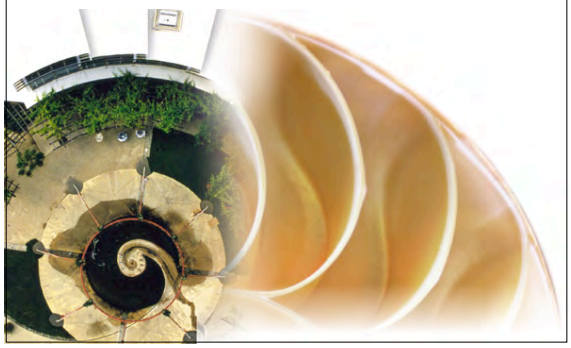
Daylight Design

ARCH 331/431 Spring 2008
Lecture 19



announcements 6/3/08

Final Exam Alternate Time:

Wednesday, 6/11

4:30 - 6:20

Smith (SMI) 304

Final Exam Assigned Time:

Friday, 6/13

4:30 - 6:20

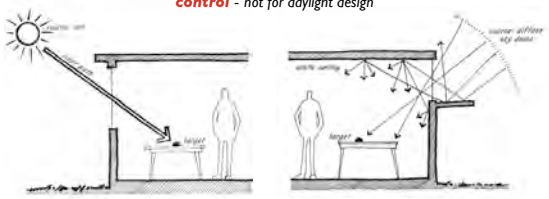
Gowan 201

Visualizing Daylight Illumination

A Conceptual Approach

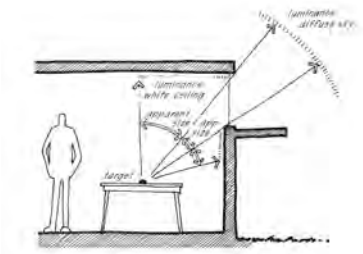
SOURCE - PATH - TARGET

*a conceptual approach that works best for **solar heating** and **solar control** - not for daylight design*



LUMINANCE x APPARENT SIZE

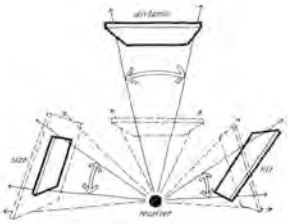
*a better conceptual approach for **daylighting design***



Consider all the light sources (windows and illuminated surfaces) and their relative sizes as ***seen*** by the target

APPARENT SIZE

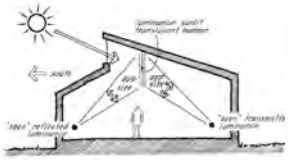
Function of Distance and Tilt

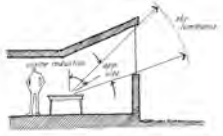


Apparent size, and resulting illuminance, is modified by the **cosine effect**

cos 90° = 0 **cos 0° = 1**

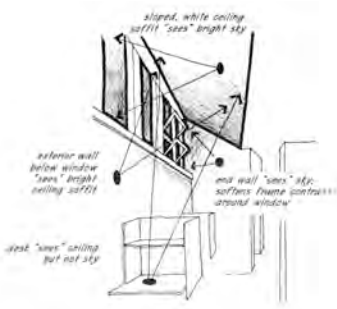
LUMINANCE x APPARENT SIZE

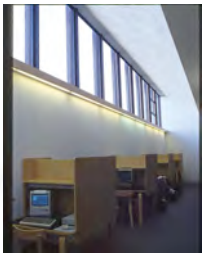




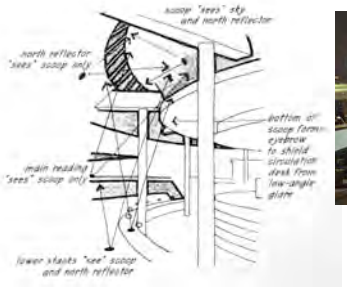
Light sources include windows, translucent banners, walls, ceilings and outdoor surfaces.

Mount Angel Abbey, Oregon
Alvar Aalto

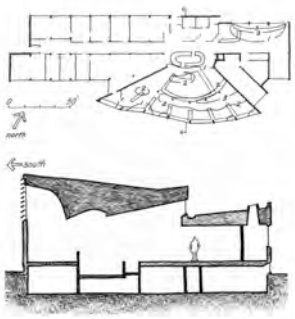




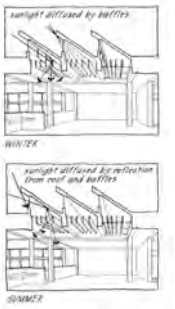
Luminance x Apparent Size Model



Seinajoki Library, Finland
Alvar Aalto

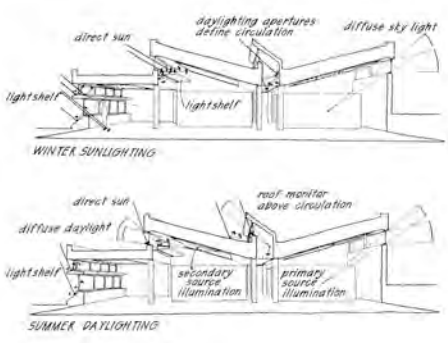


Mount Airy Library, North Carolina
Edward Mazria



Mt. Airy Library
Mt. Airy, North Carolina

Luminance x Apparent Size Model



Four goals for designing with daylight

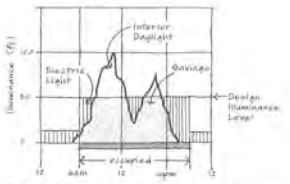
1. Use as much daylight as possible to replace electric lighting; bring it deeply into the space.
2. Provide adequate illumination levels for the given tasks and purpose of the space.
3. Avoid creating visual discomfort.
4. Consider *light as formgiver of architecture*; make use of all the visual and experiential qualities of daylight possible.

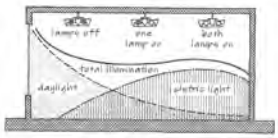
This assumes that solar control has been effectively addressed

Goal One:

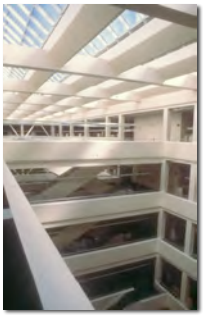
Replacing electric lighting with daylight.

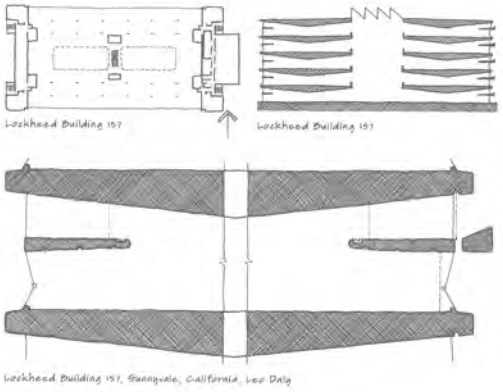
In order to reduce the environmental impact of buildings, we can use daylight to replace electric lighting when possible.





Lockheed Building 157





task / ambient

A lighting strategy in which ambient lighting is provided by one source and task lighting by another

Daylighting can be used as ambient light but may not be ideal for all tasks

Distribute light deeply and evenly into the space

Daylight, both direct beam sunlight and light from the sky-vault can provide high quality and quantity illumination that is thermally efficient (lumens/watt).

However, it must be controlled and distributed effectively to achieve high quality lighting.