ARCHITECTURAL STRUCTURES I:
STATICS AND STRENGTH OF MATERIALS

ENDS 231

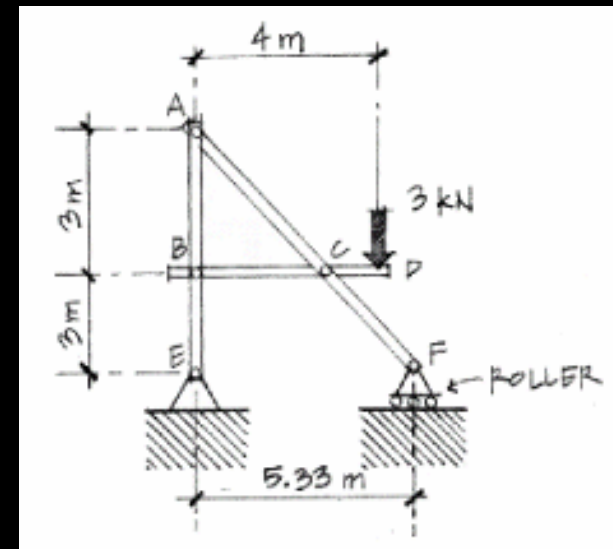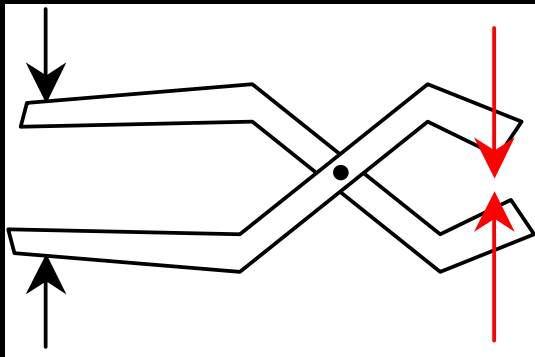**DR. ANNE NICHOLS**

SPRING 2008

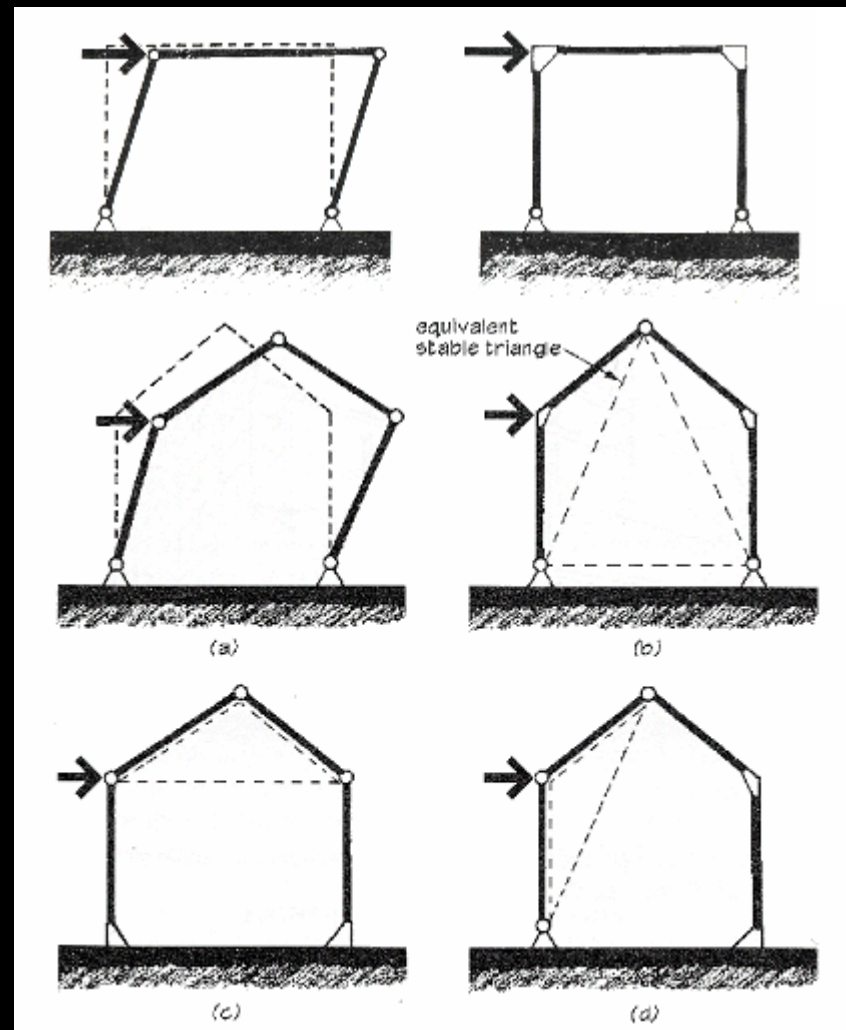lecture

nine

pinned frames, hinged arches

Pinned Frames

- *structures with at least one 3 force body*

- *connected with pins*

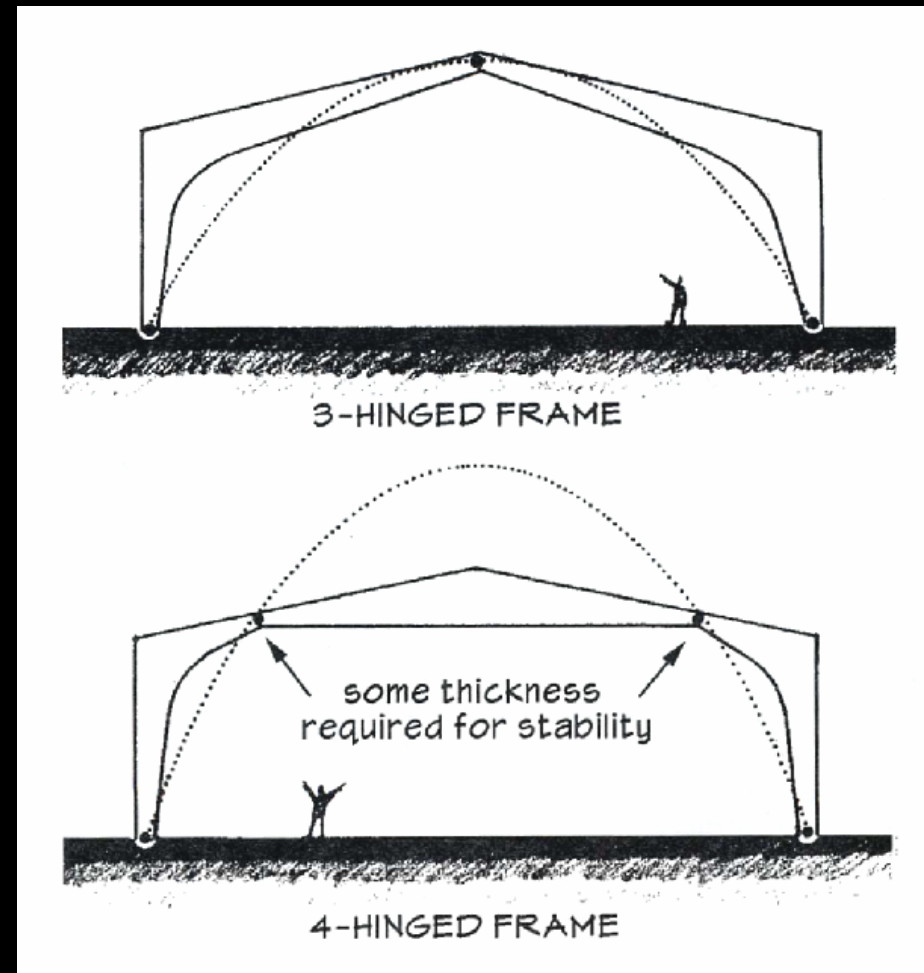- *reactions are equal and opposite*
  - *non-rigid*   *– rigid*

Rigid Frames

- *rigid frames have no pins*
- *frame is all one body*
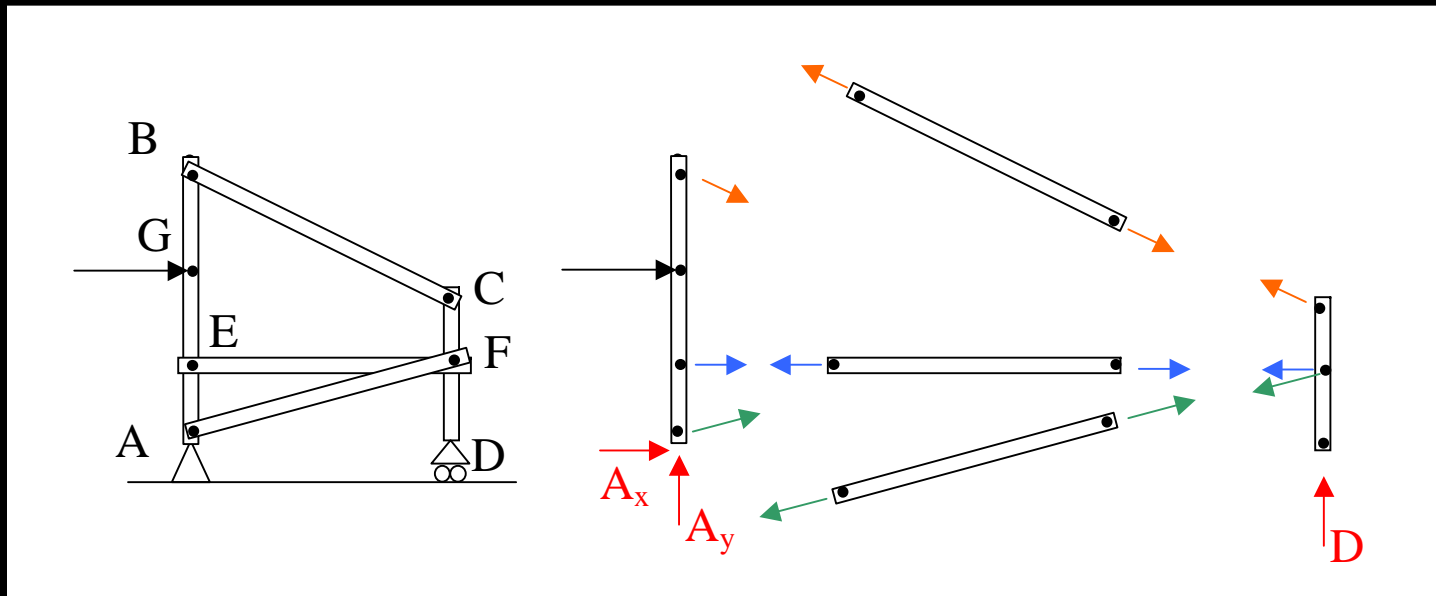- *typically statically indeterminate*
- *types*
  - *portal*
  - *gable*

Rigid Frames with PINS

- *frame pieces with connecting pins*
- *not necessarily symmetrical*

3-HINGED FRAME

some thickness required for stability

4-HINGED FRAME

Internal Pin Connections

- *statically determinant*
  - *3 equations per body*
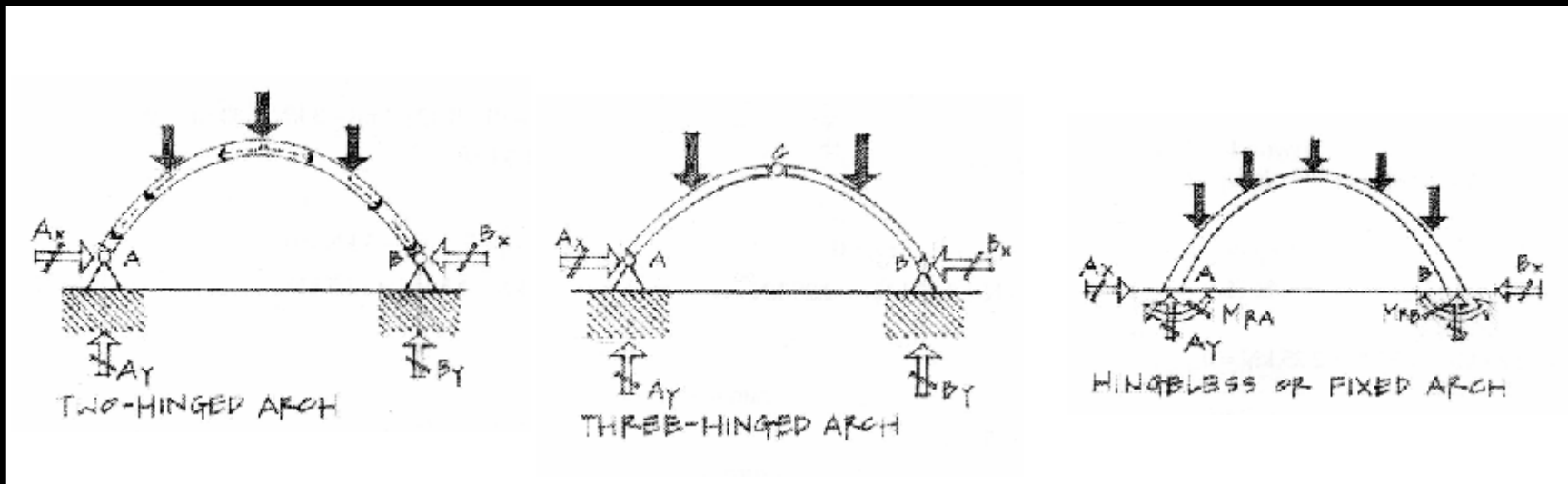 - *2 reactions per pin + support forces*

Arches

- *ancient*

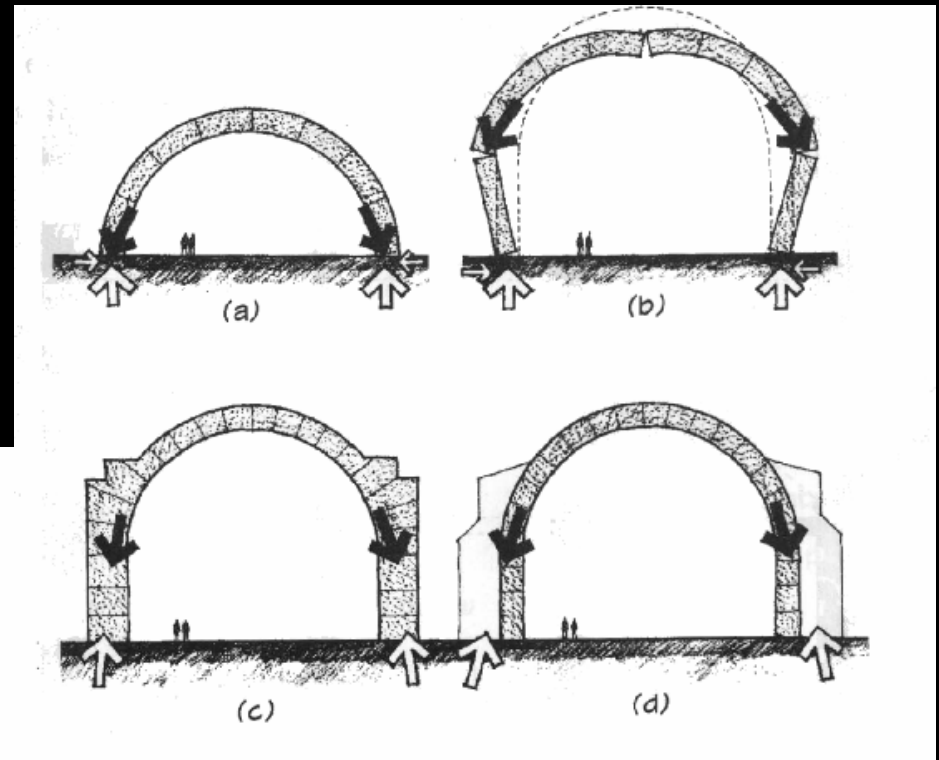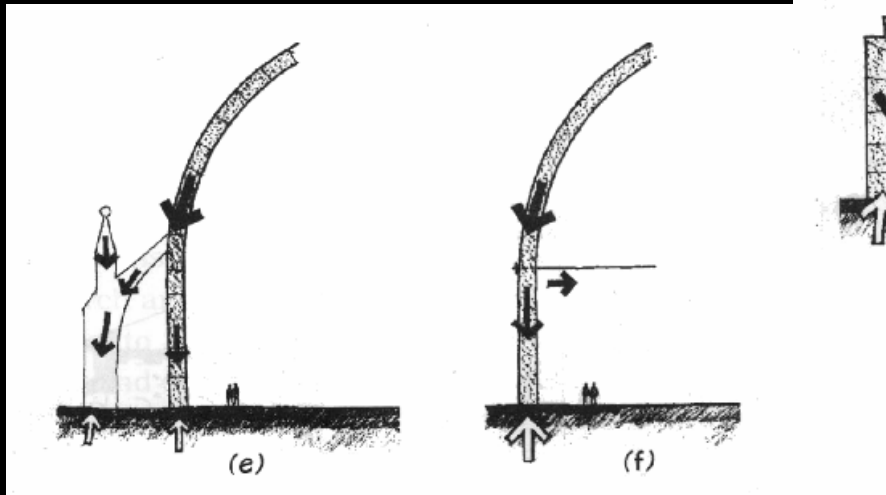- *traditional shape to span long distances*

Arches

- *primarily sees compression*
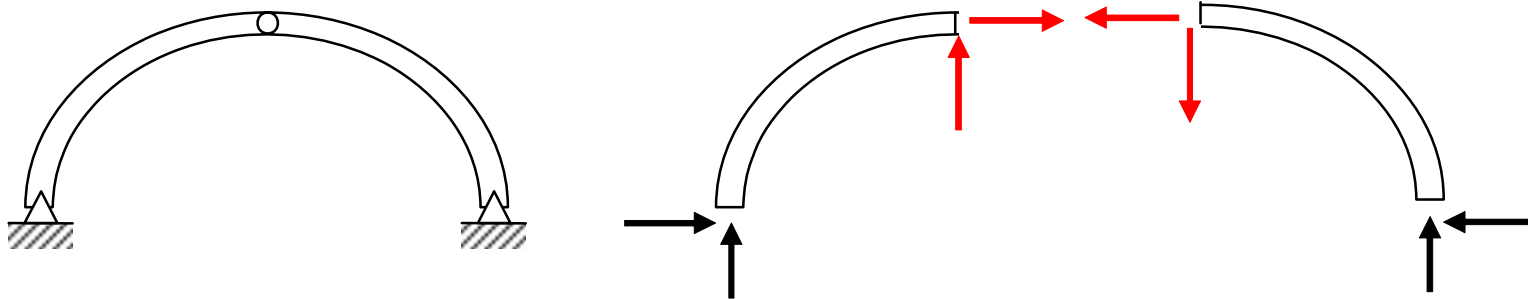- *a brick "likes an arch"*

Arches

- ## behavior
  - ### thrust related to height to width

Three-Hinged Arch

- *statically determinant*
  - *2 bodies, 6 equilibrium equations*
  - *4 support, 2 pin reactions (=6)*

Procedure

- *solve for all support forces you can*

- *draw a FBD of each member*
  - *pins are integral with member*
  - *pins with loads should belong to 3+ force bodies*
  - *pin forces are equal and opposite on connecting bodies*
  - *identify 2 force bodies vs. 3+ force bodies*
  - *use all equilibrium equations*