Influence of Temperature on the Tensile Strength Of Spider Silk (*Araneus gemmoides*)

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Background

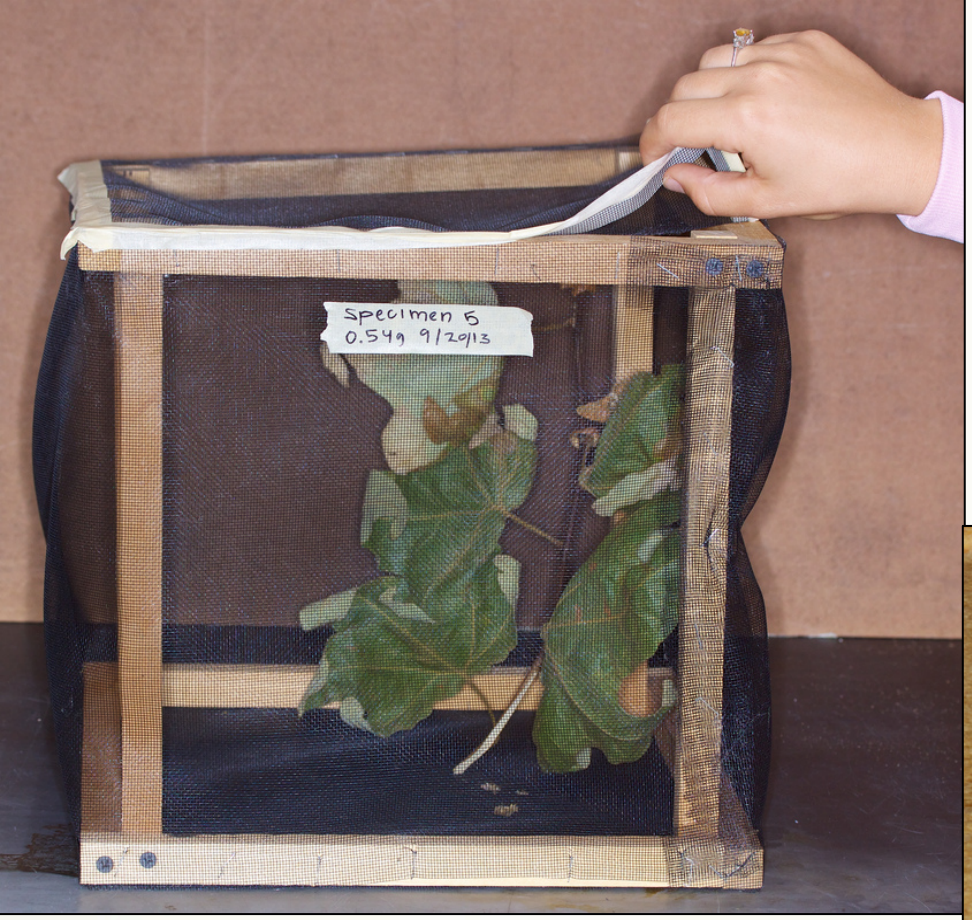
- Orb-Weaver
  - Ectothermic
- Different silk types
  - Dragline silk
- Malibu Creek State Park
- >30°C Temperature range
  - 10°C Average during lifetime

Questions

- Effect of temperature?
- Optimal temperature?
- Correlation with life type?

Methods

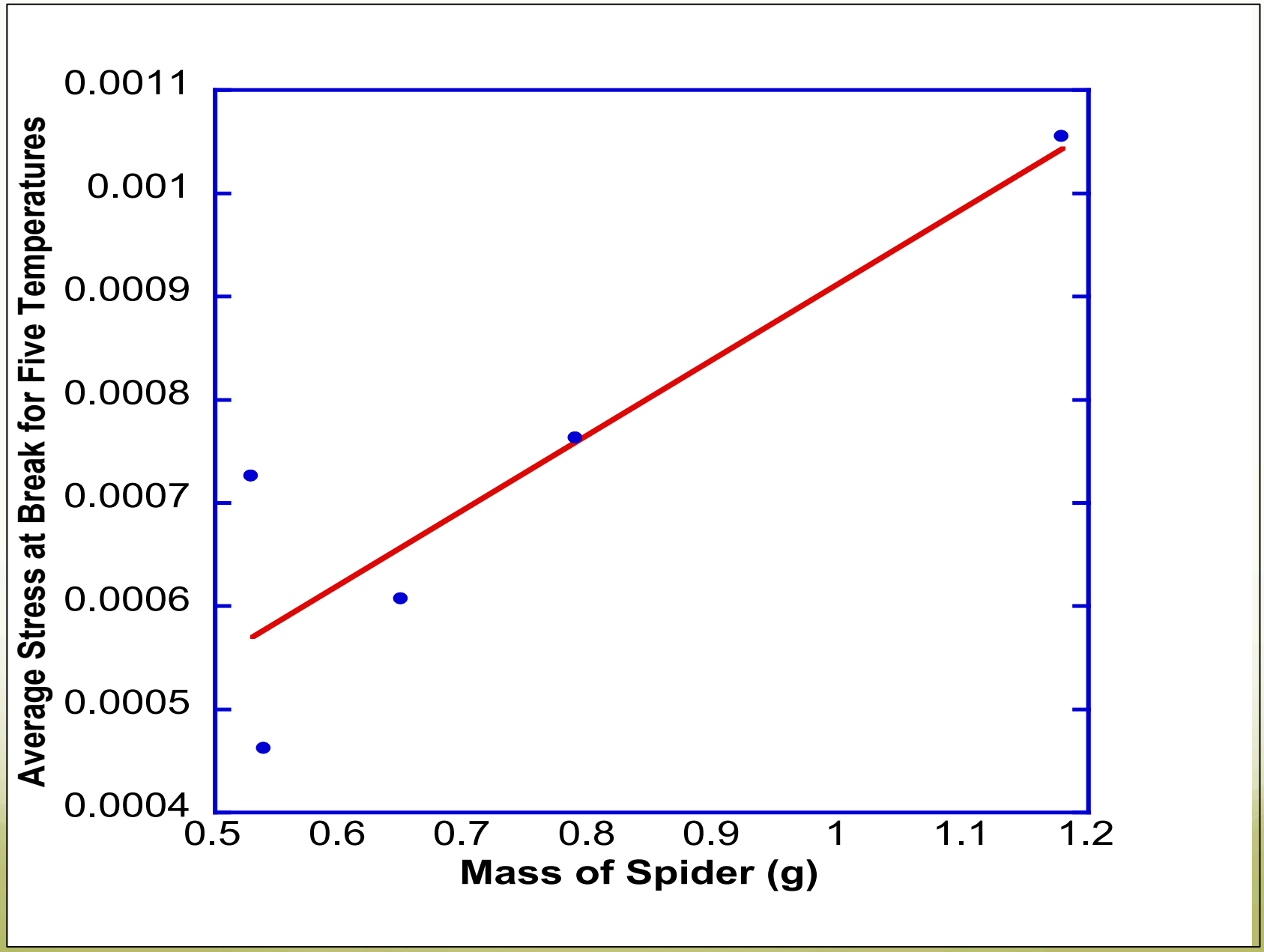
- 5 specimens [September 2013]
- Separate 0.028 m^3 mesh enclosures
- 12 hour photoperiod
- 10°C-30°C, 5°C intervals
- Instron Mechanical Testing Device

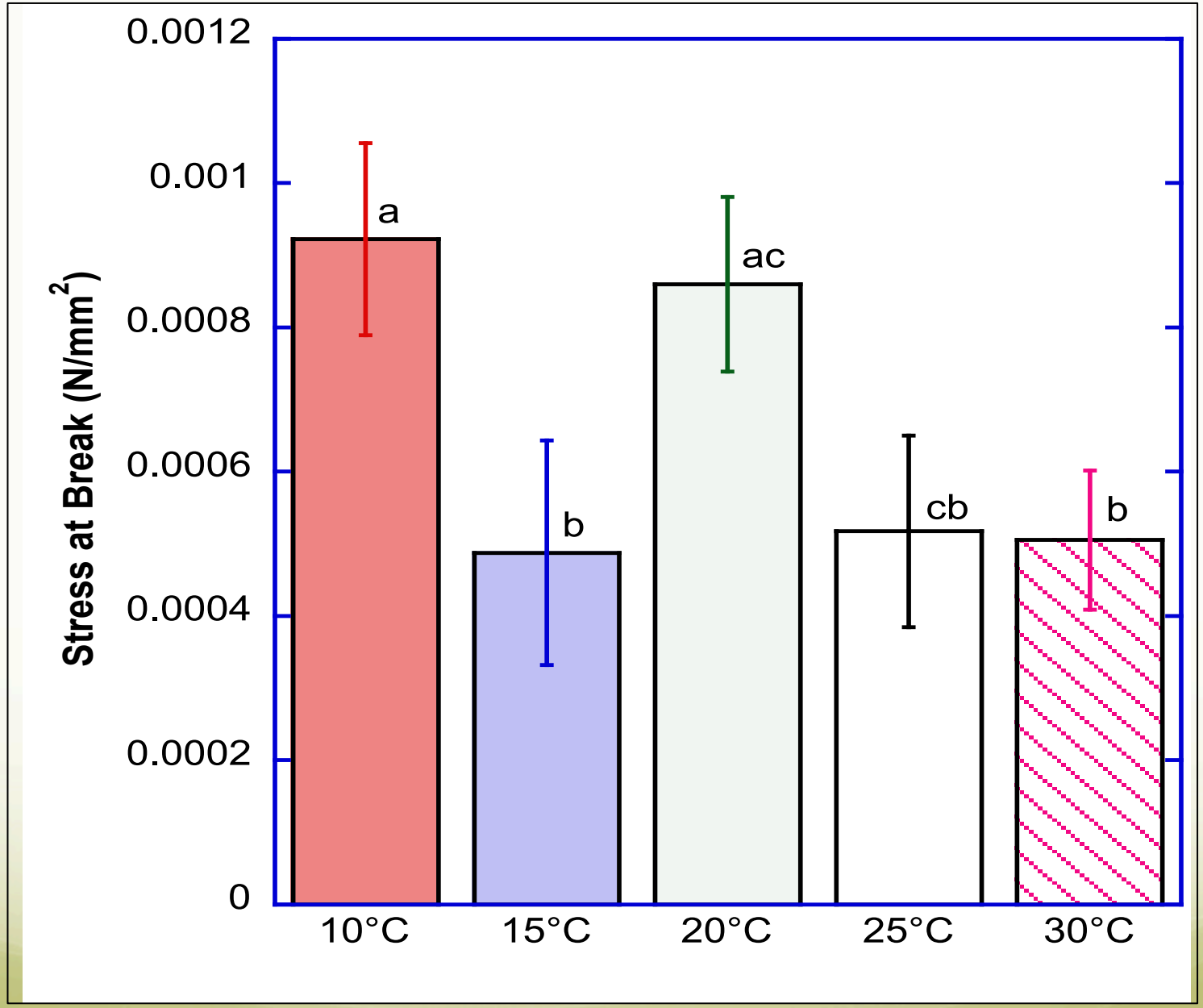


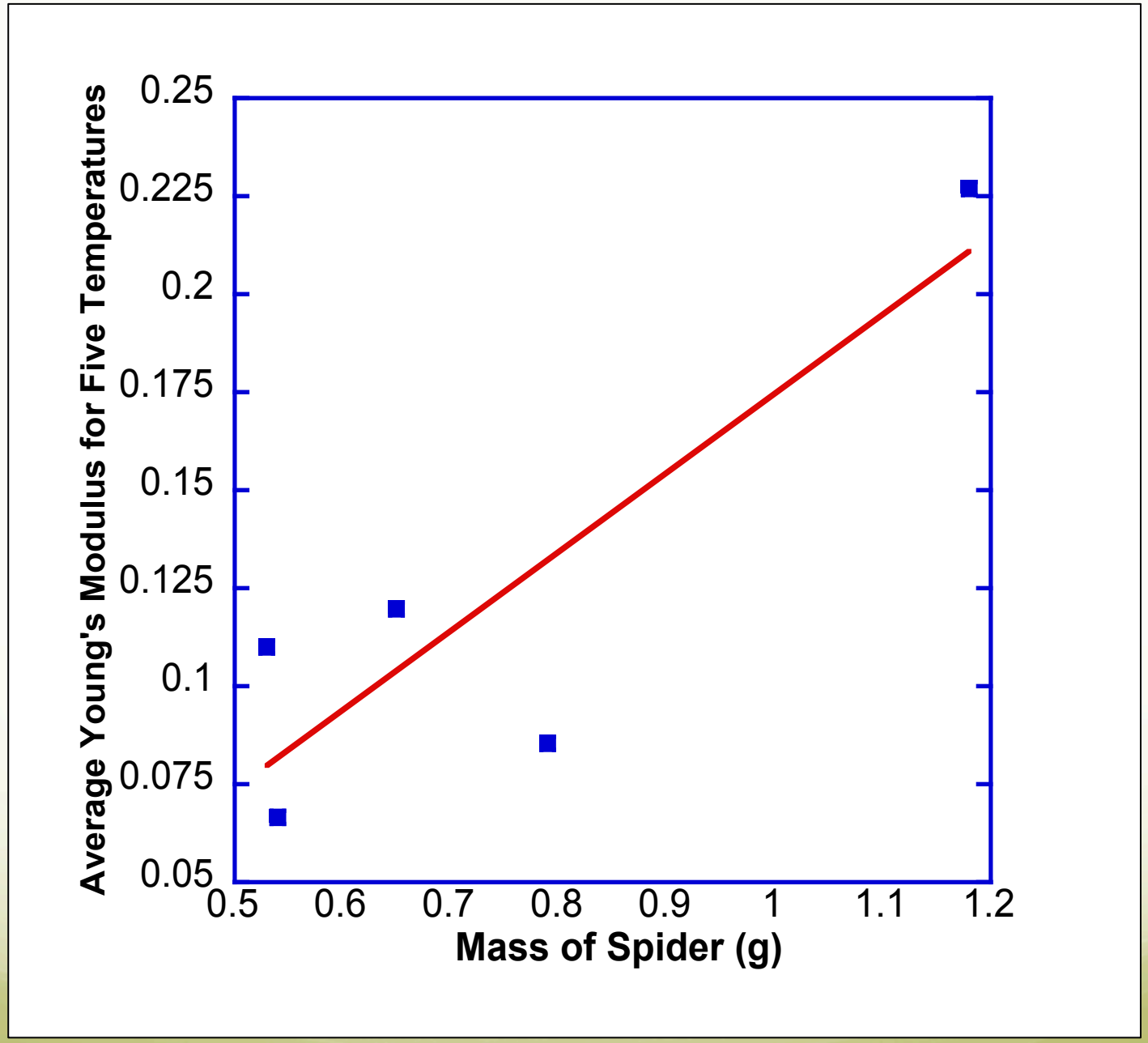
← Mesh enclosure

Docile *Araneus gemmoides* →

Results


Average Stress at Break for Five Temperatures
0.0011
0.001
0.0009
0.0008
0.0007
0.0006
0.0005
0.0004
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
Mass of Spider (g)


0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
Stress at Break (N/mm2)
a
ac
b
cb
b
10°C
15°C
20°C
25°C
30°C


Average Young's Modulus for Five Temperatures
0.25
0.225
0.2
0.175
0.15
0.125
0.1
0.075
0.05
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
Mass of Spider (g)

Discussion

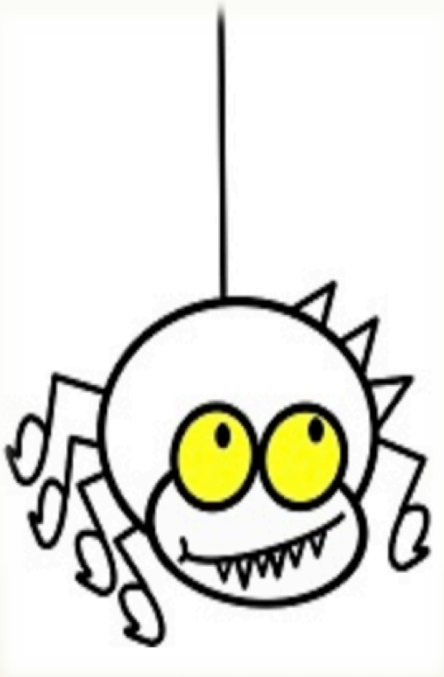
- Tensile strength greatest at 10°C
- Sample size ≥ 12
- Mass correlation〔normalized〕
- Atypical stress-strain curve
  - "Climbing knots" ?
- Biochemical analysis

Conclusion

- Temperature
  - Nighttime
- Mass
- Microscopic examination useful
- Innovation for biomaterials science

Thank you!

- Dr. Stephen Davis & Dr. Laurieanne Dent
- 8 legged friends
- Keck Committee
- Pepperdine Natural Science Division



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