



Universität für Bodenkultur Wien  
Department für Bautechnik und  
Naturgefahren

## Sustainable Buildings

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**Vienna**  
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Eco-efficiency buildings and architecture I | Dipl.-Ing. Roman Grüner

## Sustainability

### Historical Development:

The term originates in **German** language from the **forest industry**. First mentioned in 12th century.

1144: Forest arrangement of the alsatian cloister Mauermünster - „*not to cut more wood than it can grow back again*“.

1480: Requirement - „*to preserve the forest, because the progeny will once also need it*“.

1713: Saxony Captain Hans Carl von Carlowitz demanded in „*Sylvicultura Oeconomica*“, „*that a continuing sustainable use should become indispensable*“.

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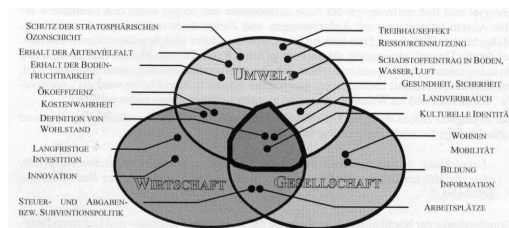
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1992: **Earth Summit in Rio de Janeiro** defined the sustainable development as a *development, that can be continued over the whole earth without affecting the natural balance and the society in their functionality.*

1997 and 1998 the EN ISO 14.040 and 14.041 were published, handling the Ecobalancing, replacing the simple SETAC Scheme.

1999 **Contract of Amsterdam**: Sustainability is and intangible part of the European Union.

2001 **Göteborg**: European council adds the environmental dimension to the social and economic dimension.



[Quelle: GRAUBNER, C.-A., HÜSKE, K. 2003]

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## Resources in Building Industry

-Energy: for Material production, operating buildings, demolition and disposal

-Soil: ground for building, living space for organisms and production of biomass, oxygen and drinking-water

-Water: living space, origin of life

-Resources: renewable vs. non-renewable resources.

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**Rock and Earth Caves: the earliest forms of human housing**

Advantage: Living temperature in the cave = middle-year temperature of the surrounding, Summer – cool, winter – warm, constant

Examples: in the valleys of Dordogne and Vézère (F), Göreme (Turkey), Matmata (Tunisia), Loyang (China), Montezuma Castle (Arizona), Mesa Verde (Colorado), Matera (Apulien)



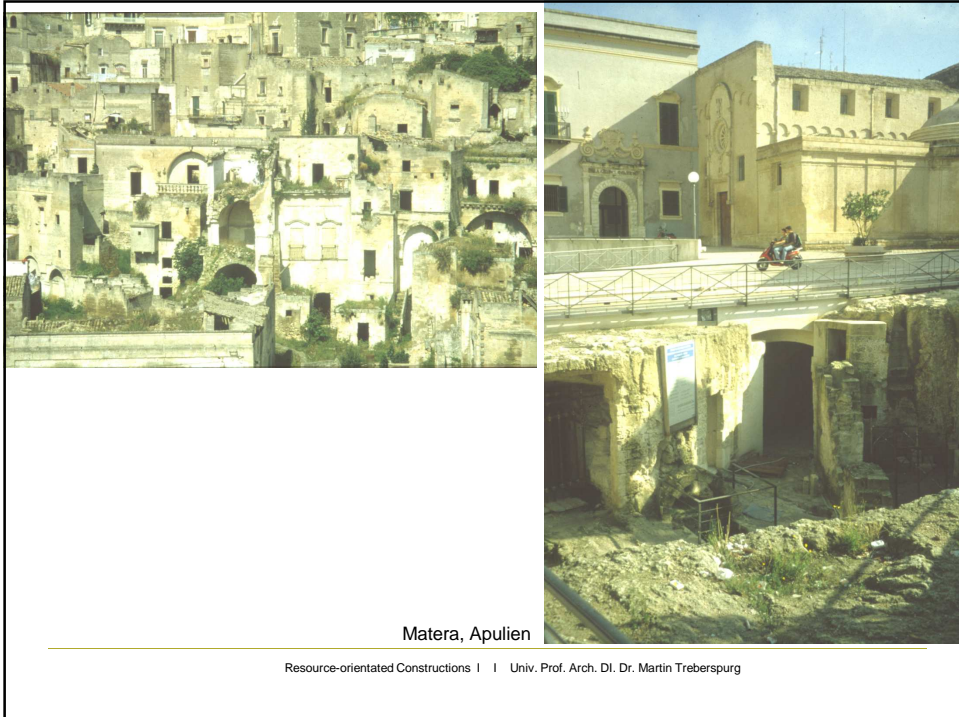
Höhlenwohnungen in Matmata, Tunesien

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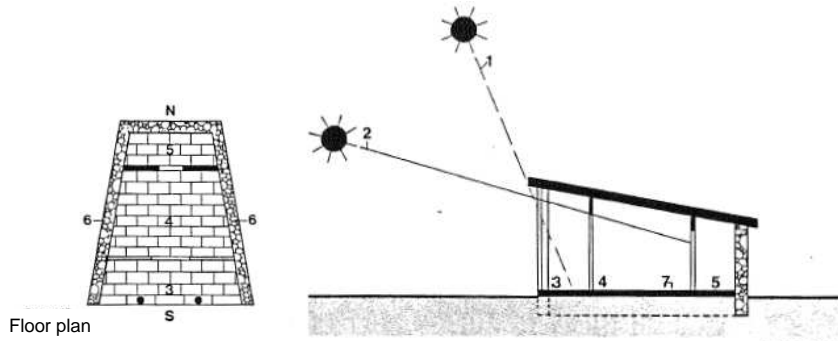


Matera

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Sunhouse of Socrates (469 – 397 v. Chr.)

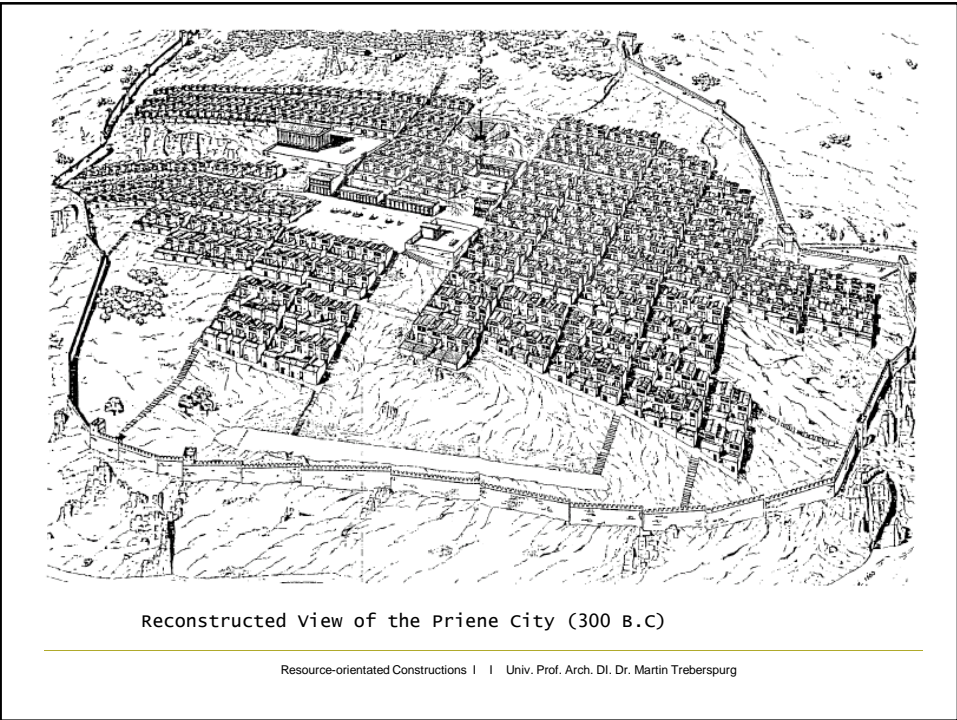
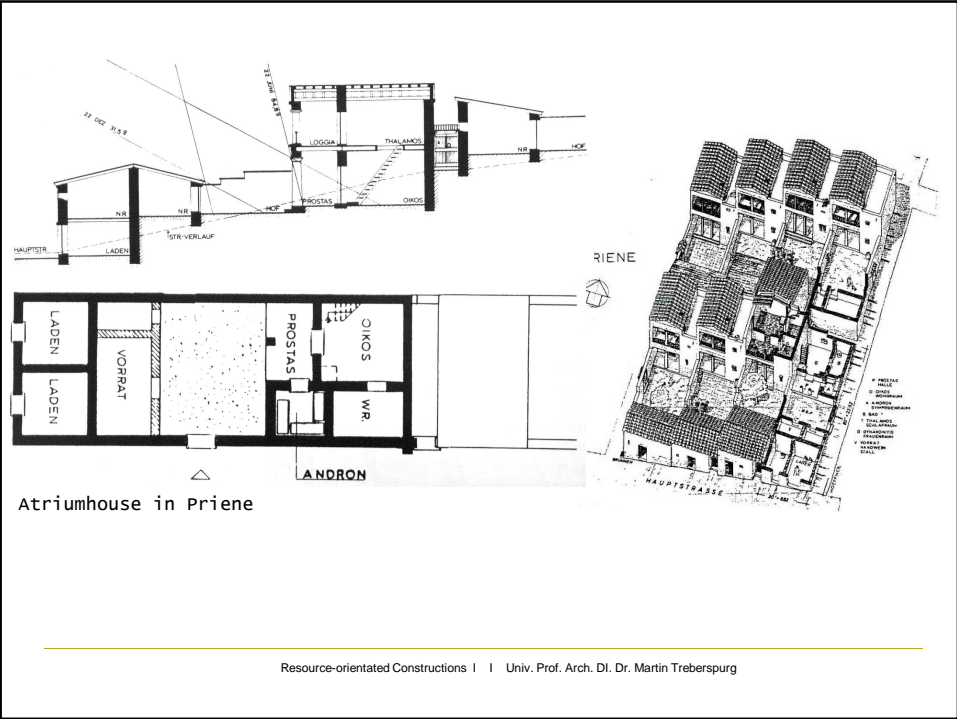


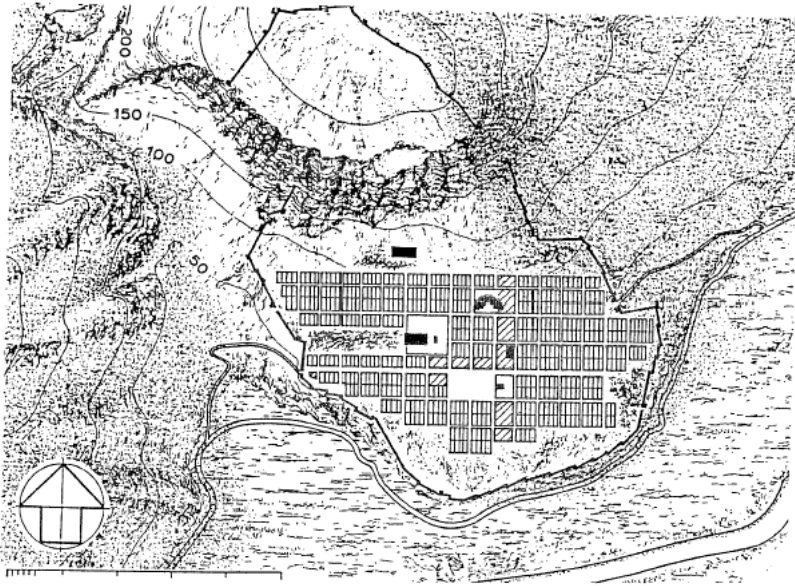
Floor plan

Cross section

- Legend:
- 3 Terrace, Forecourt
  - 4 Living space
  - 5 Storage room, also buffer zone
  - 6 Massive Walls for accumulation of heat
  - 7 Stonefloor, also heat accumulation







Streetplan of Priene

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1 Sonneneinstrahlung im Sommer  
2 Sonneneinstrahlung im Winter

Grundriß

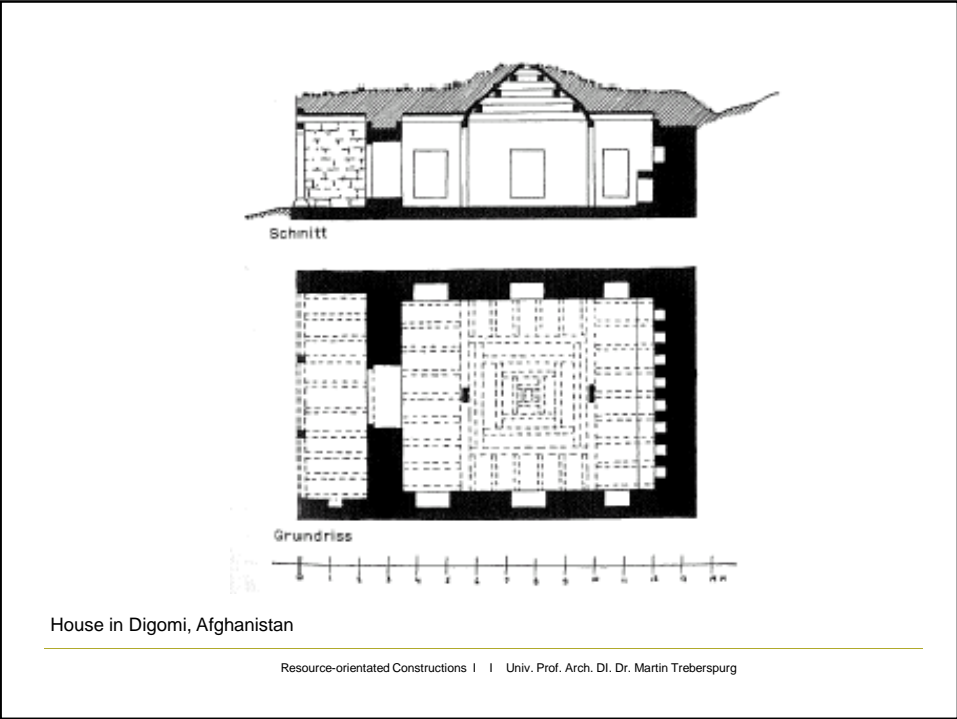
Längsschnitt

3 zweigeschossiges Hausgebäude  
4 Wände mit Efeu beschnitten  
5 eingeschossiges Vorergebäude  
6 Atriumhof  
7 Wasser Becken  
8 Straße

OLYNTH

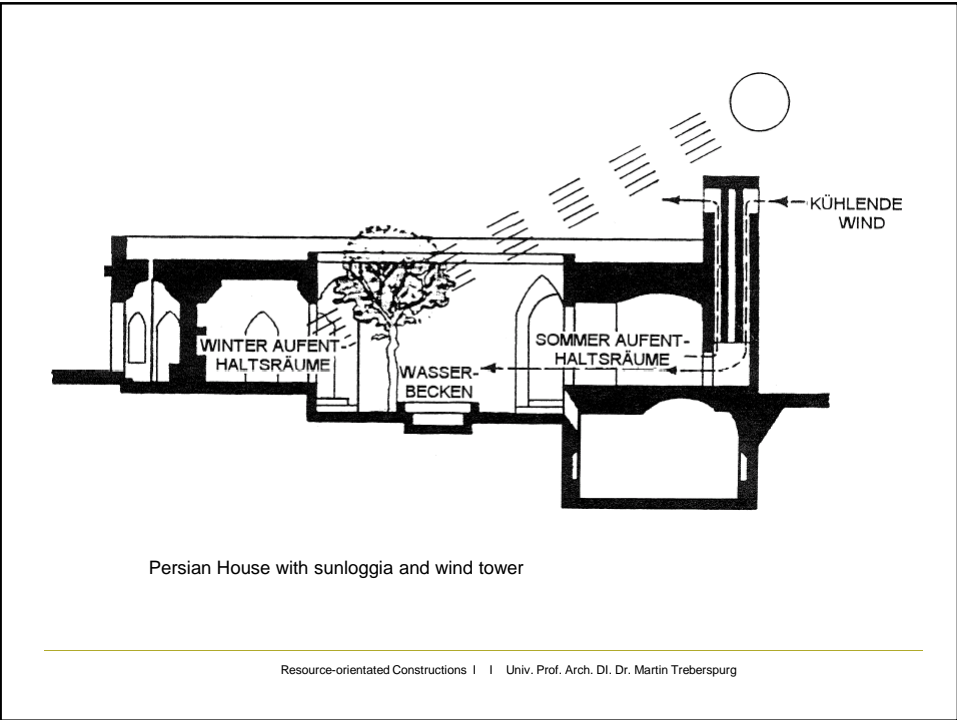
Atrium house of the ancient time (from 2nd century B.C

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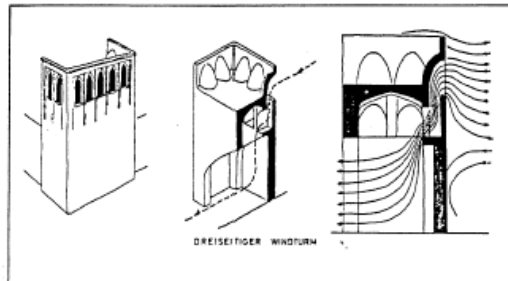
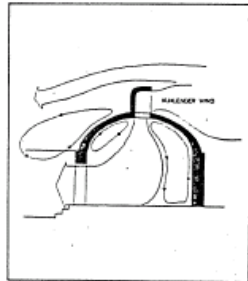
House in Digomi, Afghanistan

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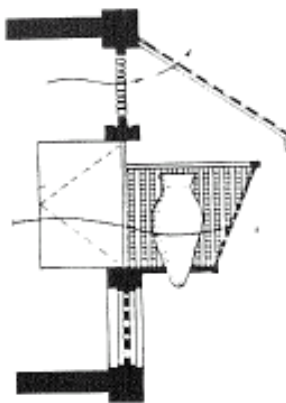


Persian House with sunloggia and wind tower

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Natural air conditioning in building of persian times





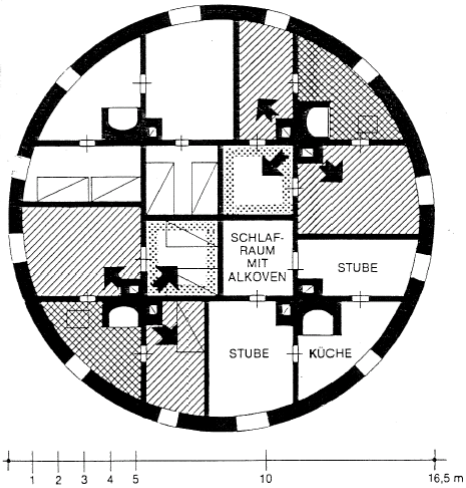


Abb. 2.10.: Rostocker Rundkate

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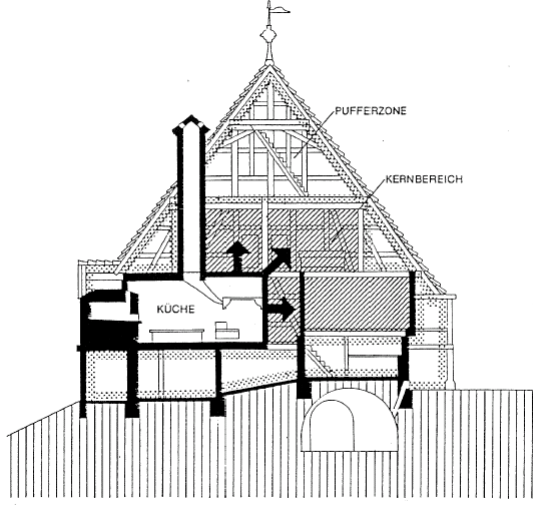
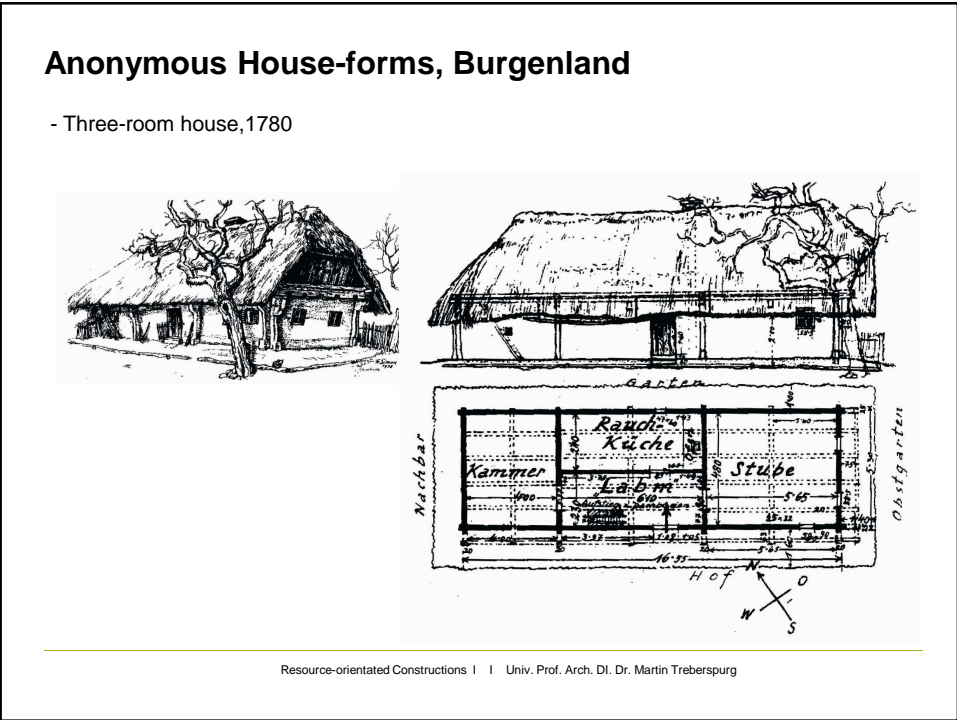
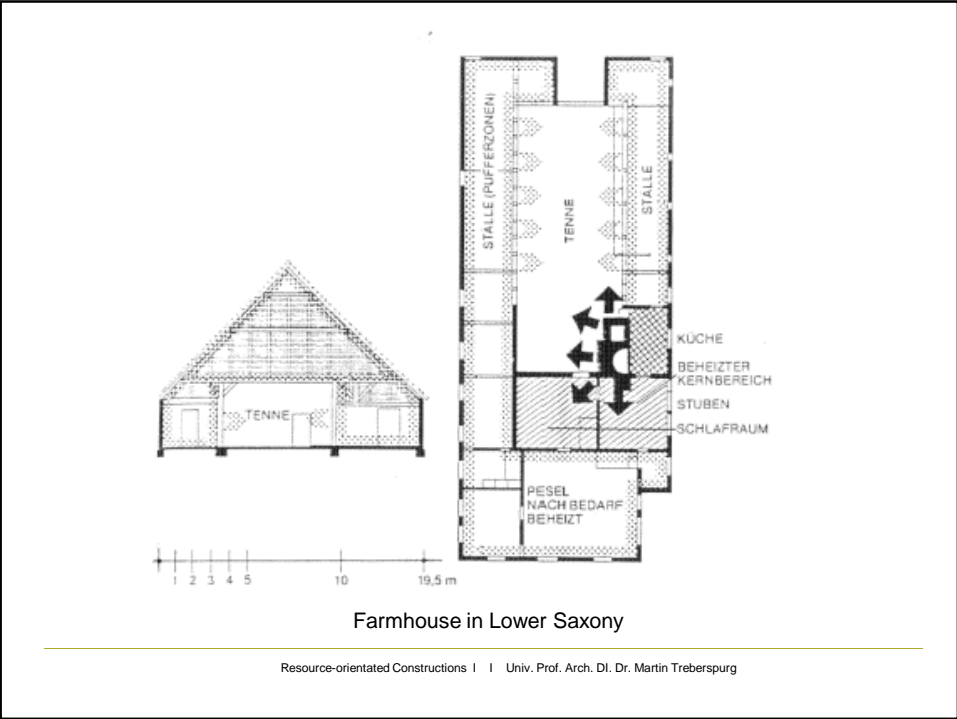


Abb. 2.11.: Süddeutsches Bauernhaus, Schemaschnitt

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Farmhouse in Steyregg /  
Oberösterreich

17. century

Living space = 72,24 m<sup>2</sup>, 170 kWh/m<sup>2</sup>a  
heating consumption

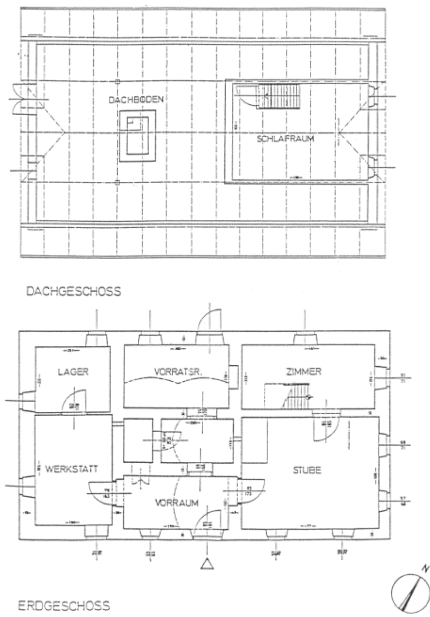
factory, storage, stash and bedroom- not  
heated

Heatet living space = 41,66 m<sup>2</sup>, 290 kWh/m<sup>2</sup>a

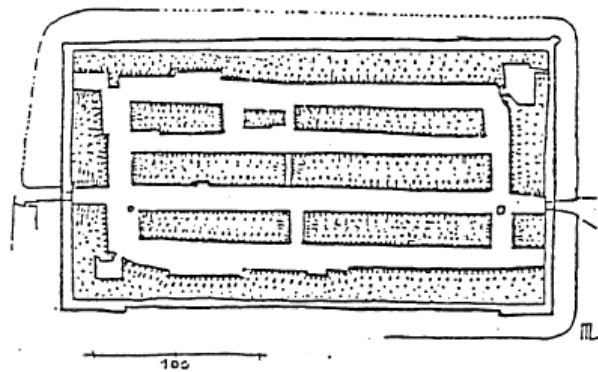
4,5 fm = 2.500 kg wood per heating season

Exterior walls: 46 cm Sandstone

U=1.92 W/m<sup>2</sup>K

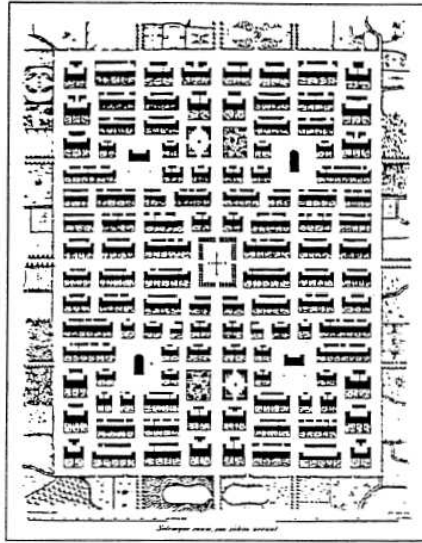


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City plan of Neukirchen at Schaffhausen (14. Century)

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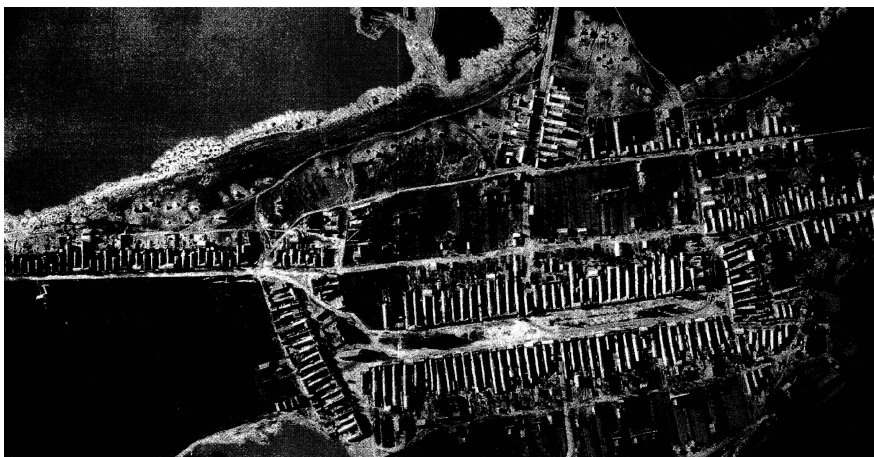


Dr. Faust "Sun- and Garden cityplan

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## Ingenieurdörfer, Burgenland

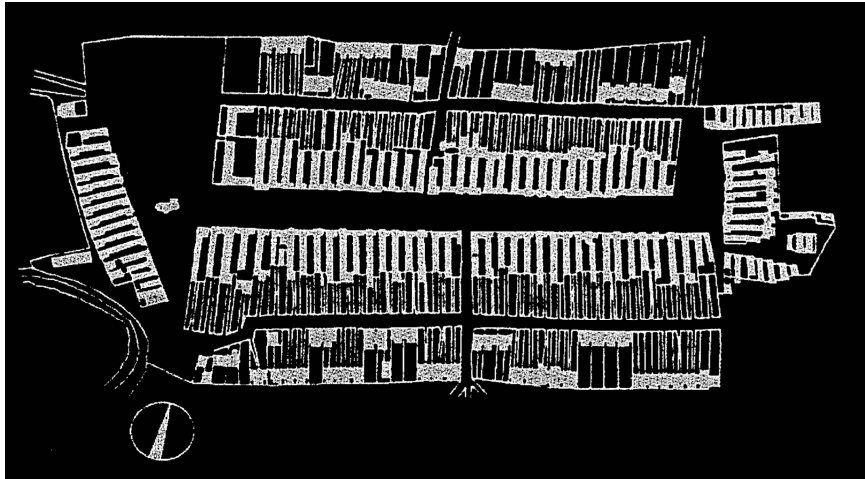
St. Andrä, aerophoto



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## Ingenieurdörfer, Burgenland

Cityplan St. Andrä. Frontage: SE, NW; Court façade: NE, SE



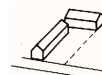
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## Anonymous Houseforms, Burgenland

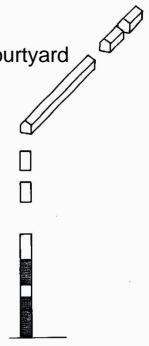
- Stretched courtyard



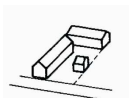
- Two-sided courtyard



- Attached courtyard



- Common three-sided courtyard

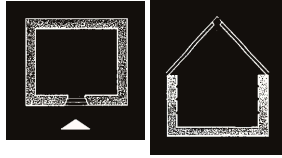


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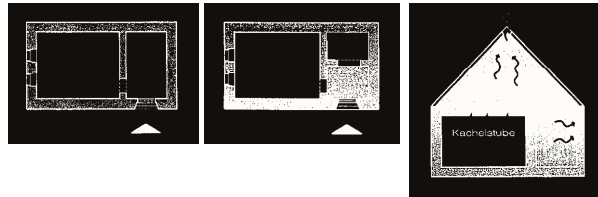


## Anonymous Houseforms, Burgenland

- One-room living place



- Two-rooms house



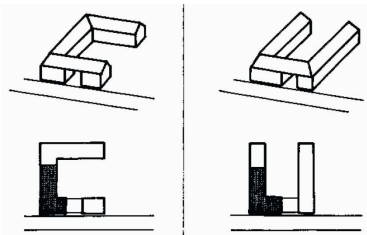
- Three-rooms house



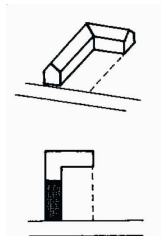
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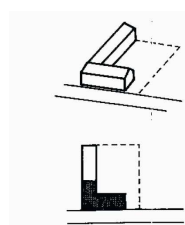
- Saddle courtyard with streetwing in 2 variations



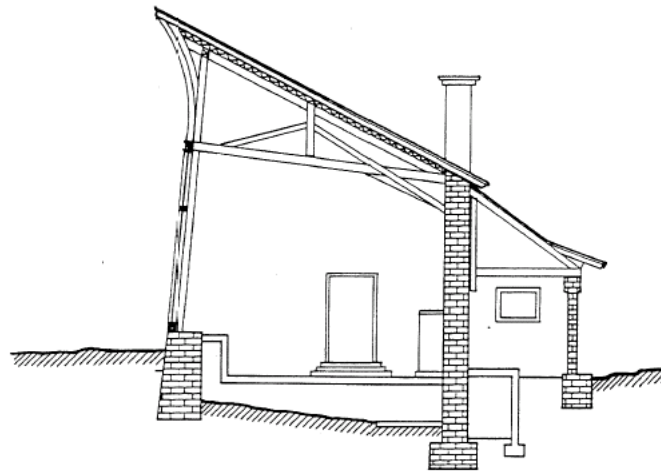
- L-house form with one pediment



- Crooked courtyard with cullis orientation



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Baroque greenhouse

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Greenhouse Telc, Czech republic

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Orangery Castle Schönbrunn, Vienna, 1755

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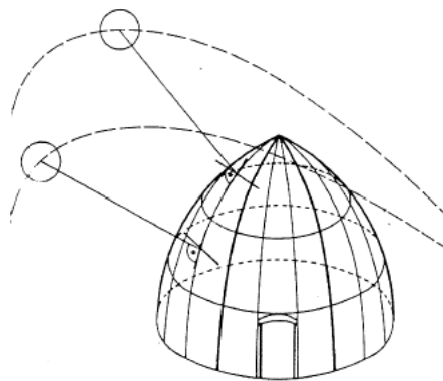
Orangery Castle Schönbrunn, Vienna, 1755

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Crystalpalace (1851), London by Sir Joseph Paxton.



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Scheme of a spherical glasshouse

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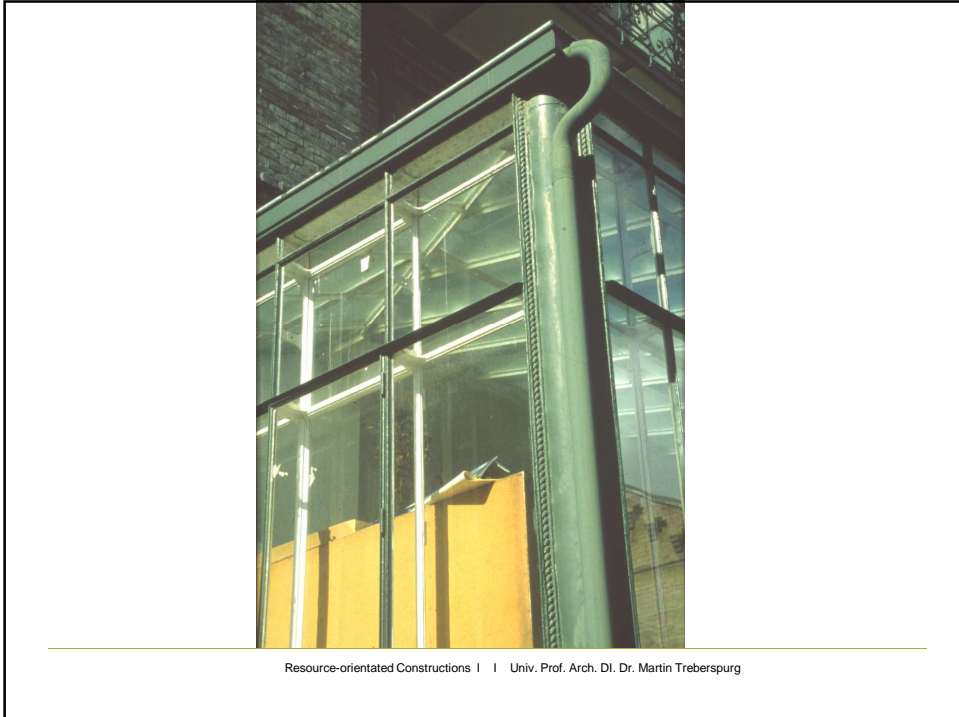




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La Coruna, Galizien, North-west Spain

Glass-fronts, 1840 – 1890

Houses from massive granite

Climate sunny, windy, humid

More living quality through the glass-fronts

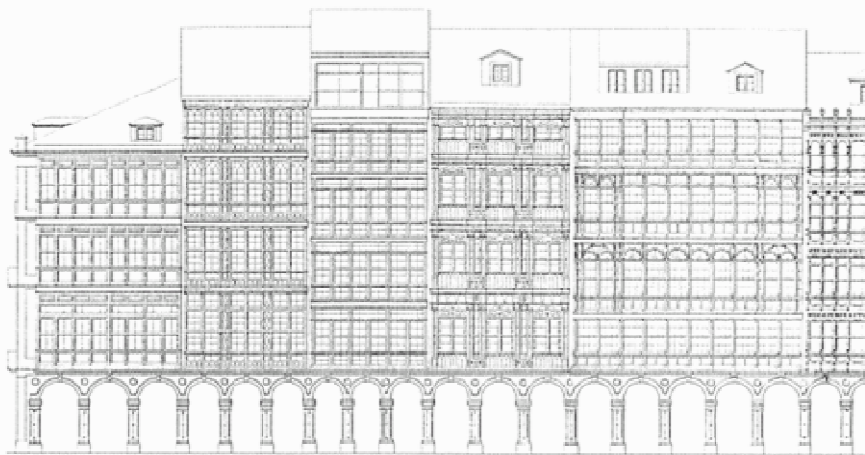
High carpenter handcraft - shipbuilding

Large große Glasswork „La Corunesa“,  
1830

Building regulations for glass-fronts, 1854

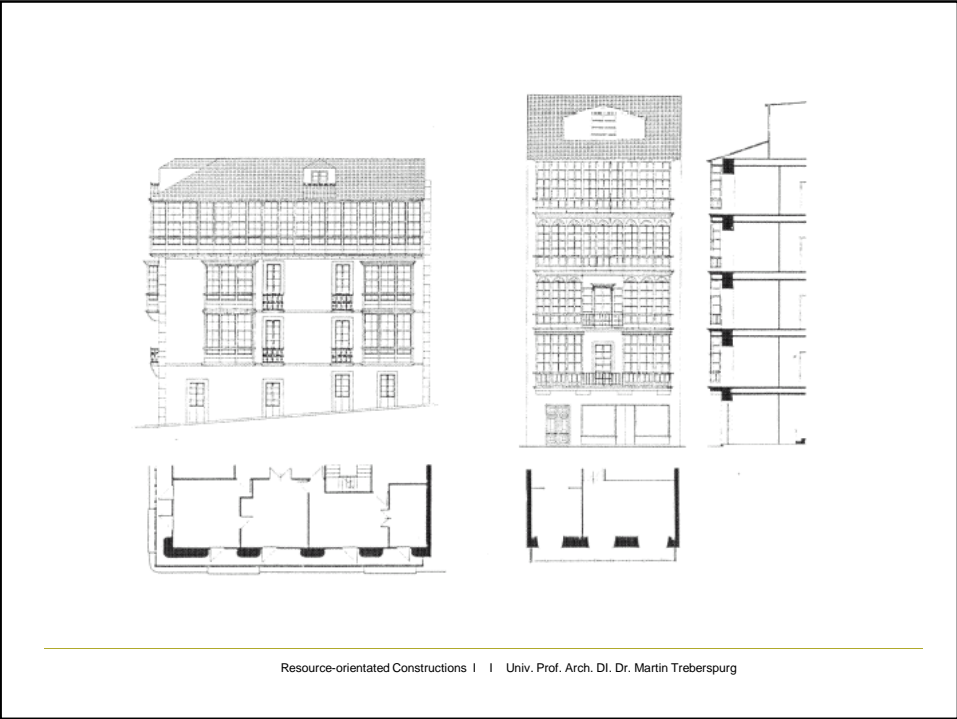


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Street view – Avenida de la Marina

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Santiago de Compostela



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