

**IES**  
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SEMINARS



**SF** Education

# Lighting & Urban Placemaking

Part 1- How Light Drives Urban Vitality



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**Lighting &  
Urban Placemaking**



**A Brief History of Public Lighting**  
Clifton Lemon



We are brothers and sisters of our machine. Minds and tools have been sharpened against each other ever since a scavenger's stone fractured cleanly and the first cutting edge was held in a hunter's hand. The obsidian flake and the LED chip are struck by the light of the same campfire that has passed from hand to hand since the human mind began. – George Dyson, *Darwin Among the Machines*

My own pet theory is that on some deep unconscious level we recognize electric light as fire, and that our behavior around energy and light must be influenced by how our brains evolved in what evolutionary biologists call the ancestral environment.

## All in a Day's Work



2000 BC- 10  
minutes

Today- 20,000 hrs.

The amount of light bought by the average days wage.

## Equal R Value



We've reduced the cost of energy by a huge factor, but we haven't evolved our ability to conserve it in our buildings. The ancient stone grain storage hut at left has an R value ( a measure of the insulation capacity of the building envelope) approximately equal to that of the high tech glass tower at right. Conflicting adaptive strategies – urban densification vs energy efficiency.

## Lighting Leads

- Lighting makes the infrastructure of human life possible
- Lighting was dormant in the 20<sup>th</sup> century. LEDs are the awakening
- IOT is the real revolution: Lighting is the backbone of the Smart City

### **Lighting Leads**

Throughout history, lighting has led many innovations and economic developments. But when electric lighting became ubiquitous, it became invisible: We've forgotten how fundamental light is to the infrastructure of civilization and what massive changes it drove in the relatively recent past.

Lighting technology was basically dormant for most of the 20<sup>th</sup> century while other technologies evolved at an increasingly rapid rate. Recently, driven largely by energy efficiency, LEDs have forced lighting technology to catch up. But the real revolution today is not in LEDs, but in distributed smart networks in the built environment, and this is being driven by lighting.

The evolution of lighting technology and networks over the last several hundred years was driven by diverse social, economic, and political factors and included several innovations that made current Internet of Things (IOT) technology possible. Let's look at the roles lighting has played in cities in the past.

## Providing Security



### **Light Provides Security**

In medieval times, the torch was synonymous with security at night. At sunset, people locked themselves into their houses (or were locked into them by the police). The few people allowed on the streets were required to carry a torch for identification as much as for navigation. Because of the way our eyes work, torchbearers could also become easy targets for muggers- a conflict that persists today in public lighting between being able to see and being seen. Fire was regulated closely. The word “curfew” comes from old French *covre-feu*, literally “cover fire.” Public lighting in settlements began with a requirement to display lamps in windows, then eventually outside houses.



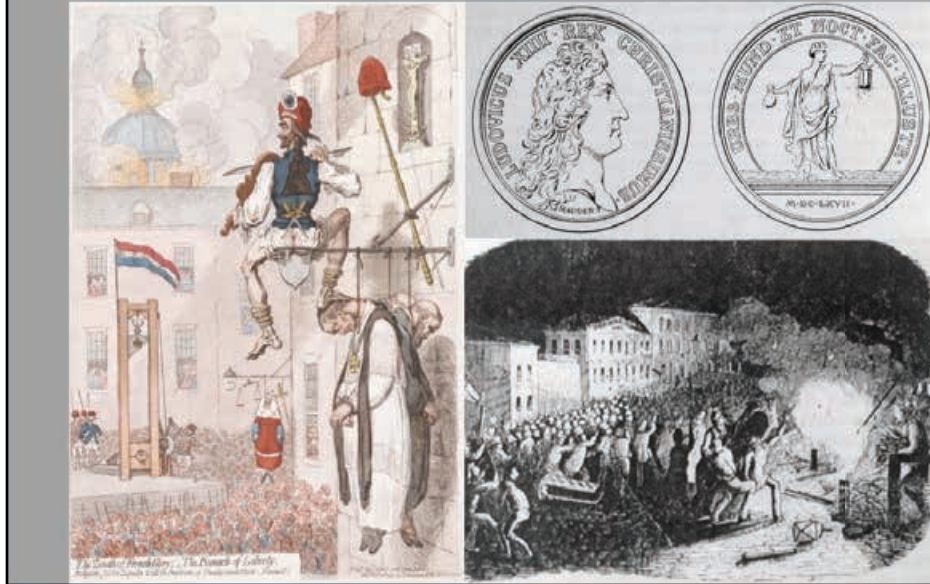


Even into late 18<sup>th</sup> century in London, torches were used for security. Torch bearing “Link boys” were hired by townspeople to guide them safely to their destinations.

Lighting was the sole domain of the police, keepers of public safety and order. In the absolutist European city states in the 17<sup>th</sup> through 19<sup>th</sup> centuries, the police had powers and responsibilities that extended far beyond their scope today. Night watchmen were recruited from the populace, who had to contribute one volunteer per household for revolving duties.



## Symbolizing Order



### **Light Symbolizes Order**

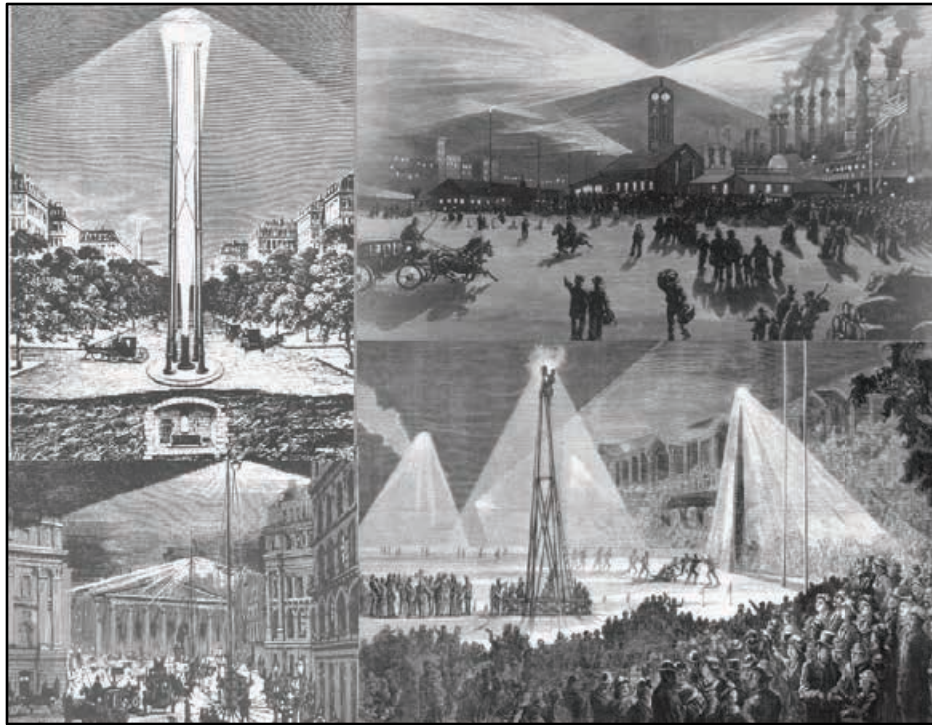
As lamps moved into the street and became what we would recognize today as public lighting, they came to symbolize the state. When economic and social inequality created rebellion in the French Revolution, public lighting, a symbol of imperial power, became a target. In the ensuing terror, victims were hung from public lamp posts. Lantern smashing became a popular form of political protest, and had the added advantage of hampering military control of angry mobs in newly darkened streets. An inherent conflict arose- lighting that was intended to increase public safety became the focus of crime and disorder. Today, with cameras on every light post in some cities, we have fear of surveillance by Big Brother.

## Fueling Competition

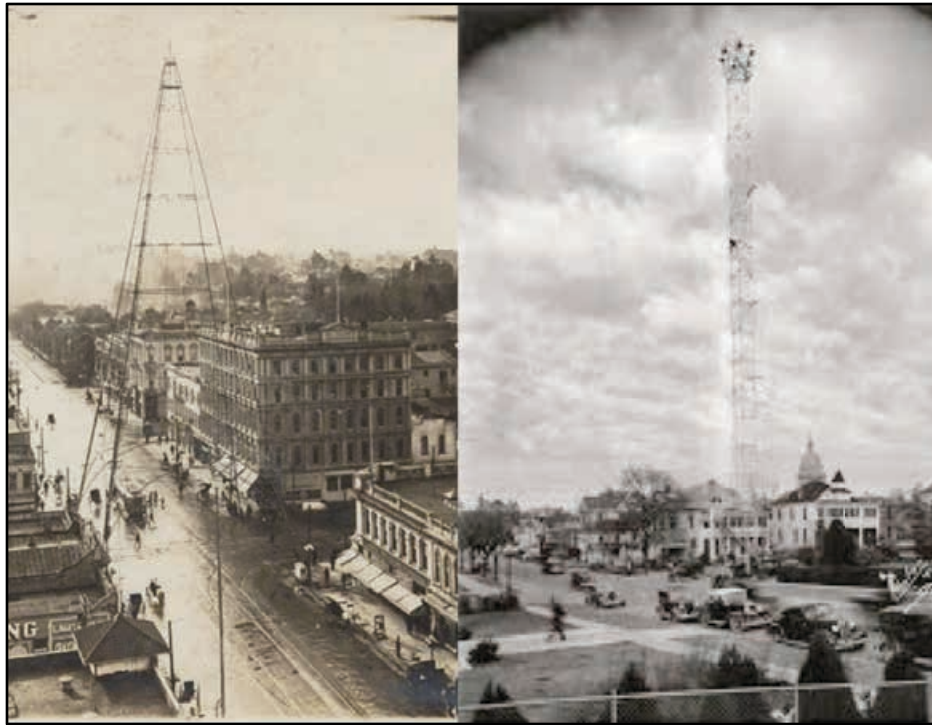


### **Light Fuels Competition**

The post Revolution governments reclaimed public lighting as a potent symbol of imperial power and sponsored grandiose projects aimed at providing light for the population. Even if the light was more symbolic than practical - these projects had an impact on public architecture that endures today, as countries seeking global status build successively taller skyscrapers. These are competing designs for a project meant to light Paris in a single tower. The winning design was the Eiffel Tower, which came to symbolize France's technocratic supremacy and inspired intense global competition, especially in the U.S.



The massive light tower designs proved impractical for street lighting at their original scale, and smaller versions were devised. These also used arc lamps, which gave a blinding, brilliant light and required individual power plants for each lamp.



In the U.S. some of the first electric public lighting was “moon towers” using arc lamps – these were soon abandoned for several reasons, not the least of which was that they were massive glare bombs. So the first problems with electric public lighting were glare and brightness- problems we’re still dealing with today.

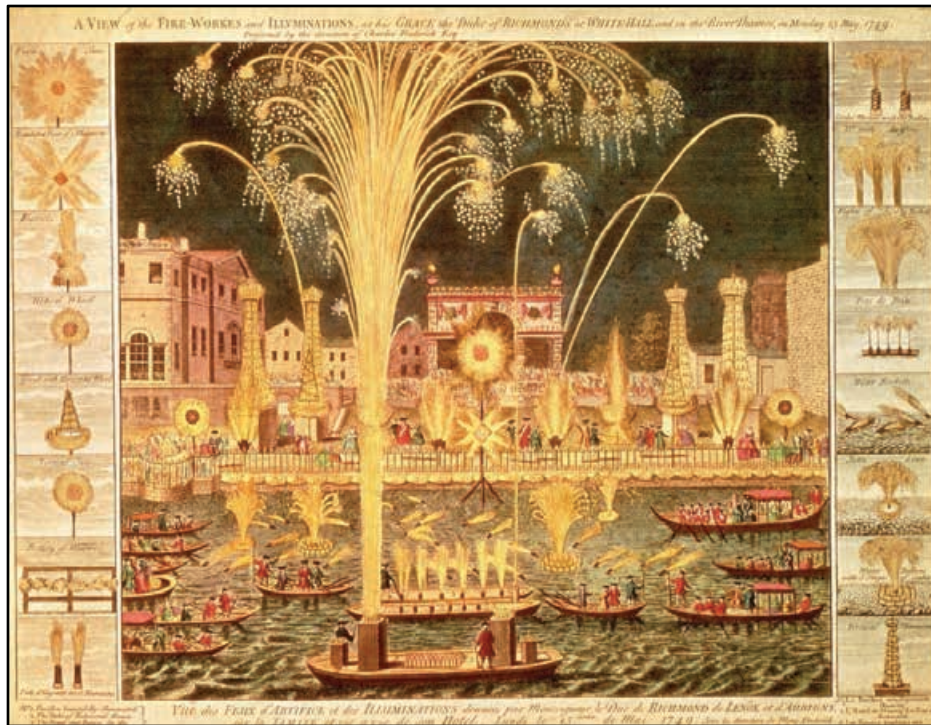
## Powering Spectacle



### **Light Powers Spectacle**

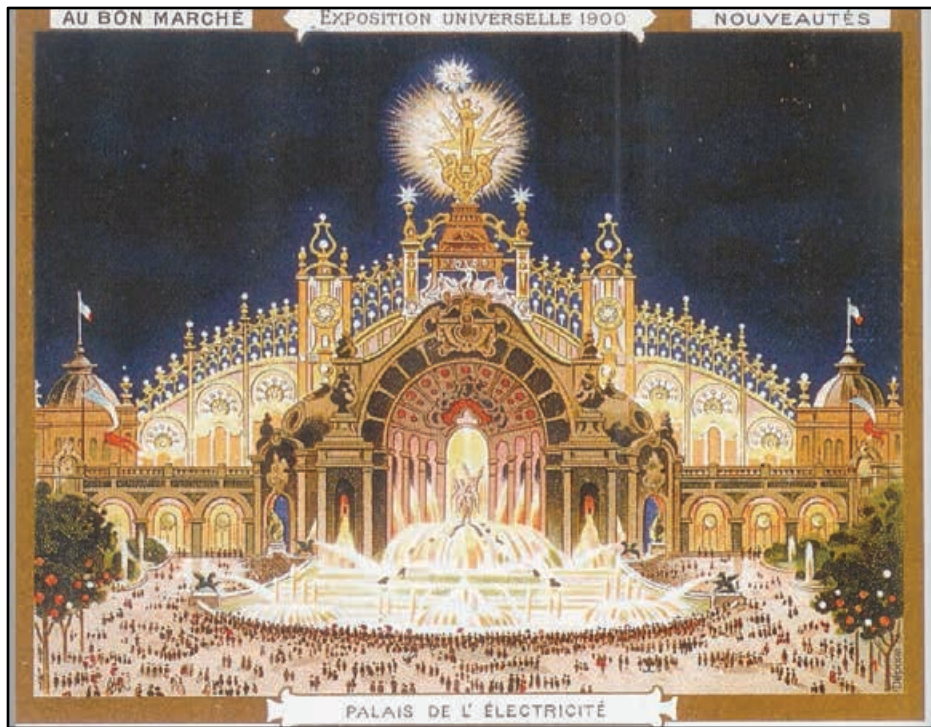
Despite the ubiquity of electric lighting today, people still have an atavistic appetite for spectacles involving fire in large quantities, in rituals like Burning Man.





Imperial administrations throughout history played to this proclivity and produced dazzling fireworks displays meant to awe subjects and strengthen loyalty.





With the advent of gas and electric lighting in the 19<sup>th</sup> century, these displays became more elaborate and were integrated into architecture, in spectacular international exhibitions.

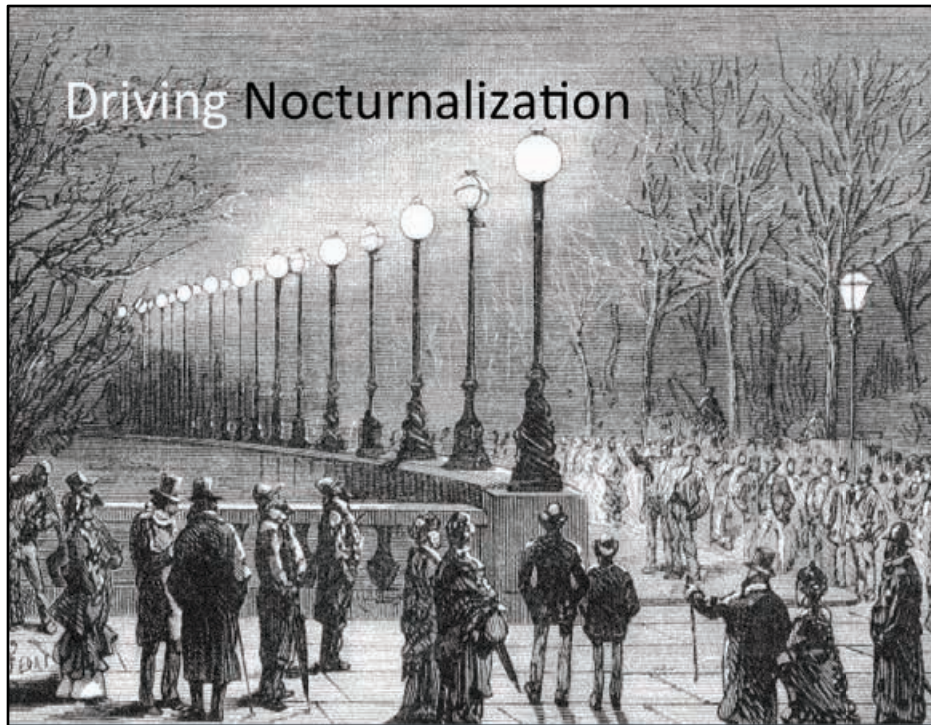


The Paris Exhibition of 1892 and Columbia Exhibition of 1893 inspired a rash of imitations in the U.S. and abroad, including the Pan Pacific Exhibition in San Francisco pictured here, as cities and countries competed desperately for status as legitimate members of the emerging global economy. Each exhibition stretched the boundaries of the possible with architecture, transportation, technology, lighting, energy, science, and commerce.



Nowhere was this accomplished at the scale of the 1893 Columbian Exhibition in Chicago, which featured the first installation of electric lighting at this scale, powered by Westinghouse's polyphase, or AC, systems and lit by Fessenden's bi-pin bulb, the precursor to today's bi-pin lamp types. This exhibition was a turning point for America, in architecture, urban development, lighting, and technology.





### **Light Drove Nocturnalization**

In the cities of the late 19<sup>th</sup> and early 20<sup>th</sup> centuries, ubiquitous light that extended and divided the day had deep social consequences, notably sharpening distinctions between classes as well as between rural and urban culture. Everyday workers needed their sleep and couldn't afford to fritter away their evenings at the posh new gathering places frequented by the emerging wealthy classes. For those at the top of the food chain, day and night became reversed- a process called "nocturnalization."



The flamboyant luxury of Parisian society flourished under gas light, and kicked into high gear with electric light. As light became brighter, whiter and more prevalent, artists like Toulouse Lautrec and Degas saw the world in a completely new way.

## Creating Beauty & Vitality



### **Light Creates Beauty and Vitality in Cities**

While class division took its toll, the core urban districts offered excitement, entertainment, and goods and services on a scale never seen before. Many qualities in the cities we love today evolved under these periods of heady economic growth.





Architecture and light at night blended perfectly to create an effect that was warm and welcoming, yet highly varied and stimulating- as depicted in Van Gogh's Arles café painting, reproduced in real life at right. Light is reflected and diffused by the café's canopy and the walls of surrounding buildings, creating the effect of an outdoor room, found in infinite variety in cities everywhere.



Regent St. in London



Picadilly Circus in London



Oxford Street in London.





Tokyo



Gdansk

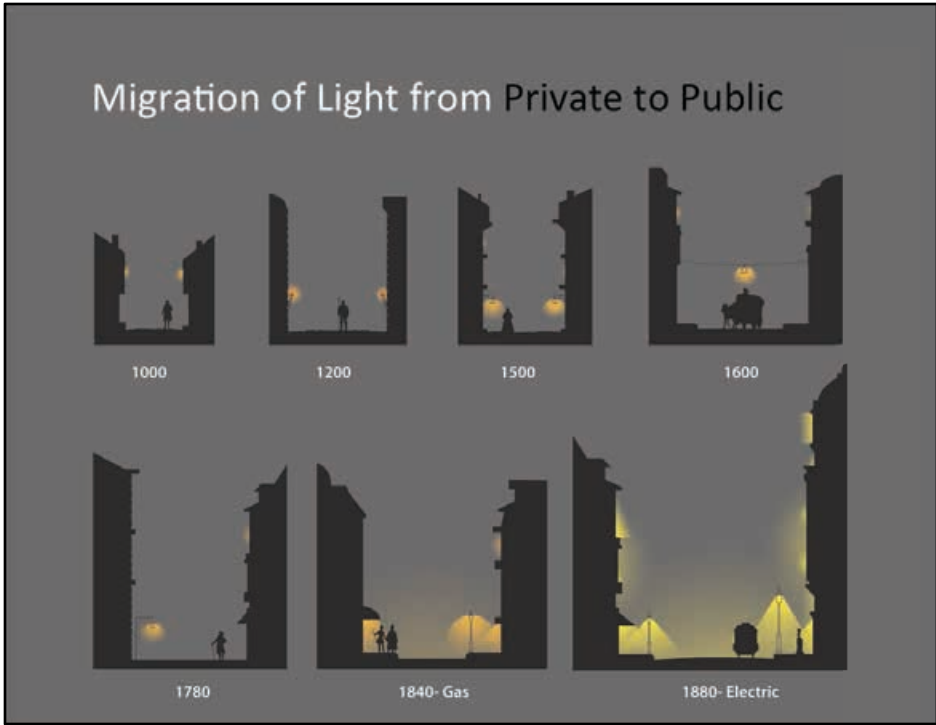




Tenerife

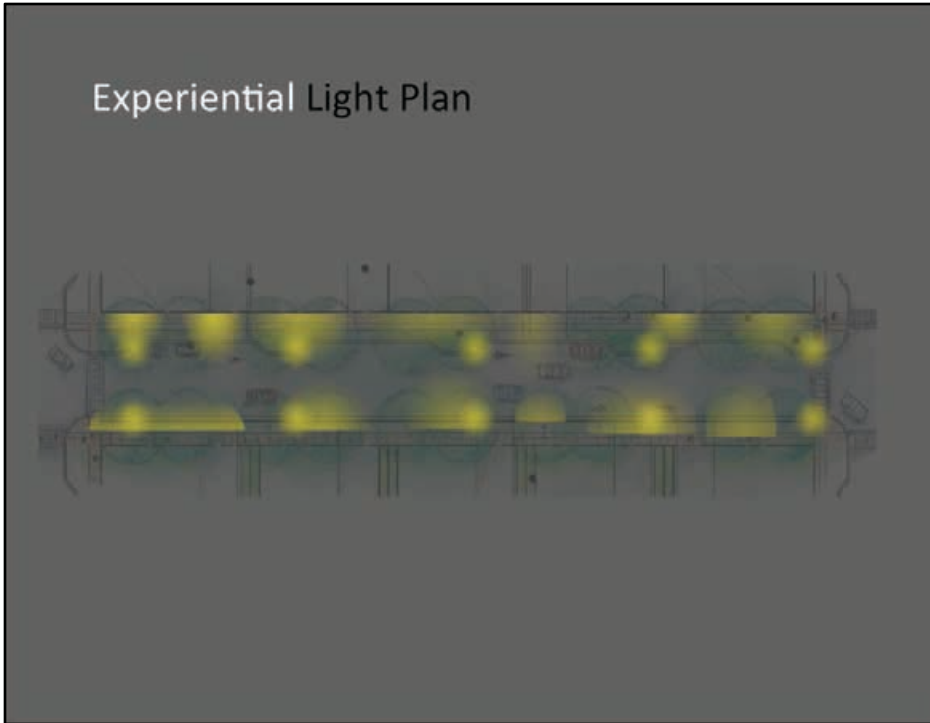


Venice



This is a diagram showing the migration of lighting from the private to the public realm.

## Experiential Light Plan



This is a plan of the typical variety of and interplay of light sources across a typical neighborhood retail street.



### **Light Creates Safety**

This row of Victorian houses creates a feeling of safety with strong visual clues that include appropriate light levels, illumination of vertical surfaces, clear focal points, and also lit windows, like those required in medieval villages - In the New Urbanist lexicon, we call these "eyes on the street." These clues instantly signal unconscious processes in our eyes and brains, creating feelings of safety.

## Extending Markets



### **Lighting Extends Markets**

Improved public lighting in cities meant that markets could be extended beyond sunset to serve customers who were increasingly working longer hours in industrial jobs. Extending the day also gave advantages to northern cities in winter, with their reduced daylight hours.



## Driving Growth



### **Light Drives Urban Growth**

Gas and later electric lighting helped to create the modern department store, exemplified by Le Bon Marche and La Samaritaine in Paris, Harrod's in London, and Marshall Fields and Macy's in the U.S. Merchants wanting to attract customers spared no expense in making their enterprises as spectacular and fabulous as possible.



Well lit window displays were gathering places, entertainment, and sources of fascination for newly arrived city dwellers and contributed greatly to the variety and ambiance of street lighting in core downtown districts, as it does today. New lighting also had the benefit of making retailers' goods look better, which increased traffic and sales.



Galeries Lafayette in Paris today. The original building was completed in 1912.

## Impact of Electric Light on Growth in Paris



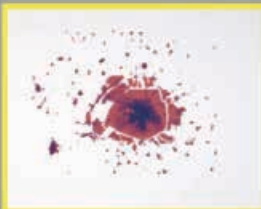
1803



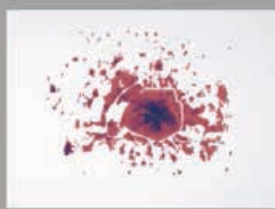
1840- Gas Lighting



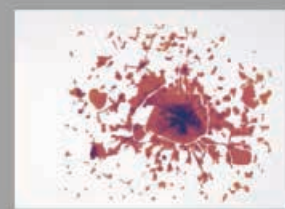
1880- Electric Lighting



1887



1895



1928

The introduction of electric street lighting in Paris seems to have had a direct impact on real estate values and densification, helping to spur a dramatic growth spurt in the city center in the 15 years between 1880 and 1895.

## Enabling Trade & Transport

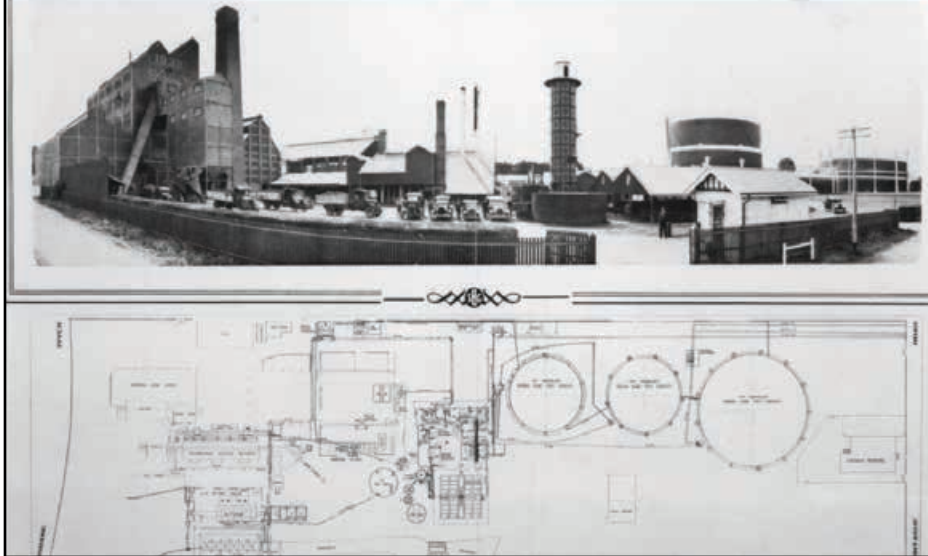


### **Light Enables Trade and Transport**

Advancements in public lighting also enabled improvement of transport within and between cities. Roadways became safer and easier to navigate.



## Driving Energy Networks



### **Lighting Drives Energy Networks**

Gasworks for lighting turned coal into more easily distributed gas and were large, dangerous, and polluting. Living near one resulted in negative health impacts and constant fear of explosions. But their urban distribution networks, with mains and branches, formed the backbone of the electrical distribution networks that followed.





Gas light, while still directly recognizable as fire, provided the benefits of reduced maintenance and distribution of fuel through a network, but did not provide much illumination until the development of more efficient and brighter lamps.



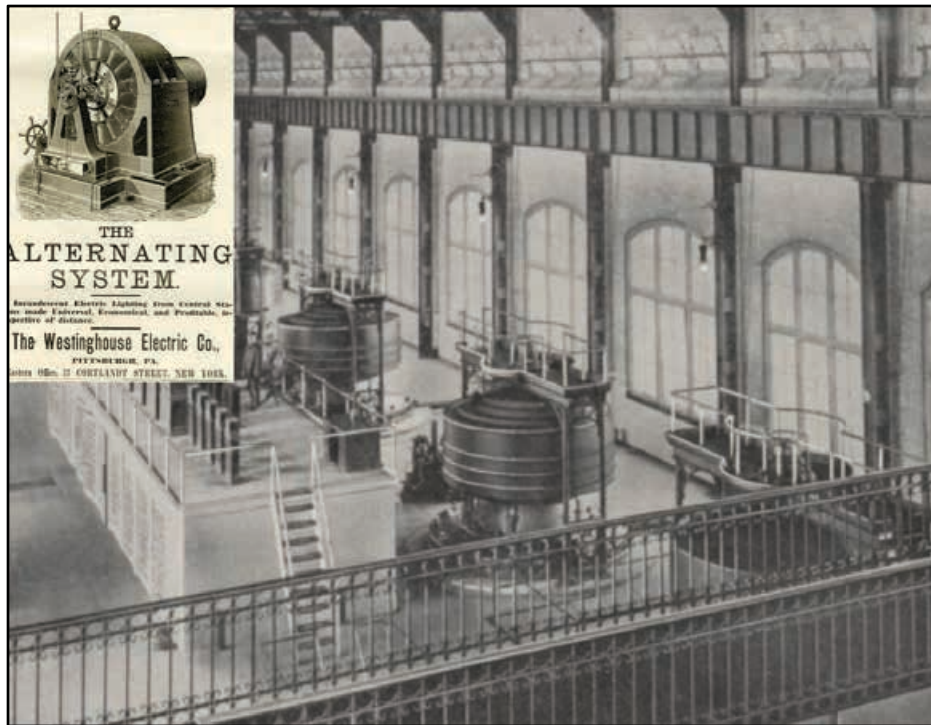


As the last lighting technology to use direct combustion of fuel, gas lamps retained a strong nostalgia value and symbolism that endures today. Two holdovers from gas lighting- on the left, original gas streetlights in Vancouver's Gastown, (now powered by CFLs). On the right, the switch for Edison bulbs remained identical to the gas valve for many years after electric lighting became standard. The distribution infrastructure for gas lamps was also a holdover in a different way-in many cases it was used directly by electrical networks.





The first electrical distribution network was designed and built by Edison and centered on the power station on Pearl Street in lower Manhattan. Opened in 1882, it delivered electric light and DC power to approximately 90 customers, but had a fatal flaw—the transmission range for DC was only 1 mile.



Long distance transmission of AC power eventually won out over DC, resulting in the first large scale power plant at Niagra Falls.

## Driving Markets- Advertising



### **Lighting Drives Markets and Communications**

Electrification on an AC power grid, driven by lighting, soon made home appliances possible (as well as the electric industrial equipment that made them). A network of global energy and intelligence that was the beginning of IOT was headed up by a woman in a *négligée* ushering in a shimmering era of freedom and enlightenment. Wash day became a day of unmitigated joy, as it is today.



The booming industrial economy needed buyers for its new products, and they had to be induced to buy. Outdoor advertising, using new lighting technology, became the better part of public lighting in many cities, especially in Times Square, where, like so many places in America, if it's worth doing...





it's worth overdoing. Times Square today.



## Global Warming

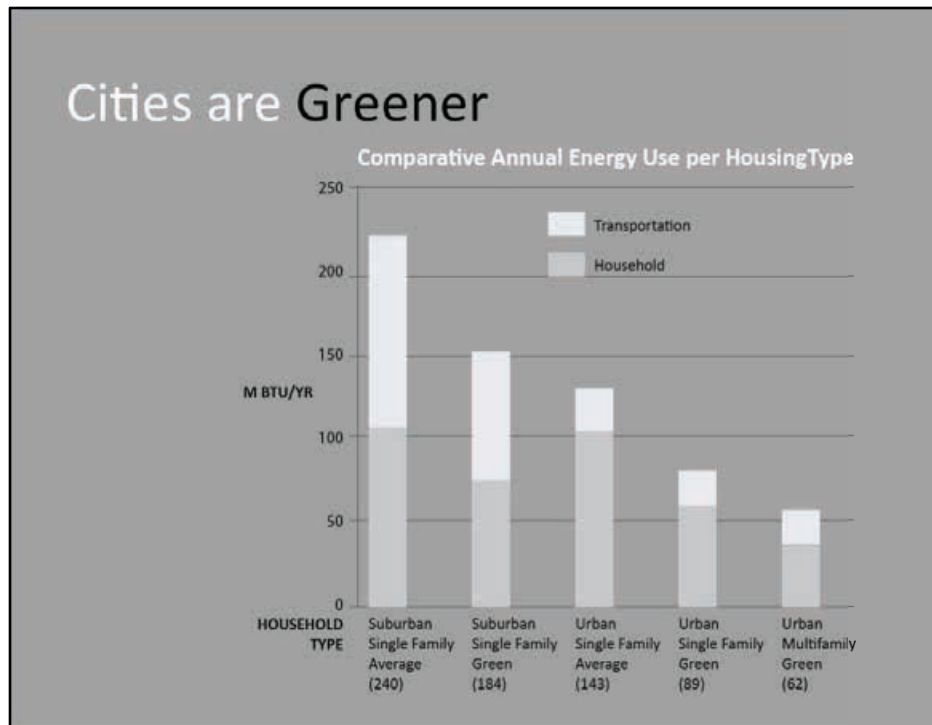


Starving baby sea lions are now washing up on Southern CA beaches because of a complex chain of environmental reactions involving increasing ocean temperatures and acidity, declining forage fish populations, and elevated CO2 levels.

We will be seeing more unanticipated signs of climate change like this in coming years.

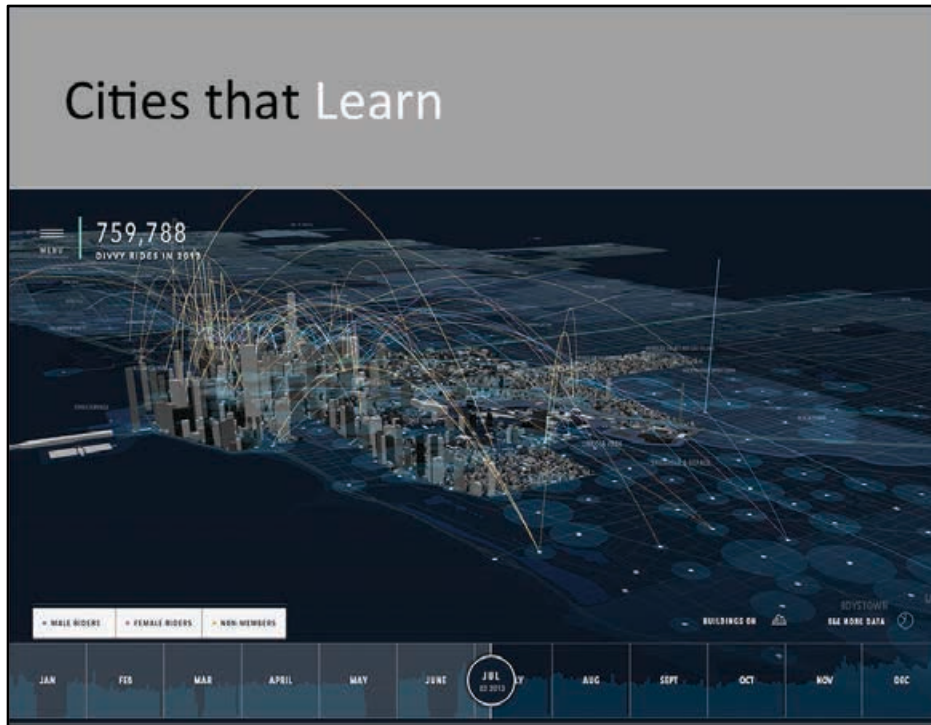
It's too late to stop global warming, but all the things we should have been doing decades or generations ago- cutting emissions, being more energy efficient, making more resilient buildings and cities- we need to do now even more so that we can better deal with whatever's coming. Since most of the planet is moving to highly dense cities, which are mostly located on coasts with rising sea levels, we have our work cut out for us. Cities are the problem... they're also the solution.

## Cities are Greener



### Cities are Greener

The bad news is that cities produce most of our pollution, congestion, and loss of habitat, and use most of our resources – all problems we faced in the past and still face today. The good news is that cities are greener because they're inherently more efficient in resource use per capita. We can take great advantage of this inherent efficiency and even multiply it by making Cities that Learn.



City simulation tools- kind of like the SIMS on steroids - have been around for at least 20 years and big cities now model their operations with dynamic data inputs, to manage everything from traffic to disaster response to garbage collection. These GIS aided tools are particularly useful in planning infrastructure projects, as many design variations, aided by realtime data from sensors, can be modeled and assessed quickly, allowing better decision making. All inputs and outputs and systems- energy, materials, waste, labor, pollution, water, transportation, finance, health- can be considered simultaneously for their interactive effects. Now, to get valuable behavioral information about how people are reacting in a given environment, we don't need to wait months for guys with clipboards to bring back data- with affective computing and analysis tools we can now read emotions, behavior, gait, in many ways much more accurately than before, and in realtime.

## Disruption vs Balance



### **Disruption vs Evolution**

In nature, when conflicting adaptations appear in a species, one of the adaptations drops away, or the species dies off, or...they reach equilibrium- balance. Today when we think about technology and the built environment, we don't really think about balance, we think about...disruption, reflected in many things, including the unfortunate spectacle of buildings that look like they're in the process of falling down or flying apart in a powerful wave of "disruptive" creativity.

Termites, on the other hand, have been at it longer than we have. They've succeeded in making their environment adapt to *them*, with highly evolved architecture, complete with biodynamic agriculture, perfect HVAC, a sophisticated communications system, energy efficiency, natural daylighting, waste management. They don't have iPhones or Vegas or plastic surgery or Lamborghinis or the internet. But who's going to be around in 10,000 years? I'd bet on the termites.

## What Will Future Cities Feel Like?



William Gibson said “The future is already here, it’s just not very evenly distributed”: these images represent not the future, but the present. We have the technology today to build whatever we want.

Many people think that the future of cities is more like the pictures on the left, basically the Jetsons with green flocking- spray plants glass and steel towers and you’re good. The welcoming street as we know it is gone. For me, a much more interesting future is more like the pictures on the right, much like the best places we already have, just with a better interface. Even if we think the Jetsons city is cool, we can’t afford it, it’s pretty much the opposite of sustainable. I’m not against being visionary, I just think we need better visions. Today our visions of the future tend to be seriously overtechnologized and under humanized, which is well, kind of so last century.

Now that we spend most of our time in a built environment increasingly managed by increasingly complex systems, we forget that our bodies and brains evolved for a very different environment. Rather than worrying about how to adapt to this new environment, let’s think about how to make it adapt to us. That’s the real power of the Smart City, and we haven’t yet even begun to fully imagine the possibilities.



Thank YOU

Clifton Lemon

BrandSequence

cliftonlemon@gmail.com

waterfireshelterfood.com

415 254 7056

@cliftonlemon