We wish to gratefully acknowledge the assistance and support of our sponsors and partners.

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Team
Organizing Committee
Scientific Committee

Ph.D. Symposium

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Athanassios Economou
Tarek Rakha
Perry Yang
Nassim Parvin
Joseph Choma
Todd Cronan
George Johnston
Lydia Kallipoliti

Exhibition

Acknowledgement
The ConCave Ph.D student group would like to welcome you to the 2020 International Ph.D. Symposium: Divergence in Architectural Research, and to the School of Architecture of Georgia Institute of Technology. Not only do we welcome you to Atlanta, but we thank you for your great generosity in joining us here, to share your research and to converge on the theme of divergence, and the many threads that make up the complex cloth of architectural research.

Since our call for papers went out in June of 2019, the Symposium team, the advisory board and the scientific committee have been dedicated to creating the blueprint for what is hoped will be the first of many future symposia. The team has worked tirelessly; to establish a communications network that would reach Ph.D. students and researchers around the globe, to structure a rigorous process for the double-blind peer reviews of both abstracts and papers, to match reviewers and papers according to areas of interest, and finally, to ensure a program of events and invited guests that would be a worthwhile culmination of your journey, and a catalyst for future explorations in the architectural domain.

What has become clear to all involved with the planning of this symposium, is that the theme of divergence has sparked the interest and enthusiasm of many, as well as the concerted desire to participate and engage in further discussion. We must confess in all honesty that we have been shocked by the overwhelmingly positive response, and also gratified by the many expressions and gestures of appreciation received by mail from all of you.

Architecture, as a discipline, embodies various fields of knowledge. Architectural research emerges from within its own discipline and diverges as an interdisciplinary field. Divergence in architectural research implies there is agency to expand the disciplinary boundary of architecture and produce various fields of knowledge originating within the architectural domain. Divergence engenders new connections across epistemological frameworks and transforms our knowledge of architecture into unanticipated forms. May these divergent approaches to architectural research prepare scholars and researchers for new groundbreaking inquiries and focused investigations in the fertile expanse of the field.

Marisabel Marratt & Hayri Dortdivanlioglu
Academic Coordinators
SYMPOSIUM TEAM

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Isra Hassan, Marketing Assistant, Digital Building Lab
SUGGESTED EVENTS: March 04 | Wednesday
6.00 pm - 7.30 pm / Reinsch-Pierce Family Auditorium
Douglas C. Allen Lecture by Marcel Wilson

8.30 pm - 9.30 pm / The Heffernan House
Welcome Social

DAY I: March 5 | Thursday
7.30-8.00 am / Caddell Building
Breakfast & Registration

8.00-8.30 am / Caddell Building
Opening Session

8.30-9.30 am / Caddell Building
SESSION I: "POST"COLONIAL NARRATIVES
Moderator: Danielle Willkens, Georgia Tech
Richard Neutra: Latin American Connections
Fernanda Critelli, Universidade Presbiteriana Mackenzie
Architectural Mutations of Individual Houses in The Sahara Desert: Case of Algerian Sahara
M. Yassine Benyoucef, Peoples' Friendship University of Russia
Changing Waterscapes: Evolution of the Eastern Canals and Wetlands of Calcutta since the British - Colonial Era
Abhinandan Bera, Penn State University
Postcolonial Possibilities of Architectural History
Soumya Dasgupta, University of Illinois at Urbana-Champaign
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Soumya Dasgupta, University of Illinois at Urbana-Champaign

The ‘Unintended’ City: A Case for Re-Reading the Spatialisation of Princely Cities During High Colonialism in India
Sonali Dhanpal, Newcastle University
9.30-40 am
Break

9.40-10.30 am / Caddell Building
SESSION II: DESIGN METHODOLOGIES AND HISTORIOGRAPHY OF COMPUTATION
Moderator: Athanassios Economou, Georgia Tech
Graphs, Sets and Covers; Seeing What Has Always Been There: Finding common ground between BIM applications and their users
Mehmet Sinan Bermek, Georgia Institute of Technology
Machine Learning for Architects and Designers
Adam Sebestyen, Vienna University of Technology
The Computable Line: Bresenham’s Algorithm 1959-1989
Shota Vashakmadze, UCLA
10.30-10.45 am
Break

10.45-11.45 am
Caddell Building
WORKSHOP I:
UNDERSTANDING ACADEMIC JOB SEARCH
By Tarek Rakha

11.45 am- 12.30 pm / Caddell Building
Lunch

12.30-1.30 pm
Caddell Building
WORKSHOP II:
PUBLISHING RESEARCH PRACTICE
By Stephen Phillips

1.30-1.45 pm
Break

1.45-3.00 pm / Caddell Building
SESSION III: BUILDING SKIN & ITS PERFORMANCE
Moderator: Tarek Rakha, Georgia Tech
The Feasibility of Natural Ventilation in Chicago’s Tall Office Buildings Using Double-Skin Facades
Yohan Kim, Illinois Institute of Technology
Performance-Based Facade Design Tool: Approach for Automated and Multi-Objective Simulation and Optimization
Mahsa Minaei, University of Massachusetts
Exploring Literature on the Relationship between Operable Windows, Thermal Comfort, and Indoor Air Quality in K-12 Schools: Identifying the Gap and Proposing Future Studies
Helia Taheri, North Carolina State University
From Segregated to Integrated: The Evolution of Shading

12.30-1.30 pm
Caddell Building
BOOK TALKS:
Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era
By Perry Yang at 12.30 pm
Retrofitting Suburbia Case Studies
by Ellen Dunham-Jones at 1 pm

10.45-11.45 am
Crow’s Nest
EXHIBITION
Designs in Marcel Breuer’s Works
Yuan Yao, University of Pennsylvania (visiting) / Southeast University, China (home university)
Shape-changing and efficient architectural systems: A bottom-up and top-down approach for developing responsive building skins
Elena Vazquez, Penn State University

3.00-3.15 pm
Break

3.15-4.15 pm / Caddell Building
SESSION IV: URBANISM, DATA STRUCTURES
Moderator: Perry Yang, Georgia Tech

A Campus Biography
Bader AlBader, University of Michigan
Big Data as a Narrative of Stadia Urban Performance
Gustavo do Amaral, Georgia Institute of Technology
Institutionalizing Co-Production in the Conservation and Renewal of Residential Urban Heritages in Shanghai: The Obstacles and Solutions
Miao Hu, Tongji University
Agent Based Semiology: Simulating Contemporary Office Occupation Patterns with Simplified Social Models
Robert Neumayr, University of Applied Arts Vienna
A Study on Community Perception to Improve the Urban Green Space Density: A Case Study of Can Tho City, Vietnam
Phuong Pham, Chonnam National University

4.15-4.30 pm
Break

4.30-5.45 pm / Caddell Building
SESSION V: ARCHITECTURE AND SOCIAL JUSTICE
Moderator: Nassim Parvin, Georgia Tech

Rival Geographies
Shahab Albahar, University of Virginia
The Microgeographies of Social Justice: Architect(ture) and Social Housing
Kourosh Mahvash, University of Waterloo
Developing ‘Urban Jungle’ as an Integrated Model of Survival: Learning from Nature in War Zones
Yasser El Masri, Georgia Institute of Technology
Designing ‘Safe’ Schools: Competing Logics in Achieving School Security
Michael Nowak, Pennsylvania State University
Document, Notation, Signals: The Construction Drawing, a Social Object at the Threshold of the Digital
Klaus Platzgummer, Technical University of Berlin

5.45-6.00 pm
Break

6.00-7.15 pm / Reinsch-Pierce Family Auditorium
KEYNOTE I: KATHY VELIKOV
FROM PROTOTYPES TO TERRITORIES: MULTI DOMAIN DESIGN RESEARCH

7.15-9.00 pm / Crow’s Nest
Opening Reception

DAY II: March 6 | Friday

7.30-8.00 am / Caddell Building
Breakfast & Registration

8.00-9.00 am / Caddell Building
SESSION VI: NEW MATERIALS AND CONSTRUCTION TECHNIQUES
Moderator: Joseph Choma, Clemson University

Tapping into Urban Recycling for Low-Cost Building Alternatives: Experimenting Waste Cardboard Reuse in Architecture
Julio Diarte, Penn State University
Mycelium-Based Bio-Composites in Architecture: A Paradigm Shift in Architectural Materials
Ali Ghazvinian, Penn State University
Dressmaking Techniques for Pneumatic Forms
Virginia Melnyk, Tongji University
Bending Parabolas: Formwork for Compression-only Structures
Wesam Al Asali, University of Cambridge

9.00-9.15 am
Break

9.15-10.15 am
Caddell Building
WORKSHOP IV: CONTESTED HISTORIES OF ECOLOGICAL DESIGN
By Lydia Kallipoliti

9.15-10.15 am
Meeting at the Caddell Building
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KATHY VELIKOV
FROM PROTOTYPES TO TERRITORIES:
MULTI DOMAIN DESIGN RESEARCH

Kathy Velikov is a registered architect, associate professor at the University of Michigan Taubman College of Architecture and Urban Planning, and the current president of ACADIA (Association for Computer Aided Design in Architecture). She is founding partner of the research-based practice RVTR, which serves as a platform for exploration and experimentation in the intertwinements between architecture, the environment, technology, and sociopolitics. Her work ranges from material prototypes that explore new possibilities for architectural skins that mediate matter, energy, information, space, and atmosphere between bodies and environments, to the investigation of urban infrastructures and territorial practices, working through the techniques of mapping and analysis, speculative design propositions, installations, and writing. Kathy is a recipient of the Architectural League’s Young Architects Award, the Canadian Professional Prix de Rome in Architecture, and the Oberdick Fellowship at Taubman College.

Her practice, RVTR, has won numerous awards and their work has been exhibited widely; recently, “Infundibuliforms” received a 2016 R+D Awards honorable mention from Architect Magazine and EXTRACTION, the Canadian Pavilion for the 2016 Venice Architecture Biennale received a 2017 CSLA Award of Excellence. She is co-author of Infra Eco Logi Urbanism (2015) and her work and writing has been published in TAD, AD, Footprint, JAE, IJAC, Leonardo, New Geographies, eVolo, Volume, [bracket] Goes Soft, and MONU, as well as in the books Towards a Robotic Architecture, Third Coast Atlas, Infrastructure Space, Hypernatural, Paradigms in Computing, Performative Materials in Architecture, and High Performance Homes. She is co-curator of the traveling exhibition “Ambiguous Territory: Architecture, Landscape and the Postnatural” and co-editor of an upcoming book on the topic.

She has held previous teaching appointments at the University of Toronto and the University of Waterloo. At Taubman College, Kathy teaches Architecture studios, thesis, ecology and technology seminars, and in the Master of Science in Digital and Material Technologies.
March 6, 2020, Friday at 1:45 pm
Reinsch-Pierce Family Auditorium

STEPHEN PHILLIPS
A DIVERGENT MIND: ARCHITECTURE’S INTERDISCIPLINARITY

Stephen Phillips is principal architect in the California firm Stephen Phillips Architects (SPARCHS). He is Professor of Architecture at California Polytechnic State University, San Luis Obispo and Founding Director of the Cal Poly Los Angeles Metropolitan Program in Architecture and Urban Design. He has taught as a Visiting Assistant Professor and Lecturer at University of California, Berkeley and Los Angeles, Southern California Institute of Architecture, and California College of the Arts. Phillips received his B.A. with Distinction in Architecture from Yale University, his M.Arch. with the award for best studio thesis from the University of Pennsylvania, and his Ph.D. in Architecture History/Theory from Princeton University. Phillips publishes and lectures widely on modern design, technology, media, and contemporary urban culture. He is the recipient of numerous awards, grants, and fellowships including those from the Getty Research Institute, the Smithsonian American Art Museum, the Graham Foundation, the Bruno Zevi Foundation, the AIA, and the ACSA for his projects, teaching, and writing. He is the author of L.A. [Ten]: Interviews on Los Angeles Architecture 1970s-1990s by Lars Müller Publishers, 2014 and Elastic Architecture: Frederick Kiesler and Design Research in the First Age of Robotic Culture by MIT Press, 2017.
ARCHITECTURAL RESEARCH / 10 / 

WORKSHOP SESSIONS

March 5, 2020, Thursday at 10.45 am
Caddell Building

UNDERSTANDING ACADEMIC JOB SEARCH
TAREK RAKHA

The Ph.D. journey puts you on a path for the next leap in your career. If your next step aims at a tenure-track academic position in the United States, how do you make sure you build enough depth and breadth to be attractive for the academic job market? Join this workshop to learn about the Academic Enterprise, and how to prepare to successfully land a job in academia. The workshop will demonstrate the process of application. This will include how to search for the best fitting job, and understanding application components. It will also demonstrate success in developing materials such as the Cover Letter, CV, Letters of Recommendation, Portfolio and Writing Samples. We will also discuss expected conduct if you are being considered for a position, including video interviews as well as the details of campus visits, and finally negotiating your first job offer.

March 5, 2020, Thursday at 12.30 pm
Caddell Building

PUBLISHING RESEARCH PRACTICE
STEPHEN PHILLIPS

Architect and writer Frederick Kiesler was committed to interdisciplinary research surrounding architecture and its ideas. Kiesler developed a unique and varied research practice through sculpture, painting, film, installation art, graphic media, furniture construction, exhibition design, housing, and theater architecture. He was also a prolific writer who used multi-media advantageously not only in his lifetime, but through the invention and construction of a formidable archive after his passing. Development and distribution of one’s work through varied multi-media is extremely important today as in the past. In this workshop we will look at Frederick Kiesler and his research practice to better understand the conception, invention, design, and construction of original ideas and their research, and how we can turn that work into varied media forms for mass distribution, including the continued importance, relevance, and difficulty writing and publishing books.
In this workshop, we will discuss doctoral research within the context of the changing landscape of architectural research, with particular focus on interdisciplinary research through design and creation methods such as prototyping within the field of computational design and technology, while also opening up the discussion for exploration for design research in other fields such as practices of mapping, drawing, and community engagement in urban studies. Traditional doctoral research however still tends to prioritize text-based knowledge and dissertation format and individual exploration. How can design knowledge, knowledge gained through design practices be more productively integrated into doctoral research practices? Under what circumstances can design be considered as a specific form of experimentation and the knowledge-making? The workshop will take on the form of a cooperative argumentative dialogue, critically exploring positions and presuppositions from multiple sides.
March 5, 2020, Thursday at 12.30 pm
Caddell Building

URBAN SYSTEMS DESIGN: Creating Sustainable Smart Cities in the Internet of Things Era

PERRY YANG
Co-author: Yoshiki Yamagata

Perry Yang published extensively on ecological urban design. A new book, *Urban Systems Design: Creating Sustainable Smart Cities in the Internet of Things Era* that he co-edits and co-authors was published in January 2020 by Elsevier. He is the guest editor of *Environment and Planning B: Urban Analytics and City Science* for a 2019 theme issue Urban Systems Design: From Science for Design to Design in Science to explore new urban design research agenda and applications of emerging technologies, data analytics and urban automation to placemaking in the context of smart city movement. Yang is also a faculty fellow of the Brook Byers Institute for Sustainable Systems at Georgia Tech. He is a board member of the International Urban Planning and Environment Association (UPE), and a scientific committee member of International Conference on Applied Energy (ICAE) to chair the session on Urban Energy Systems Design for ICAE from 2014 to 2019. Prior to joining the Georgia Tech faculty, he was a Fulbright Scholar and SPURS Fellow at MIT from 1999 to 2000, and an Assistant Professor of Architecture and Urban Design at the National University of Singapore from 2001 to 2008.

March 5, 2020, Thursday at 1 pm
Caddell Building

REPROFITTING SUBURBIA
CASE STUDIES

ELLEN DUNHAM-JONES
Co-author: June Williamson

Ellen Dunham-Jones is Director of the Master of Science in Urban Design degree, an authority on sustainable suburban redevelopment, and a leading urbanist. Author of over 60 articles linking contemporary theory and practice, she is co-author with June Williamson of *Retrofitting Suburbia: Urban Design Solutions for Redesigning Suburbs*, (Wiley, 2009, 2011) its documentation of successful retrofits of aging big box stores, malls, and office parks into healthier and more sustainable places received a PROSE award as the best architecture and urban planning book of 2009 and has been featured in The New York Times, Time Magazine, Harvard Business Review, NPR, PBS, TED and other prominent venues. She serves on several national boards and committees, is former Chair of the Board of the Congress for the New Urbanism, lectures widely and conducts community workshops. In both her teaching and research she focuses on helping communities address the 21st century challenges that they were never designed for – whether that’s through her unique database of successful suburban retrofits or studio classes on anticipating autonomous vehicles, coping with climate change or suburban blight. She taught at UVA and MIT before joining Georgia Tech as Architecture Program Director from 2000-2009.
March 6, 2020, Friday at 12.30 pm
Caddell Building

ASSEMBLING THE ARCHITECT: The History and Theory of Professional Practice

GEORGE JOHNSTON

George B. Johnston is Professor of Architecture at Georgia Tech and principal of Johnston+Dumais [architects]. He has over 35 years of experience as an architect, educator, academic leader, and cultural historian. He teaches courses in architectural and urban design, cultural theory, and social history of architectural practice; and his research interrogates the social, historical, and cultural implications of making architecture in the American context. He is author of the award-winning book from The MIT Press, Drafting Culture: A Social History of Architectural Graphic Standards, which has been lauded for its insights into the ongoing technological transformation of the profession. As both practicing architect and cultural historian, George is open to and supports research and design projects that involve themes of memory and modernity; institutions of cultural exhibition and display; changing design technologies and representational practices, approaches to American vernacular architecture and cultural landscape; and the critique of the everyday. Propelling his inquiries is this central concern: What recuperative role can architects’ practices play in this age of universalizing technology?

March 6, 2020, Friday at 1 pm
Caddell Building

GRACE AND GRAVITY: Architectures of the Figure

LARS SPUYBROEK

Lars Spuybroek is Professor of Architecture at the Georgia Institute of Technology in Atlanta where he teaches design methodology and aesthetic theory. He started teaching before graduating from the Technical University in Delft, and was appointed full professor at the University of Kassel (Germany) in 2001. Spuybroek was the editor of several journals such as NOX and Forum. As an architect he built the HtwoOexpo water pavilion (1997), the Maison Folie (2004) in Lille, France, and large electronic public artworks such as the D-tower and Son-O-House in the Netherlands. His works have been exhibited at various Venice Biennales, the Victoria & Albert, the Centre Pompidou a.o. and are part of the collections of the FRAC in Orléans and the CCA in Montreal. More than 400 articles have been written about his architectural work. The last ten years Spuybroek has turned his focus to writing and teaching. He is the author of The Architecture of Continuity (2008), Research and Design: The Architecture of Variation (2009), Research and Design: Textile Tectonics (2011), and The Sympathy of Things (2011 and 2016). Spuybroek is currently working on a book for Bloomsbury entitled Grace and Gravity: Architecture of the Figure (2020).
SESSION I: "POST"COLONIAL NARRATIVES

DANIELLE WILLKENS is a practicing designer, researcher, and FAA Certified Remote Pilot who is particularly interested in bringing architectural engagement to diverse audiences through interactive projects. Her experiences in practice and research include design/build projects, public installations, and on-site investigations as well as extensive archival work in several countries. As an avid photographer and illustrator, her work has been recognized in the American Institute of Architects National Photography Competition and she has contributed graphics to several exhibitions and publications. She was the 2015 recipient of the Society of Architectural Historians’ H. Allen Brooks Travelling Fellowship and her research into transatlantic design exchange has been supported by the Sir John Soane’s Museum Foundation, the International Center for Jefferson Studies, and an American Philosophical Society Franklin Research Grant.

SESSION II: DESIGN METHODOLOGIES & HISTORIOGRAPHY OF COMPUTATION

ATHANASSIOS ECONOMOU is a professor in the College of Design at Georgia Institute of Technology. Dr Economou’s teaching and research are in the areas of shape grammars, computational design, formal specification of style, computer-aided design and design theory with over forty published papers in these areas. He is the Director of the Shape Computation Lab and the Director of the Architectonics Study Abroad Program at Georgia Tech. Recent funded projects include the project Shape Machine, NSF/iCoprs, and Courtsweb: A Visual Description of Federal Courthouses, GSA/US.Courts, $1.3M. Design projects from his studios at Georgia Tech have received prestigious awards in international and national architectural competitions. He has been invited to give talks, seminars, and workshops at several universities including MIT, Harvard, TU Vienna, Tsinghua Univ, U.Michigan, NTUA, among others. Dr. Economou holds a Diploma in Architecture from NTUA, Athens, Greece, an M.Arch from USC, and a PhD in Architecture from UCLA.

SESSION III: BUILDING SKIN & ITS PERFORMANCE

TAREK RAKHA is an architect, building scientist and educator. He is an Assistant Professor of Architecture and building scientist and educator. He is an Assistant Professor of Architecture at Georgia Tech, and Faculty at the High Performance Building (HPB) Lab. Prior to joining Tech, Dr. Rakha taught at Syracuse University, Rhode Island School of Design (RISD) and MIT. He completed his Ph.D. in building technology at MIT, where he was part of the Sustainable Design Lab. He leads efforts in the acquisition and implementation of scholarly collaborations with government, industry and academic partners. This includes multiple externally sponsored projects supported by the United States Department of Energy (DOE), the National Science Foundation (NSF) and the Advanced Research Projects Agency-Energy (ARPA-E).

SESSION IV: URBANISM, DATE STRUCTURE

PERRY YANG is an Associate Professor and Director of Eco Urban Lab of the School of City and Regional Planning and the School of Architecture at the Georgia Institute of Technology. Perry’s work focuses on promoting ecological and energy performance of cities through urban design. He has been awarded prizes in international competitions continuously from 2005 in Asian cities, including the 2009 World Games Park at Kaohsiung, Taiwan, a project opened in July 2009 and featured by CNN.
SESSION V: ARCHITECTURE & SOCIAL JUSTICE

NASSIM PARVIN is an Associate Professor at the Digital Media program at Georgia Tech, where she also directs the Design and Social Interaction Studio. Her research explores the ethical and political dimensions of design and technology, especially as related to questions of democracy and justice. Rooted in pragmatist ethics and feminist theory, she critically engages emerging digital technologies—such as smart cities or artificial intelligence—in their wide-ranging and transformative effect on the future of collective and social interactions. Her interdisciplinary research integrates theoretically-driven humanistic scholarship and design-based inquiry. That is, she both writes traditional scholarly papers and makes digital artifacts that illustrate how humanistic values may be cultivated to produce radically different artifacts and infrastructures. She is an editor of Catalyst: Feminism, Theory, Technoscience, an innovative open-access journal in the expanding interdisciplinary field of STS and serve on the editorial board of Design Issues. Her teaching has also received multiple recognitions inclusive of the campus-wide 2017 GATECH CETL/BP Junior Faculty Teaching Excellence Award.

SESSION VI: NEW MATERIALS & CONSTRUCTION TECHNIQUES

JOSEPH CHOMA is the Founder of the Design Topology Lab and an Associate Professor of Architecture at Clemson University. He is the author of Morphing: A Guide to Mathematical Transformations for Architects and Designers (Laurence King Publishing, 2015) and Études for Architects (Routledge, 2018). As a researcher, his interests lie at the intersection of mathematics, folding, structure and materials. As an educator, he is invested in the advancement of design pedagogy through computational thinking. His work has been shown in five solo exhibitions and twenty group exhibitions internationally. In 2013, he was awarded the Emerging Voices citation by AIA Atlanta. In 2017, Choma led a team which was awarded First Place in the Composites in Architecture Design Challenge presented by the Architectural Division of the American Composites Manufacturers Association. In 2018, he was a keynote speaker at the Future of Architecture and Building Biennale in Mumbai, India. In 2019, he was a keynote speaker at FAB15 in Egypt. He has also given invited lectures at the ETH Zurich, University of Cambridge, Cornell University, Georgia Tech and taught a workshop at Carnegie Mellon University. His recent material explorations have been noted by Composites World Magazine as "spearheading research into the use of foldable composites". He completed graduate studies in design and computation at Massachusetts Institute of Technology. Currently, Choma is a PhD candidate at the University of Cambridge, where he is a Cambridge International Scholar. Recently, he was also selected for the 2019-20 NCCR Digital Fabrication Researcher in Residence at the ETH Zurich.

as an "eco-friendly" venue. His urban design work was published in the January 2010 issue Ecological Urbanism at WA (World Architecture), a leading architecture journal by Tsinghua University. He has been involved in smart city projects in Japan from 2016 to 2020, including one of Tokyo’s 2020 Olympic sites at Urawa Misono, in collaboration with Global Carbon Project (GCP) and the University of Tokyo.
SESSION VII: MATERIALIZATION OF SPACE

TODD CRONAN is the author of Against Affective Formalism: Matisse, Bergson, Modernism (Univ. of Minnesota Press, 2014) and articles on photographic “previsualization,” orthodoxy, Brecht, Adorno, Merleau-Ponty, Santayana, Simmel, Valéry, Max Ernst, Rodchenko, Minor White, Le Corbusier, R.M. Schindler, Richard Neutra and the Eameses. He recently drafted a book on art and politics between the Wars—Between Affect and Alienation: Rodchenko/Eisenstein/Brecht—and is finishing up a study of The Meaning of California Modern on the mid-century architecture of Schindler, Neutra, Raphael Soriano and the Eameses. He is in the early stages of a book (co-written with Charles Palermo) on the films of Billy Wilder and a catalog essay on Vincent Van Gogh. Certain basic theoretical issues are focusing elements in his work including the nature of intentionality, meaning, chance, and autonomy. He is also a founder and editor-in-chief of nonsite.org. He advises topics on all aspects of the European avant-garde (painting, sculpture, photography, architecture, and film) as well as North American painting, photography and architecture.

SESSION VIII: HISTORIOGRAPHY OF REPRESENTATION & DESIGN

GEORGE B. JOHNSTON is Professor of Architecture at Georgia Tech and principal of Johnston+Dumais [architects]. He has over 35 years of experience as an architect, educator, academic leader, and cultural historian. He teaches courses in architectural and urban design, cultural theory, and social history of architectural practice; and his research interrogates the social, historical, and cultural implications of making architecture in the American context. He is author of the award-winning book from The MIT Press, Drafting Culture: A Social History of Architectural Graphic Standards, which has been lauded for its insights into the ongoing technological transformation of the profession. As both practicing architect and cultural historian, George is open to and supports research and design projects that involve themes of memory and modernity; institutions of cultural exhibition and display; changing design technologies and representational practices, approaches to American vernacular architecture and cultural landscape; and the critique of the everyday. Propelling his inquiries is this central concern: What recuperative role can architects’ practices play in this age of universalizing technology?

SESSION IX: TECHNOLOGY, MEDIA & EPISTEMELOGIES

LYDIA KALLIPOLITI is an architect, engineer and scholar whose research focuses on the intersections of architecture, technology and environmental politics. Prior to Cooper Union, she was an Assistant Professor at Rensselaer Polytechnic Institute, where she directed the MSArch program and Syracuse University; she also taught at Columbia University, Pratt Institute and the Cooper Union. Kallipoliti is the author of the book The Architecture of Closed Worlds, Or, What is the Power of Shit (Lars Muller, 2018), as well as the History of Ecological Design for Oxford English Encyclopedia of Environmental Science. Her work has been exhibited in a number of international venues including the Venice Biennial, the Istanbul Design Biennial, the Shenzhen Biennial, the Oslo Triennalle, the London Design Museum and the Storefront for Art and Architecture. Kallipoliti is the recipient of a Webby Award, grants from the Graham Foundation, and the New York State Council for the Arts, an Honorable Mention at the Shenzhen Biennial, a Fulbright scholarship, and the ACSA annual award for Creative Achievement. Kallipoliti holds a Diploma in Architecture and Engineering from AUTH in Greece, a SMArchS from MIT and a PhD from Princeton University.
EXHIBITION PARTICIPANTS

SFL | Spatial Futures Lab
AUGMENTED LIVE UAS MODELING
by Keith Kaseman, Darcy Brown, Richard Dempsey, Collin Grill, Clay Kiningham, Shantanu Kushalappa, Michael Koliner, Monica Magcalas, Daniela Marquez, Daniel Oddo, Maria Pastorelli, and Carly Todd

BEYOND THE BUILDING REPORT: REINVENTING THE ARCHITECTURAL HISTORY ‘PAPER’
by Danielle Willkins

HPBL | High Performance Building Lab
HIGH PERFORMANCE BUILDING LAB
by Tarek Rakha, Yasser El Masri, Eleanna Panagoulia, Tyler Pilet, Jayati Chhabra, Nourhan El Sayed, Madison Prince, Deva Shree Saini, and Tarek Sherif
Georgia Tech Research Institute

MARTIAN ADVANCED RENEWABLE SYSTEMS (M.A.R.S.)
by Sara Laudeman, Brian Smith, Laila Jarrad, and Zachary Tidler

StadiaLab
A METHODOLOGICAL ASSESSMENT OF STADIA’S URBAN PERFORMANCE
by Gustavo Amaral, and Charlotte Steinichen

MIXED REALITY DESIGN-PRODUCTION
by Keith Kaseman

DFL | Digital Fabrication Lab
REUSE AND RECYCLING OF DECOMMISSIONED COMPOSITE MATERIAL WIND TURBINE BLADES
by Mehmet Bermek, Ammar Alshannaq, Chloe Kiernicki, Zoe Zhang, Benjamin Tasistro-Hart, and Jamieson Pye

TORSION IN SELF-SUPPORTING PLATE BENDING ACTIVE SYSTEMS
by Niloofar Nikookar

SimTigrate Design Lab
USING SIMULATION AND CO-DESIGN TO INFORM THE DESIGN OF SAFER ENVIRONMENTS
by Zorana Matic, Benton Humphreys & Jennifer DuBose

ZERO ENERGY URBAN HOUSING COMPETITION & THE EPSTEN PRIZE
by Michael Gamble, Daniel Baerlecken, Jason Brown, and Tarek Rakha
Current historiographical discourse on Richard Neutra’s designs and professional trajectory constantly repeat assessments that express the strangeness regarding some aspects of his works. With that in mind and after identifying those aspects, the purpose of this paper is to present an analysis of Neutra’s designs from a different point of view: One that acknowledges his connections with Latin American architects and that identifies in that strangeness the reflections of this relation. The first step was to understand the historical background: Neutra’s trip to South America and connections established there, and the United States’ political situation of the time. After that, the systematic reading of the main studies/books on Neutra evidenced a gap in the understanding of his works or even a lack of a more focused analysis in some aspects of his designs. By changing the point of view and, also, by looking to those strange aspects with closer attention, new interpretations can be made and that consider Neutra’s trajectory in all its particularities, including the relation established with Latin America. The result is a possibility for new discussions on the architect’s legacy and a contribution to the historiographical discourse.

Keywords: Richard Neutra, Latin America, design, connections, historiographical discourse
ARCHITECTURAL MUTATIONS OF INDIVIDUAL HOUSES IN THE SAHARA DESERT: Case of Algerian Sahara

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Peoples’ Friendship University of Russia, Moscow, Russia
Ph.D. in Architecture
Advisor: Razin Andrey Dionisovich

Yassine is a third-year Ph.D. student in architecture at the People’s Friendship University of Russia, Moscow. Currently, he is writing his thesis on the residential buildings’ development in the Sahara Desert. His research interests center around the residential buildings and architecture in hot arid areas, vernacular architecture, biomimicry and bio-inspiration in architecture.

He holds a master’s degree in the preservation of the architectural heritage in the Sahara Desert from Tahri Mohammed University of Bechar, Algeria in 2016. He has been working as an architect with different architectural companies in Russia and Algeria.

The residential architecture in the Algerian Sahara passed through several phases from the precolonial period to the current period; the precolonial period characterized by traditional (vernacular) architecture with a compact urban fabric. But during the colonization, these communities are subject to architectural and social destruction. At the same time, the appearance of new architectural models and cultural organization, the European way of life generated by the French colonization, has triggered major architectural and urban changes. At independence, the official urban practice was made in direct continuity and relay colonial laws and architectural and urban orientations. Today, the housing sector in the Algerian Saharan cities faces many problems, in each city, the burst of housing is manifested under several types of housing. Moreover, the inhabitants spontaneously try to transform their habitat according to their image of modernity.

Methodologically, owing to the aims of this research, an analysis of population development and the different socio-cultural mutations is based, and an architectural analysis during the main three phases starting from the precolonial period till nowadays. This article will give an overview of the mutations and transformations of individual habitation typology in the Algerian Sahara. These mutations were multi-level, urban, architectural, and sociocultural.

Keywords: Individual houses, architectural mutations, housing typology, Algerian Sahara
SESSION I: "POST"COLONIAL NARRATIVES / March 5 / Thursday / 8.30-9.30 am

CHANGING WATERSCAPES: Evolution of the Eastern Canals and Wetlands of Calcutta since the British - Colonial Era

Abhinandan Bera
Penn State University, State College, USA
Ph.D. in Architecture
Advisor: Charles Andrew Cole

Abhinandan, from Calcutta, India has a background in architecture from IIEST, Shibpur and in landscape architecture from Penn State. Currently, he is finishing his doctoral dissertation in Architecture from Penn State, where he investigates water-related urban planning strategies in postcolonial South Asia taking the case of Calcutta, India. His research interests include landscape design, socio-ecological systems, urban systems, colonial urban studies, GIS, and interdisciplinary research and pedagogy; other interests include exploration of cuisines, creative writing, music, photography, and films. In the future, he wishes to teach, and conduct research on urban landscape systems, and colonial and post-colonial urban development.

The canal networks in Calcutta and the East Calcutta Wetlands present a critical case of a human-water relationship. The eastern canals of the city carry the city's waste to the wetlands, and then to the Bay of Bengal via the Kulti River. The unregulated disposal of untreated domestic and industrial wastes in these canals has polluted the water, which flows to the wetlands. Here, sewage fed fisheries use this wastewater to provide food and employment, besides saving the costs for artificial wastewater treatment aiding in resource recovery. This hydrologic system is now at risk owing to problems like contaminated water and encroachment from the development of transit corridors and real estate, posing an immense threat to the existing human-water relationships. In this research, I look at the case of Calcutta through a study of the urban strategies since its colonial era and build a case for assessing relevant processes through a theoretical framework that integrates both social and natural elements. A crucial component of this study involves studying water management strategies in colonial Calcutta, which is the subject of this paper. Below is a brief overview of my paper on this historical component of the study.

First, I provide background on the British colonial era of Calcutta and its significance with respect to settlement patterns, improvement of urban conditions and Calcutta’s waterscape. Next, I discuss the ‘Water Woes in colonial Calcutta’; this section speaks of poor drainage as a persistent issue, and the roles played by canals and the saltwater marshes in the city. I further discuss the conditions which called for a shift of focus on the drainage and sanitation of the city in ‘Need for strategies’, and the consequences of such initiatives towards improvement of the town of Calcutta. Finally, I conclude my findings and discuss the significance of this study and subsequent parts of my research, which complete my dissertation as an ethnographic narrative.

Keywords: waterscapes, canals, wetlands, colonial, Calcutta.
As the 21st century unfolds before us, the megacities of Global South experience unprecedented urbanizations and gains increasing attention from scholars and researchers from various disciplines concerning the built environments of our world. Influenced by Postcolonial Studies, while several emergent theoretical perspectives from the fields such as Urban Planning, Sociology, and Geography have contributed heavily in understanding and explaining the urbanisms of Global South and their complicated and contested narratives, Architectural History and Theory, as a discipline still struggles to articulate these transformations meaningfully, especially regarding urban informality. In the context of this epistemological dichotomy, this paper delves into an academic multilogue between Architectural History as a methodological apparatus to read and understand space, recent theoretical insights from related built-environment disciplines that have reflected on Global South (particularly on urban informality), and critical theories that help us understand socio-spatial processes, productions, and practices. In doing so, first, this paper critiques the role of architectural history in not being able to include much of the spatial narratives of Global South and questions the canonical understandings of architecture; second, it discusses the potentials of how and what architectural history and theory can learn from the contemporary discourses in its neighboring subjects; and third, calls for a postcolonial intervention into architectural history and theory. Further, by configuring a critical conversation between theoretical perspectives such as hybridity (Bhabha), production of space (Lefebvre), spatial stories (DeCerteau), and insurgent architect (Harvey) this paper proposes an analytical framework which might help us read the complex, entangled, and contested urbanisms of Global South and the history of their architectural productions.

Keywords: Architectural History, Postcolonial Studies, Global South
Cities have witnessed a surge in attention from urban scholarship in what is now referred to as the ‘urban turn’ in South Asian studies. In recent years, colonial Presidency capital cities such as Bombay, Calcutta and Delhi and their mutually constitutive architecture and urban history, have received significant recognition. The urban history of nominally sovereign, princely states and their respective capital cities, however, have been relegated to regional histories, sustaining limited inquiry. This paper, therefore, focuses on colonial urbanism in one such understudied princely city, Bangalore, the administrative capital of the princely state of Mysore. It reveals a more complex story than that of a racially partitioned “European” and “native” city that colonial administrators commonly ascribed to its specialization. It investigates residential patterns in parts of the city that fell under British jurisdiction, during a critical period in the state between when princely rule was reinstated in 1881 until the beginnings of the national movements towards freedom in 1920. It will show how the colonial “master plan” for Bangalore in the form of “improvement” projects often produced paradoxical results. On the one hand, such improvement projects were central to the imagination of the city, twinning as both, sanitary and moral reform. On the other hand, capitalist imperatives and laissez-faire economics compromised planning measures, making available such improvements to limited populations. Such projects, became a means of and reason for social control, resulting in urban segregation that often overlapped with religious, ethnolinguistic and caste segregation, creating a metaphorical ‘unintended city’. This paper, therefore, examines this ‘unintended city’, to demonstrate ways of thinking about architecture and urbanism, beyond social privilege and aesthetics of envisioned, formal, master plans. I question imposed paradigms in architectural history by radically reconstituting the object of investigation and recognizing ephemeral spaces such as segregation camps and hospitals, both “temporary” and “permanent”. I argue that the spaces conceived from these momentary exchanges, uneven development and displacement are key to understanding space making in Bangalore city before formal improvement schemes. There exists a lacuna of unadulterated self-representation of marginalized, non-local, migrant inhabitants. This paper, however, allows me to examine their lives to some extent, through the spaces they inhabited, were limited to and those that were excluded from. Employing a wide variety of unexamined archival sources that range from gazetteers, plague reports, and records that have hitherto not been used for the purposes of a spatial inquiry to examine Bangalore, I provide a rich depiction of the ‘unintended’ city and its inhabitants.

Keywords: princely urbanism, spatial control, ephemeral spaces, improvement projects, segregation
GRAPHS, SETS AND COVERS; SEEING WHAT HAS ALWAYS BEEN THERE: Finding common ground between BIM applications and their users

Mehmet Sinan Bermek
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Ph.D. in Architecture
Advisor: Russle Gentry

Mehmet is an Architect and Structural Engineer pursuing his Ph.D. at Georgia Tech under the supervision of Dr. Russel Gentry concentrating on graph based reasoners for Building Information Models.

He presented his master’s thesis on “Dynamic Analysis of Base Isolated Healthcare Structures” at Sapienza, University of Rome. Mehmet’s industry work was initially in international engineering projects in healthcare and higher education. This was followed by a research contract and lecturing position at Sapienza. During this time he covered the roles of computational designer and digital fabrications supervisor at NONE Collective in Rome.

Having nurtured a lifelong personal interest in computing and mechatronics, his work has extended into the domain of automation, large scale kinetic installations and robotics from wearables to use of industrial robots for construction.

Outside work he is active in food security, mutual aid, and right to housing projects. Time to time he translates books and organizes building and DIY workshops and can be found birdwatching in the closest ditch.

Building Information Models and Process Diagrams rely on data modeling types that can vary. By definition information contained in the very common Relational Model Databases (RMDB) can be contained in the GDBs; by expressing relations as tuples enriched with attributes. Other Data Modeling paradigms more specifically explored in the Architecture, Engineering, and Construction (AEC) realm; such as (Extended) Entity Relationship Models (EER), Object Role Models (ORM) are already structured as networks, making them directly transferable to GDBs. While maintaining functionalities such as “attribute sets” in querying the resulting structures through clustering. Graph Databases (GDB) are database architectures structured to permit network analysis methods on structured data. These databases are built using graph structures comprised of Nodes, Edges, and Properties (Labels or Attributes). These structures can be explored with semantic queries while storing data in a correlated manner. In the Process Modeling domain, common methods of rigorous communication, such as UML or BPMN derive their validation and semantic execution capabilities thanks to their directed network structure making it possible to host native information in GDBs.

Small World Networks are network graphs that can be used to represent day to day problem spaces. While these are tools to store information related to building and design practice in this paper we want to extend the Network Model towards the cognitive processes that are part of design and engineering, to this end World Graph (WG) theory that provides a scaffolding to lay out the interactions between cognitive and motivational states that are part of the decision making. Yet one of the caveats of this process is that real-world components of AEC information spaces can represent very scattered and clustered within different expertise domains. (e.g. panels can be dependent on very intricate hardware of many low tolerance components, or material differences in common building methods such as RC detailing) This is why we believe Small network models can be good candidates for structuring cross-domain relationships in a process and object-oriented AEC workflow. Bridging the gap between human cognition and Building Information Models. To this end we will demonstrate Graph mappings of design parameters (affordances, objectives ...), material properties (ductility, weight ...), logistics (order, transportation ...), and fabrication methods (shaping, fitting ...) tracing a contiguous network between expertise domains.

As a proof of concept for developing a common modeling environment between human understanding, communication and storage tools in AEC problem spaces.

KEYWORDS: Semantic Web, IFC, Graph databases, Design cognition, Process Model
Georgia Tech, Atlanta / March 5-6, 2020

MACHINE LEARNING FOR ARCHITECTS AND DESIGNERS

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Ph.D. in Technical Sciences, Architecture
Advisor: Michael U. Hensel

In 1962, engineer Douglas Engelbart proposed overlapping the creative mind with artificial intelligence to create designs which couldn’t be created by either entity alone (Engelbart, 1962). Today Machine Learning (ML) has entered the public consciousness emerging as an important tool in many industries. Architects should understand these tools to be able to create new and innovative design ideas to meet complex design criteria.

According to Hebron (2016) traditional design algorithms rely on the information programmed into the design software combined with a specific user input/workflow. These systems allow the computer programs behavior to be defined as a finite set of rules that will behave in a predictable manner and thus conform to the programmers’ or users intentions. In comparison, ML can detect patterns inside observed workflow data and provide mechanisms for imparting experiential knowledge upon computer systems.

In the specific case of parametric design, rules are established by the user by defining a sequential step-by-step instruction set of geometrical operation tasks upon a set of input data. However, establishing these rules can be a time consuming and complex task. ML can help create those specific rules if the user can define and provided the necessary input- and desired output-data. This could lead to faster simulation and optimization methods as well as the discovery of new parametric design rules.

This paper aims to break down basic ML concepts and proposes how they could be implemented in the architectural digital design process. The focus will be put on supervised machine learning as a tool in aiding and complementing parametric design tasks. Prototype projects will be showcased. On top, this paper lies out hypotheses on how ML could be further implemented inside the digital design process. Further, an overview will be given of basic ML and parametric design principles, as well as the need, will be demonstrated for architects and designers to implement ML in their design workflow.

Keywords: Machine Learning, Artificial Intelligence, Computational Design, Digital Design Workflow
The procedure of drawing a line on a screen, an elementary function of graphical computing, subjects both the notions of drawing and line to a process of computational specification. It enumerates the set of data that constitutes a line and determines exactly how that data is output, or drawn. This process relies on the close integration of software and hardware to confront the problem of encoding mathematically defined geometries into finite media. Bresenham's 1962 "line-drawing algorithm" represents an early solution to this problem, forming a foundational technique that became central to the emerging field of computer graphics.

The algorithm mobilized the line-drawing problem into a far-reaching complex of graphical technologies: first proposed as a method for the numerical control of pen plotters, it soon found widespread use in rendering linework on a raster screen, and later for generating output instructions for high-resolution printers. Across the range of computational environments in which it could be found, the algorithm contributed to a broad infrastructure of common methods and protocols that lay underneath otherwise disparate computational environments, disseminating a particular notion of the line and participating in a broader historical transition towards the virtualization of software and computing.

Through this, it was inextricably linked to ongoing developments in CAD, allowing the graphic display and manipulation of drawn lines to become a primary site of human-computer interaction. In the context of computational drawing, the automated and continuous representation of lines that the algorithm produced made it possible for drawing softwares to have an interactive graphic interface, and for competing ideas of the architectural drawing and line to be formed over the course of its development.

This paper will examine the computational history of Bresenham's algorithm, situating it in relation to the tools and practices that it engendered within architecture. Rather than outlining an institutional context or a microhistory of its development, the paper will describe a wider trajectory, engaging the algorithm within a category of transdisciplinary historical objects that extend horizontally across the practical and discursive spaces of computation. In doing so, it will refer to ongoing discourses in the historiography of technology and architecture to locate an early shift in the status of architectural labor towards information management and modeling. Above all, the paper will contend that drawing and line are not consistent disciplinary notions against which architectural technologies can be historically evaluated, but are themselves subject to historical change on fundamental terms.

Keywords: Line, Drawing, Algorithm, Computer Graphics

Shota Vashakmadze is currently pursuing a PhD at UCLA's AUD, researching the early history of computational practices in architecture. He has worked in architecture and landscape design, and holds degrees from Princeton University and Georgia Tech.
Thirty-one tall buildings (i.e., buildings of, or taller than, 200 m) have been erected to date in Chicago; a 51% accounting for office function, according to Council on Tall Buildings and Urban Habitat (CTBUH). Their energy-efficiency and healthy environment has become an important concern, given the current environmental challenges and health considerations. Many strategies in improving the properties of windows and building systems have been adopted to save energy and improve the working environment in tall office buildings in Chicago. However, only a few passive design techniques for natural ventilation have been employed. Double-skin facade (DSF) systems can provide an opportunity to apply natural ventilation strategy to tall office buildings, as they can mitigate the high wind speed and pressure through the additional skin and regulate the vertical stack flows through the segmentation. This study will investigate the feasibility of natural ventilation in Chicago’s tall office buildings using DSFs. Computational fluid dynamics (CFD) will be the main tool to simulate DSF configurations including opening size and location, cavity depth, and segmentation. Indoor air velocity, indoor operative temperature, and air change rate will be calculated under the climatic condition in the CFD simulation to assess the impact of DSF configurations on indoor airflow and natural ventilation. These simulation results are of interest to determine if the requirements for natural ventilation established in ASHRAE standards are met in the indoor spaces. The DSF configurations are key determinants of the air temperature and velocity distributions on each floor, and the proportion of driving forces between wind and stack effects. In order to assess the feasibility of natural ventilation in tall office buildings which still rely on mechanical ventilation, the number of natural ventilation hours throughout the year in Chicago will be predicted by comparing the airflow and temperature distributions with the weather data. The proper DSF configurations with quantified natural ventilation will lead to a better understanding of how DSFs should be designed for tall office buildings and provide a performance-based design guideline for the early design stage in which iterative and rapid design decisions are made.

Keywords: Double-skin facade, Natural ventilation, Tall office building, CFD simulation
Buildings have a considerable impact on the environment, and it is crucial to consider environmental and energy performance in building design. Buildings account for about 40% of the global energy consumption and contribute over 30% of the CO2 emissions. A large proportion of this energy is used for meeting occupants' thermal comfort in buildings, followed by lighting. The building facade forms a barrier between the exterior and interior environments, therefore it has a crucial role in improving energy efficiency and building performance. In this regard, decision-makers are required to establish an optimal solution, considering multi-objective problems that are usually competitive and nonlinear, such as energy consumption, financial costs, environmental performance, occupant comfort and energy cost. Her research interest and focus are in the areas of building energy modeling, simulation and analysis, high-performance building design and decision making support for AEC industry and optimization methods in the building sector.

Sustainable building design requires considerations of a large number of design variables and multiple, often conflicting objectives, such as the initial construction cost, energy cost, energy consumption and occupant satisfaction. One approach to address these issues is the use of building performance simulations and optimization methods. This research presents a novel method for improving building facade performance, taking into consideration occupant comfort, energy consumption and energy costs. The research discusses development of a framework, which is based on multi-objective optimization and uses a Genetic Algorithm (GA) and machine learning in combination with building performance simulations. The framework utilizes EnergyPlus simulation engine and custom scripts using Python programming to implement optimization algorithm analysis and decision support. The framework is automated in all steps; generating design scenarios, sending scenarios to simulator, collect the specific output and decision making in optimization phase. So, the framework enhances the process of performance-based facade design, couples simulation and optimization packages, and provides flexible and fast supplement in facade design process by rapid generation of design alternatives.

The study describes the components and functionality of this framework in detail, as well as two-step optimization technique which is a new technique that combines GA and Machine Learning. This technique improves the framework speed, performance and stability of artificial neural network (ANN) and reduce the sensitivity.

The case study for a test cell presents, illustrating how the framework is used to test a variety of design possibilities and validation of this framework, as well as its application for facade design in different climates.

Keywords: Performance-Based Facade Design, Simulation-Based Optimization, Machine Learning, Minimum Viable Product
EXPLORING LITERATURE ON THE RELATIONSHIP BETWEEN OPERABLE WINDOWS, THERMAL COMFORT, AND INDOOR AIR QUALITY IN K-12 SCHOOLS: Identifying The Gap And Proposing Future Studies

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Helia is a third-year PhD in Design student at North Carolina State University. She believes in the importance of human-building interaction in occupants' and buildings' lives. Helia has four years of professional and teaching experiences in Iran, and there she realized the need of having more research on human behaviour in the design process. She works with Dr. Traci Rose Rider on "Factors of Using Operable Windows and Their Relationship with Thermal and Indoor Air Quality Condition in K-12 Classrooms in Raleigh and Denver" as her dissertation. She is a human-centered researcher and an energy and daylight analyst. In human-centered projects such as pre-and post-occupancy evaluation, she is using surveys and environmental monitoring. For energy and daylight analysis, she is using Honeybee, Ladybug, DIALux, EnergyPlus, OpenStudio and Sefaira.

Schools are the second most important environment in children's lives after homes (Baki-Biro et al., 2012; Mendell et al., 2013), illustrating the importance of school environments in students' learning performance, health, and comfort (Abramson et al., 2006; Madueira et al., 2009; Annesi-Maesano et al, 2013; Mendes et al., 2014; Almeida et al., 2016). Ventilation is one of the factors impacting student learning performance; ventilation can be provided through operable windows, exhaust fans, or mechanical ventilation systems (Gao et al., 2014). Additionally, different building elements such as air ventilation systems, HVAC systems, and building envelopes can affect ventilation and occupant comfort (Catalina and Iordache, 2012). ASHRAE Guideline 10P (2010) establishes four conditions for human comfort: thermal, visual, acoustic, and indoor air quality. Thermal comfort and indoor air quality are viewed as the most important of the four comfort conditions to improve occupant health and productivity (Pan et al., 2018). Several studies have focused on the relationship between operable windows, thermal comfort and/or indoor air quality, but no literature is found synthesizing these studies to establish a gap in research (Almeida et al., 2016; Dhaka et al., 2013; Jiang et al., 2018; Jindal, 2018).

Through searching keywords of operable windows, natural ventilation, open window, close window, temperature, thermal comfort, CO2, indoor air quality and IAQ, 136 articles were found on Web of Science, ScienceDirect, and Google Scholars. From these papers, only thirty-one had research conducted in schools. A synthesis shows that these thirty-one articles have been conducted largely through quantitative methods including environmental monitoring, survey, and simulation. Also, only one of them was located in the U.S., with the rest located in Europe (15 out of 31), Asia (12 out of 31), South America (2 out of 31) and South Africa (2 out of 31). In addition, 54% of total (thirty-one) papers focused only on thermal comfort, 25% focused on indoor air quality and only 21% addressed the relationship between operable windows and both thermal comfort and indoor air quality in K-12 classrooms. This synthesis of literature shows that the current research emphasized measurements in air temperature, relative humidity, and air velocity to address thermal comfort, and used CO2 as the favored metric for measuring indoor air quality. This paper proposes future studies and methodologies to fill these identified gaps in the literature.

Keywords: Operable Windows, Thermal Comfort, Indoor Air Quality, K-12 Schools, Classroom.
FROM SEGREGATED TO INTEGRATED: The Evolution of Shading Designs in Marcel Breuer’s Works

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This research re-evaluates the Hungarian-American architect Marcel Breuer’s sunshade facade design in his later career to highlight his integrated thinking of building envelope system for making a more performative building. Existing scholarship tends to render Breuer as a modern furniture and house designer and to emphasize the aesthetic and structural characters of his late concrete works. However, the sunshade design is a thread through his entire career, shifting from being segregated in a layered facade to being integrated into a molded concrete one with multiple relationships to other architectural elements, which is still inspiring for integrated facade design in today’s environmental building practices. The sunshade is a significant architectural invention proposed by Le Corbusier to solve the overheating problems arising from the use of large panes of glass made possible by new structural inventions. Aladar and Victor Olgyay in their book Solar Control and Shading Devices (1957) focused on shading efficiency and provided guidelines for design which connected a sunshade’s geometrical features to regional climatic parameters. Breuer’s early sunshade practices were influenced by these ideas and methods, reaching their pinnacle in the UNESCO headquarters Secretary building (1952-58). However, with the emergence of air-conditioning systems and the failure of heat control in the UNESCO building, after 1960 Breuer changed his strategy adopting a more integrated method which combined sunshade, structure, mechanical systems, and architectural programs into a single molded concrete facade. Such a transition demonstrated a combination of what Reyner Banham called structural and power-operated solutions to environmental management in the book The Architecture of Well-Tempered Environment (1969). Comparative studies on Breuer’s sunshade design before and after 1960 are made to illustrate the transition in his design attitude from a focus on sunshades that are segregated to the integration of the sunshade in the facade system. The two most important projects are explored in detail through the original drawings and archives, one being the UNESCO project, the other being the IBM research center in La Gaude, France (1960-62).

Furthermore, additional projects are selected to unfold Breuer’s creative design in combining sunshades with other architectural elements through Breuer’s writings and drawings. The HUD in Washington D.C. (1965-68) shows how Breuer’s sunshade deals with dirt and water in the weathering process. IBM administrative office in Boca Raton in FL (1968-72) presents his unusual treatment of sunshades due to their integration with the structure. The Campus Center in the University of Massachusetts (1967-70) demonstrates various shading patterns related to different architectural programs. And the inventive combination of sunshades and mechanical devices is presented in the project of HUD and the Campus Center in the UMass.

Early modern architecture demonstrates a clear separation in recognizing the building system and focuses on each part individually. Breuer’s transition shows an alternative way of treating the system as a whole and make elements multi-functional. This integrated thinking not only coordinates different parts to perform more effectively and economically but also create a more meaningful architecture representation rather than a technology-decide result.

Keywords: Sunshade, segregated, integrated, Marcel Breuer
SHAPE-CHANGING AND EFFICIENT ARCHITECTURAL SYSTEMS: A bottom-up and top-down approach for developing responsive building skins

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In recent years, there has been an increasing interest in shape-changing smart materials in architectural research and practice. Research into responsive building skins with shape-changing materials has argued that the advantage of such systems relies on their potential for achieving improved performance of buildings. However, few studies have proposed methods for developing responsive skins using shape-changing materials with the target of optimizing environmental performance. This paper discusses the methodological approach of a doctoral research agenda that aims to create a framework for developing a responsive shading system using shape-changing materials with the target of optimizing environmental performance. The methodology has two complementary approaches: a bottom-up study that deals with the development of shape-changing prototypes and top-down research that models the overall configuration of the responsive skin system. The paper discusses the two complementary approaches in terms of a case study.

Keywords: Responsive skins, Smart Materials, Shape-changing Materials, Research Methods

Elena is a Ph.D. student and teaching assistant at the Stuckeman Center for Design Computation at Penn State University. Elena holds an MS Architecture degree from Penn State, completed with the support of a Fulbright scholarship. Her research focuses on material computation, digital fabrication, generative design, and smart materials. Before coming to Penn State, she obtained her professional degree in Architecture from the Universidad Nacional de Asuncion. She worked as an architect in several architecture firms in Paraguay and was the associate architect in the detail design and construction supervision of several housing projects. Her master’s dissertation: “Perforated Masonry Walls: Creating a digital framework for optimizing environmental performance through shape configuration” has been recognized with the “Distinguished Master’s Thesis Award”, a university-wide recognition for excellence in masters-level thesis research. Elena has extensively published in computer-aided architectural design proceedings, including eCAADe, SigraDi, Caadria, and CADFutures.
A CAMPUS BIOGRAPHY

Bader AlBader
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Advisor: Linda Groat

Bader is a doctoral candidate at the University of Michigan. His research examines spaces and institutions of higher education and the ways in which they contribute to the development of cities and states, particularly in the Arab World. Bader is also interested in issues of multilingualism, transregionalism, and translation, especially as they relate to academic production. The most recent exhibition and conference he has been involved in organizing are Missing Migrants of the Mediterranean and Utopia vs. the City, respectively. He holds a Bachelor of Architecture from Pratt Institute and a Master of Arts in Architecture from Rice University.

The university, as an institution and as a space, is complex. A middle scale outside the comfort zone of architects, the campus bridges between the architectural and the urban. In response to professional pressures on architects, the study of campus planning emerged in the mid-twentieth century as a technocratic concern. The campus thus became a spatial type worthy of analytical attention. The functionalist approach to campus studies eventually gave way to more academic and less instrumental interests in the subject. To take stock of the development of the conceptualization of the campus as an object of analysis, I utilize the biographical method as a lens through which to read the differentiation within the field. This essay vicariously traces the contours of the campus’ discursive landscape by focusing on the oeuvre of the discourse’s prime inciter to discourse, Richard Dober. Through a close reading of his monographs, a textured picture of campus studies emerges: the discourse first coalesces around modernist, functionalist, and subsequently international concerns about the efficacy and adequacy of the spatial provisions accorded to rapidly expanding higher education. This is followed by a discursive turn towards more humanistic concerns like history and art, ushered by the publication of Paul Turner’s seminal history of the campus in the United States. Dober was not immune to this discursive shift, but took it in stride, producing many books attempting to reconcile his rationalist, modernist predilections with the ascendance of lyricism and beauty as core analytical concerns. His oeuvre developed and expanded, incorporating campus history and aesthetics as primary interpretive threads. The ardent functionalist of yesteryear had to adapt and assume a humanistic outlook in his later years. Campus discourse’s story is a bipolar one, jumpstarted by modernist concerns spearheaded by Dober only to later be inflected by the Turner plot point towards scholarship in the vein of that produced by historian-aesthetes. Because Dober lived, worked, and wrote prolifically through all this, his collective works serve as an index of the evolution and differentiation of the campus discourse, and his books as lampposts along the shifting discursive landscape of campus planning and design. This deep dive into Dober’s oeuvre and its interfaces with discursive developments illuminates how his oeuvre is reflected in and inflected by the evolution of the campus discourse. Uniquely intertwined with the discourse, Dober’s biography is an opportune proxy through which to sketch a biography of the discursive campus.

Keywords: campus planning and design, higher education, Richard Dober, intellectual biography, discursive paradigm shift

SESSION IV: URBANISM, DATA STRUCTURE / March 5 / Thursday / 3.15-4.15 pm
From the 1950’s, the advances made in telecommunications systems have consolidated sports as an industry and transformed related competitions in major events of international impact. Stadia is one of the most tangible legacies of sports industry on society. Surprisingly, in spite of their significance and monumentality, stadia remained unstudied by architecture academia. With that, the questions related to the real urban legacy derived from the construction of stadia remains unclear, culminating in cases where the construction of a new stadium has represented social displacement, urban scale discrepancy, public financial burden and in a costly and underutilized building. In effect, the analysis of contemporary urban stadia projects necessitates the study of the very questions related to the city of the future: the impact of new technologies in shaping how mega projects are built, how climate change will shape the character of urban life and the infrastructure that supports it, and the socio-economic implications of these factors combined. 

Often thought of as an icon, the legacy of an important global event, or the symbolic identity for a city, the stadium must achieve more than mere functionality. It can and should generate urban redevelopment and regeneration. This study envisions the development of novel urban analytical methodologies to observe how this building impacts human behavior in the urban space. This methodology relies on the hypothesis that big data offers new information about urban space patterns of usage after the construction of large scale architecture opening up possibilities for place making professionals to interpret architectures’ ability to attract people, affecting movement patterns through the urban space and at the same time to re-visualize the real impact of stadia in the city. In the context of this research, the 1998 World Cup, hosted by France, is understood as a historical mark on stadia design with the construction of the Stade de France in the city of Saint Denis just outside of Paris with architecture solutions that incorporated spaces and urban design strategies to connect the stadium to its urban context. With the analysis of the Stade de France it will be possible to develop a new understanding about stadia-related architecture and urban design, amplifying architecture’s comprehension about the legacy to be achieved by stadiums in their host cities.

Keywords: Stadia; Urban Analysis; Big-Data
In Shanghai, the spatial division inside residential heritages is intricate. Even the smallest top-down renewal projects involve several households' interests. Without an 'empowered participatory governance' (Fung and Wright, 2003), communities tend to form intense exclusion, refusing the government's interventions (Tallon, 2013). Under such background, in 2017, the author accompanied a co-producing renewal process along with the Shanghai Xuhui district and communities.

This paper reviews the co-production theory, summarizes its advantages of meeting individual demands and utilizing residents' initiative inputs, its nature of breaking current rules and using conflicts tactics, as well as its drawbacks of potential structural and fire-fighting dangers of buildings, as shown in the "Dream Home" TV program.

Then the paper examines the case of No.620 West Jianguo Road, a pilot project of institutionalizing the co-production, aiming at bringing out its merits and eliminating its defects. Two obstacles in this process are elaborated and the reasons for them are analyzed:

a) The intricate interests within residents are hard to coordinate only by designers, but the current mechanism does not enable the residents to reach a consensus beforehand or integrate them into the design phase. b) The division of ownership and use-right in the history causes unequal duties and rights and mutually restricted power between the residents and the state, resulting in the state's inability to occupy or repair its property as well as the reluctance to support the residents' initiative repair.

Afterward, the paper proposes corresponding solutions based on relevant practical references, focusing on optimizing and deepening the mechanism of state-community engagement in the residential renewal, and adjusting the rights, responsibilities, and benefits of the owners and users.

To sum up, this research suggests that a "public-sector led" co-production may be still possible, with a changed power balance and certain modification to the current rules, and could achieve unexpected results when the state has difficulty in delivering services; whereas the shift of planners' roles indicate that empowerment may be gradually taking place.

Keywords: Co-production, Historic Conservation, Residential Urban Heritage, Urban Renewal, Shanghai.
Knowledge economy has become an increasingly important factor over recent years. Office environments have changed accordingly and contemporary office space layouts have become more complex, as their qualities rely on their capacity to enhance the continuous transfer of knowledge and information rather than the exchange of work or goods. As the performance of these types of spaces becomes more difficult to assess, new methods need to be developed.

The research methodology described in this paper aims to predict the complex emerging spatial occupation patterns in contemporary office environments. Its ambition is to develop a novel method of architectural design that generates spatial environments with high social performativity. Embedded in the conceptual framework of agent-based simulation, this research does not foreground the configuration of space itself (like other tools such as space syntax) but rather focuses on devising behavioural rules of social interaction for a set of active agents within the space in question, with the goal to develop a population of agents that is sophisticated enough to allow for the emergence of an abstract, yet plausibly life-like collective event scenario within an office space that features typical elements of interaction such as tables, desks and coffee bars. Behavioral patterns are driven by a carefully constructed simplified social model that differentiates agents according to their "social attractiveness" and their "social alignment" which govern the rules of interaction with other agents and objects in space.

Results show that all simulations exhibit an overall life-like behaviour when run and observed. Agents show differentiated behaviour towards other agents and frame dependency to the varying distribution of objects in their space. Different space layouts result in differentiated spatial occupation patterns. While the overall number of interactions remains stable across all scenarios, the numbers for interactions with objects differ considerably depending on their location in space, indicating that different object formations within the same space influence the individual number of interactions and therefore render a space more or less performative.

Keywords: Agent-based simulation, work and office environments, contemporary spatial occupation patterns, digital design, social performance simulation, human space design.
A STUDY ON COMMUNITY PERCEPTION TO IMPROVE THE URBAN GREEN SPACE DENSITY: A Case Study Of Can Tho City, Vietnam

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Phuong graduated from University of Architecture Ho Chi Minh City with a Bachelor of Architecture in building design in 2011 and a master of urban planning in 2015. With a formal background in architecture design and urban planning, he starts my work at Mien Tay Construction University in Mekong Delta, Vietnam. He has a passion for design and urban planning in Mekong Delta, Vietnam.

He has five years’ experience in this field in Vietnam such as:
Attending the rural region renovation project in Mekong Delta, Vietnam, research on application local people perception to improve the quality of urban living in Vinh Long city, Vietnam, housing design in the rural region for poor people, research on the climate change for Mekong Delta and applying it for renewing urban space.

The study aims to examine the green density in Can Tho city, Vietnam, where urbanization has been rapidly growing and urban green space has gradually disappeared because the built-up land has been increased rapidly over the last 20 years. First, this study conducted a survey and interviewing the local people to explore the existing problems and residents’ perceptions about the current quality of urban green space. The survey will be focused on the green space density, the types of current housings, and the quality of housings to suggest a vertical resettlement concept for improvement of green space. The results of the questionnaire survey actually show a lack of green spaces in the center of the city, and local people entirely concur with relocation into high rise buildings in order to cede land to green spaces. Thus, the study chooses the study area, where the survey results reveal that the current housing conditions and quality of life of the habitants are low and chaotic, therefore, the solution of the vertical resettlement is considered as a suitable solution for this case. In this way, this solution can enhance the living conditions of the habitant and allow to optimize land use planning in this study area.

Keywords: Urban green space, Questionnaire survey, Residents’ perception, Improving green space, Vertical resettlement concept.
The following essay is a critical historical analysis of national planning interventions in the United States between 1945 and 1964. Drawing inspiration from radical black scholarship, it reinterprets the national urban renewal movement at the end of WWII as a racial project that exercised a 'color-blind' race-neutral rhetoric to help expand government police powers and realize the spatial specifics of neoliberal hegemony. It uses the case of Southwest, D.C. to explore the intersection of social identity, law, and planning in the early Cold War. It views modernist planning as a settler colonialist project, reaffirming hegemony in sustained racialization processes. It analyzes modernist planning at the nexus of state-society-space power relations to elucidate the dialectic of 'planning as social control.' By critically examining the 1954 landmark decision in Berman, I perceive planning as mediating the "social production of space" at the disjuncture of legal interpretation and urban reconfiguration. I speculate that court legitimations of overtly racist planning projects reflect an epistemic lag between the American judicial system and the shifting discourses on urban development and technologies. In Represet and Destroy, Jodi Melamed examines the WWII "racial break," and how the entrance of official antiracisms into American governmentality in the ensuing new world-historical formation was instrumental for U.S. global ascendancy and leadership of transnational capitalism. Through a historical-materialist lens Melamed's genealogy of race-liberal orders reinterprets U.S. literary studies as a "key site of geopolitical struggle around the meaning and significance of race." She delineates three successive official antiracist regimes pertinent to the history of modern American planning: racial-liberalism (1945-1964); liberal-multiculturalism (1965-1990s); and neoliberal-multiculturalism (2000s). In linking the first official antiracist regime in Melamed's periodization with the national urban renewal program, the 1945 District of Columbia Redevelopment Act (DCRA) arguably paved the way for what I am referring to as antiracist negating mechanisms. In my formulation antiracist negating mechanisms are not antithetical to official antiracisms; rather they coexist in a synergetic complementary relationship. Whereas official antiracist discourses explicitly identified race "as the central problem – the crux of everything wrong and unequal in governance, economy, and society," antiracist negating mechanisms exercised a 'color-blind' rhetoric, to further obscure the workings of heteronormative hegemony. In an attempt to redress the normalizing and rationalizing violences within the silencing discourses of modernist planning projects, I turn to Roderick Ferguson's work in my concluding notes to reflect on the insightfulness of queer-of-color critiques for advancing a critical planning theory.

Keywords: Southwest D.C., antiracism, urban renewal, eminent domain, racial planning.
With over twenty years of experience in both academia and practice, Kourosh has worked as architectural educator, researcher-in-practice and designer. Kourosh is currently pursuing his PhD studies at the University of Waterloo (Canada) while teaching part-time at the Ontario College of Art and Design University (OCADU) in Toronto. His previous academic experience includes teaching at the British Columbia Institute of Technology (BCIT) in Vancouver and School of Architecture, Dalhousie University (2003 to 2006). Kourosh was the ‘sustainable research leader’ for HCMA Architecture + Design from 2010 to 2014.

Kourosh received his First Professional Master of Architecture from Tehran University (1995), his Post-Professional Master of Architecture from Dalhousie University (2002) and his Master of Studies in Interdisciplinary Design for the Built Environment from the University of Cambridge (2009). He is a member of the Royal Architectural Institute of Canada (RAIC).

This paper outlines the preliminary framework for the author’s doctoral studies in urban planning which aims to be an academic critique and investigation of the role of architecture, as a practice, and architects, as professionals, in the current status of social housing development. Based on an evolving and expanding literature review, the discussions are framed in three broader categories of ‘premise’, ‘context' and ‘investigation’. The study would be primarily premised on the notions of the necessity of decommodification of housing and Lefebvre’s “Right to the City”. Within such preliminary and broad conceptual framework, the study then proposes positioning the research within its socio-political and architectural contexts. While the former is represented by neoliberalism, the currently predominant ideology and driving force behind the majority of governments’ decisions and policies all over the world, the latter limits the study to social housing as the architectural manifestation of social justice in the contemporary city. For further contextualization as well as proper – feasible – examination of how state policies have evolved, social housing development and government’s attitudes towards it would be examined more thoroughly in the Canadian context. The Canadian case study would delineate how capitalist and neoliberal ideologies have been applied in a geographically and socio-politically specific context. To complete the roadmap for the study, it is then proposed to critically investigate the role of architects and architecture in the process of social housing production. The hypothesis is that architectural practice is so tightly entangled with capital that architects have been reduced to mere facilitators of the neoliberal modes of production of space and, in doing so, have knowingly or unwittingly deprived architecture from being a powerful aesthetic, experiential and morphological tool for the manifestation and embodiment of social justice in the city.

Keywords: Architecture, Right to the City, Social Housing, Capitalism, Neoliberalism
DEVELOPING ‘URBAN JUNGLE’ AS AN INTEGRATED MODEL OF SURVIVAL: Learning from Nature in War Zones

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Advisor: Tarek Rakha

This paper explores the relationship between conflict in the urban environment and natural systems of resiliency found in forests and jungles. Studying the different accounts of inhabitants of cities under siege during the Syrian Civil war indicates that various sustainable practices were implemented within the built environment that helped inhabitants survive the devastating process. The circular economy that was innovated allowed the inhabitants to survive their plight and lessened the intended effects of the devastating sieges. Drawing parallels with how forests and jungles utilize different natural systems such as mycorrhizal networks to increase resiliency, many lessons are imbibed about sustainable resource management and efficient allocation in the face of different threats. The "Urban Jungle" is thus synthesized as a model that attempts to augment and maximize the practices inhabitants had innovated through mimicking the model found in the natural jungle. Applying this model to conflict zones allows the evolution of survival tactics into a form of insurgent resilience, with wider socio-political ramifications on the survivability of the inhabitants, their political will, and the effectiveness of the conflict, and sieges in particular as a political tool.

Keywords: Sustainable Design, Urban Jungles, Low Tech Sustainability, Peace Building Architecture, Resilience
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Multiple stakeholders have an interest in making our schools ‘safe’ places to learn and work. Among these are students and parents, law enforcement officials, school administrators and teachers, code officials, and architects. Each profession or group approaches the concept of ‘safe’ from varying institutional logics defined by their professional culture or place in society. Institutional logics represent frameworks for how people in society can frame an issue and help guide them to solve problems. These logics can be complementary or competing. One issue in working towards making schools ‘safe’ is finding common ground defining the problem and finding a common language with which stakeholders can communicate and work together. Another problem is understanding how practices and customs differ between stakeholders. Knowing how each interested party frames the issue of ‘safe’ schools can allow for finding solutions to impasses where logics conflict by knowing that there may be a more expanded definition than originally believed. It also allows us to know varying approaches to problem solving empirically and where research is being conducted on the issue. 

In approaching the problem of creating ‘safe’ schools, professional organizations such as the American Institute of Architects have lobbied the US government to establish a “Safe Schools Clearinghouse.” Conceived as a repository of best practices for ‘safe’ school design this clearinghouse would also encourage empirical research by our design schools. Research would be the foundation for decision-making by local school districts and would also encourage the development of new technologies and solutions in school safety. However, there is now a lack of research within our architecture schools. To understand where academia, and more specifically architecture, is on the issue of school safety research, this paper explores, through a contemporary literature review, the areas of peer-reviewed research on four key terms: safe schools, school safety, school security, and school shootings. The results of this search indicate that the topic of school safety is virtually ignored by architecture academics. Research on this topic of school safety is most prevalent in the fields of psychology and education. While there is a great deal of literature on school safety outside academia sharing ideas, opinions, and case studies of design practices, no rigorous research appears to be being conducted in our design schools that can be generalizable and offer the validity necessary to make prudent decisions that consider all of the consequences, and manage the various of institutional logics involved. If architects are expected to act as arbiters of best practices to guide society on the design of ‘safe’ schools, then research within our design schools must begin now.

Keywords: Safe Schools, Institutional Logics, Security, Safety
The philosopher Maurizio Ferraris differentiates weak documents from strong documents, whether an act is inscribed in an object or not. A document that records only facts and no acts is a weak document. A strong document, on the other hand, is an object in which acts between multiple actors are inscribed within it. As such, all strong documents are social objects.

In Lasciar Tracce: Documentalità e Architettura, Ferraris questions architecture's documentality. He locates the documentality of architecture in buildings and design objects. In this paper, however, I will turn away from this assumption and argue that the documentality of architecture cannot be limited to built objects. The sphere of documentality of architecture unfolds in specific moments of architectural projects: in the phase in which ‘napkin sketches’ are translated into construction drawings and those construction drawings are translated into acts on the construction site.

In order to understand how acts are inscribed in construction drawings and those acts are enacted on site, it is crucial to consider the history of architectural notation. In notation systems of construction drawings lie the root of a truly problematic social object – the root of a social object that causes “social alienation.” Today it is once again apparent that construction drawings are never only technical, but at the same time always social objects. It is in the realm of digitalisation of the drawing in which the technical and social side of the construction drawings becomes visible again.

Keywords: Document, Notation, Social Object, Technical Object, Drawings
The work presented in this paper is part of a research that explores upcycling waste corrugated cardboard into building components. The research focuses on developing countries where there is a vast low-income population that needs housing but who find standard construction systems unaffordable. The research involves observational studies on the work of cardboard pickers in Paraguay seeking to understand the cycle of waste cardboard in the local context; development of digital tools to design building parts with waste cardboard and generate their fabrication instructions; hands-on work in an academic setting prototyping and testing building parts; and experimenting with the building system in the target context through workshops. This article summarizes several lessons learned during a construction workshop developed with a group of waste cardboard collectors and discuss the potential alternatives to the shortcomings.

Keywords: Waste Material Reuse, Waste Cardboard Upcycling, Low-cost Architecture, Digital Tools, Construction Workshop
In the history of architecture, technologies adapted from other disciplines have created new paradigms for design and production. During the first Industrial Revolution, for instance, developments in mechanical and material engineering, and the introduction of wrought-iron, steel and concrete, led to revolutionary changes in architecture. In the 19th and 20th centuries, electrical engineering and electronics had a similar groundbreaking effect on architecture and design. It seems that regarding the necessities and problems that exist in the 21st century, such as dependency on fossil fuels for construction that lead to carbon emission, abundance of solid and liquid waste and unjustifiable costs, another change in the paradigm of construction is required. One possible way to address these issues is to return to nature and take advantage of biomaterials. This research studies the integration of mycelium-based bio-composites to the field of architecture. Mycelium is the vegetative part of mushrooms by which they absorb nutrients from the soil. When treated, mycelium results in a foam-like composite material that is lightweight, and biodegradable. Over the past couple of years, designers started to use mycelium-based composites in several applications ranging from product design and furniture to building panels and masonry blocks. In this research, the aim is to explore novel methods to use mycelium-based bio-composites in temporary and/or low-rise constructions. The focus of the research is on enhancing the material properties by investigating the factors that affect the nature and growth of the cultivated mycelium-based bio-composites and exploring novel structural systems based on the constraints and affordances of mycelium-based bio-composites, using computational form-finding techniques, generative design and optimization methods. In this paper, the initial incentives for conducting the research and the proposed methodology are discussed.

**Keywords:** Biomaterials, Biodesign, Mycelium, Bio-composites, Masonry.
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Digital Futures: International Ph.D. Program
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Virginia has a Bachelor’s of Science in Architecture from the University at Buffalo School of Architecture and Urban Planning, and a Masters in Architecture from the University of Pennsylvania Stuart Weitzman School of Design. She has worked at design offices in New York City and Beijing, and has held teaching positions at University of Pennsylvania and University at Buffalo. She is currently lecturer at Clemson University. Her research focuses on digital design and textiles. She utilizes traditional techniques from sewing, embroidery, weaving, knitting and more; and transitions these traditional methods to new novel digital ways of production. The work ultimately is explored through small scale prototypes and speculative installation scale works. She has presented temporary installations at art events and exhibitions in Toronto, Boston, Cincinnati, Buffalo, Detroit, Beijing, and more.

This paper explores a process for digitally designing doubly curved forms out of flat woven textiles. These three dimensional forms are structure through pneumatics. Utilizing computational modeling techniques, such as NURBS and sub-division modeling, we can easily create complex curvature in the computer, yet many fabrication methods fall short of creating these types of forms from flat materials. Techniques such as parametric paneling patterns are one approach when working with woven textiles. These penalization techniques also only create an approximate of the doubly curved form. For this research I reject this approach and explore the potentials to integrate dressmaking techniques of creating shaping and form for the design of pneumatic structures. These traditional methods offer the ability to make two dimensional fabrics fit around the curves of the human body. They can generate approximations of doubly curved forms by the way that they are cut or shaped and sewn.

Secondly the paper explores a new novel approach to the digital workflow by utilizing computer programs that are created for the fashion industry rather than architecture. they provide possible decorative or stylized aesthetics expressing the manipulation of the fabric. These programs are designed to integrate of sewing techniques into a three-dimensional design environment, preview simulations of designs and seamlessly output to patterns for production. Three prototypes are created, that explore different techniques and study the results and the outcomes of these novel sewing techniques and the quality forms that they might generate. Resultantly it is important to compare the digital designs to the physical results, as design is first done in the computer and it is important to understand how well the approximation of the digital simulation compares to the reality of physical materiality.

Keywords: Computational Design, Fabrication, Pneumatic, Membranes, Sewing, Dressmaking, Craft
BENDING PARABOLAS: Formwork for Compression-only Structures

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The "elastic" curves formed by a uniform buckled strut are not optimal shapes as guidework and formwork for compression-only structures. In this paper, we adapt the family of the elastic curves to vaults and arches, by changing the stiffness of the strut to force it to buckle as a parabola. The approximation of elastica to parabola in a bent strip makes it useful to form-find, support, and guide the construction of vaults. Consequently, an average variation of the stiffness will form a strip that always generates parabolic arches as it moves, opens, or closes. Hence, the strip becomes a tool that always finds and describes multiple vaulted geometries that otherwise require complicated, one-use and bulky formwork systems. The system was tested with thin-tile vaulting through building three thin-tile vaults using the bending system for simple in-situ construction.

Finding simple in-situ solutions for compression-only structures advocates local grassroots construction that seeks alternatives not only to the way we build now but also to the way we think about design. The production of the built environment is not always in the hands of architects and engineers; a dialogue between high-knowledge analysis and low-tech everyday construction is much needed. In this particular context, the paper proposes optimizing on-site technology through design analysis that focuses on the dialogue between material behavior and craftsmanship.

Keywords: Active bending, thin-tile vault, Construction, Geometry, Shells
Michel Foucault qualified the writing of Maurice Blanchot as “thought from the outside.” The reference is to absence or, the ability of what we cannot know to shed light on what we seek. In the context of the present-day, European city, connections to existing cultural frameworks make it difficult to identify agents and processes of change. And yet, these same blind spots hold the potential to generate new knowledge. The current paper searches for the unknown in the semi-obscurity of the urban night. This does not imply that nocturnal landscapes are absent, on the contrary, they are territories of distinct appropriations, contestation and reflective agency. The nightscape offers an alternate understanding of the diurnal city, a view that in darkness, requires even greater focus. Exploring Blanchot’s concept of the “other” night, as defined in “Le Dehors, La Nuit,” from L’Espace Littéraire (1955), provides a means of elucidating limits of alterity within nocturnal darkness. And yet, in search of an actionable alterity, the current research asks if there is not a third, anticipatory night, one that situates itself between what Blanchot calls the “first,” or knowable night, the realm of sleep and everyday(night) life, and the unattainability of the other. It is in this night that moments of possibility are accessed and articulated.

Relevance comes as European cities grow darker to reduce energy consumption and light pollution. At the same time, greater populations are investing the night, imposing questions of how the night city is appropriated, where actions may take place and who may participate in these actions. This proposal fits within a larger, interdisciplinary doctoral research project: “Utopian Nights, Navigating No Place in Nocturnal Urban Landscapes.” A project which, through the practice of nightwalking, seeks to generate possibility within specific atmospheres of the nocturnal European city.

Keynotes: Blanchot, Night Studies, Nightwalking, Urban
The essay attends to the American City in Pisa, a refugee settlement developed by the American Red Cross (ARC) during the First World War, in the aftermath of the devastating defeat of Italy’s forces along the Northern line, which resulted in the displacement of more than 500,000 refugees. The defeat prompted the intensification of the ARC’s presence in Italy and the deployment of a territorial scheme for the management of the displaced population. Spearheaded by the Director General of ARC’s Civil Affairs in Italy, the architect Chester Aldrich, the settlement in Pisa intended not only to provide emergency relief but also to serve as a propaganda campaign targeting audiences both in Italy and the United States. Initially heralded as a modern and replicable strategy that represented America’s benevolence, the settlement was never to be completed and swiftly disappeared from history. With a little more than half of its buildings standing, it was transferred to the Italian government and eventually converted into Pisa’s largest carceral institution.

In this essay, I will focus on the intentions and constituent parts of the American City and extrapolate on the humanitarian imperatives as formulated and enacted by the American Red Cross and its permanent Commission in Italy during the First World War. I will trace a lineage that links wartime relief campaigns to the rise of the humanitarian organization as the primary instrument of US foreign aid and diplomacy. In addition, the history of this settlement will be treated as a paradigmatic case study for the rise of these institutional formations—the modern humanitarian organizations—and their convergence with modern architecture and planning. I will argue that this coterie of humanitarian experts merged military technologies and urbanism, and the link between human rights, conflict, and the provision of shelter.
On the evening of Friday, May 8, 1953, Robert Cutler, the National Security Advisor to President Dwight Eisenhower, entered the White House. Accompanied by several officials and advisors, Cutler climbed up to the mansion's top floor and entered a room virtually unknown to the public eye. There, in the White House Solarium, the President and his “group of fine fellows,” held a meeting of grave consequences to American policy in the Cold War. The undisclosed gathering and the room in which it took place gave birth to the namesake Project Solarium: a month-long war-game simulation that shaped official US policy toward the recently nuclearized Soviet Union.

This paper takes the moment of the gathering at the White House Solarium as an entry point for a renewed discussion of the cultural images cultivated during the Cold War, as well as the role which architectural space plays, figuratively, in such constructions. Both visible and hidden, covered under the shadows of secrecy while basking in sunlight, the ambiguous Solarium becomes a quintessential space of the Cold War. The programmatic history of this garden-like interior as the First Family’s private retreat on one hand, and a space for secretive meetings on the other, challenges conventional images of the decision-making spaces and holds within its transparent walls an ambiguous tale of the making of world history.

Situated against the geopolitical history of the Cold War policies and propaganda, this paper presents the supposedly insignificant architecture of the Solarium as the physical and metaphorical representation of the culture of images proliferating throughout the Cold War. On its catastrophic and shadowed edge one finds apocalyptic visions of nuclear war and fallout shelters; on the other, the positivist, light-filled imaginations associating nuclear energy with the benevolent power of the sun. Hiding watchfully on the sovereign's roof, the sunlit yet hidden room observes the unfolding of American and global histories, as it simultaneously constructs and directs these. As politics, architecture and propaganda secretly coalesce behind its opaque glass curtain, the Solarium is exposed as a space for the projection of both history and its images. Its tale reveals architecture’s participation in the making of grave decisions, and its role as an instrument of vision, providing a unique space for the construction of future histories and worldviews.

Keywords: Architecture, Cold War, Nuclear, Solarium, White House
THE BREUER WHITNEY IN THE AMBIGUOUS
PRESENT: A Spatialized History of the
Whitney Museum of American Art

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Precariously in limbo, Marcel Breuer's Madison Avenue Whitney Museum of American Art has been left without a permanent occupant since the museum relocated to its new, Renzo Piano designed home in 2015. While its institutional abandonment has, in a sense, left the building adrift within the larger context of New York City's prestigious architectural and cultural landscape, these unusual circumstances locate Breuer's design within an unprecedented position in the ongoing negotiation of art, architecture, and material culture in the discourse of architectural history and theory. Much of the existing scholarship dedicated to the Whitney has focused on the influences of its founding family, its directors/curators, and its various architects without taking a comprehensive stance on the interrelation of these actors. As a mid-century environment designed for the display and contemplation of the art of its time, the Breuer Whitney's agency has ultimately contributed to difficulties in adapting, expanding, or altering the building's physical presence while also exerting significant influence on the institutional evolution of the museum itself over the last 50 years. As such, this paper will extend beyond the biographic accountings associated with the Breuer Whitney to consider the building and its history as part of a larger networked, institutional assemblage whose key components including the museum's institutional structure, architectural presence, and relationship with its cultural context and critical public in New York City have parallel and interconnected histories. Through this lens this research seeks to provide an alternative interpretation of the historical conditions of the museum while also revealing a new understanding of the Breuer Whitney's current circumstances and unknown future.

Keywords: Whitney Museum of American Art, art/architecture, institutional history, assemblage, agency

Lauren is a PhD student in the Constructed Environment at the University of Virginia’s School of Architecture. Her work focuses on art museums and their constituent spatiality as sites for the formation of the "contemporary". Her research engages the inherent tensions between the various entities and institutions which define "the contemporary," the spaces which frame these processes, and how the resulting periodization of contemporary artistic production plays a role in our historical understanding of the world. She received her Bachelor of Science in Architecture at the University of Virginia and her Master of Architecture at the University of California Berkeley.
This research delves into the minutia of architectural experience in a (neuro)phenomenal sense. Phenomenology of architecture and aesthetic theory offered sophisticated empirical definitions and descriptions of architectural experience, for the better part of the 20th century. While there is an undisputable ineffable dimension to architectural experience, previously inaccessible processes are coming to light as the neurosciences tap into and unveil the complexity of our engagement with our surroundings — especially through the recently founded neurophenomenology (1996) and neuroaesthetics (2002), confirmations of previously theorized aspects and further revelations about its components can now be extracted. It is our view that such confirmations and revelations are particularly interesting for architectural theory as an area of scientific inquiry. In this research, these are considered adjuvants in our looking for evidence of experiential phenomena and instrumental in further theorizing their underlying components in a way that is methodologically and hermeneutically coherent throughout.

Once previously inaccessible components become apparent, is it then possible to venture into identifying evidence of architectural experience, in a similar fashion to how components of architecture can be considered evidence of a much larger phenomenon? From an architectural theory and historiography of architecture standpoint, the possibility of a retrospective reading of both architectural theories and architectural production as a result of the moment at hand is most enthralling. A retrospective reading of not only long-established theories but also of architectural authorship and production is, thus, proposed with this research. This is not intended to be and cannot be a neuroscientific study, but rather a historiographic exercise, a study of architectural experience in its artifacts, recognizing phenomena of embodiment within the materials particular to architectural production and those resulting from its in situ experience.

We propose artifacts are to be found in what are designated here the three parts of architectural experience: not unlike a succession of events over a timeline, the experiential intention embedded within the authorial production of architecture percolates onto in situ experiential phenomena, which in turn percolate onto the expression about experience in the words of others. To demonstrate architectural experience in its embodied and longitudinal nature, two examples were selected: Álvaro Siza’s Museu de Serralves (1991-1999) and Rem Koolhaas/OMA’s Casa da Música (1999-2005), in Porto, Portugal. One greater object of analysis per building is being composed — artifacts of experience are collected, characterized in their components and specificities, and correlations between them established.

Keywords: Architecture, experience, embodiment, architectural theory, historiography of architecture.
MAKING AND RECKONING: An Inquiry into the Relationship between Fabrica and Ratiocinatio in Vitruvius’s definition of Architecture

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Hayri is a Fulbright Scholar and Ph.D. student in architecture at the Georgia Tech, where he also teaches architectural design studios. He is currently researching the intertwined relationship between the six Vitruvian principles and his triadic structure of Firmitas, Utilitas, and Venustas through complexity theories. In a broader sense, his research interests include historiography of architectural theories, new materialism, design process, form generation, diagramming, formal analysis, shape grammar, and architectural representation.

Besides his concentration in architecture, Hayri is pursuing the Science, Technology, and Society certificate program. He is the co-founder and coordinator of the ConCave Ph.D. Student group in Design at Georgia Tech, and also the coordinator of the International Ph.D. Symposium 2020: Divergence in Architectural Research.

Vitruvius lays the foundations of his architectural theory by disclosing all the principles of the art of building - ‘disciplinae rationes’ - in the first three chapters of De Architectura. He defines architecture as a discipline born from ‘fabrica’ and ‘ratiocinatio’ in the first chapter. For him, architects should perform both to gain speed and authority in their works. In the next chapter, he lists and briefly explains his six principles that architecture consists of. Then, he adds that an architecture designed through these six principles must display qualities of ‘firmitas’, ‘utilitas’ and ‘venustas’. After the third chapter, he turns to more practical topics of architecture, such as describing the standards of civic structures, sun dials and machines, and he rarely mentions his theoretical concepts again. Vitruvius’s abstract concepts have held an enigmatic position for modern readers. Since the first copy of De Architectura was published in 15th century Italy, Vitruvian scholars have produced several interpretations of these terms, most of which contradict or challenges each other.

A proper reading of Vitruvius’s definition of architecture is essential to understand his theory in general and more specifically the relation between his six principles of architecture and his famous triad of firmitas, utilitas and venustas. Several significant Vitruvian scholars, including Barbaro (1567), Perrault (1674), Galiani (1758), Jolles (1905) and Watzinger (1907), analyze Vitruvian principles based on their interpretations of fabrica and ratiocinatio. Therefore, this paper questions the relationship between the two ambiguous in order to form a foundation for the study of Vitruvian principles in a larger system. Fabrica and ratiocinatio have had various translations, such as fabbrica, l’esperienza, craftsmanship, manual skills, making for the former term, and speculazione, il raziocinio, technology, reasoning, reckoning for the latter. Perrault’s translation as ‘practice’ and ‘theory’ for the first time in 1673 becomes the most accepted translation of the terms. However, calling them practice and theory does not end the semantic confusion over the terms. On the one hand, some scholars, like Frezouls (1989), interpret theory as the reflection on the practice; i.e. opus, and argues there is no theory without the practice. On the other hand, Wilson Jones (2009) argues that practice comes second after the theory, which is the creative act. Moreover, some other scholars are more interested in historical references of Vitruvius and compares his pair of fabrica and ratiocinatio with Plato’s ‘praktike’ and ‘gnostike’ (Pont, 2005) or with Greek dichotomy between ‘tekhne’ and ‘episteme’. While these individual interpretations challenge one another, this paper argues that reading them together builds a multi-layered view of fabrica and ratiocinatio. Both terms convey multiple meanings. Besides the literate review on Vitruvius’s definition of architecture, this paper utilizes a close reading of Vitruvian text and etymological analysis of fabrica and ratiocinatio as its methodology. Based in this multi-layered structure, this paper claims that fabrica and ratiocinatio perform simultaneously in design.

Keywords: De Architectura, Vitruvius, fabrica, ratiocinatio, multi-layer structure, historiography, design theory
A CRITICAL INQUIRY INTO THE ‘PROBLEM’ OF STOPPING IN ARCHITECTURE

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"Self-driving Uber Car Kills Pedestrian in Arizona, Where Robots Roam," reads a *New York Times* article of March 19th, 2018, one day after the accident. The fundamental problem of artificial intelligence has always been how the robot stops; not how to make the robot walk, say "Hello!" or "Good Morning!"; do things so complicated as to make us mumble in awe: "Wow!", but rather how not to act, how not to say "Hello!" at the right, or rather wrong moment. What is this moment? How can it be found?

This paper asks such questions in the context of design and architecture: How does architecture stop? How do we close a design process, or choose among different design variations? Such concern for stopping has persisted in history, even if it has been eclipsed by what could be called, perhaps redundantly, the ideology of self-generation. Architects are always busy discoursing about generation, how architecture should come about, by itself, NOW!, in an eternal present. Upon close inspection, however, we find that the desire for stopping has been there all along, creeping from between the building blocks of architecture, undermining the absolutism of self-generation. From the projectiles of Vitruvius foundering in mud to the 'hermaphrodite' forms of Ronchamp, and today, in our deceptively fluid digital age, there are architects who have paid as much attention to stopping architecture as they have to generating it. The paper highlights instances of stopping in history, from Perrault to Paul Valéry, Le Corbusier and the digital. The argument is that stopping is an event that can only be found during the design process, rather than an epistemological ‘problem’ that has to be solved, in general.

Keywords: Stopping, Generation, Architecture, Design Process
Chinese traditional 'architectural' drawing possessed a unique set of terminologies and geometric principles that were entirely distinguished from the Western Euclidean geometry that can be framed by the character tu (the Chinese character for drawing). This paper etymologically and geometrically investigates the evolution of Chinese traditional drawing concerned with the built environment, from around the Tang (618-907) and Song (960-1279) Dynasties to the early modern period in the twentieth century. The etymological analysis centres on the terms di pan, shi and yang. The geometrical analysis deconstructs the composition of a selected drawing in the Yang Shi Lei tu archives in the Qing Dynasty (1636-1912).

By doing so, this research reveals two issues. First, the terminologies corresponding to different geometrical forms respectively indicate associations between 'architectural' drawing and the philosophy of Chinese cosmology. Second, the arrangement of the geometrical forms in the visual picture plane facilitates expressions of the concepts of space and position in geometrical cosmology. Moreover, the 'architectural' tu itself as an entity situating in between the technical tu tradition and painting tradition, developed the architecturalization of pictorial languages.

Keywords: Chinese traditional 'architectural' drawing, tu, terminology, geometry, cosmology
This paper studies the evolution of representation of urban form from early visual drawings to orthogonal plans. It problematizes the process of prioritization of information while representing the city. Thus, it looks at the relationship between Figure Ground, understanding what becomes Figure and what remains Ground.

In early representations cities are shown as a staggering of selected icons, Figures on a nonexistent Ground. Later in the sixteenth hundreds, shifts in the political governance lead to an increase of land value. At this point, representing cities in a visual manner is no longer efficient. A precise method is needed to record land in order to demarcate, manage and mark ownership. With the discovery of measuring techniques and tools, cities are now surveyed and represented as an orthogonal projection. The evolution of this process takes place from the end of the Middle Ages until the eighteen hundreds. This paper traces back this evolution of representing the city as an abstraction, I will first look at early representations of Rome, where the origins of this transition have their roots. I will then proceed in unfolding political transformations that happened during the transitioning periods, since it is this shift of power that lead to the necessity of recording land for renovation, fortification and management purposes. For this I will investigate the Leonardo Bufalini plan that applied in the 1551 survey to map the city of Rome. After Bufalini, orthogonal projection as a technique of representing urban form wasn't used until the 1700s when the city needed a series of renovation projects and land demarcation after the wars of reformation. There is a reintroduction of survey plans and cadastral registry becomes an important tool for land management. Finally, I will end by analyzing Giambatista Nolli’s Nuova Pianta di Roma, where this technique reached its peak in terms of accuracy as well as influence all over Europe.

This evolution of representing cities is particularly important because it shows us that there is a clear transition from a visual to a surveyed measured plan which is triggered by governance. Orthogonal plans are the result of political gestures in the form of abstraction linking the governmental authority to the ground. Entities prioritized as Figure or Ground represent land demarcation and use; an instrument to quantify land and its commodities. Thus these representations not only define the way we design projects, the way we live in cities, but also the subjects that we become.

Keywords: Representation, Cities, Orthogonal Plan, Figure Ground, Nolli Map.
This paper investigates the divergent and conflicting effect of both ornament and its shadow on traditional architectural solidity. Classical ornament is well-known to support the constructive idea of an edifice. Its main elements and patterns, from the column to the entablature, have throughout the centuries conveyed the idea of its constructive system. Treatises, beginning with Vitruvius' *De architectura*, codified its proportions and disposition on key places of the facade in order to appraise, at first glance, the architectural solidity. Whatever may be the style – Doric, Ionic or Corinthian – whatever may be the purpose – church or palace – the moldings and sculptures are deployed in an overall decorative system which should be in adequacy with the constructive idea.

Yet, as architects systematized sculptural ornaments, they could not but face an inherent difficulty induced by the relief itself: its own casted shadow. If sculptural ornament is supposed to reveal tectonic and solidity, its shadow may have the power to affect this latter. How a mere shadow, ever-changing and moving on the facade, could endanger the solidity of a building and the mass and weight of the stones?

Based on architecture treatises, this paper will focus on a critical gap between two stances. First, we shall observe how Vitruvius and Alberti linked solidity with ornaments and their shadows, and if it was even of an importance for them. A second step shall bring us a few centuries later in the French 18th century when architecture borrowed from painting theories the question of aesthetic shadow. Beforehand, a mere precision on the definitions of the three terms used – solidity, ornament and shadow – may be useful to capture how shadows put at risk the architectural solidity.

Keywords: Shadow, ornament, decorative system, solidity
According to the theory of relativity, there is no essential distinction between mass and energy. Energy has mass and mass represents energy. Instead of two conservation laws, we have only one, that of mass-energy. (Einstein, Calaprice, and Einstein 2005)

This essay elaborates on the emerging amalgam of the biosphere and the techno-sphere as a single dynamical system.

In today’s sciences we pay a great deal of attention to the complexity of biological form and ecological formation. Analogies in urban research refer to cities as living (eco)systems, organisms or technological artifacts which follow the rules of an urban metabolism. All these narratives seem to suggest that all matter (acting and interacting) on earth belong to a complex whole and their physiological characteristics share common organizational physical laws which are rather dynamic and formless by their nature. A quantitative and qualitative theory for understanding these complexities and dynamics of such a condensed organization of urban organic and inorganic materialization remains elusive, however it’s impact on our planet is explicit and evident in various forms. Most of humanity lives right now in cities. Their organization of human society and the tendency of cities to grow put ecological pressure on the global environment.

The urban realm is an ever-unfolding amalgam of the biosphere and the techno-sphere within a dynamical system of materiality which threatens the concept of static form as an expression of physiological states. This formlessness is rather an expression (and empowering) of emerging patterns than an ambiguous loss of control.

This paper argues that developing a new theoretical measure of understanding the materiality of forms, and the formation of the urban realm(s) as the effect of a complex information system of interrelations seems to be necessary. The following text will discuss the trajectory through three major approaches: The philosophical concept of (New) Materialism in relation to discursive formations (A terminology developed by Michel Foucault), The scientific concept of Systems Ecology of Howard T. Odum and the theoretical concept of individuation by Gilbert Simondon. (Simondon 1992) Systems ecology grants a view to dynamism of the physical, chemical, economic and social forces in the field of urban morphological ensembles - the passive potentialities (energy storage) and the active transgressing forces (energy transfer) governed by the second law of thermodynamics. Odum’s understanding of urban energy cycles bears the potential to unravel the information patterns of an urban organism controlled by time.

Keywords: Theory of Urbanism, Ecology, Energy, Individuation
OVERSEAS MEDIA EVENT AS DICTATOR OF CONTEMPORARY CHINESE ARCHITECTURE: "TU MU: Young Architecture of China" in a World Media System

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Focusing on the first European exhibition staging independent Chinese architects "TU MU: Young Architecture of China," I investigate the process in which overseas architectural exhibitions instigated the recognition of the neglected, marginalized and suppressed Chinese "non-mainstream" architects both at home and abroad. Curated by the Europeans, the exhibition appropriated the peripheral Chinese practices into the discourse of world contemporary architecture, established the architects' advantaged position in the design market and academic institutions and ultimately empowered the creative class, instead of the state-owned institutes, to represent China on the world platform. In this research, architectural production is approached as a mediated culture phenomenon rather than the construction of physical buildings in a local setting. By analyzing the prerequisites of the exhibition in the Chinese and German media system and identifying the empowered institutions, entities and authors in constructing the narrative, I evaluate the Chinese participants as voiceless objects, problematize the issue of subjectivity, identity, and authorship in the established discourse, and address the continuous impact of the consolidated canon for the younger generations in the architectural circle today.

Keywords: Contemporary Chinese Architecture, Exhibitionary Event, Transcultural Communication.
Marisabel Marratt holds a BA and M. Arch from Princeton University, and has practiced extensively in architecture, interior architecture and scenography. She is a Ph.D. candidate in the History and Theory concentration of the School of Architecture. Her interests lie at the intersection of history and theory, science and technology studies, and design materialization. Her research centers on the post-war work of French philosopher of technology Gilbert Simondon (1924-1989), and his study of materialization as mode of existence, and as an emergent techno-aesthetics. She explores the resonance between this work and architecture, with the potential to contribute to the current discourse on history, emergence, and materiality. Marisabel also holds a Graduate Certificate in Science and Technology Studies from the Ivan Allen School of the Arts at Georgia Tech, and teaches architectural design studios and a survey course in the History of Modern Architecture. She is a member of the Executive Board of the ConCave Ph.D. student group, and Academic Coordinator for the 2020 International PhD Symposium, Divergence in Architectural Research.

"Without man, no machine; no machine without man" (Lafitte, 119)

When Jacques Lafitte, architect and civil engineer, publishes these words in Reflexions sur la Science des Machines (1932, 1972), he is writing across disciplines. The dedication reveals this work as the fruit of a collaboration, in which he invokes his progenitors and crisscrosses the movement of their lives. Calling forth the architect-engineer, the artist, the stonemason, the metalsmith, and the sculptor from his lineage, Lafitte arrives at his own reflection on the complex dynamic existing between human realities and that of machines, be that as means to our ends, as shapers of those means, and finally as the potent catalysts of a vital and ever-evolving creative force. "Machines": extension of man, integrating man himself "They are us; they are beautiful like us, and ugly like us. To shape them, to build them, is to build ourselves" (Lafitte, 119).

Observations of this dynamic are not unusual for the period, during which subtle polarizations are taking place, revealing that the machine's relationship to humanity, far from being resolved, is a matter continually addressed. While those under the thrall of the idea of progress are seduced by the myths of modernity and machines, others are threatened by heightened automatization, standardization and the reformulation of work-as-labor. This machinisme, variously understood as Taylorism, homogenization, and the highly choreographed organization of parts, is perceived as mounting an assault on the coherence of society and the preservation of human value(s). In this light, some would raise protective barriers between what is held most sacred to man and the venal mechanisms of objects and markets; still others launch a call to further abstraction, negating the idea that machines, by any definition, are aligned with human nature. Lafitte's Reflexions sur la Science des Machines does not polarize. Instead, it seeks to establish a middle ground from which to forge a new discipline, with a new methodology for engaging these polarities. He coins the term mechanology, proposing to construct a science of machines that reveals how human culture, alongside machines, evolves from the same logic, or awareness, of a shared energetic and material transformation. Into his system of classification, he situates the work of architecture as a primordial, genetic catalyst.

Lafitte's book gains little purchase in the world between the wars. Only in the postwar does the work awaken interest and acquire new resonance for a society captivated by the complexities and ambiguities presented by information theory, cybernetics and the expansion of the communications medium. A resonance is then drawn between Jacques Lafitte and French philosopher of technics, Gilbert Simondon. In his work, On the Mode of Existence of Technical Objects (1958, 2012, 2017), Simondon outlines technicity as a “mode of existence” particular to technical objects, by presenting the technical object as a field of operation, thus setting in motion an understanding of technicity as “ontological force.” (Hoel, van der Tuin, 2013)

Proposing a “chiastic” reading of this virtual meeting between Lafitte and Simondon, this paper suggests that navigating the chiasms, between the works of the two men, reveals a shift in the way of defining, structuring and imagining machines, be that as mechanisms, as organisms, or as some other all-encompassing existence. The premise of this paper is that taking a closer look at the crossing from the one to the other provides a subtler reading of the machine-organism dynamic, expands the framework for understanding phenomena of emergence, and may suggest a different approach to structuring a program of research in architectural history.

Keywords: mechanology, technicity, emergence, machine, Simondon
SYSTEMS EVERYWHERE: on the incorporation of the vocabulary of Systems Sciences in architectural discourse during the second half of the 20th century

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Michael’s research is focused on the 1970s when housing became an essential strategy for politicians, economists, and technocratic elites promoting national development in Latin America. His dissertation, "Systems of National Development: A History of Housing, Cybernetics, and Self-Organization," addresses technological ambitions in architectural work, economic policy, and the formation of local neighborhood organizations and solidarity movements. Before Cornell, he received a master’s degree from The Bartlett, University College London and a bachelor’s degree from the University of Colorado–Boulder.

Through a consideration of well-known architectural sources, this paper will focus on the way systems thinking infiltrated architectural writing in the second half of the twentieth century. Because the expansion of architectural theory in the 1960s and 70s shared the same conceptual stage as the advent of cybernetics, examples of this are everywhere. In fact, sometimes it is surprising how often architects and architectural writers rely on the language of systems sciences to describe the built environment.

For example, in K. Michael Hays’ anthology Architecture Theory Since 1968, the word “system” appeared 640 times. Alberto Perez-Gomez used the word 51 times in his short introduction to Claude Perrault’s Ordonnance to explain methodological changes occurring in 18th century France. There are other examples, of course: What Denise Scott Brown and Robert Venturi intended to learn from—far more than Las Vegas or Levittown—were “communication systems;” Jane Jacobs used complexity theory; Christopher Alexander said the city is a system not a tree; and even John Turner, an architect best known for self-build housing in Peru, used Ashby’s Law of Requisite Variety (more commonly known as the first law of cybernetics) to argue against corporate and state power.

As Ludwig Von Bertalanffy said in his influential book General Systems Theory, “systems were everywhere.” In this paper, I will untangle this complicated encounter between architecture and information sciences in two ways. First, I will show how systems metaphors have been used as a conceptual tool to define what has been called “architectural autonomy.” This includes writers who created a systematic traceable relationship between organizational protocols of architectural form to define architecture as separate from culture, politics, or ideology. Second, I will show examples of how systems have been used as an operative tool for the designer; specifically, architects and city planners who used new sciences of control to solve large complex problems.

Keywords: Systems, Autonomy, Cybernetics, Self-Organization
This paper looks to the investigatory work of Forensic Architecture as a model for ethically responsible and practicable architecture historiography in the twenty-first century. Departing from architecture history’s long-standing familiarity with events corresponding to long histories, this paper instead investigates the “split-second” event and the media platforms that mobilize it. A close reading of a series of videos and still-images comprising Forensic Architecture’s video-based spatiotemporal investigations reveals that the density of contemporary media has reconditioned our perception of the duration of historical events, as well as the spaces in which these events are thought to have occurred. Beginning with an outline of Forensic Architecture’s spatiotemporal model and the historical narratives it produces, this paper subsequently traces Forensic Architecture’s most recent investigations back to eighteenth-century precedents, making evident an historical trend toward increasingly higher “thresholds of detectability.” The emergence of a more general “forensic aesthetics” in the mid-1980s is then read as the seed of a historiographic rhetoric concerned with the ethical dimensions of both densifying and diversifying medias, as well as the platforms facilitating their circulation. Finally, Forensic Architecture’s investigatory work is presented as producing historical narratives in which dominant historiographic methods differentiating between speaker, content and reference are eclipsed, offering instead near-seamless continuity and an emergent opportunity to witness architecture history speak for the events and objects under its gaze. If Forensic Architecture’s investigations take place within the rectilinear frame defining the web-based video, then the investigatory work comprising this paper looks outside this frame and aims to better contextualize Forensic Architecture’s work as a historiographic model tuned toward new media in which twenty-first-century scholarship can be both formulated and disseminated.

Keywords: Historiography, Forensic Architecture, Media, Evidence, Method
/ Divergence in Architectural Research /

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