

Lecture 10: Passive Solar

The useful practice of the “Ancients” should be employed on the site so that loggias should be filled with winter sun, but shaded in the summer.

Leone Battista Alberti from his treatise De Re Aedificatoria, 1452, the first modern work on architecture, which influenced the development of the Renaissance architectural style.

Orientation is 80 percent of passive solar design.

Doug Balcomb, solar scientist

The south facade is a goldmine for harvesting winter sun, easy summer shading, and year-round quality daylighting.

Anonymous



Introduction

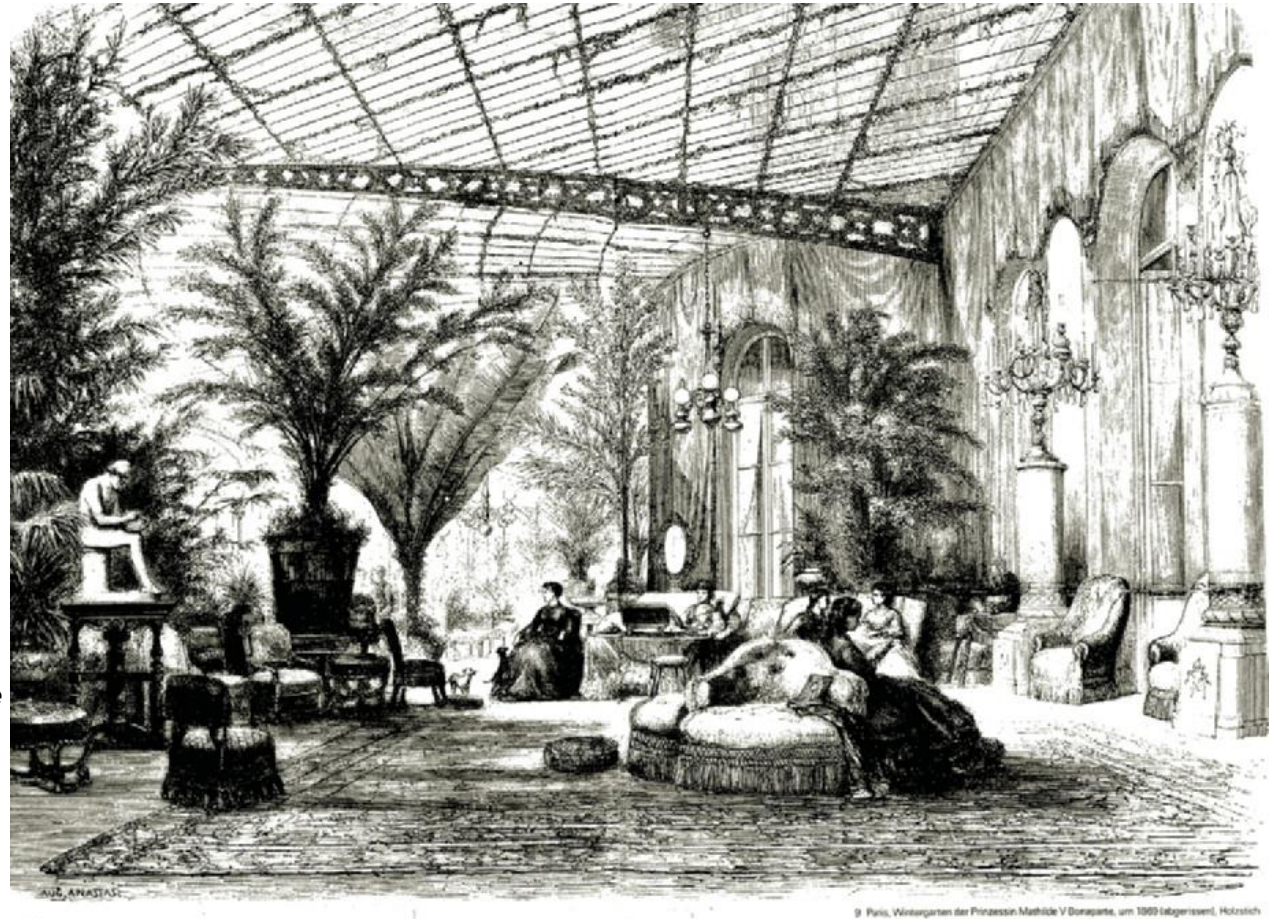
Although the ancient Greeks used the sun to heat their homes, the benefits were modest because much of the captured heat escaped again through the open windows during the day. The efficient and practical Romans first solved this problem by using glass in their windows sometime around a.d. 50. The glass created an efficient heat trap by what we now call the greenhouse effect.

The orangery on the grounds of the royal palace in Prague, the Czech Republic, has an all-glass south facade and an opaque roof, which are typical of the greenhouses that became popular in the eighteenth century



Conservatories supplied plants, heat, and extra living space for the upper classes in nineteenth-century Europe. Conservatory of Princess Mathilde Bonaparte, Paris, about 1869.

From *Über Land und Meer*, Allgemeine Illustrierte Zeitung, 1868.



9. Paris, Wintergarten der Prinzessin Mathilde V Bonaparte, um 1869 (abgerissen), Holzschnitt

SOLAR IN AMERICA



The New England saltbox faced the sun and turned its back to the cold northern winds. (From Regional Guidelines for Building Passive Energy Conserving Homes, by AIA Research Corporation, U.S. G.P.O., 1980.)

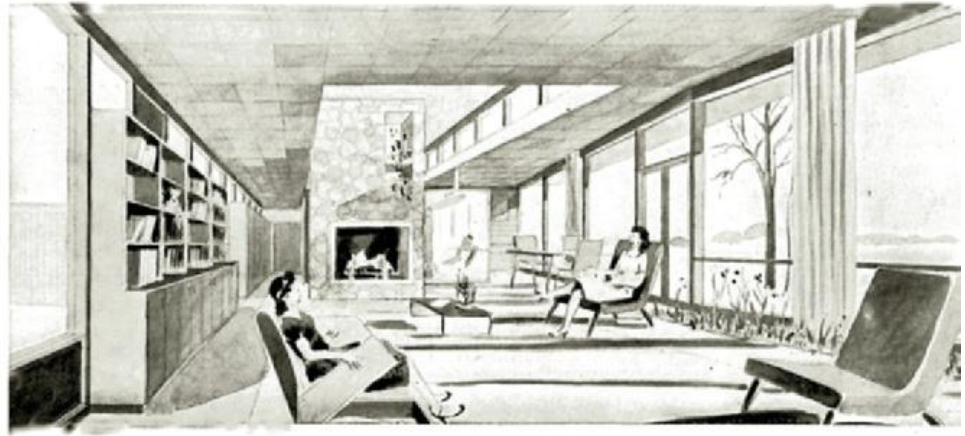


This is an artistic reconstruction of Pueblo Bonito, Chaco Canyon, New Mexico.

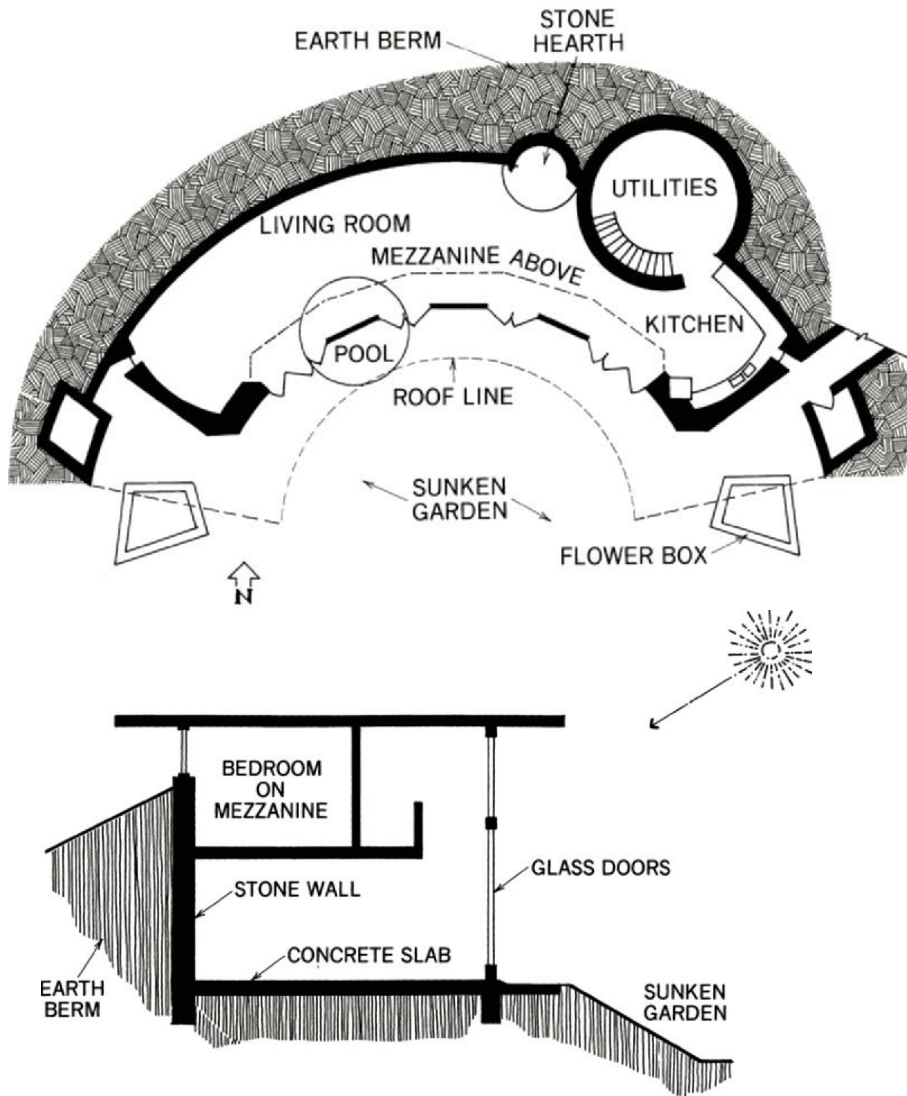
Built about a.d. 1000, Pueblo Bonito is an example of an indigenous American solar village.

(From Houses and House-Life of the American Aborigines, by Lewis Morgan [contributions to North American Ethnology. Vol. 4], U.S. Department of the Interior/U.S. G.P.O., 1881.)

SOLAR HEMICYCLE



One of the first modern solar houses in America was designed by architect George Fred Keck in Chicago in the 1940s. (Used by ermission of Pilkington North America, Inc.)



The Jacobs II House was designed by architect Frank Lloyd Wright and built in Madison, Wisconsin, circa 1948. (Photograph by Ezra Stoller © Esto.)



This interior view of the Jacobs II House shows the two-story south-facing window wall, the concrete floor, and the stone walls for storing heat. (Photograph by Ezra Stoller © Esto).

LATEST REDISCOVERY OF PASSIVE SOLAR

Passive solar also provides security from power interruptions and the possibility of extremely high energy costs. There is a growing conviction that buildings should be designed to be resilient. With so many benefits, passive solar should be a fundamental part of every design for a building that has access to the winter sun.

LATESTThe Human Services Field Office, Taos, New Mexico (1979), has all of its windows facing 20° east of south to take advantage of the winter morning sun. The clerestory windows, which cover the whole roof, supply both daylight and solar heat. T REDISCOVERY OF PASSIVE SOLAR



Integrated passive and hybrid solar multiple housing, Berlin, 1988. (Courtesy of and copyright Institute für Bau-, Umwelt- und Solar Forschung.)



References

Norbert Lechner-Heating, Cooling, Lighting_
Sustainable Design Methods for Architects-
Wiley (2014)

Disclaimer:

Images are imported from either the book or
the internet, and used only for demonstration
and educational purposes.