable housing through formal design. Understanding the mechanisms behind affordable housing production is, however, critical to moving design off the drawing board and into the real world. In a fast-growing city with rapidly expanding housing costs and decreasing access to affordable housing, my city borrows success metrics from the for-profit market. Total units produced is paramount and is reinforced by programs like the Low-Income Housing Tax Credit (LIHTC). The research and design discussed in this paper include analysis of data and affordable housing policies and practices in order to identify "soft spots" in the current systems that can be foundations for design investigations. Data analysis focused on XXXX's Housing Trust Fund (HTF), described as "the City's primary tool for creating and preserving affordable housing" (HTF 20th, 4). Looking at HTF-funded projects between 2005 and 2020 (Figure 1), over 90 per cent of the funded projects were multi-family rental units. Furthermore, to qualify for HTF dollars, companies must show they carry significant debt as well as assets, demonstrating history of financial stability. As a result, small developers and small infill sites are shut out and most projects are large buildings on large sites disconnected from social networks, public transportation, and good schools (Figure 2). As a member of the City's Neighborhood Equity and Stabilization Commission (NEST), a group focused on affordable housing and neighborhood displacement, I've had opportunities to work with City Council, city staff, and a range of affordable housing experts. This experience has confirmed many of my assumptions and translated them into policy proposals. This year NEST recommended that the 2024 bond for the HTF be doubled from $50 million to $100 million and include funding for innovative pilot programs and ranking changes to prioritize location over cost savings. A major goal of these initiatives is to take a long-term, multi-faceted approach to affordable housing as a starting point for household and community success. In parallel to the efforts described above, I have run a series of architecture studios on affordable housing. They begin with the premise that modular logics for housing design can benefit from the economies-of-scale of multi-unit housing construction while facilitating variety in unit types and site designs. Each studio had a different community partner including a neighborhood organization combining affordable housing and food systems (Figure 3), a non-profit creating a prototype village for the unhoused (Figure 4), and a city department looking at difficult-to-develop city-owned sites (Figure 5). Each studio explored modularity in a different way but all relied on design logics derived from understanding of existing systems and where their premises can be expanded through design. Overall, this work generates design praxis based on replicability while generating variety, principles discovered through research into current practices and policies.

Pedagogy: Urban Models
Friday, January 10, 2025, 2:30pm-4:00pm

At the Urban Fringe: Housing Innovation in Loosely Regulated Peripheries
Jaehun Woo, California Polytechnic State University

In the evolving landscape of American urbanism, the peripheries of major metropolitan areas present unique challenges for housing development. These regions, often marked by loosely enforced regulations, reflect different socio-economic realities and political ambitions. Housing policy here is frequently shaped by short-term agendas, whether to achieve quick results or leverage housing initiatives for electoral gains.   Unlike the more rigorous regulatory frameworks in central urban areas, the outskirts operate with vague codes and minimal oversight. This raises key questions: What happens when the usual markers of urban planning—strict building codes, zoning laws, and oversight—are absent or inconsistently applied? How can these conditions be used to create housing solutions that meet community needs while contributing to a broader understanding of housing as a social and cultural marker?   This research examines two forthcoming pilot projects in the periphery cities around Los Angeles, exploring the potential for constructing and redefining housing under such ambiguous conditions. These projects engage at different points in the design-construction-occupancy process and aim to serve as testing grounds for flexible, innovative housing solutions that may influence broader urban strategies. Pilot 1 addresses a development post-permitting but pre-construction, while Pilot 2 engages a city with no defined planning framework.   Pilot 1: Transforming an Approved Housing Development   The first pilot transforms an already approved development initially designed with minimal rigor, focused solely on unit count. Recognizing the potential for improvement, City A allowed internal layout modifications while maintaining the external elevation. This creates an opportunity to optimize the internal layout and introduce programmatic diversity within a constrained framework.   By reconfiguring structural grids and adding 18 ADU units, this project enhances functionality and livability while maintaining the original approval. The transformation includes a new structural layout, programmatic mixes and reorganization, and the optimization of inaccessible or unused spaces, turning limitations into opportunities. This project tests the flexibility of regulatory frameworks, offering a model for revisiting and improving approved projects without reopening the entire approval process.   Pilot 2: Contextual Housing in a Loosely Defined Social Landscape   The second pilot is in a city with growing development interest but lacks a clear social or cultural identity. Here, the challenge is not to maximize units efficiently, but to create housing that resonates with the local community and supports its growth. By integrating local narratives and cultural references, the design fosters a strong sense of place, transforming the development into a vibrant center of community life.   In City B, a rapidly developing city with many pre-approved housing projects, there is little need for more affordable or targeted housing. Instead, this project goes beyond conventional models, offering a strategy to improve residents' lives by introducing mixed-use spaces and a central hub that encourages community engagement. This approach makes City B more desirable for families considering relocation, while also setting a new vision for the city's future.   Rather than conforming to existing urban goals, this project aims to redefine Pomona's ambiguous vision, shaping the city's evolving identity through spaces that support communal living, work, and interaction.

Common Ground: Reimagining Residential Block for Collective Living

Leyuan Li, University of Colorado Denver

[City Redacted] is facing one of the most acute housing shortages in the United States, plagued by a deficit of approximately 70,000 housing units. This scarcity has led to significant housing inequity and unaffordability, further exacerbated by the predominant single-family housing model prevalent in most American cities. With a growing population and limited land availability, rental and mortgage costs have continued to increase, resulting in the displacement of low- and moderate-income households, thus intensifying the existing social and racial segregation. Moreover, the continued emphasis on single-family housing has prioritized the individualization and privatization of domestic spaces within its zone lot, attenuating the advantage of sharing spaces and resources among a more diverse constituency. With less flexible, collective arrangements, single-family housing fails to engage a wider variety of dwelling demands, creating more barriers to expanding the measures of affordability and collectivity celebrated by contemporary households. Following the ongoing efforts in many cities to reform zoning and housing policies, [City Redacted]'s Five-Year Strategic Plan has suggested new paths for expanding housing options by allowing the development of "Missing Middle" housing in low-rise neighborhoods. While these options are effective in improving affordability, the existing "Missing Middle" housing models appeal for an update to address cultural shifts and social challenges that influence dwelling changes for evolving demographics. Additionally, housing at this scale is usually explored on individual lots, overlooking the potential for larger, collective impacts prone to be cultivated at the scale of a residential block. Given these challenges, this pedagogical project asks: how could we reinvent "Missing Middle" housing and develop new typologies that engage diverse constituents and dwellers of growing American cities? Using the site of a block to explore a collective model for envisioning housing solutions, what domestic forms—such as living rooms and collective kitchens—could be shared and collectivized to enable a common ground for the community living in the block and beyond? In response to these inquiries, this paper presents a collaborative pedagogy for a foundational housing studio, proposing a series of reimagined "Missing Middle" housing schemes on a residential block in [Neighborhood Redacted] to explore new forms of collective living. Reflecting upon existing housing typologies and policies, students engage with local residents to develop a guiding framework for design efforts, such as rethinking building heights and incorporating shared facilities. Moving forward, students develop design schemes that tackle different lot conditions within the block, such as utilizing the backyards of multiple adjacent lots. By examining different collective arrangements and shared domestic spaces on the ground level, students propose new "Missing Middle" housing strategies, formulating a hypothesis of "Common Ground" that envisions a collective development of the residential block. Through accumulating a network of shared spatial and social resources, these reinvented "Missing Middle" housing options seek to establish a new mode of development at the scale of a block where the relationships between individual, collective, community, and city are socially defined and formally celebrated. This collaborative learning approach to redefining a housing paradigm will be further elaborated in the essay.

Simulating Effects of Florida's SB102 Live Local Act
Stephen Bender, University of Florida

Signed into law March 28, 2023, "The Live Local Act (LLA) is a comprehensive, statewide attainable housing strategy, designed to increase the availability of affordable housing opportunities for Florida's residents, who desire to live within the communities they serve." (https://www.floridahousing.org) By January of 2024 LLA was still fresh. Planners, developers, researchers, or policymakers could not ascertain its impact This Graduate Architecture Design Studio put forward cases, on sites in the Orlando, Florida, metro area that create housing to take advantage of LLA. Students looked at the contemporary city as a manifestation of limits prescribed by codes. They diagramed the rules of codes to uncover intended and unintended consequences by evaluating what values we perceive in the codes – existing and with the LLA.. Students developed affordable housing on a site, approx 2-4 acres that they selected based on SB102, Live Local Act (LLA) which preempts local zoning restrictions on density and building height, among other things. Projects reacted to two constraints, an imagined developer mentality which includes seeking the lowest cost and results in prevalent typologies, and the requirement to lower carbon, both embodied and operational. The studio focused on land use provisions of Live Local, not tax incentives. However, we assumed that developers will tilt the projects toward affordability to gain favorable financial results. The results quantify units LLA allows compared with the local code, and the number created after addressing development requirements such as open space, parking, building codes, and comprehensive design requirements. Students sought sites that support resident's success - near transportation, schools, healthcare, parks, urban amenities, jobs, and other benefits. The projects were reviewed by a panel of experts from each jurisdiction: Orange County, and the City of Orlando. It was important to see codes from the point of view of the jurisdiction that is hopefully making rules to make things better. Results show that the effects of Live Local Act are highly dependent on the jurisdiction. In Orlando LLA allowed the creation of 1.5 times the overall housing units, with a possibility that 20 percent of them might serve low-income needs. In Orange County LLA allowed 452 affordable units where there were none before. 350 could be low-income, or low-low income units using tax incentives. Our results are preliminary, not scientific, but nonetheless meaningful. This presentation will pair quantitative and qualitative results. We recognize that to practice architecture, we cede much decision-making authority to codes. Once we have understood these limits we operate within a realm defined by our decisions. These permutations, the iterations of design possibility on these sites within the limits of the code are the first instance of design. The decisions made by an architect within these limits are the expression of values that are not codified. The presentation offers six evocative architecture projects that express community focused values though design in the era of LLA.

Investigative Design Methodologies for Affordable Housing: Urban Complexity in the UAE's Industrial Zones

Jason Carlow, American University of Sharjah

This paper presents a range of investigative research and design methodologies aimed at understanding and improving affordable housing for working class expatriates in the Gulf region. The work, executed through a combination of undergraduate architectural design studios and independent faculty research, has focused primarily on the residential context within the industrial districts of the United Arab Emirates (UAE). Student-led design research has informed faculty-initiated scholarship and vice versa. This reciprocal approach to integrating design research and design education featured photo essays, written fictional narratives, short films, urban cartography and speculative architectural proposals. The provision of affordable housing is a particularly sensitive issue in the UAE, where there is a large, expatriate, working-class population and a large wealth gap between groups of residents at either end of the socio-economic spectrum. Between buildings dedicated to manufacturing, warehousing, the UAE's industrial zones are home to thousands of expatriate workers who reside in dormitories, apartments and make-shift dwellings nestled within the logistical infrastructure of the city. In reaction to a lack of public amenities, the working-class residents in these zones have re-inhabited the fabric of an inhospitable district with an informal layer of domesticity, work and leisure. If one wanders through the dusty streets and alleyways, one will discover vibrant domestic spaces, lively informal marketplaces and empty or ambiguous sites, adapted for play. Despite outward appearances, the industrial districts are incredibly complex and intertwined socio-economic networks of work, life and play. The understanding and definition of complex urban sites is a complicated task (Kahn,286) but one that is necessary for a sensitively designed architectural proposal. In order to foster better student understanding of the existing living conditions in the industrial zones, a series of design studio curricula employed investigative methods such as mapping, creative writing assignments and story-telling through short film production. Exercises in creating narratives were embedded into design assignments to contextualize the socio-economic forces that impact housing choice and availability. Focused on topics such as flows, informal networks, nodes and boundaries, projects developed cohesive and complex stories about cultural, social, and economic life in the industrial areas of Sharjah. According to Juhani Pallasmaa, "Architectural form is humanly meaningful only when it is experienced in resonance with life—real, remembered or imagined" (Pallasmaa, 6). This process provided students and educators with a conceptual framework to "imagine" architectural form, and think more empathetically about the complex conditions that affordable housing should address in rapidly developing cities. Through the formulation of narrative in the design process, students and faculty alike, developed a more empathetic awareness of the challenges that various groups of migrant workers face and how issues such as informality and geographical displacement impact the social and cultural resiliency of cities.

'Good Bones' and Changing Skins: Converting Post-war Towers into Accessible, Inclusive and Adaptable Housing

Madeleine Lachance, McGill University

While contemporary conversations focus on building new, most of the spaces we will be occupying in 2030 are those already built. In Québec, a significant proportion of our existing social housing stock is in a state of disrepair and was not designed to support the changing user needs of our diversely-abled population or our changing climate. This design research project explores the potential of gut-renovations for post-war concrete housing towers in Montreal, proposing a solution to upgrade the quality and sustainability of our existing housing infrastructure while filling the gap of adequate housing for people with more restrictive needs. The housing crisis will be exacerbated by the poor maintenance and subsequent loss of the housing we already have. Towers in the park are models for dense housing that represent significant embodied carbon and large financial investments from a previous generation yet many need major repairs. With their generous offset from lot lines, density built around elevator cores and the durability of their concrete superstructures, this typology represents exceptional potential for renewal and expansion. Yet, buildings like Montreal's, Habitation Rosemont the focus of this study, were built before the disability rights movement or creation of accessibility guidelines in Canada. They represent outdated spatial standards rooted in optimizing space for the "average" body resulting in restrictive environments for those who deviate from the presumed norm. People with low mobility, low vision, hearing difficulties or cognitive disabilities all embody complex and intersectional identities whose needs are rarely fully met by existing or even new built housing. Starting from the principals of Universal Design and current accessibility standards in Canada this project's goal was to 'meet and beat' our contemporary prescriptive approach to designing accessible spaces. Instead, it explores how accessible spaces must be designed centering adaptability and resilience to truly accommodate the changing and ageing of both buildings and occupants. Making a point to preserve the number of bedrooms in the original tower while upgrading and diversifying its unit typologies, the resulting design proposal introduces multi-bedroom units, communal kitchens and 'supported' units modelled on those in long-term care, to accommodate a wider range of atypical co-living and community care structures. By extending the floorplate at key locations, improving exterior balcony conditions and wrapping the building in an energy efficient skin, the result is an upgrade to the architecture, accessibility and sustainability of the housing complex. This proposed solution radically rethinks the social housing unit and tower, focusing on the ways spaces work in dialog with community supports and social systems to meet diverse needs. Whether formal (ex: home care, long term care, etc.) or informal (ex: community care webs, elderly family members living with younger family members, etc.), systems of care and support are essential to true accessibility. By facilitating the ways people already live and care for each other in community, this tower retrofit design creates intentional space within our housing stock for those who are typically excluded.

A Taxonomy of Vacancy: Assessing the Capacity of Underutilized Commercial Strips to Absorb Infill Housing

Ian Caine, Wei Zhai & Esteban López Ochoa, University of Texas at San Antonio
Rudy Niño, City of San Antonio
Chris Quattro, Appalachian State University

This research project aims to counteract geographic expansion in San Antonio, Texas by identifying and quantifying underutilized parcels along commercial strips and proposing their strategic infill with multifamily housing. The shifting landscape of retail and office space, driven by the growth of e-commerce and remote work, presents an opportunity to reconsider land use along primary arterials. Furthermore, advancements in shared mobility, automated vehicles, and bus rapid transit reduce the need for parking lots, changing the highest and best use of land in these areas. This project supports efforts to accommodate Bexar County's expected growth of over one million people in the next 25 years, requiring 500,000 new homes [1]. The project combines data analysis and design thinking to explore the following research question: To what extent can San Antonio policymakers accelerate multifamily housing production by encouraging residential construction along underutilized commercial strips? The research team is led by an architect and includes two data scientists specializing in urban planning, a municipal planning director, and an expert in land development regulations and zoning. The project is structured in two phases. In Phase I, the team employs quantitative methods to develop a taxonomy of vacant and underutilized land parcels, focusing on seven commercial strips corresponding to proposed bus rapid transit routes in San Antonio. In Phase II, architecture graduate students will use design methods to create new prototypes for affordable and sustainable multifamily housing that address changing economic, programmatic, and demographic needs. The idea of infilling or repurposing vacant and underutilized land is well-documented in architecture and urban planning literature. Ellen Dunham-Jones and June Williamson's comprehensive case studies highlight the adaptation of typical suburban typologies, promoting walkable infill development to improve long-term sustainability through more efficient land use [2]. Likewise, Peter Calthorpe has explored revitalizing the Bay Area's underused arterial strips, potentially developing 1.3 million multifamily units at medium- to high-density levels along existing and future transit corridors [3]. This paper presents results from Phase I of the team's research, which uses quantitative methods to evaluate, count, and classify vacant and underutilized land along aging commercial strips in San Antonio. The team employs ArcGIS Pro to develop proformas for these land parcels along seven commercial strips that align with proposed bus rapid transit routes. To identify and assess the parcels, the team leverages data from the American Community Survey, satellite images, Data Axle sales data, open vacant land data, and cell phone records, aiming to establish benchmarks for evaluating their viability for infill housing. After identifying the quantities and locations, the team will develop a visual Taxonomy of Vacancy for the seven strips. The findings will be presented through data visualizations that illustrate the intersection of vacancy, geography, economics, and demographics.

Open-Air Care: Two Models for Collective Living in Los Angeles
Jeffrey Liu, California Polytechnic State University

Long dominated by low-density zoning policies at odds with the increasing demand for housing, Los Angeles is in dire need for dense, affordable housing models. Beyond the benefits of density for sustainability and affordability, this case study presentation will highlight how collective living establishes communities of care that help working-class residents sustain themselves. Ranging from cooking to childcare to labor deemed as "housework", care is work that households perform to maintain themselves, uncompensated labor which Sylvia Federici argues as a form of exploitation.[1] Not only is this exploitation classist, as poorer people tend to lack resources and access to care, but it is also gendered, as this domestic labor is often relegated to women. As a solution to the housewife's exploitation, feminist movements in the 19th century proposed collective living models with common domestic spaces in which housework would be performed more efficiently as a collaborative effort.[2] This case study presentation will highlight two proposed models for affordable collective housing in Los Angeles that utilize outdoor and semi-outdoor spaces as domestic commons. The first project, Dingbat Court, combines and reinvents the multifamily typologies of the dingbat and the bungalow court for communal living (Figures 1-5).[3] Drawing from the dingbat's strategy to create useable covered space below elevating living units, as well as the bungalow court's spatial arrangement of units, the building is organized around a central courtyard with a porous street-facing facade of shaded outdoor patio and parking spaces. The elevated second level provides semi-enclosed "wintergarden" spaces at the shared entry between units, allocating expanded areas for cooking, laundry, and childcare without the increased cost of full enclosure.The second project, Shadow Housing, is a live/work collective housing model that configures new domestic schedules of work and care through light and shadows (Figures 6-9). As remote work paradigms rupture the boundary between the office and the home, the available time for housework is being subsumed by a "flexible" expanded workday. Shadow Housing utilizes the sun to dictate a daily schedule balanced between productive and domestic labor. Above a ground floor of enclosed private units and semi-enclosed patio rooms shared by two units, the rooftop common is composed of walls angled to cast shadows, forming shaded outdoor rooms at designated times of day. Demarcated by lines that approximate the average shadow length and angle at the specified time of day, these spaces shift in and out of alignment with the casted shadows according to their scheduled time of use within a reconstituted workday. By alternating between periods for work and shared domestic labor, Shadow Housing tethers the workday to the movement of the sun, establishing a spatial and temporal separation between work and the necessary labor of care. Ultimately, for a city of predominately low-density or single-family zoning where care is performed as an isolated act, these models of housing with open-air commons can facilitate networks of communal care between residents, serving as potent paradigms for affordable co-living within the low-rise conditions of Los Angeles.

DRIVE-IN

Daniel Jacobs, University of Houston
Brittany Utting, Rice University

Despite Houston's characteristic suburban sprawl, distinctive housing types have developed in response to the city's economic and climatic conditions. This project updates one such type—the low-rise drive-in courtyard apartment—which emerged in the 1960s and remains one of the few sources of affordable multi-family housing in the urban core. The type consists of elevated second-floor residential units with parking below, minimizing land costs while fulfilling the city's parking requirements. The courtyard typically includes a shared garden and swimming pool for Houston's hot summers. Yet despite the typology's climatic adaptations, the incorporation of mechanical systems has compromised the original schemes, creating air-conditioned interiors closed off from Houston's varied seasons and climates. Today, the city's mechanisms of private development are replacing these modest courtyard types with luxury townhouses and large-scale developments, not only causing significant gentrification and displacement but also radically altering the accessibility of historically diverse neighborhoods. By recalibrating the relationship between land use, collective ownership, and adaptive urban form, DRIVE-IN reimagines the courtyard apartment as a critical source of affordable housing in Houston's core. DRIVE-IN is an ongoing research and design project that seeks to update Houston's drive-in courtyard apartments as a new approach to housing affordability, density, and climate agency. As speculative development in Houston continues to cause rampant increases in rent and cost of living, the project proposes alternative ways to increase density without displacing people to the periphery. Through the design of twelve new typological adaptations of the drive-in courtyard apartment, the project tested the degree to which the constraints of the existing type allow for new forms of environmental enclosure and collective life. The typological system can expand to include multiple courtyards interconnected by shared balconies, potentially offering new sequences and relationships between the units and the landscape. The project assumes a future planned obsolescence of parking requirements, converting the existing spaces into shaded breezeways, covered passages, or multi-function workshops that animate the interior collective spaces and connect the courtyards with the street. This project further adapts the envelope system of the drive-in to create a more open relationship to the building's exterior, using the second-floor facade as a flexible and layered system of operable panels that maximize access to light and air and generate new collective relationships. DRIVE-IN also proposes an approach to housing governance using alternative ownership models, such as Community Land Trusts, building off of successful financial infrastructures that already exist in the Houston context. Through a process of accumulating, centralizing, and collectivizing ownership of parcels at a variety scales, the projects works between and against the dominant free-market logics of housing development to challenge the inequitable conditions of the city today. Ultimately, as a study in pragmatism, DRIVE-IN asks: Can these outdated building types be reimagined to adapt to Houston's rapidly changing climatic stresses without compromising their affordability, modesty, and economy? By adjusting the relationship between typology, ownership, and envelope, the project imagines new ways to restructure the relationships between Houston's climate, social life, and current forms of urbanization in the city.

Workforce Housing Townhouse: Parking and Affordability
Jason Chandler, Florida International University

Located in the heart of a diverse city these apartment townhouses are conceived as a prototype for the city. As compact urban buildings, these structures can be built incrementally over time on small or large lots. This project was built in two phases by separate owners. The second owner liking the first project, sought to maintain the project's design with slight internal and façade variations Each of the (4) apartment townhouse is three stories tall and 4,500 square feet in size with (2) two-bedroom (1,170 sqft each) and (2) efficiency/one bedrooms units (600 sqft each). The front and back facades are open and the sides are party walls. At 25'-0" wide, these townhouses can be repeated to fit the typical 50'x100' building lot. The building structure is composed of reinforced concrete block masonry with cast-in-place concrete slabs. This city is dominated by vehicular traffic, highways and minimal public transportation. These four infill apartment townhouses were built without on-site parking. Over the years, parking requirements have risen. They began with one parking space per unit and now have grown to 1.5 spaces per unit with additional parking for visitors, or 1.7 spaces per unit (essentially 2 per unit). This causes residential buildings to become more expensive to build and forces developers to build for a more affluent buyer. This insidious zoning requirement incentivizes gentrification and makes affordable housing financially undesirable. To create affordable housing in the urban core, the architect and developer lobbied for and changed the zoning code to allow no on-site parking for small-scale buildings near mass transit in the city center. Before this code change, 12 parking spaces were required for this project (10 on site, 2 off-site). For these small sites, this would have required the entire ground floor to be parking, lift the project off the ground and require an elevator. While this new code may sound common for cities around the world it is not for this car-centric city. Without having to build on-site parking this project promotes the use of mass transit and a pedestrian friendly environment. Each townhouse is a prototype for small scale ownership and equity growth. These townhouses are four individual buildings that can have four separate owners- ones that can live in one unit, rent out the others and have a business on the ground floor. The townhouse is, for many American cities, a typology that creates dense, mixed-use neighborhoods. It is repetitious and small-scale and creates a fine grain of urbanism of walkable streets, developed facades, and clearly defined public space. For these cities, the townhouse has proven to be a durable building type that, after its inception as a single-family house, has been broken into smaller apartments with ground-floor commercial uses.

Party Wall Common

Petra Kempf, Washington University in St. Louis

This proposal confronts the concept of ownership, as well as the challenges pertaining to our disconnection from one another and our environment, by exploring the legal and spatial conversion of party walls typical of row house typology into a common ground. In such a common ground, neither the public nor the private "governs"; rather, a multitude of interactions generated by a collective body embracing a field of changing configurations, by which the duality of "I" versus "THEY" is permeated by a third entity: the "WE". The notion of "we" is understood here as the legal and spatial materialization of a common ground unfolding via a party wall, in which a collective embraces a generative form of ownership that embraces social equity and care for one another, while sharing both material and immaterial resources by means of inhabiting Party Wall Common. Fostered by the urban grid and its underlying legal apparatus, row houses were built predominately on speculation in the United States. In anticipation of the efficient prefab architecture of today, most builders followed pattern books to build this housing typology, comprised of replicable forms and designs based on a "kit of parts," which guided them through the construction process. This form of assembly allowed the builder to save labor and material costs and the involvement of an architect. Row houses are wooden framed dwellings that are attached to one another so that each one shares a party wall with its neighbor. The party wall, built on the property line between two properties is a loadbearing masonry structure to service two row houses with plumbing and other infrastructural support, and connecting to the larger urban system.   Given the party wall's legal context and spatial position between two row houses, they provide an ideal ground to speculate about different forms of ownership and future ways of living. In other words, the party wall resembles an ideal platform towards the possibility of spatializing common ground, literally and figuratively speaking. Obviously, transforming a party wall into a common ground requires a different understanding of its legal status. This could include the introduction of a Community Land Trust (CLT) where land is owned collectively while the housing unit is owned individually. This sets up the ground for the physical transformation of the party wall. The scale of such intervention could include the insertion of a sliding door, or a built-in wall cabinet for sharing kitchen appliances, to the scale of a mini house or a work-from-home setup; all to enable the sharing of space, knowledge and goods among its residents. Within these parameters, this proposal will examine two questions. First: how can a party wall serve as a legal and spatial trigger to be distinguished from property configurations that are tied to extractive forms of ownership and allow for a common ground to unfold, and second: what mechanisms could architecture offer to respond to and absorb the spatial changes common ground generates?

Well-Being + Health: Rethinking Standards
Friday, January 10, 2025, 4:30pm-6:00pm

Defining and Redefining Affordable Housing Design Standards Through A Wellness Lens

Camille Sherrod, Florencia Jouan, Daniela León, Joelle Guay & Thomas Wensing, Kean University

Our student-led project "Defining and Redefining" addresses critical issues related to housing quality, mental health, and social stigma. It aims to introduce a creative approach to both better understand affordable housing design and provide suggestions that could redefine design practices based on evidence-based metrics. Complex funding models and financial intricacies in the U.S. hinder the realization of affordable housing projects without an emphasis on cost-cutting. As a result, design proposals often feature typical, bland cost-reducing or value-engineered details due to funding constraints. This leads to designed environments which both contribute to the stigmatization of affordable housing and neglect essential psychological human needs, negatively impact residents' mental and psychological wellbeing. Given widespread focus on addressing health inequities associated with affordable housing, discussions about housing design quality and mental health become increasingly significant. Our research identifies a crucial gap: the absence of an affordable housing study tracking successful design solutions and their associated psychological impact. Our study evaluates contemporary examples of 'good design' and assesses them on psychological wellbeing through a wellness lens. Our goal is to reshape how affordable housing projects are evaluated and to advocate for a healthier environment for residents, leading to broad implications for housing policy and design evaluation metrics. Our comparative analysis of 247 regional and national award winning non-market housing projects from 2003 to 2023 uses databases that include the AIA National Awards database, SARA National Design Awards database, and the RIBA International Awards database. It assesses three key design elements: material selection, spatial planning, visual stimulation. By challenging contemporary design approaches, it argues for a new qualitative metric for evaluating these projects. Evaluating residential projects can serve as a form of community repair, fostering a sense of wellbeing and pride among residents. Addressing this aspect of wellbeing is particularly important as cities seek to address the housing crisis. In the US, recently created federal programs have paved the way for government-funded residential conversions in urban counties nationwide, including 67% of counties in [state redacted]. Viewing affordable housing projects solely through the lens of economic and environmental metrics fails to fully capture the wellness drivers behind good design. Many studies support this by exploring the significance of texture-rich environments' impact on psychological wellbeing, mood, and cognitive function [1]. Our research identifies a significant gap: the lack of comprehensive studies tracking successful design solutions and their psychological impacts particularly concerning texture-rich and visually stimulating design elements in affordable housing. We advocate for a redesign of affordable housing practices that support mental health, reduce stigma, and become sources of pride and well-being for their residents. In essence, this proposal advocates for a new standard for affordable housing—one that challenges current trends of cost-cutting designs and instead advocates for an approach to foster health and dignity, setting a new standard for what affordable housing can, and should be.

Regenerative Sustainability as a Catalyst for Community Salutogenic Health
Lisa Platt, University of Florida

Understanding the impact of residential dwelling design on human well-being is essential for advancing comprehensive community health equity. Housing quality is an important social determinant of health, particularly in marginalized communities facing structural injustices, the adverse impacts of climate change, medical under service, economic disenfranchisement, and disparity (Swope & Hernández, 2019). This session discusses current case study research examining the aspects of housing design that may impact individual residents' perceptions of mental and physical well-being. The methods the study employs include the administration and analysis of the results of a Regenerative Sustainability-based survey to evaluate ongoing neighborhood housing revitalization projects' potential to influence resident salutogenic health.   Salutogenic models of health consider contextual factors that contribute to human physical and mental well-being, like access to healthy and restorative environments (Beute & de Kort, 2014). A viable method for operationalizing design that promotes salutogenesis, in other words, whole-person health, is to select and apply evidence-based systems strategies that facilitate this outcome (Quesada-García et al., 2023). Implementing salutogenesis within research-informed sustainable planning frameworks provides a decision-support tool for designing environments that optimally promote human and ecological vitality (Stoltz & Schaffer, 2018). Using Regenerative Sustainability (RS) models to improve the salutogenic potential of design can improve occupants' physical and mental wellness through enhanced interior environmental quality, placemaking, and universal design (Kujundzic et al., 2023). The RS paradigm evolves the process of sustainable planning, design, and construction by shifting its focus from resource use reduction to universal and continuous improvement of holistic socio-ecological system viability and well-being (Gibbons, 2020).   The context of the community case study presented is the Historic Eastside neighborhood in Jacksonville, Florida. This urban-core community is one of Jacksonville's oldest and holds significant local and national importance as a hub of Black economic, social, and cultural vitality. The Historic Eastside neighborhood is also situated at the southern end of the coastal Gullah Geechee Cultural Heritage Corridor, making it a prominent example of this unique heritage and an important cultural asset to the region. The preliminary outcomes of the case study analysis suggest that RS housing design may better support urban core communities' changing needs and ability to adapt to evolving climate conditions, ultimately improving overall quality of life and reducing health disparities in vulnerable populations. By continuing to analyze housing revitalization initiatives in the Historic Eastside neighborhood against RS design goals, this research seeks to understand the emergent relationships between housing design, resident perceived well-being, and community resilience to escalating regional environmental risks. The presentation of current study findings will also demonstrate how RS design strategies may enhance housing environments' ability to support universal design goals, improve interior environmental quality, promote aging in place for older adults, foster social cohesion, and optimize resource distribution. The outcomes from this research will potentially guide neighborhood planning decision support, inform policy decisions, and contribute to housing design that promotes more resilient communities.

A Polyvalent Approach to High-Density Housing: Rethinking NYC's Housing Design Guidelines

Katharina Kral & Yue Lin, Cornell University

Housing design guidelines have traditionally adhered to rigid standards that promote one-size-fits-all apartments, often struggling to address the evolving needs of contemporary urban dwellers. By focusing on unit sizes and room dimensions, these guidelines often do not adequately respond to site constraints and overlook opportunities to optimize space usage and unit layouts for more efficient solutions. Yet, given the exacerbating housing crisis in U.S. cities, with a nationwide deficit of 1.5–2 million housing units and rising rents [1], combined with the fact that buildings contribute significantly to climate change by accounting for 35% of U.S. carbon emissions [2], there is an urgent need to rethink how we design, build, and live. This paper introduces polyvalence as a spatial tool for rethinking the housing design guidelines specified by the New York City Department of Housing Design and Preservation (NYC HPD) [3], emphasizing the importance of spatial versatility for long-term sustainability, housing equity, and resident well-being.Polyvalence, in contrast to conventional single-purpose housing design, aims to maximize the utility of spaces and facilitate adaptation to changing needs over time without significant physical alterations—a proactive measure to help future-proof housing against changing demographic and societal trends. Moreover, designing in alignment with residents' needs has been shown to enhance well-being [4] and promote sustainability by extending the lifespan of buildings and reducing the need for frequent renovations, material waste, and associated emissions [5], [6]. To illustrate the practical application of polyvalent housing, this paper presents a series of innovative case studies from different global contexts. These case studies are analyzed to identify and categorize architectural elements, patterns, and spatial tactics contributing to polyvalence, such as room proportions, spatial divisions, adjacencies, and access routes. The insights gleaned from this study are used to propose alternative, more versatile solutions to NYC HPD's housing design guidelines, aiming to quantify the benefits of polyvalent housing for environmental, societal, and human well-being. Specifically, the study seeks to investigate the effects of the revised design guidelines on alleviating the housing crisis, housing inequities, and climate change, and understanding their impact on resident well-being. In conclusion, this paper argues for a paradigm shift in high-density housing design guidelines, advocating for a polyvalent approach that embraces spatial versatility and sustainability as core principles. By rethinking how spaces can be used and how they can evolve over time, architects, planners, and policymakers can create housing that is better suited to meet the diverse needs of contemporary urban dwellers. The adoption of polyvalent strategies presents a significant opportunity to redefine the future of housing, making it more resilient, inclusive, and environmentally conscious.

Thinking Inside the Box: Radically Rethinking Graduate Student Housing

Ahmed Ali, Texas A&M University
Rohit Kumar, Piloo Mody College of Architecture
Patricia Kio, University of Florida

According to the National Center for Education Statistics (NCES), and as of 2021, out of 19.0 million students attended colleges and universities, including non-degree-granting institutions, there were approximately 3.2 million graduate students enrolled in masters, doctoral, or professional degree programs in the United States (US). Although many studies have focused on housing issues for undergraduate college students, there is little data on housing challenges for students who pursue graduate and professional degrees. A large number of full-time graduate students who are single, married, or have children, solely rely on teaching or research assistantship stipends received from their respective universities. These graduate students typically spend more than half of their monthly income on housing. With the rising cost of off-campus housing, and the lack of affordable on-campus solutions, graduate students in the US are faced with major challenges, housing insecurity and homelessness. This research radically rethinks housing for graduate students and proposes alternative solution to housing insecurity and homelessness at the currently largest university in the US. An innovative architectural solution namely, on-campus infill housing, attempts at providing a case-study parasite solution designed for a particular campus building. The infill housing approach utilizes the typical American university campus as an urban context that provides innovative architectural solutions. The study also surveys the graduate students' population, documents their responses to the infill architectural solution and analyzes their housing challenges. The study utilized a two-stage mixed methodology. First, an architectural proposal for small, medium, and large (S, M, L) infill housing units that was designed and modeled based on a host building on the university main campus. Second, an online survey deployed through a university-wide distribution channel for more than 15,000 graduate students. Approximately 1,500 respondents completed the survey, with a response rate of 11%. Findings from the data analyzed indicated that nearly 35% of the respondents had experienced housing insecurity whereas 13% of the respondents had experienced homelessness. In terms of gender, non-binary students reported 79% and 53% housing and homelessness challenges. In terms of race, black and native American students reported higher numbers of housing issues in contrast to other races. 44% of the respondents expressed the willingness to live in the study proposed in-fill housing units' solutions. The majority of participating graduate students preferred the medium size infill housing model.This research intends to propose a new housing paradigm for an under researched college students' population and ultimately benefit university administrators who struggle to address the issues of housing for their graduate students' population using mainstream developer model housing approach. Architects and campus planners who are involved in university housing projects and need a better understanding of the housing issue will benefit from this study. Lastly, researchers who are involved in college students housing insecurity and homelessness.

Reimagining Collective Ownership: Grassroots Strategies for Affordable Housing in New York City

Edward Palka, Columbia University

New York City has long been emblematic of both opportunity and inequality, with its housing market increasingly defined by unaffordability. With rental rates in the city hovering around twice the national average (NYU Furman Center, 2021), and homeownership remaining unattainable for those without significant financial resources, the city's housing crisis has reached a critical juncture. Currently, one-third of New Yorkers spend over 50% of their income on rent, far exceeding the commonly recommended 30% threshold (NYU Furman Center, 2021). Compounding this issue, the city's cost of living index stood at 2.3 in 2022, making living in New York City 230% more expensive than the national average (MERIC, 2021). These figures underscore the unsustainable nature of the current housing market, threatening both the city's functionality and its cultural and economic diversity. Given this context, there is an urgent need to explore alternative models of housing that prioritize equity and community. This paper proposes a shift towards collective ownership models, which leverage grassroots capital to create more just investment opportunities within the city. By drawing on both local and international examples, this research aims to provide a framework for more accessible and equitable housing solutions in New York City. The paper begins with an overview of the existing housing policy framework in New York City, including an analysis of current ownership models. It then surveys collective ownership approaches within the United States, such as deed-restricted homeownership, limited equity cooperatives, community land trusts, and neighborhood associations. These models are examined not only for their ability to make housing more affordable but also for their potential to foster community resilience and social cohesion. Further, the paper expands its scope by examining "Collaborative Housing" models from Europe and South America, where innovative approaches to collective ownership have been successfully implemented. For instance, the community land trust model, which has gained traction in various U.S. cities, is critically analyzed through the lens of John E. Davis's The Community Land Trust Reader (2010). Similarly, international examples from Europe's collaborative housing sector, as detailed by Blanc (2020), provide valuable insights into how such models might be adapted to the New York City context. Building on these examples, the paper proposes a new model of grassroots intra-generational investment and ownership. This model seeks to diffuse the capital intensity of homeownership by pooling resources at a community level, thus making ownership more attainable in a city where renting is currently the only viable option. Moreover, this model introduces a novel pattern of collective living, emphasizing the importance of community-oriented spaces that are currently lacking in New York City. In conclusion, this paper argues that reimagining housing through the lens of collective ownership can help address the intersecting crises of affordability, equity, and community in New York City. By adopting these alternative models, the city can not only provide more accessible housing options but also reinforce its social fabric, ensuring that New York remains a vibrant and diverse place to live for all its residents.

False Creek and St. Lawrence housing: Ideologies of community housing in Vancouver and Toronto in the 1970s

Sara Stevens, University of British Columbia
Adrian Blackwell, University of Waterloo

If architectural form can offer a window into understanding political ideologies, then what can two housing projects tell us about a moment of transition? False Creek South in Vancouver and St. Lawrence in Toronto, two of the largest urban redevelopment projects in Canada in the 1970s, were built at a time when architects in North America began to rethink the form of high density modernist social housing of the postwar decades. In the large Canadian cities of Vancouver and Toronto, "progressive" municipal councils embarked on ambitious plans to create social housing based in new planning and architectural principles that emphasized walkability, sociability and community. But were these forms embodiments of a more progressive approach to integrated-income neighbourhoods, or were they early indicators of the neoliberalism to come that dashed the hopes of a more stable presence of government in the construction and management of social housing?   While both St. Lawrence and False Creek South mobilized current planning theories and referenced contemporary precedents, the urban forms they produced were radically distinct. Architects in Vancouver, like Richard Henriquez and Thomson Berwick Pratt and Partners, focused on the sectional interaction of landscapes and built form and the graduation of public and private spaces; architects in Toronto, like Irving Grossman, Jerome Markson and George Baird, focused on the continuity of urban form, hybrid programs and the clear delineation of public and private space.   Both projects offered significant improvements on the paternalistic and highly disciplined forms of modernist housing development. At the same time, they emphasized the mixing of incomes and tenure types, which reflected that government attention had turned away from an emphasis on deep affordability of state-owned rent-geared-to-income housing, and toward tenures like rental cooperative and condominium, approaches which reflect the political shift toward neoliberalism.   This paper compares and contrasts the architectural form of these two projects to understand the different precedents and design philosophies that undergird them, locating these material characteristics in the context of the changing landscape of municipal politics in 1970s Canada, and in relation to larger international political and economic forces in which these developments operated.   ---------   Image 1 caption: False Creek Cooperative Housing by Henriquez Partners. "False Creek Decline & Rebirth: History, Planning, Architecture, Feedback," The Canadian Architect 25, no. 7 (July 1980), 32. Image 2 caption: Thompson Berwick Pratt and Partners for City of Vancouver, "False Creek Area Six Proposal." From "False Creek Decline & Rebirth: History, Planning, Architecture, Feedback," The Canadian Architect 25, no. 7 (July 1980), 19.   Image 3 caption: Block Study, City of Toronto Housing Department w/ George Baird Architect, October 1975   Image 4 caption: St. Lawrence Housing, Toronto, Axonometric of the completed Project, late 1990s.

Housing the Floating Population

Evan Saarinen, Wenzhou-Kean University

Our research centers on China's Floating Population- the 375 million migrant workers who reside within urban areas but lack equity in access to various services and amenities provided to urban residents due to their rural domicile status. [1] This inequity is in part due to the country's Hukou system, which designates all citizens as either urban or rural residents. Designed to limit population movement, extract rural surpluses, and develop urban industries, the Hukou system perpetuates economic inequality. [2] Migrant communities exist in a state of precarity, building the very cities they are denied access to. [3] How can architecture give form to these migrant communities by reframing their social, cultural, and political institutions through the development of new prototypes for workers' housing?   Through an intensive study of the lives, customs, family structures, habits, and migratory patterns of the Floating Population, we were able to formulate housing strategies that deviated from conventional housing models. We placed particular emphasis on the socio-spatial patterns we observed within both the city and the countryside. This included observations of leisure farming, commensal eating patterns, and the use of the street as a place of production and socialization. [4] This point of departure allowed us to rethink space-making, recognizing architecture as a form of research-based knowledge. Our investigation reveals the repercussions of China's urban liberalization since the 1970s. It highlights opportunities to improve migrant living conditions and opens the floor for architects/urbanists to advocate Hukou reform. [5] This research can serve as a platform for public dialogue on experimental, socially inclusive urban models in China. The extended families of migrant workers are equally impacted by this urban-rural divide. The scale of this demographic, and the underresearched new forms of domestic and collective life that have developed out of necessity, demand attention to gain a clearer picture of the economic and social conditions present in China today. Often, the middle generation migrates to cities for work, while the elderly care for grandchildren in the home village. Once the grandchildren are old enough, they too migrate to the cities, as their parents return to the village. This cycle, repeated by over 80% of rural families, places domestic tasks like childcare, housekeeping, and land cultivation on the elderly and women - unpaid labor that sustains the exploitative migrant labor model. [6] When the elderly generation can no longer care for the household and the land, extended family or neighbors assist. The dissolved rural household has adapted in the absence of the middle generation, developing new collaborative social relations beyond the immediate family. New models and networks of care and collectivized life have emerged and can be further imagined.

Innovation in Family Needs and Strategic Deployment: Dalmatian Case Studies URBS-4 and URBS-5

Dragana Zoric, Pratt Institute

From 1949 to 1974, Yugoslavia built a staggering two million housing units[1] for its worker population[2]. The remarkable numbers can be attributed to the inclusion of the right to housing in the Yugoslav Constitution (Ustav) of 1948.   The formation of socialist Yugoslavia at the conclusion of WWII, was predicated upon a large-scale peasant uprising against Nazi occupation. What followed were four long years of ground combat, intense war unaided by the East or West. The events resulted in devastated cities, saw each family decimated, and finally - a new reinvented society being born. Having replaced a largely agrarian economy, the novel, devised system of self-governance called "self-management" arose as a radical and complete transformation of ethics, social structure and working life, where the masses were tasked with its implementation. It was a subtle, yet strikingly important realization that to self-manage, and to do it well, the masses needed to be educated, and thus new institutions of all types were required. Yugoslav society was completely rethought and restructured: governance, all phases of education, entire industries, infrastructure and housing - all created anew, from scratch. Housing of that period was characterized by a mandate of innovation and experimentation, both on an urban scale, but also at the level of the detail - materiality, constructibility and prefabrication. Much of it involved a deep inquiry into patterns of many mediums and configurations. The design process of "packing" units for efficiency (of egress, layout…) but also increased privacy, resulted in novel settlement densities and innovative building types[3]. A modernist aesthetic held much value as the architects in charge were influenced by the West, and as a collective, strove to surpass it. Amongst the resulting plethora of diversity of Yugoslav socialist housing, which runs the gamut of scale, form and type, this paper dispenses with looking at large-scale planning efforts, nor does it dwell on brutalist sculptural form; instead, it focuses on a strategy of the URBS(Urban Institute for Dalmatia)[4], which, constrained by historic city remnants, implemented discreet identical individual buildings across the region as reproducible types.   The two buildings covered here, named URBS-4 and URBS-5, were designed by the prolific architect Lovro Perković. URBS-4 was built in at least 11 documented locations (Bol, Trogir, Plokita-Split, Mažuranićevo šetalište-Split, Balkanska-Split, XX Divizije-Split, Makarska, Kaštel Gomilica, Dubrovnik, Herceg Novi, Knin) and URBS-5 in 7 (Mintička -Spilt, Šibenik, Pula, Skalice-Split, Opatija, Glavičina-Split)[5], from 1958 to 1965.   The idea behind the buildings was rooted in innovation into basic family programmatic needs and w the results of new residential standards. Differing in proportion and volume, URBS-4 is a cuboid object, while URBS-5 is a long bar; both reflect budgetary discipline within which they excel in maximizing geometry and composition. Perković's architecture provides an equal distribution of light and space, despite lacking heroic architectural gestures. Former Yugoslavian cities today all reflect the heroic effort to meet the urgent demand for quality housing through large public works. In the housing crisis of today, we can look to proven compelling Yugoslav solutions and strategies[6].

Ecology: From Values to Standards
Saturday, January 11, 2025, 9:00am-10:30am

Architectural Speculations of Future-Proofing NYCHA Housing

Timur Dogan & Katharina Kral, Cornell University

Cities in the U.S. are currently grappling with climate change and a severe (affordable) housing shortage. These interrelated crises especially affect marginalized communities. Despite the growing risk from various climate change-induced environmental hazards such as sea level rise and pluvial flooding, high temperatures are the single most deadly climate change hazard in the US [1]. With adults in North America spending 87% of their time indoors [2], underserved neighborhoods often struggle to equip their homes to meet this growing hazard [3]. The aggravating housing shortage across U.S. cities, with a nationwide deficit of 1.5–2 million housing units and rising rents, makes it increasingly difficult to find affordable housing options, especially for low-income families. This forces more residents into substandard living conditions, straining the already overburdened public housing system and aggravating housing discrimination and health inequities [4], [5]. In addition to these societal challenges, it is well known that the built environment is a major contributor to global greenhouse gas emissions [6]. Its decarbonization is a massive challenge that requires immediate attention to limit the adverse effects of climate change [7]. Hence, cities across the U.S. are implementing ambitious decarbonization mandates. However, these policies often fall short of promoting housing justice and do not consider well-being, health benefits, and risks [8], even though decarbonization measures often require significant architectural changes that immediately impact the residents.   This research explores whether decarbonization efforts can simultaneously address these critical housing quality issues through targeted architectural interventions, thereby enhancing residents' quality of life while advancing environmental objectives, using the Redfern community in Far Rockaway, Queens, as a case study (Figure 1). The Redfern community is emblematic of the broader systemic challenges public housing residents face across NYC, including environmental injustices and substandard living conditions. This study proposes several architectural retrofitting strategies tailored to the unique typologies of NYCHA (New York City Housing Authority) buildings. Figure 2 shows an example retrofitting strategy that combines re-skinning of the building envelope with densification with strategically placed microphone units and rooftop activation. The study integrates a socioeconomic model with bottom-up building energy modeling to evaluate these design approaches. This methodology allows for a comprehensive analysis of the financial burdens associated with retrofitting specific building components, the cost-effectiveness of various retrofit measures, and the optimization of incentive allocations. Additionally, it assesses how different metric systems influence the prioritization of upgrade measures, ensuring that the most effective strategies are identified and implemented. This research aims to create a scalable blueprint for future-proofing NYCHA housing, one of the largest public housing networks in North America, which serves about 361K residents in 177.5K apartments across 335 developments [9], with the potential to extend these findings to other public housing developments facing similar challenges. The paper will describe a catalog of viable design measures and will extrapolate their potential impact by mapping adequate strategies to all suitable NYCHA housing in NYC.

Free Sustainability: Identifying Cost-neutral Operational Energy Improvements in Mulitfamily Typologies

Grant Mosey, University of Nevada, Las Vegas

According to the US Census, in 2023, the United States alone constructed approximately 450,000 units of new multifamily housing. This represents greater than triple the rate of construction of multifamily residential units observed during the 2011 trough following the great recession. Given the average size of a new construction unit now exceeds 1,000 net rentable square feet, this suggests that each year, the United States is adding almost half-a-billion net rentable square feet of new-construction multi-family housing units.   The vast majority of this development is being undertaken by for-profit developers. Because the profitability of these projects is inversely proportional to the cost of their delivery, developers are highly incentivized to deliver projects at the lowest possible price. Making large up-front investments to improve long-term operational energy performance is often not a priority, as this will increase the developer's up-front cost with the most of long-term benefit accruing to individual tenants and owners. It is perhaps understandable why developer's have historically been reticent to take on large, up-front expenses of installations like, for example, photovoltaic arrays, when they will be unlikely to realize much economic reward.   However, there are another host of sustainability measures which are capable of delivering long-term energy savings, which do not increase the up-front construction costs of a project. For example, while a developer may have no desire to contribute additional funds for the aforementioned photovoltaic array, he or she may be more likely to be open to changes such as altering the orientation of the building or the placement of fenestration on the envelope, provided these changes can be made at no additional cost.   Yet, the world around us appears full of new construction multi-family projects which have not only eschewed expensive sustainability measures, but have also been constructed without "free" sustainability measures. This project endeavors to question how much operational energy and associated greenhouse gas emissions may be saved by examining three projects, each representing a common multifamily typology in a unique climate region. As a proof of concept, we examine construction drawings for a garden apartment project in Northern California, a single-story apartment project in Florida's Gulf Cost, and a Mid-Rise "Four-over-one" double-loaded corridor building in Northern Wisconsin.   For each building and climate condition, we propose and test with hourly energy models a series of changes to explore how much operational energy demand can be reduced making up-front design changes which are "free". Stated another way, we approach each case study by asking how much energy could be saved over the building's lifespan through making changes which do not impact up-front construction costs. Our findings indicate that, for each of these real-world projects, substantial energy savings could have been realized using design changes which would not have increased the cost of the building. We propose using the results of this pilot test to prepare a more externally valid tool for designers which would help identify common places in which "free sustainability" opportunities are being missed for various multifamily housing typologies and climate regions.

[Project]: a Sustainable, Resilient, Affordable Housing Prototype
Duane McLemore, Mississippi State University

Students and faculty at [Institution] designed [Project] for [Competition]. Over thirty students from across [Institution] participated in this interdisciplinary proposal for a new single-family housing typology which addresses many of the challenges specific to the [Region]. This required a holistic reexamination of affordability, constructability, sustainability, and resiliency.   Addressing the affordability crisis for an entire region is not trivial. Encompassing the gamut of population densities, the [Region] demands a response that is flexible and scalable. Starting from a modular 4' grid and hybrid off/on-site construction, each home can be expanded from a one bedroom one bath core up to six bedrooms and four baths (all with optional carport). In [Project] a single person can purchase the core unit, then expand to two, four, or six bedrooms as their family grows. On sites with higher property costs, using a core unit as an ADU can help defray the higher mortgage amount. In rural areas, a single larger unit can replace multiple mobile homes on a property. A team of MBA students from [Institution] performed a market analysis, and respondents were positive about expandability as a driver of affordability. Major building elements will be built off-site using partially automated techniques, then transported to the site and installed. Unlike the mobile homes [Project] is intended to replace, it is built to standard building codes. This increases quality of life and safety and allows the home to be used as mortgage collateral. Facilitating the prefab modular approach, the exterior structural wall assembly is to be constructed of continuous 2-1/4" thick CLT panels (constructed from a native wood species). Insulation, exterior finishes, and external solar shades are packed inside the module for transport and applied on-site without need for special skills. By separating the structural and insulation / finish systems, on-site disassembly for expansion, maintenance, upgrade, and recycling are facilitated. This hybrid construction allows for quality control and economies of scale in the building the most complex building elements: kitchen, mechanical room, and saferoom / bathroom. The saferoom / bathroom is also currently under study for marketability as a standalone component, potentially becoming the first CLT saferoom to market. The [Region] has been heavily impacted by climate change. In response, [Project] integrates passive design strategies – due to the 8' plate height the roof slope can be reversed without further redesign for optimal solar panel exposure regardless of siting. This also allows passive cooling via interior air convection up and through the clerestory windows. The saferoom increases occupant safety in a region prone to violent storms. In addition to the expandable modularity, modular CLT saferoom, and wall system, [Project] features an energy management system with whole-home battery which facilitates resiliency against brittle electrical infrastructure, especially in rural areas. This paper will expand on these areas to lay out the most urgent questions and [Project]'s proposed solutions, the outcomes of the project to date, and future challenges / potentials.

Housing Expanded – Hyper-local Food Circularity

Anna Weichsel, Portland State University

How architecture intersects with systemic conditions of practice is a pressing matter. On global and local scales, we struggle to agree on shared values or narratives, let alone how to respond to the climate crisis that we are accelerating. Amidst this epistemic ambiguity, this paper reflects on the strategies of action research studios entitled "Sponged" conducted at Portland State University and its influences on Portland's newly adopted Lower SE Rising Plan as a successful model for integrating hyper-local food circularity as an adjuvant element for equitable and ecological housing development.   In response to the accentuated changes in rainfall caused by climate change, restorative infrastructures, like the sponge city concept, introduced in situ operations of infiltration, absorption, storage, and purification of surface water, opening possibilities to rethink urban epistemic practices. The design studios "Sponged" redefined the sponge city concept by integrating social and communal network analysis as the basis for suggestive typologies and urban sequencing and expanding the conception of housing to associated communal living condition centered on ecologically and socially integrated food production.   While Portland's abundant greenery and the infamous 'Portland Sun' euphemism suggest a harmonious relationship with rainwater in urban hydrology, the reality differs drastically - flooding, drought, heat islands, and polluted warmed stormwater are the typical suspects. These problems grow increasingly severe in the underdeveloped and disadvantaged neighborhoods on the SE city edge of Portland, pressured by a disproportionate impact of urban densification and dislocation of its population.   While the studios' focus on rainwater mediation centered conceptually on environmental potentialities within urban framework conditions, the outcome of an in situ action research exposed the communal need for an expanded conception of housing inclusive of culturally specific food production, processing, and retail as community stabilizing urban values in one of Portland's most racially and ethnically diverse SE areas. Based on Kurt Lewin's "Action Research and Minority Problems," we defined our action research as "comparative research on the conditions and effects of various forms of social action and research leading to social action." The urban analysis elevated an existing diversity of ethnically specific urban practices of farming, food production, and restorative actions for urban wetlands. This paper will delineate how engaging directly with local Indigenous and BIPOC communities informed the experimentation with architectural typologies and expanded the conception of housing to urban sequencing of hyper-local food circularity responsive to new environmental and communal realities.   This paper will further explicate the influences of these action research strategies on informing land use and urban zoning developments. From 2021 to 2024, Portland's Bureau of Planning and Sustainability (BPS), a specifically convened Project Advisory Committee (PAC), and the design studios addressed collaboratively the complex aspects of land use and transportation challenges in the precariously underserved area. The successful collaborative work model resulted in an integrative approach in BPS's zoning proposal, balancing urban densification with expanding environmentally significant zones for continuous open land in the plan area combining restorative environmental practices with a hyper-local food circularity.

The Solar Bundle: A Housing Model for Aligning the Solar Envelope with Urban Upzoning
De Peter Yi, University of Cincinnati

In 2021, Vancouver's city council approved the construction of six-story residential buildings on major arterial streets without the need to rezone. A major challenge facing such zoning policy reforms is the integration of medium-density housing in formerly low-rise neighborhoods. In response, the Solar Bundle is a housing design proposal that doubles as a tool for environmentally responsive upzoning. The project applies lessons from Ralph Knowles' groundbreaking research on solar access design, which he termed "solar envelopes."[1] Our proposal starts as a collection of stems: stacked rooms including stair cores, kitchens, bathrooms, bedrooms, and living spaces. These stems can be arranged into bundles of different units aggregated around a single stair core, inspired by the Point Access Block typology. The bundled stems can be shaped for different infill site conditions to create solar access benefits for residents and neighbors. Our project looks at the application of the Solar Bundle design strategy in a residential block in the Mount Pleasant neighborhood of Vancouver. We create a matrix of options for adding six-story residential buildings onto existing lots. Using Ladybug for Grasshopper, we reshape these six-story buildings to maintain a target range of direct sun hours for neighboring lots. The resultant building shapes inform our stem modules and the ways they form bundles, comprising the Solar Bundle design proposal. Through this method, environmental factors are used to inform an architectural strategy that can be resolved into specific designs. These designs create both environmental and social benefits. Stems step down to the south to reduce their cast shadows and step in at the east and west to allow more sunlight to shine into side alleys shared with neighboring buildings. The building's stepped form creates more exposure to natural daylighting and corner rooms for cross ventilation. The resultant terraces created by the stepping can be used for both private and shared access to outdoor space. Furthermore, the Solar Bundle also breaks down the monolithic form of typical multi-family dwelling typologies into smaller chunks, modeling a gradual densification of single-family zoned fabrics. The overall goal of the proposal is to bridge a technical approach to environmental benefits and a design-oriented approach to social questions of growing density.

The Intersection Of Inside and Outside

Graham McKay, Kean University

The Pritzker Prize Laureate for 2024 is Riken Yamamoto. The statement[1] accompanying the announcement praised Yamamoto's lifetime concerns for "community" but didn't elaborate on what this meant, how it was manifested in Yamamoto's built work, or how it began from a series of field surveys by Yamamoto and Japanese architect Hiroshi Hara. These surveys, beginning in 1972, surveyed over 500 vernacular towns and villages in over 50 countries. In 2015, Yamamoto published his conclusions in a book titled "権力の空間／空間の権力"[2] which translates as The Space of Power \ The Power of Space. Yamamoto found that housing in many cultures has a transition space between the public realm and the private realm and, since as early as 1978, has been designing residential projects that have some kind of physical "threshold" space neither public nor private[3]. This thinking runs counter to contemporary housing paradigms that enforce isolation in the name of privacy, either with houses turning their backs to the street or as apartments designed as hotels with anonymous doors off anonymous corridors. Yamamoto has designed many variations of "threshold" spaces linking public and private realms for persons visiting a house(hold) but the four projects of mine I present here are about the visual permeability of walls separating those public and private realms. Specifically, they incorporate voids mediating between windows and doors and the ostensibly public realm of an access corridor or lobby. In these four projects, persons in the public realm are aware of who is at home, and people in the private realm are aware of the comings and goings that constitute the life of the building. The first two projects originate in the British terraced house and US brownstone with their void spaces common to the semi-basement and semi-raised first floor distancing (but not separateing) the public realm of the sidewalk from the windows of the semi-basement and semi-raised first floor. [Fig. 1] The second project uses a variation of the access topology of 1960s scissor apartment blocks[4]. [Fig. 2] The third project adapts the access of André Devin's Cité Frais Vallon project to the same ends [Fig. 3] and the fourth project adapts the relationships of traditional Chinese courtyards[5] to low-rise and high-rise buildings. [Fig. 4] It might just be that we already have sufficient housing paradigms, and that all we need do is continually revise and update the ones we have, for the inevitably higher densities and lower-quality materials and construction of the future.

Thermal Comfort and Overheating in the Northeast of Mexico
Carlos Zepeda-Gil, Sylandy Flores-Suárez, Abril Vargas-Zamora, Juan Diego Maya & Ximena Contreras-Jaschack, Universidad de Monterrey

As the impacts of climate change intensify, housing in hot and arid climates faces significant challenges, particularly regarding indoor thermal conditions and their effects on residents' health. It has been well established that long-term exposure to high temperatures can exacerbate health problems, leading to discomfort and potential heat-related illnesses. Understanding these impacts is crucial for improving housing designs and developing localized thermal comfort standards that cater to the region's unique conditions. This study proposes a one-month pilot to monitor indoor environmental conditions and their effect on occupant health in 25 homes. The methodology includes recording temperature, relative humidity, and administering thermal comfort surveys using the 7-point ASHRAE scale, and self-monitored health . Additionally, participants will be equipped with smart wearables, such as smart rings, to measure key health indicators like oxygen saturation, heart rate, and sleep patterns. The aim is to gather comprehensive data on how environmental conditions inside homes in this region influence residents' well-being. Although the study is yet to take place, the anticipated results are expected to highlight significant correlations between indoor heat exposure and adverse health effects, especially in homes with inadequate cooling measures. These findings will inform the discussion on the urgent need for region-specific thermal comfort models that consider both environmental and health aspects. In conclusion, this study will contribute to developing new housing strategies that prioritize health in extreme climates, guiding policy and design decisions for more sustainable and resilient housing solutions in the northeast of Mexico.

Integrating 3D Printed Ceramic-Based Evaporative Cooling into Studio Teaching

Erin Hunt, Texas Tech University

As global temperatures rise due to climate change, the demand for cooling is projected to triple by 2050. This presents a significant challenge, particularly in the hottest regions where traditional air conditioning places immense strain on electrical grids (Walecki, 2022). Innovative systems that utilize minimal energy and feature lower operating costs could offer cost-effective solutions to alleviate this pressure.   In response, this 4th-year Bachelor of Science in Architecture studio is dedicated to designing sustainable housing solutions for vulnerable communities in Phoenix, Arizona. The potential impact of our work is significant, as low-income populations facing escalating temperatures and limited resources for adaptation require low-energy and affordable housing options that enhance community resilience while reducing grid strain.   Historically, clay has been utilized for evaporative cooling since around 2500 BC, exemplified by Muscatese systems that combine wooden screens (mashrabiya) with water-filled ceramic vessels for passive cooling. Recent advancements have evolved this approach, incorporating irrigated 3D-printed ceramic screens and blocks with variable porosities (Gan et al., 2022; Rael et al., 2015). The studio advocated for the use of clay 3D printing to create modern evaporative cooling systems, emphasizing energy-efficient and passive housing designs. Through the integration of computational design and contemporary fabrication techniques, students developed environmentally responsive facades, addressing both technical considerations and the socioeconomic and cultural contexts of the built environment.   Students, as active participants in the research, identified suitable sites for passive housing, targeting low-income communities and incorporating clay-based evaporative cooling systems with modern advancements. This sustainable approach aims to reduce reliance on energy-intensive air conditioning, thereby lessening grid strain and prioritizing the needs of vulnerable populations. The studio's pedagogical framework emphasized collaborative problem-solving and contextual analysis, equipping students with skills to create low-energy, affordable designs that enhance community resilience amid climate adaptation challenges. The multifaceted approach involved research-driven design processes and the integration of clay-based evaporative cooling systems into architectural proposals through collaborative workshops, computational tools, and hands-on fabrication techniques. By merging traditional wisdom with modern technologies, the course prepares future architects to effectively address climate-related challenges and promotes sustainable architectural practices to tackle pressing global issues. The presentation will discuss the structure of the course and showcase examples of student work.

Ecology: Carbon Ecologies
Saturday, January 11, 2025, 11:00am-12:30pm

From Energy Codes to Carbon Codes: The Role of Embodied Carbon in Contemporary Code-Compliant Residential Design
Robert Williams, University of Massachusetts Amherst

While not initially intended to address climate change, building energy codes (BECs) are increasingly employed as critical tools for reducing the carbon emissions from the building sector (Cabeza et. al 2022). This is true at the national and international level where numerous governments are explicitly citing BECs as integral components of their carbon emissions reductions commitments under the Paris Climate Accords and subsequent climate agreements (IPCC 2018). This is also true at the local level where, in the absence of national legislation, numerous municipal and state governments are taking advantage of their jurisdiction over BECs to reduce carbon emissions through revisions to these codes (Kaufman 2024). Accordingly, the prevailing BEC used in the United States – the International Energy Conservation Code (IECC) – has become increasingly more stringent in its prescriptive and performative requirements. Between the 2009 edition of the IECC, which was the first widely adopted BEC in the U.S., and the 2021 edition, projected energy use in residential buildings decreased by approximately 28% (DOE 2022). And while these code changes are ostensibly aimed, in part, at reducing carbon emissions, there is very little mention of carbon in the codes themselves. Like many codes and green building certifications, the IECC relies on energy reduction as a proxy for carbon emissions reduction. There is substantial research indicating that increasingly stringent BECs do lead to actual reductions in building energy use (Livingston et al. 2014 and Enker and Morrison 2020). However, operational carbon from building energy use is only one factor in the total carbon impact of buildings, and there is comparatively little research into the life-cycle carbon impacts of BECs and the embodied carbon impacts of improving the energy efficiency of code-compliant buildings. This project aims to begin addressing this gap by assessing the potential embodied carbon impacts of compliance with recent editions of IECC. Using a prototypical single-family house in Climate Zone 5 as a case study, this research includes a series of partial life-cycle assessments of variations of code-compliant exterior envelope assemblies for the case-study house. Preliminary results indicate that material choices in the exterior envelope, particularly the inclusion of high-carbon, foam-based insulation products, can substantially impact the total, life-cycle carbon emissions of code-compliant residential buildings. In the worst cases, the material carbon emissions (i.e. cradle-to-gate emissions) of exterior envelope assemblies can account for upwards of 40% and 20% of the carbon use intensity across 10- and 30-year timeframes, respectively. More importantly, the results indicate that improving energy efficiency through compliance with more stringent BECs does not necessarily lead to reductions in overall carbon-use intensity. This presentation begins with a brief history of building energy codes in the U.S., details the research methodology and the preliminary results, and concludes with a discussion of potential regulatory options for significantly reducing the embodied carbon emissions in code-compliant residential buildings.

Embodied efficiency: Enabling Low-Carbon Concrete Housing in Nairobi, Kenya
Mohamed Ismail, University of Virginia

Standard building practices contribute to 11% of anthropogenic carbon emissions, which is expected to rise due to rapid urbanization and widespread concrete construction [1], [2]. This is especially relevant to Less Economically Developed Countries (LEDCs) that are vulnerable to climate-related threats and struggling to meet the demand for urban construction and affordable housing [3]. There are several reasons for this, but a major concern is the high cost of construction materials which can comprise 60-80% of the total cost of residential construction. Nonetheless, their construction mimics the materially inefficient practices of the More Economically Developed Countries (MEDCs), which were developed to reduce labor over material costs (see Figure 1). Consequently, construction accounts for 20-30% of LEDCs' total emissions [4], [5], nearly three times the global average.   Figure 1: Exterior and interior images of multi-story concrete affordable housing under construction in Nairobi, Kenya. Designed to reduce labor over material costs, most building structures are designed to meet the highest local stresses rather than reflecting an accurate distribution of their global stresses, resulting in oversized prismatic elements [6]. However, research has shown that shape optimization can result in a a reduction of over 60% of a concrete structure's embodied carbon while using readily available and code-compliant materials [7] (see Figure 2). Unfortunately, builders in LEDCs do not typically have access to shape optimization methods that enable the design of locally fabricable optimized concrete structures. To address the gap between shape optimization research and structural engineering practice, this paper presents a prototype shape optimized floor slab that demonstrates how shape optimization may reduce the material costs and embodied carbon of multi-story concrete housing while meeting local codes and building constraints. The prototype is designed and built with partners in one of the Africa's fastest growing cities: Nairobi, Kenya. Figure 2: Preliminary comparison of a multi-story residential building using flat slabs and shape optimized slabs showing a potential ~75% reduction in the embodied carbon of the superstructure.The research starts by determining and implementing fabrication constraints for scalable formwork systems, adapting a previously published shape optimization method to local fabrication possibilities. The method is tested through a full-scale prototype designed to meet local codes while using substantially less material than standard beam designs. This work will be tested in Nairobi, Kenya, one of Africa's fastest growing cities in need of affordable and low-carbon construction alternatives to standard practice [9], [10]. Critical to this proposal is the partnership with local AEC partners, Framework Designs in Kenya, who inform the direction and relevance of the work, collaborating to develop solutions and methods that address industry relevant fabrication challenges and carbon mitigation goals. Beyond the scope of this paper, local housing developer and construction industry feedback will inform the development of a set of open-source computational tools that plug into existing CAD environments, providing access to novel optimization methods for the design, analysis, and fabrication of shape optimized concrete structures informed by–and developed for–the realities of construction in Kenya and other rapidly urbanizing LEDCs.

Biogenic Carbon sequestration and Storage Potential of Urban Residential Environment

Sonsoles Vela & Rubén García Rubio, Tulane University

Housing is a fundamental human need[1], but it also has a significant environmental impact. Residential buildings contribute to 21 percent of global energy usage and 17 percent of global CO2 emissions [2]. By 2030, around 3 billion people will need suitable housing [3], providing an opportunity to improve housing while minimizing environmental impact. Existing environmental policies have focused on energy efficiency and renewable energy but have not adequately addressed material efficiency in construction and the carbon storage capabilities of different materials beyond on-site landscape sequestration. These are proven strategies for reducing carbon emissions and achieving climate-positive designs. A new concept, the "Carbon Bank," aims to create low-carbon neighborhoods and increase carbon-sequestering green spaces in urban areas. The goal is for every housing development to sequester more carbon over its lifecycle than it emits. This approach requires early decisions in site planning to minimize future carbon emissions and utilize the natural landscape to offset emissions from construction. The research paper aims to create a residential building development with a zero-carbon footprint, focusing on the Little River neighborhood in Miami, Florida. It will explore the potential of creating a "Carbon Bank" to develop a carbon-neutral neighborhood and investing in land-based solutions to capture and store carbon. Designing for carbon sequestration involves regulating the entire life cycle of the building, including the embodied emissions of materials, construction, maintenance, and end-of-life. The site location will target Little River Terraces, a public priority property slated for new development. This will serve as the practical setting for this paper, which involves addressing the housing crisis with a specific focus on achieving carbon budget zero in the built environment. The design parameters will center on both embodied and operational carbon. Additionally, the urban context will examine the potential of land-based solutions for capturing and storing carbon. Designing for carbon sequestration involves regulating the entire life cycle of the building, including the embodied emissions of materials from harvesting and manufacturing processes, construction works, maintenance, and end-of-life. This paper includes an assessment methodology to establish strategies for housing building decarbonization, focusing on rethinking urban design approaches to cover the biogenic carbon storage potential and using material as a driver to minimize the reliance on limited natural resources and fossil fuels as primary ingredients of design.The paper will utilize One-click LCA software as part of the methodology process to calculate the life cycle assessment quantifying GWP fossil and biogenic from cradle to cradle, also accounting for the benefits and loads beyond the system boundary, such as reuse, recovery, and recycling potential. I-tree software will be used to calculate the withdrawals for vegetation and landscaping urban design scenarios. 1 Maslow's Hierarchy of Needs 2. IEA 2023 a. Adapted from 'Tracking Clean Energy Progress' 3. United Nations Human Settlements Programme (UN-Habitat)

Digital Harvest: Parametric Design Tools for Wood-frame Carbon Calculations in Canadian Housing

Sheryl Boyle & Frangiscos Hinoporos, Carleton University

In 2020 the anthropomass surpassed biomass on Earth; meaning the mass of human-made objects is larger than the mass of all living things (plants & animals), and most of that mass is attributed to buildings and infrastructure.[i] In 2021 a study for a 33-story residential building calculated the CO_2 emissions per stage of construction by material. By extrapolating emissions percentages produced during each stage of construction, the case study demonstrated that the vast majority of emissions (95.7%) occur during the material manufacture stage.[ii] This highlights the need for expanding material reuse and the implementation of Design for Disassembly and Adaptability (DfDA) principles moving forward.[iii] By the end of 2024 there will be 2.12 billion tons of waste globally. Approximately 35% of that is construction and demolition waste and "75% of that has a residual value and is not currently reused or recycled".[iv]   This paper presents the development and use of a parametric design tool for the calculation of embodied carbon in new and existing stick frame housing. The tool grew from the slow manual 3D-modeling of archetypal homes in Rhino used to assess wood frame component count (Figure 1) and expanded into a nimble parametric drawing/design process. Using current construction practices and framing videos as a guide to understand how to code the assembly, we created a parametric GH script that could "build" accurate foundation, wood-framed floor and wall assemblies complete with openings, doors and windows through simple parameters and inputs using a workflow combining Rhino, Grasshopper (GH), Revit, and Rhino.Inside. The primary modelling was done using a curve input (line in the Rhino model-space) bound to a series of parameters controlled through switches and sliders inside GH. Parameters for walls include stud size (2x4s/2x6s), stud spacing, wall height, number of top plates and insulation thickness and location. Floor parameters use a closed curve input (closed shape in the Rhino model-space) for the floor plate profile. Parameters controlled the size of floor joists (direction and spacing), rim joist and insulation (Figure 2). The tool then outputs material volumes for the entire construction which can be plugged into an embodied carbon calculator. By enabling architects and construction professionals to account for the embodied carbon debt of a building early in the design or assessment of a building, we aim to support the recycling of existing buildings and materials. The authors see future potential for parametric tools that raise our consciousness about the Anthropomass through attention to volumetric calculation of material, and in particular of light-frame wood members. Wood framing is difficult to account for, in detail, with existing mainstream design software, and this creates the idea that it is dispensable, in a sense an embedded ethics of waste is present in common design tools. We feel that this parametric tool, and others like it are critical to drawing attention to both design intentions and post-construction methods of assessment to prolong the life of light-frame building mass, and hopefully slow the rate at which the Anthropomass moves past the biomass of the planet.

A Way Home: Renovating Housing Communities for Seniors with Alzheimer's
Liwei Shen, Sasaki Design

As cities grow older, so do their populations. This demographic shift brings the need for environments that cater to the elderly. In China, the crude mortality rate (CMR) for Alzheimer's disease (AD) and other dementias doubled between 2011 and 2020. The challenges facing seniors with Alzheimer's have been exacerbated during the pandemic. This study aims to reimagine Alzheimer-friendly communities from architectural and urban design perspectives, respecting and responding to the needs of individuals with Alzheimer's. The post-1950 expansion of Wuhan aligns with China's industrial growth. To accommodate millions of young workers, large-scale housing units were built alongside heavy industries. Yet, these now-retired populations face isolation, health issues, and limited social support. In many cities with aging populations, elderly residents share similar life trajectories that contribute to a high prevalence of dementia and other age-related diseases. Many suffer from Alzheimer's, exhibiting symptoms such as memory loss and disorientation, and face associated risks of wandering and getting lost. This project selected a medium-scale housing community for field research and takes an evidence-based approach to design solutions. We followed two individuals with Alzheimer's for four weeks, tracking their daily movements and identifying patterns that could inform design strategies. The findings revealed that while their short-term memories are deteriorating, their collective memories from their working years remain vivid. Additionally, colors and familiar objects, such as antiques, proved effective in stimulating their senses and aiding recognition for wayfinding. The design strategies employ a color-coded system with colored strips and vegetation as guides. Historical building elements are integrated to improve navigation and foster a sense of security and autonomy. The design focuses on three key principles, each addressing different scales of the community: One Color (Community Scale): A color-coded wayfinding system assigns a distinct color to define each street in the community. Highlighted by strips and vegetation with different flowering and fruit colors, this visual cue helps residents associate their location with a specific color, making navigation easier for individuals with memory impairment. One Entrance (Street Scale): Alzheimer's patients often struggle to recognize the entrances to their homes. To address this, an additional, easily identifiable entrance with elevators and color signals is designed for them. These cues provide visual reassurance and guidance, helping seniors find their way home. One Family (Housing Unit Scale): A shared living room is incorporated into each housing unit to foster a sense of community. This communal space encourages social interaction among residents, promoting a support network within the building and reducing the isolation commonly experienced by Alzheimer's patients. This project explores the potential of urban design to transform a public health issue into a functional cultural representation. It aims to help seniors with Alzheimer's live with dignity by creating an environment that supports their cognitive and physical needs. The project seeks to commemorate the past while integrating urban solutions that enhance the quality of life. It addresses health inequalities and the specific vulnerabilities of seniors with AD and explores how urban design contributes to the equity and accessibility of space.

Towards More Play and Autonomy: Designing Child-Friendly Housing and Neighborhoods in Medium and Small Sized Cities

Emilie Pinard, Laurentian University

Designing more equitable and healthier communities should include taking into account children, their specific needs, experiences and aspirations in and for the built environment. Research has shown that the decline of children's play, active mobility and autonomy in their environment have significant negative consequences on their overall development, including current and rising physical and mental health issues such as inactivity, obesity and anxiety. As strong correlations have been drawn between the design of living environments and the ability of children to play, move and explore independently, an important body of research and initiatives now supports "child-friendly" cities and housing. For example, UNICEF's Child-Friendly Cities program has generated numerous indicators and monitoring tools for local governments, which often align very closely with core principles of ecological and social sustainability. With its capability to positively and directly impact children and their family, housing is considered one of the three key (and interconnected) pillars of child friendly environments, along with services and public realm. In dense urban environments, where most of the research has been done so far, child friendly housing can be translated into a set of design strategies at the neighborhood and at the building scales, such as travel routes and playable streets, the presence of schools and childcare, open spaces, courtyards and gardens. Yet, it seems that in medium and smaller sized cities, which are typically car oriented and quite limited in terms of public infrastructure and resources, suitable and affordable housing, as a pillar, could have an even more central role to play to support children's everyday freedom to be mobile and play. How do the design strategies gathered and tested so far in the literature translate, or not, in such context? This paper will present a research project that aims at better understanding specific challenges and potentials for the innovative design of child-friendly housing and neighborhoods in medium and small sized cities. It takes the city of Greater Sudbury, Ontario (Canada) as its first test site to explore how housing can bridge scales of intervention and creatively compensate for the limited resources and public services offered in such living environments. The research combines literature review, case studies of innovative housing typologies, design and policies, and participatory work with key stakeholders. The intent is to produce a support guide for municipalities showcasing housing design interventions and processes that increase liveabilty and positively impact children's health through their capacity to play, connect and explore the built environment more freely.

Proactive Design for Aging in Place: A Functional Scenarios Analysis Approach to Home Environment Assessments

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As the global population ages, ensuring that older adults can age in place—remaining in their own homes safely, independently, and comfortably—becomes a critical societal goal (Higo & Khan, 2015), considering that most people would rather continue to live in their own home than move into senior care (Bayer & Harper, 2000; Binette, & Vasold, 2018; Lee & Vouchilas, 2016; Ewen, et al., 2014; Hobbs & Damon, 1996). However, current home assessment tools predominantly focus on hazard reduction (Chau & Jamei, 2021), failing to address the broader and evolving psychosocial and socioecological needs of aging individuals, such as social connectedness, emotional well-being, and the ability to manage home maintenance. This paper introduces a novel architectural approach to home assessments through the Functional Scenarios (FS) Analysis method, originally developed for healthcare settings (Hadi, et al.,2015), to examine how the home environment is able to meet the evolving needs of aging individuals. The FS method translates the specific needs of older adults into spatial metrics, providing a comprehensive, user-centered evaluation of home environments. The paper presents a case study analyzing three homes using the FS method: the author's residence in its original and modified forms (home 1a, and home 1b), and an additional single-family home (home 2). Key user needs identified through this analysis, including the ability to navigate the home's perimeter, engage in social interactions that accommodate both wheelchair and non-wheelchair users, and ensure safe entry and exit regardless of mobility, reveal significant gaps in current home design practices. The findings underscore the critical importance of proactive design in supporting aging in place. The modified home (home 1b) demonstrates how early, intentional design changes—such as adding a ramped entrance, widening doorways, and rearranging living spaces—can significantly enhance a home's ability to meet the long-term needs of its residents. In contrast, the unmodified home (home 1a) and the additional home (home 2) illustrate common design shortcomings that could create barriers to aging in place, emphasizing the potential difficulties and costs of retrofitting homes after needs arise. This paper argues that the FS method can contribute to filling a gap in current home assessment tools and also, more importantly, serves as a powerful strategy for architects, designers, and policymakers to anticipate and integrate aging-related needs into home environments from the outset. By aligning the built environment with the evolving needs of aging populations, proactive design can reduce the need for later modifications, mitigate stress, and ensure that homes remain supportive, safe, and adaptable as residents age. Future research should explore the application of this methodology across diverse home types and cultural contexts to validate its effectiveness and further develop proactive strategies for aging in place.

Long-Term Care Elderhousing and Occupant Health: Japan and Canada—A Comparative Assessment

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The world is greying. By 2050 the global population age sixty-five and older is predicted to double—from 12% to 22%. While most older persons continue to experience relatively good health, with many contributing importantly to society as family members, volunteers, and in the workforce, many are increasingly at risk of experiencing health inequities, including becoming unhoused, experiencing mental health and cognitive disorders, alcohol and substance abuse problems, and economic despair. With respect to housing and health equity, older persons are particularly vulnerable. Two countries—Japan and Canada—are compared. These countries were selected because both have rapidly aging populations although their immigrations policies are diametrically opposite. Societal attitudes and public policies toward housing the aged, and measures in support of the escalating need for equitably designed long-term care residential housing options for older populations, is the core focus —particularly with respect to the intensifying climate crisis. To facilitate the analysis, two streams of theoretical work in the field of person-environment (P-E) relations are deployed. The first, a functionalist-evolutionary (F-E) perspective of human functioning in the physical environment, is premised on the inherent uncertainty within physical environments in which humans evolved over the millennia. A second, complimentary, perspective put forth by the late gerontologist M. Powell Lawton is the support-autonomy dialectic. This theory, drawing obliquely from F-E theory, posits the degree of non-support (environmental press) inherent in a built environment setting, and here, applied to housing, is commensurate with an individual's physical and cognitive ability (personal competency). Personal competencies directly correlate with health outcomes—relative to the degree of functional and emotive support an elderhousing setting affords. Stability—equilibrium— exists when an individual's personal autonomy exists sustainably. By contrast, reactivity, or behavioral coping (failure, in the extreme), occurs when an unsuitable, hence, inequitably designed, otherwise poorly designed residential setting exerts its dysfunctionality, resulting in excessive environmental press. Eight contributing determinants of housing inequity and adverse health outcomes are examined within this causative model: indoor air pollution, excessive noise levels, excessive heat, denaturization, mold caused by flooding and concomitant adverse events, overcrowding/density, stigmatization of the aged, and the adverse impacts of forced relocation. These determinants are viewed in relation to eight outcomes (effects): cognitive stress, physical immobility, physical retreat/isolation due to fear, learned helplessness, anti-social behavior, poorer overall health, the incidence of falls and related injuries in residential settings, and adverse impacts of forced relocation, including heightened mortality rates due to poor quality elderhousing. Demographic trends, together with the causative model of press-competency, are then applied, architecturally, to an analysis of recently built long-term care (LTC) housing in Japan and in Canada. These cross-cultural case studies are comparatively examined for their architectural and therapeutic amenity relative to the needs of older occupants. Lessons learned from this cumulative analysis are discussed for their applicability to other nations with rapidly aging societies, including the United States. The presentation concludes with a call to action for public policies to result in far more architecturally supportive, equitable housing for this rapidly growing population globally.

Urban Variability: Housing for Cognitive Impairments
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In the dense fabric of urban environments, where space is at a premium, and the pace of life is relentless, creating a sanctuary for the most vulnerable members of our society presents a profound challenge. Children with developmental and cognitive disabilities, especially those living in urban minority communities, often find themselves in spaces that exacerbate rather than alleviate their sensory sensitivities and behavioral challenges. This project confronts that reality head-on, reimagining urban housing not just as a place to live, but as a haven for social and behavioral de-escalation. The design of Living/Learning Cabins attuned to the unique needs of children—spaces where sensory modulation, emotional comfort, and inclusivity are not afterthoughts but foundational principles. By focusing on the intersection of architecture, health, and social equity, this project offers a blueprint for how architecture transforms urban spaces into supportive environments that foster well-being and resilience for children. The project involves designing and developing an urban prototype for Living/Learning Seasonal Cabins to serve children and young people with disabilities. The initial prototype cabins were to replace outdated facilities on an existing rural campus established as a summer camp for children with polio. The camp now serves a broader range of physical and cognitive disabilities and is expanding its mission to an urban campus. Both projects involved extensive research, including client-engaged and archival studies, which informs the design framework for this discussion. The cabin design is multifunctional, adapting spaces that could accommodate their users' overlapping recreational, educational, and residential needs. The design emphasizes flexibility, enabling spaces that respond to the specific physical and emotional needs of children with disabilities, such as an individual on the autism spectrum, cerebral palsy, and Down syndrome. The cabins incorporate features like deep walls with fold-up beds, fold-out tables, window seat storage, and steeply sloped roofs with intimate nooks that open to views of the campus, all intended to support various activities and provide comfort. Key accomplishments include developing alternative design strategies for providing de-escalation spaces and assistive interdependent spaces. Similar to the creation of the rural design, this urban prototype works towards integrating sensory considerations, access features, and connections to nature, offering an environment that supports the diverse needs of the intended users. One aspect covered in this discussion is the educational component embedded within the project, mainly how it involved architectural design students in a hands-on learning experience. The project was a critical learning opportunity for graduate and undergraduate students actively engaged in the research, design, and implementation phases. Through seminars and workshops, students explored the intersection of architecture, health, and social equity, gaining practical experience designing spaces for vulnerable populations. Additionally, the project's alignment with broader academic and professional frameworks, such as inclusive and resilient design principles, provided a valuable context for students to apply theoretical knowledge in real-world scenarios.