


RMS

**“One Sees Only What One Knows”  
SEM Image Interpretation**

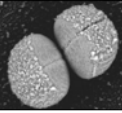


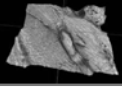
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RMS/ESB Workshop Sorrento 2005

**SEM Imaging**

- Information required ?
  - Signal types
  - Resolution ?
- Specimen preparation
  - Preservation ?
  - Dehydration ?
  - Coating
- Microscope settings
- Interpretation
  - Analysis







**Potential SEM Information**

- If used incorrectly
  - Very little
  - Waste of time and effort
- If used to its potential
  - Much
  - Dependent upon
    - Specimen preparation
    - Imaging conditions
  - Interpretation and analysis

**Quotation**

*“Man sieht nur was man weiss”*  
(One sees only what one knows)



Goethe

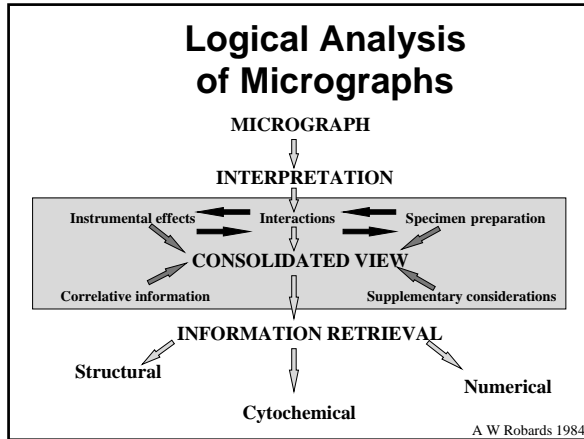
**What is this?**



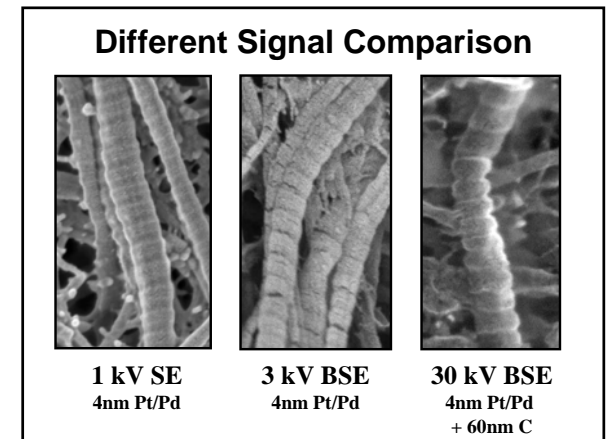
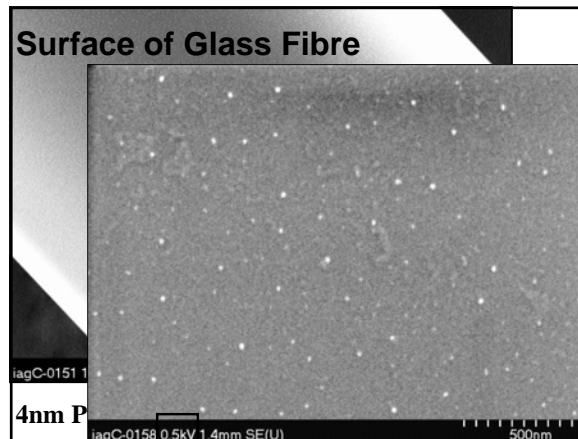
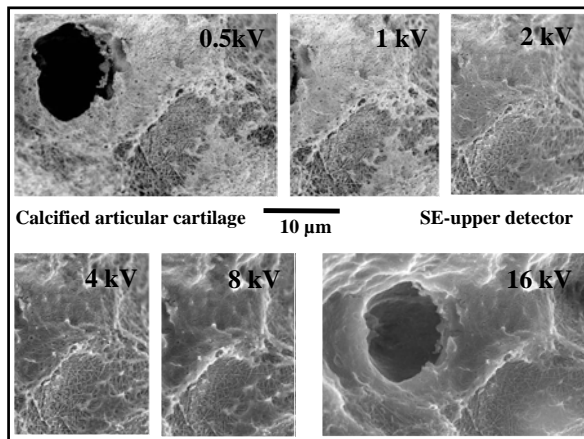
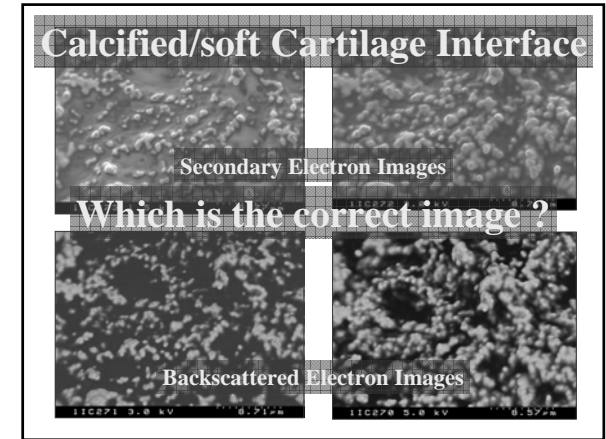
Romanesco Broccoli flower (Romanesco)

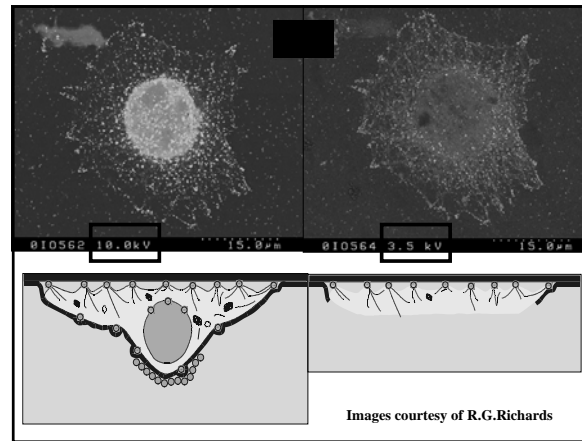
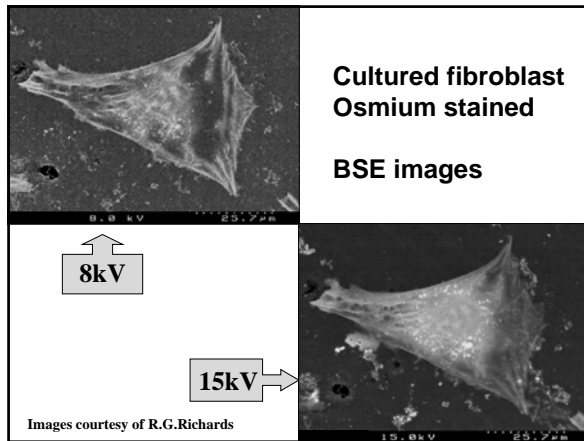
**Purpose of SEM Studies**

- **Reveal topographical surface detail**
  - SE – low voltage
  - BSE – all voltages
- **Detect sub-surface information**
  - BSE – optimise voltage
- **Detect compositional differences**
  - BSE – Atomic number contrast
  - XRA – element specific



- ### Reasons for Lack of Positive Contrast e.g. BSE imaging
- Microscope settings?
  - Fixing/staining agent(s) has not penetrated
  - Fixing/staining agent(s) has not reacted
  - Coating unsuitable
  - ... etc.



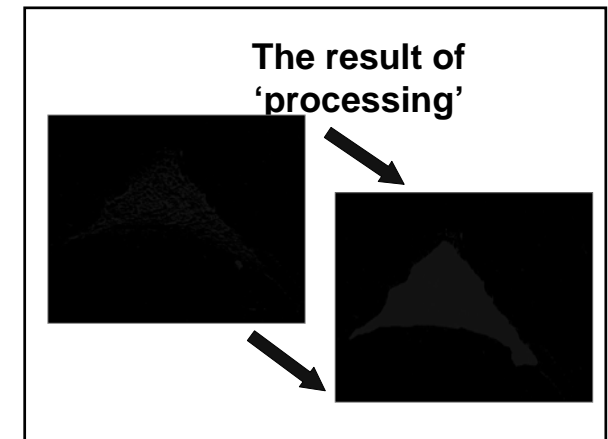
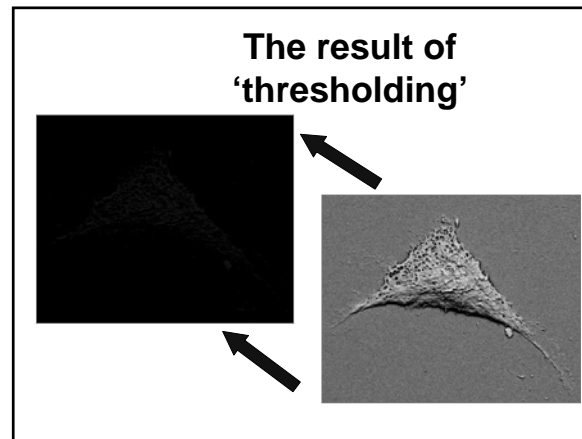


## Image Analysis

Quantitative data  
Grey level values (256 / pixel)  
Measurements  
length, breadth, areas etc  
Counting  
labels

## Basic Principles of Image Analysis

Areas of interest defined  
expressed as binary (0 & 1) image  
Measurements on binary image.




## Some Measurements Possible

**Others:**

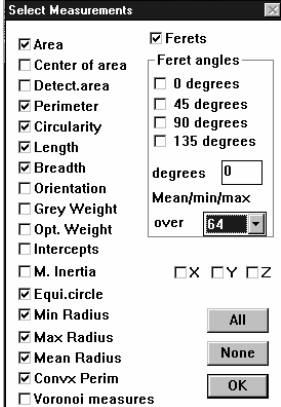
6. Equivalent circle
7. Ferets
8. ... and more

1. Count the No of objects
2. Area
3. Length
4. Breadth
5. Perimeter

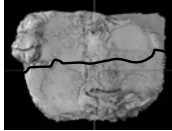
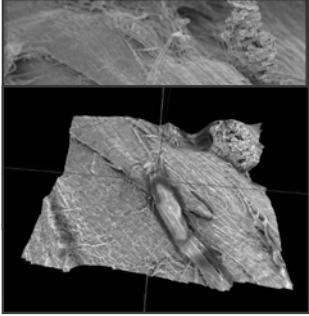


## PC\_Image

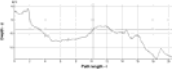
### Select Measurements



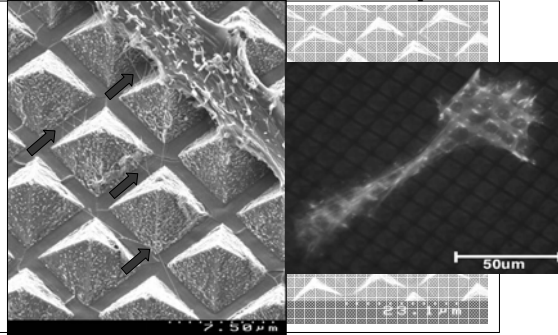
## 3D Rendering by software (Alicona: Mex)

**Articular cartilage fracture propagation = Undulation of matrix**





## Combining Microscopies



Images courtesy of DO Meredith, AO

## Take Home Messages

- Do microscopy
  - Carefully
  - Not a means to ‘decorate’ publications
- Research background
  - Carefully (broad sources)
- Ask a microscopist!
  - Before you start (potential information)
  - To interpret results

### SEM Workshop

ap Gwynn & Richards 2005

