AFM Visualization

By Justin Marbutt

The Customer

- Dr. Renato Camata

  associate professor of physics at UAB. Research in materials science

- Research

  placement of peptides as bonding agents for cells on small surfaces (i.e. implants).

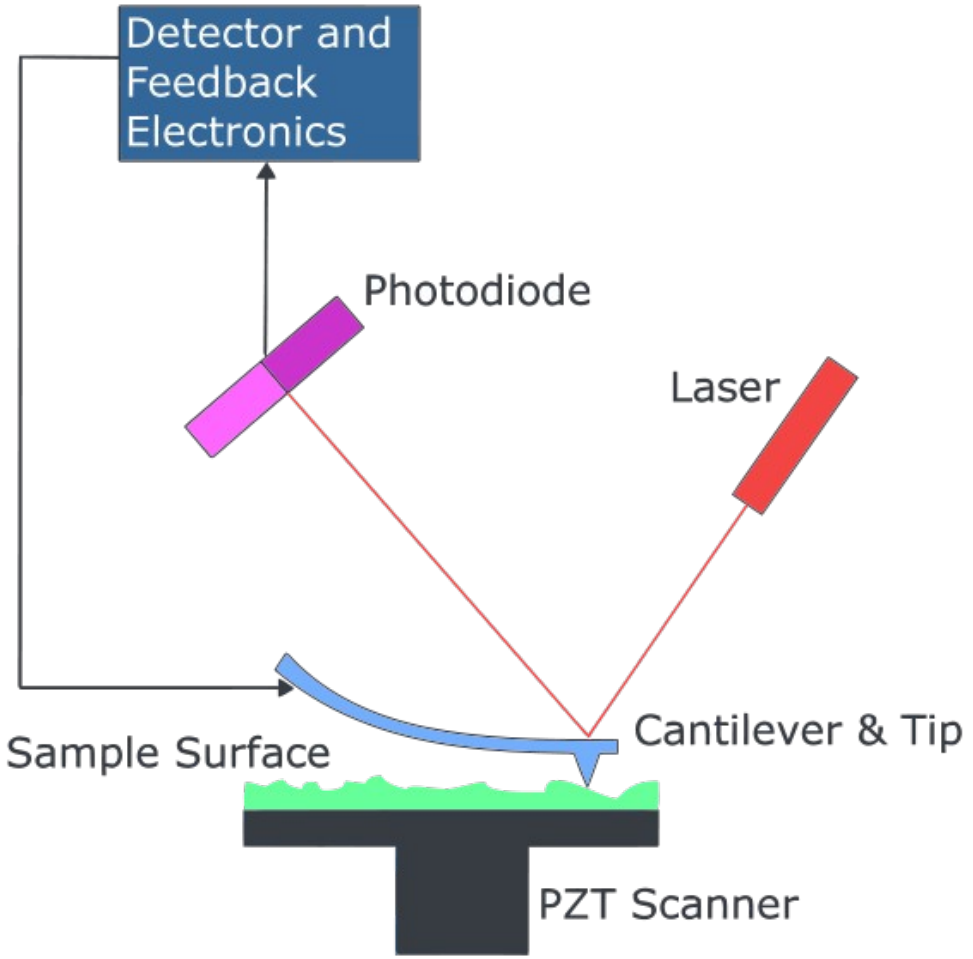
The Data

3D AFM Surface Data

[Header Section]
Version=v6.02
Date/Time=06/25/2010 11:40:24
Description=
Data Offset=3144
Stage Type=Explorer AFM
Probe Type=AFM
Scanner SerialNum=EX350511
Experiment Type=Plane Image
Data Type=Linearized Height
Calibration Type=System Calibration
Z Gain=High
Image Size=80 µm x 80 µm
Image Resolution=200 x 200 pixels
Data Range=32763, 32772
Scan Rate=179.93 µm/s
Scan Direction=Forward
Rotation=0 degrees
PID Settings=2.000   0.100   0.000
Relative Set Point=-1 nA
Sample Bias=0.00 mV
[Data Section]
Shade data: [a.u]
3.1217e+000 3.1217e+000 3.7460e+000 3.1217e+000 2.4973e+000 3.7460e+000
3.7460e+000

Atomic Force Microscopy

- Mapping of a 2D-Surface with fundamental forces measured by a incident angle of a laser



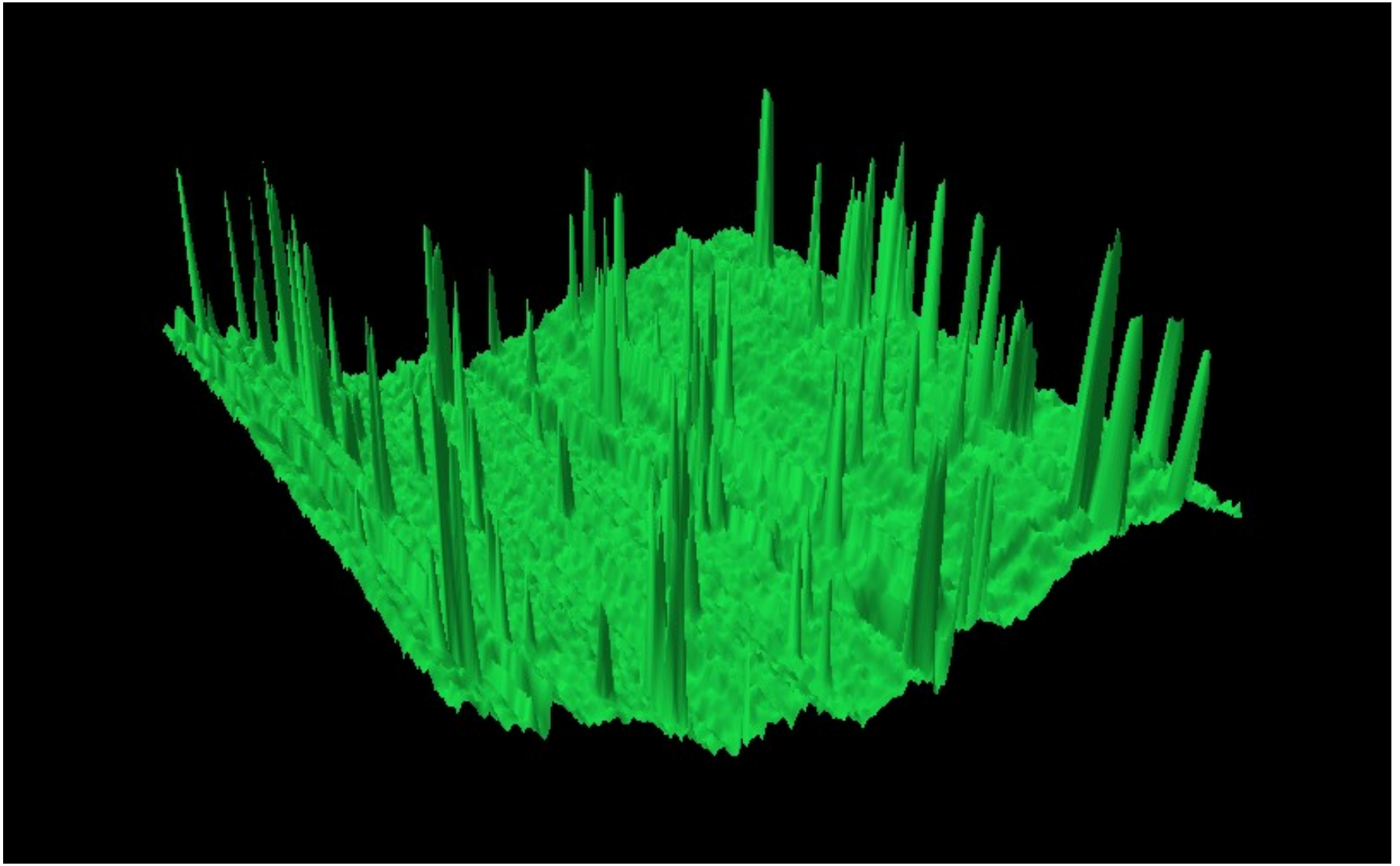
Goals of Visualization

- Visualize Manipulations to Data
  - Visualize the manipulation of the data in real time to ensure correctness of manipulation
- Visualize Surface
  - Visualize surface accurately with open knowledge of algorithm
  - Allow for resizing of the visualization with minimal information loss.

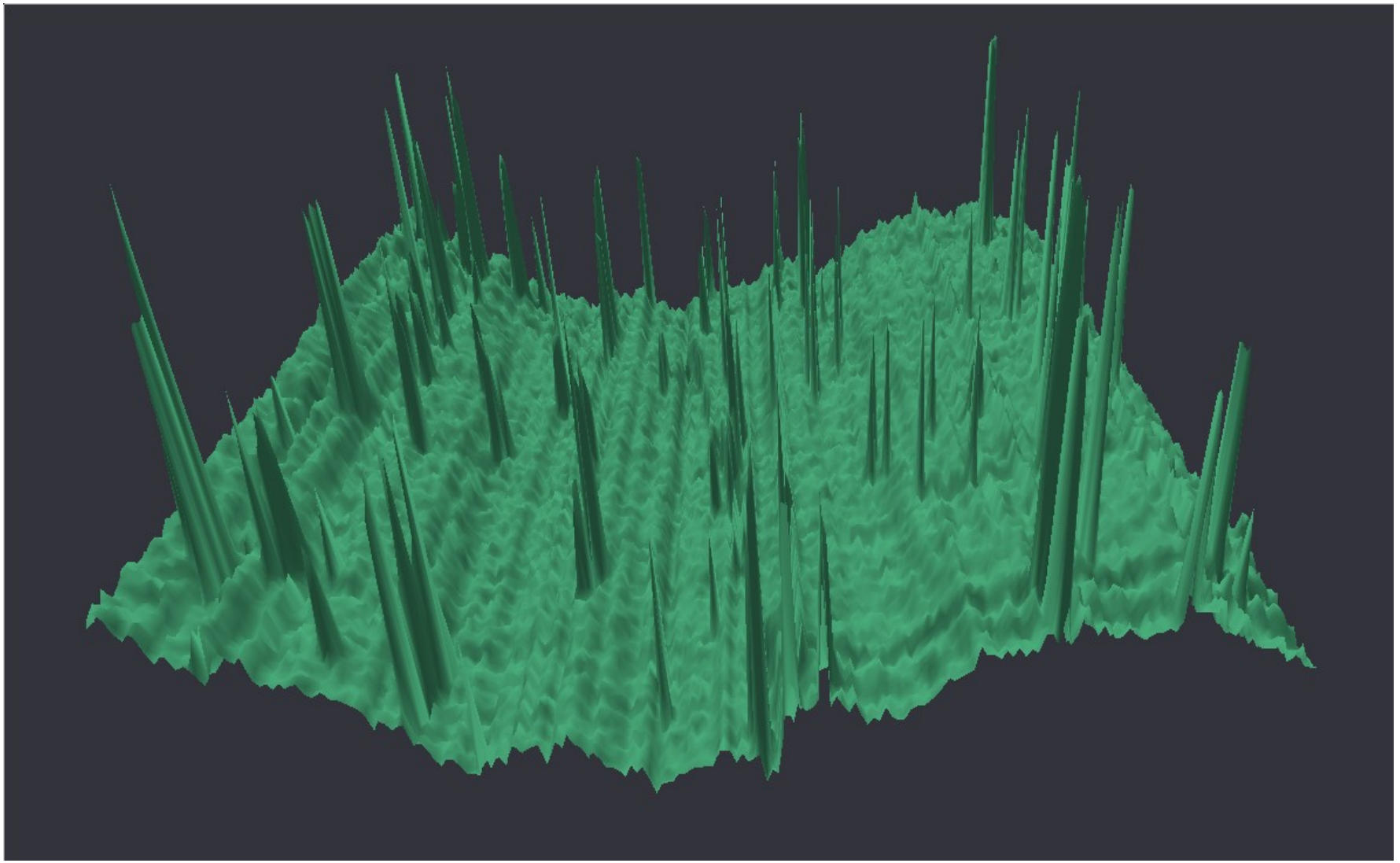
Visualizing Manipulations

- Visualize the manipulation of the data to remove artifacts created by the machine
- Visualize the application of a threshold to determine what is and is not a particle
- Visualize the size distribution of the particles once identified

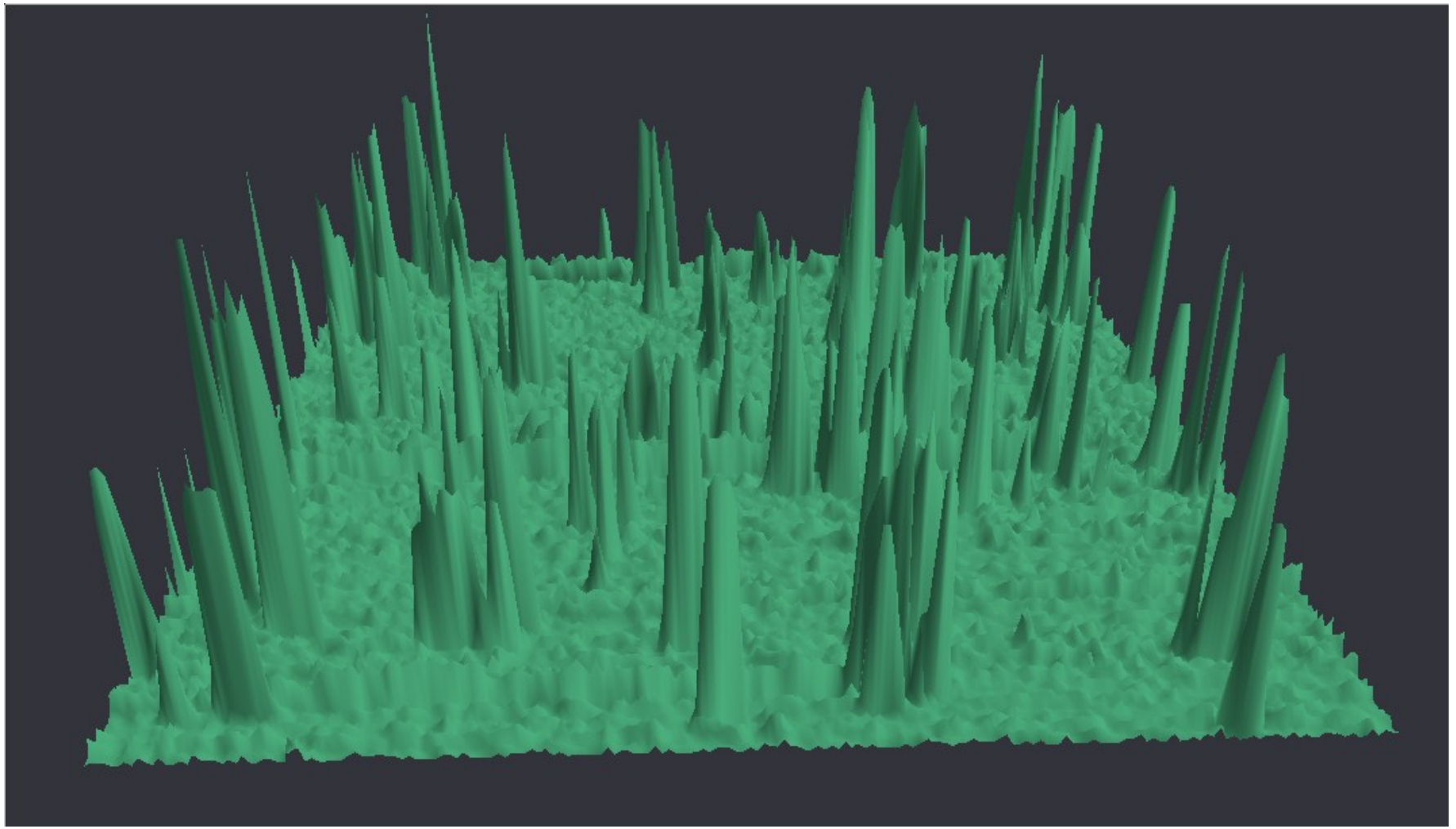
3-D height map visualization



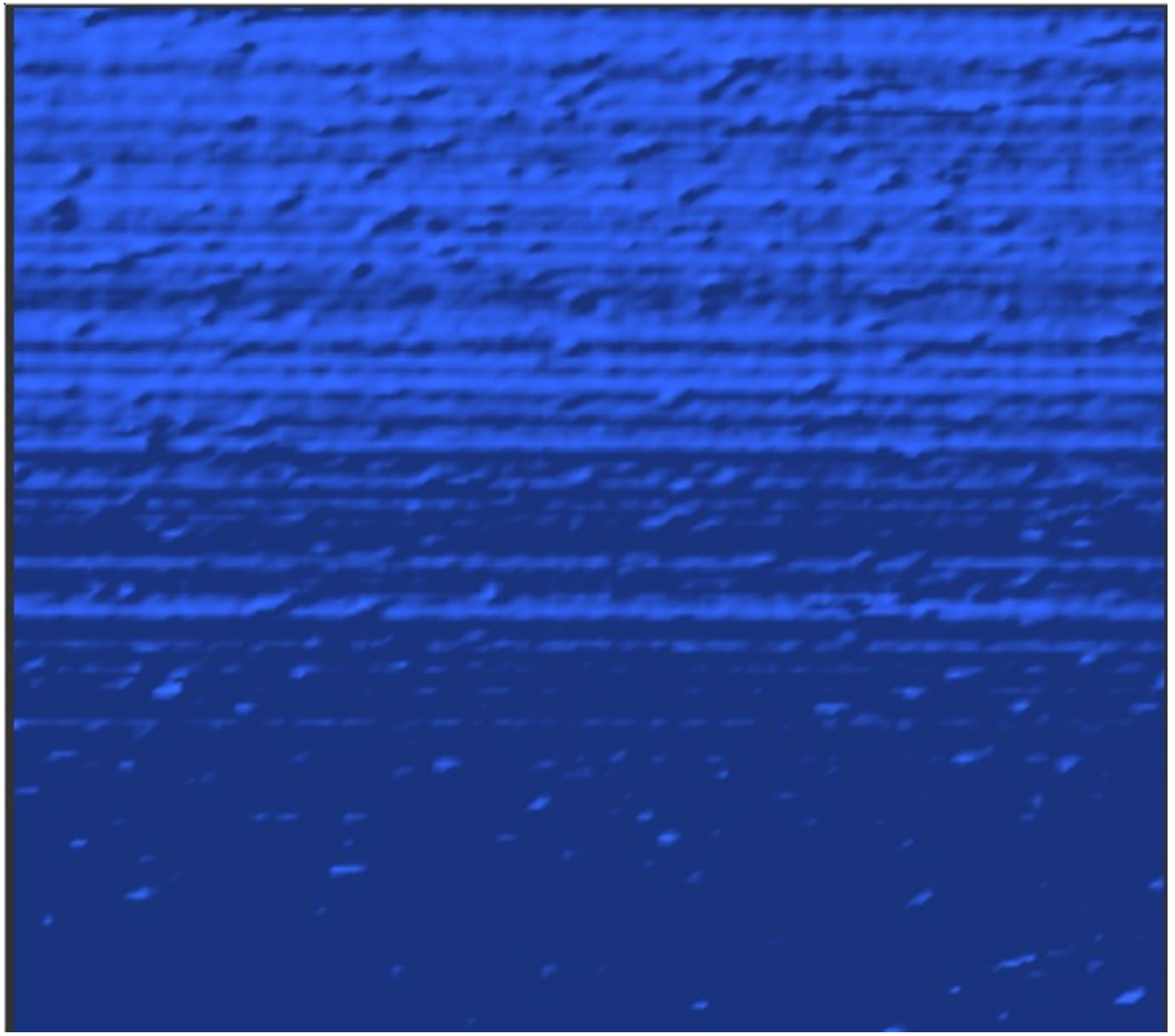
Curve in surface created by machine



After curve removed

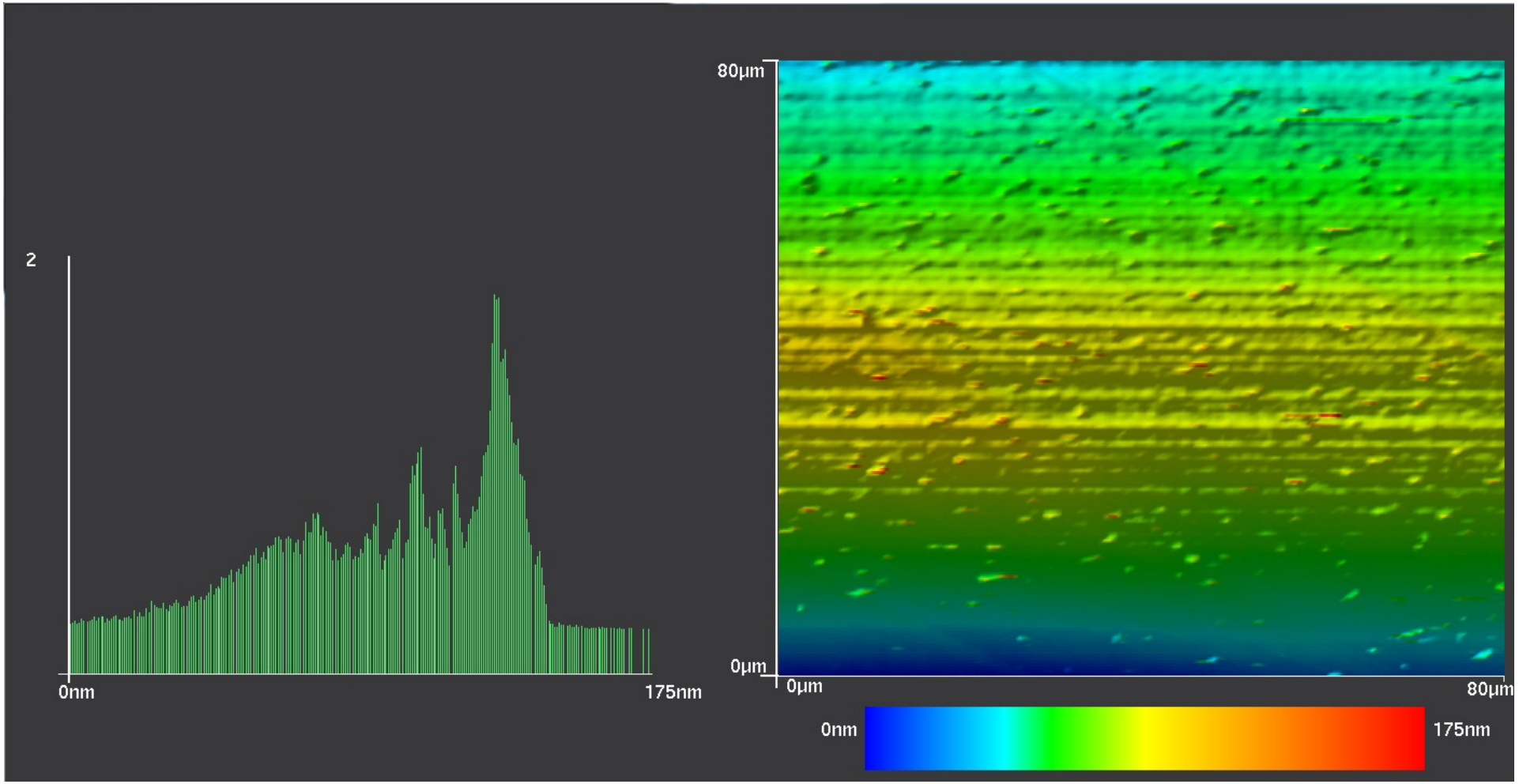


Top-down visualization

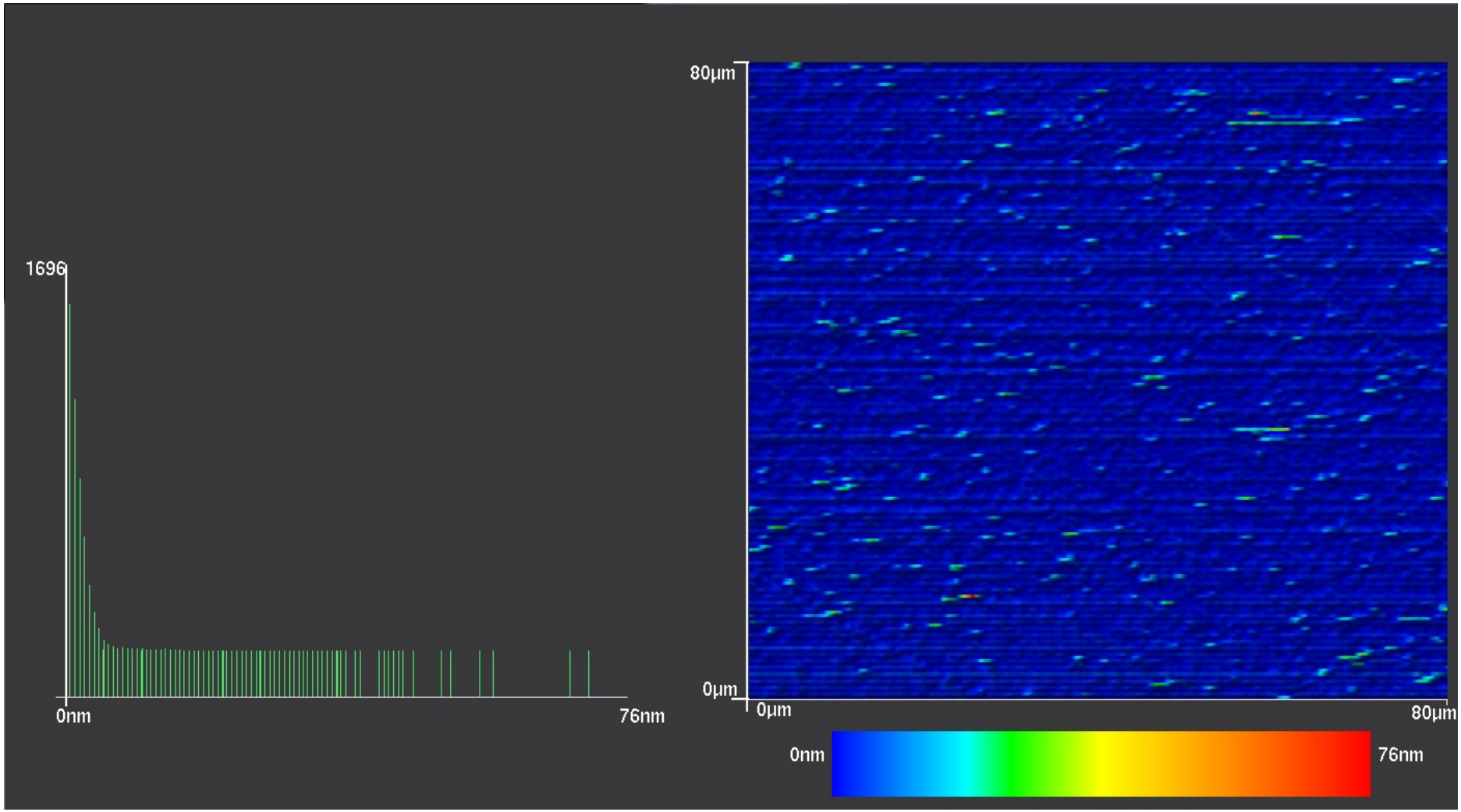


- Pros
  - Better view of the number of particles
- Cons
  - Loss of perspective on height

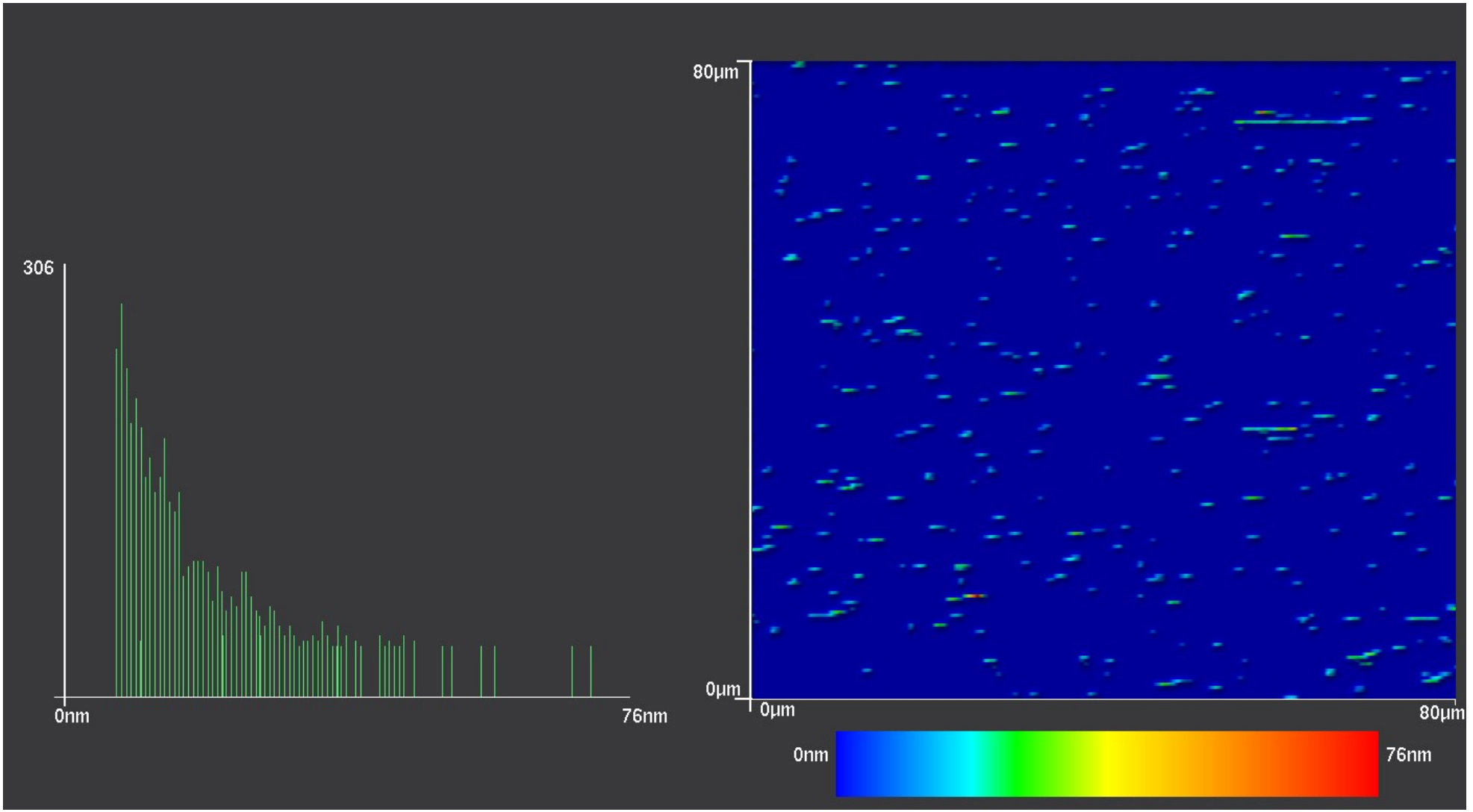
Third dimension of color & histogram



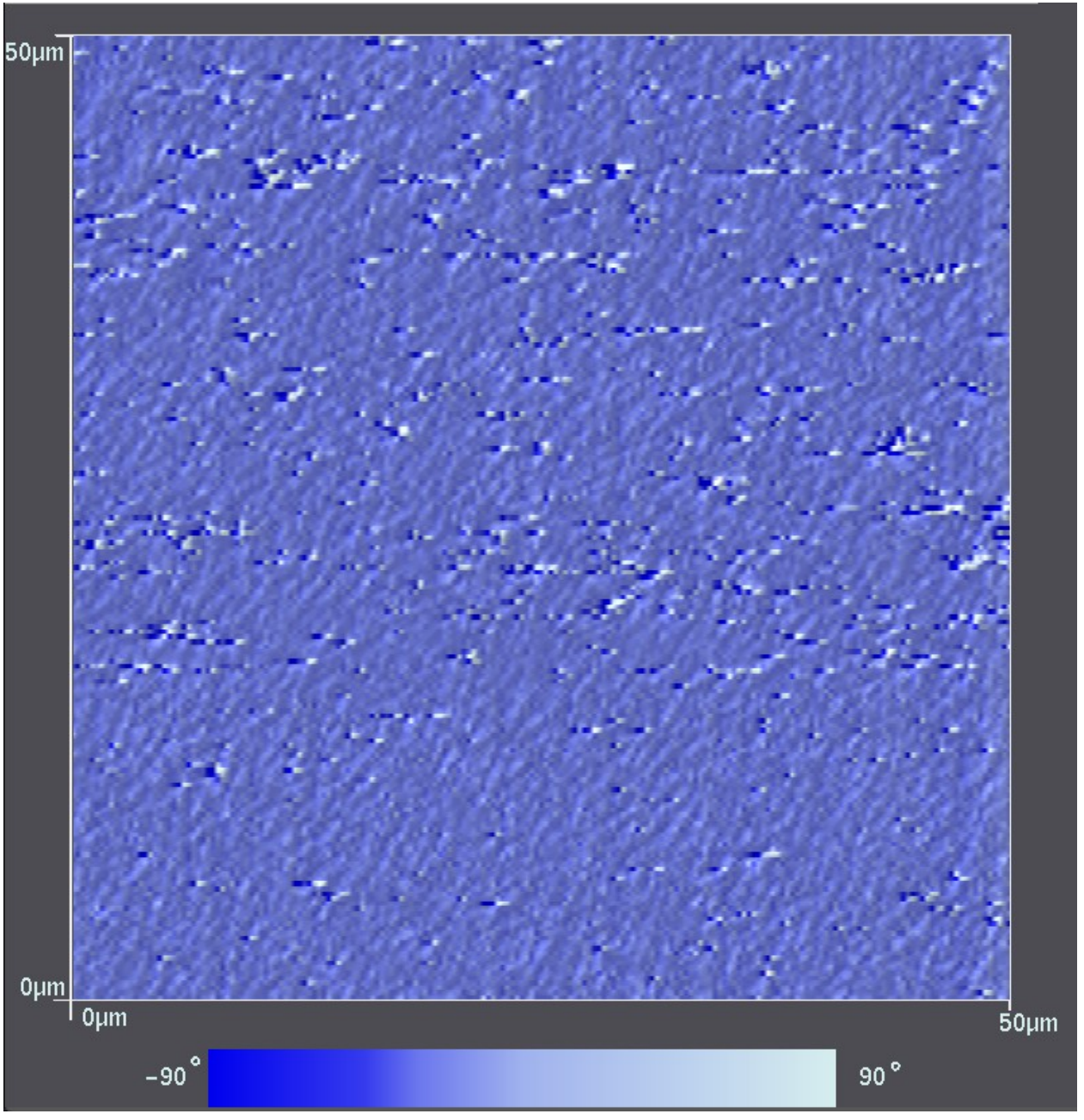
After removing curve



After threshold applied



Visualization of the surface through an emulated light



- An emulated light placed above and to the right of the surface
- Color is mapped to the angle of reflection to visualize the surface as a human would see it

Fitted DPI and scaling using Gaussian blur and Bi-Cubic Interpolation