

Temperature

Passive Design, University of Ferrara

Lecture Three: October 11th, 2011

Matthew Woodruff MAIBC

Introduction

- Controlling temperature in buildings with passive means is an inexact science
- Calculations can be used to determine the general behaviour of the environment and building elements, but...
- The behaviour of PEOPLE, cannot be calculated and is dependent up variables such as mood, diet, activity and physiomy
- This leads to the idea that the best passive buildings are tuned by the users depending upon the specifics of the day and occupants

The Challenges

- Managing the sun, and managing the wind are the two basic challenges of passive building design
- The goal is to extend the times of ambient comfort in a way that is meaningful for the users



Managing Sun

EXAMPLE STRATEGIES

Heat Islands



Creating Comfort

- From the igloo study in the first lecture we learned that comfortable shelter can be created in even the most hostile climate



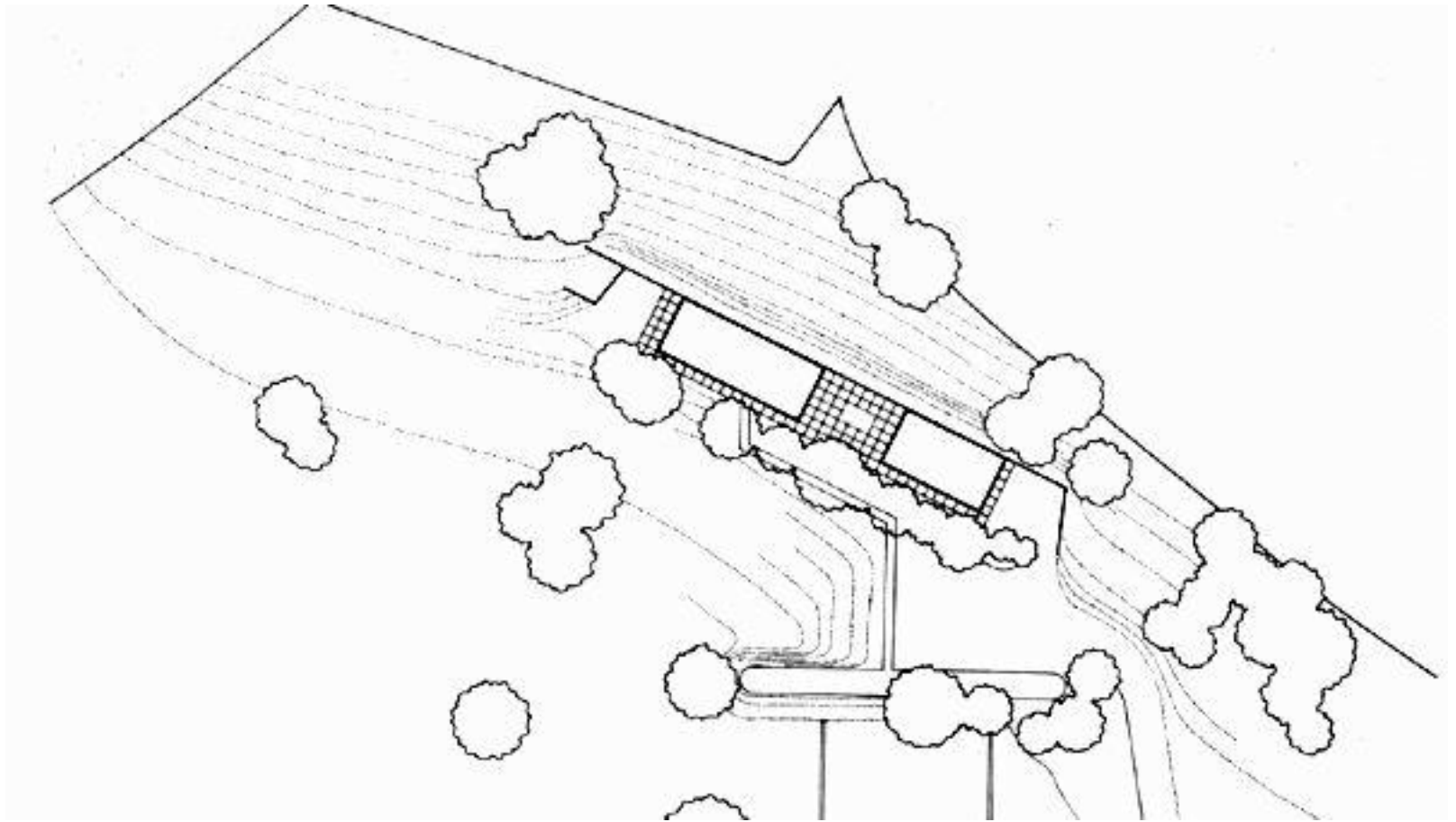
An Alternate Vernacular Response





Shade

Eames House, Charles and Ray Eames





Mass: Rammed Earth Walls

Rick Joy Office, Tucson Arizona



Mass: Hothouses

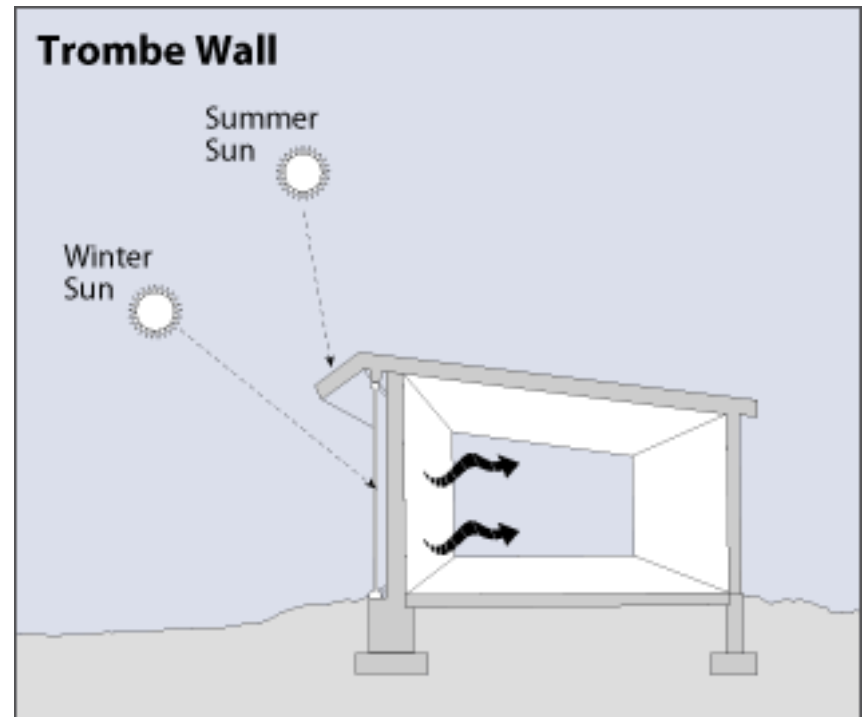
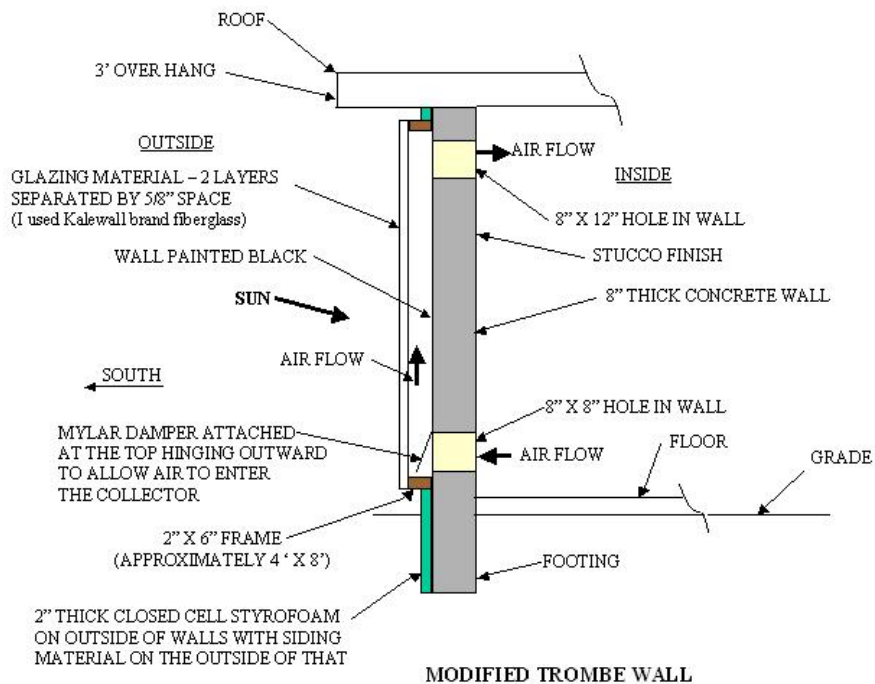
Terraced greenhouses,
Sanssouci Palace, Potsdam Germany



Technical Invention



- A Trombe wall is a south facing mass wall with a glazed exterior
- It is covered with an insulating curtain at night
- Is this a good idea?
- Technical drawings from Wikipedia



Managing Wind

EXAMPLE STRATEGIES

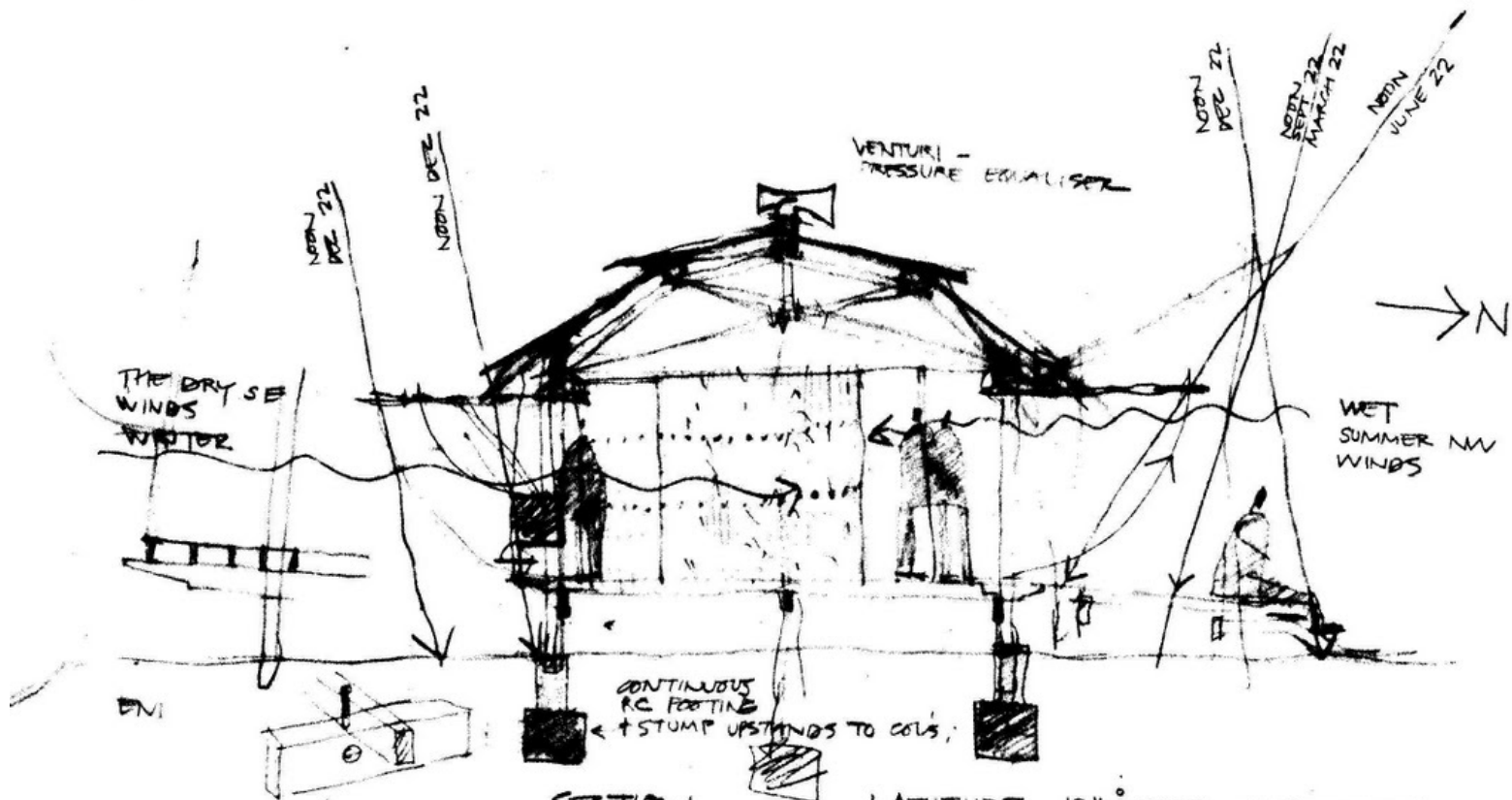
Scientific Principles

- There are a few things that you need to understand when designing with wind
- The prevailing wind usually changes with the time and the season
- Hot air rises
- Wind behaves like a fluid
- Wind speeds up when the outlet is smaller than the inlet (the Venturi Effect)



Wind and Shade

Marika-Alderton House, Glenn Murcutt



SECTION

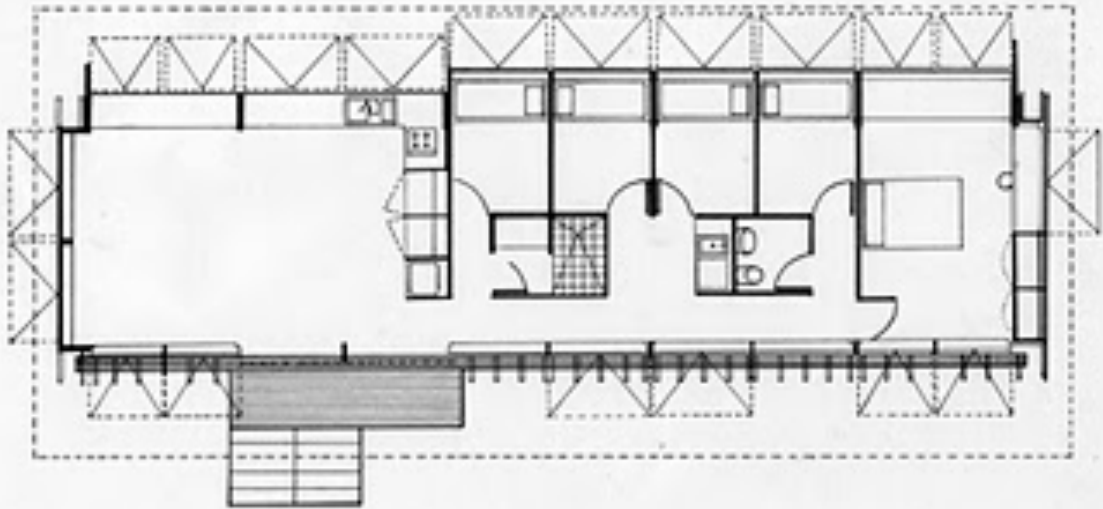
24
11
40

LATITUDE 12 1/2° SOUTH, 137° LONGITUDE

Flying 39,000 ft over Ankara Turkey
 Writing to back
 Clear sunny day
 22:50 hr Sydney time
 Show covered mts
 cannot see if any
 trees or in fact
 trees in mts
 ridiculous



2



Floor Plan

Scale 1:100

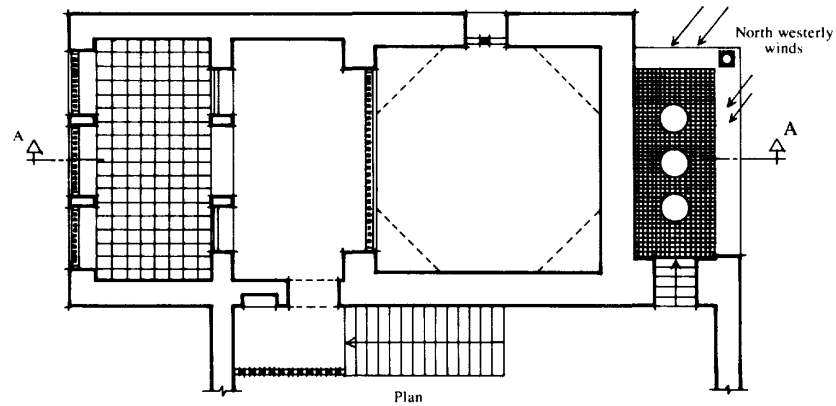
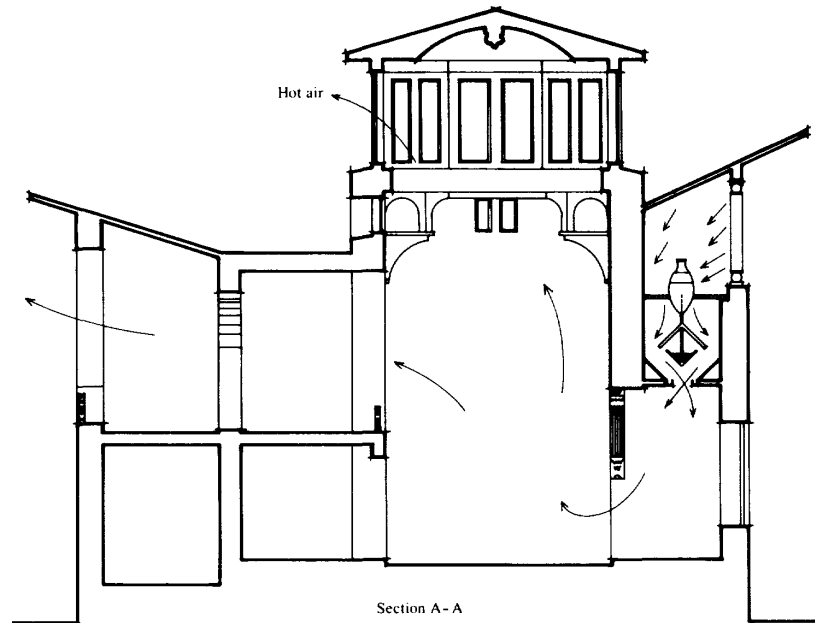


Prevailing Winds

Jean Marie Tjibaou Cultural Centre, Noumea
Renzo Piano Building Workshop







Evaporative Cooling

Examples from Natural Energy and Vernacular Architecture
Hassan Fathy