BOOK OF ABSTRACTS

EAAE-ARCC CONFERENCE 2024

ARCHITECTURE INTO THE UNKNOWN

23-26 MAY
AARHUS SCHOOL OF ARCHITECTURE

European Association for Architectural Education
Association Européenne pour l'Enseignement de l'Architecture

ARCC
architectural research centers consortium

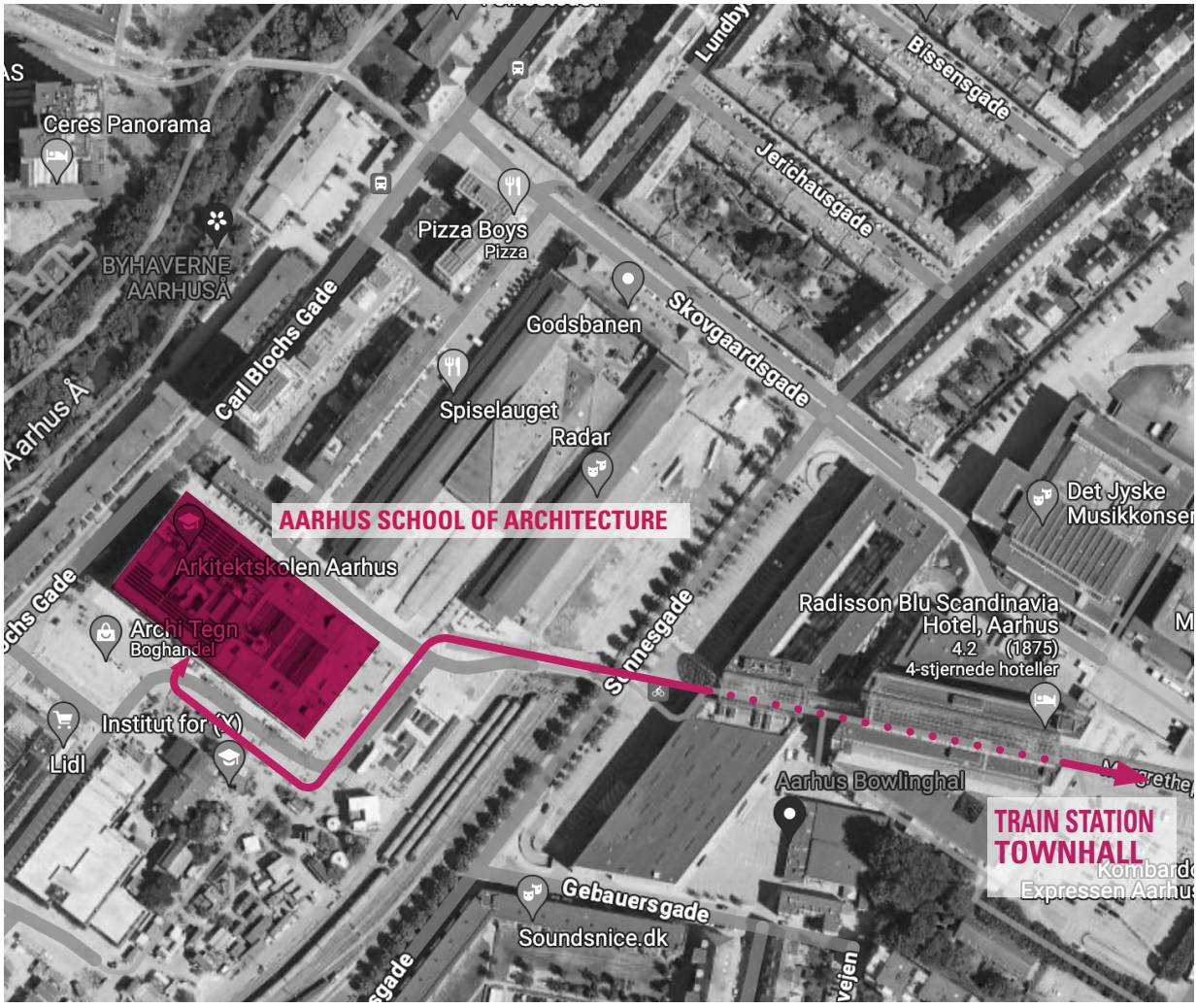
AARHUS SCHOOL OF ARCHITECTURE

VELUX®

AIM OF THE CONFERENCE

It is evident that architecture and related fields are undergoing significant changes in response to various pressing issues. Adapting to climate change might be the field's most critical challenge today. The needed adaptations raise questions about the consumption of material and spatial resources, which along with increasing demands for social responsibility and accountability, challenge the ethical and aesthetic foundations of the architecture discipline. The emergence of artificial intelligence challenges notions of creativity and authorship. At the same time, digital design and fabrication tools intermesh with fundamental economic and organisational changes in the building industry, challenging disciplinarity boundaries and workflows and established architectural paradigms.As we navigate these changes, it becomes clear that architects must remain reflective, agile and innovative to understand and engage with the needs of a rapidly evolving world. It is a challenging and exciting time to be involved in architecture. The challenges we face provide opportunities for transformation, creativity, and innovation but also for examining the architecture discipline's ideals, methods and practices.During the conference, we aim to delve into how research and didactics can contribute to the complex challenges facing the field of architecture. Our objective is to examine these challenges from a dual perspective. On the one hand, we want to explore how architectural research and didactics can support architecture to examine, engage and act in these challenges. Such examinations can involve exploring theories, quantitative and qualitative methods, tools, collaborations, and interdisciplinary interactions to tackle the challenges. On the other hand, we invite participants to investigate how these challenges affect the future discipline of architecture: Is the field of architecture disappearing, diversifying, fragmenting, transforming, or is it resting on an immutable core that allow the discipline to engage with new challenges? We delve deeper into the discipline's current state and attempt to understand how it can continue to evolve and adapt to changing circumstances. We aim to explore how architects can make a meaningful contribution to the future of our built environment.The conference will invite experts in the field to come together and share their knowledge and experiences, providing insights that will contribute to improving and critically challenging our understanding of architecture's possible futures. Through presentations, discussions and debates, we hope to create a platform for exchanging ideas and generating new perspectives that will drive the field forward.

VENUE



ADRESS OF VENUE:

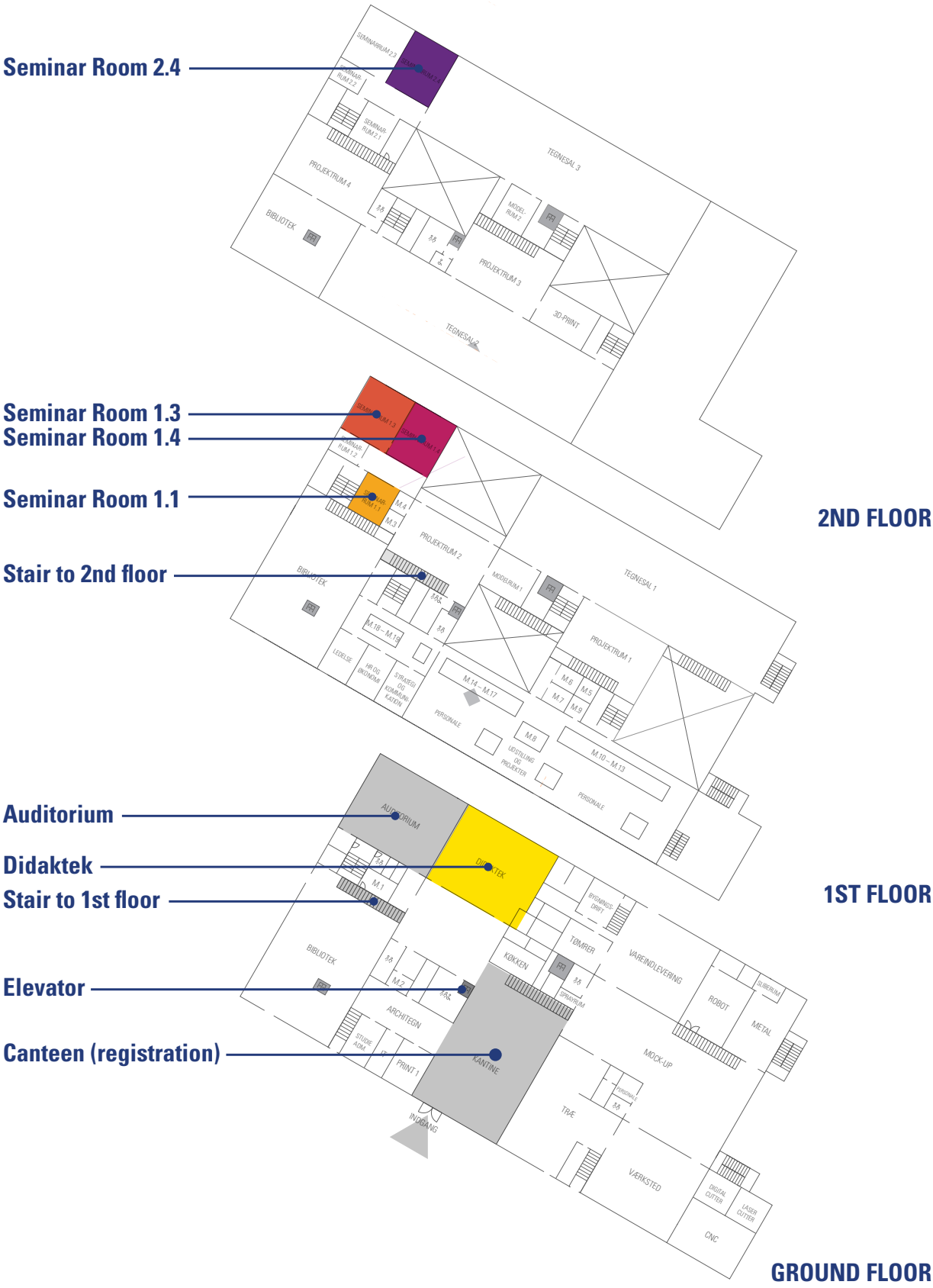
AARHUS SCHOOL OF ARCHITECTURE

EXNERS PLADS 7

8000 AARHUS C

DENMARK

VENUE


Seminar Room 2.4
Seminar Room 1.3
Seminar Room 1.4
Seminar Room 1.1
Stair to 2nd floor
2ND FLOOR
Auditorium
Didaktek
Stair to 1st floor
Elevator
Canteen (registration)
1ST FLOOR
GROUND FLOOR

EAAE-ARCC 2024 CONFERENCE COMMITTEE

Conference Chair

Claus Peder Pedersen

Conference Leadership + Advisory Committee

Oya Atalay Frank
President, EAAE

Tadeja Zupancic
Board member, EAAE

Adil Sharaq-Eldin
President, ARCC

Barbara Klinkhammer
Vice-President/President-Elect, ARCC

Conference organising committee

Anders Kruse Aagaard
Aarhus School of Architecture

Naime Esra Akin
Aarhus School of Architecture

Stefan Darlan Boris
Aarhus School of Architecture

Nuria Casais
Aarhus School of Architecture

Hanne Foged Gjelstrup
Aarhus School of Architecture

Marie Frier Hvejsel
Aarhus School of Architecture

Mo Michelsen Stochholm Krag
Aarhus School of Architecture

Mette Volf
Aarhus School of Architecture

Session Moderators

Anders Kruse Aagaard
Aarhus School of Architecture

Naime Esra Akin
Aarhus School of Architecture

Pravin Bhuapurkar
University of Cincinnati

Stefan Darlan Boris
Aarhus School of Architecture

Nuria Casais
Aarhus School of Architecture

Jeff Collins
Kennesaw State University

Lyndsey Deaton
Clemson University

Ihab Elzeyadi
University of Oregon

Marie Frier Hvejsel
Aarhus School of Architecture

Ming Hu
University of Notre Dame

Lisa Iulo
Penn State University

Mo Michelsen Stochholm Krag
Aarhus School of Architecture

Kyounghee Kim
University of North Carolina

Traci Rider
North Carolina State

Adil Sharag-Eldin
Kent State University

Yves Schoonjans
KU Leuven

Mette Volf
Aarhus School of Architecture

Tadeja Zupancic
Ljubljana University

Peer Review Committee

Anders Kruse Aagaard
Aarhus School of Architecture

Henri Achten
Czech Technical University in Prague

Naime Esra Akin
Aarhus School of Architecture

Tasbeeh Musa Alaqtum
Texas A&M University

Pnina Avidar
Fontys Academie voor Architectuur en Stedenbouw

Nina Bartošová
Faculty of architecture, Brno University of Technology

Genevieve Baudoin
Kansas State University

Pravin Bhiwapurkar
University of Cincinnati

Matej Blenkus
studio abiro, d.o.o.

Nuria Casais
Aarhus School of Architecture

Roberto Cavallo
TU Delft

Camilo Cerro
American University of Sharjah

Mike Christenson
University of Minnesota

Fernando Cirino
FMC Urban Design

Sara Codarin
Lawrence Technological University

Antonella Contin
Politecnico di Milano

Rossella Corrao
University of Palermo

Marwa Dabaieh
Malmo University

Stefan Darlan Boris
Aarhus School of Architecture

Adalberto Del Bo
Politecnico di Milano

Matt Demers
Barker Nestor Architects

Peng Du
Thomas Jefferson University

Maria Faraone
Oxford Brookes University

Irena Fialovã
FA CTU Prague

Robert Fryer
Thomas Jefferson University

Stefania Plamyra Geraki
University of Wisconsin Milwaukee

Bob Giddings
Northumbria University

Mary Guzowski
University of Minnesota

Mahyar Hadighi
Texas Tech University

Bruce Haglund
University of Idaho

Saif Haq
Texas Tech University

Richard Lee Hayes
Central Michigan University

Deirdre LC Hennebury
University of Michigan

Laura Holden Hollengreen
University of Arizona

Seyedeh nazli Hosseini
West Virginia University

Marie Frier Hvejsel
Aarhus School of Architecture

Roberta Ingaramo
Politecnico di Torino

Demet Irkli Eryildiz
Okan University

Soo Jeong Jo
Louisiana State University

Mona Khafif
School of Architecture

Patricia Njideka Kio
Fitchburg State Universisty

Niels Martin Larsen
Aarhus School of Architecture

Khaled Mansy Oklahoma
State University

Andrea Martinez Arias
Universidad de Conceptción

Alessandro Massarente
Università degli Studi di Ferrara

Elizabeth L. McCormick
University of North Carolina at Charlotte

Michael McGarry
Queen's University Belfast

Gabriella Medvegy
University of Pécs

Virginia Ellyn Melnyk
Tongji University

Taraneh Meshkani
Kent State University

Mo Michelsen Stochholm Krag
Aarhus School of Architecture

Mark Mistur
Kent State University

Junyoung Myung
University of Illinois at Urbana-Champaign

Vera Parlac
New Jersey Institute of Technology

Claus Peder Pedersen
Aarhus School of Architecture

Jens Pedersen
Aarhus School of Architecture

Eric Peterson
University of Hawai'i

Ekin Pinar
Middle East Technical University/

Çigdem Polatoglu
Yildiz Technical University

Gennaro Postiglione
DASTU-Politecnico di Milano

Ash Ragheb
Lawrence Tech University

Alice Read
Private Practice

Traci Rose Rider
North Carolina State University

Saglinda Roberts
Jefferson

Alessandro Rocca
Politecnico di Milano

Edite Rosa
University of Beira Interior

Fauzia Sadiq Garcia
Temple University

Sareh Saeidi Derakhshi
The Norwegian University of Life Sciences

Sofia Salema
University of Évora

Massimo Santanicchia
Iceland University of the Arts

Kevin Santus
Politecnico di Milano

Yves Schoonjans
KU Leuven

Markus Schwai
NTNU

Adil Sharag-Eldin
Kent State University

Brian R. Sinclair
University of Calgary + sinclairstudio

Jose Pedro Sousa
University of Porto

Alexandra Staub
Penn State University

Sally Stewart
Glasgow School of Art

Romuald Tarczewski
Wroclaw University of Science and Technology

Tasneem Tariq
Pennsylvania State University

Walter Unterrainer
University of Chalmers

Mette Volf
Aarhus School of Architecture

Chengde Wu
Iowa State University

Tadeja Zupancic
University of Ljubljana

Organising Institutions

European Association for Architectural Education
Association Européenne pour l'Enseignement de l'Architecture

ARCC
architectural research centers consortium

AARHUS SCHOOL OF ARCHITECTURE

Sponsor

VELUX®

PROGRAM

PROGRAM OVERVIEW

	Thursday May 23	Friday May 24	Saturday May 25	Sunday May 26
09.00		Paper presentations	Paper presentations Workshop	Paper presentations
10.00				
		Coffee	Coffee	
11.00		Paper presentations Workshop	Paper presentations Workshop	Conference closing
12.00		Lunch Poster presentations	Lunch Poster presentations	Lunch in the canteen
13.00	Excursions	Explorative Practice presentations	Paper presentations	
14.00				
15.00		Coffee ARCC awards Next Conference	Coffee EAAE-ARCC board meeting	
16.00	Welcome and opening	Paper presentations	Paper presentations	
	Keynote + plenary	Break	Break	
17.00		Keynote + plenary	Keynote + plenary	
18.00	Reception			
19.00			Conference Dinner	

PROGRAM

THURSDAY MAY 23

13.00-15.30 — **EXCURSIONS**

16.00-16.30 — **WELCOME AND OPENING**
Didaktek

16.30-18.00 — **KEYNOTE - ANDERS LENDAGER**
Didaktek

18.00-19.30 — **RECEPTION**
Didaktek

FRIDAY MAY 24

09.00-10.30 — **PAPER PRESENTATIONS**

Seminarrum 1.1

Forced Labor in Building Material Supply Chains – Evaluating Risk in Specifying Architectural Materials from XUAR, China
Trubiano

Equity in Design: Confronting the Past to Develop Equitable Designers
Pindyck, Bird

Critical Inquiry
Weinstein, Hollengreen

Chair: Jeff Collins

Topics: Ethics and Social Responsibility

Seminarrum 1.3

Planetary Boundaries As A Framework For Course Development - What does it take to design for absolute sustainability?
Jensen, Petersen, Hatic, Sack-Nielsen, Donovan

Finite Earth, Open-Ended Architecture? Framing a Qualitative, Ecological Perspective on Housing
Petersen

Where Architecture and Furniture Design Overlap in The Terms of Circularity: A Cross-Disciplinary Field
Møller, Guha

Chair: Roberto Cavallo

Topics: Sustainable Architecture

Seminarrum 1.4

Experimental Practice. Architecture as a Shared Field of an Exploratory Rethink ONLINE
Raonic

Redeployed: A Circular Approach to Construction Pedagogy
Mayer

Vertical Gardens – Built Environment Education Tool In Schools In Serbia
Radic Sibinovic

Chair: Naime Esra Akin

Topics: Disciplinary and interdisciplinary Approaches / Future Architectural Education

Seminarrum 2.4

The Intersection of Explored and Unexplored Design Processes with AI Image Generators in Three Design Studios
Park

Public Space Design enabled by Artificial Intelligence Generative Tools
Riether, Zarzycki

The Space Groups and Collaborative Assembly
McLemore

Chair: Adil Sharaq-Eldin

Topics: Future Architectural Education

10.30-10.45 — **COFFEE**
Didaktek

10.45-12.15 — **PAPER PRESENTATIONS**

Seminarrum 1.1

The Rhythms of Liminal Urbanisation in Montenegro: Assemblages of Multiple Temporalities
Marinovic

Titomeniks: Bridging Past and Future. A Socio-Architectural Exploration of Yugoslav Monuments through the Lens of Star´s Boundary Object Theory
Furbach

Architecture As A Mediator Of Empathy: The Case Of The Pavillon De l'Orbe, France
Tesson, Pillot

Chair:

Topics: Ethics and Social Responsibility/Disciplinary and interdisciplinary Approaches

Seminarrum 1.3

The Petrological Imprint: A Comprehensive Study of Spindletop's Role in the Morphogenesis of the Golden Triangle of Texas
Mehan, Casey ONLINE

Making the Global Local: Designing and Building a Mobile Studio to Research the Impact of Industry, Globalization, and Climate Change on Coastal Communities and Ecosystems
Rhodes

Pop-up Earthquake Architecture for Integrating Practical Experience and Social Responsibility into Architectural Education ONLINE
Morales-Beltran, Bakan, Pedergnana, Kızılörenli

Chair: Barbara Klinkhammer

Topics: Sustainable Architecture / Future Architectural Education

Seminarrum 1.4

Systems Thinking: A Methodological Approach for the Deep Reading of Cities
Ucar, Inan

Bridging Disciplines: Utilising Large Language Models for interdisciplinary Collaboration and Innovation in Architectural Design
Sloan Wood, Farooq

Redefining Architectural Montage: The Synergistic Role of Artificial Intelligence in Contemporary Architectural Practice
Yang

Chair:

Topics: Disciplinary and interdisciplinary Approaches

Seminarrum 2.4

The experience of space: A sensorial analysis of the Chapelle Notre-Dame-du-Haut by Le Corbusier (1955) and Bruder Klaus Field Chapel by Peter Zumthor (2007) ONLINE
dos Santos Faísca

Designing Atmospheres: The Pedagogical Approach of Peter Zumthor
Potworowski

Architectural Writing Laboratory: A Design Learning Experiment
Korkmaz, Aydemir

Chair:

Topics: Future Architectural Education / Disciplinary and interdisciplinary Approaches

12.15-13.00 — **LUNCH & POSTER PRESENTATIONS**
Didaktek

FRIDAY MAY 24

13.00-14.30

EXPLORATIVE PRACTICE PRESENTATIONS + ARCC WORKSHOP

Sensualizing, Interlinking, Anchoring – Research Collage as an explorative research practice in the Anthropocene
Zihlmann

Topics: Future Architectural Education

Seminarrum 1.1

The role of Artificial Intelligence-Assisted Qualitative Analysis in Architectural Programming
Duval, Chouinard, de Paredes & Carole Després

Topics: Open Category

Seminarrum 1.3

Cybermodeling into the Computational Unknown
Iverson-Radtke, Gandia, Payne

Topics: Open Category

Seminarrum 1.4

Fieldwork Across Disciplines – Six Phases Towards a Situated Design Approach
Holten-Andersen, Engemann

Topics: Sustainable Architecture

Outdoors (meet at Info Desk)

ARCC WORKSHOP

Spatial Equity and Inclusiveness in the City Centre
Research, Education, and Practice
Elzeyadi, Giddings, Melhadoe
Seminarrum 2.3

14.30 - 15.15

COFFEE

The ARCC awards and next Conference announcement
Didaktek

15.15 - 16.45

PAPER PRESENTATIONS

Introducing Bamboo as a Building Material in Architecture Education of Aspiring Young Building Designers for Sustainable Community Development
Ema

Hybridity in Architectural Design: Past, Present, and into the Unknown
Hadighi

American Squalor: A Case Study in Combating Low-Quality Housing Construction
Kennedy, Kuhns

Chair:

Topics: Innovative Materials and Construction

Seminarrum 1.1

Spatiotemporal Assessment of Outdoor Thermal Comfort Regimes in Urban Plazas of Chicago
Khan

Performance Evaluation of Digitally Fabricated Perforated Screens Inspired by the Mashrabiya in a Hot and Humid Climate
Alkhatib, Wibranek, Martinez-Molina

The Effects of Passive Design on Indoor Thermal Comfort and Energy Savings for Residential Buildings in Hot Climates: A Systematic Review
Hu

Chair:

Topics: Sustainable Architecture

Seminarrum 1.3

The Secondary School Classroom: An Architectural Object to Rethink for Better Support of Educational Success in Quebec. A Literature Review ONLINE
Ballita, Després

Future School Architecture - from Ideas of the Future School to the Space Lived in School.
Gjessing

Rethinking The Home Office: Insights from Teleworking Mothers' Pandemic Adaptations
Garcia de Paredes, Baron, LeBlanc, Després

Chair:

Topics: Disciplinary and interdisciplinary Approaches / Sustainable Architecture

Seminarrum 1.4

Low Tech Strategies with High Tech Tools: Integrated Modeling in the Early Architectural Education
Frank

Material Knowledge and Digital Thinking: Reflections on Research-based Teaching
Aagaard, Larsen

Bridging Analog and Digital Realms: Fostering Sustainable Design Innovation Through Integrated Teaching Techniques
Stoyanova, Mishra, Hokstad, Finocchiaro

Chair: Adil Sharaq-Eldin

Topics: Future Architectural Education

Seminarrum 2.4

16.45 - 17.00

BREAK

17.00 - 18.30

KEYNOTE - ALEXANDRA ARÈNES

Didaktek

SATURDAY MAY 25

09.00-10.30

PAPER PRESENTATIONS

Inhabiting The Plastisphere? – Architectural Making As a Prelude To Transdisciplinary Sense Making Of Plastics In The Environmental World
Thurlbourne

Multi-Robotic 3D Printing Wood-Based Slurry on Construction Scale Kamhawi,
Varadharjan, Khan, Aghaei Meibodi

Resilience in Bamboo
Ali, Ema, Rahman

Chair: Tadeja Zupancic

Topics: Sustainable Architecture

Didaktek

Designing an Inclusive Public Realm: Gentrification and Perspectives on Active Transportation in the American South
Deaton, Ghazanfari, Spencer, Denton, Cox

Community-based Approaches to Creating Adaptive Solutions for Urban Challenges: Two Case Studies
AdibKizhakkemarakkattil Janardhanan, Tariq, Iulo, Wu, Azari

Unveiling Transformative Urban Dynamics: The Symbiosis of Squatting Movement and Urban Renewal in Copenhagen's Architectural Landscape
Li

Chair: Barbara Klinkhammer

Topics: Ethics and Social Responsibility

Seminarrum 1.1

Advancing Transitional Shelter Provision Through Innovative Structural Solutions
Rajanayagam,Beatini,Pologanathan, Nagaratnam

Manufactured Homes: Accessibility, Resilience, and Enhanced Quality of Life in Three Extreme Climates
Hancock,Ghiai, Deshotels

Breaking the Renovation Cycle: Learning from Architectures of the Past for Contemporary Building Design
Hentzer Dausgaard, Morgen, Bjerregaard Jensen, Frier Hvejsel

Chair:

Topics: Innovative Materials and Construction

Seminarrum 1.3

Investigating The Narrative Space through Reader-Viewer Experience in Film "Roma"
Atam, Unsal Gulmez

AI-informed Field Notes for a Roman Travel Experience
Codarin, Daubmann

Chair:

Topics: Disciplinary and interdisciplinary Approaches

Seminarrum 1.4

SATURDAY MAY 25

10.30-10.45 COFFEE

Canteen

10.45-12.15 PAPER PRESENTATIONS + ARCC WORKSHOP

The Transmission Of Intangible Values In Vernacular Architecture. The Case Of The Valencian Barraca.
Rosaleny-Gamón,

The Modern Trinity; Affordable, Sustainable, Urban Infill Housing
Griffen

Demolition Towards Premature Obsolescence Of Neighbourhoods
Stolz, Wtellinger

Chair

Topics: Sustainable Architecture

Didaktek

The Climate HubLAB at NTNU
Finocchiaro, Stoyanova, Hokstad

An Explorative Tracing Of Peer Learning Dynamics In A PBL-Oriented Design Engineering Education
Berger, Olsen

Under, On, And Around The Table: A Case Study On Designing For Food Equity And Climate Justice In Architectural Design Studios
Sang Delgado, Alicea-Chuqui

Chair:

Topics: Future Architectural Education

Seminarrum 1.1

The Design and Fabrication of the Bleachery Heritage Project
Dickey

Bridging Cultures: Explorations, Collisions + Considerations of Indigeneity & Design
Sinclair, Soto Rubio, John, Acharya

Phygital Fabrication and the Evolution of Traditional Handicraft
He, Gipe-Lazarou

Chair:

Topics: Innovative Materials and Construction/Ethics and Social Responsibility

Seminarrum 1.3

Interdisciplinary Collaboration and Inclusivity: Methodological Innovations in Architectural Practice and Pedagogy
Mehan, Mostafavi

Aina-based Design Solution for Indigenous Communities in Hawaii: a Pedagogy Approach
Hu

Material Literacy in the Age of Component Reuse: Critical Reading and Full-Scale Testing in Architecture Education
Rinke, Tellini

Chair: Naime Esra Akin

Topics: Future Architectural Education

Seminarrum 1.4

WORKSHOP

Rethinking Architectural Research:
spatial agency towards a more equitable future
Staub, Robinson
Auditorium

12.15-13.00 LUNCH & POSTER PRESENTATIONS

Canteen & Didaktek

13.00-14.30 PAPER PRESENTATIONS

Considering Complexity + Navigating Change: An Integrative Strategy for Addressing Contemporary Challenges in Architectural Design
Bahonar, Sinclair ONLINE

Affordances of Architectural Typology
Lechner, Gold, Postiglione, Serrazanetti

Informing Life Cycle Assessments Through Design for Disassembly
Frederiksen, Munch-Petersen

Chair: Kyounghee Kim

Topics: Sustainable Architecture

Didaktek

The Profession and the Discipline: Some Thoughts on Healthcare Design Teaching in the USA
Haq

The Role of Playgrounds in Children's Cultural Worlds. Are Playgrounds Redundant in the Urban Environment?
Häselhoff

Integrating the Autism Spectrum Disorder Student in the Architectural Studio Classroom
Santos

Chair: Lyndsey Deaton

Topics: Future Architectural Education

Seminarrum 1.1

(Pre)casting Architectural Concrete: Searching for a Design Guide for Techniques, Resources, and Advancements of Architectural Precast Concrete
Gulling, Lucier

Circular Immersive Parametric Design Workflow for Innovative Materials
Kio

Robotic Concrete 3D Printing Continuous Toolpath Planning: From Single Curve to Voxel-Based Systems for Design-to-Production of Urban Furnitures
Mostafavi, Montejano Hernandez, Bagheri, Howell, Etemadi, Mehan, Asma

Chair: Anders Kruse Aagaard

Topics: Innovative Materials and Construction

Seminarrum 1.3

Building a Lab: Constructing Realities
Uzal

Architecture of the Known and Unknown: Defining and Inhabiting Peripheries
Schwartz

The Role of International Experiences in Architectural Education: Research Reflections from Thailand
Rutkowski, Todd, McCormick

Chair: Tadeja Zupancic

Topics: Disciplinary and interdisciplinary Approaches

Seminarrum 1.4

ARCC WORKSHOP

From Data to Discovery: AI Tools for the
Next Generation of Architectural Scholars
Sharag-Eldin, Rashed-Ali
Auditorium

14.30 - 15.15 COFFEE

Canteen

THE EAAE-ARCC BOARD MEETING

SATURDAY MAY 25

15.15 - 16.45 PAPER PRESENTATIONS

Seminarrum 1.1

The Energy Storage Capability of Building Rainscreen Cladding Panels Integrated with Photovoltaic and Reversible Proton Exchange Membrane Fuel Cells
Zhang, Azari, Poerschke

Verification of the Energy Attributes of a Biochromic Facade through Real-time Measurements
Sangdeh, Kim

Augmented Reality Driven Design and Fabrication of Shading Devices
Wibranek

Chair: Ming Hu

Topics: Innovative Materials and Construction / Sustainable Architecture

Seminarrum 1.3

Critically Engaging The Past To Build A More Just And Sustainable Future
mac Aoidh

Stakeholder Research in Architecture and Urban Design: Assessing Emerging Methods for a Post-Pandemic World
Staub, Ahrar

The Studio: Operative Urban Practice from Research to Speculation
Hsu

Chair:

Topics: Disciplinary and interdisciplinary Approaches

Seminarrum 1.4

Architecture Washing, A Framework for Investigating if the AEC is Complicit in Human Rights Abuses, the Case of Neom
Trubiano

Air Quality and Teacher Health in the Context of Energy Poverty in Chile
Coronado, Rivera, Martinez, Kwok

Towards a New Studio Pedagogy: Improving Social Determinants of Health through Community-based Participatory Research and Design
Bhiwapurkar

Chair: Traci Rose Rider

Topics: Ethics and Social Responsibility

16.45 - 17.00 BREAK

17.00 - 18.30 KEYNOTE - GÜNTER VOGT

Didaktek

19.00- CONFERENCE DINNER

Canteen

SUNDAY MAY 26

09:30 - 11.00 PAPER PRESENTATIONS

Seminarrum 1.1

Pedagogical Approach for Additive Manufacturing of Molds to Produce Topological Interlocking Assemblies
Emami

Curved-crease Cardboard Origami: A Framework for Modular Deployable Cardboard Structures
Diarte Almada, Vazquez Peña

Enhancing Rammed Earth's Accessibility Through Novel Tectonic Machines: Developing and Testing a Rotational Tamper
Shaffer

Chair: Anders Kruse Aagaard

Topics: Innovative Materials and Construction

Seminarrum 1.3

Navigating Future Urban Housing Challenges: Uncovering Skid Row's Informality in the Global North
Meshkani

ADAPT: A Collaborative Approach to Accessible Affordable Housing
Miller, Collins, Tzeng

Beyond Arrival: Ethics in Housing Those Who Will Come ONLINE
Schreyer

Gulling, Lucier

Chair:

Topics: Ethics and Social Responsibility

Seminarrum 1.4

ResThermoVR: Development and Assessment of VR Educational Tool
Alhazzaa, Dixit, Yan

Expanding Protocols: Teaching Construction Through Immersive Virtual Learning Environments
Rule

A New Way of Presenting: Redefining Architecture and Design Exhibition through Virtual Realms
Çalıskan, Ceylan

Chair:

Topics: Future Architectural Education

11.00 - 11.30 CONFERENCE CLOSING

Didaktek

11.30 - 12.30 LUNCH

Canteen

KEYNOTES

Sponsored by

VELUX®

ANDERS LENDAGER

THURSDAY MAY 24, 16.30-18.00
DIDAKTEK

Photo: Maria Albrechtsen Mortensen

Anders Lendager is an architect, creative director and founder of Lendager. His company has established itself as a front runner and one of the most influential architecture studios and strategic consultancies working within sustainability and circular economy. Anders oversees various projects and ensures the implementation of cutting-edge approaches to change-making in the built environment within a wide range of typologies, scales and consultancy services. He aims to push the boundaries and scale sustainable transition throughout the value chain.

Anders Lendager graduated as an architect from the Aarhus School of Architecture and has since been immersed in the development and promotion of sustainability in practice and as an external consultant, keynote speaker and international lecturer on resource efficiency, innovation and holistic sustainability. His pioneering spirit has positioned him as a recognised proponent of turning strategy into concrete actions. Further, Anders has been represented on the board of the Danish Association of Architectural Firms and committees such as UNDP SDG Accelerator.

During the last decade, Anders has created and developed three companies working with architecture, circular consultancy and building component production, and has recently sold and spun-off a company dedicated to developing and selling upcycled building products to the wider market. Innovation, a keen eye for scalability and the ability to assist clients in translating long-term strategic goals into new business opportunities is one of his strong points. His visionary approach is anchored in his deep understanding of the potential for using architecture as a process to convey and create climate action.

His pioneering spirit and willingness to go beyond common conceptions of the possible have already changed many people's conception of what opportunities lie in creatively working with the most pressing issues of our time.

ALEXANDRA ARÈNES

FRIDAY, MAY 25, FROM 5:00 PM TO 6:30 PM
DIDAKTEK

Alexandra Arènes is a French graduate architect (2009) and holds a PhD in Architecture (University of Manchester, 2022). Her research and practice focus on understanding and representing landscapes in the context of climate change, at S.O.C (Société d'Objets cartographiques) and Shaa, studio for architecture and urbanism. The studio designed an installation at the ZKM museum in Karlsruhe for the exhibition Critical Zones. Observatories for Earthly Politics, curated by Bruno Latour. She is co-author of Terra Forma, a book of speculative maps published by MIT. In collaboration with scientists from the Critical Zone, she is developing maps of the Earth's cycles. She is currently a post-doctoral researcher at the IPGP (Institut de Physique du Globe de Paris).

GÜNTHER VOGT

SATURDAY, MAY 26, FROM 5:00 PM TO 6:30 PM
DIDAKTEK

Günther Vogt's training at Gartenbauschule Oeschberg provided the practical basis for his intensive landscape work. His knowledge of vegetation and his skills in cultivation continue to be the very cornerstones of his work. His studies with Peter Erni, Jürg Altherr, and Dieter Kienast at Interkantonales Technikum Rapperswil, combined the disciplines of culture, design, and natural sciences. VOGT Landschaftsarchitekten emerged from the office partnership with Dieter Kienast in 2000. With projects such as the Tate Modern in London, Allianz Arena in Munich, or the Masoala Rainforest Hall at the Zurich Zoo, the firm has achieved international recognition. Its work is characterized by the dialogue established between the various disciplines and its close cooperation with artists. Since 2005, Günther Vogt has been pursuing a combination of teaching, practice, and research with his chair at the Institute of Landscape Architecture at the Swiss Federal Institute of Technology (ETH) in Zurich. As a passionate collector and keen traveler, he is looking for ways to read, interpret, and describe landscapes, and finding answers to questions about future forms of urban coexistence. In 2012, Günther Vogt was awarded the Prix Meret Oppenheim by the Federal Office of Culture.

WORKSHOPS

WORKSHOP

SPATIAL EQUITY AND INCLUSIVENESS IN THE CITY CENTRE

RESEARCH, EDUCATION, AND PRACTICE

FRIDAY 24 MAY 13.00-14.30, SEMINARRUM 2.3

Organised by:

Architectural Research Centers Consortium
Council for Research and Innovation in Building and Construction:
Working Commission in Architectural Design and Management

Facilitators:

Ihab Elzeyadi
Bob Giddings
Silvio Melhado

Synopsis:

Among present urban dilemmas are the social and cultural integration of diverse populations and responses to the barriers created by limited access to the critical elements of safe, healthy, and dignified lives. The focus of this session is the role of research, education, and practice in inclusiveness and generating spatial equity. The challenge of creating socially and environmentally sustainable places that are accessible to various communities lies at the core of critical research in the design disciplines. Research into spatial equity and inclusiveness in architectural education and practice is manifested in both process and product. In thinking about the conference theme, this workshop will engage participants in a lively debate around a set of conditions and provocations that will assist the development of a resilient city center. The concept of universal access to city center facilities, regardless of social class, race, gender, and ethnic background needs to be carried through to practice. Moreover, inclusion for some members of society can represent exclusion for others. Thus, there is a continuum from the producers of urban space in all its scales, through to the users. The outcome of the workshop will be to elicit ideas, opinions, and different perspectives from the participants, and lay out a plan of action for a future research agenda.

Issues for Discussion:

Environment
– healthy places, sustainable spaces, infrastructure

Social Change
– lived experiences, capacity building

Economic Challenges
– to benefit society rather than capitalists

Movement
– equity in transport

Culture
– re-use of heritage buildings and spaces

WORKSHOP

RETHINKING ARCHITECTURAL RESEARCH:
SPATIAL AGENCY TOWARDS A MORE EQUITABLE FUTURE

SATURDAY 25 MAY 10.45-12.15, SEMINARRUM 2.3

Organised by:
Architecture Research Centers Consortium

Facilitators
Alexandra Staub & Clare Robinson

Workshop Overview:
In this hands-on workshop, we will use five prompts to re-think how we can use social and spatial measures to work towards a more equitable future. The five prompts range in scale from "Voting", "Throwing a Party", and "Shopping" to "Building a House" and "Raising a Barn". All of these measures are intended to blur boundaries between designers and those being designed for, thus challenging conventional power structures in place making and the definition of "successful" architecture and urban design.
The workshop involves a short reading, after which we will break into groups to discuss ideas for our work moving forward.

WORKSHOP

FROM DATA TO DISCOVERY:
AI TOOLS FOR THE NEXT GENERATION OF ARCHITECTURAL SCHOLARS

SATURDAY 25 MAY 13.00-14.30, SEMINARRUM 2.3

Organised by:
Architecture Research Centers Consortium

Facilitators
Adil Sharag-Eldin, Kent State University, USA
Hazem Rashed-Ali, Kennesaw State University, USA

Workshop Overview:
This workshop is designed to equip Ph.D. students and new researchers in architectural fields with cutting-edge AI tools and methodologies to enhance their research capabilities. Through a hands-on approach, participants will learn how to utilize AI technologies to focus their research questions, organize their study, and develop comprehensive literature reviews. The workshop aims to streamline the research process, enabling scholars to conduct more efficient, thorough, and innovative investigations in the field of architectural research.

Justification:
Integrating Artificial Intelligence (AI) into architectural research represents a transformative shift toward more efficient, precise, and innovative exploration within the field. As architectural research continues to evolve, the complexity and volume of data available for study have grown exponentially. This burgeoning data landscape presents both an opportunity and a challenge for Ph.D. students and new researchers who strive to create novel research niches and contribute meaningful insights to the discipline. The proposed workshop, " From Data to Discovery: AI Tools for the Next Generation of Architectural Scholars," is designed to empower emerging scholars with the knowledge and a few tools necessary to harness AI effectively, enhancing their research capabilities and enabling them to stay at the forefront of architectural innovation.

The rationale for focusing on AI in architectural research is multifold. Firstly, AI offers several capabilities in managing and analyzing large datasets, a common challenge in architectural studies that often involve complex multidisciplinary literature reviews. Thus, it deliberates research findings and significantly reduces the time spent on literature review, allowing scholars to dedicate more effort to reading the materials and finding gaps and opportunities. Secondly, the workshop addresses a critical need for methodological modernization in architectural research. With the growing acceptance of interdisciplinary approaches and digital technologies, traditional research methods need to evolve. The workshop offers hands-on training in a few AI tools for research organization,

literature review development, and data synthesis. Moreover, the interactive format of the workshop, focusing on developing a literature review outline on a topic of the participant's choosing, ensures practical learning that can be directly applied to their ongoing or future research projects.

Objectives of the Workshop:

1. Introduce participants to AI technologies relevant to architectural research.
2. Demonstrate how AI may assist in identifying and focusing research questions.
3. Teach strategies for organizing research effectively using AI tools.
4. Guide participants through the process of developing a comprehensive literature review with AI assistance.
5. Foster skills in critical thinking and analysis enhanced by AI capabilities.

Target Audience:

- Ph.D. students in architectural sciences.
- New researchers entering the field of architectural research.
- Scholars who are interested in integrating AI into their research methodologies.

Workshop Content:

Part 1: Introduction to AI in Architectural Research
- Overview of AI technologies applicable to architectural research.
- Benefits of using AI for research focus, organization, and literature review development.
- Examples of successful AI applications in architectural studies.

Part 2: Focusing Your Research with AI
- Techniques for using AI to refine research questions.
- Identifying key research areas and gaps with AI analytics.

Part 3: Organizing Research with AI Tools
- Introduction to AI-based research management tools.
- Strategies for effective research data organization and management.

Part 4: Developing a Comprehensive Literature Review with AI
- Hands-on session: Participants will select a research topic and use AI tools to identify relevant literature.
- Guidance on synthesizing literature using AI to uncover trends, gaps, and opportunities for new research.

Expected Outcomes:

Participants will leave the workshop with an understanding of how AI may transform the architectural research process. They will have hands-on experience utilizing AI to develop focused research questions, organize their studies, and create comprehensive literature reviews. Furthermore, participants will develop an outline of a literature review on a chosen topic, setting a solid foundation for their research projects.

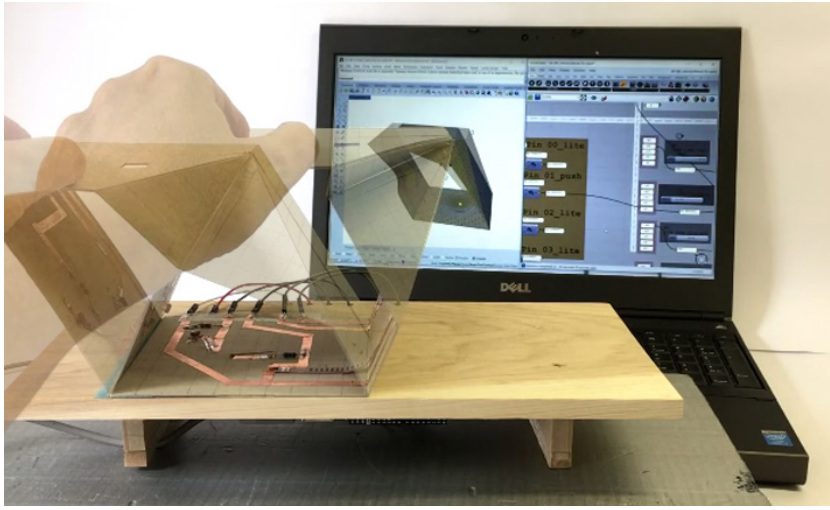
EXPLORATIVE PRACTICES

EXPLORATIVE PRACTICES

Explorative Practices is an innovative conference format that promotes alternative formats for architectural knowledge production. This knowledge may be produced through artistic or professional practice, education, co-creative processes, or user involvement. The presentations of Explorative Practices use alternative formats that may involve artifacts, performances, or workshops.

CYBERMODELING
INTO THE COMPUTATIONAL UNKNOWN

AILEEN IVERSON-RADTKE
AIR ARCHITECTURE, GERMANY



This explorative practice conducts digital architectural modeling through analogue means. Termed 'hybrid analogue-digital architectural modeling', the practice is extensively explored in a recently completed Design Driven Doctoral Research (DDDR); and is being further developed in workshops and research papers to introduce and encourage its use in academia.

Hybrid analogue-digital modeling uses simple microsensor technology to detect manual manipulations (bending, folding, etc.) and contextual information (gravity, light, distance, etc.). The analogue side of the model is embedded with microsensors connected to parametric code. This analogue sensor model acts as interface to digital modeling, replacing mouse and keyboard.

Hybrid modeling, linking digital models to real-time sensor data, generates 'live' digital design objects animated by the reaction of their (digital) material properties attached to spatial forces. Hybrid modeling teaches architecture design as an engagement with media connected to dynamic systems (material, spatial, and environmental). Additionally, hybrid modeling prioritizes our uniquely embodied intelligence by formatting digital design through physical making, thus accessible to sensory and intuitive knowledge.

The presentation will consist of three parts: a lecture, demonstration, and exhibit/ mini-workshop. Participants are invited to try out the Cybermodeling methodology during the mini-workshop. The mini-workshop experiments with micro- sensors and controllers (Arduinos) to produce interactions and manipulations with simple digital models. Those interested should have some familiarity with Rhino and Grasshopper. Familiarity with microsensors and Arduino microcontrollers are beneficial but not required.

IMPORTANT NOTE:
For this workshop a PC laptop is required (Firefly is not supported on Apple Mac) with the following software installed:

Firefly
https://www.food4rhino.com/en/app/firefly
Arduino Firmata
https://www.arduino.cc/en/software
Rhino and Grasshopper
https://www.rhino3d.com/download/

THE ROLE OF ARTIFICIAL INTELLIGENCE-ASSISTED QUALITATIVE ANALYSIS IN ARCHITECTURAL PROGRAMMING

ESTELLE DUVAL, CATHERINE CHOUINARD, PABLO GARCIA DE PAREDES, CAROLE DESPRÉS

ÉCOLE D'ARCHITECTURE DE L'UNIVERSITÉ LAVAL, QUEBEC, CANADA

Architectural programming requires extensive and varied information and data. Local knowledge of space use, and of user satisfaction and needs is often the result of a combination of multiple sources (on-site observations, interviews, focus groups, administered qualitative surveys, or participatory sessions). Outside academic circles, the analysis of this qualitative material, most often texts and verbatim reports, is costly and time-consuming. While firms specializing in architectural programming often use qualitative data analysis software, most practitioners generally examine meeting minutes and open comments through informal procedures to identify issues and challenges. This workshop explores the benefits and limitations of AI-assisted content analysis compared with more traditional human-driven analysis in two case studies. Architectural researchers involved in AI-assisted qualitative analysis or interested to learn about it are invited to attend this workshop. After a brief introduction where everyone will have the opportunity to indicate where they are from and why they are interested in the session, a 30-minute presentation of the two case studies will follow after which people in the audience will be invited to share their own AI experiences or ask questions.

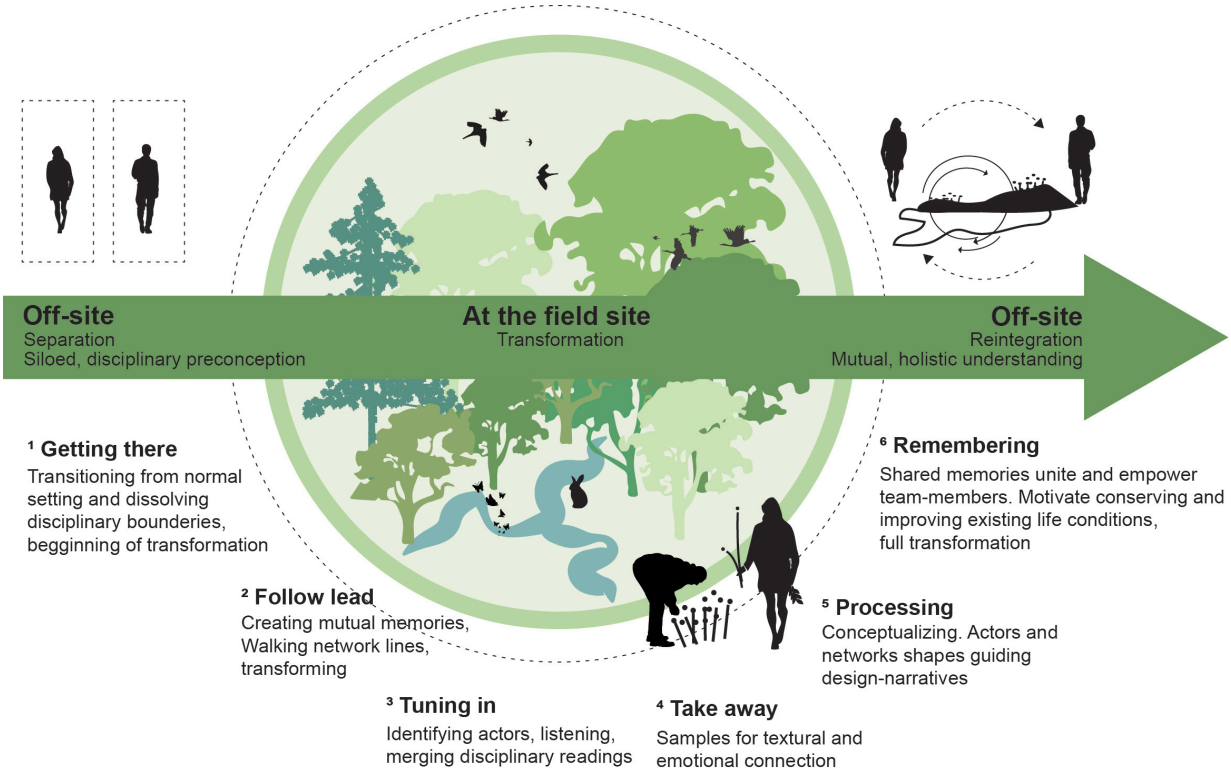
The first case study presents the AI-assisted qualitative analysis of open-ended comments to 25 questions from an online survey designed to assess school staff's appreciation of their facilities (n=356). The survey was part of a larger data collection to inform the development of guidelines to support designers and decision makers in the renovation of public schools in Quebec (Canada). The organization and categorization of text responses performed by ChatGPT 4.0 were compared to those resulting from two judges The AI-assisted approach confirmed most of the patterns identified by the judges and identified more subtle ones, while significantly speeding up the sorting process. The comparison of the two methods also enabled us to identify precautions and control measures that should be put forward for this type of AI-assisted analysis. The second case study aimed at better understanding the contribution of housing to the adaptation process of teleworking mothers during the COVID-19 pandemic, with a view to advancing the design of home-based offices. Chat GPT-4.0 was used to analyze the qualitative material collected through semi-structured Zoom interviews including: 1) verbatim from 33 interviews; 2) architectural plans of participants' homes and photographs of their workstations; 4) participants' residential and mental health. These multiple information sources are common in architectural programming to formalize the requirements and parameters of a project. ChatGPT-4 helped develop accurate categories linking the different pieces of a complex puzzle layers, whereas this procedure by hand or using qualitative tools such as N-vivo would have been an extremely tedious and time-consuming. In conclusion, the potential of artificial intelligence to help with the onerous task of qualitative analysis and to enhance the value of this type of data is discussed. The results suggest that, with this ability to speed up and improve content analysis, architects may be more inclined to use qualitative data to inform decision-making.

FIELDWORK ACROSS DISCIPLINES

SIX PHASES TOWARDS A SITUATED DESIGN APPROACH

KRISTINE C.V. HOLTEN-ANDERSEN & KRISTINE ENGEMANN

SLA, DENMARK & AU, DEPARTMENT OF BIOLOGY - ECOINFORMATICS AND BIODIVERSITY, AARHUSDENMARK



The escalating climate- and biodiversity crisis, urges practices of urban planning and -design to focus on how urban interventions protect and support local conditions for life, for all species. Such a quest calls for novel approaches in early-phase site-assessment. In our exploratory paper, we research whether and how practicing fieldwork across disciplines (e.g. Biology and Architecture) can generate enhanced sensitivity towards sites, empower more-than-human actors and interests, and drive possibilities for systemic transformative change. We tap into an understanding of 'sites' as comprised by thick and precious networks of heterogeneous actors (human and non-human, a-biotic and biotic) entangled in Critical Zones where they collaborate over various timespans to create habitable conditions. Based on research into interdisciplinary cooperation at the nature-based design studio of SLA (IDF), we conclude, that activities of interdisciplinary fieldwork (IDF) can support a design-teams recognition of the broad spectra of site-specific natural values and processes of life, thus enhancing the chance to design with them. Rather than providing layered or kaleido-

scopic perspectives, IDF seem to afford merging of disciplinary perspectives into conjoint appreciations. Based on the findings we propose the contours of a formal framework for IDF, to be further developed. It consists of three stages and six phases: (1) Getting there; (2) Tuning in; (3) Take away; (4) Follow lead; (5) Processing; (6) Remembering.

Presentation format and content:
During the conference workshop participants will actively partake in transdisciplinary biological- and architectural field work, aiming to join the two disciplines in a mutual and deepened understanding of an urban nature site. The workshop will guide participants on an urban nature field trip, led by the authors. Here we will test the IDF-methodology, presented by the authors, by acting out five of the six phases. We will jointly make observations and interactions along the route, using our respective disciplinary lenses and learn from each other's perspectives. Concluding the workshop, we will facilitate a discussion in plenum, resulting in co-development of perspectives for further development of the IDF-methodology.

Presentation place:
We meet at the information desk. The workshop will include a walk at a nearby urban nature site: the river Aarhus Å. Participants should wear weather-appropriate clothing and footwear.

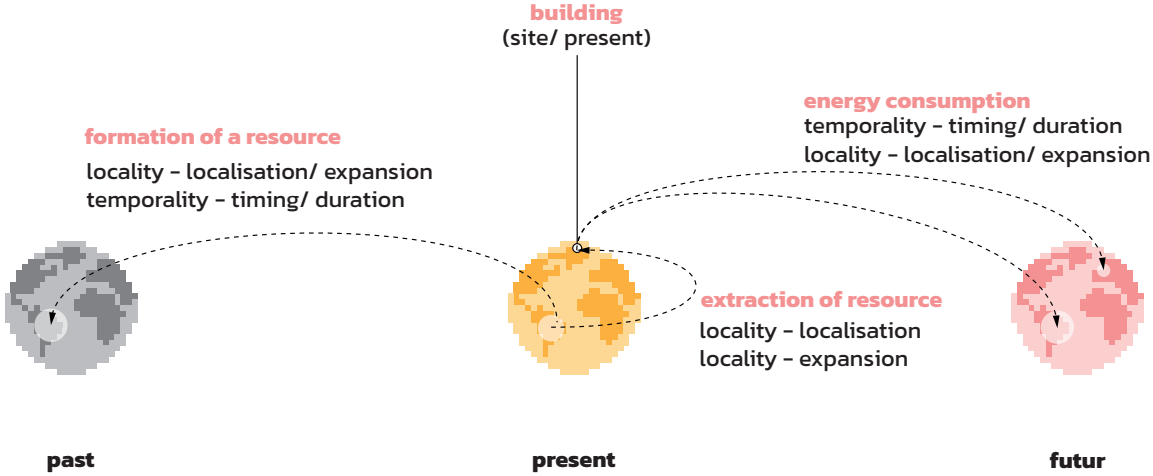
Presentation length:
1.5 hours

SENSUALIZING, INTERLINKING, ANCHORING

RESEARCH COLLAGE AS AN EXPLORATIVE RESEARCH PRACTICE IN THE ANTHROPOCENE FIELDWORK ACROSS DISCIPLINES

TILL ZIHLMANN

INSTITUTE FOR BUILDING CLIMATOLOGY AND ENERGY OF ARCHITECTURE, TECHNICAL UNIVERSITY BRAUNSCHWEIG, GERMANY



The Research Collage addresses the challenges of architectural practice in the present, which we are confronted with due to the end of the environmental conditions of the geological epoch of the Holocene and the beginning of the Anthropocene. The aim is to extend the perspective to processes beyond the architectural object and to investigate the multidimensional manifestations of architectural practice in place and time in the Anthropocene. In order to overcome familiar thought patterns, the technical perspective of architectural production is complemented by the consideration of the aesthetic dimensions which is intrinsically tied to architecture. In addition to imparting tangible knowledge of architectural education, the research practice aims to create a framework in which students can exploratively transform knowledge and thus develop their own approach to a new geological reality. The methodology developed operates at the interface of scientific research and the visual translation of knowledge. Therefore, three instruments are implemented: The Threads of Thought (Process, Locality, Temporality, Scale) provide a language framework to describe the multidimensional manifestations of architectural practice and Anchor them in the Anthropocene. The media technique of collage uses architecture-specific representations for Sensualizing knowledge and enables the multidimensional Interlinking of different places and times. The iterative design process stimulates associative relations and facilitates a dialog between the technical and the sensuous dimension of architecture. The Research Collage developed in this way is an epistemic artifact of the examination of architectural practice in the present and operates as a constant aesthetic echo of scientific research.

The presentation of the explorative practice takes place as a discursive format consisting of three parts: (1) Introduction: A short presentation introduces the context, the aim and the tools of the research collage. (2) Examples: Examples from teaching are then shown, which are analysed/ discussed in small groups.
(3) Reflection: To conclude, a discussion round with all participants is planned. Together, the opportunities and limitations of the research collage will be discussed.

ABSTRACTS

RETHINKING THE HOME OFFICE:
INSIGHTS FROM TELEWORKING MOTHERS' MATERIAL ADAPTATIONS DURING COVID-19

PABLO MANUEL GARCIA DE PAREDESORCID, MARIE BARON, LEBLANC ANNIE, DESPRÉS CAROLE
UNIVERSITÉ LAVAL, CANADA

KEYWORDS: RESIDENTIAL SITUATION, ADAPTATION, TELEWORK, HOME OFFICE, CHATGPT-4, SITUATIONAL ANALYSIS

This follow-up qualitative study delves into the contribution of housing on the material adaptations of teleworking mothers during the COVID-19 pandemic. The investigation concentrates on the interplay between housing conditions, the multifaceted challenge of daily routines faced by mothers, and telework setups during stay-at-home orders. Insights from the adaptation process will inform flexible design criteria for home offices in the context of a global telework upsurge and enhance preparedness for future emergencies. Narrative accounts were gathered through 33 semi-structured Zoom interviews of teleworking mothers, supplemented by annotated architectural plans. AI-assisted discourse analysis using ChatGPT-4.0 was conducted on four groupings defined by comparable residential situations (defined along housing attributes, family structure, and work modality profiles). Floor plans, dwelling pictures from home offices or multifunctional spaces, participant profiles, and interview extracts, were used for a thorough architectural assessment and for uncovering each group's material adaptations. The findings were subsequently verified through qualitative analysis. Key design strategies for future housing projects and renovations to improve work modality transitions and telework productivity, especially when living in apartments or with small children, are the inclusion of flexible multifunctional rooms, quiet areas with foldable desks, portable home office setups for the self-employed on the move, small home offices for occasional meetings in sub-utilized storage rooms, modular and soundproof partitions temporarily separating open plans or shared home office spaces, visual partitions to demarcate private and work environments, designing office spaces in intermediate and exterior areas like verandas and balconies through the inclusion of glassed perimeters for winter use, and planning adaptable building systems.

AINA-BASED DESIGN SOLUTION FOR INDIGENOUS COMMUNITIES IN HAWAII: *A PEDAGOGY APPROACH*

MING HU
UNIVERSITY OF NOTRE DAME, USA

KEYWORDS: INDIGENOUS COMMUNITIES, PEDAGOGY APPROACH, AINA-BASED DESIGN

The objective of this endeavor is to develop, evaluate, and substantiate an integrative design methodology grounded in Aina, which is tailored to address the needs of indigenous populations in Hawai'i. This methodology is operationalized through a triad of courses at Chaminade University of Honolulu. These courses are designed to facilitate a collaborative learning environment that unites students, community stakeholders, and academics through hands-on design studios, mandatory thematic courses, and optional seminars. The practical application of this design approach is examined through two key initiatives: the refurbishment of the Maunalua Fishpond Heritage Center and the conception of a modular shelter aimed at assisting the homeless and providing aid during disasters. The collaborative efforts are supported by a partnership between the Chaminade team, the Maunalua Fishpond Heritage Foundation, and the Institute of Human Services in Hawaii, with a focus on discerning and fulfilling the community's specific requirements.

THE EFFECTS OF PASSIVE DESIGN ON INDOOR THERMAL COMFORT AND ENERGY SAVINGS FOR RESIDENTIAL BUILDINGS IN HOT CLIMATES: *A SYSTEMATIC REVIEW*

MING HU
UNIVERSITY OF NOTRE DAME, USA

KEYWORDS: PASSIVE DESIGN, INDOOR THERMAL COMFORT, ENERGY SAVINGS, REVIEW

In this study, a systematic review and meta-analysis were conducted to identify, categorize, and investigate the effectiveness of passive cooling strategies (PCSs) for residential buildings. Forty-two studies published between 2000 and 2021 were reviewed; they examined the effects of PCSs on indoor temperature decrease, cooling load reduction, energy savings, and thermal comfort hour extension. In total, 30 passive strategies were identified and classified into three categories: design approach, building envelope, and passive cooling system. The review found that using various passive strategies can achieve, on average, (i) an indoor temperature decrease of 2.2°C, (ii) a cooling load reduction of 31%, (iii) energy savings of 29%, and (v) a thermal comfort hour extension of 23%. Moreover, the five most effective passive strategies were identified as well as the differences between hot and dry climates and hot and humid climates.

VERIFICATION OF THE ENERGY ATTRIBUTES OF A BIOCHROMIC FACADE THROUGH REAL-TIME MEASUREMENTS

PARHAM KHEIRKHAH SANGDEH, KYOUNG HEE KIM
UNC CHARLOTTE, USA

KEYWORDS: MICROALGAE FAÇADES, BIO-BASED, ENERGY CONSUMPTION, SOLAR HEAT GAIN, VISUAL LIGHT TRANSMISSION

Microalgae facades can significantly impact a building's energy consumption and carbon neutrality. This particular facade achieves this effect through various mechanisms, including dynamic shading efficacy, winter solar gain, dynamic visual light transmission, carbon sequestration through photosynthesis, and the transfer of produced oxygen to indoor space. While numerous smart facades have been introduced in the contemporary era, the imperative to attain zero-carbon buildings has intensified the quest for nature based, sustainable solutions characterized by minimal carbon production and real time carbon sink throughout their life cycles. This paper aims to assess the potential for reducing building energy consumption by examining the influence of microalgae facades on Solar Heat Gain Coefficient (SHGC) and Visual Light Transmission (VLT).

The research employs a combination of experimental and simulation approaches to facilitate comprehensive result comparisons. Microalgae façade samples were prepared at four distinct cell densities (25%, 50%, 75%, and 100%) to examine the density's impact on SHGC and VLT. Furthermore, the study undertakes a comparative analysis of energy consumption of a reference building and a microalgae building across diverse climates. This comparison is conducted using conventional glazing according to ASHRAE 90.1 and microalgae facades with varying cell densities, contributing to a nuanced understanding of their respective energy efficiency implications. The results indicate that cell density and thickness of microalgae facades can play a key role in SHGC and VLT. Therefore, microalgae can act as a façade with dynamic U-value and VLT depending on different climate zones. The results indicate that almost in all climates integrating microalgae façade can reduce the energy consumption by 4% to 12%.

THE PETROLOGICAL IMPRINT:
A COMPREHENSIVE STUDY OF SPINDLETOP'S ROLE IN THE MORPHOGENESIS OF THE GOLDEN TRIANGLE OF TEXAS

ASMA MEHAN, ZACHARY S. CASEY
UCKABEE COLLEGE OF ARCHITECTURE,
TEXAS TECH UNIVERSITY, USA

KEYWORDS: PETROCULTURAL TRANSFORMATIONS, SOCIO-INDUSTRIAL EVOLUTION, OIL HERITAGE, GLADYS CITY URBAN TRANSFORMATION, GOLDEN TRIANGLE INDUSTRIALIZATION

Nestled within the "Golden Triangle" of Southeast Texas is a remarkable tale of economic metamorphosis, with its epicenter deeply rooted in the Spindletop oil reserves. This research seeks to shed light on the seminal 1901 discovery at Spindletop and its profound ripple effects, which transformed a region previously known for its lumber and cattle activities into a trailblazing hub during the petroleum epoch. Central to our inquiry are the guiding research questions:

- How did the Spindletop discovery reconfigure the socio-economic and urban tapestry of the Golden Triangle's foundational cities: Beaumont, Port Arthur, and Orange?
- What indelible mark has institutions like the Spindletop-Gladys City Boomtown Museum imprinted in archiving and elucidating this period of intense transformation?
- As industrial activities burgeoned, how have the resulting environmental reverberations shaped contemporary views on the Golden Triangle's trajectory?

To unpack these questions, a holistic mixed-methods strategy was adopted. This combined the richness of archival research and oral histories to capture the nuanced socio-cultural shifts, while employing spatial analysis tools to quantify and visualize the urban expansion in the aftermath of the Spindletop discovery. Furthermore, thorough environmental impact assessments were undertaken, offering a critical lens into the ecological side-effects borne from industrial efflorescence. The journey of the Golden Triangle serves as a compelling microcosm of broader global themes: the delicate balance between innovation and sustainability, the tension between economic growth and ecological responsibility. It underscores the historical gravitation towards fossil fuels, while simultaneously spotlighting the urgent call for innovative and sustainable energy trajectories. In chronicling this journey, we are reminded of the cyclical nature of progress and the paramount importance of harmonizing human aspirations with environmental prudence.

INTERDISCIPLINARY COLLABORATION AND INCLUSIVITY:
METHODOLOGICAL INNOVATIONS IN ARCHITECTURAL PRACTICE AND PEDAGOGY

ASMA MEHAN, SINA MOSTAFAVI
HUCKABEE COLLEGE OF ARCHITECTURE, TEXAS TECH UNIVERSITY, USA

KEYWORDS: INTERDISCIPLINARY COLLABORATION, INCLUSIVE ARCHITECTURAL PRACTICE, TRANSFORMATIVE PEDAGOGY, CO-PRODUCTION, DIGITAL MAPPING, AUGMENTED REALITY (AR)

This paper critically explores innovative methodological frameworks we have developed within our design studios. It foregrounds the themes of interdisciplinarity and inclusivity within architectural practice and pedagogy as tools to navigate the complexities of contemporary socio-technical challenges and the ever-evolving terrain of architectural design. The argument is hinged on the understanding that an inclusive and collaborative praxis in architectural pedagogy can offer constructive responses to these challenges. Our discourse delves into the significance of interdisciplinary collaboration as a cornerstone for innovating innovative pedagogical strategies. By bridging disciplinary silos, fostering egalitarian participation, and enhancing the dynamism of design processes, interdisciplinary approaches provide a robust scaffold for architectural pedagogy. We present a detailed exposition of the co-production methodologies employed within our studios. The outcomes demonstrate the efficacy of such methodologies in shaping collaborative learning environments and fostering sophisticated communication and teamwork skills that transcend traditional disciplinary boundaries. Simultaneously, the paper elucidates our empirical exploration of digital mapping and augmented reality technologies within architectural practice and pedagogy. Drawing from the practical, hands-on experiences within our design studios, we chronicle the transformative potential of these digital tools. Incorporating such technologies is shown to reconceptualize design practices across various scales, from innovating material design methodologies to fostering critical urban thinking. Further, we investigate our pedagogical strategies in urban community development, intertwining with digital mapping applications. This exploration reveals the intricate interplay between spatial design, social responsiveness, and technological interventions, offering a nuanced understanding of these symbiotic relationships. Additionally, our successful implementation of computational design and fabrication techniques within our studios underscores the critical role of interdisciplinary collaboration and technological fluency in sculpting the architects of the future. In conclusion, this paper contributes more than a contribution to the ongoing discourse on inclusivity and collaborative praxis in architectural education. It offers a tangible manifestation of these concepts through practical, evidence-based insights from our design studios. By showcasing the transformative, equitable, and forward-thinking approaches employed in our pedagogical practices, this study serves as a practical guide for educators in architecture seeking to reinvent their own teaching and learning strategies.

DESIGNING AN INCLUSIVE PUBLIC REALM:
GENTRIFICATION AND PERSPECTIVES ON ACTIVE TRANSPORTATION IN THE AMERICAN SOUTH

LYNDSEY DEATON, ZAHRA GHAZANFARI, ARIELLE SPENCER, N. GRAHAM DENTON, TAYLOR COX
CLEMSON UNIVERSITY, USA

KEYWORDS: ACTIVE TRANSPORTATION, GENTRIFICATION, INCLUSIVE COMMUNITIES, COMMUNITY HEALTH

Deeply rooted traditions of personal property and anti-government sentiments in the American South clash against design goals to support active transportation. Leveraging the framework of the "underdog," this paper identifies two groups fighting the establishment to shape and control the built environment: the legacy residents of historically black, low-income communities and the active mobility advocates. The case study of West Greenville, South Carolina reveals tensions and illuminates the complicated history and relationships behind gentrification for these two groups. West Greenville is a revitalizing hub where active mobility architecture encroaches into four historically black, low-income neighborhoods. Designing an inclusive public realm is out-of-reach without a deeper understanding of the range of stakeholder perspectives that are often regionally specific. By rigorously investigating these perspectives through qualitative methods such as behavior mapping, interviews, and observations, this paper seeks to move discourse on gentrification in a rapidly growing region where social justice concerns lie at the intersection of race and class. The paper concludes that active transportation architecture gave rise to and later symbolized gentrification to the legacy residents, contrary to current best practices and local government planning intentions.

PEDAGOGICAL APPROACH FOR ADDITIVE MANUFACTURING OF MOLDS TO PRODUCE TOPOLOGICAL INTERLOCKING ASSEMBLIES

NILOUFAR EMAMI

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAGNE, USA

KEYWORDS: PEDAGOGY, ADDITIVE MANUFACTURING (AM), TOPOLOGICAL INTERLOCKING ASSEMBLIES (TIA), 3D PRINTED MOLDS, PRECAST.

With bespoke fabrication on one end and mass production on the other end of the fabrication spectrum, this paper focuses on custom repetitive manufacturing. It reviews the process and outcomes of a studio offered at REDACTED School of Architecture. The objective of the studio was to enable students to design building components for assembly, followed by digital fabrication of the components. The pedagogical methodology employed a project-based learning (PBL) method in the first project, and a problem and project-based learning (PPBL) method for the second project. In the first project, students developed an understanding of precast elements as well as acquiring a set of skills in additive manufacturing (AM) and mold making by analyzing a built precast case study. In the second project, students were presented with the problem of designing topological interlocking assemblies (TIA) while being required to design a reusable mold for casting the modules. Pedagogy encourages reflecting on past architectural projects by exploring the rationale and limitations of traditional production techniques, before rethinking design and production methods by using advanced building technologies. This manuscript explains the process and outcome of the second project. Among the challenges to be solved in the second project was 1- designing a block geometry with complex curvatures on all sides for mortarless assembly; 2- designing the assembly resulting from the design of the block and iterating while assessing the daylighting and structural performance of the assembly; 3- digital design and fabrication of a plastic mold for repeatable casting of the block geometry. The projects were assessed based on responding to these three challenges. The studio resulted in installations that were exhibited at the end-of semester showcasing students' projects. The installations demonstrated a proof-of-concept for 3D printing plastics as a formwork for repeated casting of interlocking concrete blocks.

ResThermoVR:
DEVELOPMENT AND ASSESSMENT OF VR EDUCATIONAL TOOL

KIFAH ALHAZZAA[1,3], MANISH DIXIT[2], WEI YAN[1]

[1]DEPARTMENT OF ARCHITECTURE, COLLEGE OF ARCHITECTURE, TEXAS A&M UNIVERSITY, USA,
[2]DEPARTMENT OF CONSTRUCTION SCIENCE, COLLEGE OF ARCHITECTURE, TEXAS A&M UNIVERSITY, USA,
3: DEPARTMENT OF ARCHITECTURE, COLLEGE OF ARCHITECTURE AND PLANNING,
QASSIM UNIVERSITY, SAUDI ARABIA

KEYWORDS: VR SIMULATION, VR BUILDING SIMULATION, VR ENERGY, VR EDUCATION, VR ARCHITECTURAL EDUCATION

Understanding building energy simulation poses a significant challenge due to the intricate nature of energy modeling principles, particularly among secondary school students who form the groundwork for addressing climate change. Raising awareness about energy consumption and wastage among students at an early educational stage holds paramount importance for the future environmental well-being. This stems from the fact that individuals commonly encounter difficulty in concretely grasping the extent of their energy usage. This research endeavor seeks to tackle this challenge by conceptualizing and assessing an educational tool in the realm of Virtual Reality (VR) named ResThermoVR. The central objective of ResThermoVR is to augment students' comprehension of diverse aspects, including building thermal behavior, operational and embodied energy of buildings, and the associated carbon footprint linked to environmental consequences. The meticulous development of ResThermoVR from the ground up aligns with the goals and aims of this study. It introduces a distinct VR environment that facilitates interaction with nine distinct simulation scenarios. These scenarios encompass a variety of factors influencing building performance, ranging from alterations in architectural design to modifications in construction materials. A pivotal phase of the research entails presenting a prototype through a guest lecture in the field of architecture at a high school. This prototype stands as an inventive pedagogical medium, plunging students into the intricacies of a building's energy usage and its ecological consequence. The immersive and captivating nature of this experience contributes to expounding complex concepts. The primary purpose of the prototype development session revolves around involving end-users in refining the prototype, subsequent assessments, and evaluations, leveraging their input and feedback. The students' experience with the ResThermoVR prototype yielded constructive feedback in terms of Prototype improvements and enhancements, and future user study preparation. The feedback obtained from students' interaction with the ResThermoVR prototype provided valuable insights for refining and enhancing the prototype, as well as for preparing for future user studies.

ENHANCING RAMMED EARTH'S ACCESSIBILITY THROUGH NOVEL TECTONIC MACHINES:
DEVELOPING AND TESTING A ROTATIONAL TAMPER

MARCUS SHAFFER
PENN STATE, USA

KEYWORDS: ROTATIONAL TAMPER, MACHINE DEVELOPMENT, ACCESSIBLE RAMMED EARTH, LOW-CALORIE RAMMED EARTH, TECTONIC MACHINES

In the realm of accessible building technologies, rammed earth construction is a low-skilled, low-cost process of making architecture that commonly employs material found on site. This ancient construction process, where a loose earthen material mix is placed in formwork and compacted with simple tooling, results in walls that are sustainable, healthy for inhabitants, and high-performance. Rammed earth walls offer significant compressive strength, filter air, capture and release heat, transpire moisture, become more durable with age, and are resistant to fire and infestation.

While anyone can skill-up to make rammed earth architecture, the basic tooling and intensive labor involved can significantly tax and/or harm a builder's body. This form of inaccessibility can be off-putting to would-be earth builders, people who may not possess or who cannot afford the requisite calorie-intensive physicality to construct with rammed earth. The research detailed in this paper starts with the observation that rammed earth construction is associated with a technological evolution filled with gaps. In the current spectrum of rammed earth tooling/machinery there is significant space for machine development – new tooling/machines that operate between hand-tamping (low tech), and industrial-scale robotics and/or rammed earth "printing" (high tech).

With the goal of making rammed earth more accessible by specifically addressing the requisite physical labor, a series of prototypical machines – Rotational Tampers – were developed and fabricated at 1:1 scale. These machines were tested in producing rammed earth walls and/or test samples for compaction, while monitoring the machine-user's heart rate as means of measuring expended energy in relation to tamping labor. In developing the machines, the researcher prioritizes simplifying the Rotational Tamper (making it easy to fabricate, assemble, and maintain), its operation (making it easy to set up, intuitive to operate, and easy to disassemble), and its effectiveness (producing quality rammed earth walls with less effort). Ultimately, the resultant Rotational Tamper(s) will be freely available as open-source plans/instructions.

STAKEHOLDER RESEARCH IN ARCHITECTURE AND URBAN DESIGN:
ASSESSING EMERGING METHODS FOR A POST-PANDEMIC WORLD

ALEXANDRA STAUB, SANA AHRAR
PENN STATE UNIVERSITY, USA

KEYWORDS: EMERGING RESEARCH METHODS, COMMUNITY ENGAGEMENT, DIGITAL RESEARCH METHODS, STAKEHOLDER THEORY

Architecture and urban design represent spatial conceptualizations at different, interlinked scales. Economic and social sustainability as part of the design concept requires user and community-based research to determine stakeholder habits and needs. One of the largest challenges in such research is collecting representative data, a challenge that was exacerbated by the lack of in-person research opportunities during the Covid-19 pan- demic.

The pandemic forced research method adaptions for both qualitative and quantitative community-based research. Our paper examines these adaptations as examples of emerging methods more generally. We first summarize both analog and digital stakeholder-focused built-environment research over the past decade. Next, through a literature review, we focus on studies conducted during the COVID-19 pandemic to detail new methods and tools developed during this time. A special focus is on methods developed to access stakeholder groups often overlooked in built- environment research, such as low-income and other vulnerable populations.

We analyze emergent and newly developed methods to determine their applicability, benefits, and limitations for use in a post-pandemic world. In doing so, we contribute to developing methodologies and tools for built-environ- ment stakeholder research where data has typically been harder to access.

AFFORDANCES OF ARCHITECTURAL TYPOLOGY

ANDREAS LECHNER[2], MAIKE GOLD[2], GENNARO POSTIGLIONE[1], FRANCESCA SERRAZANETTI[1]
[1]*DASTU-POLITECNICO DI MILANO, ITALY,*
[2]*INSTITUT FUER GEBAEUDELEHRE, TU GRAZ, AUSTRIA*

KEYWORDS: ARCHITECTURAL TYPOLOGY, ADAPTIVE REUSE, INTERIORS

Affordances of Architectural Typology is the concept for a design-driven research reflection that seeks to explore and further sustainable design strategies that are aiming at resilient building structures but are quintessentially architectural in nature. As material composition, buildings are mediations between forms and functions that belong to different timescales. Considering the "shearing layers" of a building, the primary structural system can last for hundreds of years, while non-bearing walls, surfaces, furnishings, etc. are – like the harbouring of a specific use – of a more temporary character. The wiggle room resulting from these timescales produces a gap that architects bridge "designerly" – i.e. through different techniques of abstraction that grant us both the possibility of envisioning past and future forms of inhabitation and alteration and thus reveal a vague and unaltered character underneath – the building's type. A resilient structure seemingly coincides with its type – as formal structure or notion of organizing forms that confers a recognizable order upon architectural elements. This coincidence is evident in the strong footprint of historical buildings – load bearing elements, building volume and rooms overlap structurally and allow, along with generous dimensions, for centuries of different uses and adaptions. But with modern, energy intensive building technologies and the separation of the building envelope this coincidence becomes rare. Convincing transformations of modern structures thus necessitate both more interpretation and more self-determination in design.

Along these considerations this paper examines affordances of architectural typologies in two directions that follow the authors' expertise: Firstly, affordances are understood as extensions to the notion of type in architecture and are illustrated with reuse projects that show: beyond tailoring towards a specific functional requirement, aiming at typological clarity is a key to both (re-) establishing architectural quality and wiggle room for future transformations. Secondly, for an innovative approach in resilient architectural design, we need to update the post-functionalist critique around the notion of 'type' as an epistemology of the architectural discipline that renews, reuses and recycles both the knowledge and the materiality of buildings.

CURVED-CREASE CARDBOARD ORIGAMI:
A FRAMEWORK FOR MODULAR DEPLOYABLE CARDBOARD STRUCTURES

JULIO C DIARTE ALMADA, ELENA M VAZQUEZ PEÑA
UMEÅ UNIVERSITY, SWEDEN

KEYWORDS: CURVED-CREASED, ORIGAMI, CARDBOARD, MODULAR, LIGHTWEIGHT

The work presented in this paper investigated the potential of curved-creased Origami to create complex three-dimensional architectural forms made from corrugated cardboard sheets. Curved-creased folding is a hybrid between folding and bending that uses curvilinear creases to transform flat materials into 3d forms that can withstand considerable loads. The technique has been used to fabricate both kinetic and static architectural components using paper, aluminum, and plywood, among other materials but cardboard hasn't been explored yet. The project implemented quantitative and experimental research methods to prototype ten different design templates examining material behavior and aesthetical qualities through digital simulation, physical production of prototype modules, and mock-up assembly. Design and a fabrication requirement included using the least number of cuts, minimize wrinkles, avoid tearing sheets, and facilitate joins between modules to create a potential larger structure. Main findings indicate that while simulations predicted several areas of stress in the curve-creased cardboard modules, physical prototyping highlighted the tendency of corrugated cardboard to release those stresses through wrinkles or unwanted creases mainly along the sheets' corrugation channels. To prevent wrinkles or unwanted folds in the assemblies, researchers designed two types of lines in addition to regular folding lines: supplementary folding lines and stress-releasing fold lines. These lines can help to control and program deformation as part of the design and fabrication adding an aesthetic expression that is particular of corrugated cardboard inner structure. The results expand the use of curved-creasing Origami and increases the potential of cardboard as an alternative low-carbon material for architectural applications.

MAKING THE GLOBAL LOCAL:
DESIGNING AND BUILDING A MOBILE STUDIO TO RESEARCH THE IMPACT OF INDUSTRY, GLOBALIZATION, AND CLIMATE CHANGE ON COASTAL COMMUNITIES AND ECOSYSTEMS

PATRICK RHODES

AMERICAN UNIVERSITY OF SHARJAH, UNITED ARAB EMIRATES

KEYWORDS: DESIGN BUILD, EXPEDITIONARY LEARNING, SUSTAINABILITY

This paper proposes a radical, multi-phase approach to architecture studio education that combines design-build, expeditionary learning, and analysis-based design research to embed students in the mobile study of the shipping industry, globalization, climate change, and their impacts on coastal communities and ecosystems. The modern shipping industry is the backbone of international trade, accounting for more than eighty percent of world trade, and its impact on the environment, coastal communities, and culture in general has become increasingly problematic. The model presented here proposes a series of interconnected courses, including design-build studios, history theory seminars, and research methodologies classes to allow students to form a comprehensive understanding of the core phenomenon while utilizing research and architectural production as a mode of inquiry. In the first phase begun in spring of 2023, students will design and build a mobile studio housed within a modified shipping container, sited temporarily on campus but designed to be periodically transported aboard an ocean-going cargo container ship. During concurrent and subsequent theory courses, students will establish research agendas focusing on links between the shipping industry and climate change, cultural globalization, and the economy while concentrating on the transformative effects it has on coastal communities and the environment. Students will engage in gathering data, mapping, marking, and making while searching for the intersection between architecture and the impacts of modern global trade on the world. The following paper includes a historical and contemporary analysis of the core issues, an assessment of the first stages of phase one begun in spring 2023 and makes a case for the value of design-build, expeditionary education, and the importance of travel, not just in learning, but in learning to employ architectural production to examine in-situ the most critical issues currently facing society and the environment.

THE INTERSECTION OF EXPLORED AND UNEXPLORED DESIGN PROCESSES WITH AI IMAGE GENERATORS IN THREE DESIGN STUDIOS

JINOH PARK
UNIVERSITY OF ARKANSAS, USA

KEYWORDS: AI, DESIGN EDUCATION, ARCHITECTURE, INTERIOR ARCHITECTURE

This study explores possibilities for the integration of artificial intelligence (AI) image generators into architectural education, examining the intersection of traditional design processes and emerging AI technologies. While practitioners increasingly adopt AI in architectural practice, its incorporation in educational settings remains relatively unexplored. The research addresses the question of how to offer students the opportunity to use AI image generators while maintaining essential traditional educational content. The methodology combines the lived experience and the exploratory case study approaches, spanning three semesters. Initial observations revealed student skepticism and resistance, with a controlled integration strategy allowing AI usage only after the initial 3D modeling. Subsequent semesters witnessed increased student acceptance and curiosity, showcasing improved 3D visualization quality while maintaining design integrity. Design charrettes utilizing AI underscored the importance of clear design goals, albeit with occasional deviations from the original concept. The discussion emphasizes the nuanced dynamics between AI-enhanced and traditional approaches, offering guidelines for AI integration. Prohibiting initial AI usage and strategic instructor guidance emerged as effective strategies. The study highlights the need for a balanced integration approach, empowering students with AI tools while preserving core architectural principles. The importance of fundamental visualization skills is underscored, positioning AI as a complementary enhancement rather than a replacement. In conclusion, this research contributes to the discourse on responsible AI integration in architectural education. The controlled integration approach demonstrates improved visualization quality without compromising design integrity. The study encourages educators, practitioners, and policymakers to envision a future where AI enhances foundational skills, fostering a collaborative dialogue on the evolving role of technology in architectural education.

THE DESIGN AND FABRICATION OF THE BLEACHERY HERITAGE PROJECT

RACHEL DICKEY
UNIVERSITY OF NORTH CAROLINA CHARLOTTE, USA

KEYWORDS: CULTURAL HERITAGE, LANDSCAPE, DIGITAL FABRICATION, COMMUNITY ENGAGEMENT, INTERACTION DESIGN

This paper outlines the design and fabrication of a cultural heritage landscape project located in Rock Hill, South Carolina. The project involves the transformation of an existing median into a commemorative linear park, located on the former site of Rock Hill Printing and Finishing Company. Through an overview of the design methods and processes, this paper explores the importance of combined knowledge and methods from generally siloed topics of community engagement, construction technology, and digital fabrication.

AUGMENTED REALITY DRIVEN DESIGN AND FABRICATION OF SHADING DEVICES

BASTIAN WIBRANEK
HDA, GERMANY

KEYWORDS: AUGMENTED REALITY IN CONSTRUCTION, PARTICIPATORY DESIGN, AUGMENTED REALITY DESIGN, DIGITAL FABRICATION IN ARCHITECTURE, SHADING DEVICES

Sun exposure in urban environments regarding placemaking has become a larger area of research for city planners and architects. Placemaking is both a physical and psychological concept, as the severity of outdoor conditions and the perception of what conditions are considered normal can influence space usage. However, many urban spaces still need to be equipped to handle rising temperatures and broader placemaking needs. This paper proposes an augmented reality-driven design process for generating shading structures that can be utilized by non-experts via mobile devices. The generative algorithms streamlined the creation of design iterations and successfully utilized material simulation to develop shading devices based on looped surfaces.

Furthermore, integrating AR into the fabrication process simplifies construction, broadening accessibility and engagement for a diverse range of participants. Our research presents an accessible design approach and a fabrication methodology suitable for non-construction professionals, which can be applied in various contexts to provide shade with minimal infrastructural demands. This study will contribute to the expanding discourse on the application of AR in architectural design and fabrication, particularly concerning shading. We envisage that this accessible and engaging approach will promote wider community involvement in shaping urban spaces, offering viable solutions to rising temperatures in urban environments.

INFORMING LIFE CYCLE ASSESSMENTS THROUGH DESIGN FOR DISASSEMBLY

LINE KJÆR FREDERIKSEN, PELLE MUNCH-PETERSEN
THE ROYAL DANISH ACADEMY, DENMARK

KEYWORDS: DESIGN FOR DISASSEMBLY, LIFE CYCLE ASSESSMENT, CIRCULAR BUILDING PRINCIPLES, FACADE DESIGN

What determines the lifespan of building materials? This question can be approached in numerous ways. In this article, we work from the assumption that the least erroneous answer is: the future.

Design for disassembly (DfD) is a way to mitigate the uncertainties of dealing with the future of construction and as a way to relinquish material lifespan from construction lifespan. (Crowther, 1999) DfD is an instrumental part of developing circular economy in architecture where lifespan of materials cannot be defined by the typology or construction type as it facilitates disassembly on various levels of a building. DfD is a strategy often referred to in literature as prompting longer lifespans of materials through reuse and recycling thereby potentially both reducing the need for virgin material resources in construction and prolonging the use of a resource. Simultaneously DfD prompts an architectural understanding of buildings as changeable artifacts, as open-ended entities.

By juxtaposing the principles of DfD and LCA, this article forms a critique of the understanding of lifespan represented in conventional LCA. To contextualize this inquiry, two examples of DfD in contemporary construction are analysed, where the specific conditions for disassembly in the façade systems are laid out. The examples are two hybrid building systems in the current Danish building industry which show fundamentally different approaches to disassembly. The two examples and all data from chapter 5 in this article is based on case studies carried out by one of the authors of this article, as a part of an ongoing Ph.D. project anticipating completion in the spring of 2024.

The resulting discussion is concerned with the possibility of informing the conventional LCA paradigm by imposing on it, notions of the unpredictable nature of the future, of lifespans, of end-of-life and reuse scenarios, with which DfD is occupied.

PERFORMANCE EVALUATION OF DIGITALLY FABRICATED PERFORATED SCREENS INSPIRED BY MASHRABIYA IN HOT AND HUMID CLIMATE

REFAA MUFID ALKHATIB[1], BASTIAN WIBRANEK[2],
ANTONIO MARTINEZ-MOLINA[3]
[1]UNIVERSITY OF TEXAS, USA, [2]DARMSTADT UNIVERSITY OF APPLIED SCIENCES, GERMANY, [3]DREXEL UNIVERSITY, USA

KEYWORDS: MASHRABIYA, PASSIVE COOLING, NATURAL VENTILATION, VERNACULAR ARCHITECTURE, DIGITAL FABRICATION

In response to the escalating energy costs associated with air conditioning, architects and researchers increasingly turn to passive cooling strategies, emphasizing effective heat reduction, shading, and natural ventilation. One possibility is to introduce elements from vernacular architecture around the world into different climates. This study is aiming to evaluate the performance of a traditional element from hot arid climates to hot-humid climates. The traditional Mashrabiya screens from the Arabic architecture used to mitigate high indoor temperatures while regulating sunlight and preventing glare. Four screens were prototyped with controlled perforation parameters, utilizing Rhinoceros 3D and Computer Numerical Control (CNC) technology. The screens were produced with varying perforation percentages and thicknesses. A testbed reflecting common U.S. construction techniques was constructed for assessment, incorporating indoor and outdoor sensors measuring temperature, air velocity, humidity, and light intensity. The methodology included controlled airflow laboratory testing and outdoor testing that lasted a minimum of 48 hours for each screen, alongside a control scenario without any screen. Air movement was generated for laboratory testing using Surfer software for multiple scenarios to understand the effect on the indoor air speed when using the different screens. The collected data revealed diverse performances among the screens. The screen with 30% perforation and a 10 cm thickness demonstrated the best performance, effectively moderating indoor temperature and distributing light. Screens with the very high perforation percentages allowed for elevated air temperatures, while those with minimal perforation did not generate sufficient airflow. However, the screens struggled to maintain comfortable indoor humidity levels during high humid outdoor conditions, prompting further investigation into enhancing performance in high humidity. The study establishes a basis for further research on developing screens that can help mitigate hot and humid climates to create comfortable indoor environments.

COMMUNITY-BASED APPROACHES TO CREATING ADAPTIVE SOLUTIONS FOR URBAN CHALLENGES:
TWO CASE STUDIES

MAHSA ADIB, ARJUN KIZHAKKEMARAKKATTIL JANARDHANAN, TASNEEM TARIQ, LISA D. IULO, HONG WU, RAHMAN AZARI
PENN STATE, USA

KEYWORDS: CLIMATE CRISES, BLUE-GREEN INFRASTRUCTURE, COMMUNITY COLLABORATION, EQUITABLE PATHWAYS, URBAN ENERGY POVERTY

Addressing diverse social, environmental, cultural, and economic urban challenges requires understanding them as dynamic, complex systems. This paper presents ongoing research within the Baltimore Social- Environmental Collaborative (BSEC), a U.S. Department of Energy's Urban Integrated Field Laboratory (IFL). Focused on Baltimore as a representative mid-sized U.S. industrial city grappling with equitable solutions to climate change and social injustice, BSEC involves diverse collaborators. It adopts an iterative collaborative cycle relating regional climate trends and other factors with environmental and social priorities to inform community-guided equitable climate solutions. This paper highlights two projects within BSEC's knowledge co-creation process. The first addresses energy poverty, employing spatial statistical techniques and mapping to investigate the spatial distribution of energy burden and provide insight into the social injustice in energy access in Baltimore. The second uses field surveys, computation, and community engagement to develop a data-driven decision-making approach to integrating Blue-Green Infrastructure (BGI). The paper concludes with an overview of engagement methods important to BSEC and informative for other architectural researchers.

EXPANDING PROTOCOLS:
TEACHING CONSTRUCTION THROUGH IMMERSIVE VIRTUAL LEARNING ENVIRONMENTS

JONATHAN RULE
UNIVERSITY OF MICHIGAN, USA

KEYWORDS: EXTENDED REALITY, EDUCATION, CONSTRUCTION, ARCHITECTURE

Extended Realities or XR has become an increased field of interest over the last decade. It is more accessible than ever, becoming an everyday component found in our homes, businesses and even our education. While there is still a lot of skepticism around the value of this technology, curiosity by many has allowed for different disciplines to embrace it. Its novelty has instigated new questions and spawned new methods of engagement. This paper discusses the use of this technology and documents the development of a proprietary virtual reality application. The application is used as a supplemental tool for teaching an introduction to construction course. Over a three-year period it was tested with different groups students to better understand their acceptance of the technology and ask if it had a meaningful impact on knowledge building related to the subject. It concludes by presenting the qualitative analysis, providing suggestions for how it should be understood and makes projections for next steps.

THE SECONDARY SCHOOL CLASSROOM:
AN ARCHITECTURAL OBJECT TO RETHINK FOR BETTER SUPPORT OF EDUCATIONAL SUCCESS IN QUEBEC. A LITERATURE REVIEW

LINA BALLITA[1], CAROLE DESPRÉS[2]
[1]UNIVERSITÉ LAVAL, CANADA, [2]UNIVERSITÉ LAVAL, CANADA

KEYWORDS: PHYSICAL ENVIRONMENT, SECONDARY SCHOOL, CLASSROOM, ADOLESCENT, WELL-BEING, EDUCATIONAL SUCCESS

This literature review examines the influence of classroom architecture on the educational success of secondary school students. It is part of the work of the Schola research consortium, with the mission of guiding the renovation of Quebec's public primary and secondary schools. A basic premise is that this knowledge can help inform the renovation avenues for Quebec's public schools, the action plan put forward by the Quebec Ministry of Education, its recent Educational Success Policy to support students' health, well-being and academic perseverance. With the vast majority of Quebec's public schools having reached the end of their first architectural life cycle, the renovation of these buildings is now underway. The method adopted for this review is based on an extensive documentary research conducted across six distinct databases. This approach led to the identification of 16 relevant articles, including 6 literature reviews and 10 field studies, which utilize both quantitative and qualitative methods. The findings of this review reveal that elements such as the physical aspect of the classroom, its configuration, and the available furniture and equipment, significantly influence academic success and student perseverance, also impacting their motivation and well-being. The analysis of these factors sheds light on the specific requirements for the reconfiguration of this architectural object, the renewal of furniture, and the modernization of equipment, all aimed at significantly enriching the students' learning experience.

AIR QUALITY AND TEACHER HEALTH IN THE CONTEXT OF ENERGY POVERTY IN CHILE

MARIA CAMILA CORONADO[1], ISABEL RIVERA[2,3], ANDREA MARTINEZ[2], ALISON KWOK[1]
[1]SCHOOL OF ARCHITECTURE AND ENVIRONMENT, UNIVERSITY OF OREGON, USA
[2]DEPARTAMENTO DE ARQUITECTURA, UNIVERSIDAD DE CONCEPCIÓN, CHILE,
[3]CENTRE FOR SUSTAINABLE URBAN DEVELOPMENT, CEDEUS, CHILE

KEYWORDS: AIR QUALITY, RESPIRATORY HEALTH, ENERGY POVERTY, SCHOOLS, CHILE

Current research has found evidence of associations between particulate matter, respiratory diseases, and increases in mortality from all causes. However, most of this data comes from developed countries, whereas studies from middle to low-income countries are limited. In Chile, high levels of Energy Poverty (EP) have been identified in the central-southern towns of the country, where the primary means for household heating are wood stoves. They generate periods of high air pollution during the winter and may exacerbate preexisting health conditions that affect vulnerable populations. Air pollution from EP goes beyond residential buildings and impacts public spaces and buildings near residential areas, like schools.

This paper presents an analysis of indoor and outdoor air quality along with a survey of self-reported health symptoms of teachers in public schools in Chile, located in areas of energy poverty. During the winter, indoor and outdoor PM2.5 and PM10 concentrations were monitored for a school week in three schools in the Gran Concepción metropolitan area in Chile. Particulate matter concentrations were compared with the WHO Air Quality Guidelines (AQG) and local air quality regulations. Indoor and outdoor PM2.5 surpassed the AQG recommended levels of air pollution, with the highest concentrations occurring in the evenings and nights. In addition, the survey showed that almost a third of teachers ranked the outdoor air quality in the previous week as "bad," but only 13% saw outdoor air pollution as a big health concern. The symptoms teachers reported as being more frequent included those related to teaching, such as hoarse-dry throat, and respiratory health, like irritated, stuffy, or runny nose. This paper portrays the reality and urgency of Chilean classrooms regarding indoor and outdoor air quality during the winter months and discusses the health implications of teaching and learning in the context of energy poverty.

THE RHYTHMS OF LIMINAL URBANISATION IN MONTENEGRO:
ASSEMBLAGES OF MULTIPLE TEMPORALITIES

GORAN IVO MARINOVIC
MONTENEGRO

KEYWORDS: HENRI LEFEBVRE, LINEAR REPETITION, CYCLICAL RECURRENCE, PERIODISATION, DISPLACED PEOPLE

Liminal urbanisation is marked by subalternate open-ended dwellings, bottom-up communal organisation, and the social dependence of neighbours. Tracing low-income migrants in Montenegrin coastal districts on the periphery of cities reveals spatial, temporal and social splintering of conventional urban growth. This fragmentation is the product of linear and cyclical repetitiveness and periodisation as the spatiotemporal punctuation of neighbourhoods. Linear recurrence indicates activities during the construction of dwellings, while cyclical temporalities depend on the spatial properties of the community. Periodisation is a set of social peaks for generating multiple temporalities based on past, present, and future actions. These spatiotemporal categories are examined using qualitative methods such as questionnaires, semi-structured interviews, focused observation, and informal conversations with participants from four informal neighbourhoods, "Bijela Gora", "Palestine", "7th July", and "Meljine". The outcome is overcoming the reading of informality in particular spatial terms but the interaction of timelines attached to these districts.

TITOMENIKS: BRIDGING PAST AND FUTURE
A SOCIO-ARCHITECTURAL EXPLORATION OF YUGOSLAV MONUMENTS THROUGH THE LENS OF STAR´S BOUNDARY OBJECT THEORY

LEA SASCHA FURBACH
UNIVERSITY OF KASSEL, GERMANY

KEYWORDS: MEMORIAL ARCHITECTURE, YUGOSLAVIA, BOUNDARY OBJECT THEORY, SOCIAL WORLDS, INTERDISCIPLINARITY

The paper aims to highlight the social role of architecture and the associated social responsibility of architects. To this end the study employs a qualitative research approach to investigate the role of Yugoslav memorial architecture from the Tito era, using Boundary Object Theory as a framework drawing inspiration from Susan Leigh Star's sociological framework. Boundary Objects are located at the interface between communities and are able to build bridges between conflicting points of view. Driven by the question of how architecture can serve as a medium for engaging with different and potentially contradictory social world perspectives, Boundary Objects connect these divergent views of professionals and stakeholders, providing a common basis for discussion. An interdisciplinary approach allows for a comprehensive examination of historical complexity, the change over time and their role in evolving social and political contexts. The goal is to establish a foundation for a cooperative dialogue, providing a meaningful basis for navigating architecture into an uncertain future by integrating it into current societal dynamics.

INVESTIGATING THE NARRATIVE SPACE THROUGH READER-VIEWER EXPERIENCE IN FILM "ROMA"

BUSRA ATAM YUKSEL, NILAY UNSAL GULMEZ
BAHÇESEHIR UNIVERSITY, TURKIYE

KEYWORDS: NARRATIVE SPACE, READER'S EXPERIENCE, VIEWER'S EXPERIENCE, TEXTUAL NARRATIVE, CINEMATIC NARRATIVE

The aim of this study is to analyze the spatial connections within narrative space and gain insights into the perceptual and experiential processes of individuals in the context of architectural space as portrayed in the written word (movie scripts) and movie representations. The transformation of the subject's experience occurs while transitioning between textual and visual forms of space, due to inherent distinctions between the two mediums. The comprehension of the subject's encounter inside the realms of textual and cinematic domains facilitates the establishment of connections among the diverse narrative spaces.

The film "Roma" was chosen as a pilot study for this aim because of its rich spatial representations in both mediums and since it was written and directed by the same artist, Alfonso Quaron, avoiding multi-layered interpretation processes. The investigation of the house, which serves as the film's main backdrop, is carried out via protocol analysis. Within the framework of protocol analysis, a two-stage technique is implemented: conducting interviews and assessing participants' mental sketches. The data were categorized based on thematic groupings, which are created according to theoretical background, in the AI-based Atlas.ti software, a tool designed for qualitative data analysis. The present study involves a focus group including 13 students from the department of architecture. Through a preliminary investigation, the current study examines the reproduction process of various representations of the narrative space inside the perceptual layer of the subject's spatial perception. In prospective research endeavors, it is expected that the investigation will be conducted on a broader scale by expanding the participant group. This study can be carried forward with the question of how imagination and remembering are constructed in the process of spatial reading through literary and cinematic narrative. As a result, this study, which focuses on the subject's role and its perceptual-experiential layers, can contribute to future research regarding the understanding and transmission of evolving spatial contexts at the intersection of the physical and abstract realms at the human-scale in the context of architectural education.

BRIDGING DISCIPLINES:
UTILISING LARGE LANGUAGE MODELS FOR INTERDISCIPLINARY COLLABORATION AND INNOVATION IN ARCHITECTURAL DESIGN

OTIS SLOAN WOOD, MUHAMMAD FAROOQ
DET KONGELIGE AKADEMI, DENMARK

KEYWORDS: MOSQUITO-BORNE DISEASES, VECTOR CONTROL, LARGE LANGUAGE MODEL (LLM), PUBLIC HEALTH, BUILDING DESIGN

Interdisciplinary collaboration is essential to tackle the complex global challenges we face today. One such challenge is the proliferation of Aedes mosquitoes in recent decades, which has led to a significant and growing public health burden. Over half of the world's population is at risk of contracting Aedes mosquito-borne diseases (MBDs) such as Dengue, and this is expected to rise as climate change expands the geographic reach of Aedes mosquitoes as far north as Denmark by 2050. There is an absence of vaccines or preventative therapeutics for these MBDs, which means mosquito control remains the most viable approach to reduce them. Modifications to the built environment present numerous opportunities to reduce this disease burden, through reducing larval habitats, repelling mosquitoes, and protecting individuals from their bites. Significant advancements in vector control strategies have been made in public health and entomology; however, these have not effectively disseminated into the building profession. This paper explores the development and application chatbot platform that utilises Large Language Models (LLMs) to bridge architecture and public health, enabling the integration of evidence-based mosquito control strategies into building and landscape design. This LLM chatbot draws information from select peer-reviewed articles from leading global health journals. Users can easily access information on vector control approaches for their projects by asking simple questions like 'How can I improve entrance space to prevent mosquitoes?'. By curating the LLM's source information, we aim to reduce AI hallucinations, where generated information is presented as fact. This paper does not present the chatbot as a definitive solution; instead it aims to use the development process to critically assess the challenges and potentials of LLM technology, particularly in fostering cross-disciplinary collaboration and innovation.

INHABITING THE PLASTISPHERE?
ARCHITECTURAL MAKING AS A PRELUDE TO TRANSDISCIPLINARY SENSE MAKING OF PLASTICS IN THE ENVIRONMENTAL WORLD

CHRIS THURLBOURNE
AARHUS SCHOOL OF ARCHITECTURE, DENMARK

KEYWORDS: DISPOSED PLASTICS, ARCHITECTURAL MAKING, TECTONICS, TRANSDISCIPLINARY, (DE)COLONIZATION

In the plastisphere waste landscapes formed by human consumption are discarded products that often become the place of inhabitation of various inherent earth, and air bound microorganisms. Yet contra to the vast, increasing amount of plastic piled up in our environment, plastics are alien to us (humans of privilege) as a place of inhabitation. Plastics are associated with low quality, the cheap and the fake, and disposal after short term use is our preferred pattern of behaviour. Our relationship to plastics is uncomfortable and emblematic of our overconsumption and its social, environmental and economic consequences. We embrace the lightness, strengths, durability and ductility of the various chemical chains developed in our laboratories to further develop the needs of society, yet are uncomfortable with the notion of coexistence with this synthetic material, and pursue its removal from our lives, rather than to coexist and colonize. Posing the question of inhabitation of the plastisphere, the paper searches a direction to link the microscale potential for nonhuman colonization of disposed plastic as an architectural potential in addressing the pressing macroscale need for decolonization.

The paper hypothesizes there are qualities to be nurtured in pursuing a tectonic joinery of ecological relationships between a material, colonizing organisms and resulting performances, inviting opportunities for the benefit of both the needs of human society and needs of our natural environment. The research engages in material experimentation, embracing the continual demand for colonization without undergoing any severe material deterioration. Scrutinizing the potential of plastics as a viable place of inhabitation for human and non-human species alike through an embodied architectural confrontation with the material presented through a series of prototypes, the research explores possible inhabitable afterlives of disposed plastics that often finds its way to waste landscapes of redundancy, through an iterative process intersecting architectural knowledge and making.

BREAKING THE RENOVATION CYCLE:
LEARNING FROM ARCHITECTURES OF THE PAST FOR CONTEMPORARY BUILDING DESIGN

TOBIAS HENTZER DAUSGAARD[1,2], MOGENS MORGEN[1],
LOTTE BJERREGAARD JENSEN[1], MARIE FRIER HVEJSEL[1]
[1]*AARHUS SCHOOL OF ARCHITECTURE, DENMARK*
[2]*RØNNOW LETH & GORI*

KEYWORDS: LONG-LASTING ARCHITECTURE, LIFESPAN, RENOVATION, RESOURCE FLOW, ENVIRONMENTAL IMPACT

The paper develops new knowledge about determinants of material resource consumption in renovation cycles, to inform the design of new buildings on the design for lower future resource uses in renovations. By examining component lifespans and the environmental impact of resource flows of three Danish buildings from mainly public archival records in a comparative case study analysis, it is possible to examine both the reasons for resource use in renovation cycles, and the potential design principles of building component longevity. A paradigmatic 250+ year old case with multiple adaptive reuses is comparatively analysed and discussed with two critical cases before and after the shift in building culture around 1960. Environmental impacts of resource use in renovation cycles are linked to building component lifespans across the shift from a vernacular to an industrialised building culture. The results challenged the theoretical models of lifespan categories in both Duffy and Brand's theories, and showed a dependency between lifespan determinants in BUILD, Aalborg University's theory of lifespans, as argued for by Moneo in the essay "Life of Buildings". Further, the results showed a trend of narrowing purposes of building components and a weakening of the relationship between architectural principle and structural logic, which were found to impact component lifespans and the overall resource consumption in renovation cycles.

THE MODERN TRINITY;
AFFORDABLE, SUSTAINABLE, URBAN INFILL HOUSING

CRAIG S GRIFFEN
THOMAS JEFFERSON UNIVERSITY, USA

KEYWORDS: URBAN, INFILL, HOUSING, AFFORDABLE, SUSTAINABLE

We are in an affordable housing crisis yet there are large areas of our cities with abundant vacant infill sites with the potential to address this problem. For example, in the Lower North District of Philadelphia about 3 in every 10 rowhome properties are vacant. Rather than recreate the former cramped row homes, this project proposes a new typology of smaller more affordable homes reoriented on the site to provide greater access to sunlight, fresh air, and green space. While not every location is feasible for this approach, the Lower North is ideal because 1. It contains an abundance of 800 potential, vacant infill lots, 2. Land prices are currently low enough to make multiple lot purchases more financially feasible, and 3. Since the area's median household income is well below the city average, these smaller homes are more affordable so local residents could stay in their neighborhood and escape the gentrification currently happening nearby. The Modern Trinity home is based on the regional Philadelphia Trinity House typology in which 3 single rooms are stacked vertically to create a house with a very small footprint. This design requires 3 adjacent vacant lots, but rather than 3 homes lined up along the street front, units are repositioned along the northern boundary with large south-facing windows overlooking a large communal green space formed from the other 2 lots. The southern orientation ensures all units have abundant sunlight for passive solar heating, daylighting, and PV power. Operable windows for cross ventilation and passive shading from overhanging balconies reinforce the sustainable design strategies.

ARCHITECTURE AS A MEDIATOR OF EMPATHY:
THE CASE OF THE PAVILLON DE L'ORBE, FRANCE

MARIE TESSON[1], ANGÈLE PILLOT[2]
[1]*FOAP LAB, CONSERVATOIRE NATIONAL DES ARTS ET MÉTIERS, FRANCE*
[2]*AAU LAB, ECOLE NATIONALE SUPÉRIEURE D'ARCHITECTURE DE NANTES, FRANCE*

KEYWORDS: ARCHITECTURAL DESIGN, EMPATHY, SPATIAL EMPATHY, CARE, ARCHITECTURAL ATHMOSPHERES

At the intersection of architecture and psychology, our study delves into the nuanced relationship between architectural design, care, and atmospheric experiences. Focused on specific aspects of care and architectural atmospheres, our exploration centers on understanding the dynamic interplay between on-site experiences and the initial intentions of design teams.

In the latter half of the 20th century, the notion of a profound connection between architecture and human well-being gained prominence. Architect André Bruyère contributed significantly to this paradigm, emphasizing architectural factors in fostering well-being. Our investigation aims to ascertain whether architecture can serve as a mediator for the empathy embedded in design teams during the conceptual stage.
To achieve this goal, we conducted comprehensive spatial and ambience analyses, employing a cross-disciplinary approach. These analyses, presented as commented walks, underwent thematic analysis, revealing four key themes: rhythm, degree of intimacy and commonality, evocation of nature, and materiality. Augmenting our walks analysis, archival elements from the André Bruyère collection (Institut Français d'Architecture) were incorporated.

Our results highlight a congruence between the envisaged aspirations and the on-site experience of the Pavillon de l'Orbe. We posit that the dispositional empathy of the design team can be diffused through architecture, underscoring the importance for designers to cultivate sensitivity to their own bodily sensations. Moreover, we propose that interdisciplinary design teams, fostering a cross-fertilization of skills, are pertinent to achieving this end.

ARCHITECTURE OF THE KNOWN AND UNKNOWN:
DEFINING AND INHABITING PERIPHERIES

MARTIN SCHWARTZ
LAWRENCE TECHNOLOGICAL UNIVERSITY, USA

KEYWORDS: KNOWN, UNKNOWN, SURPRISING, FAMILIAR, EDGES

The establishment of an edge, of limits, or a periphery, is fundamental to architecture. It is the foundation of the difference between the known and unknown, inside and outside, the zone of significant energy transfers, and the making of 'place.' The term 'placemaking" may be a cliché, but there is an essential truth in the concept that makes it worth re-evaluation and definition in the context of current discourse. With that in mind, this paper will investigate how architectural peripheries are established, how they operate to mediate inside from outside, the transfer of energies, and how humans then fully establish their possession of a place in the world.

This paper investigates (1) how architectural peripheries are established and their intentions; (2) the context of the familiar: how the known prepares us for the unknown; (3) how edges may not simply be a recognition of differences, but the invention of difference; (4) how differences between inside (known) and outside (unknown) is more than a conclusive barrier, but mediation of degrees of enclosure; (5) how human activities occasion familiarity or possession of a place; (6) the notion that recently we have experienced an inversion of the inside as the place of contentment and outside as the location of unease; and (7) preliminary conclusions, mainly, the case for openness and vulnerability as modeled by a range of edges and the possibility of architecture as a model for the productive entanglement of known and unknown.

Citing specific aspects of architecture and the natural world from diverse cultures in which the values of edges, energy transfer, and human interaction, and designed spaces are represented, this paper examines the nature of peripheries, the inhabitation of edges, the making of degrees of enclosure, and the particularizing layers of space that intervene between inside and outside that create "difference."

A NEW WAY OF PRESENTING:
REDEFINING ARCHITECTURE AND DESIGN EXHIBITION THROUGH VIRTUAL REALMS

ARDA ÇALISKAN, SALIH CEYLAN
BAHÇESEHIR UNIVERSITY, TURKIYE

KEYWORDS: EXHIBITION, VIRTUAL EXHIBITION, ARCHITECTURE, DESIGN

This research offers a thorough examination of the online exhibition organized by [Host University], highlighting its methodology and development within the framework of architecture and design department. The exhibitios were a reaction to the COVID-19 pandemic's problems and marks a major move away from conventional physical exhibits and toward virtual formats. This paper's main goal is to investigate how the institution used digital technology to showcase student work in an immersive, interactive setting. In order to successfully display student work, the virtual exhibition made use of a variety of digital tools and platforms, such as 3D modeling, and interactive web-based apps. The study looks at how the virtual environment was designed and implemented, emphasizing how it promoted accessibility, engagement, and interaction for a worldwide audience. The study also places the university's virtual exhibition in the larger context of educational exhibitions' digital development. It offers a thorough overview of the state of digital exhibition practices in architecture and design education today by drawing similarities with the methods used by other institutions. This research adds to the increasing conversation about the future of academic exhibits by speculating that, in the digital era, virtual exhibitions may serve as a good substitute for or addition to physical exhibitions, in addition to serving as a temporary fix during times of crisis. In order to help educators, students, and exhibition planners in the domains of architecture and design navigate the changing requirements of exhibiting creative work in a world that is becoming more and more digital, the research intends to offer insightful information.

THE ROLE OF PLAYGROUNDS IN CHILDREN'S CULTURAL WORLDS

ARE PLAYGROUNDS REDUNDANT IN THE URBAN ENVIRONMENT?

KRISTIN-SUSANNE HÄSELHOFF

HOCHSCHULE NIEDERRHEIN, GERMANY

KEYWORDS: OUTDOOR PLAY, PLAYGROUNDS, URBAN CHILDHOOD, ARCHITECTURAL EDUCATION, CHILD DEVELOPMENT

As we struggle with the demands of rapidly growing cities, the needs of our youngest citizens are being ignored. Due to how space is allocated in cities today, playground space has decreased. The loss of playground space denies children their right to play freely. This paper argues for a reconceptualisation of play space and for cross-disciplinary collaboration to get us there. Documentation of playgrounds from Europe and the US was used to outline the changes in playground design since the start of the 20th century. The concept of free play was assessed by reviewing literature and theories of diverse disciplines such as sociology, education, and cognitive developmental psychology to understand its role in children's cultural world and well-being. The philosophical works of Foucault, Hobbes, and Rousseau were included to define the notion of childhood in the reflection of the values of different times. Building regulations from North Rhine-Westphalia, Germany were considered to understand legal planning requirements for playgrounds and their relevance for urban space allocation. The findings show that playground design has been diverse over time while its purpose remained unchanged. Unsupervised outdoor play is an essential element that creates children's culture and alters culture as such. Apart from having health consequences and impacting their cultural capital, the lack of contact with nature-related playground space has a detrimental impact on children's social development and deprives them of agency. The paper concludes that changes in procedures for authorities and architectural education are necessary to generate improvements. A cross-disciplinary collaborative approach is suggested to understand children's needs and devise solutions addressing the challenges in architecture and planning.

THE EXPERIENCE OF SPACE:
A SENSORIAL ANALYSIS OF THE CHAPELLE NOTRE-DAME-DU-HAUT BY LE CORBUSIER (1955) AND BRUDER KLAUS FIELD CHAPEL BY PETER ZUMTHOR (2007)

ADRIANA MARGARIDA DOS SANTOS FAÍSCA
FACULTY OF ARCHITECTURE AT UNIVERSITY OF PORTO, PORTUGAL

KEYWORDS: SPATIAL EXPERIENCE, LE CORBUSIER, PETER ZUMTHOR, CHAPELLE NOTRE-DAME-DU-HAUT; BRUDER KLAUS FIELD CHAPEL

Although Le Corbusier and Peter Zumthor are from different generations and their work addresses different issues and problems, both establish links with the world of the arts and both are concerned with space experience. Given today's dominance of the image, research on space experience is pertinent for contemporary architectural practice.

This paper will analyze the work of each author, the Chapelle Notre-Dame-du-Haut by Le Corbusier (1955) and the Bruder Klaus Field Chapel by Peter Zumthor (2007). The aim is to understand the influence of art on the design of each work. Le Corbusier will be approached via the links with the sculptor Joseph Savina, and Peter Zumthor via his close relation with the work of Josep Beuys. The study of the theoretical work of each author and the analysis of the graphic documentation of each chapel will allow us to better understand the response of Le Corbusier and Zumthor to a similar concern, namely the experience of space and its relation with art.

The methodology used in this research crosses different documents such as i) the theoretical work of Le Corbusier and Peter Zumthor; and ii) documents from both chapels; Findings on this research allow us to understand the response of Le Corbusier and Zumthor, on a similar concern where art has an important role in space experience. This research will further contribute to the unexplored relationship between the two architects in what concerns the awareness of the experience of space and the emotions of individuals implicated in it.

THE ROLE OF INTERNATIONAL EXPERIENCES IN ARCHITECTURAL EDUCATION:
RESEARCH REFLECTIONS FROM THAILAND

ELIJAH DAVID RUTKOWSKI[1], AMELIA TODD[1],
ELIZABETH L MCCORMICK[1,2]
[1]UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE, USA
[2]NORTH CAROLINA STATE UNIVERSITY, USA

KEYWORDS: INTERNATIONAL, INDEPENDENT, RESEARCH, PEDAGOGY, STUDENT-LED

In an era defined by unprecedented connectivity and cultural exchange, the role of international travel in shaping architectural pedagogy stands as an unequivocal cornerstone of transformative learning. This autoethnographic paper offers a unique perspective on the impact of self-directed and student-led international research experiences on the mind of the young designer. This paper describes the outcomes of two distinct international student-research experiences in Thailand during the Summer of 2023.

As national identities become blurred and architectural challenges become increasingly global in scope, students desire an enriching curriculum that addresses diverse built environments, traditions, and perspectives. International travel provides a unique opportunity for the next generation of designers to grow academically, professionally, and personally.

In the summer of 2023, two architecture students from the same university embarked on separate research experiences in Thailand. Graduate student, Elijah, explored vernacular masonry construction methods, building upon his work in a previous design studio focused on masonry construction and rural housing in tropical climates. The observational method of research allowed for a connection with Thai people and culture that helped inform their architectural conventions. Undergraduate student, Amelia, worked on an interdisciplinary team funded by the National Science Foundation to study agricultural land use change in Eastern Thailand using remote sensing techniques.

By engaging in international research, these profound experiences transcend the confines of the classroom enhancing student skills of adaptability, cross-cultural fluency, and a deep understanding of the nuanced aspects of different cultures. This underscores the significance of international travel, which is not just important but essential for the advancement of future architects and designers. The field of architectural pedagogy serves as a foundational platform through which the integration of international research can elevate the skills and perspectives of young designers, preparing them for a future grounded in global engagement.

SPATIOTEMPORAL ASSESSMENT OF OUTDOOR THERMAL COMFORT REGIMES IN URBAN PLAZAS OF CHICAGO

ZAHIDA KHAN
BALL STATE UNIVERSITY, USA

KEYWORDS: OUTDOOR THERMAL COMFORT, MICROCLIMATE, URBAN PLAZAS, ENVIMET, THERMAL STRESS

Unique microclimates in urban plazas around tall buildings impact people's presence which is driven by the Outdoor Thermal Comfort (OTC) levels. Increasing interest in OTC studies due to their significant contribution to the UN Sustainable Development Goal SDG11 has led to the development of advanced OTC indices. Urban designers and planners strive to gain knowledge in assessing their outdoor public space designs through these indices, thus understanding the impact of such developments on people's social lives. Microclimate CFD simulation is a popular method commonly employed on this topic. This study uses CFD simulation using ENVImet to model microclimates and OTC indices for five urban plazas in downtown Chicago with Dfa climate zone. The study adopts a spatiotemporal approach to assess three OTC indices namely Physiological Equivalent Temperature (PET), Standard Effective Temperature (SET*), and Universal Temperature Climate Index (UTCI). Using physiological thermal stress levels as a basis for comparison, the spatial approach involves the distribution of comfort regimes in the plazas, while the temporal approach uses the mean values of the OTC indices to address the research objectives, which are (a) comparing 'neutral' comfort regimes of PET, SET*, & UTCI during a peak lunch hour of the summer solstice day, (b) exploring spatial distribution of neutral regimes of these indices, (c) temporal analysis of PET thermal stress categories and microclimatic variables between 12-2 pm, and (d) spatiotemporal analysis of the same within and between the plazas. The findings show that SET* and UTCI lack granularity around neutral thermal stress regimes, unlike PET which limits the understanding of finer thermal conditions that may exist in the plazas and could be critical in the success of the plaza. The other key findings of this study highlight the importance of spatial distribution of thermal stresses in assessing the thermal conditions of an outdoor environment.

REDEFINING ARCHITECTURAL MONTAGE:
'THE SYNERGISTIC ROLE OF ARTIFICIAL INTELLIGENCE IN CONTEMPORARY ARCHITECTURAL PRACTICE

QIANQIAN YANG
POLITECNICO DI MILANO, ITALY

KEYWORDS: MONTAGE, ARTIFICIAL INTELLIGENCE, ARCHITECTURAL DESIGN

This study explores the application of Artificial Intelligence (AI) in contemporary architectural design, particularly in reshaping the architectural montage concept. The primary objective is to understand how AI, as a design tool, influences and transforms the methods and styles of architectural design. The research explores different applications of AI in architectural design that include assisting in conceptual design, generation and imitation of architectural styles, architectural model rendering and creation of effect images through literature review and case study analysis. The study summarises new perspectives and tools AI provides in architectural design, such as its data processing and pattern recognition capabilities, enabling designers to explore more complex and dynamic designs. The study demonstrates how AI creates and presents new architectural design concepts by analysing AI tools (such as Midjourney, Stable Diffusion, and DALL-E).

Additionally, the research explores AI's ability to rapidly generate architectural content from "low information" and to transform non-architectural information into architectural design inspiration, as well as its potential to enhance the efficiency of design communication. The findings indicate that AI impacts architectural design at a technical level and reshapes the concept of architectural montage in artistic and cultural significance. Despite specific challenges, such as ethical and aesthetic issues of AI in architectural design, the introduction of AI undoubtedly provides new possibilities for architectural practice, driving innovation and development in the design field.

UNDER, ON, AND AROUND THE TABLE:
A CASE STUDY ON DESIGNING FOR FOOD EQUITY AND CLIMATE JUSTICE IN ARCHITECTURAL DESIGN STUDIOS

STEPHANIE SANG DELGADO, VENESA ALICEA-CHUQUI
KEAN UNIVERSITY, USA

KEYWORDS: PEDAGOGY, FOOD EQUITY, COMMUNITY DESIGN, CLIMATE JUSTICE, DESIGN STUDIO

How do we teach thinking about systems in design studios? And, more importantly, how do we move systems beyond the building and into community relationships, environmental concerns, and social equity? Our food system is unbalanced and unjust; with the rising temperatures and climate crisis, our already uneven system is being pushed to its limits. This paper will be a case study centered around two fourth-year undergraduate studios. It will explore a pedagogical interdisciplinary approach to exploring the intersection of climate/environmental justice and food justice in the design studio. These studios will focus on three pedagogical approaches and themes: interdisciplinary studies, systems-level interventions, and climate realities. Through these three pedagogical approaches, students will develop an understanding of the building, not as an isolated formal exercise but as a contribution to existing communities. The key issues addressed are local food inequity, community, site, and environmental justice. These studio exercises build on ongoing university research exploring the intersection of urban research, pedagogy, and practice. Urban research has long been essential for understanding urban areas' challenges and opportunities. Still, the gap between academic research and practical implementation remains challenging, especially in design. We will discuss how studios could be used as public research infrastructures and leveraged as a design tool for bridging this gap.

EQUITY IN DESIGN:
CONFRONTING THE PAST TO DEVELOP EQUITABLE DESIGNERS

JENNIFER S PINDYCK, GORHAM BIRD
AUBURN UNIVERSITY, UNSA

KEYWORDS: KEYWORD, KEYWORD, KEYWORD, KEYWORD

Education in the United States is once again becoming a target for exclusionary practices. Since the death of George Floyd in 2020 and the subsequent call to action to improve diversity, equity, and inclusion (DEI) in society, the legislatures of several southern states in the United States have introduced or adopted bills to prevent public institutions, including higher education, from teaching any concept that "advocates, acts upon, or promote divisive concepts" (HB-7, 2023). It is within this context that undergraduate architecture students were tasked with a design project sited on a former enslavement camp (plantation) recently gifted to the University. The history of the site is well-documented, but the client, an adult education program, made it clear the expansion should create space for community learning and inquiry, and the design should welcome all visitors from the region. This charge forced students to grapple with how the history of a site influences design and confront what it means to create equity on a site born on the backs of inequity. In the current debates of disinformation and 'anti-woke' agendas, students must confront questions around racial injustice early in their architectural education. Because the architecture serves as an artifact of the site's history, this provokes discussions about ownership, politics, race, history, and basic human rights, and opens the door to conversations about systemic racism. This project primes students for the difficult histories on sites that they will encounter throughout their careers. Engaging students through design, not just in lecture courses, encourages them to develop a foundation of inclusivity in their practice. Sites that directly represent the racism and white supremacy of the past, anywhere in the world, give evidence to and help students understand the present generational impact of oppression and prepare them to be more just designers for the future.

THE SPACE GROUPS AND COLLABORATIVE ASSEMBLY

DUANE MCLEMORE
MISSISSIPPI STATE UNIVERSITY, USA

KEYWORDS: SPACE GROUPS, EMERGENT COMMUNITY, ALGORITHMIC DESIGN, DESIGN HEURISTICS, COLLABORATIVE DESIGN

This investigation reviews an unexpected outcome arising from using a tool for algorithmic design for a human fabrication project. The Space Groups are a mathematical system for describing repetitive 3d Unit Geometries commonly used in crystallography. Horta is a Grasshopper library which adapts these methods to define elements within a Unit Cell and output terse instruction sets for distributing these across a lattice to create complex honeycombs. Originally intended for automated assembly in the Computationally Optimized Robotic Architecture Laboratory (CORAL), it was found that Horta also facilitates collaborative human assembly.

Workshops were delivered at the CAAD Futures Conference 2021 to help educate architects about the use of Symmetries in design - specifically the use of the Space Groups as design tool via the units generated by Horta. The COVID-19 pandemic resulted in the Conference and Software Workshop shifting online. The original design for the Fabrication Workshop was predetermined. Without in-person Conference participants or facilities available, an ad-hoc group of volunteers gathered and through shared effort, an unanticipated potential for discrete modular assembly emerged. When the Workshop goals were simplified, the design became open-ended - the final design emerging bottom-up from the collaborative assembly process.

Horta was developed to generate "algorithmic" instructions for automated assembly. However during the Fabrication Workshop it was found that applying this system allowed a "heuristic" collaborative design method to emerge. This opened participation to the untrained, even a child. The algorithmic methods of the system directly facilitated the adaptive heuristic methods of a community fabrication project.

This paper briefly explains the Space Group Symmetries and then outlines the Workshops. It finishes by examining the outcomes of the Fabrication Workshop. Both the last-minute adaptation to the pandemic restrictions and the surprise outcome of a heuristically-driven community design effort are apt for examination along the 2024 EAAE-ARCC Conference theme Architecture Into The Unknown.

AI-INFORMED FIELD NOTES FOR A ROMAN TRAVEL EXPERIENCE

SARA CODARIN, KARL DAUBMANN
LAWRENCE TECHNOLOGICAL UNIVERSITY, COLLEGE OF ARCHITECTURE AND DESIGN, USA

KEYWORDS: TEXT-TO-IMAGE AI, GENERATIVE AI, STORYTELLING, TRAVEL EXPERIENCE, ROME

This paper explores the intersection of artificial intelligence and architectural sketching in the context of international travel experiences. Traditional hand-drawn sketches, once a medium for capturing and projecting architectural visions, have waned in the face of digital photography and social media's image-centric culture. To address this challenge, a one-week workshop was designed, leveraging AI text-to-image generation technology to document Rome as the chosen experiential site. By employing AI image generation tools, participants crafted altered narratives that provided deeper insights into Rome's essence, synthesizing historical layers with innovative elements. This pedagogical approach not only exposed attendees to the cultural richness of Rome but also empowered them to envision a future that transcended conventional design boundaries. By incorporating AI into their creative process, participants bridged the gap between past and future, history and imagination, thus fostering a productive dialogue between computation, representation, and culture.

BRIDGING CULTURES:
EXPLORATIONS, COLLISIONS + CONSIDERATIONS OF INDIGENEITY & DESIGN

BRIAN R. SINCLAIR[1,2], MAURICO SOTO RUBIO[2],
CATHRYN JOHN[2], KRITI ACHARYA[2]
[1]SINCLAIR STUDIO, CANADA,
[2]UNIVERSITY OF CALGARY, CANADA

KEYWORDS: INDIGENOUS, DESIGN, PEDAGOGY, INNOVATION, ETHICS

This research project addresses a long-standing issue in contemporary Environmental design education and practice: the exclusion of Indigenous perspectives in all educational processes, principles, and policies. This one-year research initiative collaborated with three Indigenous Knowledge Keepers as guides and mentors and aimed at integrating indigenous ways of seeing and knowing into curricula and pedagogy within the fields of Architecture, Planning, and Landscape.The initiative was funded by an Indigenous Engagement Grant from the [University Name] and spanned two consecutive semesters, involving multiple studios and courses, where instructors had the flexibility and support to align their course content with the overarching Indigenous research theme. Roundtable discussions and workshops, led by Indigenous leaders, played a pivotal role in the project. These workshops served various purposes throughout the academic year, including introducing Indigenous Culture, providing design critiques, offering reflections, and allowing for open question sessions. Key to this endeavor's success was the creation of a welcoming and respectful environment. The research recognized the need to treat Western Design and Indigenous cultures as distinct, running in parallel, with the establishment of an ethical space as a secure and safe bridge between them. In bringing Design and Indigenous realms into juxtaposition, and at times collision, the research leaders needed to be supportive and diligent around risks & vulnerabilities, while cultivating opportunities and opening doors to discovery. Despite the participants' initial lack of awareness about Indigenous ways, the guidance of Indigenous mentors, coupled with facilitation by research leaders and participant motivation, led to significant progress in design work that incorporated, respected, and celebrated Indigenous knowledge. This paper narrates the educational journey of this initiative and outlines valuable lessons that promise to positively impact the design education and practice of tomorrow.

LOW TECH STRATEGIES WITH HIGH TECH TOOLS:
INTEGRATED MODELING IN THE EARLY ARCHITECTURAL EDUCATION

TIM FRANK
KSU, USA

KEYWORDS: BUILDING PERFORMANCE SIMULATION, LOW-FIDELITY DESIGN TOOLS, NON-EXPERT SIMULATIONISTS, PASSIVE LOW-ENERGY ARCHITECTURE

There is a widespread appeal to foster the adoption of building performance simulation (BPS) tools in the education of aspiring architects with the goal of commonplace integration in architectural practices worldwide. This adoption enhances an architect's working methodology through new forms of observational testing, which demonstrate how architectural boundaries and environmental states interact. Given the opportunities provided, students should exercise careful consideration when incorporating BPS tools into their architectural workflow. This paper presents years of BPS tool implementation in the early stages of architectural education and how this work addresses new user challenges, such as the superficial acceptance of BPS outcomes, a corresponding assumption that BPS tools predict building behavior with absolute certainty, and the subsequent abbreviation of the design process when quantifiable BPS results fall within a desired set range. This paper presents a unique approach that prioritizes low-fidelity BPS tools in iterative, multi-scalar, and interactive ways that embrace the replication, augmentation, and even contradiction inherent within architectural design workflows. Instead of settling on the narrowly deterministic solutions generated by BPS tools, students exercise the potential of these state-of-the-art platforms in a manifold way, using them to observe the rich interactions between articulated architectural boundaries and the environmental states they help shape. Fourth-year students in an undergraduate architecture studio practicum use numerous low-fidelity BPS programs to observe how a building can be tasked to produce system-integrated outcomes that satisfy benchmarks set by the 2030 challenge.

INTRODUCING BAMBOO AS A BUILDING MATERIAL IN ARCHITECTURE EDUCATION OF ASPIRING YOUNG BUILDING DESIGNERS FOR SUSTAINABLE COMMUNITY DEVELOPMENT

EMMAT ARA KHANAM EMA
BRAC UNIVERSITY, BANGLADESH

KEYWORDS: ARCHITECTURE & EDUCATION, INSTALLATION, BAMBOO, BUILDING MATERIAL, SUSTAINABLE COMMUNITY DEVELOPMENT

We need to broaden our thinking, adopt new perspectives, and begin training the next generation of leaders—young students—if we are genuinely concerned about a catastrophe involving global warming, pollution, and social inequality and want to take action. Introducing bamboo's potential to the local populations through architecture education is one way to investigate and develop bamboo as an architectural element. The contribution of architectural education of aspiring students in bamboo materials for sustainable community development is the primary focus of this paper, which is based on a participatory installation of bamboo projects. Considering this, a group of students thought of ideas for an installation that would involve building structures out of bamboo, a sustainable and indigenous alternative material. There were five groups, each with five individuals. The envisioned structures changed during the review sessions of this activity from simple to complicated designs, from required forms to ones created by the students, and from small-scale models to larger ones in a 1:50 scale. Finally, they built the structure on a real scale. The hands-on and interactive exercises, which were not theory-based, incited a great deal of enthusiasm among the young designers and the group of professors. Workshops, Talks, and Presentations were used to give ideas about the stability of skeletal systems in a creative manner. The freshly constructed model, which had different joists, knots, weaving patterns, and construction techniques, was then used to immediately test any theoretical thinking flaws. Because of the availability of a wide range of alternative building materials, including bamboo or any other locally available resources, the material's tactile qualities and construction-related potential became effectively noticeable. In order to define future research on how architecture education considers the relevance of bamboo as a sustainable material, this study tries to describe the gap in the diverse research subjects on bamboo which can be considered for sustainable community development. Additionally, considering bamboo as an eco-friendly building material, it can be a step toward a positive approach to the low-carbon movement for the young leaders. More than any theoretical lecture could have done, the practical aspects of this activity helped the interested students and instructors become aware of and knowledgeable about this issue. The outcome demonstrates that the study on bamboo material is extensively developed in some fields but is hardly ever investigated in other research areas.

AN EXPLORATIVE TRACING OF PEER LEARNING DYNAMICS IN A PBL-ORIENTED DESIGN ENGINEERING EDUCATION

CHRISTIANE BERGER, TINA VESTERMANN OLSEN
DEPARTMENT OF ARCHITECTURE, DESIGN AND MEDIA TECHNOLOGY, AALBORG UNIVERSITY, DENMARK

KEYWORDS: PEER LEARNING, ARCHITECTURAL EDUCATION, PROBLEM-BASED LEARNING, TOOLS FOR DESIGNING

Facilitating deep, sustainable, and long-term learning is not a trivial matter. It is a core challenge in the educational processes aiming at sculpting the profiles of future designers with ability to take part in tackling the pluriverse crisis of climate, biological and social aspects we are facing as a collective. In this context, the paper aims to provide a rich situational insight into peer learning dynamics of a problem-based learning (PBL) architectural education in Aalborg at the department of Architecture, Design and Media Technology (CREATE). We specifically focus on the concept of peer learning within design education that tackles design issues, which are typically referred to as 'wicked' matter of complex proportions that needs addressing on a cross-disciplinary level. Previous research discusses the processes of designing as both linear and situational combining the tasks of analysis, problem formulation, solution, and evaluation showing how working analytically and design-oriented at the same time remains a focal core of the educational process of training designers. However, working in smaller groups addressing wicked designerly problems introduces also matters of collaboration, decision making and communication as important skill sets. To contribute insights, the main research question is the following: "How can the didactical practice of peer learning in groups in architectural education contribute to address wicked design problems? Furthermore, what are the potentials and challenges of group work in the process of design?" The paper outlines firstly the state-of-the-art and theoretical foundations. Secondly, empirical material from teaching at CREATE including firsthand insights into design processes is presented. Finally, the paper concludes with a critical discussion on the didactic potential of peer learning in a design education.

UNVEILING TRANSFORMATIVE URBAN DYNAMICS: THE SYMBIOSIS OF SQUATTING MOVEMENT AND URBAN RENEWAL IN COPENHAGEN'S ARCHITECTURAL LANDSCAPE

SEAN/YUXIANG LI

DET KONGELIGE AKADEMI - ARKITEKTUR, DESIGN, KONSERVERING, DENMARK

KEYWORDS: SQUATTING MOVEMENT, URBAN RENEWAL, COPENHAGEN, RIGHT TO THE CITY, ARCHITECTURAL ETHNOGRAPHY

This Study explores the dynamic interplay between Copenhagen's squatting movement and urban renewal, emphasising public spaces. The research delves into transformative urban dynamics by employing architectural ethnography and historical analysis aligned with Henri Lefebvre's concept of the right to the city. Tracing the movement's evolution from addressing the 1960s housing crisis to contemporary challenges, it highlights adaptability, strategic engagement, and contributions to urban spatial distribution. The article unveils a nuanced narrative of resistance and collaboration, portraying squatters' shift from disruptors to active political players. A historical comparison underscores urban renewal's impact on the squatter movement and evolving urban dynamics. Folkets Hus, analysed through architectural ethnography, serves as a theatre of symbiosis, reflecting grassroots activism's collaboration with municipal development. Navigating the squatting movement, urban renewal, and the right to the city reveals challenges posed by gentrification, legal restrictions, and socioeconomic shifts. The Study identifies opportunities for resilience, emphasising strategic community engagement and envisioning a more inclusive, resilient, and democratic Copenhagen.

EXPERIMENTAL PRACTICE
ARCHITECTURE AS A SHARED FIELD OF AN EXPLORATORY RETHINK

ALEKSANDRA RAONIC
ACULTY OF ARCHITECTURE AND DESIGN, NTNU, NORWAY

KEYWORDS: EXPERIMENTAL PEDAGOGIES, FULL-SCALE, ARCHI-THEATRE, COLLECTIVE/EMBODIED/EXPERIENTIAL/CONTEXTUAL KNOWLEDGE

Experimental practice – ExP, a new master course in architecture at NTNU, Norway, starts with the premise that architectural design knowledge is not made from static, unvarying facts. It is not a commodity one can purchase and therefore own it in its primary, unchangeable form. On the contrary, it is owned only when experienced through practices that are experimental and as such open to infinite processes of enquiry and critical thinking; through letting the knowns shift and adapt to everchanging circumstances. ExP tackles and frames its concerns with its course of action, shifts in protocols, experimental methods, and evolving strategies. That is, with an experimental set of actions tested out through the shared design experience and exchanges in a real-time/space with student/teacher team members.

MATERIAL KNOWLEDGE AND DIGITAL THINKING:
REFLECTIONS ON RESEARCH-BASED TEACHING

ANDERS KRUSE AAGAARD, NIELS MARTIN LARSEN
AARHUS SCHOOL OF ARCHITECTURE, DENMARK

KEYWORDS: DIGITAL WORKFLOWS, FABRICATION, EDUCATION, WORKSHOP, WOOD

Digital tools have become a part of most architectural education worldwide. Today, digital tools include much more than just drawing and modeling software. Every aspect of architectural design and development is digitized, and the component and construction industries are increasingly implementing digitization and automation. As such, digital knowledge and literacy in and around the architectural process are vast and constantly changing. While architectural education can include courses and implementations of certain digital tools, it seems impossible to teach all aspects of digital possibilities within the limited timespan of academic education. A strategy and didactic approach to the digital tool can guide the position of the educational institution and structure the ambition and intention of how digital competencies are brought to the students. Focused work on the digital curriculum at Aarhus School of Architecture led to a framework for digital teaching throughout the bachelor's and master's programs. Within that framework, a series of material- and research-based workshops for 2nd-year students were developed. This paper discusses the content of these very specific hands-on digital courses regarding their intention and ambition as components in architectural education.

DEMOLITION TOWARDS PREMATURE OBSOLESCENCE OF NEIGHBOURHOODS

BEATRICE STOLZ, STEFFEN WELLINGERORCID
DEPARTMENT OF ARCHITECTURE AND PLANNING, NTNU, NORWAY

KEYWORDS: DENSIFICATION STRATEGIES, DEMOLITION, LIFESPAN, OBSOLESCENCE

A circular development in cities aims to create ecologically regenerative and resilient environments to transition towards a more sustainable future. This means rethinking ways of designing, building, and disassembling, favouring reuse and regenerative cycles. For architects and city planners, the challenge lies in finding a balance between developing densification strategies to limit urban sprawl and preserving the built environment by slowing down lifecycles. How does densification affect the demolition and lifespan of buildings, in neighbourhoods? The objectives of this research are to discuss changes in the built environment in comparison to densification strategies; and how these changes might support or hinder circular practices. The paper explores evolutions in the building stock over time, using the city of Trondheim, Norway, as a case. First, analysing data about the existing building stock helps to understand the location and age of different building types in different neighbourhoods. Then, the collected information is contrasted with historical data about buildings being demolished from 2012 to 2021, to understand the evolution of the built environment. The data comprise information about the type of building, number of square meters, date of construction, date of demolition, and location. Three neighbourhoods are selected, having different characteristics and rates of transformation. Two types of results are observed: differences in the transformation rates of neighbourhoods and differences in the buildings' lifecycles in the different neighbourhoods. This allows for anticipating future developments of the city, as well as identifying possibilities for circularity. Moreover, comparing the age of the current building stock with the lifespan of demolished buildings casts light on the premature obsolescence of specific building types. The results are discussed alongside planning and densification strategies for the city, supporting a contextualised approach to circularity.

RESILIENCE IN BAMBOO

ZAINAB FARUQUI ALI, EMMAT ARA KHANAM EMA,
MOHAMMAD ZILLUR RAHMAN
BRAC UNIVERSITY, BANGLADESH

KEYWORDS: SUSTAINABILITY, ZERO-CARBON BUILDING, COST EFFECTIVE, PARTICIPATORY ACTION RESEARCH, COMMUNITY PARTICIPATION, PREFABRICATED BAMBOO ARCHITECTURE, DISASTER REHABILITATION BUILDING

A number of zero-carbon prefabricated bamboo buildings were built engaging marginalized communities in a few places in South Asia. This action-research was conducted by teachers and students of architecture who designed and built sustainable structures made of local materials such as bamboo, straw, rope and mud. The prototype design was revised, whenever needed, according to the climate, topography, landscape, materials as well as the traditional wisdom of the local tropical context. The building is significantly cost effective, especially in rural areas since it uses indigenous materials and local labor. The prototype structure using treated bamboo and a special rope-knotting system originally went through shaking table and wind tunnel tests by the prototype designer. The multi-use structures, now a year old, are weathering quite well. Short-term temperature readings of outdoor and indoor of some of these structures were collected to study the thermal performance in summer, and the indoors were found to be more comfortable than the outdoors.

The fact that most of the participants are women in both the students and community members prove the ability and confidence of women in building industry, which also addresses sustainable development goals.

A large impact of this endeavor was that the areas being disaster-prone, the prefabricated structures were used as disaster rehabilitation buildings proving the importance of this structure in disaster resilience. The building is made of eight prefabricated bamboo panels that could be easily transported from one place to another. An example of this impact is the construction of 2000 plus such prefabricated buildings built after a devastating flood in a city in the region. Again, the involvement of academics and students brought in direct input of the knowledge gained through this hands-on build in the classrooms. The paper thus focuses on the major contributions of this action-research on constructing sustainable buildings addressing climate change, disaster resilience, involvement of marginalized communities especially women, and the knowledge dissemination in the academia.

VERTICAL GARDENS
BUILT ENVIRONMENT EDUCATION TOOL IN SCHOOLS IN SERBIA

MINA RADIC SIBINOVIC
TECHNICAL UNIVERSITY BERLIN, GERMANY

KEYWORDS: VERTICAL GARDENS' EDUCATIONAL BENEFITS, BEE, ESD, PARTICIPATORY DESIGN METHOD, INTERDISCIPLINARITY

Built environment education (BEE) presents an interdisciplinary field of education intended for children and young people. Besides fields of architecture, urban design, art, landscape architecture, etc. it includes different social aspects such as humanity, culture, and heritage, thus being important not only for future architects but for every citizen. On the other hand, in Education for Sustainable Development (ESD), the main topics of interest are key sustainability issues such as climate change, lack of biodiversity, sustainable consumption, etc. Likewise, promoting critical thinking and decision-making in a collaborative way, ESD coincides with research methods in architecture such as participatory design. Therefore, this research focuses on developing a participatory design method with integrated BEE and ESD components, that can be applied through the school curriculum also as a teaching tool. To answer the main research question, of how we can successfully design vertical gardens (VGs) in schools that act as BEE tools for tackling sustainability issues, this research first presents a set of educational gamified workshops as a newly developed participatory design method that includes topics of environmental, ecological, and social VG benefits, and second, its evaluation results. The workshops were specially developed for the ages of 12, 13, and 14, and later tested through the collaboration of architects, one pedagogue, teachers, and pupils in the primary school "Drinka Pavlovic" in Belgrade, Serbia in April 2023. This research is part of the author's doctoral research whose related objective is the design of a toolkit for a gamified educational participatory VGs design method that can later be applicable in other schools. Therefore, this paper concludes the tested design process evaluation, suggesting recommendations for its improvement. Finally, this research contributes to filling the previously identified gap in the scientific literature on VGs' educational benefits.

WHERE ARCHITECTURE AND FURNITURE DESIGN OVERLAP IN THE TERMS OF CIRCULARITY:
A CROSS-DISCIPLINARY FIELD

CAMILLA HEDEGAARD MØLLER, AROOP RATAN GUHA
ROYAL DANISH ACADEMY

KEYWORDS: CIRCULAR ECONOMY, ARCHITECTURE AND FURNITURE DESIGN, UPCYCLING PRACTICE, DESIGN TRAJECTORY

The paper explores how circular economy (CE), and its practices relates furniture design and architecture in the case of the Regenerative Cabin, The Regenerative Cabin Table and The Lyngby Table. The paper examines the interdisciplinary field of design and architecture and how thinking and concepts of CE establish relationships across disciplines. The study is a qualitative empirical case-study based on observations, qualitative interviews with the architects involved and analysis of documents, files, and digital presentations from the design processes. The theoretical perspective is theory on circular economy. The understanding that materials and ideas such as circular economy are actors with agency is crucial to the research and ANT-inspired mappings of dynamic actors. The cabin acts as an intersection point of architecture and different avenues of furniture design. Preston´s definition of CE helps us find the overlap that happens between architecture and furniture design, when architectural waste of certain dimensions fails to find relevance within the architectural field, that same waste can find purpose in furniture design. Findings from the study indicate that circular economy and a circular mindset might suggest new possibilities that require close collaboration between actors from a cross-disciplinary field. The case also indicates that practices like this need a well-designed network to achieve the desired results.

(PRE)CASTING ARCHITECTURAL CONCRETE: *SEARCHING FOR A DESIGN GUIDE FOR TECHNIQUES, RESOURCES, AND ADVANCEMENTS OF ARCHITECTURAL PRECAST CONCRETE*

DANA KATHLEEN GULLING, GREGORY W. LUCIERORCID
NORTH CAROLINA STATE UNIVERSITY, USA

KEYWORDS: ARCHITECTURAL PRECAST, CONCRETE, CUSTOM

The integration of computer-aided design (CAD) and computer-aided manufacturing (CAM) has revolutionized the fabrication of custom architectural components, particularly in the realm of custom architectural precast concrete. This paper delves into the multifaceted world of architectural precast concrete, by doing three things. First, it identifies the manufacturing variables for architectural precast. These include but are not limited to mix design, manufacturing processes, shipping and erection considerations, mold materials and configurations, and the role of CNC equipment in mold making. Second, it lists case studies of prominent architecture projects that make notable use of architectural precast concrete. The case studies include the Perot Museum of Nature and Science, Museum of Civilizations of Europe and the Mediterranean (MuCEM), and The Broad. Third, this paper provides a narrative-style literature review of book publications that feature architectural precast. The goal of this paper is to create the framework for a published guide for architects that demonstrates what is possible when designing with architectural precast. With over 175 examples gathered from various sources spanning the last two decades, this paper offers a comprehensive overview of the design and fabrication of custom architectural precast concrete elements.

THE TRANSMISSION OF INTANGIBLE VALUES IN VERNACULAR ARCHITECTURE
THE CASE OF THE VALENCIAN BARRACA

MARCEL·LÍ ROSALENY-GAMÓN
ESCOLA TÈCNICA SUPERIOR D'ARQUITECTURA- UNIVERSITAT POLITÈCNICA DE VALÈNCIA, SPAIN

KEYWORDS: VERNACULAR ARCHITECTURE; HERITAGE; INTANGIBLE VALUES; BUILDING TRADITIONS; VALENCIAN BARRACA

Throughout the history of architecture, it has become a tool for transmitting knowledge and teachings. This is reflected in the religious temples that have been erected for millennia. However, this paper will focus on another type of architecture: vernacular, domestic architecture, and how it is capable of transmitting the values of the communities that build it. The use of certain materials and construction techniques, decorative motifs or their absence, speaks to each community's relationship with the environment in which it develops, speaks to its economy and its history, and turns each construction into a lesson for future generations. All these values, which exceed the realm of the material, succeed in endowing vernacular architecture with depth and a sense beyond the use of each building. It is these values, those that refer to ways of life, that become particularly relevant to the future of our profession, as they can become a key tool in addressing the challenges of tomorrow. Throughout the paper, a case study will be used, the Valencian barraca, to examine how this type manages to convey intangible values and how they help understand the communities that built this architecture.

FINITE EARTH, OPEN-ENDED ARCHITECTURE?
FRAMING A QUALITATIVE, ECOLOGICAL PERSPECTIVE ON HOUSING

THORBJØRN LØNBERG PETERSEN
THE ROYAL DANISH ACADEMY, DENMARK

KEYWORDS: SUSTAINABILITY, QUALITATIVE, CARE, ECOLOGY, HOUSING

In the realm of contemporary housing development, the dichotomy between quantitative and qualitative approaches underscores a fundamental tension. This article explores the significance of this dichotomy and its complex implications on the ecological relationship between humans, the built, and the natural environment. The paper asks; how can the architectural practice of housing development encompass a qualitative ecological perspective? This will be elaborated by examining the shortcomings of 'numerical environmentalism' to reevaluate the role of technology in mediating human-environment relationships, questioning not only the methodologies we utilize to assess environmental impacts, but also the way we design, build, and maintain our built environments in general. To initiate the conceptualization of a qualitative alternative, a practice situated in an ethic of care is proposed, to form a critical lens through which the normative practices of housing development can be examined. As existing practices often prioritize numerical assessments and scalable solutions over context-specific, qualitative considerations, the research will advocate for what can be considered an 'open-ended' architectural paradigm, embracing uncertainty, time, the capacity to induce and absorb change, diversity, material proximity, and so forth. This is elaborated in a logical framework of concepts, principles, and incompatibilities, and further visualized as a spectrum covering the dichotomy foregrounded. At its core, the key message of this research is a call for architects to rethink their approach to housing development to embrace care-relations and open-ended architectural principles in ambitions to cultivate a more harmonious relationship between humans and their surrounding environments.

ADVANCING TRANSITIONAL SHELTER PROVISION THROUGH INNOVATIVE STRUCTURAL SOLUTIONS

HESHACHANAA RAJANAYAGAM[1], VALENTINA BEATINI[2], KEERTHAN POOLOGANATHAN[3], BRABHA NAGARATNAM[3]

[1]UNIVERSITY OF THE WEST OF ENGLAND, UK, [2]AARHUS UNIVERSITY, DENMARK, [3]UNIVERSITY OF NORTHUMBRIA, UK

KEYWORDS: ADVANCING EMERGENCY SHELTER PROVISION THROUGH INNOVATIVE STRUCTURAL SOLUTIONS

The overarching goal of this study is to equip researchers and developers in the structural and associated sectors with the information they need to prioritize, in the creation of suitable and effective aid for emergency housing that can keep up with the projected future increase in demand. Using the grounded theory method and a series of case studies, the paper presents a compiled list of user-reported structural problems, the difficulties authorities have had in resolving those problems, and some ideal solutions, derived from the theoretical coding. The emergency shelter requirements in this study highlight the need for an economic (cost-effective), lightweight, reusable (especially if transitional), easily and efficiently manufacturable, constructable (with few in-situ installation inputs) and transportable housing solutions. Based on the structural requirements identified and acknowledged, a spectrum of innovative structural approaches, including modular and adaptable systems, site- specific designs, hybrid materials, and sustainable construction techniques have been proposed as to facilitate the development of new shelter designs and to support and enhance the usability of existing designs. These approaches emphasize the integration of advanced materials, computational tools, and resilient design principles to create shelters that are not only robust and safe but also environmentally conscious and culturally sensitive. Finally, the paper summarizes the key concerns in terms of sustainability and structural aspects of proposed designs and concludes with recommendations and suggestions to enhance the applicability of such designs, based on emergency requirements and shelter deployability. This article catalyses transformative change in the field of emergency shelter provision serving as the base for confrontation on alternative designs and materials and will support further studies on the structural and architectural design and organization of emergency shelter provisions.

ARCHITECTURAL WRITING LABORATORY:
A DESIGN LEARNING EXPERIMENT

IREM KORKMAZ, AYSE ZEYNEP AYDEMIR
MEF UNIVERSITY, TURKIYE

KEYWORDS: ARCHITECTURAL WRITING, ARCHITECTURE EDUCATION, ARCHITECTURAL DESIGN RESEARCH, CRITICAL THINKING

Writing is a spatial act - exploring different writing modes may unveil new modes of architectural thinking. When contextualised within the architectural framework, writing takes on a transformative role, capable of opening up possibilities for non-visual relationships and interconnected networks, thereby inviting critical inquiry and discourse. In architectural schools, where the design studio is the central focus, this area usually remains less explored, particularly in undergraduate programmes. However, practising architectural writing brings opportunities to students; for instance, they are introduced to and become familiar with spatial thinking in a literary space where their typically visual preconceptions do not operate.

Pursuing this perspective, this paper explores how effectively using writing as a design tool can uncover new and unconventional perspectives on architecture and proposes architectural writing as an interdisciplinary learning tool for guiding future architects and architectural design researchers. These issues are examined through an in-depth study of pedagogical objectives and outcomes of the Architectural Speaking and Writing course, a mandatory subject for third-year undergraduate students.

The course is structured as a writing laboratory that closely examines forms of architectural writing as primary instruments for finding a critical voice, engaging in critical dialogue, and communicating with the wider public. Through introducing the design of the course structure and analysing the writing exercises, this paper addresses the crucial role that diverse mediums and methods of expression play for students to connect their internal narratives with external realities in architectural education while altering the dominant position of the educator towards a facilitator.

CRITICAL INQUIRY

BETH M WEINSTEIN, LAURA H HOLLENGREEN
UNIVERSITY OF ARIZONA, USA

KEYWORDS: ARCHITECTURAL PEDAGOGY, THEORY, RESEARCH, EQUITY, AGENCY

A new required course linking architectural and critical theories in the Bachelor of Architecture curriculum of the School of Architecture at [institution] was developed in order to provide a hinge between the predicated courses of the Core curriculum and students' choice of a Research and Innovation (R&I) track for their final three semesters of study culminating in a Capstone Project. Featuring a plurality of voices in the instructional team, the course, Critical Inquiry (CI), broaches theoretical lenses for equity, ecology, and architectural agency, framed by an introduction to critical theories and research and a conclusion that showcases critical contemporary practices. Students are required to formulate a research project proposal meant to help chart a curricular path that will inform their R&I choice a semester later. This paper discusses our pedagogical innovation, our research into the course's realization of individual and institutional objectives via assessment activities with multiple stakeholders, and the iterative refinement of the course that has resulted. That refinement has affected the content and sequence of course topics, and the overall scope of the class, from its inauguration in 2020 through the pandemic, the rise of the Black Lives Matter movement, and other socio-cultural and political developments. CI increasingly approaches our goals to address equity, diversity, and inclusion in our professional curriculum and prepare students to construct and assert their individual agency during the final stage of their education.

SYSTEMS THINKING:
A METHODOLOGICAL APPROACH FOR THE DEEP READING OF CITIES

BASAK UCARORCID, DERIN INANORCID
TED UNIVERSITY, TURKIYE

KEYWORDS: SYSTEMS THINKING, DATA VISUALIZATION, ARCHITECTURAL EDUCATION

The environmental, economic, and social changes in the last decades demand the readdressing of the city as an adaptable one that is defined through a network of interwoven relations rather than well-defined rigid structures. This intricacy forges the redefinition of accustomed practices of design to manage the desired inclusive, adaptive, fluid, and responsive conditions of cities. However, incorporating these coexistences in the definition of urban conditions necessitates a multi-focal rendering of the associations and a speculative practice of a new methodological approach. Therefore, we need novel methodologies of research in the field of architecture. This paper will propose the re-visiting of 'systems thinking' as a new methodology to research on pluralities, contradictions, degradations, and climatic challenges of contemporary cities. Rather than a top-down design approach, 'systems thinking' by definition initiates a non-linear process by focusing on the relationships and even interdependent variables. Therefore, embracing 'systems thinking' in the definition of contemporary cities can respond to the ever-changing conditions, which can alter the design practices and teaching-based research processes.

However, to envisage and structure a system that can respond to the pluralities, complexities, and exigencies of the ever-changing conditions, a deep reading of the city should be provided that can be produced, processed, or engaged in all phases of the design process. In this respect, experienced data avalanche and interaction with the high scale of bytes used for data-driven practices can be considered as a challenging transformation that proposes deep readings of cities and hence can be used in practicing a 'systems thinking' approach. This new method of engagement with data-driven practices cultivates an architectural transformation by sourcing, inspiring, and informing the architectural design processes for understanding the notion of resilient cities. The paper speculates on the potential of systems thinking initiated by data visualizations in producing deep readings and research on contemporary cities and its use as a methodological approach in architectural design education.

THE PROFESSION AND THE DISCIPLINE:
SOME THOUGHTS ON HEALTHCARE DESIGN TEACHING IN THE USA

SAIF HAQ
EXAS TECH UNIVERSITY, USA

KEYWORDS: HEALTHCARE DESIGN, ARCHITECTURAL EDUCATION, DESIGN, RESEARCH

As healthcare design is gradually becoming a specialized area within architecture, many schools in the USA are proposing and implementing different curricular models. A comparison of these indicates non-agreement in the essential needs of these graduates. Additionally, the two professional credentialling agencies for healthcare designers also have dissimilar criteria. The questions thus are: what knowledge and skills do graduates interested in healthcare design need, what does the profession expect, and how can the academia be appropriate?

This paper collects data from public domains of each organization. It analyzes the criteria of the credentialling agencies through content analysis of their examinations and compares the curriculum of five healthcare certificates in leading US schools. Additionally, it presents the results of an online survey of eighty-six healthcare design professionals that was conducted to understand the profession's view of what skills and knowledge healthcare architects need. From these, the paper identifies common areas and maps out discrepancies. Of special interest, this paper discusses the duality between the inclusive characteristic of design and the exclusive nature of research, and how they can be understood and addressed in healthcare teaching. It breaks down the various aspects of design and research and maps them to find actionable intersections for the benefit of educating healthcare designers.

MANUFACTURED HOMES:
ACCESSIBILITY, RESILIENCE, AND ENHANCED QUALITY OF LIFE IN THREE EXTREME CLIMATES

LIANE HANCOCK, MOHAMMAD MEHDI GHIAI,
ALYCE DESHOTELS
UNIVERSITY OF LOUISIANA AT LAFAYETTE, USA

KEYWORDS: RETROFIT, MANUFACTURED HOME, ENERGY MODELING, RESILIENCE, EXTREME CLIMATE

This paper asks what can we learn from homeowner modifications of manufactured homes about addressing resilience, accommodation, energy savings, occupation, and flexibility? The authors identified retrofits which decrease heating and/or cooling requirements; provide long term accessibility as owner's age; plan resilience in the face of extreme weather; and enhance quality of life aligned with local culture. Three rural extreme climates in Louisiana, Arizona, and Colorado provide data on a wide range of solutions tailored to the particularities of climate conditions. The resulting assessment identifies categories of modifications and retrofits and associated typologies, for example homes on piers, unconditioned porch or carport additions, conditioned additions, envelope modifications, and changes to provide ADA accessibility.

Quantified assessment through energy and structural modeling evaluates the effectiveness of the homeowner designed retrofits observed in Louisiana, Arizona, and Colorado. The results of assessment reveal that homeowners decreased EUI through simple passive methods adapted from agricultural, aquacultural, and industrial architecture. Energy modeling simulation on case studies for observed retrofit roof assemblies showed up to a 28% decrease in EUI in Louisiana, and 58% decrease in EUI in Arizona. These same retrofits produce large exterior covered occupiable spaces which provide an extended period of thermal comfort by over 20%.

While the paper primarily focuses upon assessment heating/cooling mitigation through roof assembly retrofit, it also discusses: structural changes through the addition of piers, super structure, and lifting systems along with accessibility and circulation changes, all due to accommodation of FEMA base flood height elevation in Louisiana; window retrofits, window shading, and understory/crawlspace protection and skirting to both provide resilience during climatic events, but also to mitigate heat transfer in manufactured homes in Arizona and Colorado; and heating/cooling source retrofits and augmentation in all three locations.

BUILDING A LAB:
CONSTRUCTING REALITIES

DERYA UZAL
STANBUL TECHNICAL UNIVERSITY, TURKIYE

KEYWORDS: ARCHITECTURAL LABORATORIES, PRACTICE, EXPERIMENTAL ARCHITECTURE, AGENTS IN LAB

Laboratories, architectural-material closed spaces, have clear boundaries. On the other hand, the knowledge produced in it is universal, re-applicable and changeable. Structurally and technically limited laboratories represent an epistemologically limitless—even expansionist—space. Models and apparatuses encourage this expansion and help to translate the given world to data or vice-versa. Laboratories have a capacity to produce knowledge, through which they communicate different agents -indifferent scales- models. Application area of the laboratory proposes a spatiality that defines the case within the model and applies this model in various boundaries. (in vitro, in vivo, in papyro, in silico...) Here, a code-place is formed that the laboratory defines itself and (epistemologically) reproduces through matter. And also, laboratories with apparatuses will implement these models and enable them to observe the world with this framework in the lab. These two moves offer more than experimentation which affect each other, and can only be accomplished in the lab. But the term "laboratory" for architecture does not follow the exact line.

Researchers from the architectural field are developing new action plans by considering material relationships embedded in isolated research of disciplines that were previously ignored. These new places in architecture practice are in search of its place in debates that involve future scenarios and the ongoing discourse between theory and practice. At this point, despite fundamental criticisms of scientific research and knowledge production, the research questions why the discipline of architecture has adopted a "laboratory" practice under the name of "architecture". A comparative reading will be made between the emergence of architectural laboratories as a practice and the breaking points of scientific laboratories, starting from the historical context of the first reasons for the emergence of the "Biotechnology and Correlation Laboratory" founded by Frederick Kiesler in 1946. This comparison will question the motivations for the re-emergence of the laboratory phenomenon in the 21st century.

REDEPLOYED:
A CIRCULAR APPROACH TO CONSTRUCTION PEDAGOGY

MATAN MAYER
IE UNIVERSITY, SPAIN

KEYWORDS: MATERIAL RECOVERY, CIRCULAR CONSTRUCTION, LIFE CYCLE DESIGN

Material recovery in the built environment is typically examined and practiced as a technical endeavor, which involves multiple scientific domains. This paper explores how material recovery and reutilization could also be used to build creative problem-solving skills among students in architecture education, particularly in construction curricula. Within this context, the paper describes and analyzes findings from a five-year pilot course offered at the undergraduate level of a professional architecture program. The course substitutes a foundational construction class, which in many institutions focuses on a linear survey of widely practiced construction methods and their corresponding building details. Instead of employing that classical approach, the course aims to convey construction principles through the act of inventorying and reusing components from a given building stock. It does so through four sequential phases: an analytical phase, where students conduct an in-depth study of a case in contemporary construction at multiple scales and media, including physical models; an inventorying phase, where students are required to deconstruct their case into discrete elements and characterize their physical properties; and a redeployment phase, where students are requested to use their inventoried material stock to reconstruct their case in a considerably different configuration. This act forces the students to use components that have been designed to carry loads and connect to other components in a specific direction and manner, in an entirely different set of structural and compositional constraints. As part of this process, the students are also asked to design new connection details for the reused components while considering the new context of each component. The paper presents a comparative study of the environmental implications of this approach and concludes with a discussion regarding current limitations and future investigation trajectories.

THE CLIMATE HUBLAB AT NTNU

LUCA FINOCCHIARO, MARIYA BOND STOYANOVA,
LEIF MARTIN HOKSTAD
NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY, NORWAY

KEYWORDS: EXPERIMENTAL, BIOCLIMATIC, DESIGN, LABORATORY, STUDIO

The identification of sustainable design with the use of standards and commercially available components for energy efficiency has led architecture students to suddenly become more concerned and thirstier for existing know-how, rather than developing the ability to observe and generate their own solutions. Sustainability in architectural education cannot be limited into making students aware of environmental challenges and ready-made solutions, neither into making them able to limit environmental impact of the built environment on a pure numerical basis. We need instead to shape architectural practitioners who are able to go beyond energy and emissions accounting, to create new architectural paradigms re-harmonizing natural and built environment. The MSc program in Sustainable Architecture at NTNU collects architecture and engineering students in multidisciplinary design processes with the purpose of developing innovative design concepts and solutions for the environment. Throughout the program, students rely on different kinds of software to optimize environmental performance and minimize environmental impact of their projects. Teaching experience show that an extensive use of simulation software risk anyway of simplistically reducing complexity behind sustainability to a discreet number of parameters. Question is therefore how results provided by advanced simulation tools is combined with a holistic understanding of the process. The Climate Hub-LAB, initiated in 2016 thanks to the support of the AVIT program at NTNU, aims at providing students an integrated studio where flow of information coming from different machines and tools, can be collected, and more effectively translated in efficient architectural design concepts on the basis of hands-on experiences. In this paper we will reflect on the conversion of the design studio into an equipped research laboratory for experimental design processes, discussing how the use of digital tools have been rephrased in a way to support the development of hands-on experiments in the Climate HubLAB.

INTEGRATING THE AUTISM SPECTRUM DISORDER STUDENT IN THE ARCHITECTURAL STUDIO CLASSROOM

LUIS SANTOS
AALBORG UNIVERSITY, DENMARK

KEYWORDS: ARCHITECTURAL EDUCATION, PROBLEM-BASED LEARNING, PEDAGOGY, AUTISM SPECTRUM DISORDER, INCLUSIVITY AND DIVERSITY

Higher education's student population is growing more diverse, incorporating individuals with emotional and mental disabilities like autism spectrum disorder (ASD). Factors contributing to this trend include heightened awareness of learning differences, improved diagnostic processes for ASD, implementing enhanced individualized learning plans, and adopting more effective special education practices. Architectural education is no exception. The creative and collaborative framework fostered in architectural education, particularly in programs based on problem-based learning (PBL) pedagogy, presents critical challenges and opportunities for ASD students. This work examines such challenges and opportunities by considering all stakeholders involved, i.e., ASD students, their colleagues, and instructors. Through literature review and interviews conducted at Aalborg University (an institution that uses PBL), this work maps ASD symptomatology, ASD students' needs, the opinion of a mentor of mentally impaired students, the challenges and ad-hoc strategies used overall in higher education in general and by architecture and design faculty. Additionally, the paper presents the results of a small experiment conducted with architecture students without ASD that exposed them to an aural environment that emulates ASD-related auditory hypersensitivity. The paper articulates the different collected information to reflect on PBL adequacy in teaching ASD in architecture programs, the effectiveness of current practices, the impact of environmental factors (e.g., space, aural environment) in this population, and outlines potential pedagogical strategies for this student population in an architectural studio setting.

ADAPT:
A COLLABORATIVE APPROACH TO ¨ACCESSIBLE AFFORDABLE HOUSING

JUSTIN MILLER, WESLEY COLLINS, SHU-WEN TZENG
AUBURN UNIVERSITY, UNITED STATES OF AMERICA

KEYWORDS: AFFORDABLE HOUSING, ACCESSIBILITY, AGING IN PLACE, INTERDISCIPLINARY RESEARCH

This paper describes the outcomes of an interdisciplinary research collaboration focused on a call issued by the United States Housing and Urban Development (HUD) agency to address a need for designs for accessible affordable housing and plans for modifications necessary to make homes readily adaptable to meet the needs of individuals and families seeking to age-in-place (AIP). Specifically, the research team was directed to considered housing types with four or fewer units, commonly described as 'missing middle' or 'middle density' housing types, which fall outside of the purview of United States Fair Housing Agency (FHA) and the Americans with Disabilities Act (ADA) guidelines.

Two working groups established foundational research for the team and advisory council's review before moving into design work. One working group's literature review revealed numerous scattered high-quality resources addressing a range of topics from spatial considerations to financial resources and funding programs for aging-in-place renovations and new construction. The second working group conducted a series of focus groups with individuals with mobility and visual disabilities seeking to age-in-place.

After presenting these findings to HUD, the project team shifted approach from developing renovation design plans and singular housing prototype designs to the development of a web-app that consolidated AIP best practices and resources and to a consideration of aging-in-place more broadly than the specific design of non-detached single-family homes, semi-detached townhomes, and structures with four or fewer residential units. The team explored housing prototype design solutions that reinvested in neighborhoods with substantial vacancy by identifying land banked properties and zoning changes that would allow infill development of a range of middle density housing types. The design studies propose infill development of middle density housing types in neighborhoods with land banked properties and a return to prior land use scenarios through zoning modification.

CRITICALLY ENGAGING THE PAST TO BUILD A MORE JUST AND SUSTAINABLE FUTURE

COLM MAC AOIDH
UNIVERSITEIT HASSELT, BELGIUM

KEYWORDS: ADAPTIVE REUSE, HERITAGE, ARCHITECTURAL EDUCATION, ARCHITECTURAL PRACTICE, CLIMATE CRISIS

As the effects of the climate emergency and dwindling resources force a paradigm shift within architecture away from demolition and new construction towards renovation and adaptation of existing sites and buildings, it is becoming clear that both architectural practice and education will have to evolve and adapt to a context in which the vast majority of our built environment already exists.
Any approach to designing with the past, however, cannot ignore how buildings embody both material and immaterial heritage as products of the processes of exploitation and extraction that led to the current crises. As such, our built heritage can be said to represent part of both the cause of and solution to the situation in which the practice of architecture, and society in general, now finds itself.

This paper sets out to identify, explore and understand the intersecting challenges faced by contemporary students and practitioners of architecture through the prism of a practice no longer premised on tabula rasa but grounded in adaptation and reuse. By undertaking a critical analysis of the concept of heritage, it will investigate the history, background and causes of these challenges, and the role that architecture and the construction industry has played in creating them.

Examining how engaging with the past has the potential to both inspire and hinder creativity in architecture, it aims to uncover new solutions that help ensure current and future practitioners are equipped with the necessary skills and knowledge to work successfully within this changed reality. The paper aims to develop, highlight and share a range of attitudes and approaches that can bridge the perceived gap between historic preservation and creative adaptation and harness the full future potential of the existing building stock. This offers possible applications not just in education and practice, but also in policy-making and legislation.

CONSIDERING COMPLEXITY + NAVIGATING CHANGE:
AN INTEGRATIVE STRATEGY FOR ADDRESSING CONTEMPORARY CHALLENGES IN ARCHITECTURAL DESIGN

HOSNA BAHONAR[1], BRIAN R. SINCLAIR[1,2]
[1]UNIVERSITY OF CALGARY, CANADA,
[2]SINCLAIRSTUDIO INC., CALGARY, ALBERTA, CANADA

KEYWORDS: KDESIGN, FRAMEWORK, AGILITY, SUSTAINABILITY, HOLISM

Our modern world is dynamic and dramatic, with change commonplace and often daunting. To address the modern challenges in architecture, design potency, relevancy, and fit must be critically reconsidered, with clear understanding that the built environment has many implications to quality of life. The cultural pluralism and ethnic diversity of a country such as Canada is reflected in various lifestyles influenced by contextual and behavioral differences. It is therefore important to design for mixed-income, mixed-purpose, agility, adaptability, and sustainability.

By crafting a novel five-step methodology focused on the juxtaposition of agility and innovation, This paper critically compares, contrasts, and analyzes several existing noteworthy conceptual frameworks: notably Gordon's 3Ls, Elkington's Triple Bottom Line, Sinclair's Holistic Framework for Design + Planning, and Imam's Agile Architectural Framework. Ultimately, such models are assessed against prestigious, award-winning architectural landmarks –namely, the new Calgary Central Library, MacKimmie Tower, and Habitat 67. A distinct aspect of this research involves identifying deficiencies within the aforesaid frameworks, synthesizing findings, and subsequently developing a hybrid, more efficacious, and durable model. Depicting part of a larger research agenda, the present paper highlights core concepts and proffers strategies that underpin this novel hybrid manner of design.

It is important to stress that identified frameworks, conceived at distinct times, have understandably been formed by the constraints and conditions of their respective periods. Accordingly, this study explores ways to rethink more timeless characteristics and a refreshing shift from earlier studies that evaluated these frameworks individually (i.e., in relative isolation) into a broader, more integrative perspective that leads to the shaping of a different tactic (The Transformation Framework). Architects, developers, policy-makers, and other stakeholders will benefit from the framework, pursuing solutions that are more resilient and adaptable moving forward.

In summary, this paper highlights an innovative and timely step towards more holistic and appropriate approaches to design. The model has meaningful applicability to housing and other typologies -- drawing from the past, embracing the present, and anticipating the future.

BRIDGING ANALOG AND DIGITAL REALMS:
FOSTERING SUSTAINABLE DESIGN INNOVATION THROUGH INTEGRATED TEACHING TECHNIQUES

MARIYA STEFANOVA STOYANOVA BOND, ANSHUMAN ABHISEK MISHRA, LEIF MARTIN HOKSTAD, LUCA FINOCCHIARO
NTNU, NORWAY

KEYWORDS: ANALOG TOOLS, ARCHITECTURE EDUCATION, BIOCLIMATIC DESIGN, COMPUTATIONAL ANALYSIS, DIGITAL TOOLS

Digital simulation tools for environmental performance analysis are widely employed in architectural practices around the world. For this reason, teaching students how to use those tools is increasingly becoming an important part of the architect's education and future employability. However, in architectural design, digital tools, providing fixed numerical outputs, have the potential to lead to design fixations, limiting the students' capacity for innovative thinking by restricting their design actions. This study suggests that digital tools can be used not only as tools for complex computational analysis in the architect's practice but also as pedagogical tools facilitating the integration of numerical simulation outputs in holistic design processes, enhancing the learner's experience. The study further infers that one method to accomplish this is by incorporating digital tools into hands-on activities and experiments. To test the hypothesis, we designed and tested an experimental workshop. Action research was chosen as a methodology, enabling the researchers to participate in ongoing situations, influencing the events while simultaneously being able to measure the impact of their interventions. All activities followed Kolb's Experiential Learning Theory and Schenck & Cruickshank's Co-constructed Developmental Teaching Theory. A set of digital and analog tools for simulating environmental performance was incorporated into the teaching and learning activities of the workshop. The juxtaposition of the different simulation capabilities of those tools aimed to provoke students to reflect and build a holistic understanding of the subtleties of simulation results. This article is the conclusion of the first workshop and summarizes the attempt to incorporate those tools into hands-on activities and experiments, encouraging students to test the boundaries of their design solutions on both quantitative and qualitative basis. The main discussion points are the methodology and methods employed in the first workshop and the agenda for improving the protocols for the next planned workshop.

FUTURE SCHOOL ARCHITECTURE
FROM IDEAS OF THE FUTURE SCHOOL TO THE SPACE LIVED IN SCHOOL

EVA GJESSING[1,2]

[1]EVA GJESSING, COPENHAGEN, DENMARK

[2]DEPARTMENT OF EDUCATIONAL THEORY AND CURRICULUM STUDIES, EDUCATIONAL PHILOSOPHY, AND GENERAL EDUCATION, AARHUS UNIVERSITY, DENMARK

KEYWORDS: SCHOOL ARCHITECTURE, SOCIAL SUSTAINABILITY, WELFARE ARCHITECTURE, HENRI LEFEBVRE, THE SOCIAL PRODUCTION OF SPACE

The research project sheds a critical light on the making of Danish school architecture 2015-2020. It points to barriers in architects' practices and a discrepancy between the ideas of 'The Future School' and the conditions of real life in the schools. Henri Lefebvre's theory facilitates insights to overcome this gap through an investigation of how school space is produced socially. Lefebvre's theoretical concepts and anthropological approach provide a framework to analyse how ideas of 'The Future School' emerge and materialise into school architecture, and how teaching practices and lived school life reflect and express these ideas. The analysis examines the political and societal drivers as well as the cultural terms and bodily perceptions of architecture from the research question: How does future school architecture emerge from ideas of the future school to space lived in school? The documentation used to answer this question includes pedagogical and architectural school briefs, architects' designs for schools, teachers' didactic practices, and pupils' school life with the didactic practices embedded in the school architecture. The methods used are document analysis, field observations, interviews, ethnographic narratives, and a qualitative survey. The research shows that an ideology of 'The Future School' suppresses the voice of teachers. It shows that architects aren't allowed to communicate with teachers in an architectural school competition at the most critical part of the design process. Findings from post-occupancy studies in three built schools that have been briefed 2015-2020 show difficulties for teachers to teach inclusively. Pupils who were already challenged are challenged even more, which contrasts sharply with the visions of the pedagogical and architectural briefs. A further discussion is suggested on how to enhance new social practices in the production of future welfare architecture to better foster social sustainability to promote care, community, and belonging.

THE ENERGY STORAGE CAPABILITY OF BUILDING RAINSCREEN CLADDING PANELS INTEGRATED WITH PHOTOVOLTAIC AND REVERSIBLE PROTON EXCHANGE MEMBRANE FUEL CELLS

JINGSHI ZHANG, RAHMAN AZARI, UTE POERSCHKE
THE PENNSYLVANIA STATE UNIVERSITY, USA

KEYWORDS: SOLAR ENERGY, RENEWABLE ENERGY STORAGE, REVERSIBLE FUEL CELLS, BUILDING INTEGRATION

This study forms an integral part of an ongoing doctoral project aimed at developing and assessing building skin solutions intended for use as distributed energy sources. Photovoltaics (PV) have become extensively employed and integrated into buildings to harvest solar radiation and produce electricity. However, a notable challenge with photovoltaics lies in their intermittent nature, which leads to an unreliable and unstable energy supply. As more photovoltaics are introduced to the grid, the "duck effect" emerges, exacerbating the difference between maximum and minimum energy supply in a day, posing a threat to power infrastructure stability. Addressing these issues, one strategy involves the use of batteries, although they are constrained by scalability and degradation concerns. A promising alternative for energy storage in buildings is the Reversible Proton Exchange Membrane Fuel Cell (RPEMFC), which, despite being commonly used in power facilities, has not seen widespread adoption in buildings. Our objective is to design building components that can seamlessly integrate a reversible fuel cell with photovoltaics, creating a self-sufficient system capable of providing renewable energy for the building. This paper outlines three key contributions: (a) A proposed building cladding panel capable of harvesting solar energy, converting it into hydrogen for storage, and subsequently utilizing the stored hydrogen to generate electricity. (b) Conceptualization of the building system and an illustration of its functionality within a building context. (c) Execution of simulations using Matlab/Simulink to assess the capability of hydrogen production and storage. The simulations were conducted in two distinct locations, namely Phoenix, Arizona, and State College, Pennsylvania. The results indicate that the PV-RPEMFC cladding panels are preferred in warm weather conditions with ample sunlight. However, the study also suggests that the optimal outcomes are not necessarily achieved in the hottest weather conditions. Specifically, the highest hydrogen production occurred in State College on the Summer Solstice Day (June 21st), yielding a mass of 18.3 kg.

NAVIGATING FUTURE URBAN HOUSING CHALLENGES:
UNCOVERING SKID ROW'S INFORMALITY IN THE GLOBAL NORTH

TARANEH MESHKANI
KENT STATE UNIVERSITY, USA

KEYWORDS: TRANSITIONAL HOUSING, URBAN INFORMALITY, SKID ROW, GLOBAL NORTH, MACHINE LEARNING

This paper explores the dynamic relationship between unsheltered individuals and the phenomenon of urban housing informality in the Global North, with a detailed examination of Los Angeles's Skid Row. It places this interaction within the larger framework of urban informality, marked by the organic and often unsanctioned repurposing of city spaces. The study assesses the influence of housing strategies on these communities, highlighting the spontaneous use of urban areas.

Utilizing satellite imagery and machine learning, the research maps out the distribution of tents in Skid Row in 2022, revealing the evolving nature of unsheltered living and its integration into the urban landscape. It critically reviews the effectiveness of current transitional housing strategies, questioning their capacity to meet the complex demands of homelessness. This analysis is crucial for comprehending the spatial dynamics of homelessness and evaluating the practical impact of housing solutions.

The study employs the concept of urban informality as a key analytical tool to investigate how unsheltered individuals interact with the urban environment. It delves into the formation of informal settlements, such as makeshift tents and shelters, and examines their social structures within the city. The research highlights the importance of transitional housing programs and explores the obstacles to achieving sustainable housing solutions.

Through detailed mapping of tent distributions, the research reveals the complex fabric of urban informality within developed societies. It advances the discourse on homelessness and urban informality by unveiling the adaptive strategies of unsheltered individuals in urban landscapes, focusing on the urban and architectural attributes and resources that influence the location of tents. This study underscores the need for comprehensive solutions that address the immediate and root causes of homelessness, offering nuanced insights into the urban housing challenges faced in the Global North.

PHYGITAL FABRICATION AND THE EVOLUTION OF TRADITIONAL HANDICRAFT

NERO CHENXUAN HE[1], ANDREW GIPE-LAZAROU[2]
[1]TEXAS TECH UNIVERSITY, USA,
[2]VIRGINIA TECH UNIVERSITY, USA

KEYWORDS: PHYGITAL, MATERIALITY, FABRICATION, INDIGENOUS, QUASI-AUTONOMY

This paper untangles the emerging need for a critical understanding of phygital design and phygital material by exploring its most definitive qualities in the context of a quasi-autonomous collaboration between human agency and the computer, here explored through the digital reinterpretation of traditional handicrafts belonging to the ethnic Chinese minority Bai from the northwestern province of Yunnan. A phygital fabrication workflow challenges experience-based standardized fabrication techniques by creating atypical results from a constant exchange between physical fabrication and digital simulation, consciously acknowledging the contributions of the machine. It suggests, moreover, a new way to inherit indigenous design as a deliberate collaboration with non-human agencies, reflects the anxiety of designers seeking new positions around digital design tools, and describes a workflow not wholly defined but nonetheless integral to contemporary design practice.

DESIGNING ATMOSPHERES:
THE PEDAGOGICAL APPROACH OF PETER ZUMTHOR

ISABEL POTWOROWSKI
CARLETON UNIVERSITY, CANADA

KEYWORDS: ATMOSPHERE, MATERIALS, MEMORY, IMAGINATION, PEDAGOGY

How can the design of atmospheres be taught? How can it avoid the vagueness and superficiality at times associated with this concept? This paper describes the pedagogical approach of an architect for whom atmosphere is a central concern: Peter Zumthor. While his architecture is well known, little has been written about his teaching at the Accademia di Architettura di Mendrisio (AAM) between 1996 and 2006. The paper analyzes the documents of Zumthor's teaching, which are archived at the AAM and primarily consist of assignment outlines and images of student work. The assignments are grouped thematically to highlight three aspects of designing atmospheres: analyzing and reproducing emotionally significant memories of atmospheres, documenting observed atmospheres, and imagining and building atmospheres. The primary findings are presented as lessons for the future of architectural pedagogy: working with 'real' construction materials to develop an awareness of their sensory qualities, using personal memories, experiences and feeling as starting points for design, forming a clear intention for atmosphere and material qualities at the beginning of the design process, and designing atmospheres not merely as aesthetic experiences, but as backgrounds for social life.

CIRCULAR IMMERSIVE PARAMETRIC DESIGN WORKFLOW FOR INNOVATIVE MATERIALS

PATRICIA NJIDEKA KIO
FITCHBURG STATE UNIVERSITY, USA

KEYWORDS: CIRCULAR DESIGN, MATERIALS, BUILDING INFORMATION MODELING, SUSTAINABILITY, VIRTUAL REALITY

There is sufficient evidence that the use of Building Information Modeling (BIM) and Virtual Reality (VR) in Architecture, Engineering and Construction (AEC) education environments is desirable and beneficial. This study introduces a workflow for circular immersive parametric design (CIPaDe). The proposed CIPaDe, BIM-into- VR-based workflow is expected to improve students' learning performance, provide an environment similar to real- world, increase the visualization of models on a larger scale, and enhance their creativity. The CIPaDe Workflow includes stages of 1) material selection for non-loadbearing elements 2) geometry exploration and VR sessions 3) life cycle assessments (LCA). Secondary materials for LCA were selected from declared products on the Embodied Carbon Construction Calculator (EC3) Tool. The goal was to arrive at a design with minimal embodied carbon and energy. The intersections of material choices for innovation and sustainability provides the opportunity to test its impact through embodied energy investigations and operational energy impacts. Emerging designs are the basis for comparisons between recycling and virgin materials. The results show that the novel workflow utilizes BIM and VR to promote circularity and provide environmental benefits.

PUBLIC SPACE DESIGN ENABLED BY ARTIFICIAL INTELLIGENCE GENERATIVE TOOLS

GERNOT RIETHER, ANDRZEJ ZARZYCKI
NEW JERSEY INSTITUTE OF TECHNOLOGY, USA

KEYWORDS: PUBLIC SPACE, ARTIFICIAL INTELLIGENCE (AI), DESIGN EDUCATION

This paper discusses the integration of generative artificial intelligence (AI) tools in the conceptual phases of the design of a public space. It raises the question of how AI tools can enhance the design process and how the integration of AI tools in a design process may affect the interactions between architects and clients. The investigation uses a collaborative project between academia and a major art institution to transform a vehicular street into a pedestrian event space supporting art and community programs.

The methodology was framed around generative AI platforms, such as Dall-E 2, Midjourney, BlueWillowAI, DreamStudio, Lexica, and Stable Diffusion utilizing both text-to-image image-to-image functionalities. The approach followed the reiterative process of developing design variations, evaluating outputs, identifying desired traits in imagery/designs, and exploring new possible designs based on desirability. The study demonstrated (1) accelerated idea formations in the early stages of the design process and (2) an enhanced ability to communicate with a broad audience.

TOWARDS A NEW STUDIO PEDAGOGY:
IMPROVING SOCIAL DETERMINANTS OF HEALTH THROUGH COMMUNITY-BASED PARTICIPATORY RESEARCH AND DESIGN

PRAVIN BHIWAPURKAR
UNIVERSITY OF CINCINNATI, UNSA

KEYWORDS: PUBLIC HEALTH, ENVORNMENTAL JUSTICE, ARCHITECTURAL EDUCATION, PARTICIPATORY DESIGN, SERVICE-LEARNING MODEL

The social determinants of health (SDOH) are cited as a common reason for disparities in public health and social medicine literature. However, the interlinkage between the determinants, such as neighborhood and built environments with healthcare access and quality, education access and quality, economic stability, and social and community context is less explored and is handled independently. Therefore, this research asks a question – what role can design-based interventions play in improving SDOH? The method includes a combination of quantitative and qualitative approaches completed by the author with multiple collaborators and built upon their previous works before the multi-year senior-level studio investigation began. Using the prompts from these works, the studio integrated the community-based participatory research (CBPR) model and Jamie Learner's urban acupuncture approach to examine the role of design-based interventions for low-income black communities in Cincinnati, OH. The main contribution of this work is repurposing existing vacant lots and buildings to improve spatial, social, and service environments by integrating it with the existing community fabric via proposing programmatic gaps and improving connection between SDOH. Over thirty individual design interventions are proposed ranging from short (1-year), mid (1-3 years), and long-term projects (over 3 years), including fixing existing structures, green infrastructure and community gardens, and new building projects hosting various community functions, such as a community clinic, pharmacy, zero-energy homes, co-op grocery store, education, and training center for renewables. Integrating individual interventions with the existing community's physical, social, and economic structure provides opportunities to mitigate the impact of extreme weather events and improve SDOH while making it actionable research. Currently, community partners are pursuing these projects with the help of academic, civic, and industry partners by seeking external funding (such as EPA EJ grant) and availing the existing state-funded projects programs (such as Healthy Homes). Progress is slow but steady, and financial challenges remain a primary barrier.

BEYOND ARRIVAL:
ETHICS IN HOUSING THOSE WHO WILL COME

YONA CATRINA SCHREYER
POLITECNICO DI MILANO, ITALY

KEYWORDS: DESIGN ETHICS, ASYLUM ARCHITECTURE, INVISIBLE DESIGN ACTANTS, LAW AND LEEWAY IN ARCHITECTURE

The paper discusses ethics in architecture amid the design of asylum spaces in Europe. It queries the role of the designer in the building typologies of shelter and housing across the limitations that the contemporary asylum practice poses on the discipline, pointing out regulative, political, as well as historic and current societal aspects that critically inform the design sphere around asylum and the understanding of refuge – discussing global phenomena as much as local initiatives. In doing so, it not only works out features related to design types and methodologies, but it also reflects on the ambit in which designs are put forward, including official solutions, privately based collaborations, and university research or lab projects. Against the background of the most recent trends around standardization and design policies, the paper debates if there is an architectural leeway and its potential worth along theoretic and actual design contributions towards a humane contemporary architecture for refugees and displaced people in Europe.

POP-UP EARTHQUAKE ARCHITECTURE FOR INTEGRATING PRACTICAL EXPERIENCE AND SOCIAL RESPONSIBILITY INTO ARCHITECTURAL EDUCATION

MAURICIO MORALES-BELTRANORCID, ÖMER CAN BAKANORCID,
MATTHIEU PEDERGNANA, ECENUR KIZILÖRENLIORCID
YASAR UNIVERSITY, TURKIYE

KEYWORDS: POST-DISASTER RECOVERY, DESIGN-BUILD STUDIO, TIMBER CONSTRUCTION, ACTIVE LEARNING, HANDS-ON

The last major earthquakes that struck extended urban and rural areas in Southeast Turkey left thousands of buildings demolished or uninhabitable. After the urgent demand for temporary housing is resolved, there will be a need to provide quick solutions for adequate social spaces for the affected communities. Additionally, considering the large number of collapsed or heavily damaged buildings in past earthquakes in Turkey, schools of architecture should prepare architects capable of understanding and applying the basic principles of seismic design for buildings. Moreover, given the social responsibilities that the profession entails, future architects should also be able to engage with the communities they serve, thus providing spaces that are not only safe but also suitable for their needs. This paper describes an architectural studio with a twofold aim: firstly, making a meaningful contribution to a small community living in the earthquake zone by identifying their post-disaster needs for spaces of social interaction; and secondly, providing undergraduate students with applied knowledge and skills in conceiving, designing, planning, producing, assembling, disassembling, transporting, and installing a pop-up structure. The design-build studio was organized through a reductive selection of design proposals, where ultimately one project was selected for actual construction and another for further construction detailing. The proposed approach of using a hands-on and embedded teaching format to explore pop-up architectural design responses, following design-for-disassembly principles, ensured students' in-depth learning of construction techniques and the associated important roles of detailing and drawings for materializing a project. Due to time and material limitations, however, not all students benefited from the possibility of building their own designs, leading to a sometimes-estranged studio environment.

AMERICAN SQUALOR:
A CASE STUDY IN COMBATING LOW-QUALITY HOUSING CONSTRUCTION

DAVID KENNEDY, ALYSSA KUHNSORCID
UNIVERSITY OF ARKANSAS, USA

KEYWORDS: HOUSING, CONSTRUCTION, MATERIALS, BIOGENIC MATERIALS, BUILDING TECHNOLOGY

Located in Northwest Arkansas, the City of Fayetteville is experiencing rapid population growth, resulting in increased housing development in denser urban areas. Often this housing is characterized by inappropriate materials, faulty design and construction practices, and lack of consideration for building lifespan or performance. These factors lead to rapid degradation of new construction, rendering new units incapable of addressing long-term housing demands.

This paper provides context for Northwest Arkansas' current housing demands and impacts of attempts to respond to this demand with new supply. It presents a Case Study, couched in this context, of a regionally common building in typology (multi-unit housing) and structure (pre-engineered light wood framing), and it identifies the units' design, construction, and material flaws that led to its degradation. Further, it documents the implementation of a solution that addresses immediate deficiencies while proposing broader application of lasting, sustainable material applications.

The production and consumption of low-quality, if efficient, materials systems for lagging housing supply is a consistent narrative thread through US history. That said, the current urgency of the housing crisis is uniquely exacerbated by the paired exigencies of population growth and climate change. More than ever, solutions are needed that efficiently meet demand while ameliorating the pressures wrought by a changing climate and swelling population.

PLANETARY BOUNDARIES AS A FRAMEWORK FOR COURSE DEVELOPMENT

WHAT DOES IT TAKE TO DESIGN FOR ABSOLUTE SUSTAINABILITY?

LOTTE MARIANNE BJERREGAARD JENSEN[1], STEFFEN PETERSEN2ORCID, DAMIR HATIC[3], TORSTEN SACK-NIELSEN[3], ELIZABETH DONOVAN[1]

[1]AARHUS SCHOOL OF ARCHITECTURE, DENMARK, [2]AARHUS UNIVERSITY DEPARTMENT OF CIVIL AND ARCHITECTURAL ENGINEERING; 3: VIA UNIVERSITY COLLEGE, AARHUS

KEYWORDS: SUSTAINABILITY, PLANETARY BOUNDARIES, ABSOLUTE SUSTAINABILITY, LIFE CYCLE ASSESSMENT, INTEGRATED DESIGN

For a decade, the Stockholm Resilience Center has been developing data to help outline a safe space for human activities. This includes the activity of producing building materials, constructing and operating buildings, which is one of the largest contributors to greenhouse gas emissions. The impact categories assessed by the worldwide scientific community at the Stockholm Resilience Center match the categories in the ISO standard LCA. This effort is also an expression of the Paris Agreement, which outlines the CO2 reduction each nation must achieve by 2030 to keep the temperature rise on the planet below 2.0- or 1.5-degrees C. Based on this, a team of universities and industry partners examined what it would take for the Danish construction sector to comply. One of the universities in the project described above took the initiative to develop an interdisciplinary course to investigate the necessary set-up to teach how to design buildings whose environmental impact is within planetary boundaries. The article describes the one-year development process and the results of the first test run of the course in the summer of 2023. The course content is explained based on the discussions between the three educational institutions involved in the development and the pre- and post-evaluation of the 26 participating students as well as semi-structured interviews with the students. The challenge in course development was whether it was even possible to design for and build within the planetary boundary and how to address this open question in a course design. The ideas and reasoning behind these course design decisions, as well as the results from the pilot course, are presented and discussed in the article.

MATERIAL LITERACY IN THE AGE OF COMPONENT REUSE:
CRITICAL REFLECTION AND FULL-SCALE TESTING IN ARCHITECTURE EDUCATION

MARIO RINKE[1], ALESSANDRO TELLINI[2]
[1]UNIVERSITY OF ANTWERP, BELGIUM,
[2]ETH ZÜRICH, SWITZERLAND

KEYWORDS: HIGHER EDUCATION, DESIGN&BUILD, REUSE, PEDAGOGY, MATERIALS

Architects play a crucial role in developing sustainable design practices for our built environment. The uncertainties future architects will face are linked to a new role of design and production within a closed loop of resources. Working with something that already exists requires a specialised skill set to comprehend materials and constructional aspects. New forms of material thinking and experimentation need to be developed in teaching to keep up with the rapid development of circular construction realities that lead to fundamental changes in design and construction methodologies. In this paper, the authors outline the methodology and principles they developed for design and build courses to establish material literacy through participants' first-hand experience and systematic reflective practices. One regular bachelor course from an architecture course illustrates how competencies and new thinking patterns are established quickly. Based on the model of mastery by Sprague and Stuart (2000), the students are led through phases from novices to experts in a particular area through practical experience and independent, guided reflection. An in-depth discussion about the interaction between tutors and workshop participants forms the basis for investigating how knowledge build-up and development of skills occur within the courses' different settings, based on the assumption that progressive educational environments lead to a build-up of personal experience by the learner as a beginning for an individual process that carries over into later practice.

ROBOTIC CONCRETE 3D PRINTING CONTINUOUS TOOLPATH PLANNING:
FROM SINGLE CURVE TO VOXEL-BASED SYSTEMS FOR DESIGN-TO-PRODUCTION OF URBAN FURNITURES

SINA MOSTAFAVI[1], EDGAR MONTEJANO HERNANDEZ[1], BAHAR BAGHERI[1], COLE HOWELL[1], ALI ETEMADI[3], ASMA MEHAN[2]

[1]TEXAS TECH UNIVERSITY, HUCKABEE COLLEGE OF ARCHITECTURE, HI-DARS LAB, USA,

[2]TEXAS TECH UNIVERSITY, HUCKABEE COLLEGE OF ARCHITECTURE, AHU LAB, USA,

[3]DESSAU INSTITUTE OF ARCHITECTURE IN BAUHAUS - ANHALT UNIVERSITY OF APPLIED SCIENCES

KEYWORDS: CONTINUOUS TOOLPATH PLANNING, ROBOTIC CONCRETE 3D PRINTING, VOXEL BASED 3D PRINTING, URBAN MANUFACTURING, INTEGRATED DESIGN-TO-PRODUCTION

This paper discusses the development of integrated design-to-production frameworks for Robotic Concrete 3D Printing (RC3DP) of context-specific urban furniture projects. The study focuses on two main objectives: developing computational methods for continuous toolpath planning of bespoke components and examining integrated frameworks to make design-to-production systems more socio-environmentally inclusive and tailored to specific contexts. Following an introduction to outline the key challenges of continuous robotic concrete 3D printing, the paper is organized into two sets of case studies. The first set explores curved-based continuous 3D printing for surface-based design strategies, and the second set investigates voxel-based approaches for volumetric design 3D printing. Curve-based projects consisted of three case studies. The first case uses an AI- enabled generative system to translate a porous, cellular structure to a continuous toolpath with variable heights. The second case study is based on a workflow using a controlled reaction-diffusion algorithm as a generative strategy to create continuous infill for complex geometries. The third project focuses on growing larger than the size of the production setup by testing the assembly of multiple printed components, all produced with continuous toolpaths. The workflows and projects are developed as an integral part of a graduate-level digital design and fabrication course focusing on inclusive automation and robotic concrete 3D printing. Therefore, in addition to sharing the details of the developed computational design to production methodologies, the paper discusses the research findings from pedagogical lenses. Building on these cases, the investigation advances to the development of a generative system centered on voxels, employing a tetrahedron structure. This volumetric approach simultaneously produces external surface tectonics and internal infill through a seamless toolpath. The paper concludes by presenting sets of guidelines and future directions for both the introduced curve and voxel-based approaches in Robotic Concrete 3D printing, emphasizing the early integration of computational and fabrication intelligence into the design process.

HYBRIDITY IN ARCHITECTURAL DESIGN:
PAST, PRESENT, AND INTO THE UNKNOWN

MAHYAR HADIGHI
TEXAS TECH UNIVERSITY, USA

KEYWORDS: COLLEGE TOWN MODERNISM, HYBRIDITY, SHAPE GRAMMAR, FACULTY PRACTITIONERS

The aim of this paper is to verify and describe the hybridity between European modern architecture and American traditional architecture in mid-twentieth-century American college towns as expressed in residences built there by faculty members of NAAB-accredited architecture programs. Based on shape grammar as a computational design methodology, a comprehensive analysis is presented to reveal a hybridity phenomenon that though unique has broader implications for our understanding of architectural production.

MULTI-ROBOTIC 3D PRINTING WOOD-BASED SLURRY ON CONSTRUCTION SCALE

ABDALLAH KAMHAWI, THARANESH VARADHARJAN,
MUHAMMAD DAYYEM KHAN, MANIA AGHAEI MEIBODI
DART LAB, UNIVERSITY OF MICHIGAN, ANN ARBOR, USA

KEYWORDS: MULTI-ROBOTIC 3D PRINTING, WOOD-BASED MATERIAL, SUSTAINABLE CONSTRUCTION PRACTICES, CIRCULAR ECONOMY IN CONSTRUCTION, LARGE-SCALE ADDITIVE MANUFACTURING

In response to the escalating demand for rapid urbanization, the construction industry is compelled to shift towards sustainable alternatives, aiming to overcome various challenges, including shortages in skilled labor, material scarcity, and environmental degradation stemming from conventional and inefficient construction methods. 3D Printing (3DP) offers a transformative solution by digitizing construction processes and enabling the investigation of novel, sustainable materials that are biodegradable, reusable, and recyclable. Among these materials are wood-based slurry materials, which have the potential to divert 3 million tons of wood waste directed annually to landfills in the United States and recycle it in the production of various construction elements, making a step towards circular construction practices. This research investigates MR-3DP using wood-based slurry to manufacture ultra-lightweight, large-scale building components. This paper presents research that aims to investigate and understand the process parameters associated with the success and failure of printing construction scale objects using Multi-Robotic 3D Printing (MR-3DP) with wood-based slurry material. This is investigated through the design and fabrication of two non-load-bearing cavity wall prototypes.

FORCED LABOR IN BUILDING MATERIAL SUPPLY CHAINS

EVALUATING RISK IN SPECIFYING ARCHITECTURAL MATERIALS FROM XUAR, CHINA

FRANCA TRUBIANO

UNIVERSITY OF PENNSYLVANIA, USA

KEYWORDS: FORCED LABOR, BUILDING MATERIAL SUPPLY CHAINS, ARCHITECTURAL MATERIALS, AUDITING RISK

This paper investigates the presence of forced labor in the supply chain of materials used in the design, construction, and delivery of buildings. While the Architecture, Engineering, and Construction (AEC) industry has conclusively acknowledged the very real costs of climate change, it has addressed the impacts of coercive labor practices and modern-day slavery in the making of buildings with far less commitment. This paper seeks to redress the situation by activating three research questions: how might we identify a common language in service to recognizing forced labor, what are available tools and sources currently at our disposal for addressing the problem, and what lessons can one learn from a case study that localizes the risk of forced labor in imported building products to the United States? In response, this paper identifies an internationally sanctioned vocabulary whose terms and definitions can help the building industry better characterize instances of forced labor; offers a critical review of currently available tools, protocols, and data resources of possible use to the industry; and communicates preliminary results of a case study that sought to determine building industry risk when doing business in XUAR, China. Each finding contributes a different "data point" to the larger research that aims to identify and measure where forced labor exists in the supply chain of buildings, including the very real limits of tools and resources at our disposal. Whether in extracting raw materials, manufacturing building products, installing said products, or disposing of them as waste at the end of life, the health and safety of workers associated with building remain imperiled. As this reality can no longer be denied, this paper recognizes three aspects of a possible solution space, all the while remaining critical when confronted with the reality of forced labor as a deeply entrenched problem in the industry.

DESIGNING ATMOSPHERES:
THE PEDAGOGICAL APPROACH OF PETER ZUMTHOR

ISABEL POTWOROWSKI
CARLETON UNIVERSITY, CANADA

KEYWORDS: ATMOSPHERE, MATERIALS, MEMORY, IMAGINATION, PEDAGOGY

How can the design of atmospheres be taught? How can it avoid the vagueness and superficiality at times associated with this concept? This paper describes the pedagogical approach of an architect for whom atmosphere is a central concern: Peter Zumthor. While his architecture is well known, little has been written about his teaching at the Academy of Architecture – Università della Svizzera italiana (USI-ARC) between 1996 and 2006. The paper analyzes the documents of Zumthor's teaching, which are archived at the USI-ARC and primarily consist of assignment outlines and images of student work. The assignments are grouped thematically to highlight three aspects of designing atmospheres: analyzing and reproducing emotionally significant memories of atmospheres, documenting observed atmospheres, and imagining and building atmospheres. The primary findings are presented as lessons for the future of architectural pedagogy: working with 'real' construction materials to develop an awareness of their sensory qualities, using personal memories, experiences and feeling as starting points for design, forming a clear intention for atmosphere and material qualities at the beginning of the design process, and designing atmospheres not merely as aesthetic experiences, but as backgrounds for social life.

THE STUDIO:
OPERATIVE URBAN PRACTICE FROM RESEARCH TO SPECULATION

FRANCES HSU
UNIVERSITY OF TENNESSEE, USA

KEYWORDS: GLOBALIZATION, OPERATIVE CRITICISM

The paper addresses the extra-disciplinarity of cultural-environmental research and design speculation as an area ripe for the critical engagement of globalized architectural education and practice. Students from different disciplines (architecture, planning, urban design, anthropology, engineering, and art) studied ongoing urban and spatial transformations occurring as climactic, socio-political, and economic pressures collide in the mega-regions of the Global North (the Arctic) and the Global South (the Caribbean). They focused on understanding architecture and its interdependencies on resources and agencies/institutions within the larger territorial patterns of globalization. Investigations of the spatial, infrastructural, and typological systems emerging from a broad array of interrelated forces--e.g., global finance, industry and trade; digital media/technologies; social discourses; environmental/geophysical phenomena; geo-political strategies--prioritize crises and controversies bearing critically on the role of ethical design.

The works demonstrate a more general shift in architectural thinking, one that points to the emergence of what may be articulated as a new operative practice that reengages Manfredo Tafuri's original concept of operative criticism through the engagement of architecture with the contradictions of its capitalist mode of production today.

ARCHITECTURE WASHING, A FRAMEWORK FOR INVESTIGATING IF THE AEC IS COMPLICIT IN HUMAN RIGHTS ABUSES, THE CASE OF NEOM

FRANCA TRUBIANO
UNIVERSITY OF PENNSYLVANIA, USA

KEYWORDS: ARCHITECTURE WASHING, FORCED LABOR, HUMAN RIGHTS ABUSES, AEC INDUSTRY, NEOM

This paper identifies, names, and characterizes the practice that is 'architecture washing' as present in the Architecture, Engineering, and Construction (AEC) industry to demonstrate that when and where it occurs, 'architecture washing' detrimentally impacts the industry, the quality of our built environment, and society at large. The content addressed in this paper includes a working definition of 'architecture washing, a body of academic research associated with human rights abuses in the built environment centered on forced labor, an analysis of the more established practice of 'greenwashing' as a possible model for 'architecture washing', the outline of a framework for investigating the probability of 'architecture washing' on any given project, and the first outlines of a case study that evaluates the NEOM project in Saudi Arabia. In so doing, it offers a framework for recognizing some of the material, economic, social, and political conditions that encourage its deployment, mechanisms intentionally designed to render AEC participants complicit, and key characteristics in a project's delivery process that exposes said project to a high probability for 'architecture washing'.


European Association for
Architectural Education
Association Européenne pour
l'Enseignement de l'Architecture
ARCC
architectural research centers consortium
AARHUS SCHOOL OF ARCHITECTURE
VELUX®