

Jonah Rowen
Spring 2018

Columbia GSAPP ARCH A6718
Buildings and Materials: Architectural Histories of Resources

Tuesday, 9am – 11am, Buell Hall 300S
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Office Hours: by appointment

Course Description

Architecture is made of materials. But where do those materials come from, and what types of labor and energy do they embody? As in the cases of more easily fetishized commodities, building materials' fabrication is often concealed beneath finished architecture. Prying open buildings and the parts they are made of, this seminar will look at the composition, production, and assembly of construction materials in order to consider materials' impacts from the perspectives of environment, aesthetics, and otherwise. Modern architecture is often characterized by the inauguration of newly available, large-scale manufacture of glass, metals (iron, steel, aluminum, as well as fasteners), reinforced concrete (and its nineteenth-century predecessors, branded “Roman cement” and “Portland cement”), plywood and other standardized components (two-by-fours, drywall, precast and post-tensioned concrete), plastics, and composites. Architects have often derived inspiration from those materials, and even used certain substances to imitate the appearance of others. By tracking how parts of buildings move from their raw states to specifiable names and numbers on construction documents and sites, this course will study the aesthetics of architecture through its components, finishes, and joinery, while retaining a focus on the labor necessary for putting those pieces together.

Today, such processes have become almost unfathomably globalized, to the extent that architectural material production and demand can stand as a proxy for the world economy. The environmental impact of cement production in the China, India, and the U.S., the world's largest producers, can be felt across the planet, and it has given rise to an entire field of research into waste reduction. The float glass industry, once localized in the U.S., Britain, and France, has expanded such that Asian firms send immense quantities of sheets to Africa and the Middle East. Bauxite, the mineral in which aluminum ore is found, has sustained the Jamaican economy since its discovery there in the 1940s, and the enormously energy-consuming process of reduction is powered by hydroelectric dams in Africa and Asia, where electricity is cheap enough to make aluminum production economical. Steel, cement, plywood, and even quotidian timber are routine fulcrums in geopolitical economic negotiations among the U.S. and other countries, notably China and Canada, recently. These are just a few of the entanglements that prompt us to interpret architecture on several scales at once, from the smallest construction details of joinery between individual elements, all the way to the vastness of global imports and exports. The goal of this course will be to interrogate architecture across scales by analyzing its production.

Course Requirements

The main requirement for this course will be a single, synthetic research paper. Students will propose a research topic that follows particular materials from their production to their implementation in architecture. The topic may relate to one of the subjects covered in class, or students may choose a different material to investigate in depth and discuss in relation to one or more buildings in which it is used. In any case, students should take a critical stance toward the material, its production, the labor and energy that it requires to be made, produced, and assembled, and the ways that it appears in architects', engineers', and builders' drawings, other documents, and buildings. Because the *process* of architectural construction plays such an essential role in this course, students are encouraged to include objects that are records or artifacts of production (architectural, constructional, etc.) in their research.

A one-page (250-word) abstract will be due on **20 February** outlining a proposal for the research paper. On **20 March**, students are required to submit a three-page beginning of the paper, along with a bibliography of sources.

Papers should include a mix of primary and secondary sources, the majority of which should be from

printed books, journals, or other formats that would stand up to scholarly scrutiny. Use any materials published exclusively online judiciously and skeptically. All written work should be the students' own, and any plagiarism will be grounds for automatic failure of the course. The paper should follow conventions of academic writing, including proper citation of all sources with footnotes or endnotes according to the *Chicago Manual of Style*: http://www.chicagomanualofstyle.org/tools_citationguide/citation-guide-1.html.

Each student is also responsible for a critical presentation of one or more readings for one week, using selected architectural projects or other visual materials. The presentation may or may not relate to students' final paper topics.

All students are expected to have done the readings for each week, and to come to class prepared to discuss them. Attendance and participation in class conversations is required.

Course Schedule and Readings

Note: All readings are available on Courseworks. with the exception of the following two books, which students are encouraged to purchase because of their pertinency to the course in general:

- Cecil D. Elliott, *Technics and Architecture: The Development of Materials and Systems for Buildings* (Cambridge, MA: The MIT Press, 1992).
- Tom F. Peters, *Building the Nineteenth Century* (Cambridge, MA: The MIT Press, 1996).

16 January
Introduction

- Georgius Agricola, *De Re Metallica* (New York: Dover Publications, 1950 [1556]), 1-24.
- Ken Alder, "Making Things the Same: Representation, Tolerance and the End of the *Ancien Régime* in France" *Social Studies of Science* 28 (August 1998) 499-545.
- Carl W. Condit, "Modern Architecture: A New Technical-Aesthetic Synthesis," *The Journal of Aesthetics and Art Criticism* 6 (September 1947): 45-54.
- Reinhold Martin, "What Is a Material?" in *Eero Saarinen: Shaping the Future*, ed. Eeva-Liisa Pelkonen and Donald Albrecht (New Haven, Yale University Press, 2006), 69-82.
- Ute Poerschke, "On Concrete Materiality in Architecture," *Architectural Research Quarterly* 17 (2013): 149-156.

23 January
Wood 1: Industrialization of Timber Processing

- Colin Thom, "Fine Veneers, Army Boots and Tinfoil: New Light on Marc Isambard Brunel's Activities in Battersea," *Construction History* 25 (2010): 53-67.
- Hentie Louw. "The Mechanisation of Architectural Woodwork in Britain from the Late Eighteenth to the Early Twentieth Century, and Its Practical, Social and Aesthetic Implications, Part I: The Period c. 1790 to c. 1860; Part III: The Retreat of the Handicrafts; and Part IV: The End of an Era," *Construction History* 8 (1992): 21-54; 11 (1995): 51-71; 12 (1996): 19-40.

30 January
Wood 2: Plywood, Laminated Lumber

- Christopher Wilk, "Building the Modern World (1920s-1940s)," in *Plywood: A Material Story* (London: Thames and Hudson, 2017), 105-145.
- Beatriz Colomina, "Unbreathed Air 1956," *Grey Room* 15 (Spring 2004): 28-59.
 - [recommended: Wilk, *Plywood: A Material Story* (rest of book).]

6 February
Glass 1: Crown Glass, Cylinder Glass, Sheet

- Michael Cable, "Mechanization of Glass Manufacture," *Journal of the American Ceramics Society* 82 (1999): 1093-1112.

Glass, Plate Glass

- Hentie Louw, "Window-Glass Making in Britain c.1660-c.1860 and Its Architectural Impact," *Construction History* 7 (1991): 47-68.
- Richard O'Connor, "Perfecting the "Iron Lung": Making the New Window Glass Technology Work," *IA. The Journal of the Society for Industrial Archeology* 23 (1997), 6-24.

13 February
**Glass 2: Float Glass,
Shatterproof Glass**

- David J. Bricknell, *Float: Pilkingtons' Glass Revolution* (Lancaster, U.K.: Crucible, 2009), 1-11, 40-55.
- Alfred D. Chandler, Jr., *Scale and Scope: The Dynamics of Industrial Capitalism* (Cambridge, MA:), 113-119.
- Jeffrey T. Schnapp, "Crystalline Bodies: Fragments of a Cultural History of Glass," *West 86th* 20 (Fall-Winter 2013), 173-194.

20 February
Metals 1: Iron
****DUE: Paper Abstract**

- Turpin C. Bannister, "Bogardus Revisited, Part I: The Iron Fronts; Part II: The Iron Towers," *Journal of the Society of Architectural Historians* 15 (December 1956): 12-22; 16 (March 1957): 11-19.
- Pedro Guedes, "The Iron Duke's West Indian Barracks," in *Additions to Architectural History: Nineteenth Annual Conference of the Society of Architectural Historians, Australia and New Zealand XIX* (October 2002): 72-94.
- John Ruskin, "The Work of Iron, in Nature, Art, and Policy," *The Two Paths* (London: George Allen, 1859), online at https://en.wikisource.org/wiki/The_Two_Paths/Lecture_V, accessed 14 October 2017.
 - [recommended: Carl W. Condit, *American Building Art: 19th and 20th Centuries*, Vol. 1 (New York: Oxford University Press, 1960).]
 - [recommended: Elizabeth Pigou-Dennis, "Utility and Beauty: Iron Architecture in Jamaica, 1800-1908," in *Function and Fantasy: Iron Architecture in the Long Nineteenth Century*, ed. Paul Dobraszczyk and Peter Sealy (New York and London: Routledge, 2016), 163-180.]

27 February
Metals 2: Steel

- Carl W. Condit, "Steel Frames," in *American Building Art: 19th and 20th Centuries*, Vol. 2 (New York: Oxford University Press, 1961), 9-39.
- Thomas J. Misa, "The Structure of Cities: 1880-1900," in *A Nation of Steel: The Making of Modern America, 1865-1925* (Baltimore: The Johns Hopkins University Press), 1998, 45-89.
 - [recommended: Colin Rowe, "Chicago Frame," in *The Mathematics of the Ideal Villa and Other Essays* (Cambridge, MA: The MIT Press, 1997 [1976]), 89-117.]

6 March
Metals 3: Aluminum

- Jeffrey T. Schnapp, "The Romance of Caffeine and Aluminum," *Critical Inquiry* 28 (Autumn 2001) 244-269.
- Mimi Sheller, "Introduction," "Mobile Homes," in *Aluminum Dreams: The Making of Light Modernity* (Cambridge, MA: The MIT Press), 1-31, 115-144.
 - [recommended: Sheller, *Aluminum Dreams* (rest of book).]

[Spring Break]

20 March
**Metals 4: Tin, Copper,
Brass, Zinc, Titanium, Etc.**
****DUE: 3-Page Beginning
of Paper with Bibliography**

- Kriston Capps, "The Architects' Dream Factory," *The Atlantic Monthly* (November 2015): 32-34.
- Mike Davis, *Planet of Slums* (New York: Verso, 2006), 26-37.
- Patricio del Real, "Slums Do Stink: Artists, *Bricolage*, and Our Needs for Doses of 'Real' Life," *Art Journal* 67 (Spring 2008): 82-99.
- Annette Lecuyer, "Precious Metal: A New Era of Bespoke Systems of Structure and Cladding Is Testing Metals and Architectural Imagination to Their Limits" *The Architectural Review* (October 2005): 44ff.
- Paul Stacey and Christian Lund, "In a State of Slum: Governance in an Informal Urban Settlement in Ghana," *Journal of African Studies* 54 (2016): 591-615.
- Adam Smith, *An Inquiry into the Nature and the Causes of the Wealth of Nations*, Book I (London: W. Strahan and T. Cadell, 1776), 13-36.
 - [recommended: Robert Neuwirth, *Shadow Cities: A Billion Squatters, a New Urban World* (London and New York: Routledge, 2005).]
 - [recommended: Claire Snell-Rood, "To Know the Field: Shaping the Slum Environment and Cultivating the Self," *Ethos* 4 (2013): 271-291.]
 - [recommended: Kerry Ryan Chance, "Transitory Citizens: Contentious Housing Practices in Contemporary South Africa," *Social Analysis* 59 (Autumn 2015): 62-84.]

27 March
**Masonry, Ceramics, and
Stone**

- Reinhold Martin, "Materiality: Mirrors," *Utopia's Ghost* (Minneapolis, MN: University of Minnesota Press, 2010), 93-122.
- Charles William Pasley, *Practical Architecture* (Shaftesbury, Dorset, U.K.: Donhead Publishing, 2001 [1826]), 1-16.
- Andrew Ure, "Brick," *Recent Improvements in Arts and Manufactures* (London: Longman, Brown, Green, and Longmans, 1844).
- Kathleen Watt, "Making Drain Tiles a "Home Manufacture": Agricultural Consumers and the Social Construction of Clayworking Technology in the 1840s," *Rural History* 13 (2002): 39-60.
 - [recommended: Robin Evans, "Drawn Stone," *The Projective Cast* (Cambridge, MA: The MIT Press, 1995), 178-239.]
 - [recommended: Antoine Picon, "Stability and Construction," *French Architects and Engineers in the Age of Enlightenment* (Cambridge: Cambridge University Press, 1992), 140-185.]

3 April
**Concrete 1: Cement, Pre-
Reinforcement**

- David Hughes, Simon Swann, and Alan Gardner, "Roman Cement, Part One: Its Origins and Properties; Part Two: Stucco and Decorative Elements, a Conservation Strategy," *Journal of Architectural Conservation* 13 (March 2007; November 2007): 21-36; 41-58.
- Lawrence Hurst, "The Properties and Uses of Roman Cement," *Construction History* 18 (2002): 21-35.
- Andrew Wright, "Early Portland Cement: Its Use and Influence on Architectural Design," *Architectural Heritage* 22 (November 2011): 99-114.
 - [recommended: Robert Courland, *Concrete Planet: The Strange and Fascinating Story of the World's Most Common Man-Made Material* (Amherst, NY: Prometheus Books, 2011), 21-142.]
 - [recommended: Lawrence Hurst, "Concrete and the Structural Use of

Cements in England before 1890,” *Proceedings of the Institution of Civil Engineers – Structures and Buildings* 116 (August 1996): 283-294.]
◦ [recommended: Chandra Mukerji, “Tacit Knowledge and Classical Technique in Seventeenth-Century France: Hydraulic Cement as a Living Practice Among Masons and Military Engineers,” *Technology and Culture* 47 (October 2006): 713-733.]

10 April
Concrete 2: Reinforced & Post-Tensioned

- Adrian Forty, “Natural or Unnatural” and “Concrete and Labour,” in *Concrete and Culture: A Material History* (London: Reaktion Books, 2012), 43-78, 225-251.
- Sigfried Giedion, “Ferroconcrete,” in *Building in France, Building in Iron, Building in Ferro-Concrete* (Los Angeles: The Getty Center for the History of Art, 1995), 150-204.
- Kathleen James-Chakraborty, “Reinforced Concrete in Louis Kahn’s National Assembly, Dhaka: Modernity and Modernism in Bangladeshi Architecture,” *Frontiers of Architectural Research* 3 (June 2014): 81-88.
 - [recommended: Gregory K. Clancey, “Japanese Architecture after Nōbi,” *Earthquake Nation: The Cultural Politics of Japanese Seismicity, 1868-1930* (Berkeley: University of California Press, 2006), 180-211.]
 - [recommended: Carl W. Condit, *American Building Art: 19th and 20th Centuries*, Vols. 1 & 2 (New York: Oxford University Press, 1960, 1961)]
 - [recommended: Courland, *Concrete Planet*, 143-342.]

17 April
Plastics, Composites, and Textiles

- Wiebe E. Bijker, “The Social Construction of Bakelite: Toward a Theory of Invention,” in *The Social Construction of Technological Systems*, ed. Bijker, Thomas P. Hughes, and Trevor Pinch (Cambridge, MA: The MIT Press, 1987), 159-187.
- Arindam Dutta, “Cyborg/Artisan: On a Certain Asymmetry Deriving from the Binary System; or, Notes on a Moment in the Development of a Taylorist Feudalism,” *The Bureaucracy of Beauty* (New York: Routledge, 2007), 191-233.
- Mark Wigley, “The Emperor’s New Paint,” in *White Walls, Designer Dresses: The Fashioning of Modern Architecture* (Cambridge, MA: The MIT Press, 1995), 1-33.
 - [recommended: Daniel A. Barber, “Tomorrow’s House: Solar Housing in 1940s America,” *Technology and Culture* 55 (January 2014): 1-39.]
 - [recommended: Stephan Engelsmann, Valerie Spalding, and Stefan Peters, *Plastics in Architecture and Construction* (Basel, Switzerland: Birkhäuser, 2010), esp. 29-60 (“Plastics and Their Manufacture”).]
 - [recommended: Jeffrey Meikle, “An Industry Takes Shape,” “Design in Plastic: from Durable to Disposable,” *American Plastic: A Cultural History* (New Brunswick: Rutgers University Press, 1995), 91-124, 183-241.]
 - [recommended: Andrew Ure, *The Cotton Manufacture of Great Britain* (London: Charles Knight, 1836)].