Graduate School of Architecture, Planning and Preservation
Columbia University

Everything Must Scale (5)

Arch 4105 – Spring 2021

Michael Bell, Professor of Architecture https://bit.ly/2nW6mCQ https://amzn.to/2MpeTwR

Pilot Travel Center, Fernley, Nevada

Everything Must Scale has been a working title organizing a series of four design studios that have explored a realm where architectural design is enacted at scale – in the economic sense of the term where commodities or services or even architecture are replicated over entire territories and as construction blocks of commerce and social organization.

We have designed for the future of fueling stations (truck stops) and micro/autonomous schools in prior studios. Support for our work has come from the Stanford University Urban Futures initiative and the Center for Design Research and also with tours and meetings at Tesla in Fremont & Hawthorne, California; and Sparks, Nevada (the Gigafactory).

Some of these scalar components are changing already – such as mobility – and as a kind of precipice agent they are a promise of more rapid change. Perhaps the actual – the eventual more meaningful change, is only possible with a chaotic still unclear ensemble of propellants.

Our studio is focused on the longer-term future; but we are working for the here and now. Our studio will explore one of these items with an eye towards how architecture can act as an enzyme to effect the wider field it participates in.

The work will be literal and based in exploring how we can update the nations network of fueling stations and truck stops– what do they become as they are electrified and are they even needed in the same ways or locations.

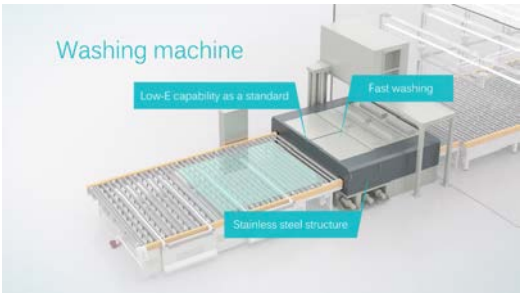
We will rely in part on a series of important studies that are in place already on de-carbonizing the nation's electric grid (for example) but also on the wider social network change happens within. On how this is a project that changes the city itself.

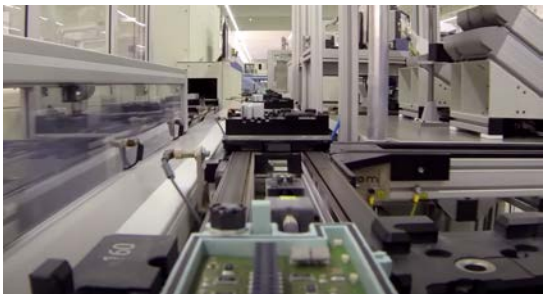
Climate Change & Automation (Joblessness) – At the Same Time.

Over the next decade projections for labor show immense regions of the United States facing large scale jobs loss and transformation of jobs due to the automation of labor.

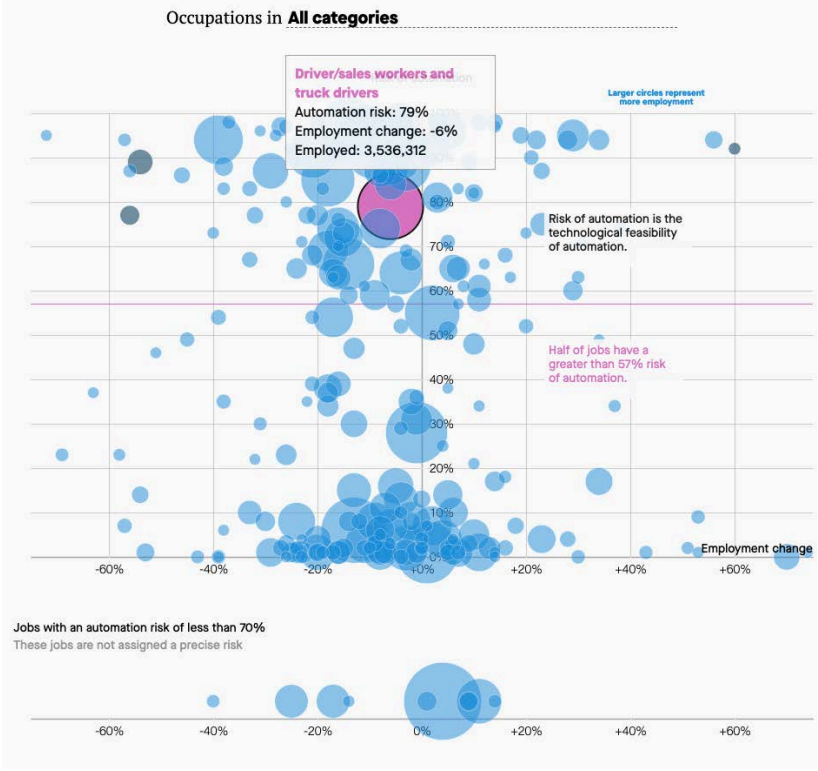
In that same period of time climate change will demand immense investment and innovation – physical change – to thwart irreparable damage.

While historical change is never fueled by a single vector we are seeing in our lifetime a persistent undoing of some of the fundamental structures of urban development. If automation reduces employment what will fund investment in climate change? What does settlement look like in this scenario? Our work on the future of the fueling station is our initial level into the future of settlement patterns.





Above: Automated glass processing – Glaston. Siemens, Automated factory: the product contains its own manufacturing intelligence/guidance.



Employment change from January to August, 2020, compared to automation risk
Data: Federal Reserve Bank of Philadelphia. Jobs represented by darker blue circles have an estimated range of automation risk of 70-95%; they are placed randomly in that range. Some occupations are outside the range of this chart. On the negative side: shuttle drivers and chauffeurs. On the positive side: physical scientists, all other; and interviewers, except eligibility and loan.

https://qz.com/1916388/the-jobs-most-threatened-by-automation-because-of-covid-19/

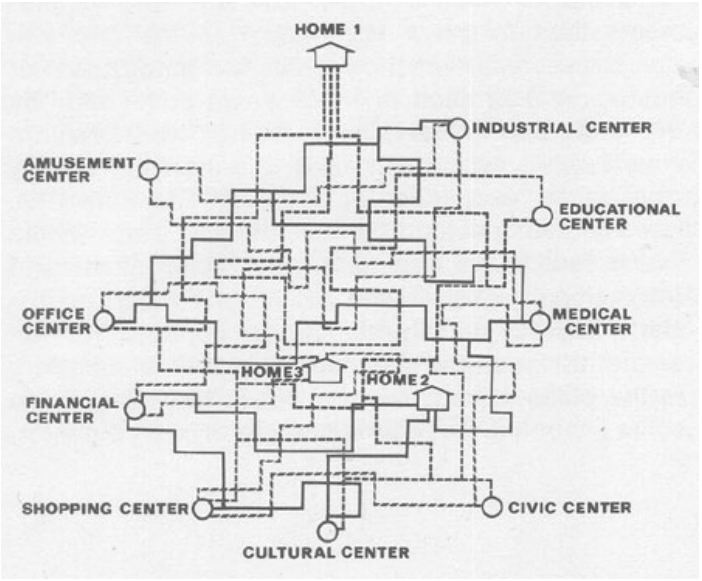
2020 – Has the past year been prelude to major transformation of settlement patterns?

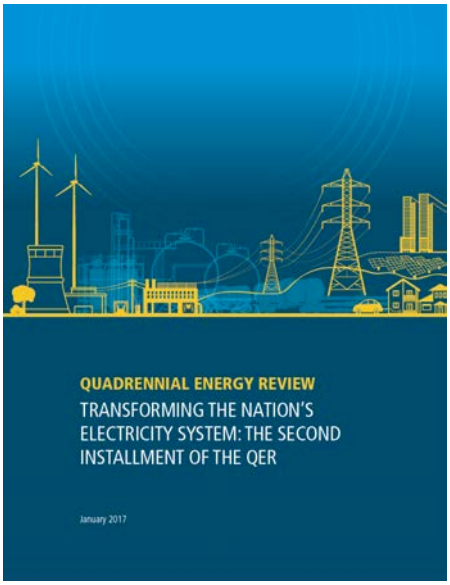
The ongoing COVID-19 pandemic has forced a profound shift in where and how we work and communicate – will this persist when the pandemic subsides?

Companies that were ready to provide remote services have flourished over this past year. Will this alter our long-term development patterns; the delivery of basic goods like food or energy or how we divide living and working? Companies with the means have distributed their work forces to remote sites – to their homes – many have gone so far as to say employees can elect to work from home indefinitely. In many cases there is a potential that this jobs that are now remote might in fact end up being automated – in effect the working from home scenario is a precursor to jobs loss.

In the major developed cities and their urban peripheries of the United States land accounts for most of housing costs – in California land is a far greater cost to housing than architecture. A building, as a component of housing, accounted for less than 30% of housing costs as the United States headed into the liquidity crisis of 2006. With automated and/or remote labor (jobs) reduced urban employment will we continue to be housed on expensive property? If COVID-19 and the distribution of work into homes and remote locations is even partially sustained what are the urban design implications.

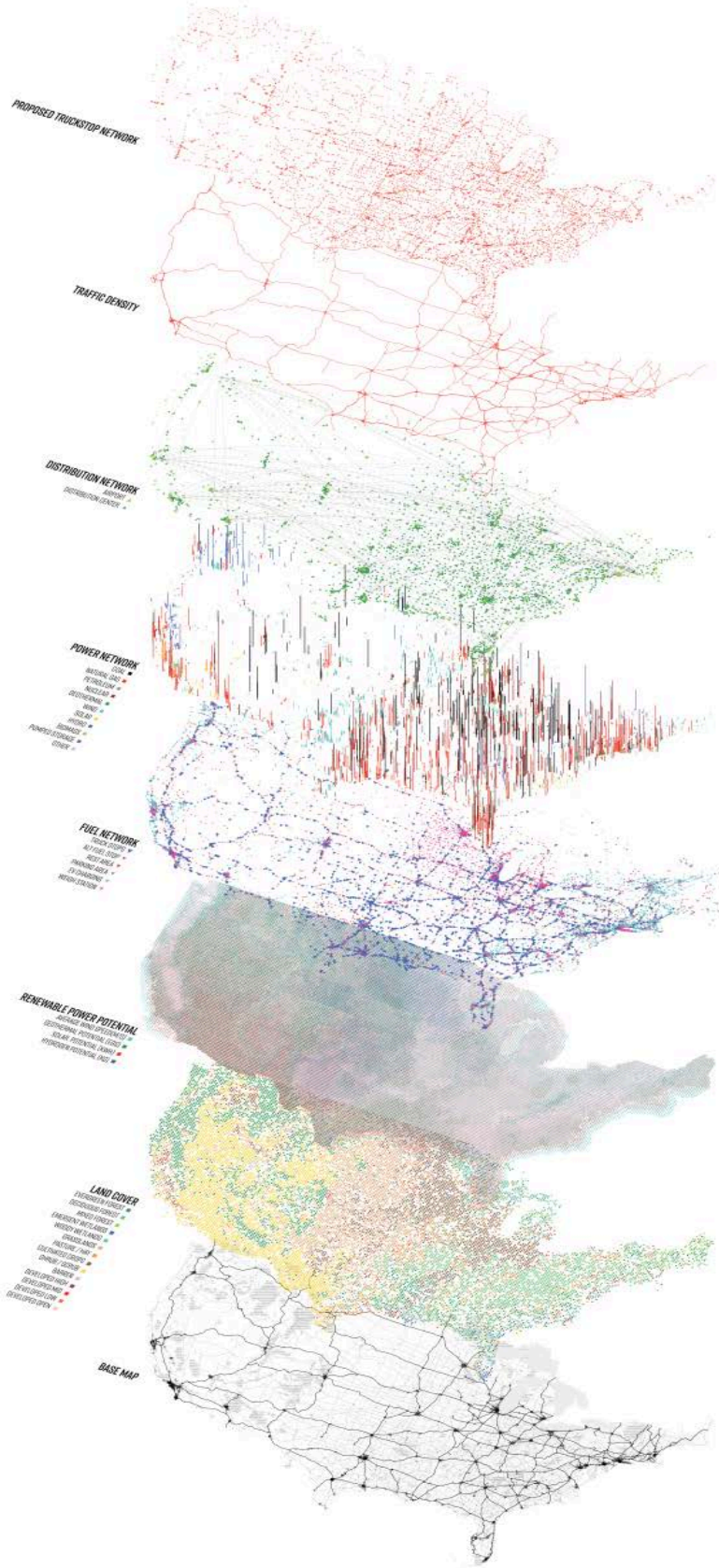
Our studio will design for scale but focus on the specifics of place, of site and need – in effect see where architecture becomes a lever in the wider matrix of change. Where the last century's settlements are remade by a new century's demands and innovations.





Above Left: Victor Gruen's diagram of the "suburban labyrinth" – will new forms of automation, mobility, climate change and working/shopping re-write the matrix of settlement patterns. Entire sectors of the post-WW2 urban network are being replaced, automated or eradicated. This leaves behind the architectural hardware.
Above Right: Quadrennial Energy Review, 2017. One of many sources to investigate the future of the electric grid.

https://www.energy.gov/sites/prod/files/2017/02/f34/Quadrennial%20Energy%20Review--Second%20Installment%20%28Full%20Report%29.pdf



Above: Michael Soberberg, GSAPP. Everything Must Scale 1 (2018)
–geo-locating fueling stations, carbon emissions and land cover / the United States. The scope of the architectural imagination is immense.

Above: James Piacentini, Mapping US fueling stations in coordination with landscape/topography. Everything Must Scale 2. 2019.

What becomes of the last gas station?

The last centuries gas station will increasingly be replaced by electric charging stations. Vehicles will be charged at work, at home, while shopping or at school – making an entire network of what was once 160,000 fueling stations to varying degrees obsolete. What will they become?

From the Department of Transportation to the Department of Energy; from within private industry and state-based planning and universities the questions of a new form of mobility are deeply underway. This is occurring in real time – and inevitably before we have a grasp of the urban design or settlement patterns before us.

Change is happening as a retrofit – lodged within existing patterns and updating an urbanism that is itself being outmoded at the same time. It's easy to imagine we will lose what was possible as we spend heavily on advancements that are soon to be obsolete. One example of this is heavily studied already: Amazon's network of distribution centers often, for example, follow existing wealth and disposable income patterns, existing freeway and shipping patterns. They follow the economy of today and where one finds a customer who can propel commerce. In this way the Amazon network may reinforce divisions and more so presume a future of consumption based in former patterns. It could prolong inequity as it replicates the existing metropolis.

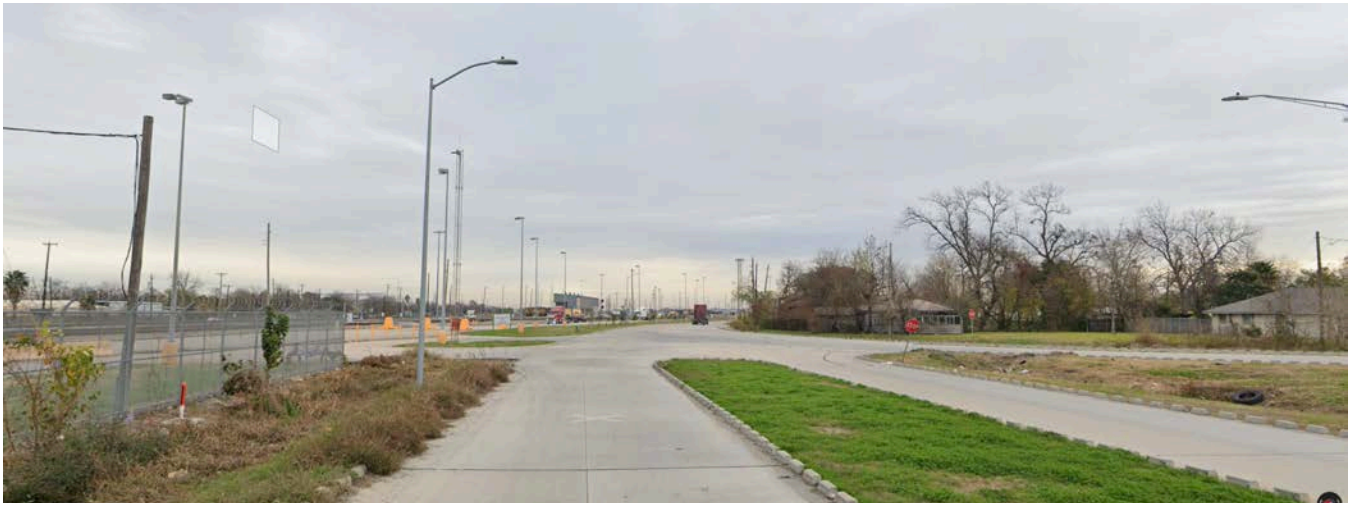
At issue is a project of the here and now; but also a need to see architectural invention as a seed of longer-term change. Our studio will focus on the future of the fueling station and truck stop as a node within the wider realm of distribution. Architecture participates in specific needs but has far larger implications.

A recent *New York Time*s article offered a journalistic view to this moment. The writers chronicled their travel by electric car – a Chevy Bolt – between San Francisco to Las Vegas. The trip required longer stays at a charging station – time to watch movies in the car but also a form of vulnerability while sitting at what were in effect truck stops. The story was not surprising – it was a harbinger, however, of the wider question of an entire architectural network of 160,000 former gas stations becoming something new.

Caption from NY Times: Tiaerra Young, a Chevy Bolt (electric car) owner, estimated that it would take her and her friend Sierra Williams a full day to get to Las Vegas from her home near San Francisco, normally a 10-hour drive. "It's been fun, though," she said. Credit: Philip Cheung for The New York Times.
https://www.nytimes.com/2019/06/22/business/energy-environment/electric-cars-charging.html

Ed Ruscha, Twentysix Gasoline Stations, 1963 (detail, Needles, California) Source: Gagosian Gallery, "There are things that I'm constantly looking at that I feel should be elevated to greater status, almost to philosophical status or to a religious status. That's why taking things out of context is a useful tool to an artist. It's the concept of taking something that's not subject matter and making it subject matter." —Ed Ruscha

https://gagosian.com/artists/ed-ruscha/



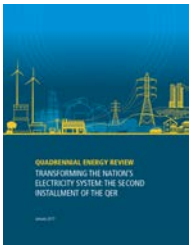
Terrain Vague: In 1998 Deron Neblett photographed Houston's Fifth Ward working with Michael Bell on the exhibition and building program 16 Houses: Owning a House in the City. The exhibition included Neblett's portraits of households and families and showed daily life against. The scale of Houston's infrastructure. Above: Neblett's photo of I-10 taken from Lockwood Avenue overpass; and today's Google Streetview. These zones where freeways meet rail me a domestic urban form have evolved over 100 years in the United States. What will they become next?

There is No Client for the What We Know is Possible – So will imagine one.

We will design for a future truck stop but also explore the wider context of what is being shipped, from where to where, for whom and by whom. The project will focus on both charging facilities for trucks but also private automobiles. It will also serve as a depot for package transfer to the "last mile" delivery. The project will be projective and offer a future to how we see what has been a standardized segment of infrastructure, machines and architecture but it's also a commission for today.

The studio will work with four major documents on the future of energy and mobility in regard to changes in issue of automation and climate change / energy provision.

Quadrennial Energy Review
https://www.energy.gov/sites/prod/files/2017/02/f34/Quadrennial%20Energy%20Review--Second%20Installment%20%28Full%20Report%29.pdf



Net-Zero America: Potential Pathways, Infrastructure, and Impacts
https://environmenthalfcentury.princeton.edu/sites/g/files/toruqf331/files/2020-12/Princeton_NZA_Interim_Report_15_Dec_2020_FINAL.pdf

Re-Think X Energy
https://www.rethinkx.com/energy

Re-Think X Mobility
https://www.rethinkx.com/transportation

Autonomous City and Factory (there are more people than imagined)

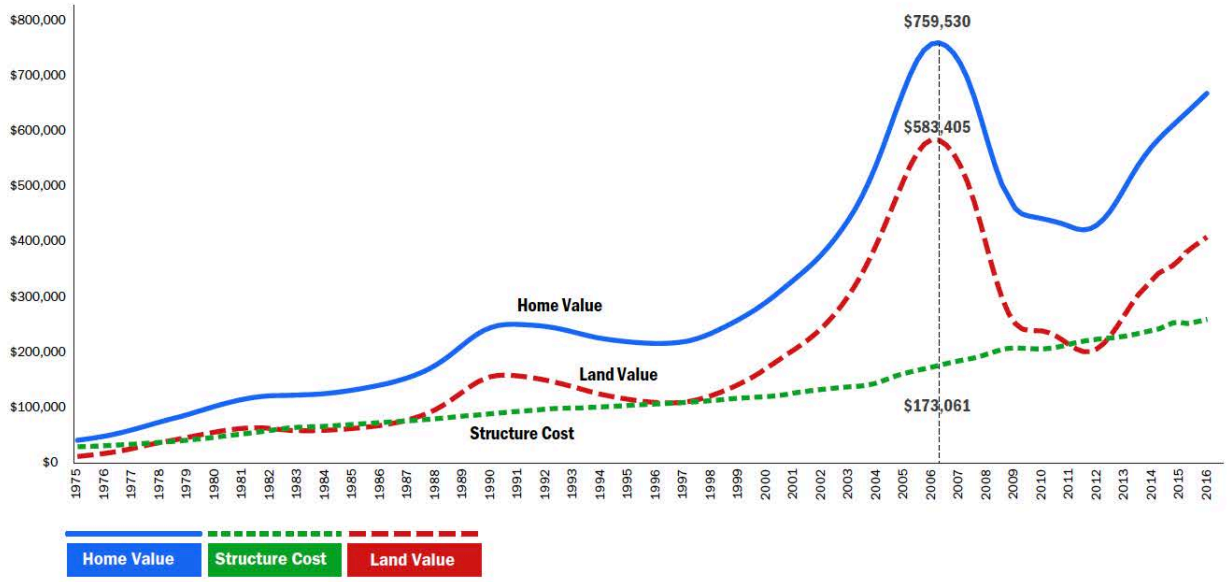
As new forms of industrial and urban development take shape in the context of Internet based commerce and retail; electric and possibly autonomous mobility; artificial intelligence, machine learning and robotic labor; and a rapid increase in local renewable energy production where and how we live and work is changing. The breadth and layering of technological change that is converging escape disciplinary boundaries and now deeply affect how we organize cities, social life, economic activity and increasingly settlement and architecture. Have we reached the limits of the software economy and are instead deep into a new version of the "valleys" mantra of scale; one that is becoming newly enmeshed with material, with architectural space and human experience. This new desert occupation east of Reno portends a newly robotic factory – a world apart from public spaces of all kinds but one that nonetheless demands a team of human workers who have full or part time residency.

What is their experience in this new form of development?

There is a clear evidence of an emerging new form of territory: a zone where work (and post-work) and domestic consumption (of all kinds) are for most of the population un-anchored and increasingly (if not severely segregate) from manufacturing and the physical-social aspects of retail space. Today Amazon runs more than hundreds of fulfillment and sorting centers around the world and in the United States (as of 2017) operated out of more than 240 million sq. ft. of offices, warehouses and data centers. The expansion of their real estate footprint has been in part fueled by the acquisition of Whole Foods creating a new presence in the everyday life of people, and blurring the boundary between net-based commerce and the physical architectural world. The wider physical presence of Internet-based commerce is by its very nature often hidden and private – indeed often based in a cartography divorced from historical forms of urban settlement and realized in distant relation to urban centers of the past. How the net meets the existing urban world is no longer a nascent matter – it is happening at immense scale.

We are not seeing the first installment of advanced industry in the desert landscape. The aerospace and defense industries have been based in the desert regions of California, Nevada, Arizona and New Mexico for a century. The Tahoe-Reno industrial development is at its outset not based in overt defense or the mechanics/physics of aerospace, but instead hosts private logistics centers and data centers and aspiring autonomous manufacturing. Four hours northeast of Silicon Valley they form a structure for perpetual delivery — a distant means to sustain

residential life without the Venn diagram of retail or other "social spaces." If the suburban matrix of home/retail/work spaces further collapses into home/work – as consumption commerce architecturally disappears we are left with a form of private domestic space and another of workspace that is likely more private (if not autonomous). Does work become less reliant on the places and geographic locations that historically drove industry (a river, a bay, a lake—a history of ice in the Great Lakes as a cooling means or food stabilizer)? Does housing continue to follow industry to remote locations where land is cheap and indeed barely part of the logistics save for privacy concerns? The Tahoe Reno Industrial Center coalesces around lower cost robotics and forms of digitally scaled commerce – yet it also converges with the hardware of the past century: highways, trucking, railroads and warehousing.



Above: A nucleus of development or a form of perpetual exchange and movement.

A New Economy is the New Site

Our initial focus will explores sites where both new manufacturing and new forms of autonomous labor are already influential. And where risk to a sensitive undeveloped landscape is under pressure.

We will initially focus on the **Tahoe Reno Industrial Center** and the I-80 corridor that is developing and the nature of the companies who form its economy and industrial technologies. Our initial studies will focus on the future of re-fueling stations for trucks and cars - for professional drivers and individuals and families.

To do this we will focus on cases where evidence gets closer to home. For example: Two recent acquisitions and a company that has a new product instigate architectural implications. They portend in scale and technology?

Above: Development along I-80 20 miles east of TRIC (Gigafactory). Land costs as component of housing costs in Nevada are a fraction of those in California.

Travel Center Programming

Energy Source: power generation.
- Fuel for Truck Stop Fuel for automobiles

- Travels Rest Stop
- Restaurant Shopping Hospitality

Private Care
- Showers Rooms Hotel

Business Center
- Meeting rooms Computer and Business Center

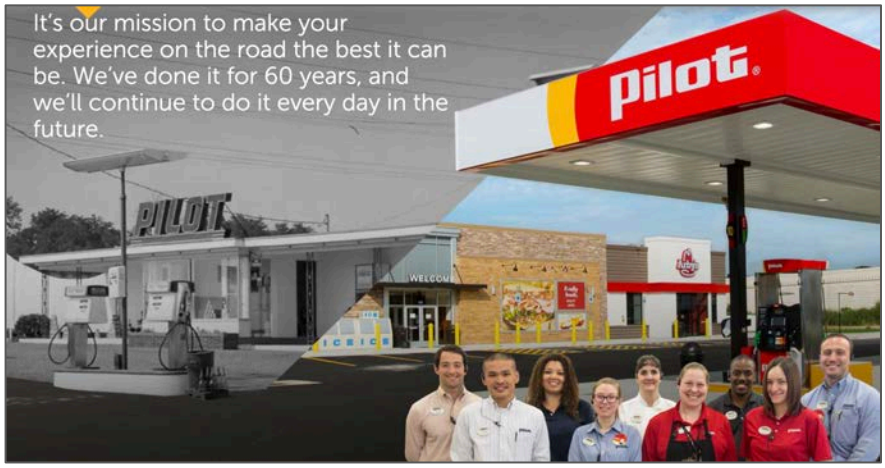
Shipping Transfer
Last Mile Exchange – depot Amazon Fulfillment Center

Follow the Money

Acquisition # 1 – What else could 750 automated electric fuel stations in 44 states become?

Berkshire Hathaway has purchased a controlling interest in the Pilot - Flying J chain of United States based truck stops. On one hand this is not surprising – Berkshire Hathaway has increasingly moved into holdings that essentially mirror the United States economy. The truck stop chain is essential for transportation and also ripe for reinvention. Electric, quasi-autonomous trucks and cars could mean an entirely new way to make wealth at these locations; but also the removal of fossil fuels would allow the former truck stops to become a fully new type of scalar asset. What do they become?

> *Pilot Flying J has more than 750 locations in 44 U.S. states and Canada selling gas, diesel fuel, and convenience goods, and offering trucks more than 70,000 parking spaces and 5,000 diesel lanes. While terms for Tuesday's transaction were not disclosed, Pilot Flying J is 15th-largest private company in the United States, with annual sales of $19.6 billion, Forbes magazine said. The family-run company employs more than 27,000 people.* *https://reut.rs/2zzPTJP*




The New American Truck Stop

Big chains are spending heavily to add services and salads — and new profit centers.

Flying J has been in the fuel business since the late 1960's, but did not get into the truck-stop business until 1979. Today it has 14 truck stops — which it calls Travel Plazas — and 29 more under construction or renovation. By the end of 1988, it said, 35 percent of its facilities will include motels and five will have restaurants and fast-food outlets. All will be new or remodeled.

Like many of the newer facilities, Sturbridge Isle almost defies definition as a truck stop. It sits on 30 acres overlooking two ponds and cost more than $6 million to build. There is a 300-seat restaurant, a 4,000-square-foot store stocked with gifts, electronic items and travel supplies, as well as a health spa, a laundromat and an ice cream parlor. In 1988 it plans to open a 110-room Best Western motel.


With Pilot Flying J Investment, Warren Buffett Bets Against Autonomous Trucks

Steve Banker Contributor
Transportation
I cover logistics and supply chain management.

Money and Engineering

Acquisition # 2 – <u>The future could be composed of fewer and more precise and composed parts.</u>

Berkshire Hathaway purchases Precision Castparts. Not well known in the general public Precision Castparts is, however, a company whose work is all around us. They are the leading engineering and manufacturing company to provide technically critical parts for jets or other high stress industrial machines. Their work encompasses a high degree of chemical engineering in materials; mechanical engineering and computational risk modeling. Berkshire's purchase of PC is again not complex – it's a valuable and essential company. But does its market grow in airplanes alone? Or is Berkshire cognizant of a need for this type of component – new markets for it. Our studio will assume the later – that our next economy could enable a new implementation of critical components in architecture, in vehicles, in infrastructure.

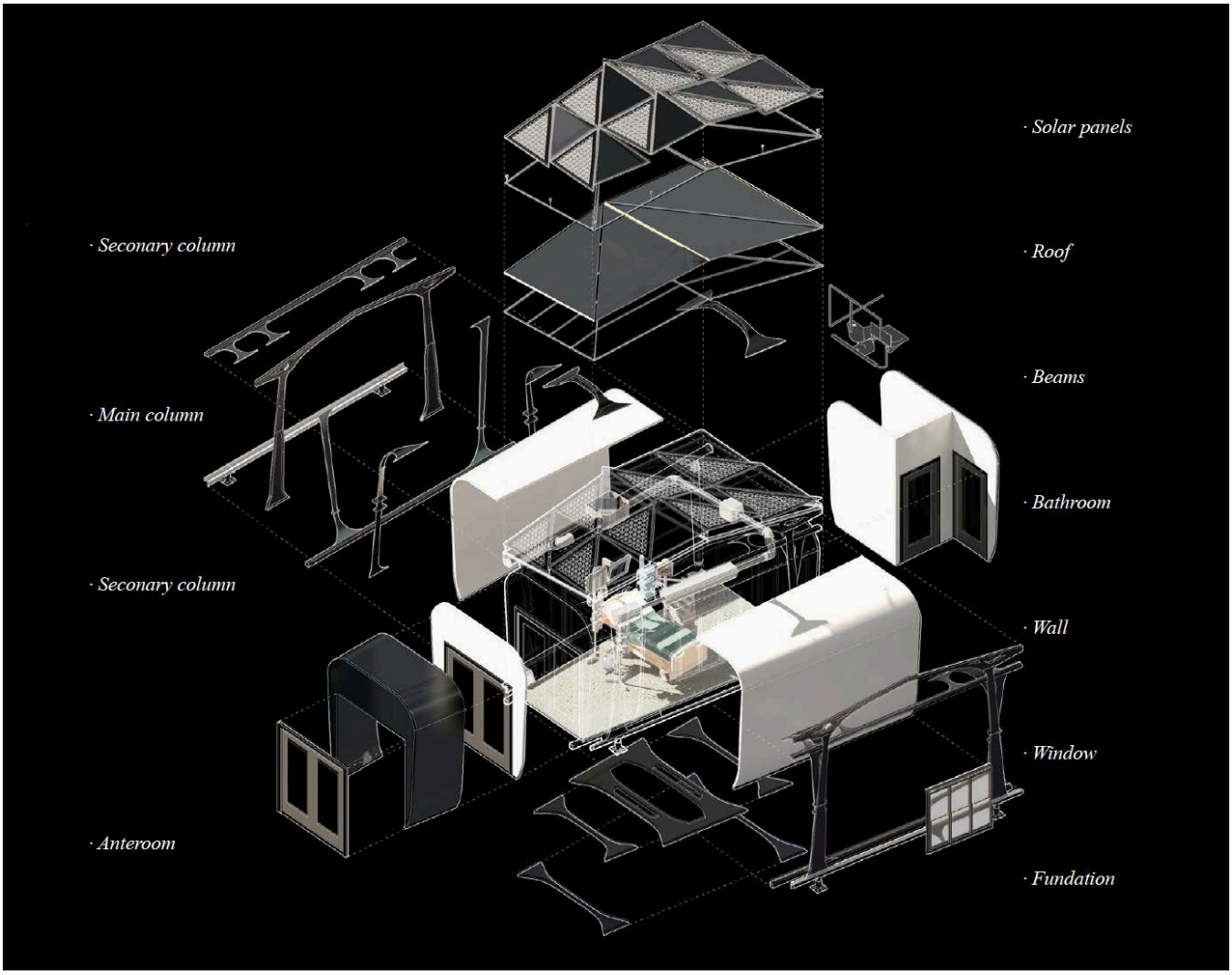
> *Warren Buffett is paying a hefty price for the biggest bet of his career as his Berkshire Hathaway Inc. (BRKa.N) has agreed to buy Precision Castparts Corp PCP.N, valuing the maker of aerospace and other parts at $32.3 billion. The purchase is Berkshire's largest, and accelerates its transformation from a company largely dependent on insurance businesses into one resembling the broader U.S. economy, including a railroad, several industrial companies, utilities, a car dealership and consumer goods businesses. The merger eclipses Omaha, Nebraska-based Berkshire's $26.5 billion purchase in 2010 of the 77.4 percent of the Burlington Northern Santa Fe railroad that it did not already own. https://reut.rs/2w2kHSX*

Foxconn launches its plans to build an electric car/truck battery, engine, chassis. Apple gets closer to launching an automobile. Rivian develops the first 100,000 electric delivery trucks for Amazon.

https://www.foxconn.com/en-us/mih-ev-open-platform

Above: Prototypes of Foxconn e-drive system; Rivian's Amazon electric delivery vehicle and electric truck chassis/battery/platform. P
Lower left: Precision Castparts

Below: Fan Liu and Haoran Xu, Everything Must Scale, 4, (2020), Liu and Xu sought to minimize the part count, reduce the Bill of Materials, for their rapidly deployable clinic. The integrated an air exchange, negative air pressure systems with a monocoque structural body to achieve this goal.



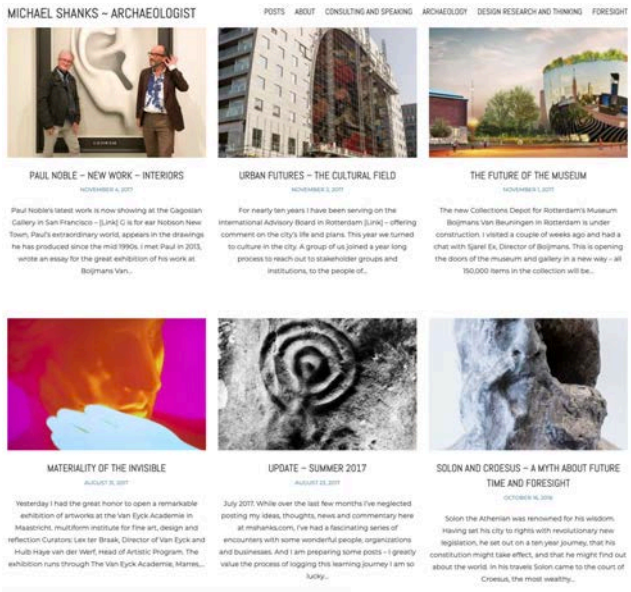
A Network of Engagement and Partners

Workshops with:

1 - Urban Futures Initiative – Stanford University

Professor Michael Shanks is an expert on historical aspects of urbanism and energy.
Workshop with Urban Futures Initiative; Stanford Archeology Center and d School.

http://www.mshanks.com/



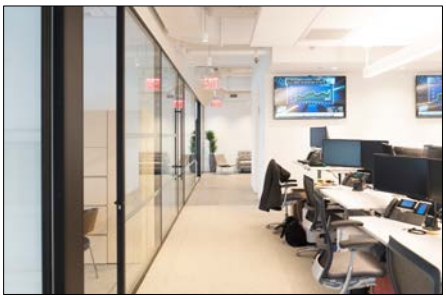
2 - Center for Design Research, Stanford Engineering

Chris Ford, PhD, architect and engineer.
https://stanford.io/2EYsKXa

3 – Gigafactory, Meeting with Tesla engineering team.

A 2018 visit to the Gigafactory – with GSAPP design studio and Tesla engineering team.

Empathy for the Workers / Empathy with Form – The Truck as a Mobile Office



Above Left: Near robotic electric trucks become quasi-offices.

Above Right: Merging the space of mobility with that of architecture, and interchanging and altering the professions we imagine for both. Dispensing volume-less electricity as opposed liquid fuels, the typology of the fueling station has rarely been an architectural focus (below are two rare examples, stations by Arne Jacobsen, 1936 and Jørn Utzon, 1986) but its future will merge with other historically architectural types forming a new network that will become the origin of a new urban experience. In 1940, Edward Hopper's painting "Gas" captured a moment of transition. Automobiles and new forms of mobility making the rural landscape less remote; what is the next stage in this development. Energy stations becoming distributed forms of urban life?

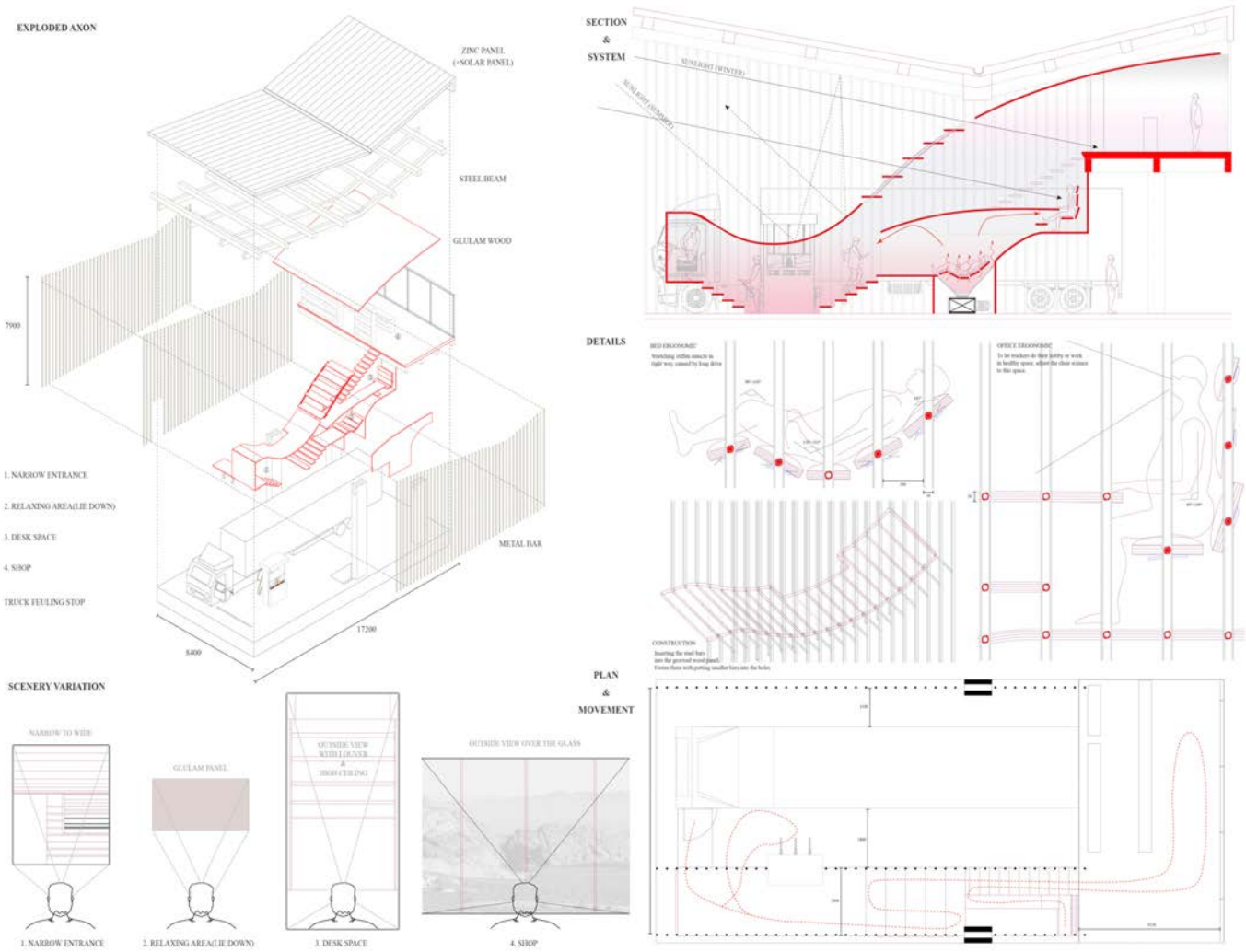
Empathy and Machines

In describing the presence of emotions such as empathy, sympathy or sentimentality in literature the Nobel Prize committee wrote that Ernest Hemingway's writing turned these emotion "inwards" – they are "not restrained, but vibrant below and beyond the level of fact and fable. The reader feels their presence, although they are not visible in the actual words. That is because of Hemingway's awareness of the relation between the truth of facts and events and his conviction that they produce corresponding emotions." Hemingway described his own path: "Find what gave you the emotion; what the action was that gave you the excitement. Then write it down making it clear so the reader will see it too and have the same feeling as you had."

Architectural ambitions in the realm of emotions and empathy are often presented as forms of anthropology or sociology; as data or attempts to understand the user by heuristic information, as a subject by means of power relations and techniques. Architects are often understated experts at invoking emotion, but given the professional stature of the discipline, we are also likely to understate the goal as professional or administrative. To speak of need, or meeting demands, or of solving a problem. We rarely discuss empathy or emotion directly.

In the Hemingway example, the conveyance of emotion is perhaps not a conveyance at all. Instead the detail of the "action" that gave the writer "excitement" – "if written down" – would in effect, regenerate the emotion anew – in the reader. Architecture resonates here – we are indeed a profession of details, we write (or draw) everything in an attempt to convey, generate, instigate emotion – the eventual quality of experience happens in our absence (when the work is complete). It is, only the detail that is left to generate the emotion.

Our studio will explore realms of empathy; at close range in terms of detailed equipment and industrial design; at the architectural / industrial ground of a future fuel (energy) stop / a mobility station; and at the confluence of macro-economic and technological change. The specific site brings all this to bear in a realm where people are increasingly living and working beside robots; where truck drivers are emerging from newly sophisticated near computer-driven trucks (if we still call them that) and where the public travelers mingle with the once gritty realm of trucking. Our studio will focus on the future of the nation's approximately 120,000 fueling stations and in particular a new form of fueling stations for electric and near autonomous would-be cars and trucks. Trucks today are re-emerging as quasi-robots; their interiors mirror high tech offices, and become in effect architectural as the drivers are more passive residents of motion.



Chang Jae Lee, Everything Must Scale, GSAPP. Everything Must Scale 1 (2018)
Lee's focus began with what he called empathy for the driver, Kinesthesis studies were made of the daily experience from driving to fueling to eating and rest.

What is a gas station after gas; what is a truck stop when trucks become near people-less robots?

Edward Hopper, **Gas**, 1940

Arne Jacobsen, Skovshoved, Denmark, Petrol Station, First opened in 1936
Jørn Utzon-designed petrol station, 1986

Prototype: A Private Fueling Station and Rest Stop

Kettleman City. California, Tesla Supercharger – the gas station becomes an airport private lounge.

Left: A former fast-food franchise becomes a private "energy" lounge. Safety, privacy, security – with ownership and transit.
Right: The customer is an advocate in global energy monitoring.

Rending / Model available @ Turbo Squid.

A Case Studio - The Tahoe Reno Industrial Center (TRIC)

http://tahoereno.com/

TRIC encompasses 107,000 acres / 167 sq. miles. *This equals 54% of New York City.
It maps twelve miles fronting I-80 the Lincoln Highway.

As the Nevada desert emerges on the eastern edge of Reno a massive industrial park serves as a testing ground to explore architecture's role in a landscape characterized by ancient natural formations and an immense new technological - industrial outpost that fuses Silicon Valley and advanced manufacturing and distribution.

The studio engages the quasi-placeless factories and aspiring automated and "lights out" (people-less) manufacturing and data centers of Google, Tesla, Switch and Blockchains LLC. We will work at the cusp – where industries are increasingly testing the edges of automation and in effect people-less architecture. But also, where there is a new fusion between mobility and architecture and where different constituencies mix in new ways.

TRIC aspires to be a new kind of manufacturing zone; and a new kind of highly automated distribution mechanism. Yet it also builds on the last century's infrastructure and is reliant on it. The development is adjacent the nation's first trans-continental highway, US I-80 – the Lincoln Highway. While it threads into historically critical infrastructure it also in effect is an immense challenge to the urban and architectural histories these infrastructures made possible. Instead of mobility enabling cities and dense urbanism will it now invoke a new occupation of mobility itself.

While emerging technologies are driving this form of real-estate development, the topology – the vast interiority of the industrial concerns and the enveloping expanse of the desert beyond – recall an entire genre of art that had taken the western deserts as their spatial genesis. Our studio will seek to understand the current site, and its technological / economic basis, while also re-exploring key works from art and architectural history that were based on issues of scale, and perception of immense scale. In aesthetic and social forms of empathy.
Note: these will be developed in the studio – see footnote for an example of readings we will explore.

In particular, how a small work of art or architecture becomes a lever on immense spaces.

Everything must scale addresses the scalar nature of architecture, its human dimension and its forms of empathy; in both the literally immense scale of TRIC, and the scale-less-ness of digital industries today. What is architecture when its subject is a robot; when the lights are off (no form?) but when it is nonetheless essential and perhaps the key to the entire equation.

The Tahoe Reno Industrial Center is hidden in plain sight (anti) epicenter of this form of development. An immense but also deeply private business park.

At the Tahoe Reno Industrial Center, we will explore how new forms of industrial interiority, newly automated sorting stations, data centers and advanced manufacturing, increasingly place new economy jobs and housing needs on the outskirts of even the extended suburbs and sprawl of past half century. While some of the companies are well known (Amazon, Tesla Gigafactory, Wal-Mart) others are less known yet increasingly based in the matrix of the new remote developments. The studio will investigate this as an architectural prompt – a new mode of architectural plastic space and experience.

Trade, commerce, fields of economic geography and technological or industrial change are not new to cities, but what is new in this era is a question of scale – both literal scale such as that of measure, but also in terms of the rapid expansion of a new product or technique. Scale as the key denominator in industrial development and product-marketing is here also driven by the deep integration of internet-based logistics, automation, communications and data processing.

Taken as a whole, Amazon is one indicator of the emerging conflation of the Internet and urbanism – a reorganization of social relations of all kinds and in any number of extrapolated indices. The wider picture of a burgeoning disruption of the economy has a deep well of scholars and analysts, but the issues of scale and newly visible urban impacts breach a threshold of everyday experience – we see side effects of change before us even when the drivers of changes are often invisible as it is in an Amazon warehouse or data center.

The site is a transit vector -- one of the earlier and still most important national highways. We will look at two forms of transit stops, for passenger cars and trucks. Both are being redefined in the new internet/physical nexus—to electric and possibly autonomous mobility and shipping.

Our focus will look towards new themes and mechanics of scale (in business models, in commerce, in geography +) and what remains or is newly possible in terms of architectural plasticity and human spatial experience in this realm.

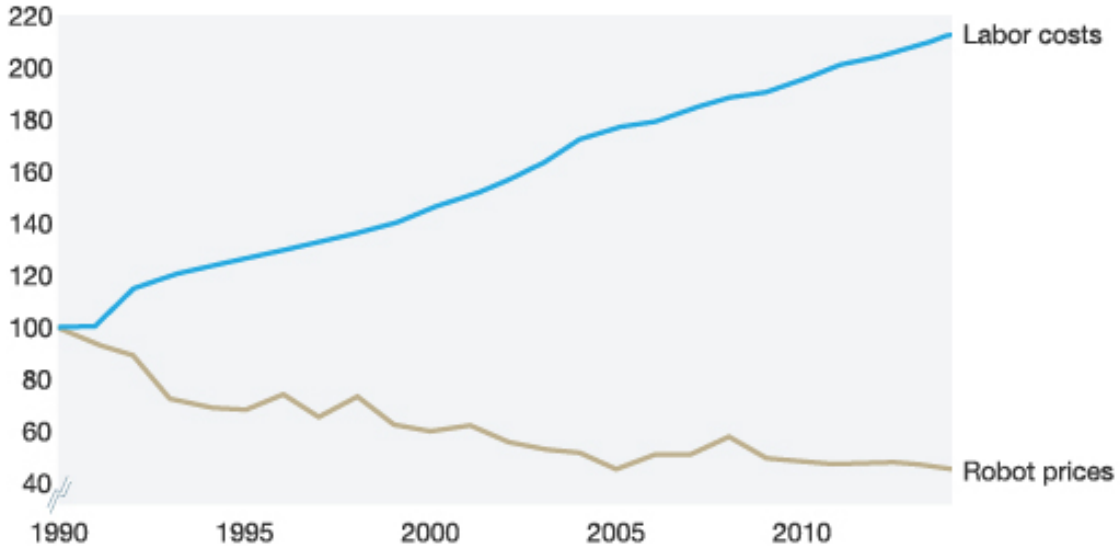
A Digital – Industrial – Robotic Desert. Distribution and Consumption is Changing (fast).

TRIC dwarfs the scale and its urban partner Reno. The studio site is within the 167 sq. miles, 107,000 acres TRIC development and desert adjacent the nation's first trans-continental highway, US I-80 – Lincoln Highway. The Lincoln Highway traverse the United States.

Amazon.com fulfillment centers: Will we find ourselves in a world where the intermediary of shipping and manufacturing are seemingly increasing disconnected from settlement patterns. A world of only home and work; or home and less work if labor is disrupted by automation?

Cost of automation

Index of average robot prices and labor compensation in manufacturing in United States, 1990 = 100%



Source: Economist Intelligence Unit; IMB; Institut für Arbeitsmarkt- und Berufsforschung; International Robot Federation; US Social Security data; McKinsey analysis

Site: Instant Permitting – 12 Miles of I-80

Here are our competitive advantages that no one in the United States can match:

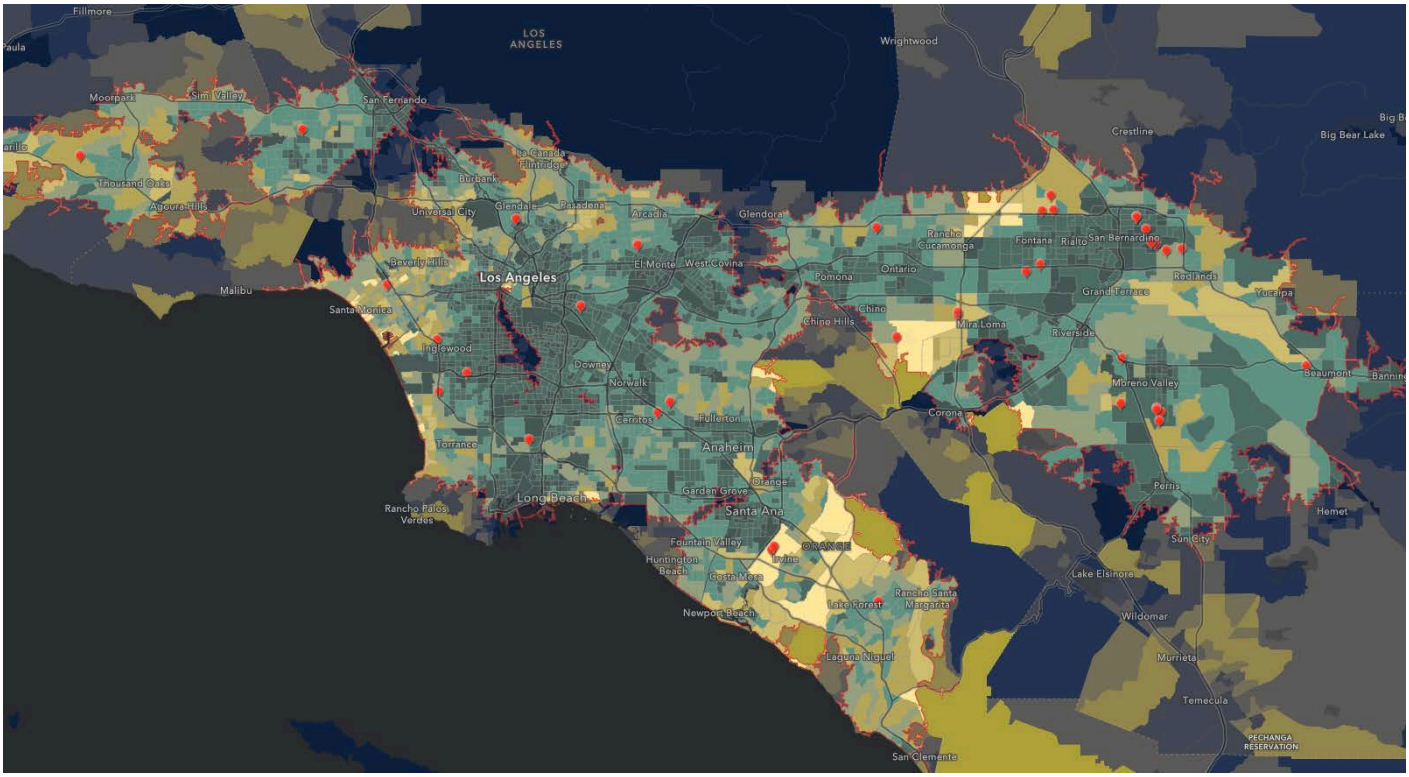
- The vast majority of industrial **uses are pre-approved**; rarely are special use permits ever required
- **Grading permits** issued within **7 days** of application
- **Building permits** issued within **30 days** of application Yes, you read that right! Just imagine, you could have your site graded, built and open for business within 180 days following close of escrow.
- **Roads** and all **utilities** (power, gas, fiber, water, wastewater, reclaimed water) are in place and built for industrial capacity

- A Berkshire Hathaway owned **power plant** is in the park with a capacity of 1100 megawatts
- Ample **water rights** secured and banked
- 12 Miles of dedicated frontage on the **I-80 corridor** and Union Pacific Intercontinental **rail line**, which is the central logistics corridor to and from the east coast
- Located in Nevada where there is **ZERO state income tax**!
- All land in the development is **owned free and clear**

Consumption and Geography

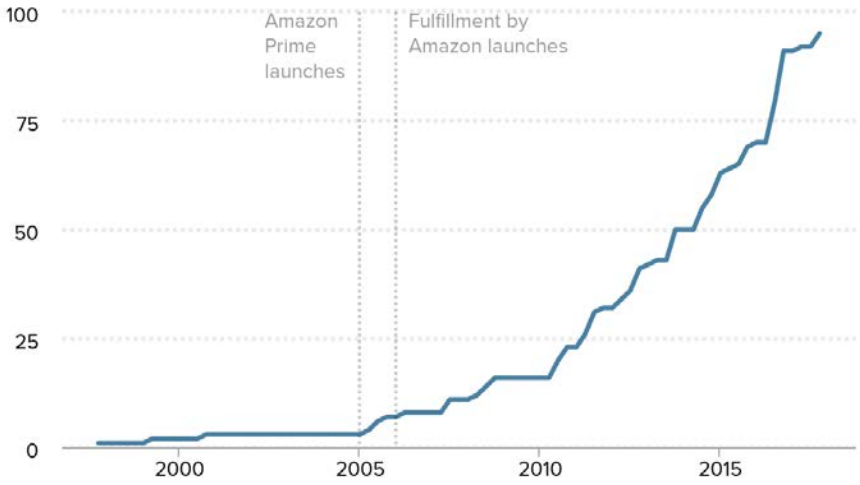
Amazon sells things and data services. While this may indeed be an era where manufacturing, distribution and consumption are more tightly woven it is an era that will increasingly rely less on stores, or retail and be less engaged with all form of intermediary between consumer and maker. This trajectory as it is portrayed to date upends a near century of suburbanization that gave rise to a single-family house (79 million in the United States) that was supplied by a Venn diagram of retail, schools, churches and public parks – architectural and social spaces the were between the home and the work place.

Do remote distribution and manufacturing sites such as TRIC portends a world of home and office and persistent delivery--. with little in between?



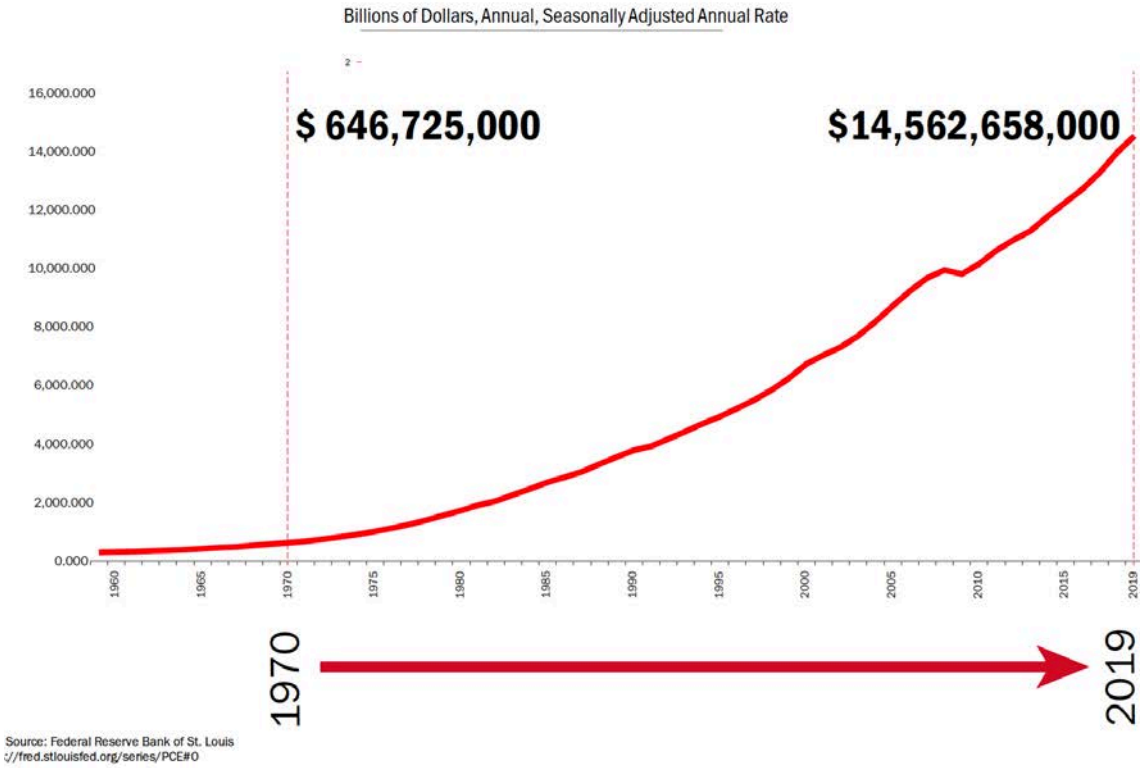
Total number of Amazon fulfillment centers

Cumulative openings, 1997—2017



Source: Fulfillment center opening dates compiled from Avalara ("Amazon Fulfillment Center Locations," accessed October 2017), Guided Imports ("The Complete List of Every Amazon Warehouse and Distribution Center in the World," last updated April 2017) and MWPVL International ("Amazon Global Fulfillment Center Network," accessed October 2017).

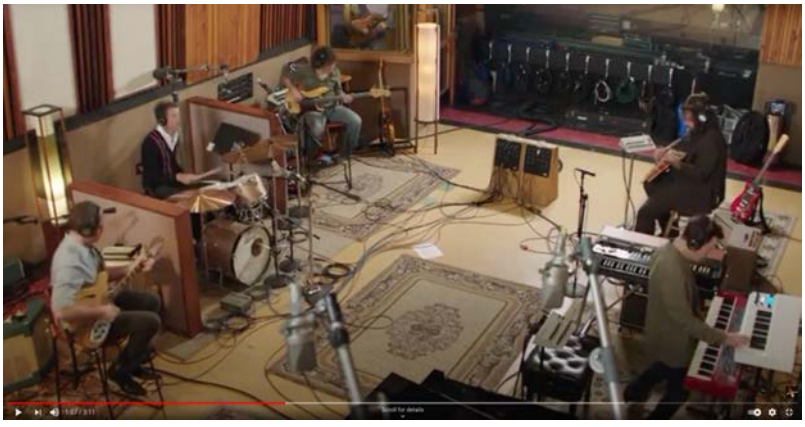
Economic Policy Institute



The Wider Context

1 The Interiority of Driving, Entertainment, Music - Architecture and the Room were Long Gone

Do architects work with the true complexity of imagination – mass cultures, entertainment, often rely on the most advanced forms of space, time and event – that supersede the often-elementary concepts of architecture.



Tenet – reversing time, a physics incantation of reversed entropy and a global story of neo-liberal trade of art and weapons told at scales that thrill and terrify.

Echo in the Canyon – the band is essentially live in the studio – but a mixing board quasi-segregates the players and instruments partially erasing the room. The listener knows this – hears it and likes it.

2 Energy as Site: The Design of Energy or Post Scarcity

"Unique electronic photograph of the sun in the extreme ultraviolet radiation from ionized helium (304 angstrom wavelength) taken 19 December 1973 by the Naval Research Laboratory's spectroheliograph aboard Skylab. The massiveness of the sun and its eruption is indicated by the comparison of it to the size of the earth. Theoretically, if it were possible to harness the energy of this eruption, it would have provided for all of mankind's power needs for the year 1 A.D. to the present – perhaps the next 2000 years

8 minutes from the Sun

Solar energy from the sun reaches the earth's surface in 8 minutes. Fossil fuels, oil and gas form over 250 – 350 million years. How do we imagine the 8-minutes as architecture?

Anyone involved in sustainability and energy knows these measurements and has long sought a transformation of our energy regimes. Whatever the goals the compensatory challenges have seemed intractably staged to stop change (and thus stage environmental calls for change as "revolts"). Blocking sustainability has been market based; there is too much easy money to make in the old energy regimes, too many assets based in fossil fuel protocols, too many stakeholders dedicated to the past. Whatever the source energy expenditures, as we know, are bound to the very nature of modern life. Divided into nomenclatures of housing / office / retail or mobility / production / leisure. Embedded or transitory. Communications and (solid-state) electronics (chips / transistors and batteries). Energy is our basis and every move removes something from the earth and re-releases it into the literal and social atmosphere. If sustainability has been an ethical question, we may concern ourselves with doing the right thing; if sustainability is a matter of survival, we had better find a path. Ethics tied to every step—anxiety and conflict. At the moment, however, most of us cannot stop moving or consuming. Anxiety and conflict have often been the sustenance of sustainability debates, yet, today, the global turn to renewable energy is not only mature but also perhaps bound to cause more change then we are prepared to imagine. Will a deep implementation of a renewable energy economy shore up old assets (houses, cars, offices et all) or will possibly instigate entirely new asset classes?

The economy of the past century dramatically reduced and induced scarcity of all kinds; from food to housing; fuel to land;

education to medicine. It simultaneously opened immense branches of low-cost communication and global communication.

How will the new renewable energy means meet new forms of intelligence, new networks for trade—they will allow us and reallocate energy as we have known it this past century.

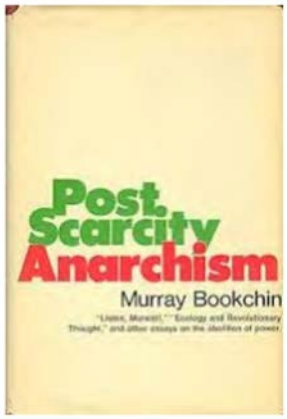
Photon Wealth

In this matrix the depth of economic upheaval – even since the mid 1990's when urban theory exploded inside architecture schools anew – has been stranger than fiction. The discussion of energy has theoretical foundations in architecture; what seemed surreal, such as Bataille's incantation of excess (energy), in the Accursed Share, is today imaginable but strangely it is arriving inside commodities such as energy products (solar panels, batteries, spray foam insulation, sensors), that at least momentarily are leaking innovation into the economy that has yet to fully map out their consequences. More broadly a focus on energy seems banished to a form of advocacy or potentially exploitive economies of scale – an energy performance contract such as those common in public housing that harvest and exports wealth from energy saving funded by an investor.[1] Renewable energy, if removed from the self-propagating realms of scarcity that sustainability often portends is an indicator of something that is not scarce. It is, in effect, barely measurable in its excess – non-denumerable.[2] Renewable energy at the

1 https://www.naesco.org/data/casestudies/BHA_CaseBriefFINAL.pdf

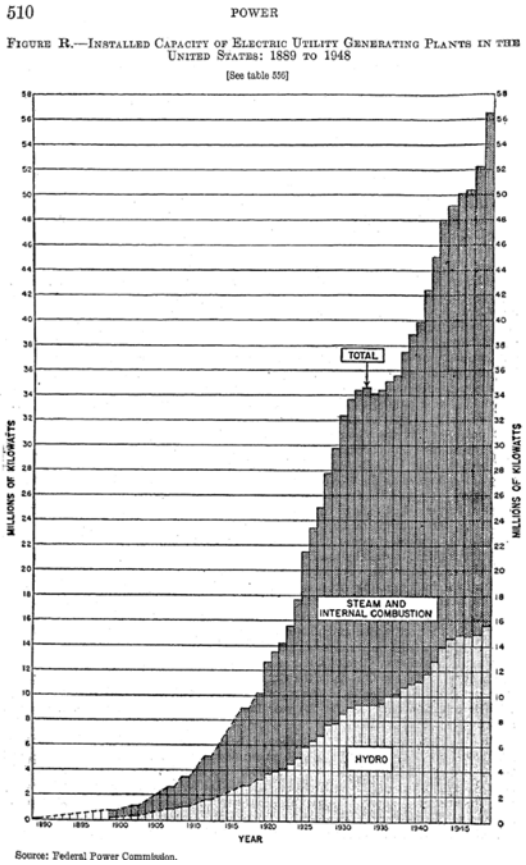
scale of solar energy is in effect architecturally scale-less, and more so, persistent – a ceaseless flood tied ultimately to the billions of years forecast for the Sun expected existence. The urban matrices of sustainability, as building code, as zoning, and in particular as tectonics, can make renewable energy newly scarce by in effect coding it back into architectural forms reliant on ancient materials, but also contemporary building practices and as a new way to monetize 20th century real-estate. Real estate practices only exist to orchestrate development as scarcity of land and architectural space, as scarcity of energy; they motivate labor and construction into realms of efficiency, and in effect re-meter the non-denumerable aspects of the sun's energy into architectural volume and mass – into real estate and its established forms of wealth – of ownership regimes. We are denying the literal excess before us if we do not find a way to make energy itself architectural and demonstrate its excess.

Will energy remain scarce – or does an era of deep renewable energy alter how we allocate energy, of all kinds. In the 1970's Murray Bookchin forecast a world where energy was not scarce. Foreseeing an era of energy abundance – and its potential affects Bookchin was also forced to revise his reliance on economic theories based on challenging scarcity.

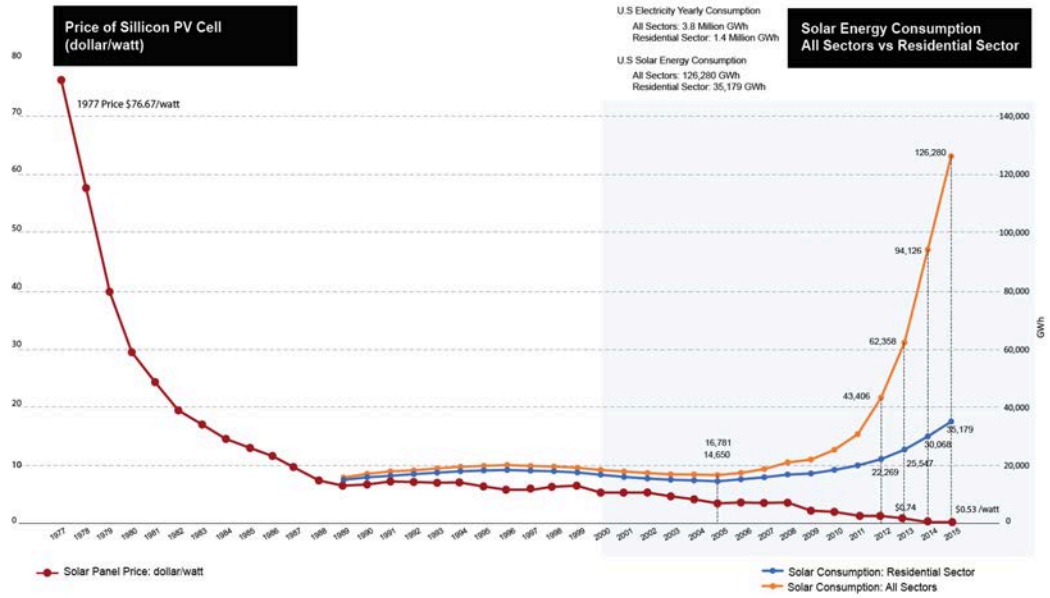


The term non-denumerable comes from mathematics and in part from a design studio I taught at Columbia University exploring renewable energy as scale-less question for architecture: Steven Cooke and Alexander Tepper, members of the studio, termed my description of renewable energy as non-denumerable. The studio was working with George Bataille's The Accursed Share, An Essay on General Economy. Bataille considered himself quasi-embarrassed by the subject of this writing, but nonetheless opened the text by calling his work "a book of political economy." He was not an economist nor a specialist in the earth's physics, but he nonetheless had a fully formed discourse on an economy of energy—on how humans power the world and indeed distribute and share assets. He offered a theory of political economy and described as false the scarcity and lack of energy apportioned by financial markets under the broader auspices of an economy driven by capitalism. Bataille in essence offered a theory that scarcity was a false concept in realms of energy and the earth. Bataille linked economic thought to the world's energy sources in a manner that supposed as fact that on a daily basis the surface of the earth received more energy than was needed to sustain life. The excess energy needed to be released and spent, indeed wasted to allow renewal and release of excess energy.

Quote: For some years, being obliged on occasion to answer the question "What are you working on?" I was embarrassed to have to say, "A book of political economy." Coming from me, this venture was disconcerting, at least to those who did not know me well. (The interest that is usually conferred on my books is of a literary sort and this was doubtless to be expected: One cannot as a matter of fact class them in a pre-defined genre.) I am still annoyed when I recall the superficial astonishment that greeted my reply; I had to explain myself, and what I was able to say in a few words was neither precise nor intelligible. Indeed, I had to add that the book I was writing (which I am now publishing) did not consider the facts the way qualified economists do, that I had a point of view from which a human sacrifice, the construction of a church or the gift of a jewel were no less interesting than the sale of wheat. In short, I had to try in vain to make clear the notion of a "general economy" in which the "expenditure" (the "consumption") of wealth, rather than production, was the primary object.



Above: the rise of eclectic power in the United States and the means of generating it often meant that industrialized energy was both necessity and commodity. It also meant it was deeply capitalized in ways that only the state could sustain. A future of renewable energy will likely be distributed and based in smaller scale commodity energy devices – consumer based and lower cost. Energy derived from photovoltaics has plunged in cost since the 1970's and today.

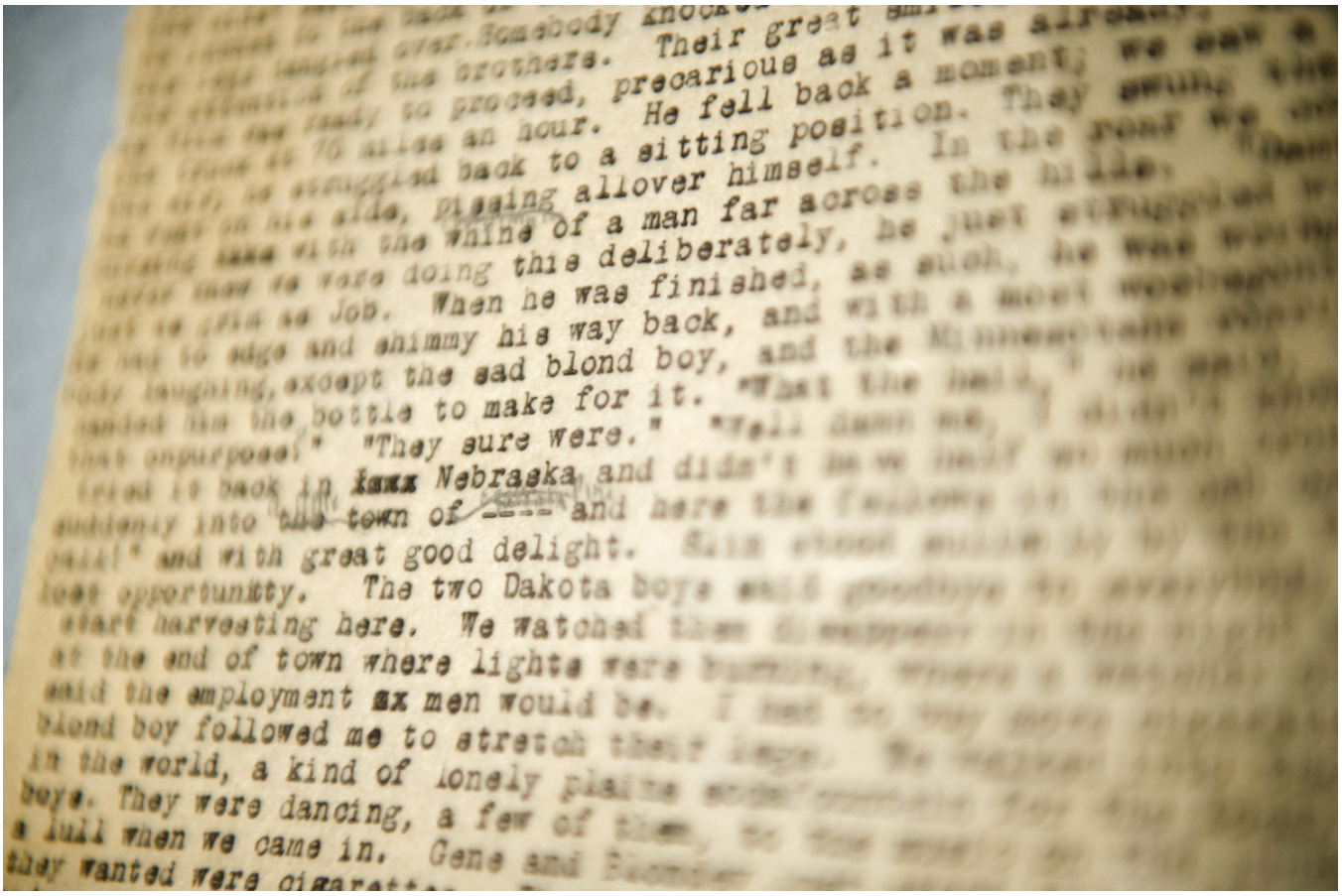


A declining logarithmic curve depicts Silicon PV cell pricing (dollar/watt). Lower prices are possible but they will arrive at slower pace. A rising exponential curve in solar energy consumption could accelerate in time, but what relation will that curve have to PV panel pricing? What assures this arc continues? Will growth in solar energy consumption require a new type of panel or more accurately an entirely new integration of energy production and building materials. A new and fully synthetic energy and building system – a conflation of mechanics, physics, chemistry and materials as well as new manufacturing.

3 A Literary Site: Jack Kerouac's On the Road was released on Sept. 5, 1957

Our studio site fronts US I-80 for 12 miles. I-80, also known, as the Lincoln Highway is the nation's first coast-to-coast highway.

Originating in Trenton, New Jersey and ending in San Francisco, California the highway encompasses the eastern industrial cities; Midwestern farms; near South Chicago and on to the great plains; deserts and mountains of the west. Released in 1957, Jack Kerouac's "On the Road" was written on Teletype paper – a continuous scroll of text. Kerouac's perpetual motion back and forth across the nation on the nation's coast-to-coast highways was in part enacted as the writing of the book.



On Jack Kerouac's On the Road; manuscript as photographed by Time magazine. https://ti.me/2eGCl9r

The Lincoln Highway: Trenton NJ to San Francisco, CA

4 Energy Density: Architectural Physics + Chemistry

Energy Density: Tesla's Gigafactory is a major presence at the Tahoe Reno Industrial Center. The factory's primary mission is to produce lithium-ion batteries for its automobiles. The larger context for this work, however, comes from physics in particular research into energy density. Simply put this is a concern for the amount of energy available or stored in a given system or volume/space. The scale of the Giga Factory links energy density in lithium-ion batteries with the commercial and manufacturing scale needed for Tesla to achieve mass production of electric automobiles. If taken to its larger context of matter and energy—that is, away from mobility or batteries the term energy density becomes available to architecture in ways that are distinctly historical and essential to our field. The Giga factory is an experiment in manufacturing and architectural density.

Architectural Physics: Aldo Rossi opened his 1981 book, A Scientific Autobiography, with an existential concern and in reference to physicist Max Planck's 1949 publication Scientific Autobiography and Other Papers. Rossi refers his architectural reader to Planck and the physicist reaction to a story he had been told as a young student enunciating the principle of the conservation of energy. Planck learns the principle by way of a story of a stone falling to the earth from its place within an architectural wall. The latent of energy accrued in lifting the stone to its height within the wall was released to tragic effect—it killed a passerby.

Rossi's autobiography characterized by a generation of academics as "melancholy" was shaped within a disillusionment with technical progress and the potential of society to change from within its later day scientific/technical, capital-driven means. Rossi's manuscript nonetheless infused or one should say witnessed in architecture a latent and unrevealed energy. In the face of a visually fragmented, inchoate, then late modern city--forged by a century of industrial evolution—architecture and the city were in large part revealed by their own disregard for human presence. The energy stored inside architecture (at its making) may allow a semblance of shelter of human life (within its walls), but it also disregards its inhabitants in the seeming monotony of its own self-perpetuation. Building do fail—decay--aside the passage of life, but in Rossi's appraisal the city was virtually autonomous; a self-regulated entity that ran parallel to but disregarded its inhabitant's lives--buildings endure beyond and precede human presence registering generations but seemingly withholding the promise of their making and embedded energy and labor. While not his goal, Rossi often was seen as a force that instigated a deep distrust of technology in architecture, and more so, a turning away from the capital or scientific aspects of materials in architecture.

Rossi described his awareness of Planck and more so his understanding of the term conservation of energy and entropy. Our studio will return to this writing to gage how it might open up new readings of our current world – that is the race towards new forms of energy density.

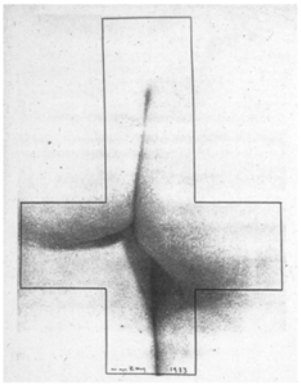
From Aldo Rossi: A Scientific Autobiography. MIT Press, The Institute for Architecture and Urban Studies, 1981, Page 1.

> *Certainly, a very important point of reference is Max Planck's Scientific Autobiography. In this book, Planck returns to the discoveries of modern physics, recapturing the impression made on him by the enunciation of the principle of the conservation of energy; he always recalled this principle in connection with his schoolmaster Mueller's story about a mason who with great effort heaved a block of stone up on the roof of a house. The mason was struck by the fact that expended energy does not get lost; it remains stored for many years, never diminished, latent in the block of stone, until one day it happens that the block slides off the roof and falls on the head of a passerby, killing him.*
>
> . . .
>
> *It may seem strange that Planck and Dante associate their scientific and autobiographical search with death, but it is a death that is in some sense a continuation of energy. Actually, the principle of the conservation of energy is mingled in every artist or technician with the search for happiness and death.*
>
> *In architecture, this search is also undoubtedly bound up with the material and with energy; and if one fails to take note of this, it is not possible to comprehend any building, either from a technical point of view or from a compositional one. In the use of every material there must be an anticipation of the construction of a place and its transformation.*

5 Historical Context – Scale-less Art (was ready for this moment)

Did the earthworks of the 1970's predate the decentered subject of the new industrial desert fortifications? A person on the sidelines of something that they are thwarted from occupying.

Rosalind Krauss' writing on Michael Heizer and the wider movement of earthworks by Heizer, and Robert Smithson but also Donald Judd's installations at Marfa point towards a landscape where the plastic energy or presence of a body fails to be shored up by classical framing devices. The art invokes a new reading of the body in relation to the expanse of the art and the desert.



Rosaline Krauss on Michael Heizer, *Double Negative* and Man Ray's *Monument to de Sade*.
https://goo.gl/maps/z5bGEeJS9br

The Double Negative (figs. 206a and 206b), an earthwork sculpture by Michael Heizer, was made in 1969 in the Nevada desert. It consists of two slots, each forty feet deep and a hundred feet long, dug into the tops of two mesas, sited opposite one another and separated by a deep ravine. Because of its enormous size, and its location, the only means of experiencing this work is to be in it — to inhabit it the way we think of ourselves as inhabiting the space of our bodies. Yet the image we have of our own relation to our bodies is that we are centered inside them; we have knowledge of ourselves that places us, so to speak, at our own absolute core; we are wholly transparent to our own consciousness in a manner that seems to permit us to say, "I know what I think and feel but he does not." In this sense, the Double Negative does not resemble the picture that we have of the way we inhabit ourselves. For, although it is symmetrical and has a center (the mid-point of the ravine separating the two slots), the center is one we cannot occupy. We can only stand in one slotted space and look across to the other. Indeed, it is only by looking at the other that we can form a picture of the space in which we stand. By forcing on us this eccentric position relative to the center of the work, the Negative suggests an alternative to the picture we have of how we know ourselves. It causes us to meditate on a knowledge of ourselves that is formed by looking outward toward the responses of others as they look back at us, it is a metaphor for the self as it is known through its appearance to the other. The effect of the Double Negative is to declare the eccentricity of the position we occupy relative to our physical and psychological centers. But it goes even further than that. Because we must look across the ravine to see the mirror image of the space we occupy, the expanse of the ravine itself must be incorporated into the enclosure formed by the sculpture. Heizer's image therefore depicts the intervention of the outer world into the body's internal being, taking up residence there and forming its motivations and its meanings.

Density - Unframed : In the context of an essay published in October Krauss suggested that the frame of a picture provides a reciprocal supportive reaction to that which it contains. Krauss's frame supports the dissipating body in the Man Ray photomontage Monument to de Sade. In her essay "The Photographic Condition of Surrealism," she writes:

"Two further aspects of this image bespeak the structural reciprocity between frame and image, container and contained. The lighting of the . . . subject is such that the physical density drains off the body as it moves from the center of the image, so that by the time one's gaze approaches the margins, flesh has become so generalized and flattened as to be assimilated into the printed page. Given this threat of dissipation of physical substance, the frame is experienced as shoring up the collapsing structure . . . and guaranteeing its density."

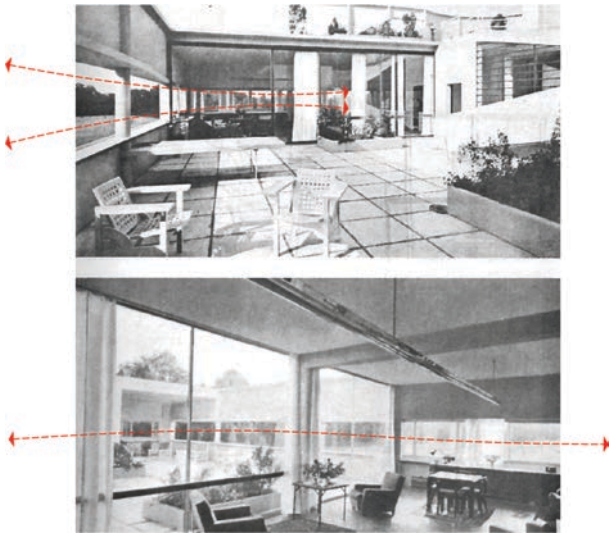
Rosalind Krauss, October, Vol. 19 (Winter, 1981), pp. 3-34

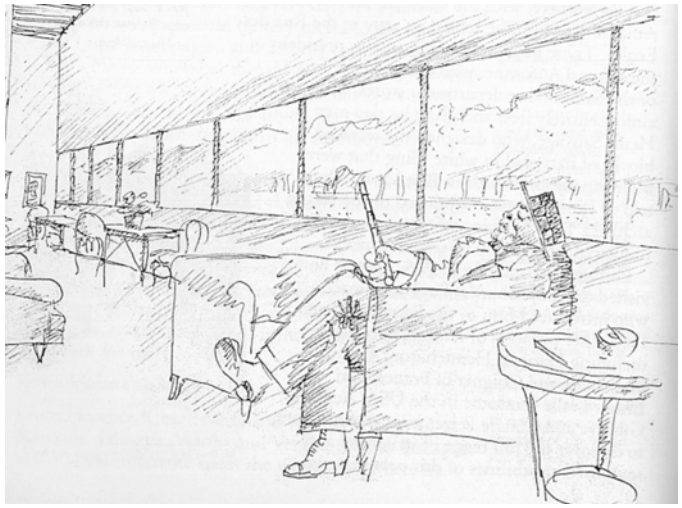
6 Historical Context - Topological Window - Architecture Inside Out

What kind of window does the desert invoke? What kind of window creates a new horizon?

Is there another design evolution possible inside the architectural nomenclature of window or doorway? Of roof or wall or floor—in foundations? Historically we can point to pivotal moments when terms have changed and where new technologies instigated changes and innovation to the very DNA of an architectural element.

Today relatively inexpensive software offers a technology to examine (to see) materials and structural behavior in ways that could render old categories obsolete. Structural analysis allows us to see stress/strain but the computer is modeling chemical behavior and showing molecular stressing of chemical materials in geometrical mesh. Can we model our way out of the past and indeed find new architectural elements Architectural work is deeply rooted in geometry and form: we are reminded of the emergence of the "ribbon window" and of Bruno Reichlin's later declaration of its extended horizon, a topology of space, that curves and threatens the vertical reciprocity with a standing person? Reichlin's reading of the ribbon window still allowed the term window to persist, but he saw Le Corbusier's window as threatening the stability that his mentor, Auguste Perret, saw as essential to the very term window. For Perret, the vertically proportioned aedicule window delineated a threshold between inside by way of its tense and short horizon line. Yet the ribbon window was still called a window. Was it? Formally, perhaps this is the case but what of the experience?





The strip window: an anti-perspectival device

Unlike the traditional opening, the strip window performs best as a link between the inside and the outside when the threshold effect is attenuated. The photograph of the interior of the *petite maison* published in *Almanach*[13] makes this point most graphically. All that belongs to the building is reduced to a dark background, against which the euphoric image of one of the world's most beautiful panoramas stands out, stretching from edge to edge of the image. The caption for the photograph confirms the effect of sitting in the living room: "le site 'est là' comme si l'on était au jardin."[14] [The site "is there" as if we were in the garden.] The traditional window cuts out a picture from the landscape and thereby manipulates it, giving it the aura of a view. But the strip window satisfies the demands of objectivity so dear to the Purists and the Modern Movement. It renders nature just as it is: "La fenêtre de 11 mètres introduit l'immensité du dehors, l'infalsifiable unité d'un paysage lacustre avec tempêtes ou calme radieux."[15] [the 11 meters window makes the imensity of the outside enter the house, the majesty of a lake landscape with its tempests and radiaus calm.]

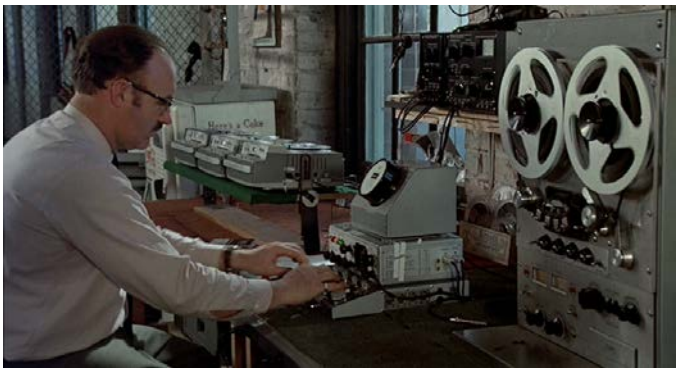
7 Historical Context – Seeing without Seeing.

Gene Hackman, The Conversation. Architecture thwarts surveillance. Seeing around corners. Harry Caul, audio surveillance specialist cranes to see inside a hotel room he is staking out. The camera watches as he struggles to fill in what he can't see – and what he can't believe he is hearing.

In the 1974 film The Conversation two actors pace Union Square in San Francisco. Fragments of the conversation are being recorded by three distant parabolic microphones. The camera follows them as we lose sight of them between people and monuments. They are being watched and recorded - at distance. Using three microphone sources, two parabolic and one up close carried by a contract agent the actual statement was only assembled later in the film. Assembled by correlating the divergent array of recordings and their sound waves into a decipherable whole. Two otherwise wholesome seeming characters utter "he'd kill us if he had the chance" setting into motion a film where vision fails the director and audience and listening driving the plot. We watch the main character listens to things we (as audience) cannot verify by sight—the words are only partially present as limited spectrums of the sounds waves being recorded. In the mix of fragments captured is a comment on how a person ends up homeless, empathy? But also, an incantation of criminal plans and covers up.

The audience completes the film. We watch an actor assembles a partial whole from diverging spectrum of sound waves. They reveal events in an adjacent, unrevealed hotel room. The verification of what occurred in his audio surveillance is never confirmed and indeed may not have happened at all.

The actress in a few phases causes deep anxiety in the mind of the person listening to her – or quasi-listening. Our studio will take the film, written and directed by Francis Coppola as a starting point – as a juncture in art's estimation of surveillance and more so surveillance as creating deep unease in what was the privacy and intimacy of what we colloquially call home. Our private lives lead in public spaces and inside our homes.



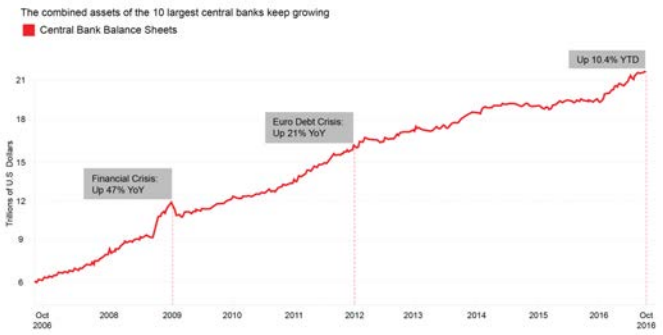
The Conversation was released in the immediate wake of Watergate and at a time when theory and criticism of television and media were a vivid component of intellectual life. In 1963 Michel Foucault's The Birth of the Clinic was published; in retrospect, one could imagine a time when the concern about surveillance was both intense and real but also still being explored and perhaps nascent in scale.

The Conversation starred Gene Hackman but also relied on two nearly silent characters played by Cindy Williams and Harrison Ford. Williams, strolling Union Square and Ford inhabit a kind of silent motion picture. The issue here is that Coppola has made a film – about listening more than looking. A film that undermines what you can learn by looking. So much so that the main character privy to the entire body of audio surveillance he acquires and constructs is unsure if what he hears actually happened. The audience is left to construct the would-be film in their own imagination – in their own gray matter and brain. We are the makers of the actual visual film.

At the Jack Tar Hotel, San Francisco, Harry Caul, master of audio surveillance is confronted by what he imagined but is not sure actually happened – according to his audio surveillance. Caul eventually breaks into the then empty hotel room: a drop of water on the tub drain convinces him evidence of a crime has been erased before a toilet overflows with blood in a surreal flood that to the audience is made to seem a dream. In other words, we are left like Harry unsure of any occurrence. The film's trajectory is negated and its only presence is in our imagination. Caul ends up dismantling his own domestic life—his apartment is torn apart as he seeks evidence of his own being bugged

Today these ideas of surveillance are narrow by this measure but if you put them in perspective with a more limited mobility were people in 1973 easier to surveil then they are today? And does architecture have a sense of where it fits in the pan project of making visible our every move? More importantly, are there larger changes in what underpins architecture and development today that would altogether alter how we imagine the place of architecture in this equation?

8 The Desert Industrial Complex: the end of risk?



Central Banks worldwide are holding immense sums of debt off the markets -- effectively shoring up weak assets and their markets. Between 2006 and 2016 the world's top 10 central banks holdings rose by more than 400% -- from approximately 6 trillion to 24 trillion dollars. In the wake of 2007-08 financial crisis central banks entered an unprecedented role in stabilizing markets.

Markets for real estate and virtually every form of production and consumption were sustained by global quantitative easing. Near- zero interest rates. Personal housing debt and household debt as a percentage of the GDP has over the last century seen immense expansion. Will the architecture of the future rely on debt the same way and if not, what can sustain it? Architecture today has become very adept at modeling risk and economy. Does this portend a new architectural nomenclature; a new asset?

Markets and reconciliation with scarcity have often gripped the architectural imagination—is this the norm for our future? We are increasingly advanced agents in modeling risk and opening new means—what will this enable?

Architecture and development are to a tremendous extent realized inside financial and economic risk models. Will this continue to the case in our future?

At the annual Berkshire Hathaway shareholders meeting (which is often seen more as a state fair) Jack Bogle, the founder of Vanguard Group, and a confidante of Warren Buffett offered a proclamation on risk by discussing the state of index trading—a use of algorithms to essentially trade the probability and momentum of an entire stock exchange. Indexing removes stock picking or the discrete, strategic, construction of a portfolio (as a means to hedge risk) and instead seeks to harvest the movement of the intelligence evident in the broader trading of the exchange itself. It harvests what everyone else is figuring out via artificial intelligence, machine learning or simply immense computational and stochastic modeling. For many index trading is a low-cost way to diminish trading risk and yet harvest the collective insight of the market itself.

Indexing, while far from mathematically total, aspires to limit the risk associated with accessing a small (minute) or even large sector of the exchange. Bogle seemed to be seeing this aspiration to the removal of risk as a disincentive to trading—if there is no risk and no unrealized opportunity (that is identified by the trader as an opportunity) there is not a need to trade. Indexing relies on an active underlying market—it models a propensity that it then seeks to mine. Without real traders, there is no risk to mine according to Bogle.

According to Bogle about 1/3 of United States' stock trading is done by indexing: he predicted a turning point, a threshold at which markets would freeze as indexing would arm everyone with a same ability to react to and forecast risk—each trader would in effect thwart the trajectory of the other. "If everybody indexed, the only word you could use is chaos, catastrophe," he said. "There would be no trading, there would be no way to convert a stream of income into a pile of capital or a pile of capital into a stream of income. The markets would fail."

Bloomberg, Jack Bogle in Markets and Stock Indexing: Riskhttps://goo.gl/88bmjo

Artificial intelligence, machine learning and robotics are often proclaimed to be a threat to labor markets. What do they portend in financial or economic markets? Aside from displaced jobs what do they incentivize or indeed make almost inevitable in development and the distribution of economic resources. What will be built in such a world if, for example, A.I. alters job migration, or collapses asset values?

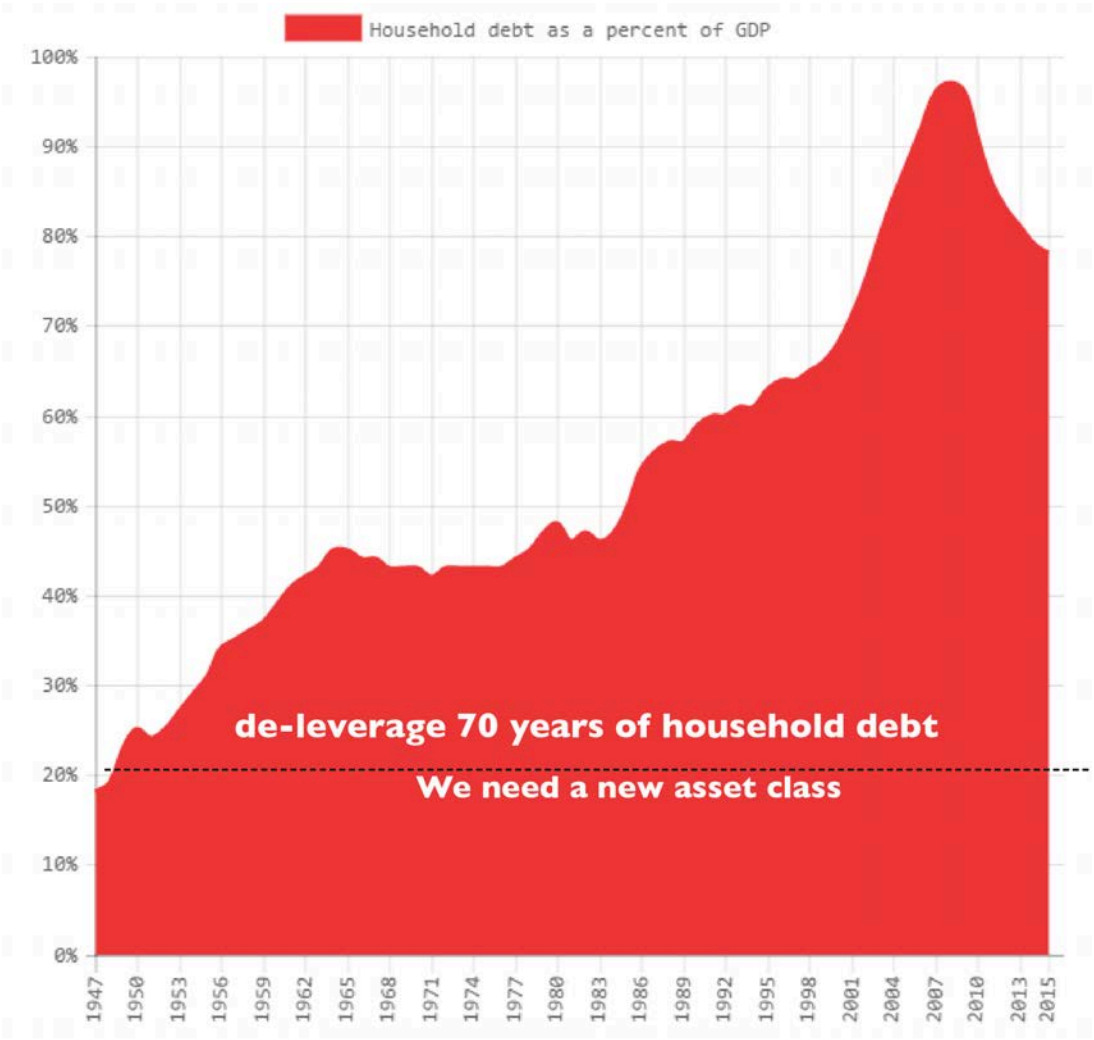
Markets may fear uncertainty but risk is a driver and motivation and it is the unseen or undervalued asset that has historically been a source of future wealth production—if you can see a potential and you are (nearly) alone in knowing its existence the trade is yours. The wealth could be yours—it could belong to a nation, a city or a state--or neighborhood and constituency.

Today we see new means to model risk of every kind. But we also increasingly imagine ourselves less at the brunt of some forms of risk while others form immense crisis and undermine stability of all kinds. From structural mechanics to chemical engineering to fluid dynamics and geography and economics. Risk as its forecast within relatively low-level computational systems is today increasingly made transparent to analysis and thus adjudication. Inside realms of engineering or medicine, advertising or banking or autonomous mobility and safety the

prospects of a world driven more by choice then necessity is often depicted as offering a new model of liberty and indeed freedom. From social media to personal delivery—limits seem diminished, even as crisis of all kinds still exists. Counter the immediacy of some forms of risk control vs. the global migration from war or climate change.

Much of the confidence (when it occurs) seems to rise from a new and more granular scale to modeling. Risk modeling has opened a finer parsing of the value of what have been seen as stable or older assets: indeed, often exhausted assets. A re-monetization of private housing (Airbnb) or the private automobile (Uber, Lyft)—risk models made possible by anonymous, but secure transactions (peer to peer), in effect, begin to revise the privacy and value of entire asset classes. You can share a latent temporal value in your home. But do they change the assets themselves and when, if at all, will these new models give rise to entirely new assets. After all, the private car – relied upon by Uber or Lyft – is only a century old as a human invention—an entirely new asset that drove 100 years of urbanization (and de-urbanization).

What are the next assets, how do we find them and more so do we trade them?



The new matrix of commerce: Can we invert the debt and leverage curves of the past century? Or will new forms of manufacturing and commerce simply extend our uses of leverage and debt in creating the settlement of the future?

In 2006 the United States household debt rose to nearly 95% of the national GDP. In 1947, it totaled only 18% of GDP.

9 Historical Context

Designing from Coast to Coast. Intellectual history / industrial/technological difference and coincidence.

A riff	A riff
West	East
Gold rush	Stock Market NY and Banking and Real Estate
Wood / Douglas Fir/ Redwood	Stone, Steel, terra cotta, concrete
The "valley" *Solid State electronics* *Transistor, processor* *The PC* *Software, code* *Linguistics (not literature)* *GUI-anthropology* *Xerox Parc* *Keyboard / mouse*	Glass
FROG design	NY and modernism NY and density NY and Cubism NY Five The Grays Abstract Expressionism
Operating system *Internet* *Java Jini* *Social Media*	NY and anxiety NY and psychoanalysis NY and anomie NY and privacy NY and independence
Epicurean food *Epicurean social media* *Mirror communities - echo chambers*	Journalism / Editor / Curators
Fog *BAY* *Pacific* *Mexico* *Asia* *Russian River*	Subways NY and centralized heating / steam Grid Rivers Bays Atlantic
The "Well" net community *Whole Earth Catalog* *Apple* *SAP / VM Software*	NYC / Boroughs Frances Fox Piven / Sociology / Public Housing / Rent Control
Tesla	The managed city Silicon Alley Offices Hotels
Stanford/Berkeley/Cal Tech *Lawrence Berkeley Labs*	Ivy League Columbia / Manhattan Project
Joan Brown, figurative art	City College G Village, east vs. west
Victorian *Maybeck*	Central Park
The Castro	Bankruptcy 1975 Trade
The Hills *Dark Red Suspension Bridges*	Humidity Ice
Hand held *Touch screen*	Institutions: MoMA - Lincoln Center, Columbia, FED, Goldman, Met, Whitney….92nd Street Y….
A.I. *Machine Learning* *Clouds of all kinds* *Self-realization*	Mondrian
Venture Capital *Algorithm*	Taxis
North Face-Fleece *Hike* *Kaiser Ships / later medical care*	Immense cultural engines of exchange.
Foucault at Berkeley *Post Structuralism at Berkeley* *Rabinow and Dreyfus host Foucault*	
Stanford Hoover Institute	
Burning Man	