ARCHITECTURAL STRUCTURES I:
STATICS AND STRENGTH OF MATERIALS

ENDS 231

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SPRING 2008
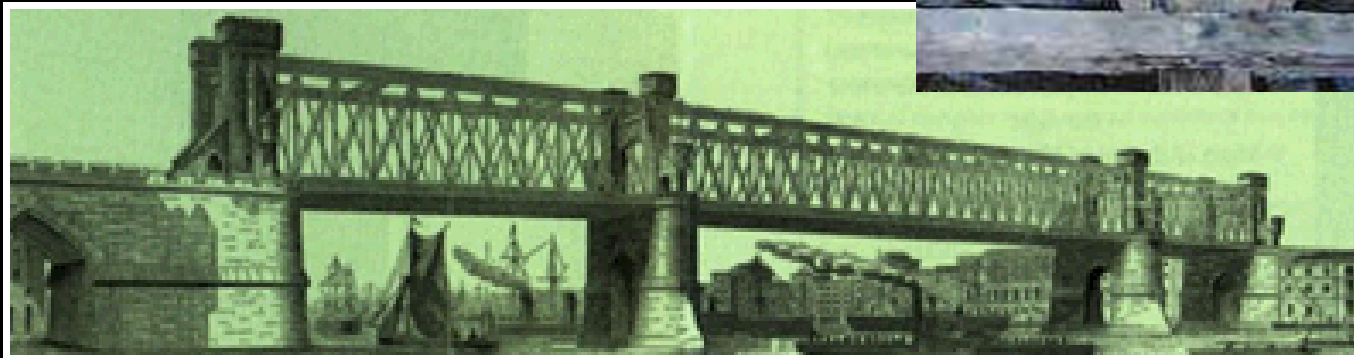
lecture
SIX
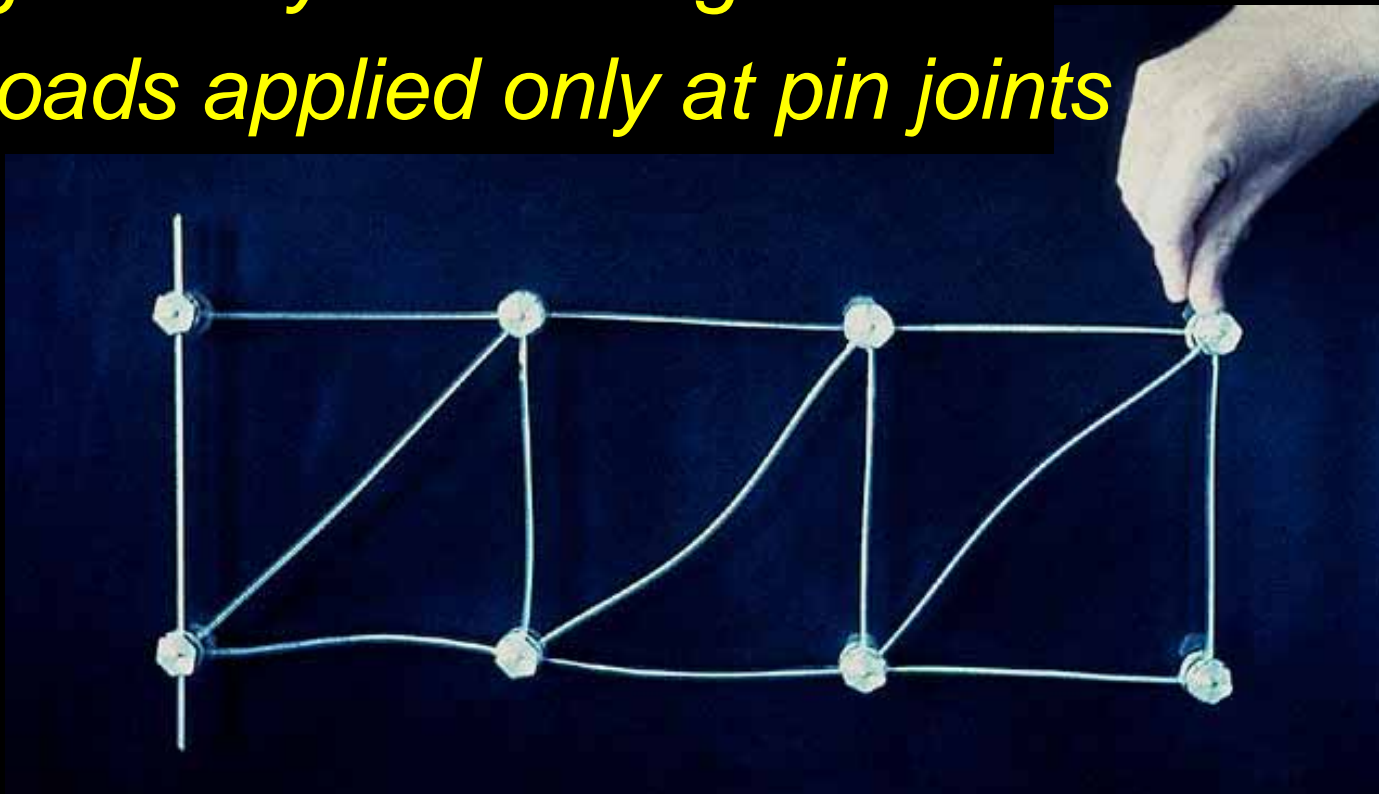

introduction to trusses

Truss Structures

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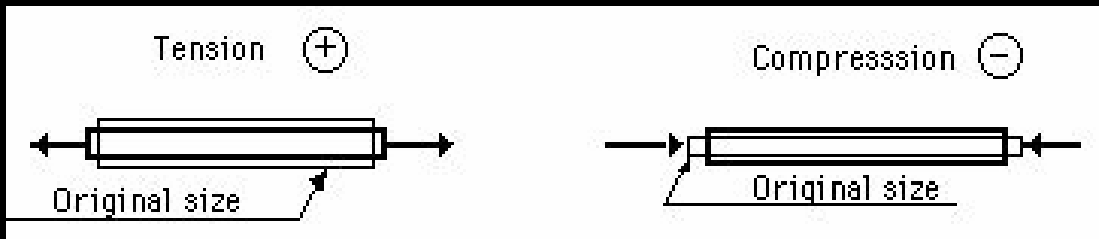- *1800's analysis*
- *efficient*

Truss Structures

- *comprised of straight members*

- *geometry with triangles is stable*
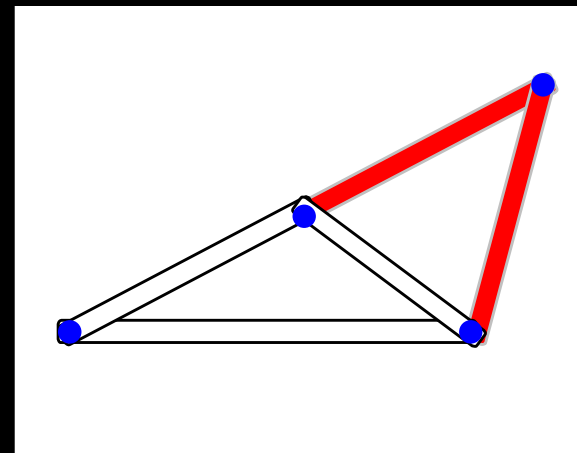
- *loads applied only at pin joints*

Truss Structures

- ## 2 force members
  - ### compression
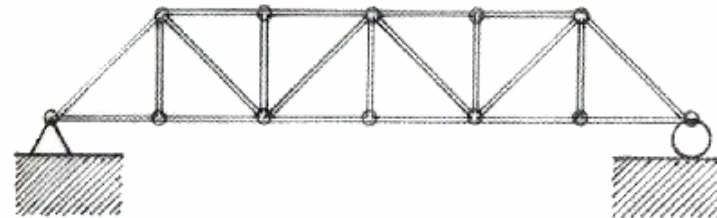 - ### tension

- ## 3 members connected by 3 joints

- ## 2 more members need 1 more joint

$$b = 2n - 3$$

Truss Structures
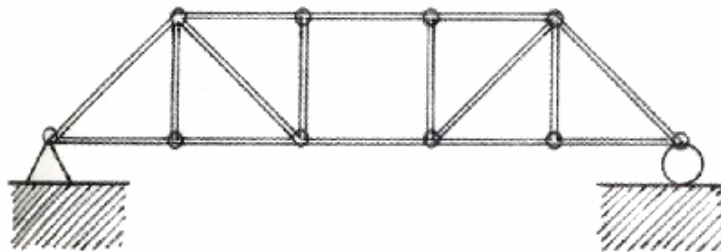
- *statically determinate*

- *indeterminate*

- *unstable*

$b = 21$ $n = 12$ $2(n) - 3 = 2(12) - 3 = 21$
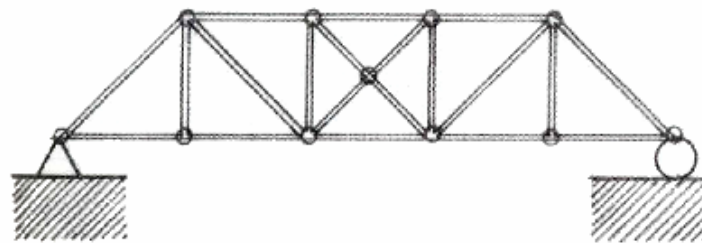
(a) Determinate.

$b = 16$ $n = 10$ $b = 16 < 2(10) - 3 = 17$
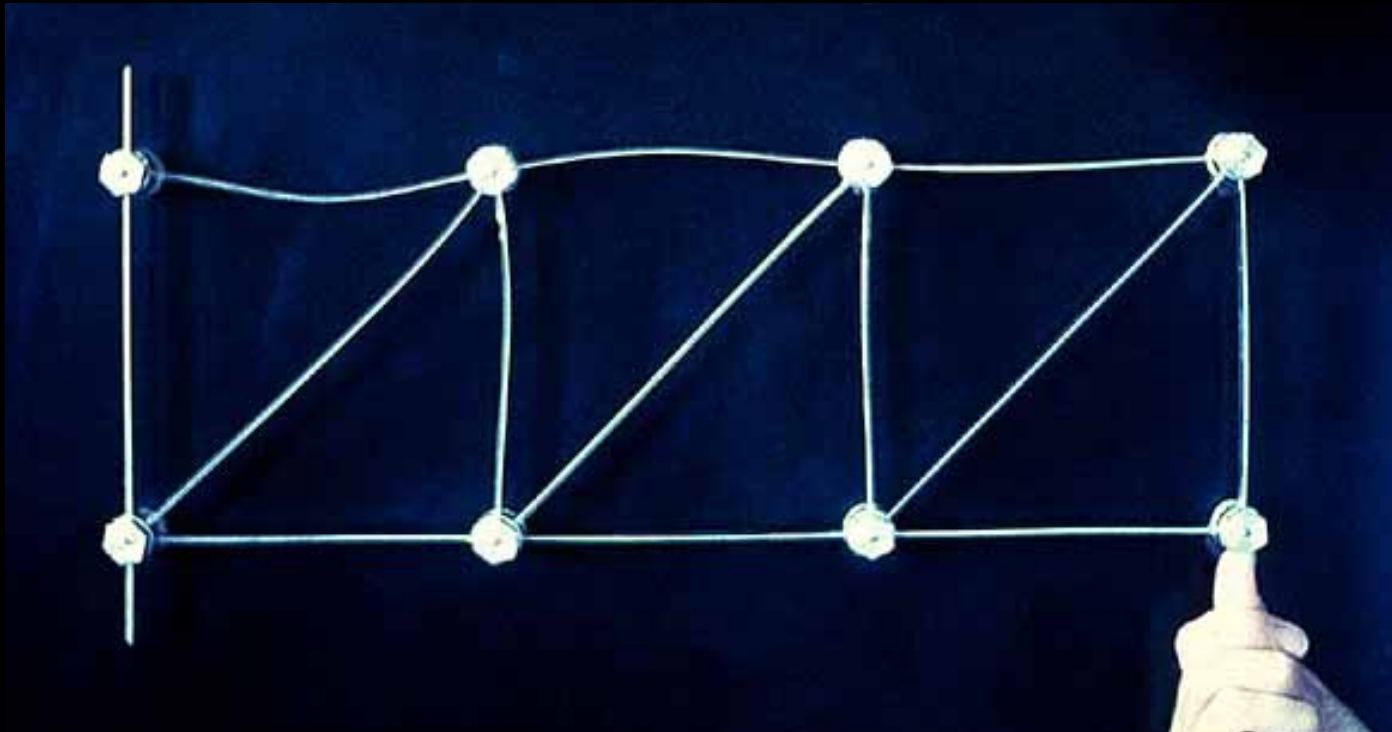*(Too few members—square panel is unstable)*

(c) Unstable.

$b = 18$ $n = 10$ $b = 18 > 2(10) - 3 = 17$
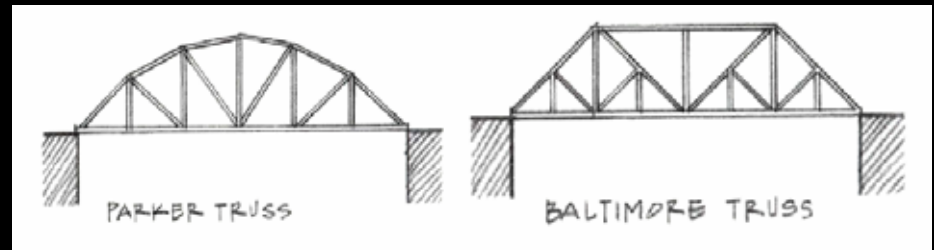*(Too many members)*

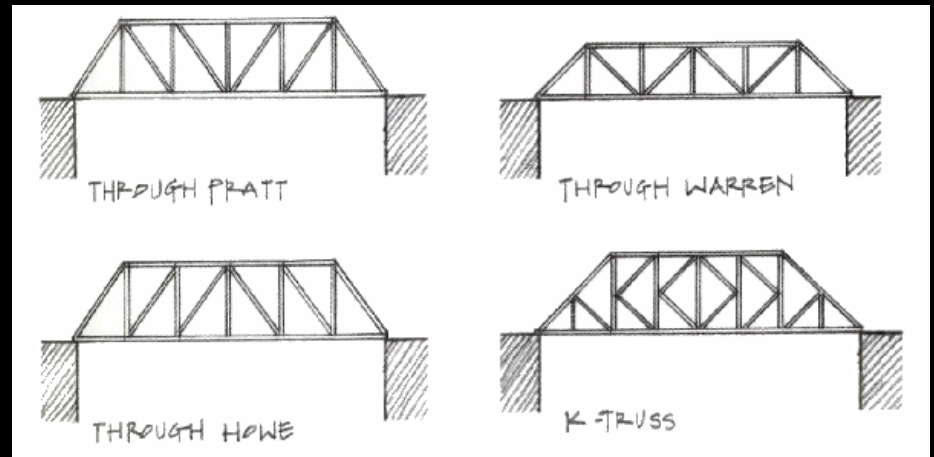*(b) Indeterminate.*

Truss Analysis

- *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*

THROUGH PRATT — THROUGH WARREN — THROUGH HOWE — K-TRUSS
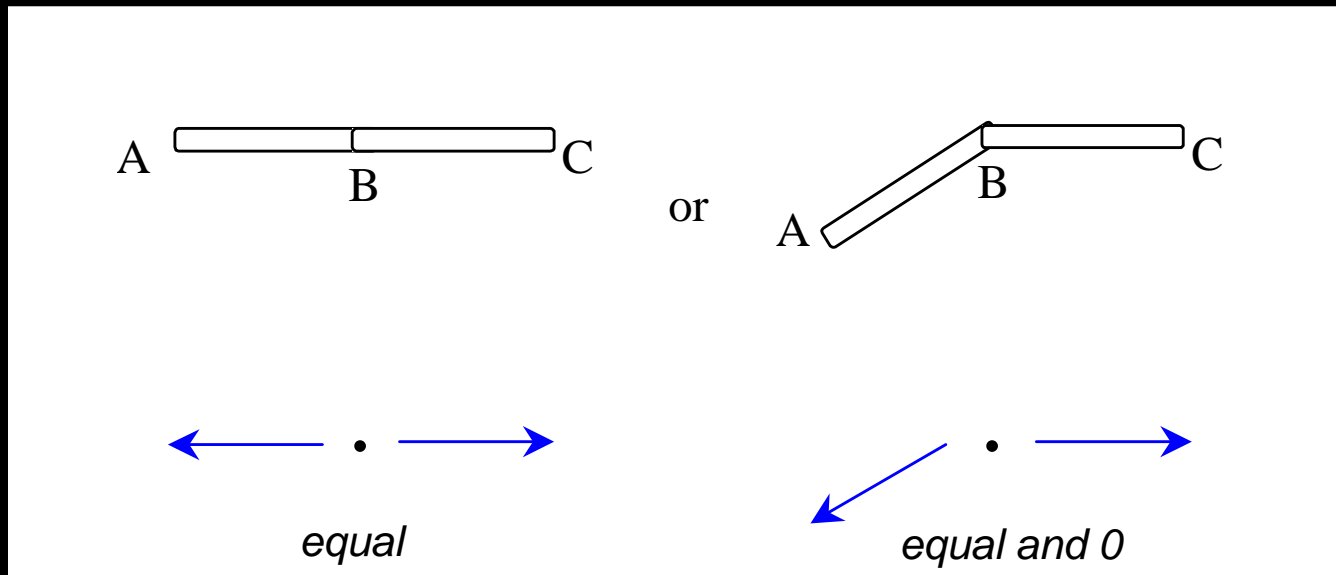

PARKER TRUSS — BALTIMORE TRUSS

Method of Joints

- *isolate each joint*

- *enforce equilibrium in F_x and F_y*

- *can find all forces*

- *long*

- *easy to mess up*
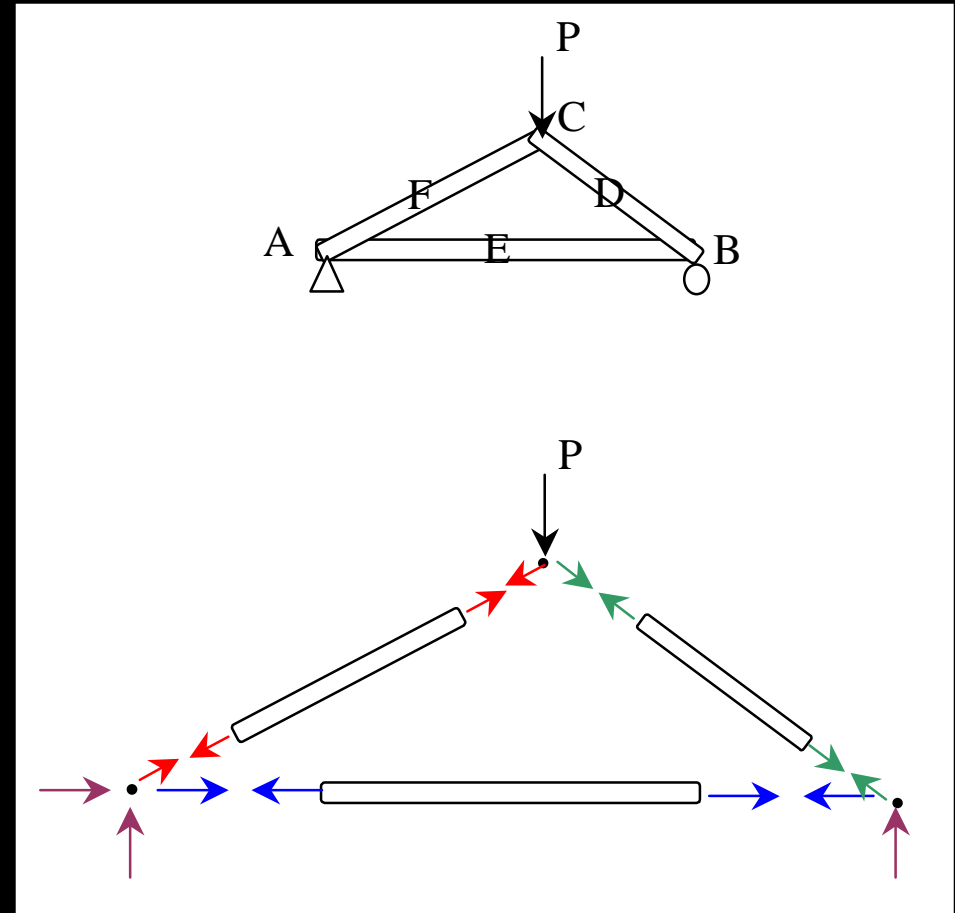
Joint Cases

- ## *two bodies connected*

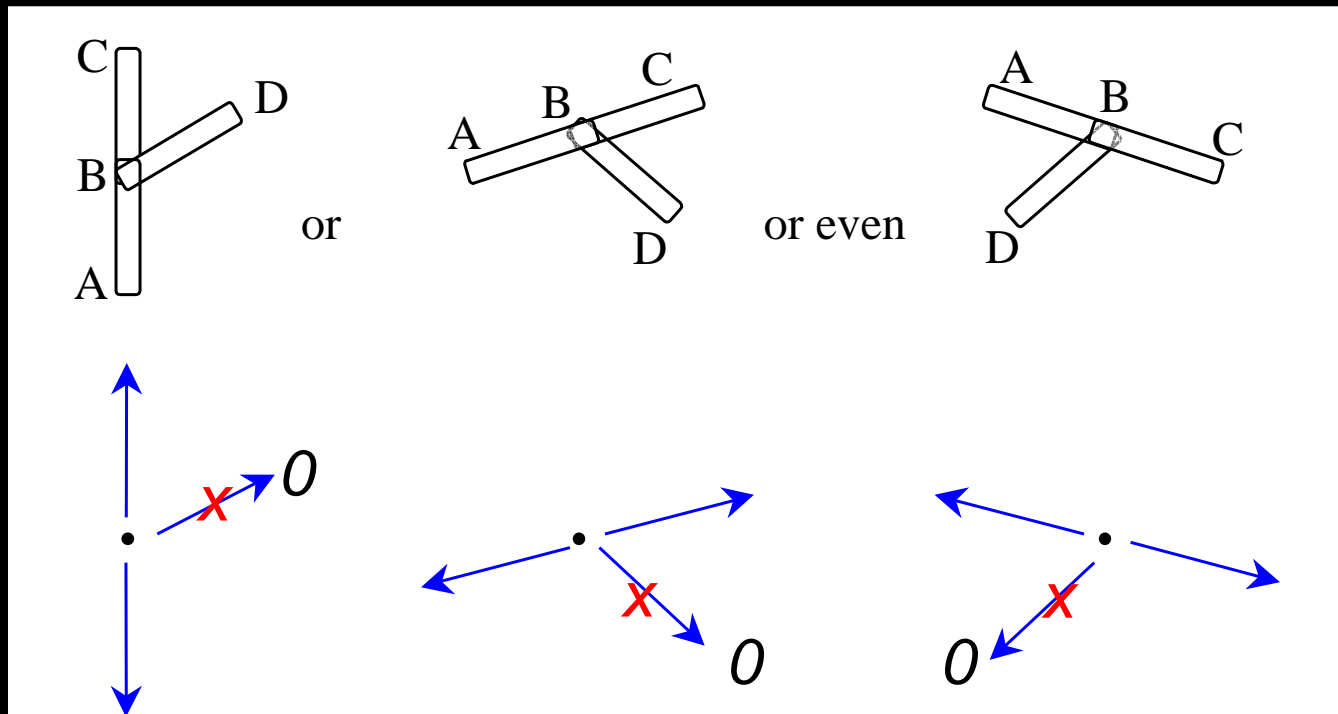# *Joint Cases*

- *three bodies with two in line*

Joint Cases

- *crossed*