

**ARCHITECTURAL STRUCTURES I:  
STATICS AND STRENGTH OF MATERIALS**

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**ENDS 231**

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**FALL 2007**

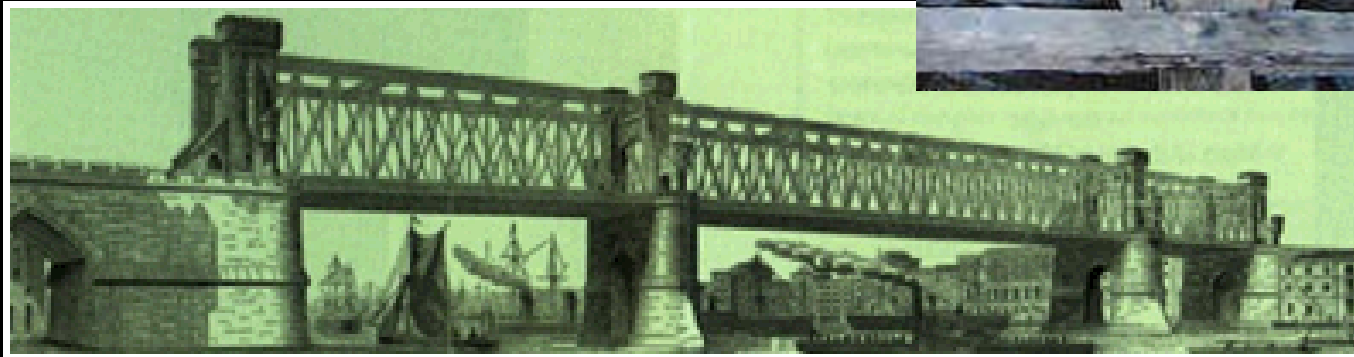
**lecture  
SIX**



**introduction  
to trusses**

# Truss Structures

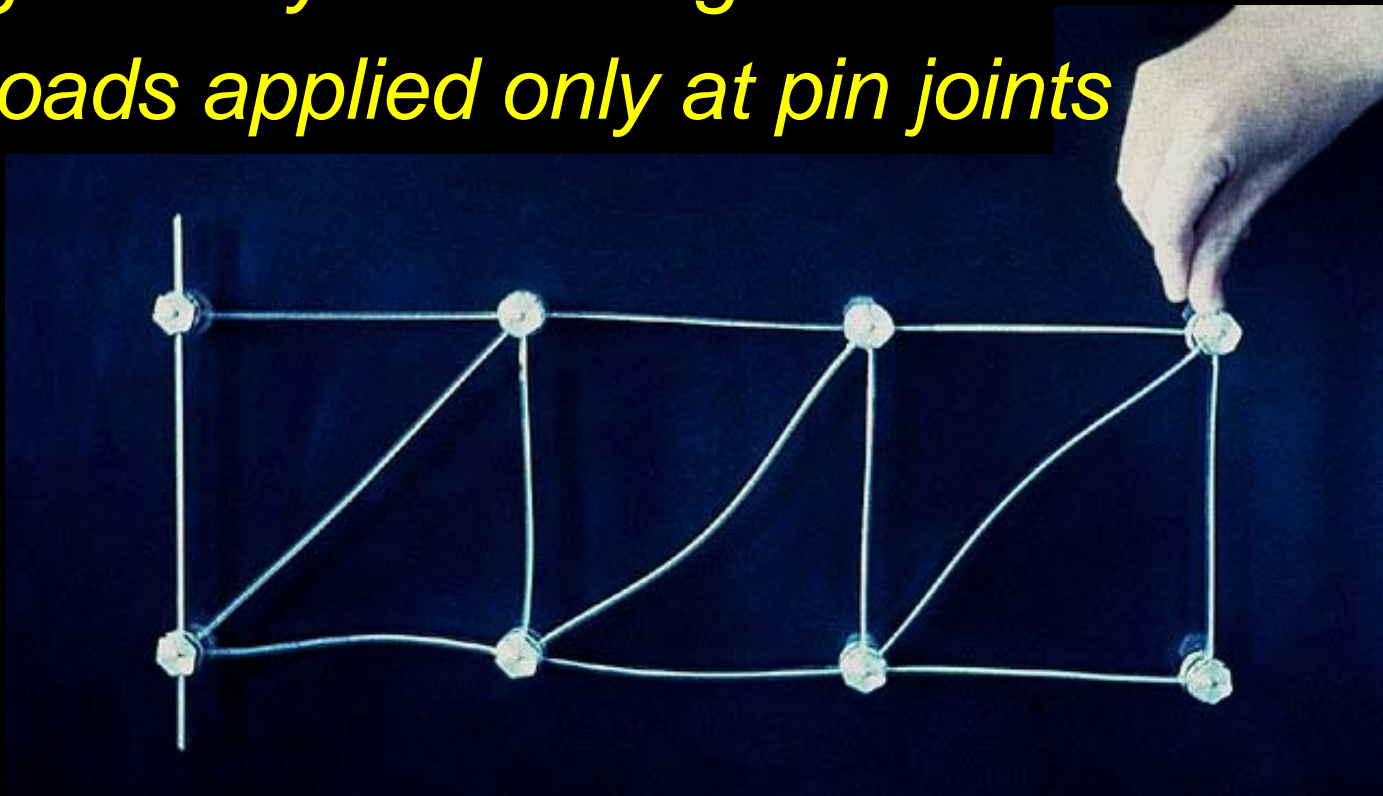
- *ancient (?) wood*
  - *Romans 500 B.C.*
- *Renaissance revival*
- *1800's analysis*
- *efficient*



# Truss Structures

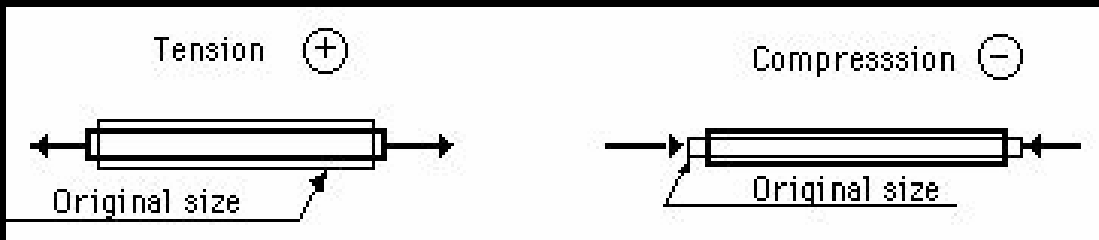
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- *comprised of straight members*
- *geometry with triangles is stable*
- *loads applied only at pin joints*



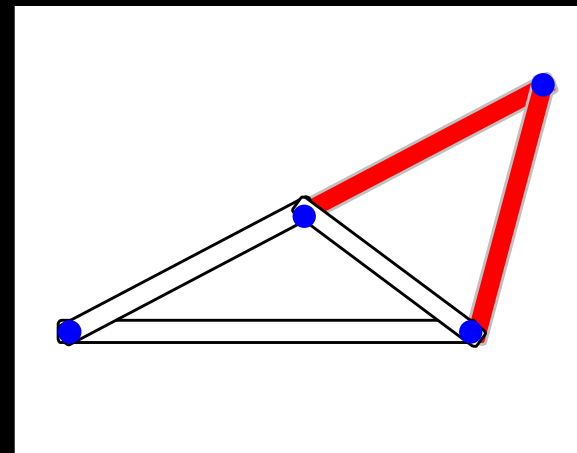
# Truss Structures

- 2 force members
  - compression
  - tension



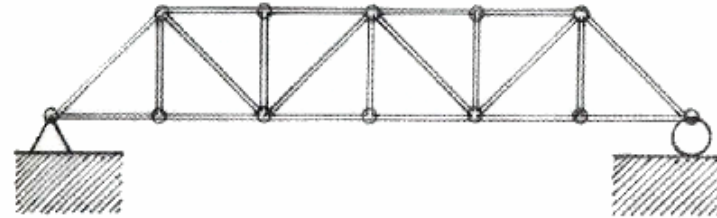
- 3 members connected by 3 joints
- 2 more members need 1 more joint

$$b = 2n - 3$$



# Truss Structures

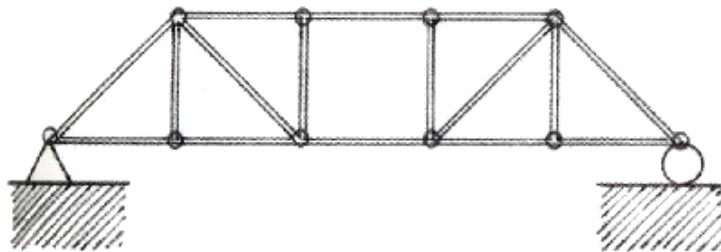
- *statically determinate*
- *indeterminate*
- *unstable*



$b = 21$

$n = 12 \quad 2(n) - 3 = 2(12) - 3 = 21$

(a) *Determinate.*

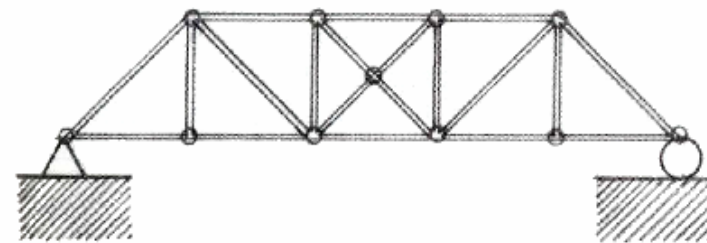


$b = 16$

$n = 10 \quad b = 16 < 2(10) - 3 = 17$

(Too few members—square panel is unstable)

(c) *Unstable.*



$b = 18$

$n = 10 \quad b = 18 > 2(10) - 3 = 17$

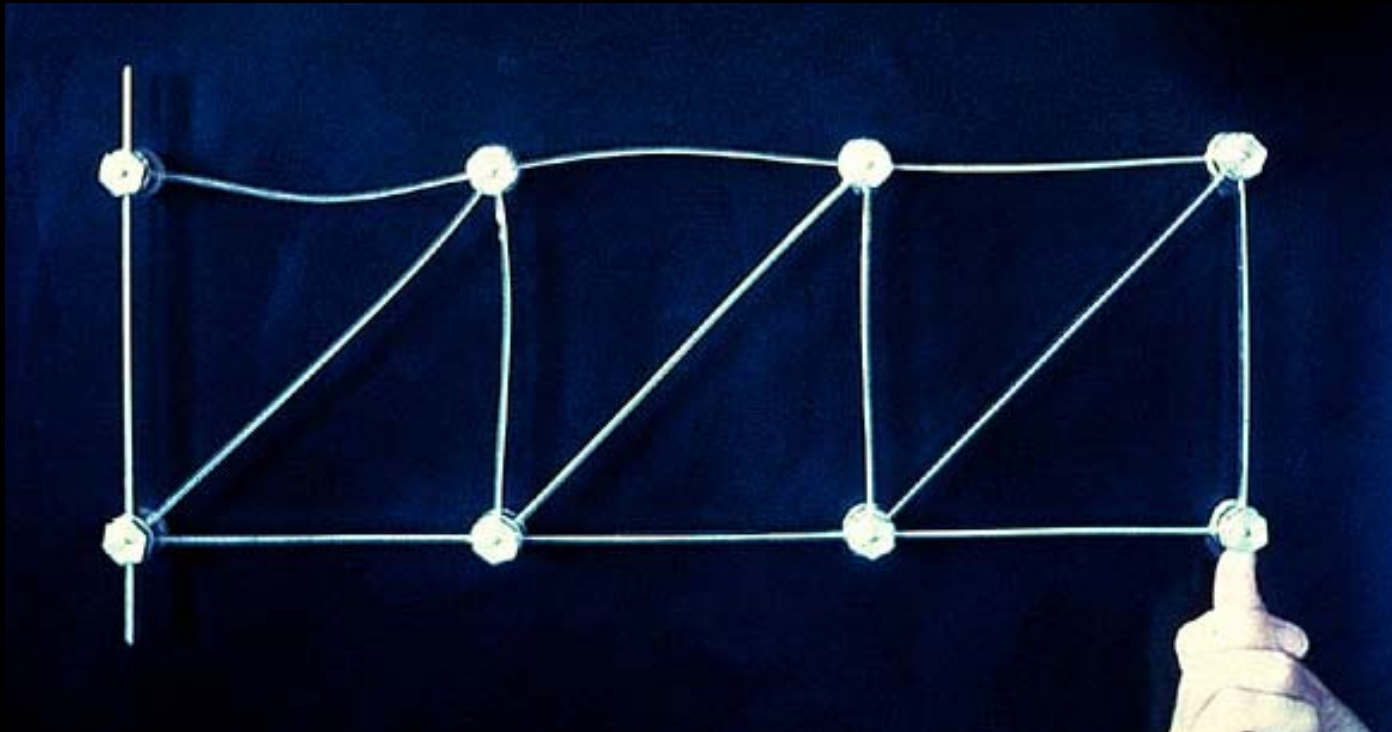
(Too many members)

(b) *Indeterminate.*

# *Truss Analysis*

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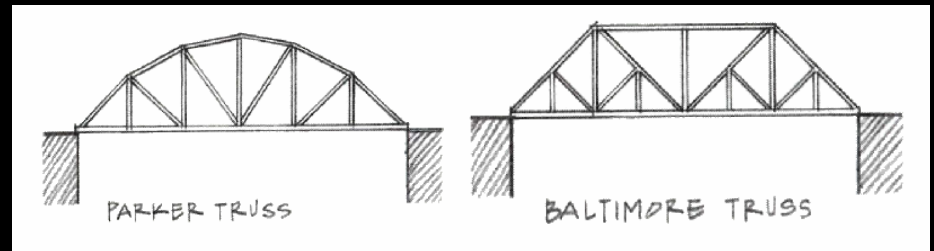
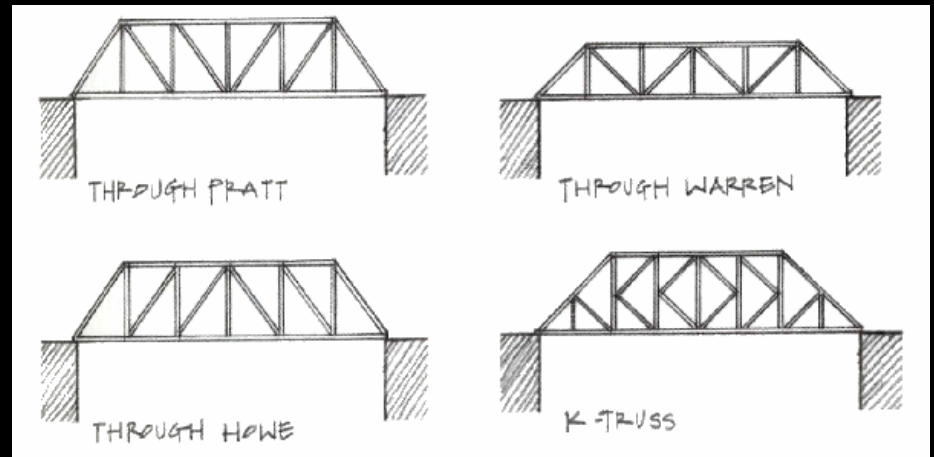
- *visualize compression and tension from deformed shape*





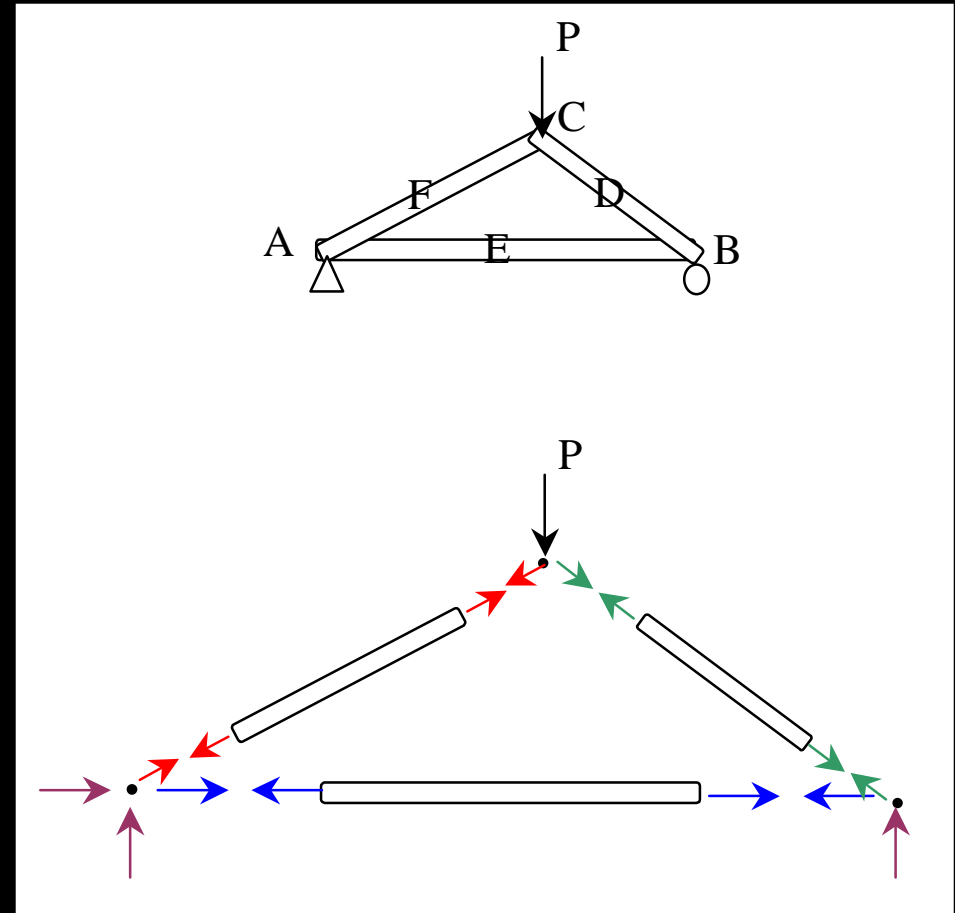
# Truss Analysis

- *Method of Joints*
- *Graphical Methods*
- *Method of Sections*
  
- *all rely on equilibrium*
  - *of bodies*
  - *internal equilibrium*



# Method of Joints

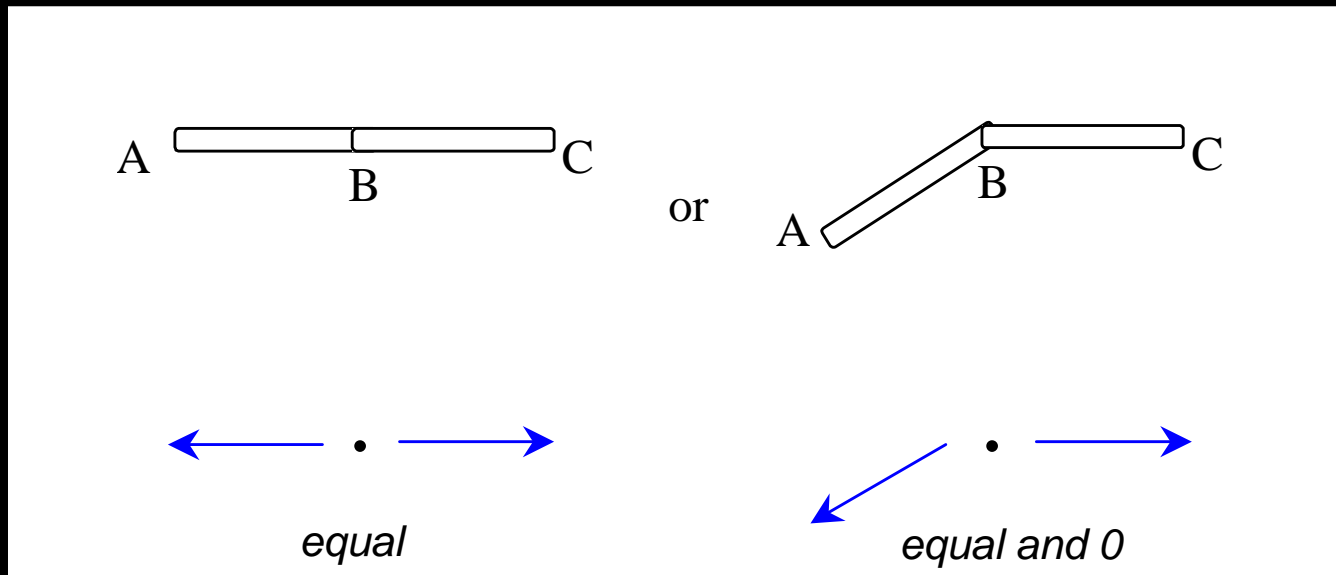
- *isolate each joint*
- *enforce equilibrium in  $F_x$  and  $F_y$*
- *can find all forces*
- *long*
- *easy to mess up*





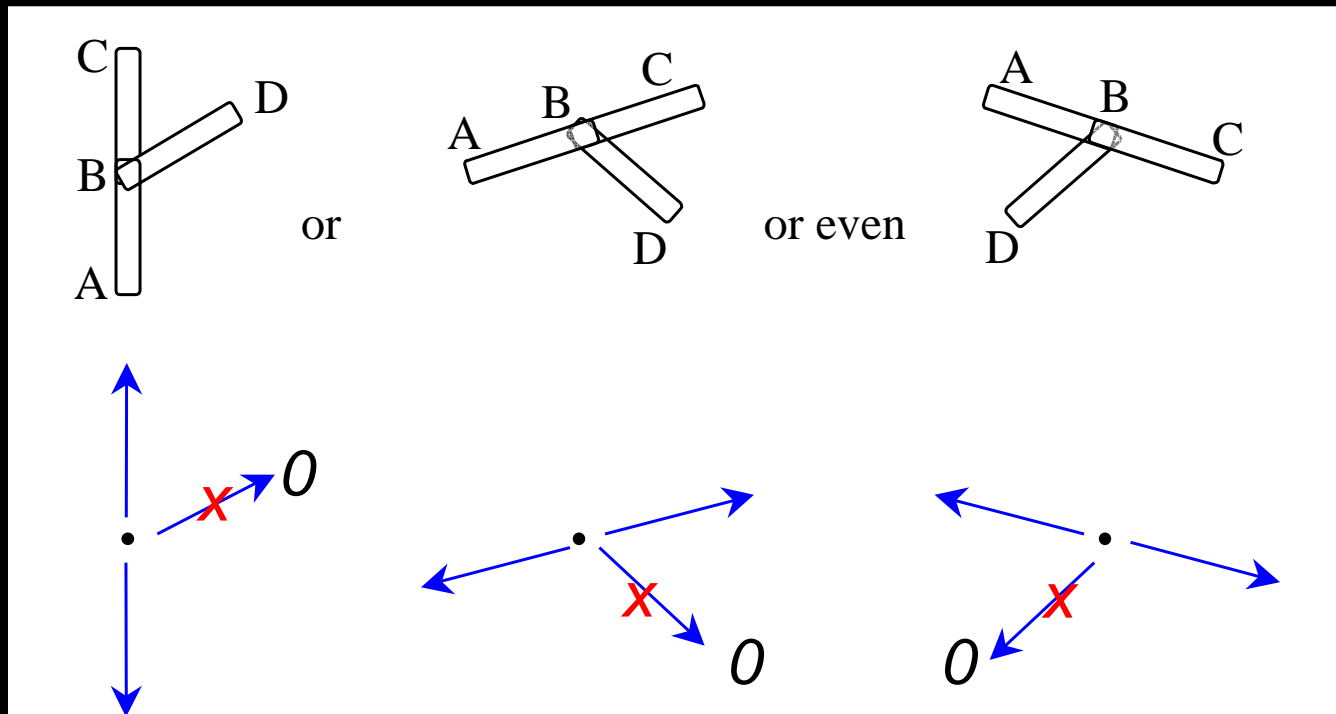
# Joint Cases

- *two bodies connected*



# Joint Cases

- *three bodies with two in line*



# Joint Cases

- *crossed*

