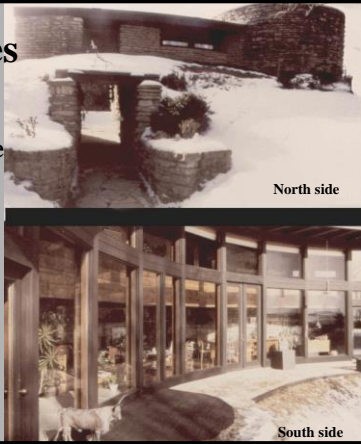


Microclimates

Passive design is the manipulation of microclimates to provide human comfort.

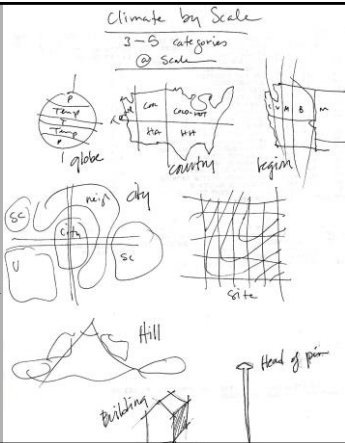
Solar Hemicycle
Jacobs II house, Madison, WI
—Frank Lloyd Wright



1

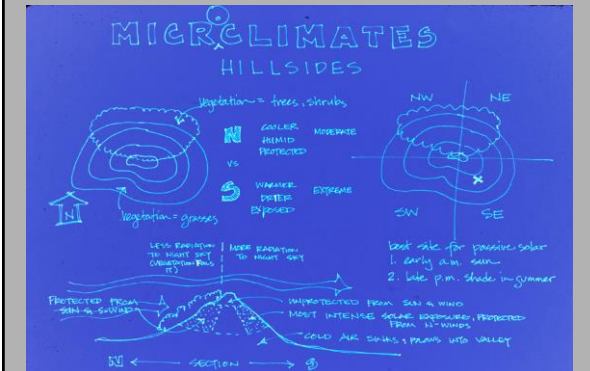
Microclimatic influences:

- Hillsides
- Elevation
- Bodies of Water
- Vegetation
- Wind Breaks
- Night Sky Radiation
- Valleys
- City Effect



2

Hillsides



3

Microclimate effect

What's Machu Picchu's climate?

More on this in vernacular architecture talk...stay tuned.

4

“By the eldest son, Thomas, a carpenter, a house was built on a gently sloping hillside facing south. The lanes warm-fenced with oak rails split in the hillside forests which clung to the northern slopes and hill crown. The southern slopes were all too dry for wood and were bare except where rock ledges came through... the small simple house... was modern clapboard with the kitchen a lean-to at the rear (N).”

FLW, *An Autobiography*

5

Elevation

Oregon Cascades
West side vs. East side

6

Bodies of Water

BODIES of WATER



- WATER:**
- holds heat longer
 - adds moisture to air
 - causes onshore/off-shore breezes
- result:** moderates microclimate of nearby land



7

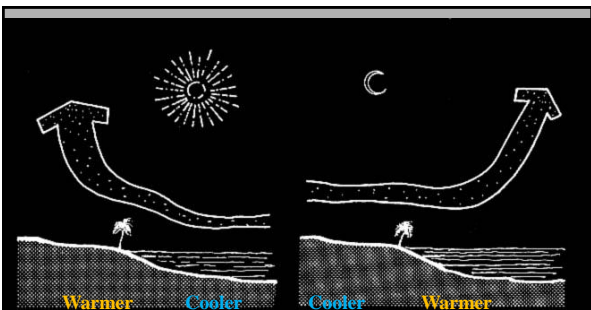
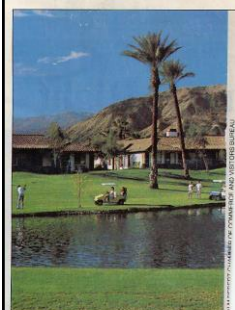


Figure 5.2h The temperature differences between land and water create sea breezes during the day and land breezes at night.

Daytime on-shore breeze vs. nighttime off-shore breeze

8

Vegetation



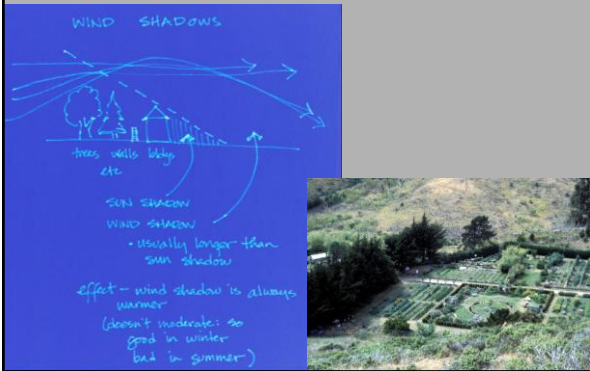
Desert greens chip a few degrees.
Golf Greens Change Climate's Course

VEGETATION

-
- grasses**
 - readily absorbs heat
 - shrubs**
 - retains moisture
 - slows absorption of heat
 - trees**
 - slowly add moisture by transpiration
 - trees & shrubs provide shade block wind
 - remove air pollution

9

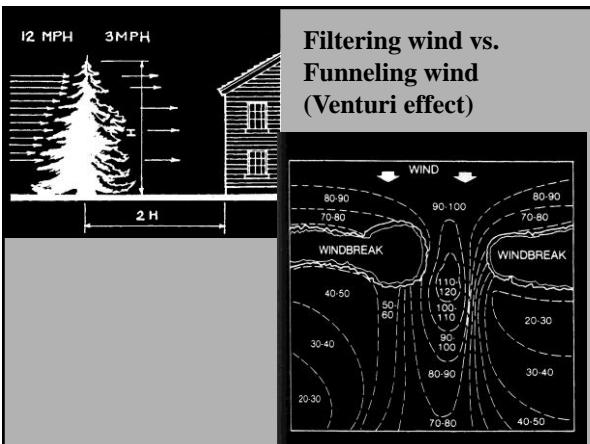
Wind Breaks



10



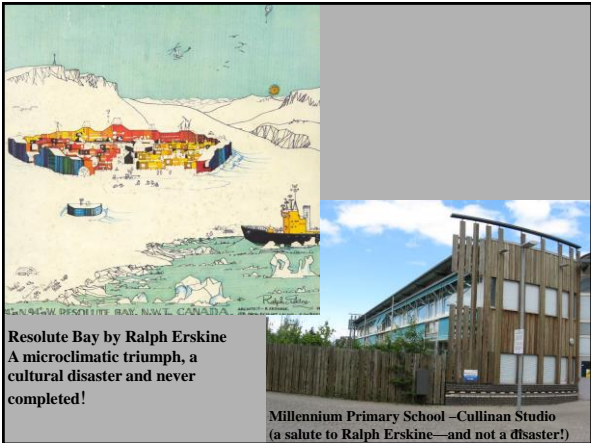
11



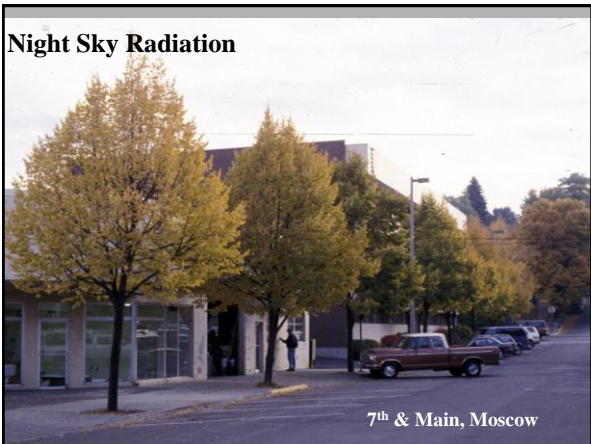
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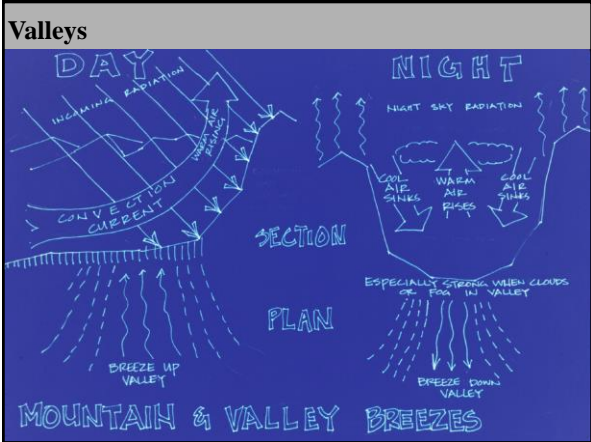
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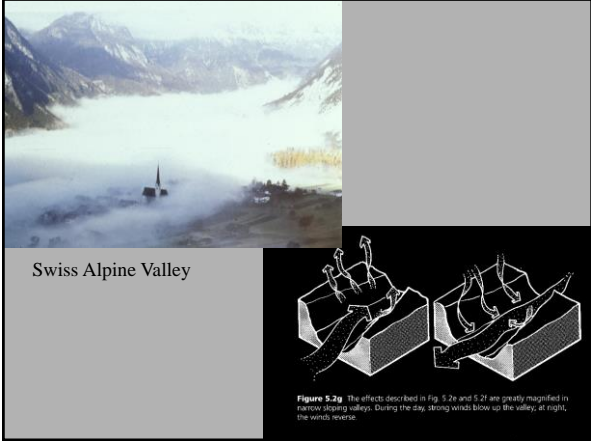
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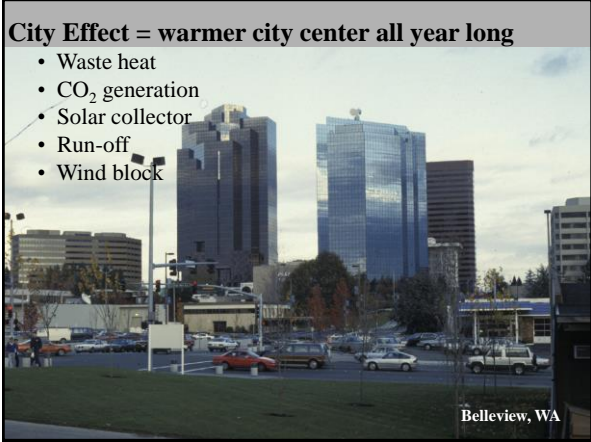
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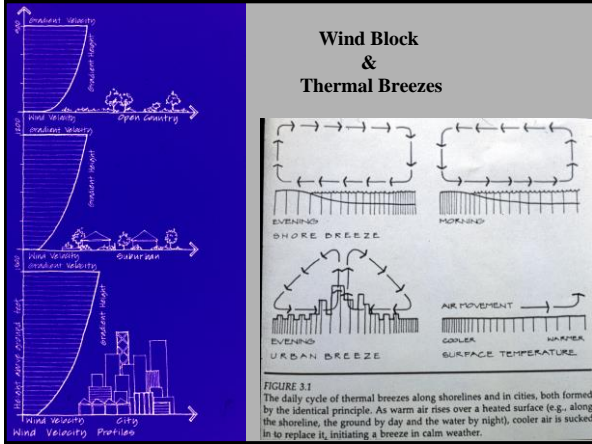
16



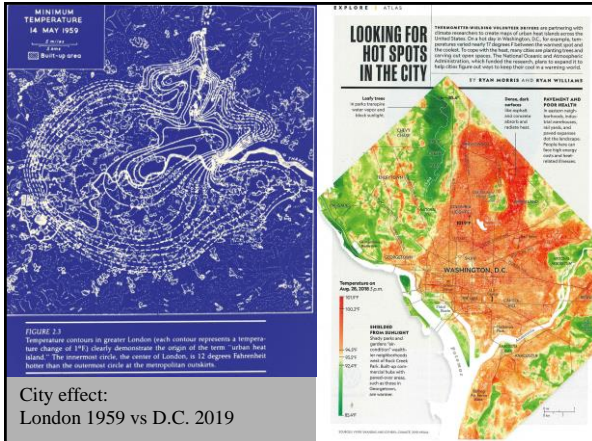
17



18

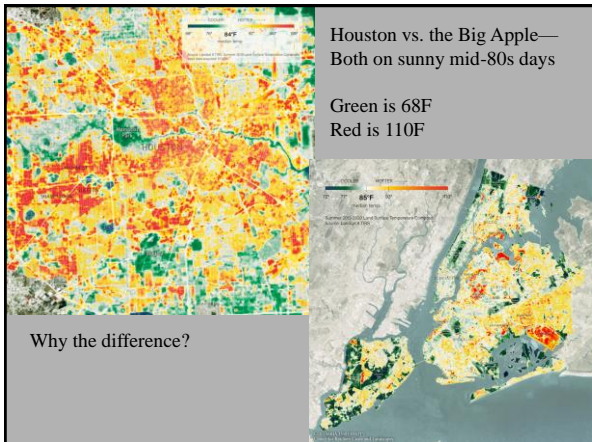


19



City effect:
London 1959 vs D.C. 2019

20

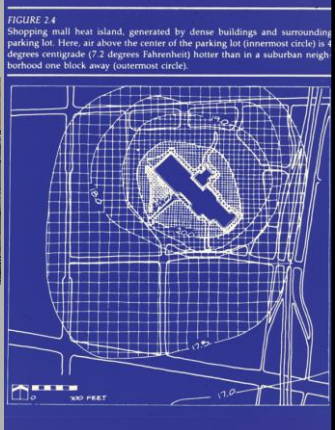


21

**Parking lot effect=
Smaller scale city effect**



Where would you like to be on a hot day in Moscow?



22

**Design for the City Effect:
Mitigation in the City**



Chicago, digital model by SOM

23

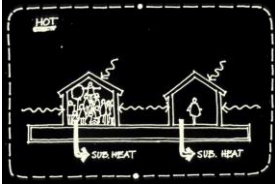
Doesn't the city effect improve the climate by making it milder?

Big problem →

Not a problem →



24

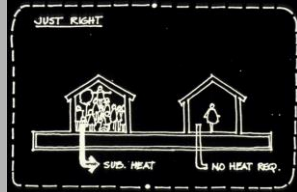
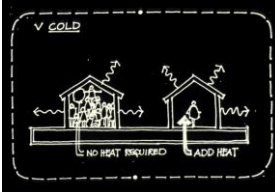


Your workplace vs. your house

IDL vs. SDL

[internal dominated load vs. skin dominated load]

Thermal needs differ!



25

What can architects and designers do about it?

To get more energy *savings* into architecture.

we need to get more architects into energy.

26

Reduce Waste Heat & CO₂ Emissions

a. Plan for transit

New York

27

Make it attractive!

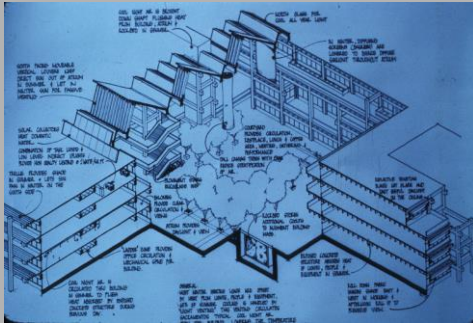


^ Portland, OR
< London, UK

28

Reduce Waste Heat & CO₂ Emissions

b. Design efficient buildings



Bateson Bldg, Sacramento, CA

29



Bateson Bldg, Sacramento

30

Reduce Waste Heat & CO₂ Emissions

c. Use Daylight



Light wells and crenellation



Carson Pirrie Scott, Chicago

31

Reduce Waste Heat & CO₂ Emissions

d. Use alternative energy sources



32

Reduce Waste Heat & CO₂ Emissions

d. Replace cars with pedestrians

[Popular COVID tactic]



The Strand in London
Before (above)
During (right)...

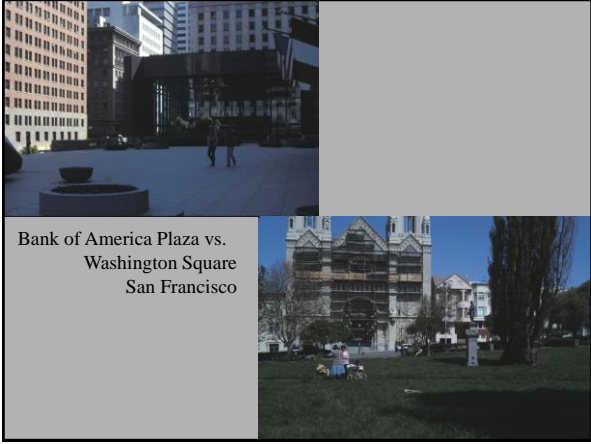
33



34



35



36

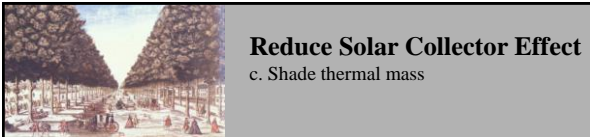
Reduce Solar Collector Effect

b. Improve solar geometry



Porticulus House
Addition to Houses of Parliament
-Hopkins

37



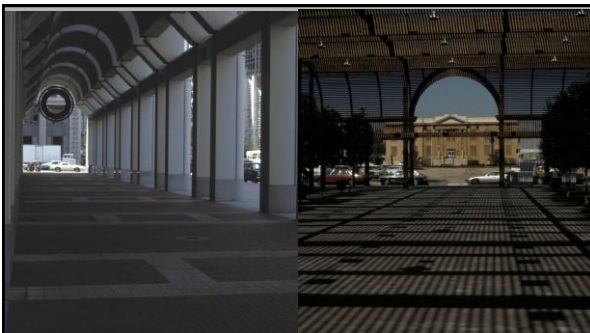
Reduce Solar Collector Effect
c. Shade thermal mass

Paris



San Francisco

38



San Francisco



Phoenix

39

Retain water on site

a. Add fountains and vegetation



San Francisco



Moscow

40

Retain water on site

b. Use permeable paving



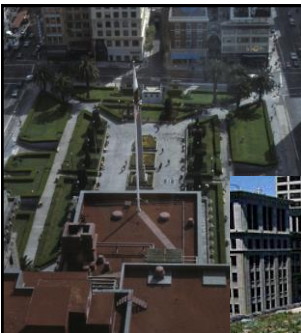
Eugene



41

Retain water on site

c. Green roofs



SF Union Square



Chicago City Hall

42

Retain water on site

d. Collect rainwater



Bioswales Portland, OR

43

Reduce Wind Block Effect

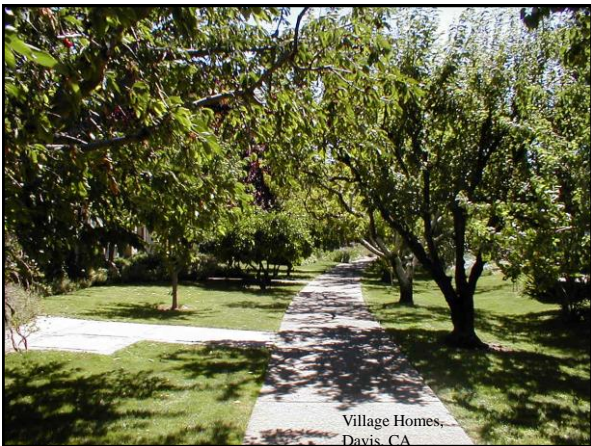
Stuttgart, Germany

a. Create ventilation corridors

Santa Fe, NM



44



Village Homes,
Davis, CA

45



46
