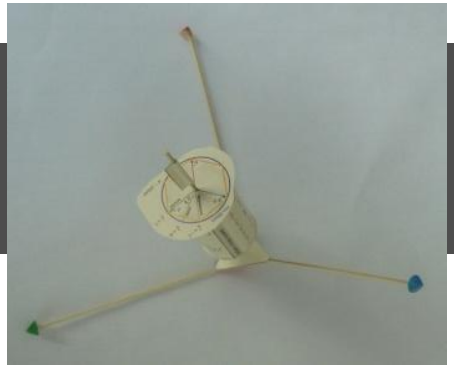

The Stress Invariant Simulator (SISi)

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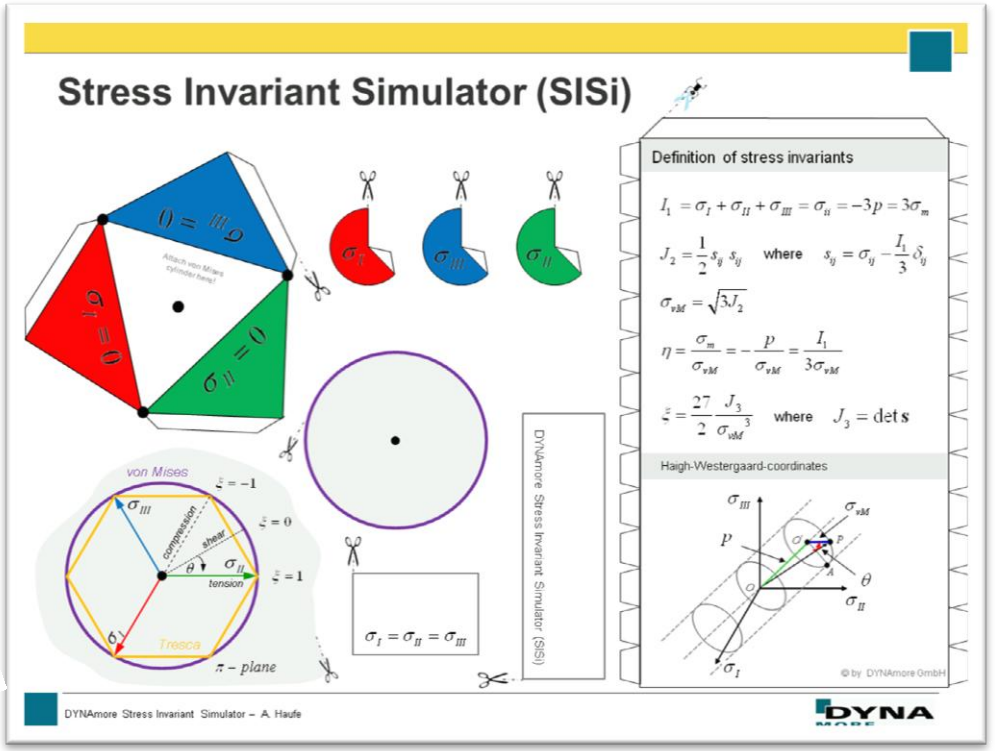
An engineering toy to visualize stress invariants
(downloadable from the www.dynamore.de)

Crafting instructions

- Download the PDF-file (this file!)
- Print crafting sections on thick piece of paper
- Cut out where indicated
- Add four wooden sticks (approx.15cm of length)
- Add some glue where necessary
  (engineers should find out the locations without further instructions from the pictures – all others contact their local distributor please)
- Have fun!

page 1:

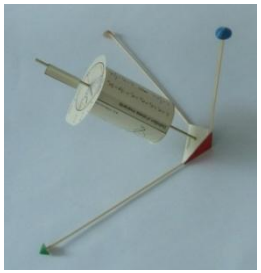
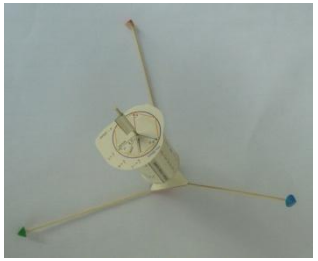
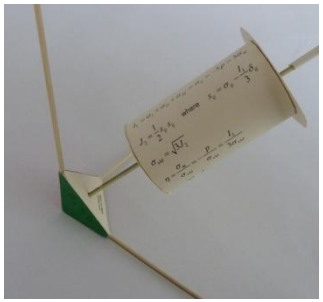
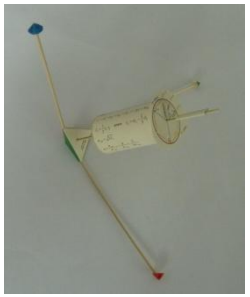


An engineering toy to visualize stress invariants
(downloadable from the www.dynamore.de)

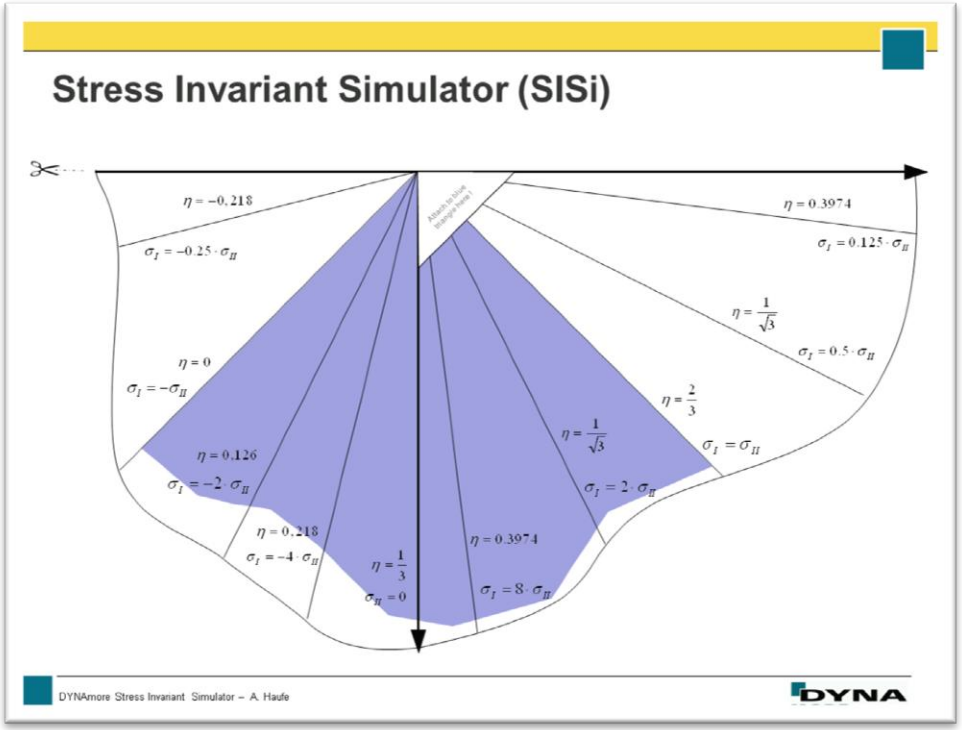
Crafting instructions

- Page 2 of the set may be added for further clarification of the triaxiality variable.

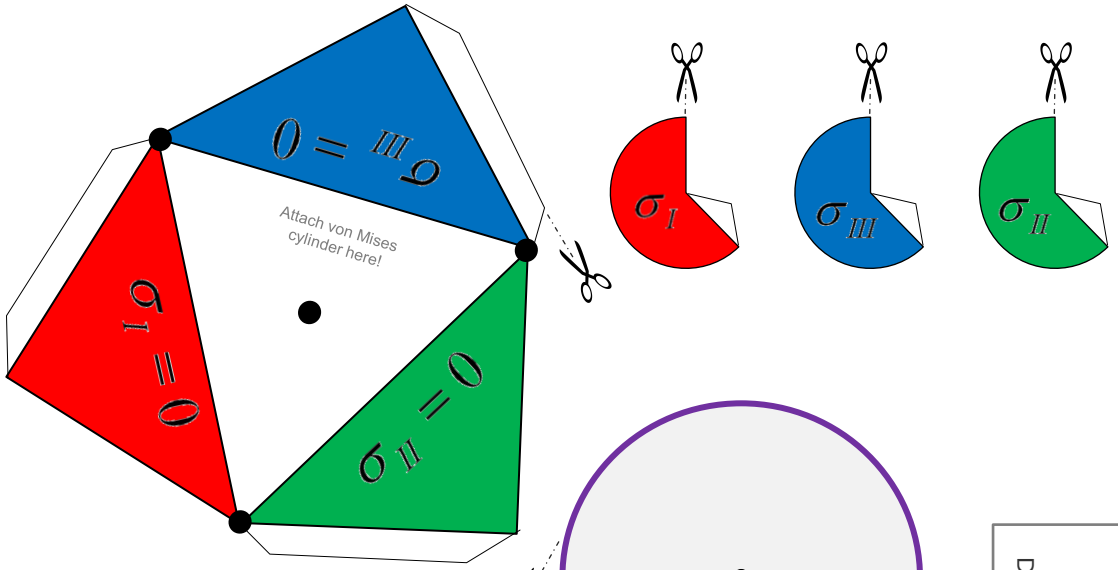
Final shape of toy

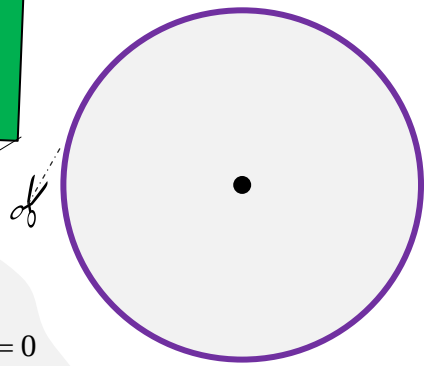





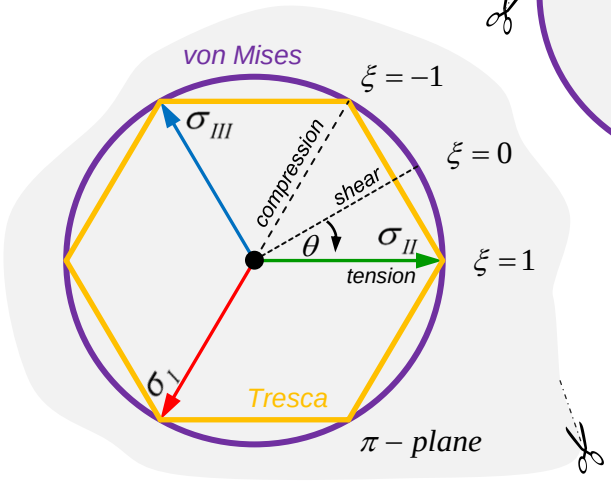
page 2:



Stress Invariant Simulator (SISi)







$\sigma_I = \sigma_{II} = \sigma_{III}$

DYNAmore Stress Invariant Simulator (SISi)

Definition of stress invariants

$$I_1 = \sigma_I + \sigma_{II} + \sigma_{III} = \sigma_{ii} = -3p = 3\sigma_m$$

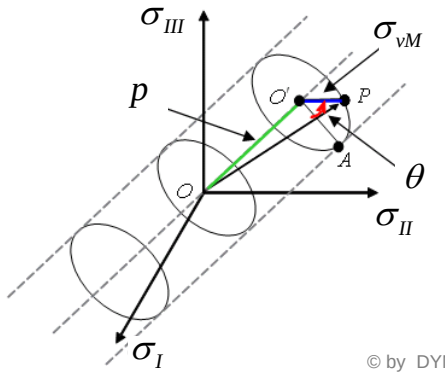
$$J_2 = \frac{1}{2} s_{ij}\, s_{ij} \quad \text{where} \quad s_{ij} = \sigma_{ij} - \frac{I_1}{3}\delta_{ij}$$

$$\sigma_{vM} = \sqrt{3J_2}$$

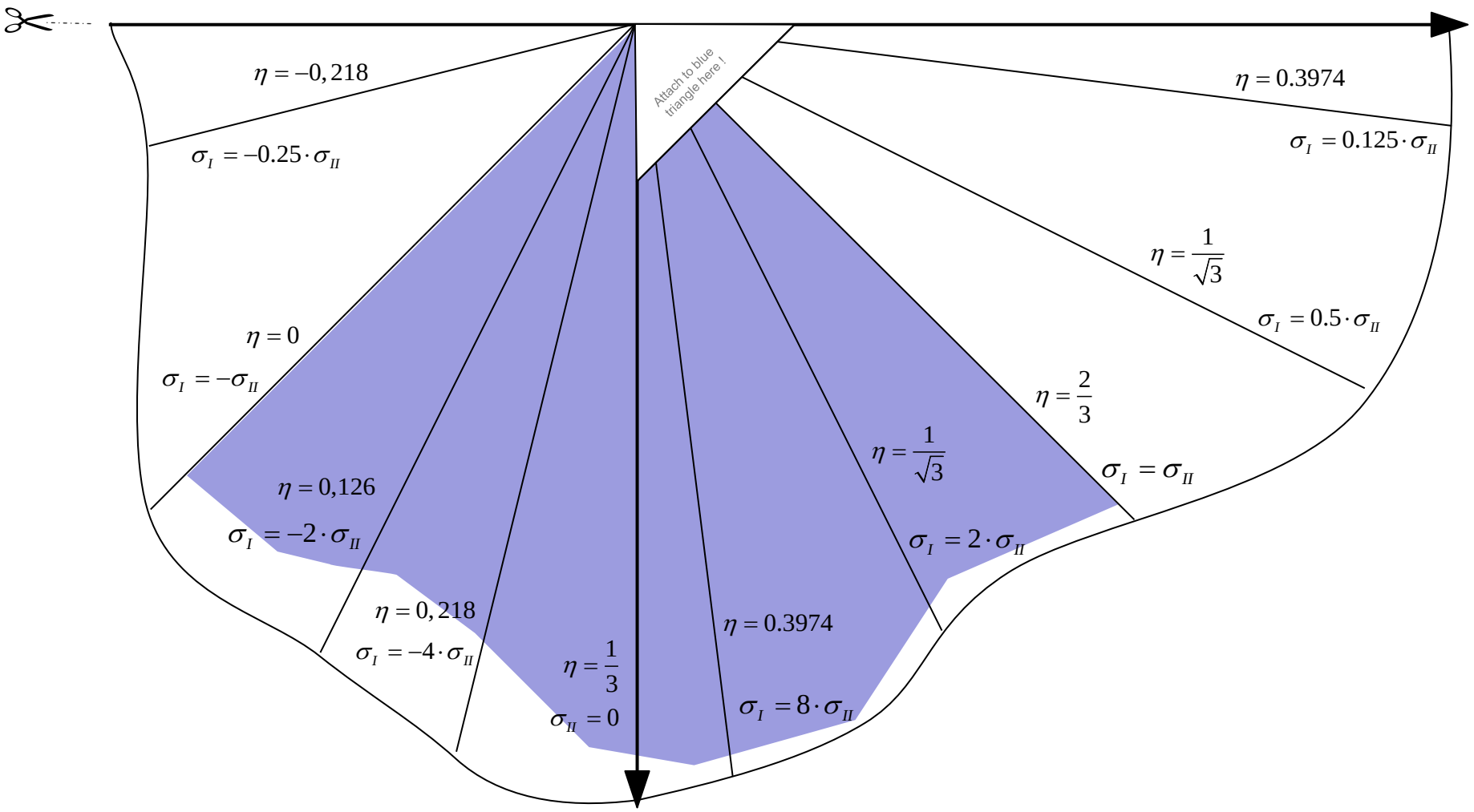
$$\eta = \frac{\sigma_m}{\sigma_{vM}} = -\frac{p}{\sigma_{vM}} = \frac{I_1}{3\sigma_{vM}}$$

$$\xi = \frac{27}{2}\frac{J_3}{\sigma_{vM}{}^3} \quad \text{where} \quad J_3 = \det \mathbf{s}$$

Haigh-Westergaard-coordinates



Stress Invariant Simulator (SISi)



FIN