The conservation of silver & the textiles of the showcases

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Hubert Beolet, Marie-Christine Dorothe (C2RMF)

7th IAQ Braunschweig 15-16
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method


Biennais

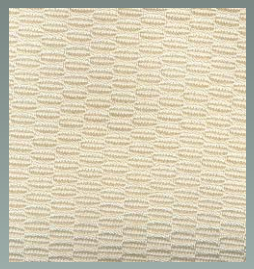

Feuchère

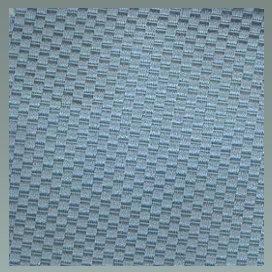

trésor de l'Ariège


Galerie d'Apollon

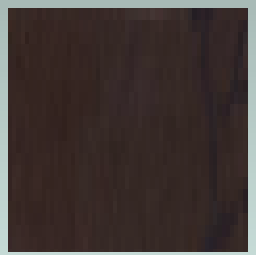

trésor du Saint-Esprit

recognize potential hazard

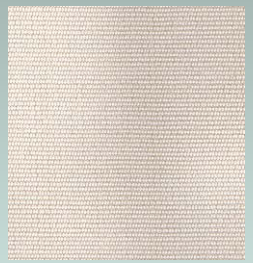




silk?



velvet?



satin?

cotton?

felt?

wool?

cross section
2 triangular fibers
solded together

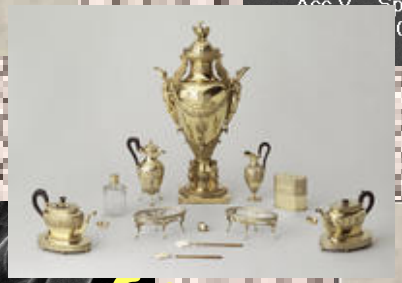
20 µm

beige silk

longitudinal view
uneven diameter
surface irregular

Acc.V Spot Magn Det WD 50 µm
0 500x SE 36.7

yarn: raw silk



longitudinal view
0.6 µm thick scales
characteristic shape
sheep wool

Acc.V Spot Magn Det WD 50 µm
10.0 kV 4.0 500x SE 36.7

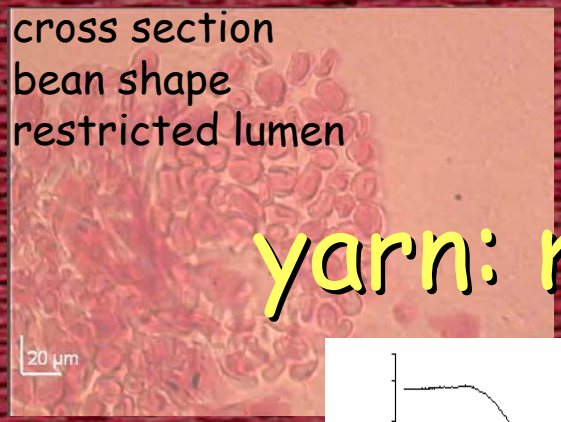
weft: wool + degummed silk

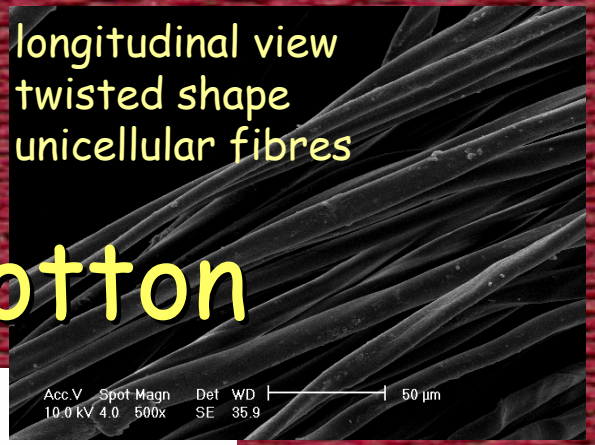
20 µm

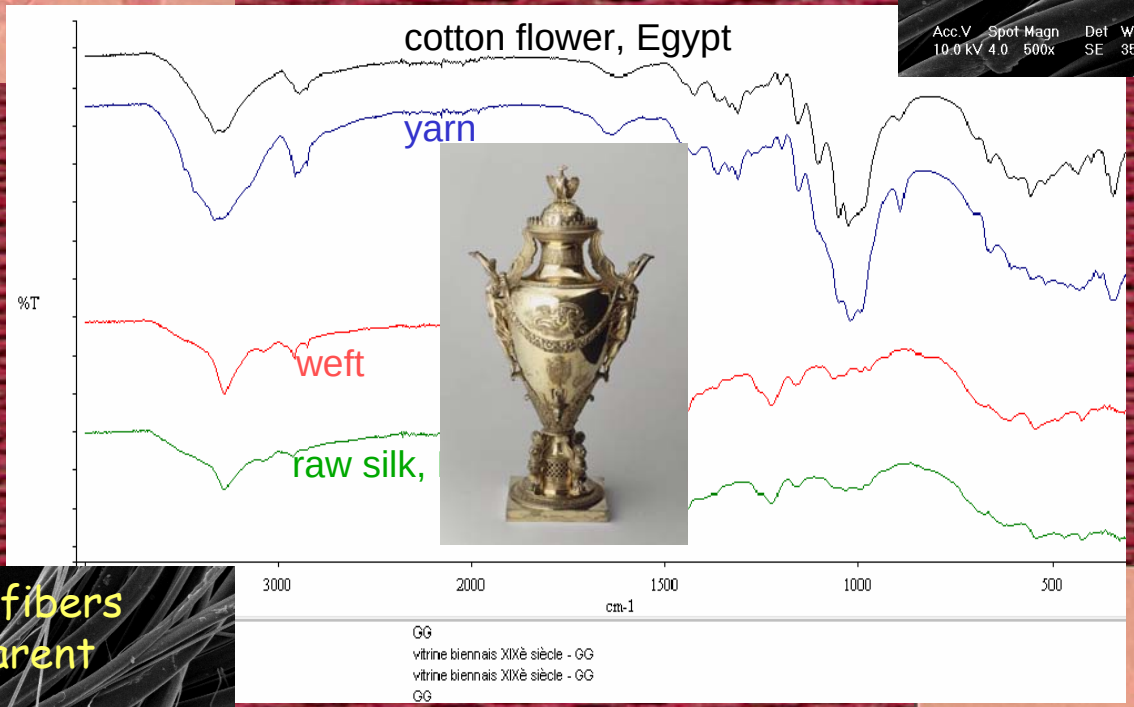
cross section
2 separated fibers
triangular section
smooth & transparent
10 µm diameter
degummed silk

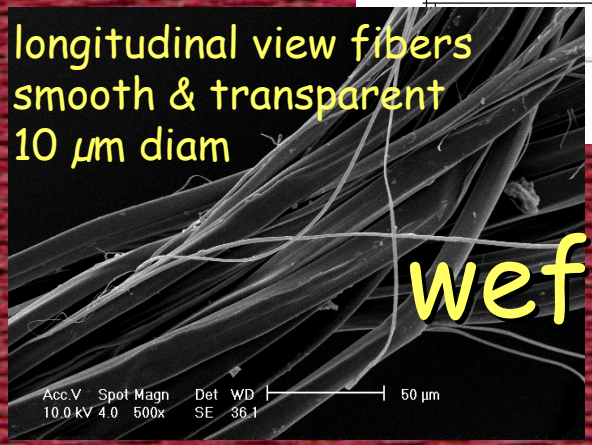
red silk

yarn: mercerized cotton

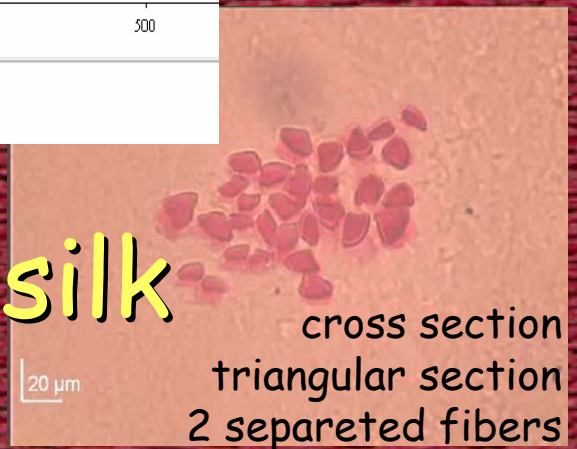






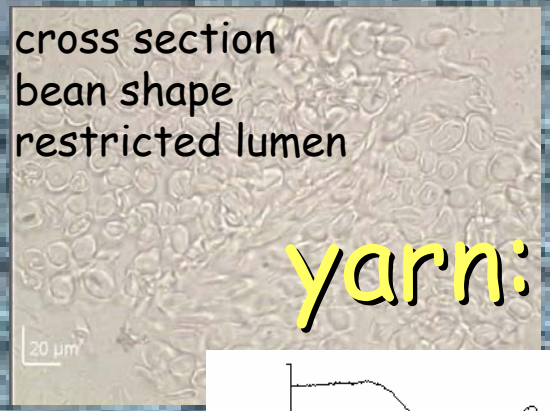


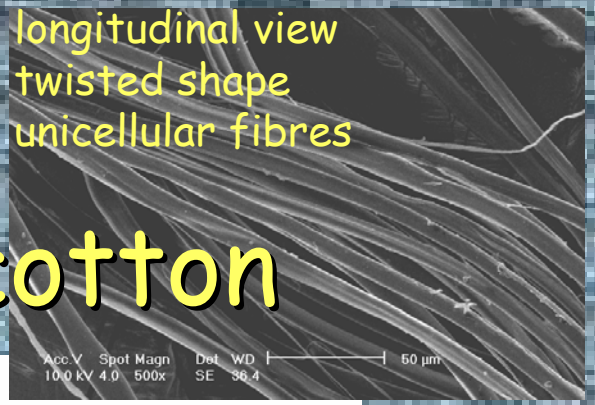
weft: degummed silk

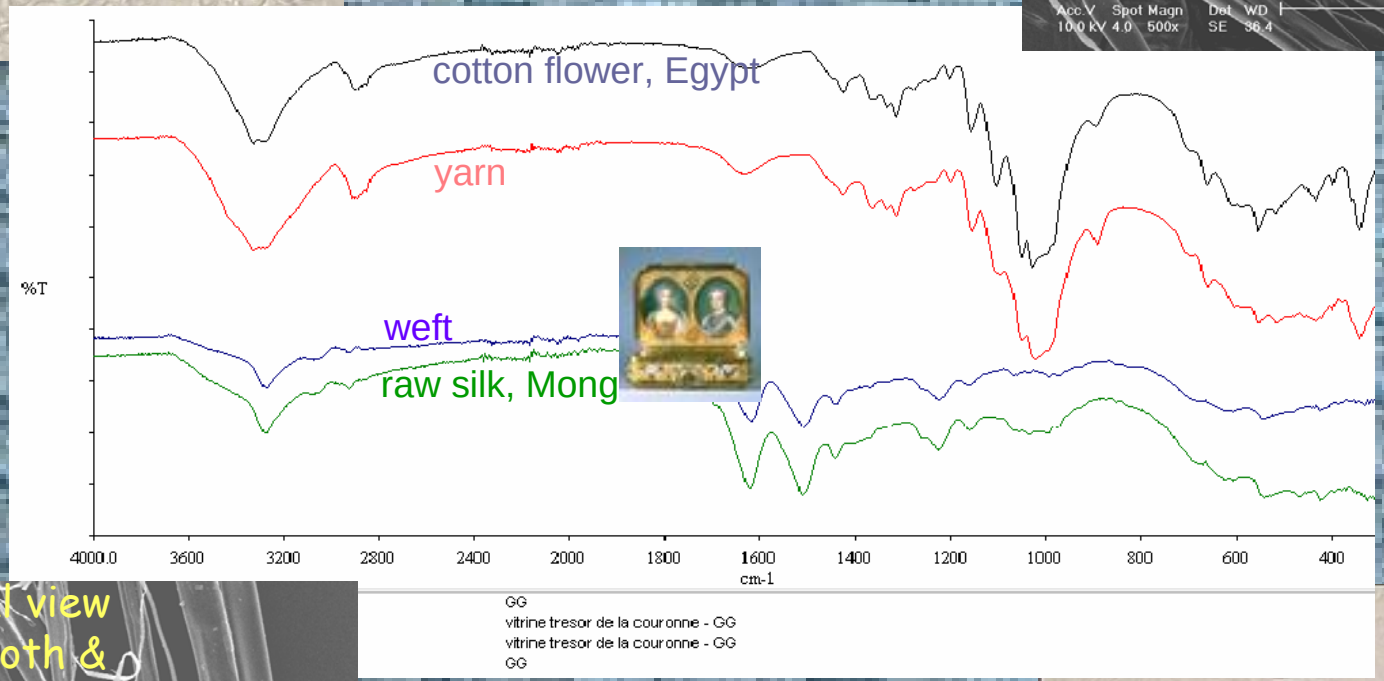


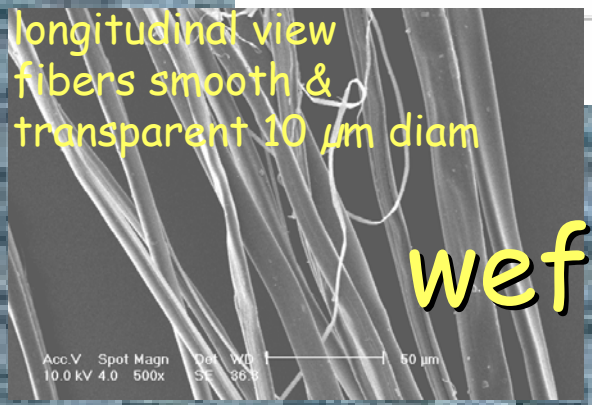
blue silk

yarn: mercerized cotton

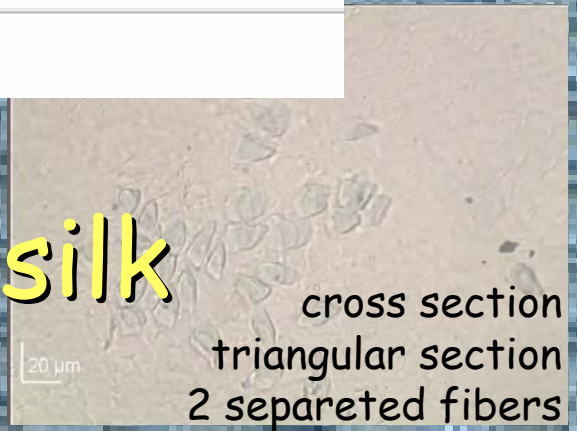




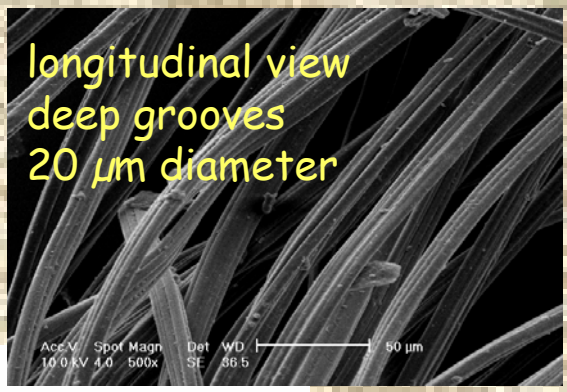


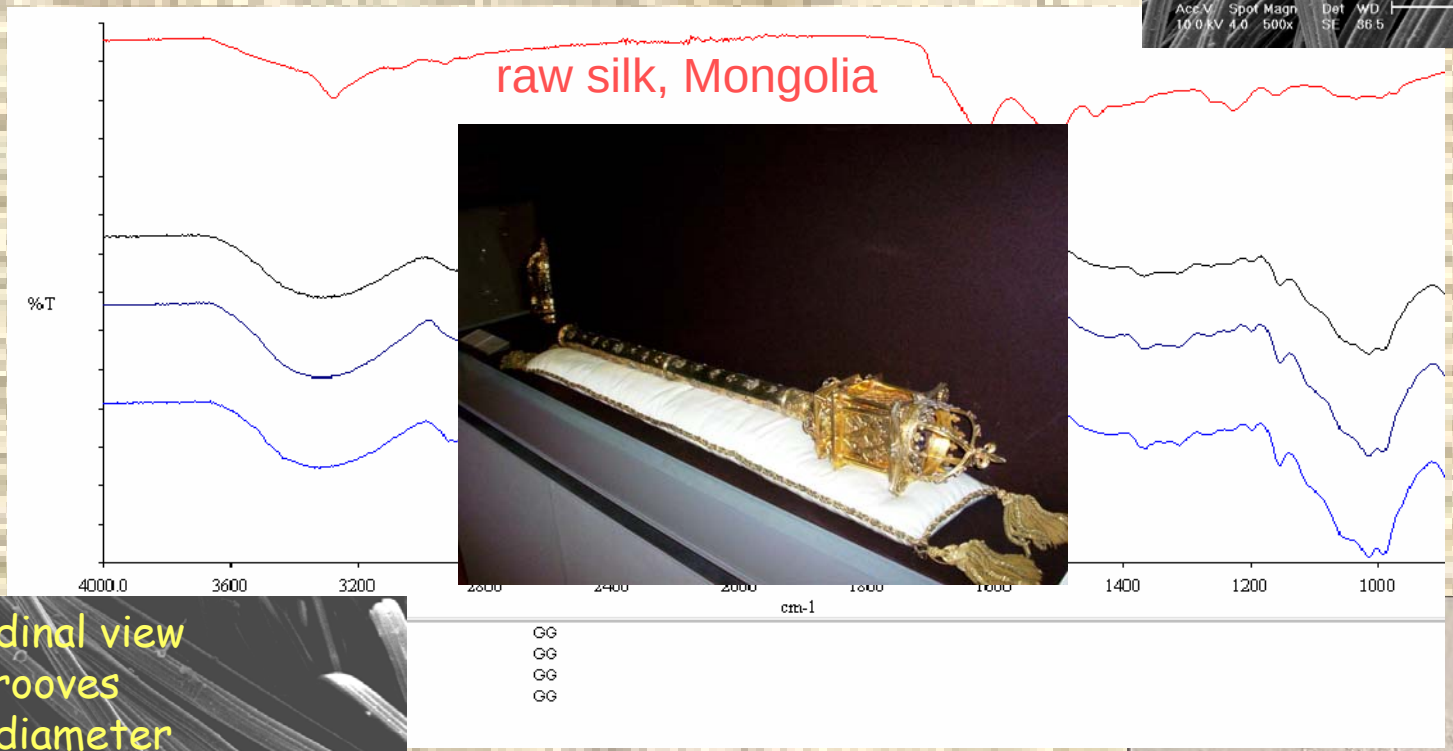


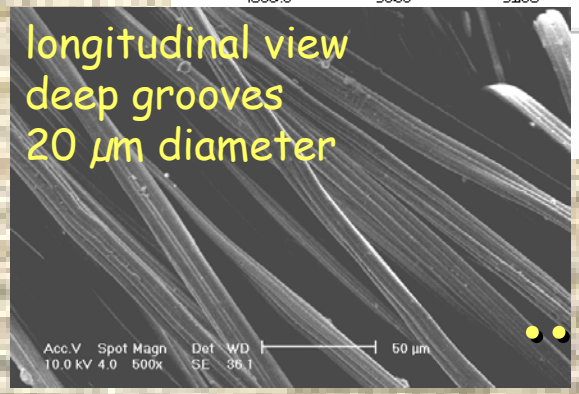
weft: degummed silk



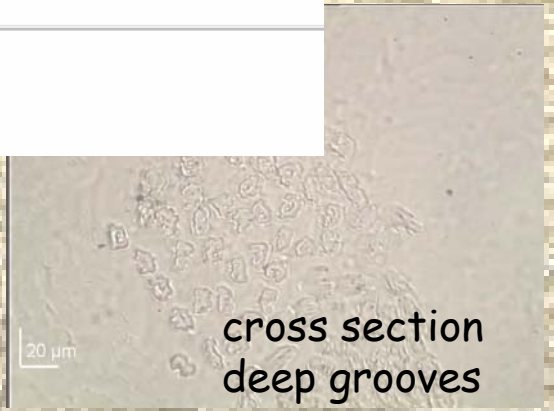
white silk...





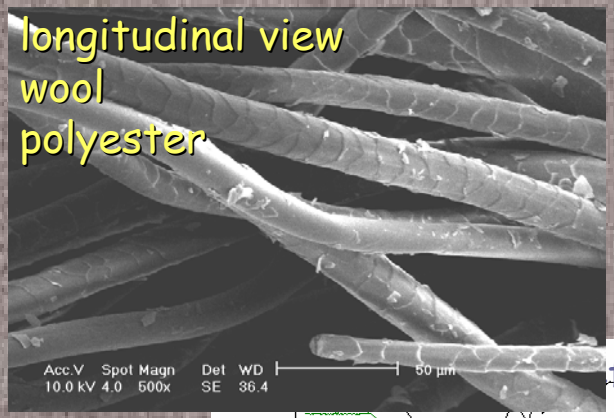


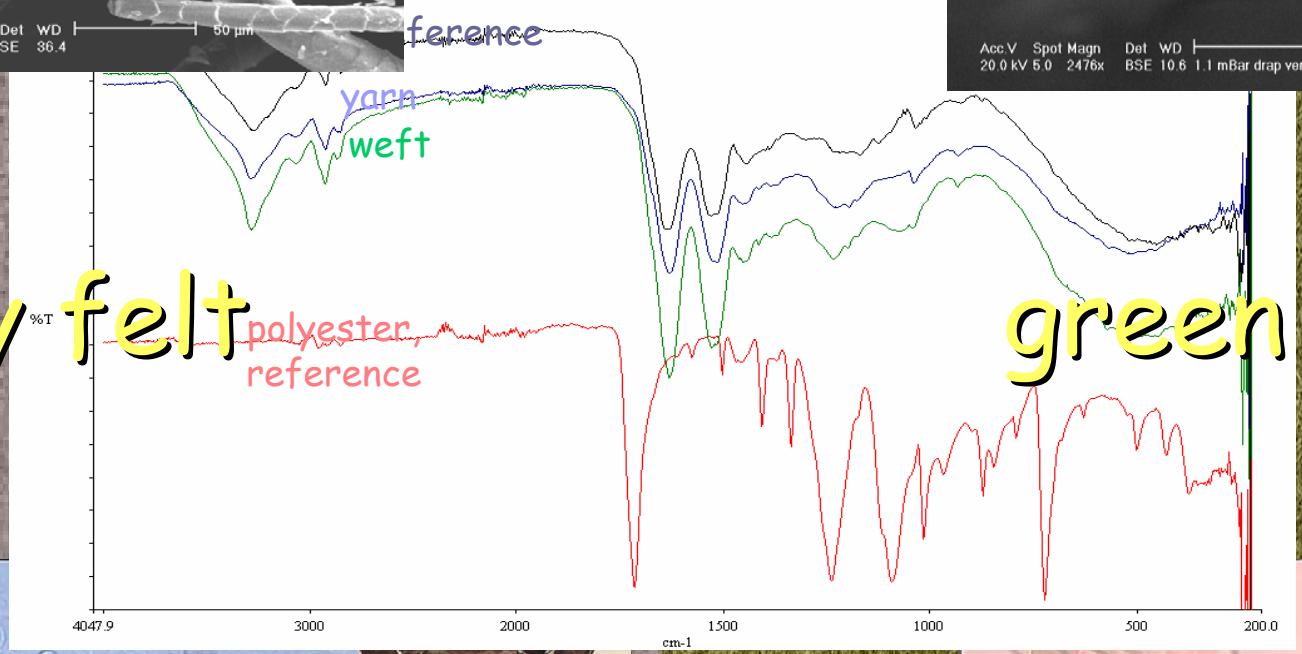
...100% viscose!

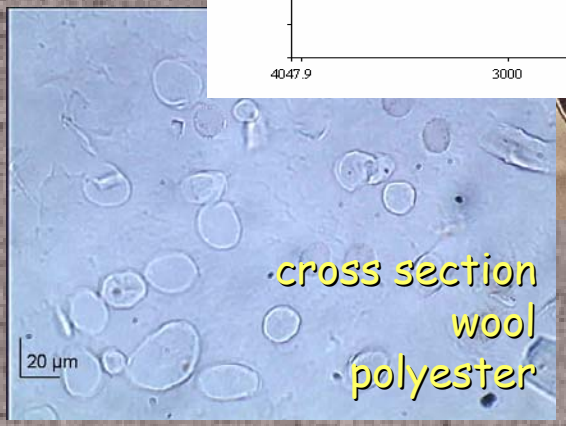


cross section
deep grooves

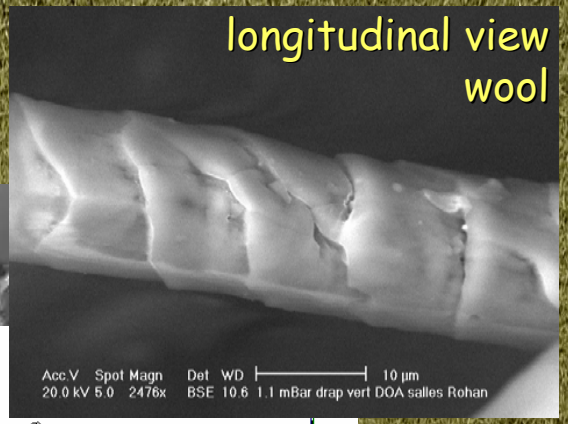
grey felt

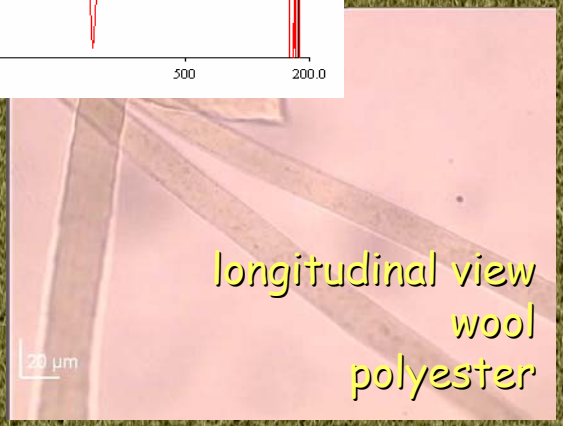






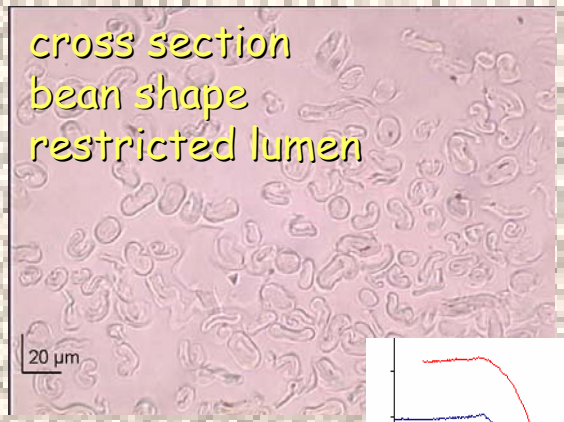
green felt

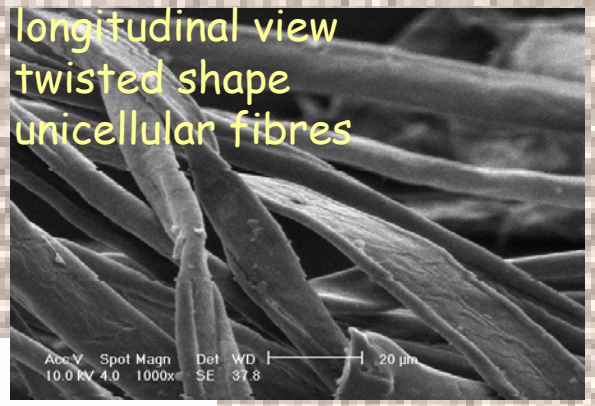


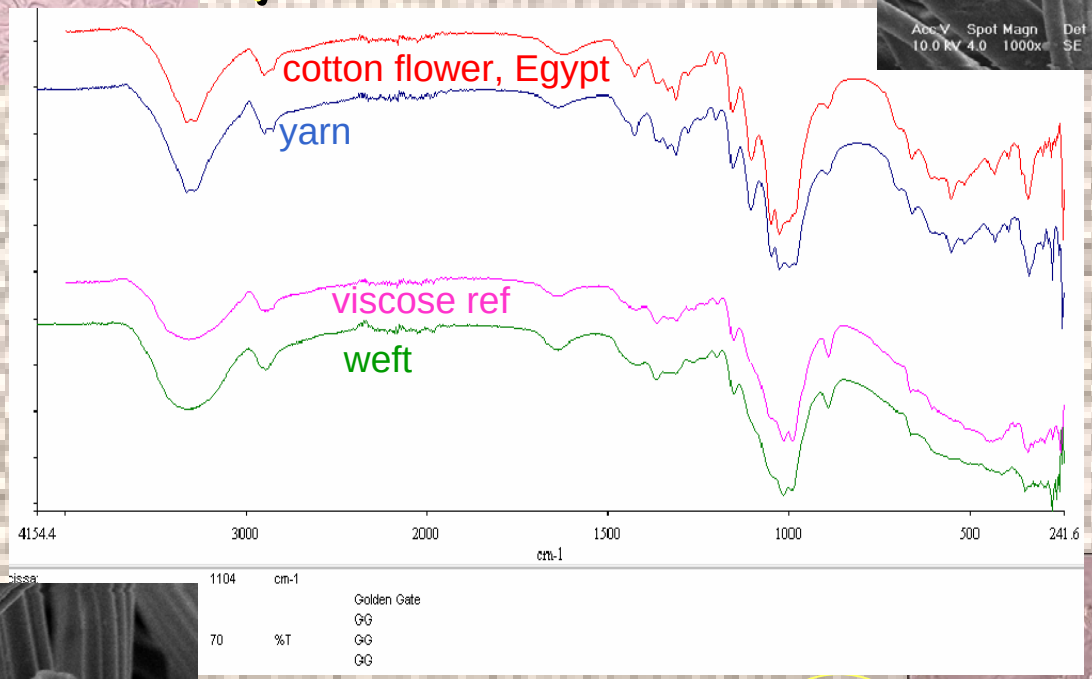


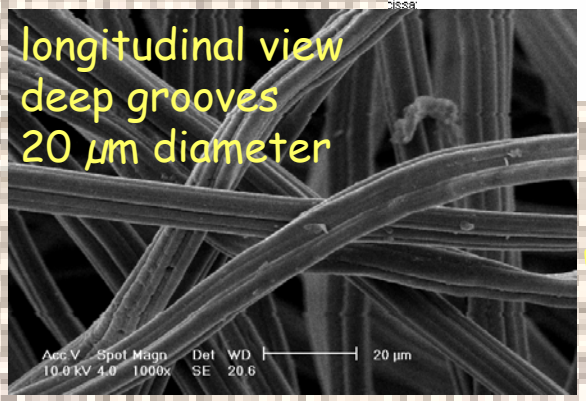
unknown

yarn: cotton





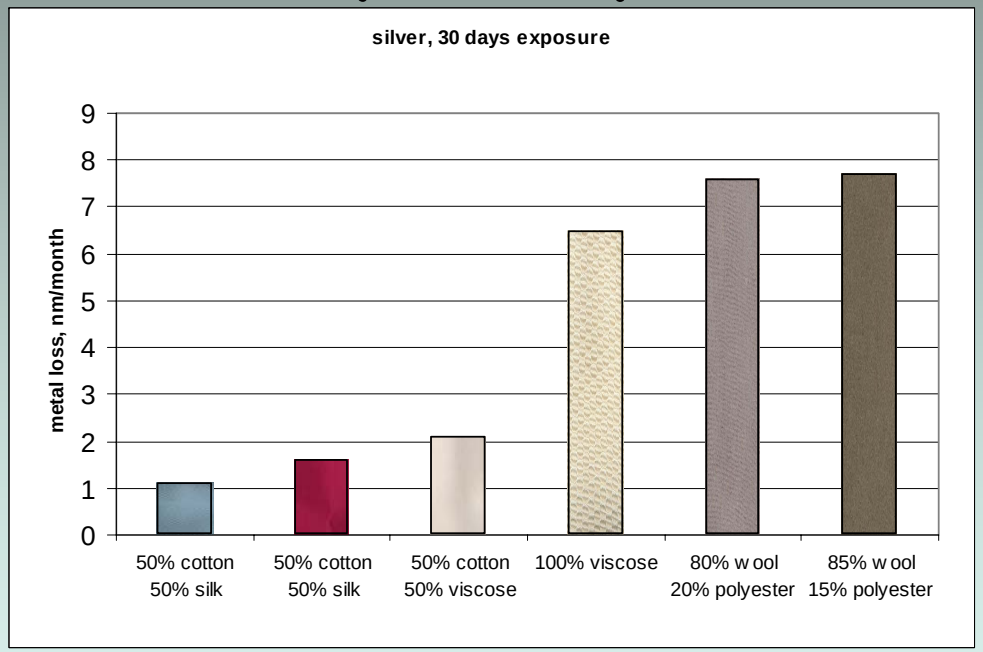




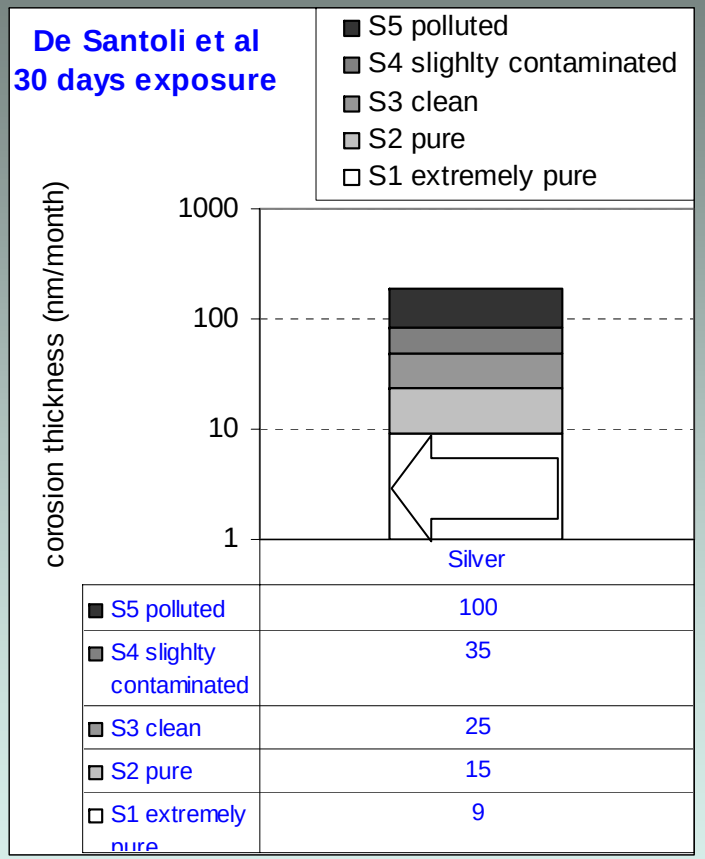
weft: viscose

establish critical limits

30 days exposure



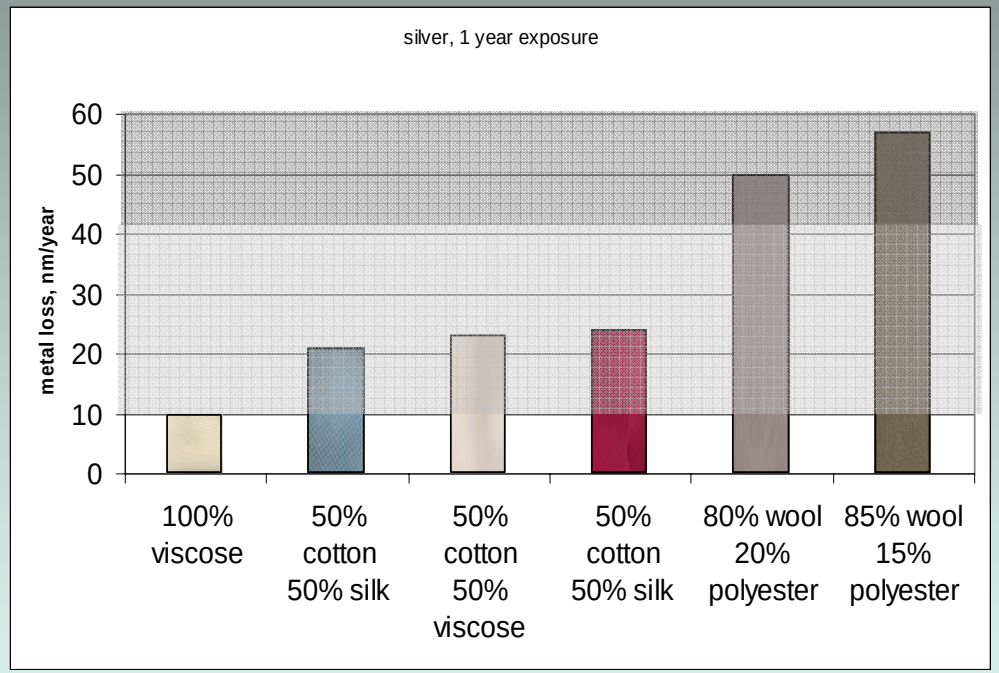
metal loss, resistivity measurements



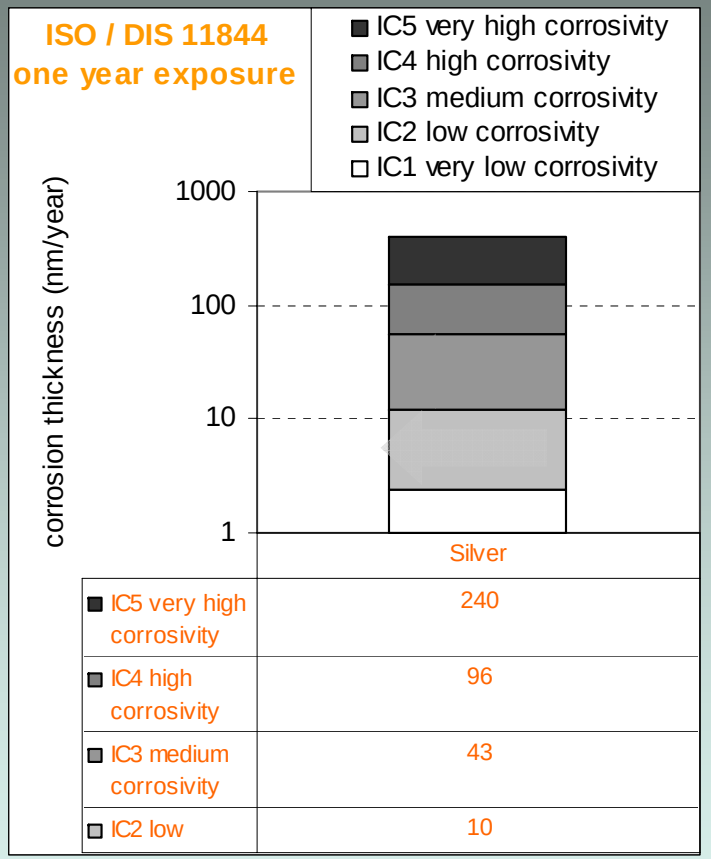
mass gain, QCM

establish critical limits

1 year exposure

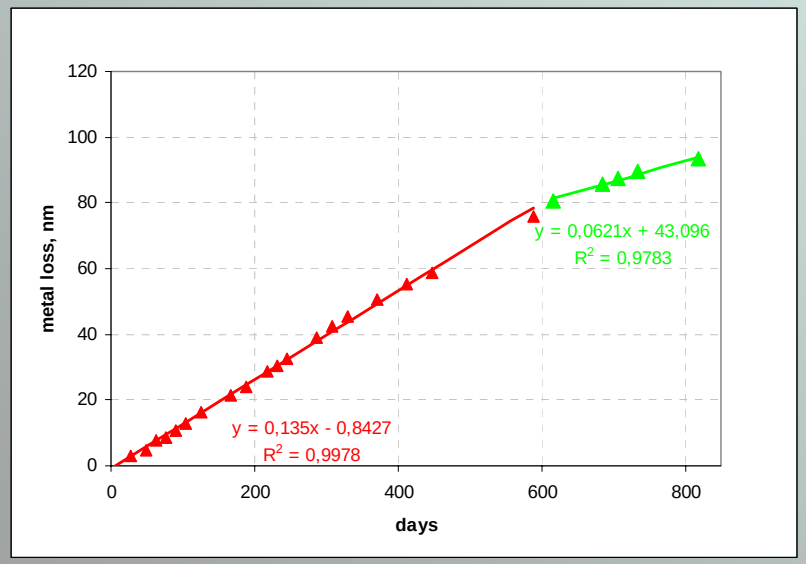


metal loss, resistivity measurements



mass gain,
cathodic reduction or QCM

correct the critical points
monitor the prevention measures



- cost of improving the showcases
  - 1 day * 15 showcases = 15 days
  - price of the new textile
- benefits
  - corrosion rate / 2
  - cost of cleaning / 2
  - life span of the objects * 2

wool

integrity of the objects

- yellowing within 2 years
- tarnish layer = 50 – 200 nm thick

conclusions

- upstream
  - control quality of materials
  - collaboration
- this study
  - recognize the potential hazards
  - identify critical points
  - establish critical limits
  - correct the critical points
  - monitor the prevention measures
- downstream
  - record keeping procedures
  - validate the showcases
- nice to know:
  - FT-IR + ATR for rapid identification of textiles

Thank you for your attention

experimental

- textiles
  - SEM-EDS
  - transmission optical microscopy with polarized light
  - FT-IR + ATR
    - Perkin-Elmer Spectrum 2000
    - ATR Golden Gate simple reflection (Specac) + crystal diamond
    - 4000 – 300 cm-1
    - accuracy: 4 cm-1
    - 20 scans
- silver
  - in-situ resistance measurements (based on metal loss)
  - GI-XRD of 3-1 test coupons