

# Metrological Characterisation of Microvesicles with TSEM

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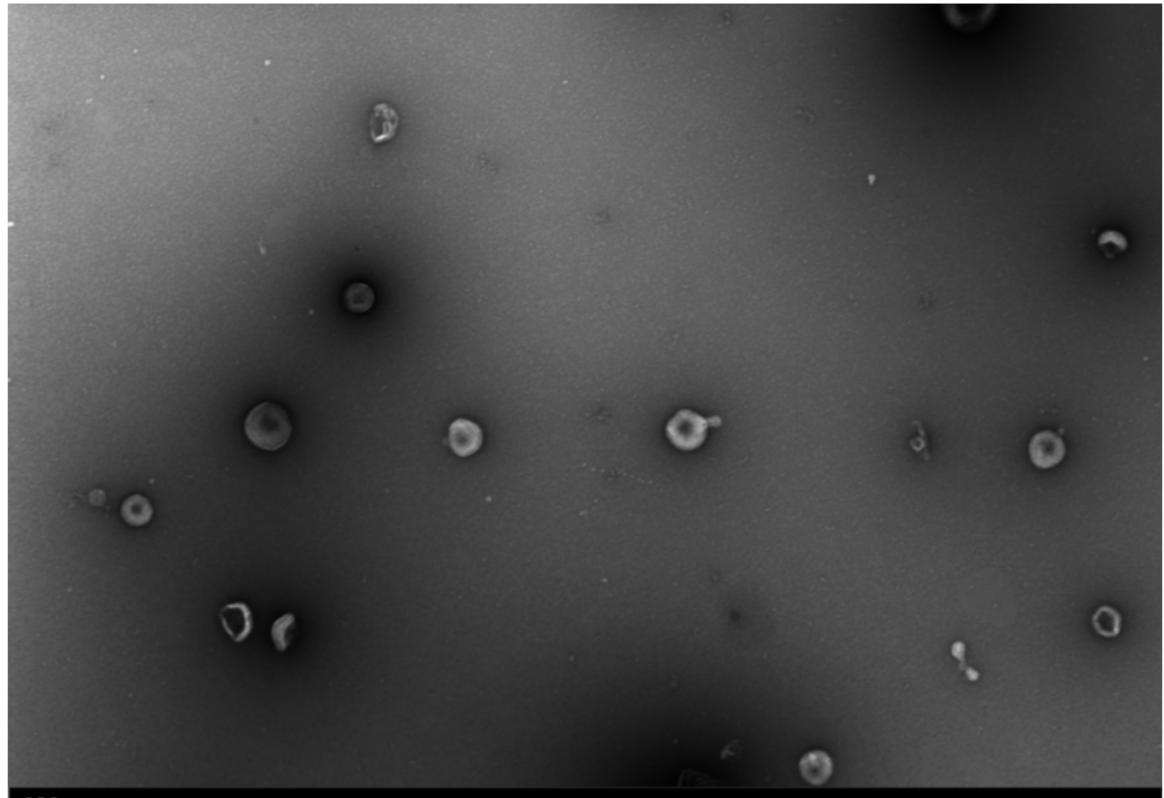
November 28-29, 2013

# Slides Removed

Unrelated slides have been removed...

## Image Processing of TSEM Images of Microvesicles

# TSEM Image of Microvesicles

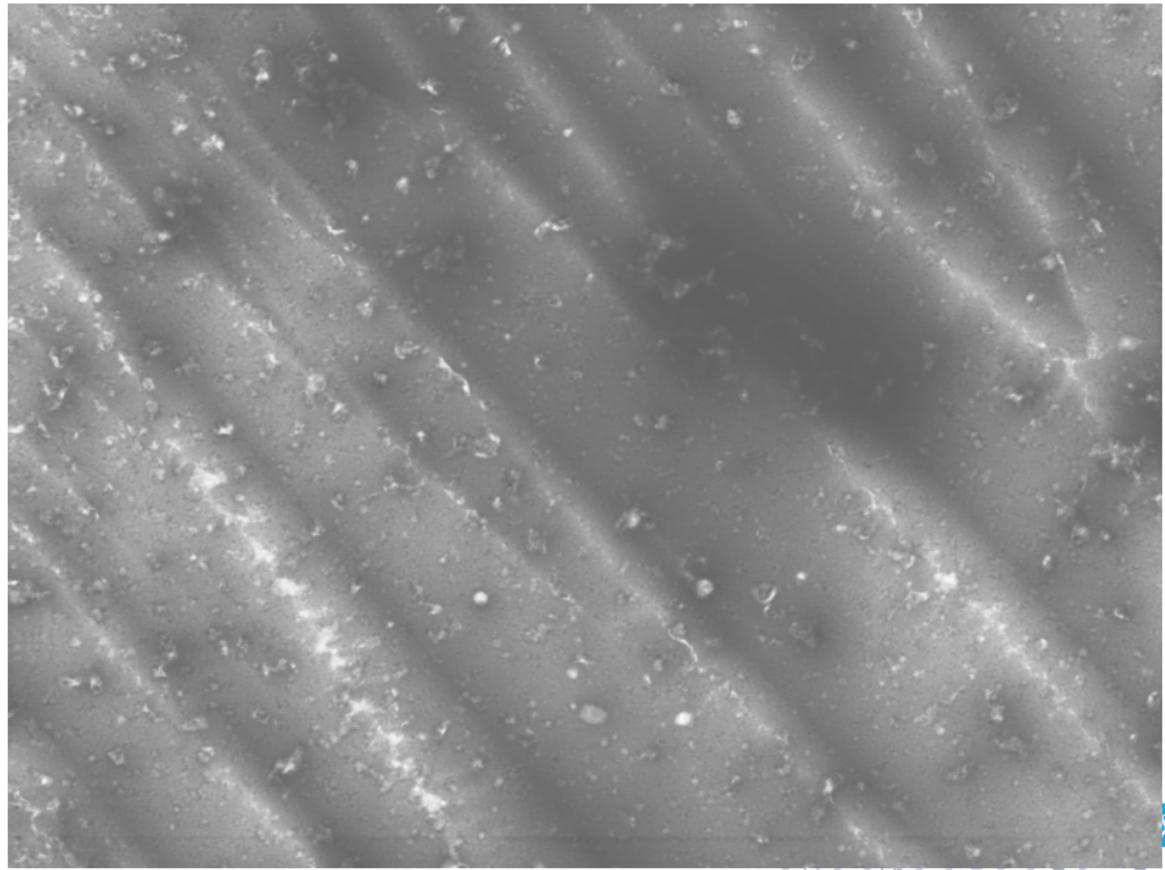


200 nm  

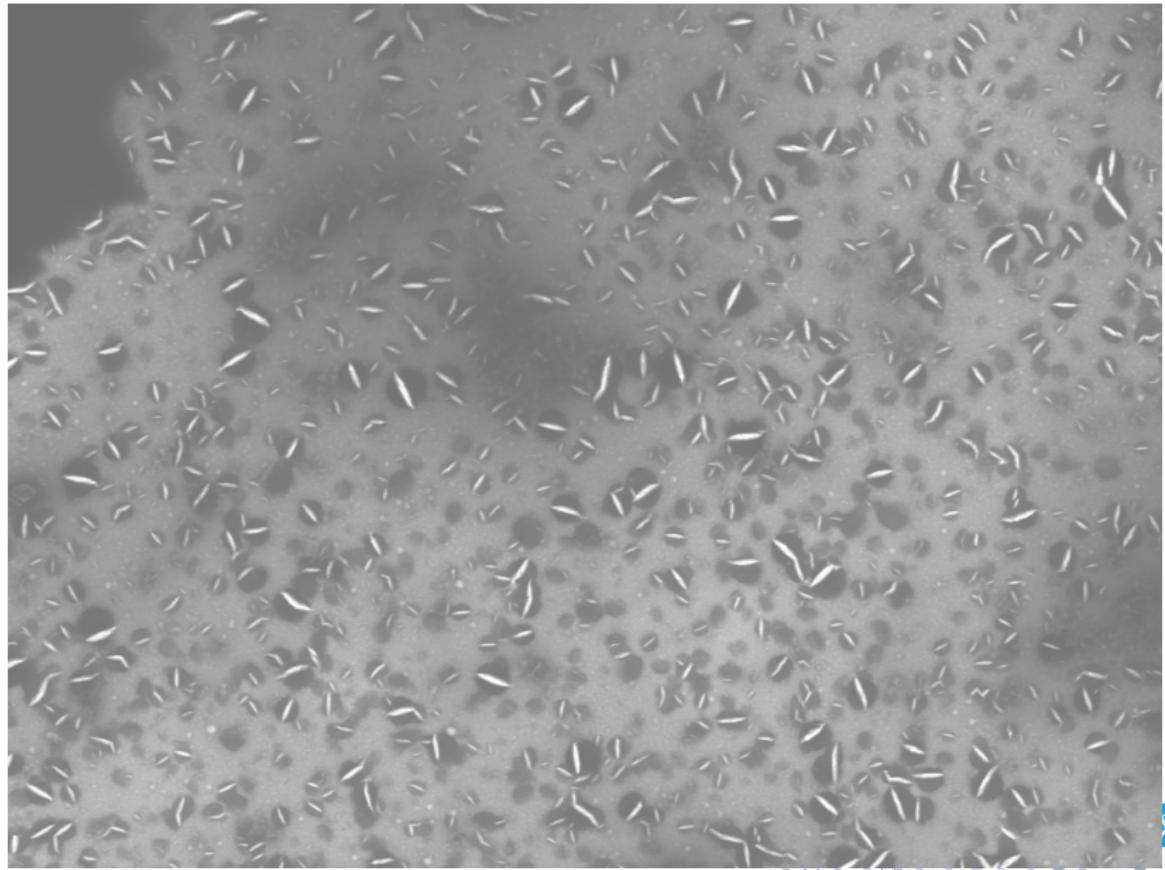

EHT = 30.00 kV      Signal A = STEM      Date : 9Nov 2012      Pixel Size = 5.583 nm  
WD = 3.0 mm      Mag = 20.00 KX

 PTB 4.2

# TSEM Images of Microvesicles



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# Image Processing: Search Procedure

- **Preparation.**

- Reduce background roughness using Discrete Cosine Transform (DCT).
- Slightly Gaussian-blur image to suppress noise.
- Mask construction.

Scanning  
The search procedure starts with scanning the image. This means that the image is processed pixel by pixel. The search area is divided into a grid of small squares. The size of these squares depends on the size of the particles to be detected. The search area is divided into a grid of small squares. The size of these squares depends on the size of the particles to be detected.

- Scanning
- Calculate resulting parameters.

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# Image Processing: Search Procedure

- Preparation.
- Reduce background roughness using Discrete Cosine Transform (DCT).
- Slightly Gaussian-blur image to suppress noise.
- Mask construction.
  - Calculate Sobel-derivatives in 4 directions.
  - Find local maxima in the derivatives.
  - Create mask from local maxima.
- Scanning
- Calculate resulting parameters.

- **Preparation.**
- **Reduce background roughness** using Discrete Cosine Transform (DCT).
- Slightly Gaussian-blur image to **suppress noise**.
- **Mask construction.**
  - Calculate Sobel-derivatives in 4 directions.
  - Threshold and erode derivative images.
  - Find contours of candidate areas.
  - Find bounding-boxes for the contours and enlarge them.
- **Scanning**
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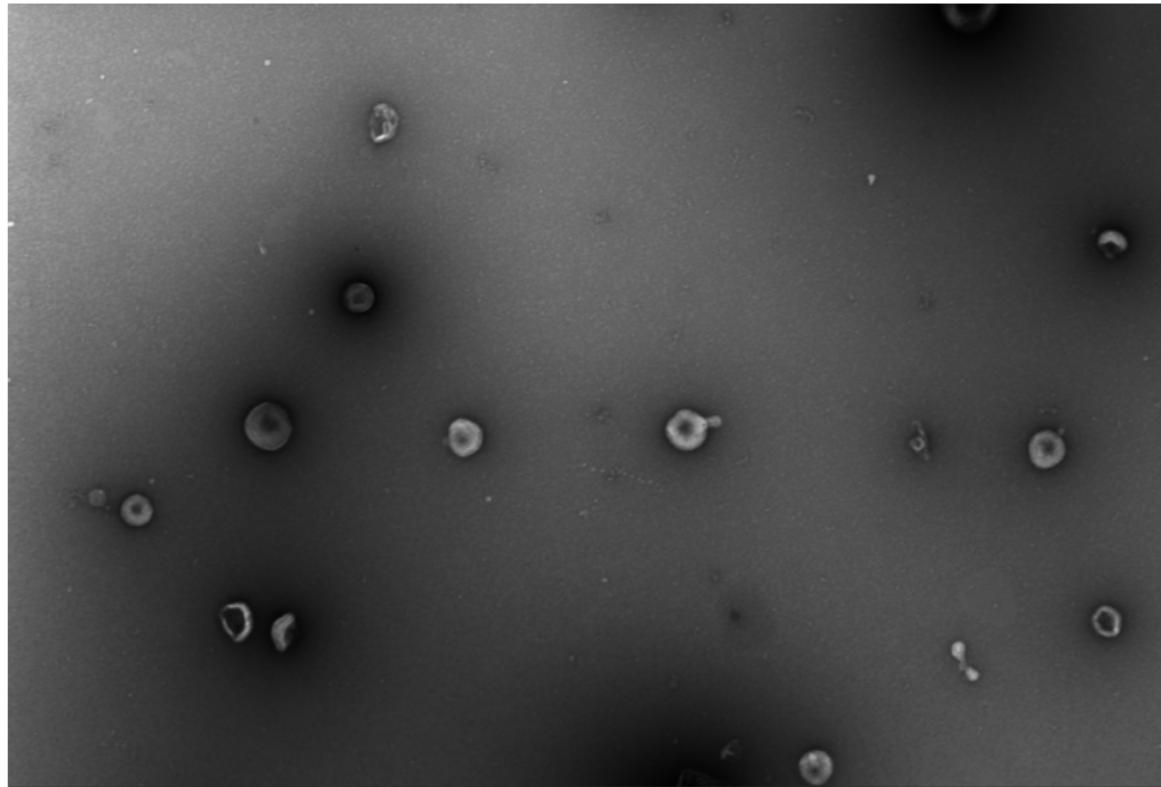
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# Original Image

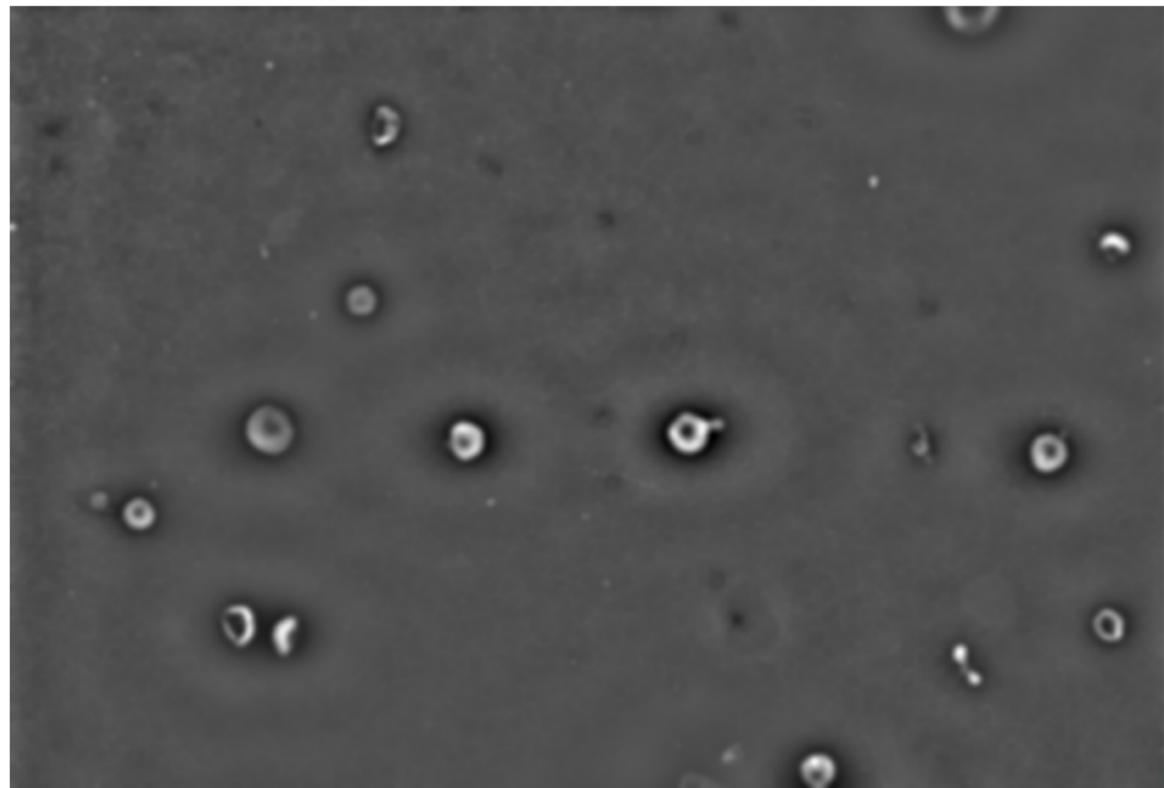


200 nm  

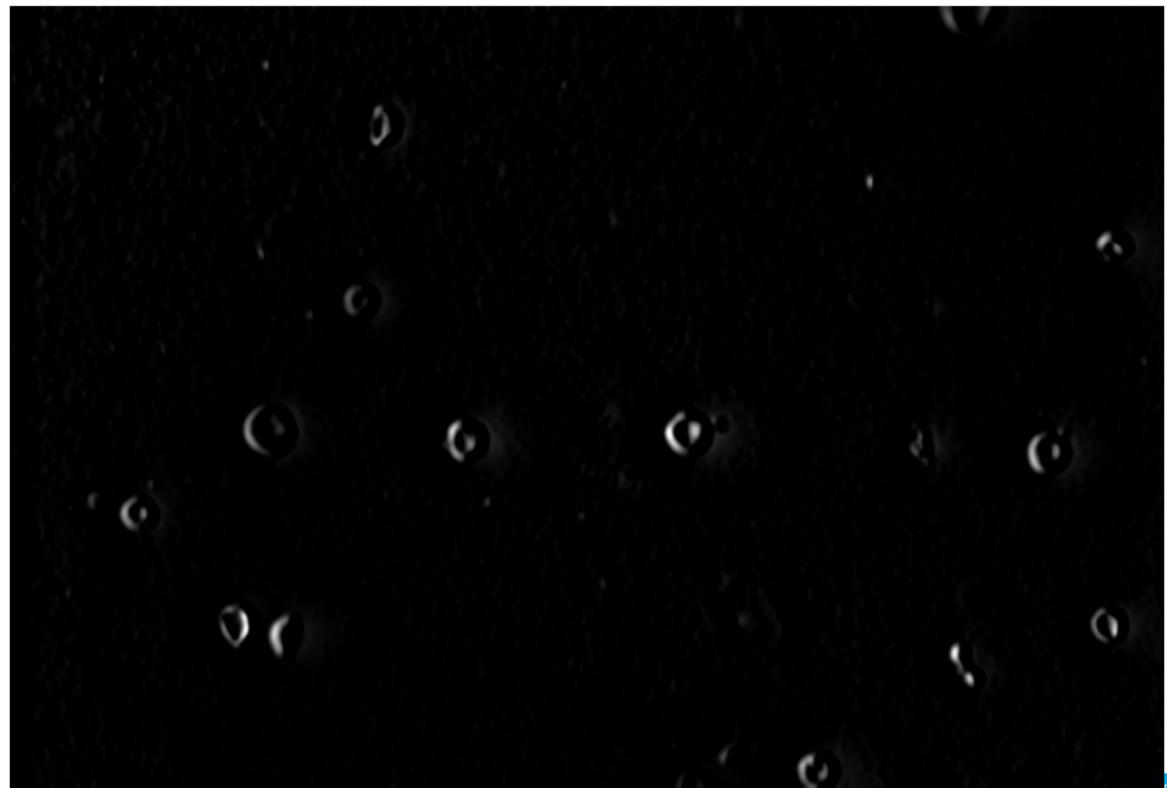

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# Cropped and Blurred Image



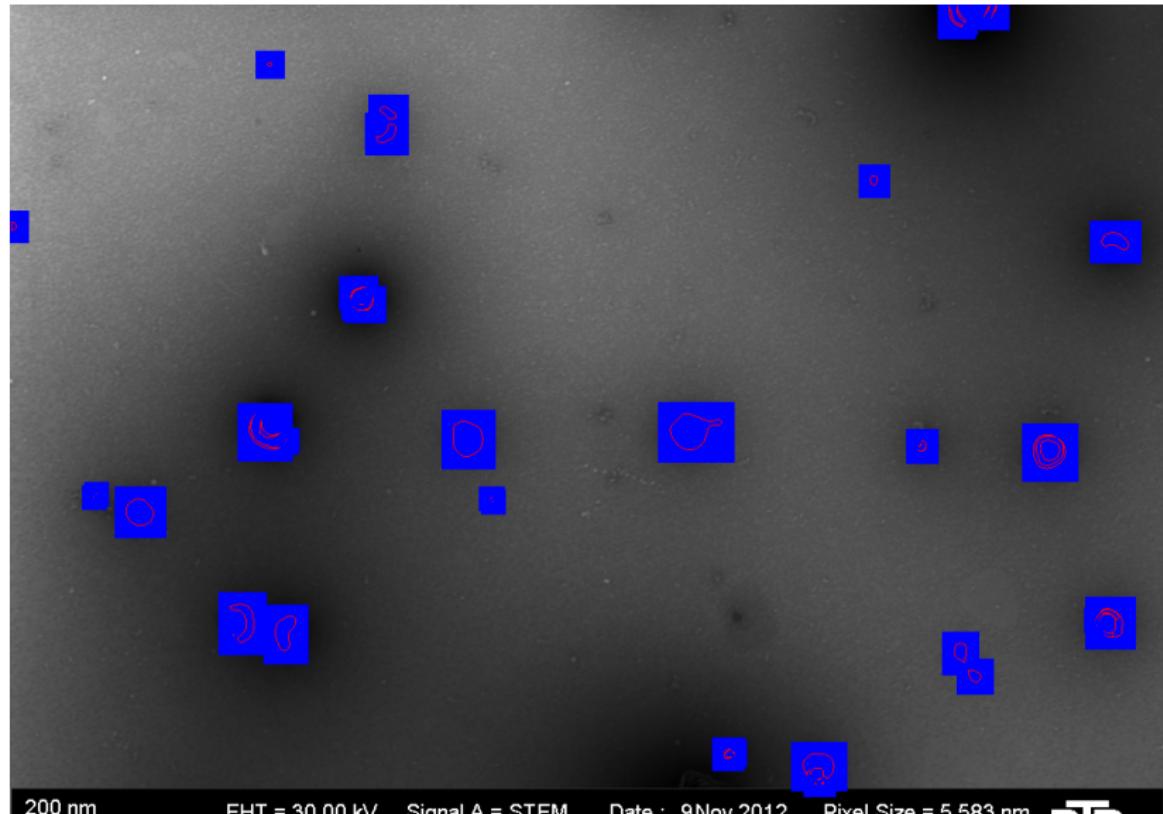
# Sobel in x-Direction



# Thresholded and Eroded - Candidate Features



# The Mask



200 nm

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Date : 9 Nov 2012  
Pixel Size = 5.583 nm

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- **Scanning.**

- Inspect **profile** in 6 directions.
- Find **borders**.
- Inspect borders in 36 directions (**10-degree steps**).
- Fit **circle** on found border points.

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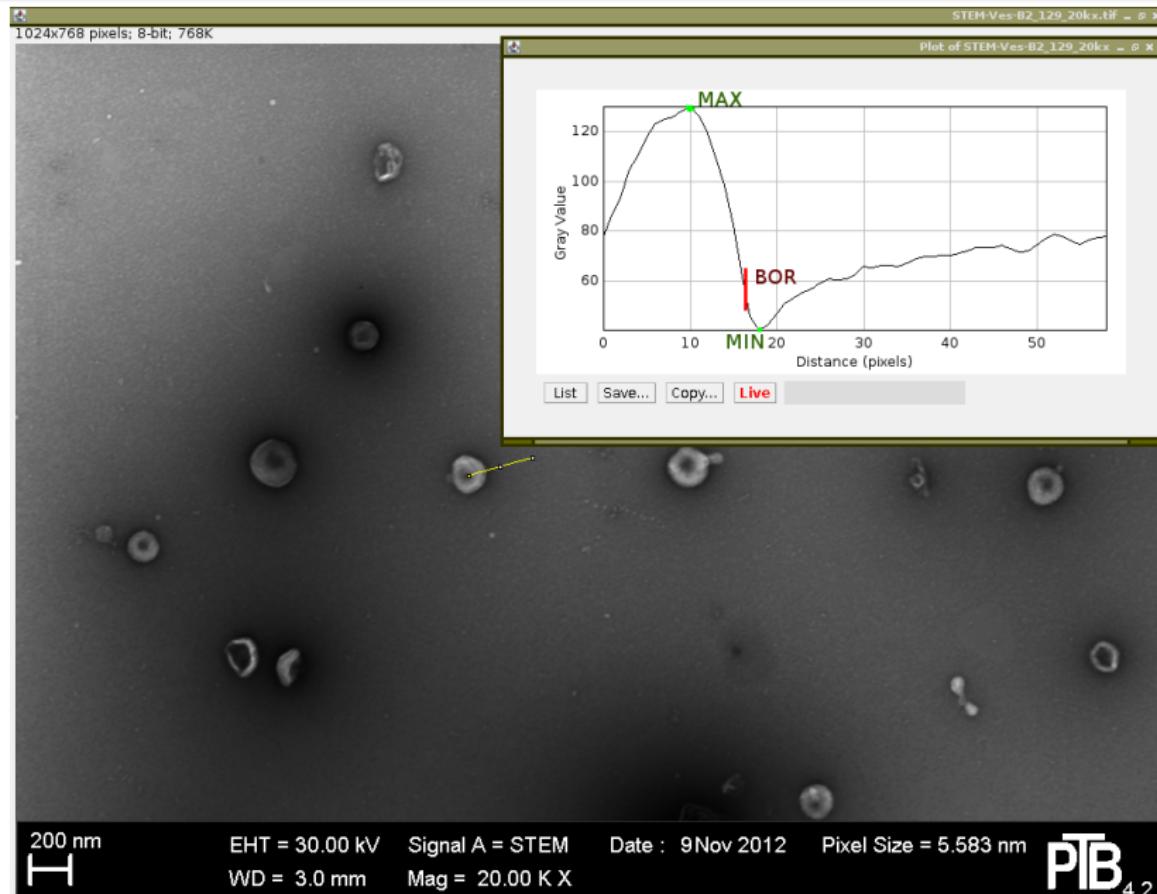
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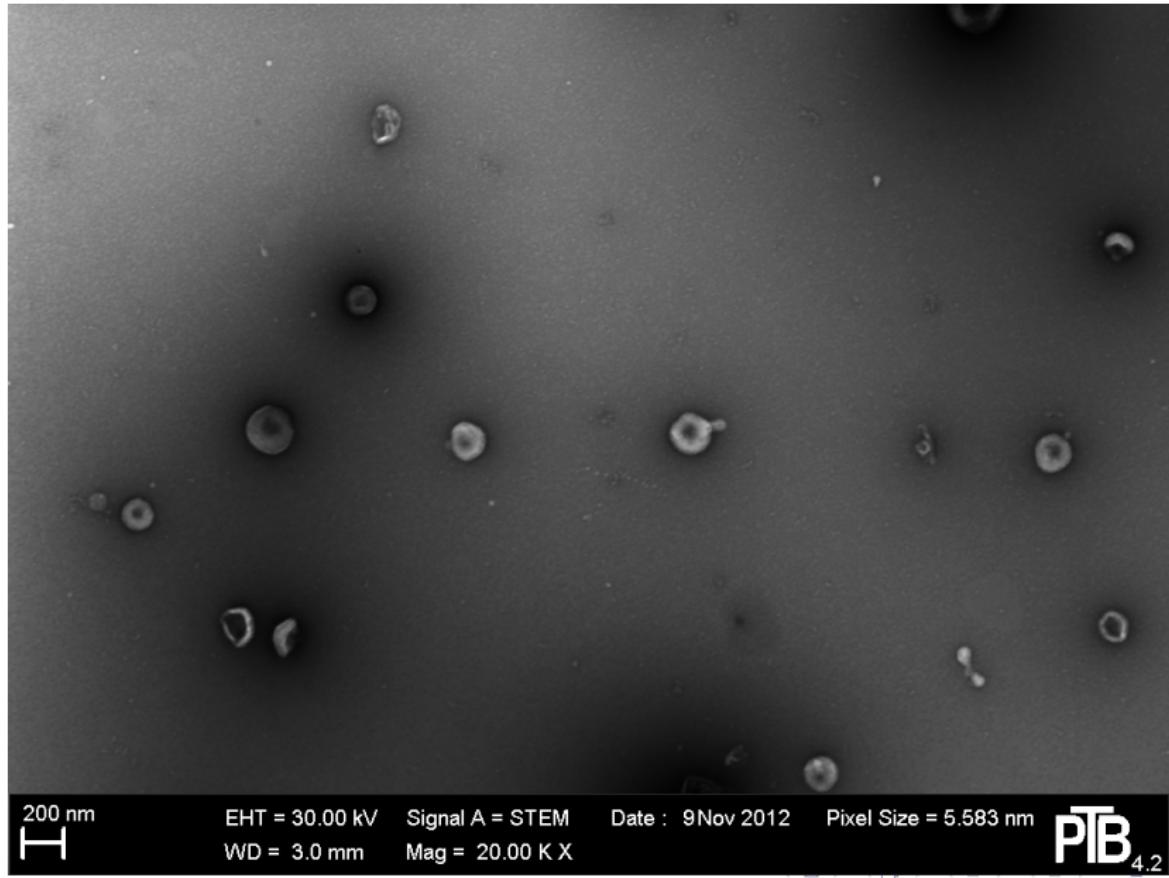
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# Search for Border Points



# Brute-Force Scanning

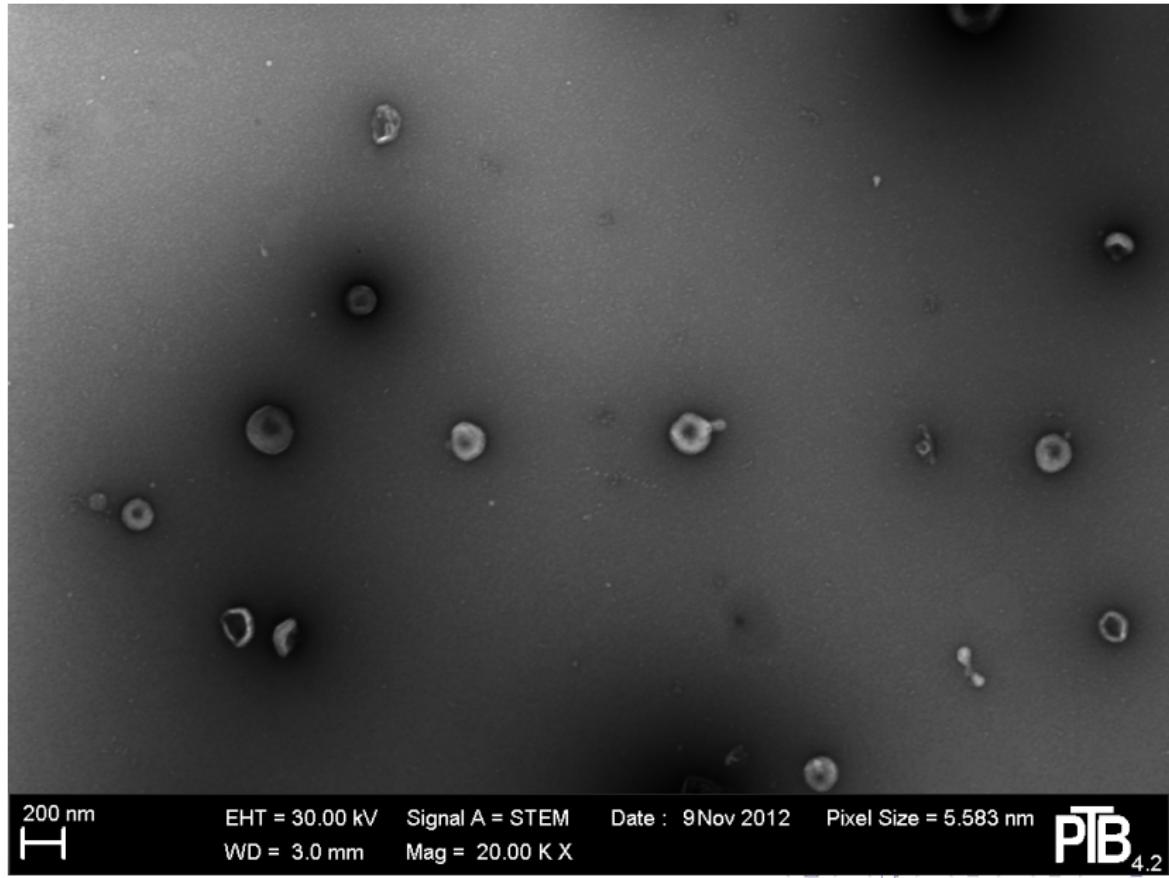


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# Scanning with Mask



200 nm  
H

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