Columbia University, GSAPP Adv. VI Studio, Spring 2020
Mimi Hoang, Adjunct Associate Professor
Eugenie Bliah, T.A.

FACTORY

"Ours is a collective time. The work of the autonomous artisan is being replaced with teamwork, and people have to be prepared for this collaboration where there is no hierarchy separating designers from producers. Collective rather than individual participation, the technical outcome of the craftwork of our day: industry."[1]

"Not products and technologies circulating in space but space itself is the operating system to manipulate or overwrite. Spatial variables are the crucial active forms in an extensive shared platform – at once information, technology, product, and pawn."[2]

… as in a spatial structure for the manufacturing of artifacts and shaping of exchanges.

Synopsis: Since the rise of post-modernism in the 1980s, the design of production has been a minor concern for architectural practice and discourse. Yet, over the same period, our relationship to work has dramatically shifted, raising difficult questions about how and where we work and who produces the things we consume. Technological innovations, the advent of green and automated manufacturing, the need or greed for higher levels of consumption, and the globalization of labor, have simultaneously outpaced architectural narratives and shaped contemporary spaces of production. In the midst of trade wars and xenophobia, skilled workforces capable of making the things we consume are disappearing from our ever-gentrifying cities, while the laptop-bound, co-working crowd is well serviced by low wage workers. The absence of 'real' work in large cities is perhaps as terrifying as our pervasive connection to work via our devices.

As we continue to raise our collective conscience regarding socially and environmentally progressive production practices, speculating about architecture's role in shaping the processes and geographies of production becomes critically important. What are the architectural corollaries and opportunities for innovation at the scale of the factory building, its spatial components and its relation to the city?

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[1] Lina Bo Bardi, "Industrial Art", in *Architecture Words 12: Stones Against Diamonds* (London, AA, 2013), 66-67.
[2] Keller Easterling, *Extrastatecraft*, (London, Verso, 2014), 232.

An Urban Factory – Spatial Structures for Manufacture and Exchange

Site: Our studio site is the Bush Terminal, which is located on the Brooklyn waterfront in Sunset Park. Built between 1905 and 1925, it was a massive and revolutionary intermodal shipping, storage, and distribution complex. As real estate prices have pushed garment production out of Manhattan's Garment District, the city is investing in the creation of a new garment district at the Bush Terminal. It's part of a larger mayoral initiative aimed at retaining the city's manufacturing, known as *Made in New York*. Our project will reconsider the entire Bush Terminal complex and envision a new future for it as a center for new industries.

Program: This studio will ask you to design an urban factory complex that creates collective spatial structures for the manufacturing of artifacts and the shaping of exchanges. Our work will require critical engagement with the many historical, social, economic, and technological contexts influencing the design of factories, and will ask you to re-frame these conditions as innovative spatial formats for manufacture in your architecture.

Format: You might develop a singular factory typology as an intentionally repeatable, mutable prototype or address the site as a comprehensive complex. Working in groups of two or three is highly encouraged. We will consider how each project connects to or informs that of your studio mates as the semester unfolds – ie. as exquisite corpse, as collage or as part of a master plan – with the goal of defining the unifying and anomalous criteria of each project in relation to the whole (ie. to the studio and the site) by the final.

Trip: Our current trade war with China is shifting garment production to Vietnam, the second largest exporter of apparel to the U.S., currently producing 14% of our textile imports. Our Kinne trip to Vietnam will serve as a window onto its regional architecture and global clothing production – a set of processes and locations that are largely invisible to us which nonetheless produce items that become an intimate part of our everyday life. On our way to Vietnam, we will use our layover in Los Angeles to visit US garment facilities.

Past and Future Revolutions – Modernism's Legacies

The west has witnessed two industrial revolutions, each accompanied by their respective periods of social unrest and progress. In the first revolution, innovations in the textile industry, such as the spinning jenny, flying shuttle, and the cotton gin, introduced mechanized labor, greater production speeds, new understandings of time, and new forms of social life. Machinery replaced home-based hand crafted processes with repetitive work produced in workshops and factories, and new types of industrial cities emerged, concentrating people, materials, and infrastructures. The advent of steel, petroleum, and electrical power prompted a second industrial revolution, and introduced a new scale of standardization, concentration, and production. A 'religion' of scientific management, Fredrick Taylor's systematic approach to workplace efficiency, emerged towards the end of this period. Taylor advocated the application of engineering processes to labor organization and treated the worker as a quasi-extension of the machine. These innovations in workplace organization and management increased productivity and efficiency, while lowering the level of skill required of workers. Increasingly dangerous work conditions, low pay, and unreasonable workloads sparked decades of labor protests spanning the two revolutions. Very slowly, progressive attitudes demanding safety in the workplace, environmental standards, shorter work-days, and the elimination of child labor, began to emerge in Europe and North America.

In response to a desire for speed and economy and workers' demands for humane work conditions, Modernist architecture embraced concrete and glass as ideal construction methodologies and material expressions of industry. Innovations in day lighting, ventilation, material economy, and streamlined construction methods reshaped the space of work, defining iconic Modernist buildings, such as Albert Kahn's factories for Ford, along with Candela, Nervi and Maillart's experiments with construction processes and techniques.[3] Reyner Banham's *A Concrete Atlantis* exhaustively surveys American industrial architecture, and argues that industry, whether real or romanticized, served as Modernity's muse.

How the Other Half Works – Re-shaping Production

In 1890, Jacob Riis exposed the horrific living conditions of the American working class in his book, *How the Other Half Lives.* His photographs propelled the city and nation's civic leadership into action – legislating standards for space, light, air, and sanitation. Just as the lives of the largely immigrant poor (constituting nearly half of NYC's population at the time) were invisible to the elite in the 1890s, the working conditions in Chinese, Bangladeshi, and Indonesian factories are likewise invisible to us now. Since nearly 60% of our consumer goods are made overseas, we are effectively outsourcing our air and water pollution and labor rights issues.

And yet, we are undergoing our third industrial revolution, which champions the maker class, sustainable processes, digital manufacturing, and the merger of production and creation, while depending upon automation and the devaluation of human capital. The coincidence of complex global supply chains, robotics, and the advent of maker culture seems to produce a strange disappearance of the spaces of production -- whether they are invisible to us because of their location on the other side of the globe or integrated clandestinely or deliberately into other types of work spaces. This strange invisibility creates an opportunity for architects to re-envision these places and advance a new, collective architecture for industry.

Center, Margin, Edge, Center (again)

Industry has long been relegated to the margins cities by design or due to political and economic pressure. These zones often occupied urban waterfronts, distant from downtown business cores, but strategically aligned with supply and distribution networks. At the turn of the twentieth century, some enterprises left American cities for small towns and rural areas, to avoid the labor riots and general strikes that regularly ignited and spread from factory to factory in the city.[4] In the 1960s and 1970s, industry again relocated to the suburbs, often aggregating into industrial parks, seeking lower real estate costs and refuge from the urban unrest associated with the civil rights movement.

In contrast, some mid-century industrialists supplemented industrial workplaces with facilities and programs for wellness, education and childcare – most notably, the Van Nelle Factory in Rotterdam and the Olivetti complex in Italy. This innovative programming, combined with an architecture of lightness and transparency, which made industrial production public and brought natural light into the workplace, explicitly expressed Modernity's opposition to the congested early twentieth century city. Adriano Olivetti believed that "the giant factories, the overcrowded metropolises ... are without a doubt the leviathans of our time, also destined to disappear to leave room for forms of life that are more

[3] Jeannette Kuo, "Space of Production", (Zurich, Park Books, 2015), 6.
[4] Howard Zinn, A People's History of the United States, (New York, HarperCollins, 2003), 321-358.

agile, more harmonious and, in one word, more human."[5] For Le Corbusier, the Van Nelle complex manifested "sparkling evidence of the life that is yet to come, of clean, absolute purity".

Another example of the shift of manufacturing from center to margin occurred in Manhattan. The developers and owners of luxury department stores pushed New York City's garment industry off of 5th Avenue in the 1920's, seeking a more genteel street environment free of immigrant workers. The garment industry defiantly organized and developed hundreds of loft buildings into a new Garment District, between 31st and 45th St. and 6th and 7th Ave.

This shift to the periphery has persisted. Zoning ordinances limit industry's encroachment into residential districts, but not the reverse.[6] As the revival and gentrification of urban cores emerged in the 1980s and continues today, edge conditions previously designed for manufacturing have been transformed into desirable places for domestic and public life. Development is again forcing the garment industry still further out – to new centers in Detroit, Los Angeles, and Asia. How do we re-center manufacturing within cities again?

Mono/Stacked to Polycentric Models

Two typologies dominate the evolution of factories and our industrial neighborhoods: the purpose built model for specific entities or processes and the speculative, stacked plate assemblies for nameless future tenants. Whereas the architecture of purpose built factories optimized the multiple processes and flows across production phases towards the making of one product, the speculative factory offered an abstract space for the production of anything and many things. Entire urban districts comprised of these Domino House-like frameworks, including New York City's Bush Terminal, the Brooklyn Army Terminal, Brooklyn Navy Yard, and the Garment District sprang to life within a span of a few decades in the early 1900s.

Several factors are shifting industrial spaces away from mono-spatial type towards polycentric models. A post-recession, renewed interest in hand-made, artisanal crafts has fueled a proliferation of maker spaces and a DIY ethos. On the other hand, a parallel trend towards automation eliminates the need for human labor in certain processes. It would be overly simplistic to compare both of these recent trends to earlier cottage industries, but by overlapping the realms of designer, producer, and consumer, they challenge notions of the specificity of industrial buildings, whether it is particular processes within the factories themselves or their location within cities. More significantly, the space of manufacturing has dispersed into a globalized network, disconnecting the place of design and engineering from its material source, production spaces, and dissemination networks. These factors, combined with a growing consumer and producer-driven insistence on sustainable processes, are driving a rise of small-scale manufacturing. What are the new spatial structures for our cleaner, more agile, hybridized and polycentric modes of manufacturing?

The Theatrics of Production

A prevailing trope in contemporary manufacturing spaces for luxury goods fetishizes transparency in an attempt to render the artifacts and social forces of labor visible. The factories for Vacheron (Tschumi) and BMW (Hadid) use vast expanses of glass to expose their internal processes in an attempt to demonstrate the trustworthiness of their processes

[5] Claire Provost and Simone Lai, "Olivetti Tries To Build The Ideal 'Human City' For Its Workers," http://theguardian.com, (April 13, 2016).
[6] Rappaport, Vertical Urban Factory, (New York, Actar, 2015), 72-94.

and products. In the case of VW's Glaserne however, one might be skeptical of the use of glazing as a metaphor for corporate transparency in light of their systematic deception of diesel-fuel car consumers. Given the highly controlled environment of contemporary industrial workplaces, with its real-time monitoring of people, materials, and processes that produces high levels of efficiency and social control, we should recognize our tendency to romanticize technology and the theatrics of production. How do we resist this impulse to simply make a spectacle out of the workplace?

A New Economy of Means

The desire for an economy of materials and means is evident in the 'beamless' floors, ribbed concrete slabs, thin-shell concrete, column-less sheds, moveable concrete molds, and curtain wall systems of Modernist industrial architecture. Equally inspiring are the accommodations for infrastructure, structure, ventilation, and daylight, developed through elemental components inextricable to the factory's architectural language and identity. Miguel Fisac's 'bone beams' and Felix Candela's 'umbrellas', for example, integrate structure, drainage, and lighting with the spatial configuration of their factories. This low-tech ethos stands in contrast to contemporary projects that make a spectacle out of industrial products, processes, and workers. Ironically, the highly prescribed mechanics of these contemporary projects are often choreographed within a flexible framework of generic floor plates and columns.

Therefore, the concept of flexibility, an inherent attribute of factory typologies, deserves our critical reevaluation. Adrian Forty traces three historical interpretations of the term flexibility: the first refers to the creation of spatial redundancy and excess capacity (i.e. spatial volume); the second extends the functionalist argument, generating an abstraction of space (i.e. the generic floor plane with reconfigurable components atop that enable specific use in De Stijl projects); and the third understands it as a concept that resists specific function, not as a building attribute, but as a political act by its users (i.e. Situationist projects).[7] How will you challenge generic notions of flexibility?

Critical Design Questions

The following questions should define the criteria you will use to develop your project.

- While Modernist factory architecture embodied and embraced efficiency and rationality as an ideal, what are the new spatial ambitions for the contemporary factory? How do you define these spatial organizations and metrics?
- How can we critically re-frame flexibility, in relation to specific spatial components and processes? Can we express new organizational structures and production processes by manipulating spatial determinants, with a real impact on how we work? This is the studio's essential paradox.
- How does the blurring of distinctions and compression of distance between different contemporary manufacturing processes reconfigure the abstract frameworks of stacked plates and infinitely repeating column grid assemblies that typically characterize industrial buildings?
- To re-center manufacturing in cities, how should we recharge industry's relationship to the water's edge (once critical for freight shipping via water) with new identities and exchange networks?

[7] Adrian Forty, *Words and Buildings*, (New York, Thames & Hudson, 2000), 142-148.

Factory Studio

Working in groups of two is highly encouraged, to address the complexity and magnitude of issues.

Week 0 **Lottery / Intro**

Weeks 1-2 **Manufacturing Processes and Buildings Precedents**
Pin-up: Mon. 2/3/19
Research, analyze, contextualize and project new possibilities, through original (re)drawings, of: a) a historic manufacturing technology / machine / process, related to the garment industry or other critical manufacturing industry; b) a Modernist era factory building (see Precedent list). Drawings to consist of lines only.

Week 3 **Manufacturing Processes and Ecosystems**
Pin-up: Fri. 2/14/19
Research, analyze, contextualize and project new possibilities, through original (re)drawings, of: a) a contemporary manufacturing technology / machine / process, related to the garment industry or other critical manufacturing industry; b) an urban manufacturing district / ecosystem / network that challenges the singularity and object-ness of the factory building. Drawings to consist of lines only.

Week 4-5 **Elements / Components: Flow of Material / People**
Mid-term: 2/28/19, 9am – 1pm
Develop prototypical spatial structures that move and organize: material (air, heat, waste, resources and/or goods) and workers.

Week 6 **Bush Terminal Siting, Vietnam & Los Angeles Research**

Week 7-8 **Kinne Trip & Spring Break**

Weeks 9-13 **TBD**

PRECEDENTS

PRE-MODERN AND EARLY MODERN

1104	**unknown**	**Arsenale de Venezia**
1775	**Ledoux**	**Royal Saltworks (Arc-et-Senans)**
1771	Richard Arkwright	Cromford Mill
1791	unknown	Slater Mill (Rhode Island)
1810	Bentham	Sheerness Naval Dockyard (proposed)
1830	Rennie	Sheerness Naval Dockyard (built)
1846	Hartley/Hardwick	Royal Albert Dock
1872	**Jules Saulnier**	**Menier Chocolate Factory (Noisel, France)**
1883	Solon Beman	Pullman Palace Car Works (Chicago)

MODERN

1905	Nimmons & Fellows	Sears, Roebuck & Co., Chicago
1909	**Peter Behrens**	**Turbine Factory, Berlin**
1910	**Albert Kahn**	**Packard Motor Co. Forge Shop, Detroit**
1914	**Robert Maillart**	**Pirelli & Co. Cable Factory, Villaneuva y Geltru, Spain**
1918	**Albert Kahn**	**Ford Motor Company, Highland Park**
1920	August Perret	Ateliers Esders, Paris
1923	**Erich Mendelsohn**	**Steinberg Hat Factory, Luckenwalde, Germany**
1923	Matté Trucco	Fiat Lingotto Building, Lingotto
1931	Van der Vlugt	Van Nelle Factory, Rotterdam
1935	Figini & Pollini	Olivetti Factory, Ivrea, Italy
1953	**Pier Luigi Nervi**	**Gatti Wool Factory, Rome, Italy**
1955	**Felix Candela**	**High Life Textile Factory, Coyoacan, Mexico**
1955	**Marco Zanuso**	**Olivetti Factories, Buenos Aires**
1963	**Miguel Fisac**	**Center for Hydrographic Studies, Madrid, Spain**
1965	**Miguel Fisac**	**Jorba Laboratory, Madrid, Spain**
1967	Team 4	Reliance Controls, UK
1970	**Louis Kahn**	**Olivetti Factory, Harrisburg, PA**
1979	**Eladio Dieste**	**Julio Herrera Obes Warehouse, Uruguay**

POST MODERN AND CONTEMPORARY

1982	Richard Rogers	Inmos Microprocessor Factory (Wales)
1985	**Roche Dinkeloo**	**Cummins Engine Headquarters, Columbus, ID**
1997	Jean Nouvel	Ferrari Assembly Plant (Maranello)
1999	**Abalos & Herreros**	**Valdemingomez Recycling Plant**
2002	Gunter Henn	Transparent Factory (Dresden)
2010	**Maupin & Hugon**	**Helicopter Building (Paris)**
2012	**SANAA**	**Factory Building, Vitra (Weil am Rhein)**
2014	Max-A	Cero-K (Chile)
2014	Herzog & de Meuron	Ricola Krauterzentrum
2014	Imagine	Tea Seed Oil Plant (Shangrao, China)
2014	**Erick van Egeraat**	**Incineration Building (Roskilde, Denmark)**
2015	Tschumi	Bacheron Constantin
2016	Vaillo + Irigaray	Lozy's Pharmaceuticals
2016	DnA	Brown Sugar Factory (Lishui, China)
2017	**Oppenheim**	**Muttenz Water Purification Plant (Switzerland)**
2018	**Sameep Padora**	**Concrete Void (Mumbai)**
2018	WXY	Brooklyn Navy Yard Industrial Master Plan
2019	Dhooge & Meganck	Camp's (Belgium)
2019	BIG	CopenHill Energy Plant
2019	Gad-Line + Studio	Zhejiang Factory
2019	**Studio VDGA**	**Star Engineers (Hanoi)**

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Required Readings

Banham, Reyner. *A Concrete Atlantis : U.S. Industrial Building and European Modern Architecture, 1900-1925*. Cambridge, MIT Press, 1989, Intro and 3rd chapter.

Bo Bardi, Lina. "Industrial Art". *Architecture Words 12: Stones against Diamonds*. London, Architectural Association, 2013, p. 66-67

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Dolkart, Andrew, "The Fabric of New York City's Garment District," *Buildings & Landscapes: Journal of the Vernacular Architecture Forum*, Vol 18, No 1 (Spring 2011), pp 14-42.

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Factory Typology
https://www.architectural-review.com/essays/typology/typology-factories/8691159.article

NYC Garment Industry
https://www.nytimes.com/2017/02/07/nyregion/new-york-garment-industry-brooklyn.html

https://edc.nyc/press-release/nycedc-and-cfda-announce-14m-expansion-fashion-manufacturing-initiative

https://ny.curbed.com/2018/8/9/17667488/new-york-domino-park-hunters-point-south-photo-essay

Factories, cities, and social life
https://www.theguardian.com/cities/2016/apr/13/story-cities-21-adriano-olivetti-ivrea-italy-typewriter-factory-human-city

https://www.nytimes.com/2019/08/28/t-magazine/olivetti-typewriters-ivrea-italy.html

NYC Site Visits - TBD
Bush Terminal
Brooklyn Army Terminal
New Lab, Brooklyn Navy Yard
Brooklyn STEAM https://www.brooklynsteamcenter.org/
Sunset Park Material Recovery Facility, Selldorf, 2014 (Sunset Park)

FILMS

Modern Times, 1936. Directed by and starring Charlie Chaplin. [A classic!]

Cheaper by the Dozen, 1950. Directed by Walter Lang. Screenplay by Lamar Trotti. Starring Clifton Webb and Myrna Loy.

Blue Collar, 1978. Directed and written by Paul Shrader. Starring Richard Pryor, Harvey Keitel, Yaphet Kotto. [The beginning of the end of American manufacturing. Dark and sad and beautiful.]

Roger and Me, 1989. Directed by Michael Moore [The classic documentary about the closure of the GM plant in Flint.]

The Last Truck, 2009. Directed by Bognar/Reichert. [Documentary about the closure of a GM plant in a small Ohio town.]

American Factory, 2019. Directed by Bognar/Reichert. [Documentary. Follow up to their earlier film.]