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Reconstruction and computation of biovolumes: potential problems

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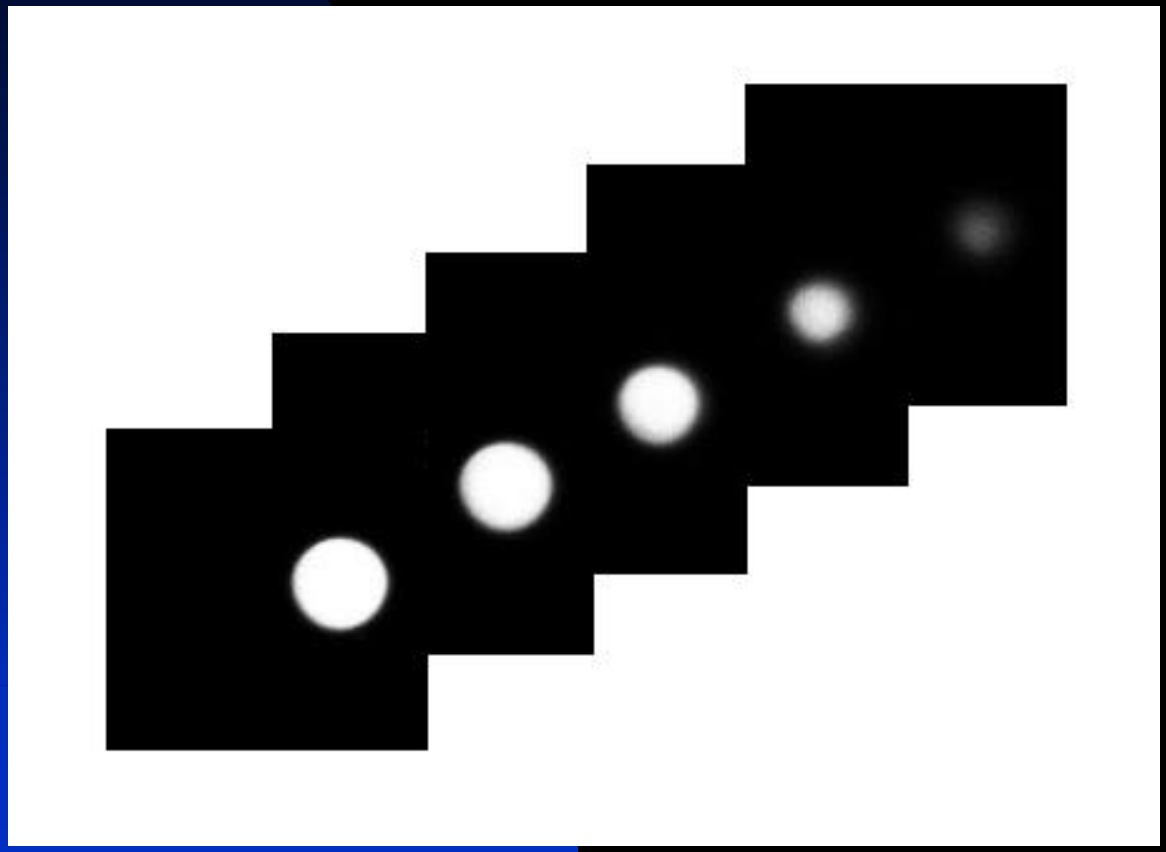
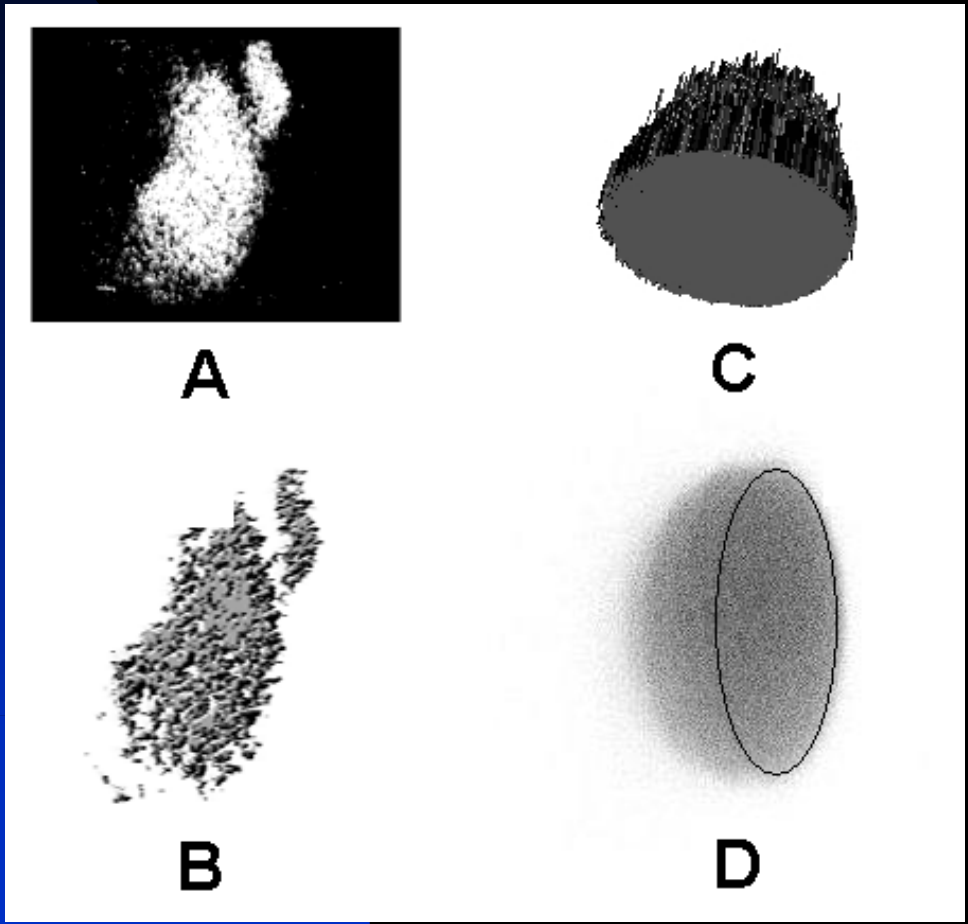
Materials and methods



Fluorescent microspheres of known sizes (1 μm diameter) were used to build an approach to the computation of biovolumes. For each microsphere, images of five parallel sections were taken at equal distances.

[A.I. Petrisor, A. Cuc, and A.W. Decho, Reconstruction and Computation of Microscale Biovolumes Using Geographical Information Systems: Potential Difficulties, submitted to Research in Microbiology]

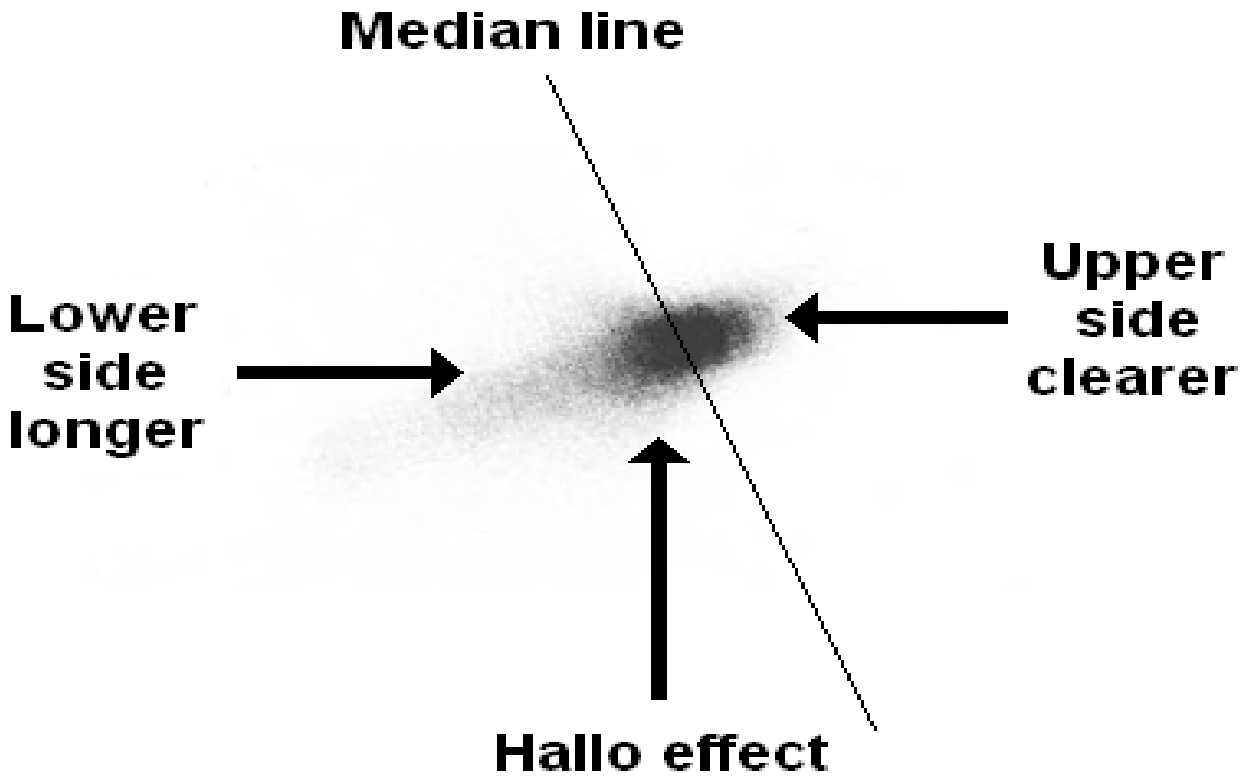
Reconstruction of biovolumes



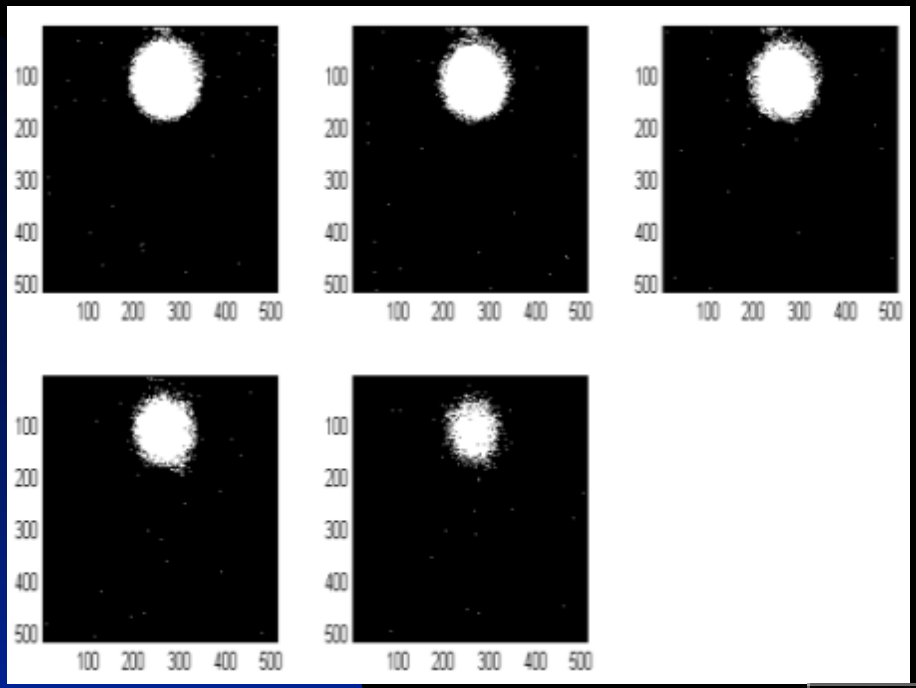
A and B- two, respectively three-dimensional reconstruction of a portion of a biofilm, using five parallel sections

C, D- reconstruction of the upper portion of a 1 μ-diameter microsphere using five parallel sections

Potential problems



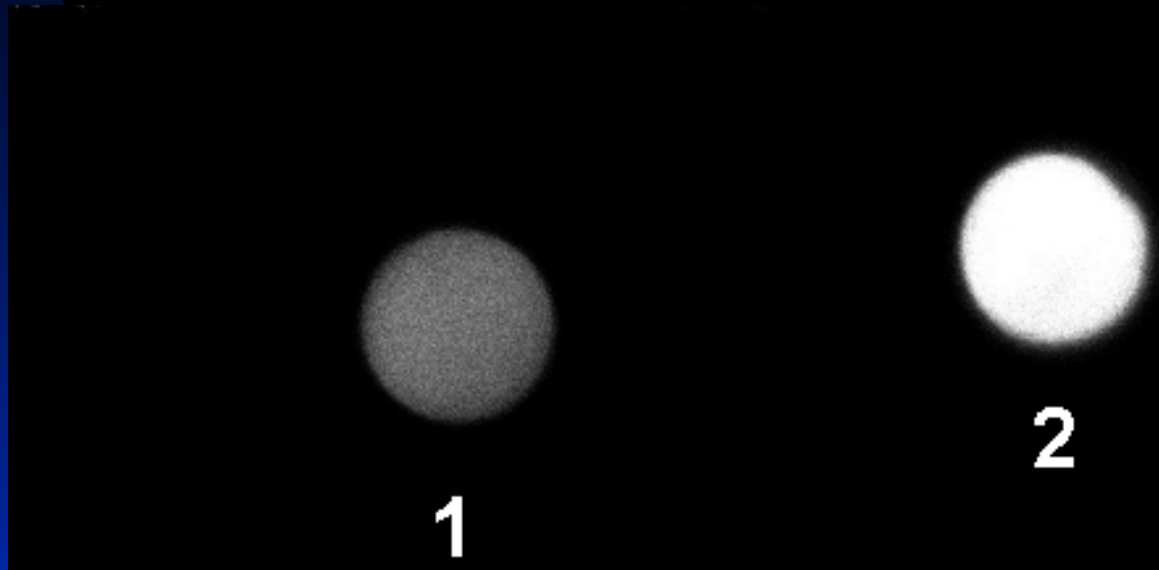
The hallo effect



2-D analysis: areas of upper sections appear larger than they should be

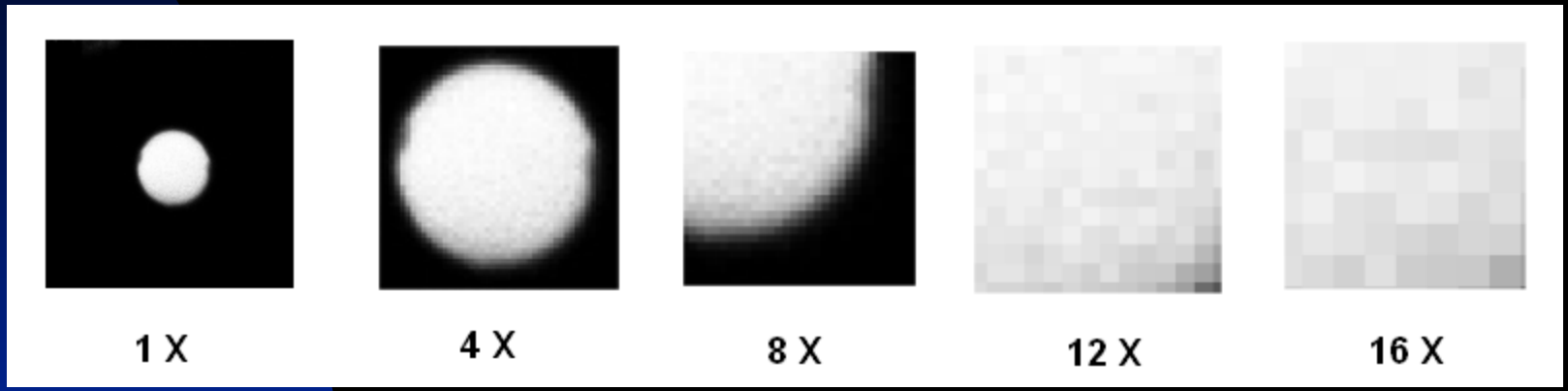
3-D analysis: actual view of the hallo

Differences in color intensity



1- pale appearance; 2- bright appearance

Differences at the pixel level



Even though images appear homogeneous, they represent collections of pixels having different colors or intensities of the same color

Effect of the threshold value used in unsupervised classification

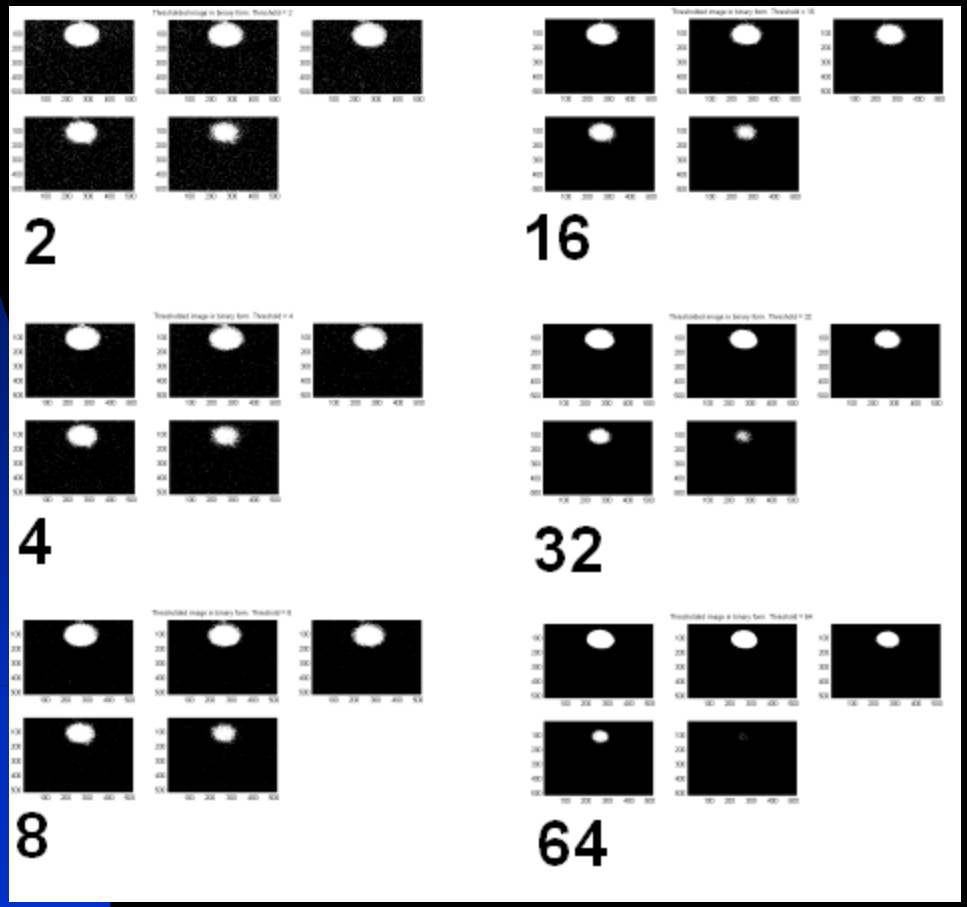
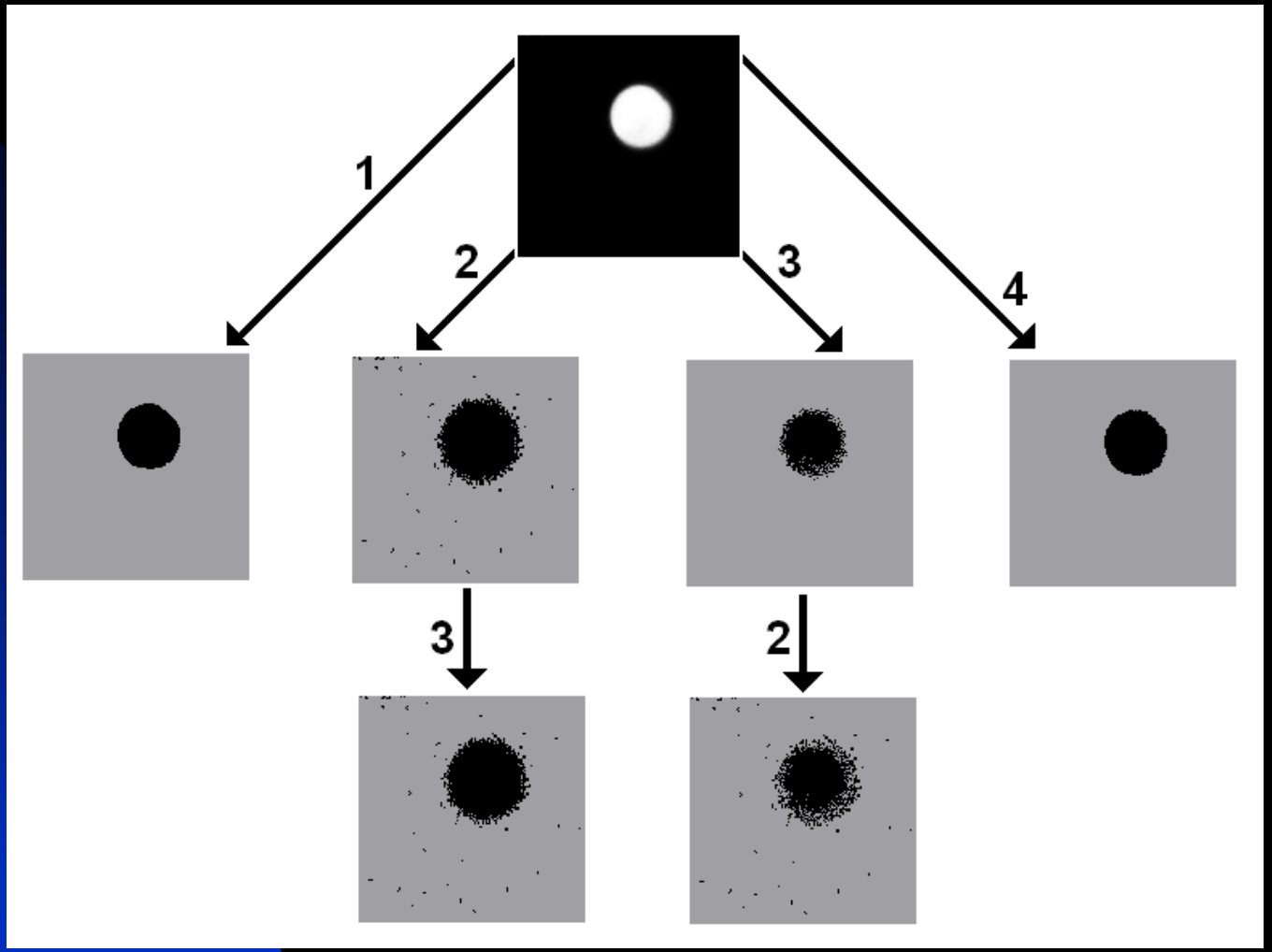
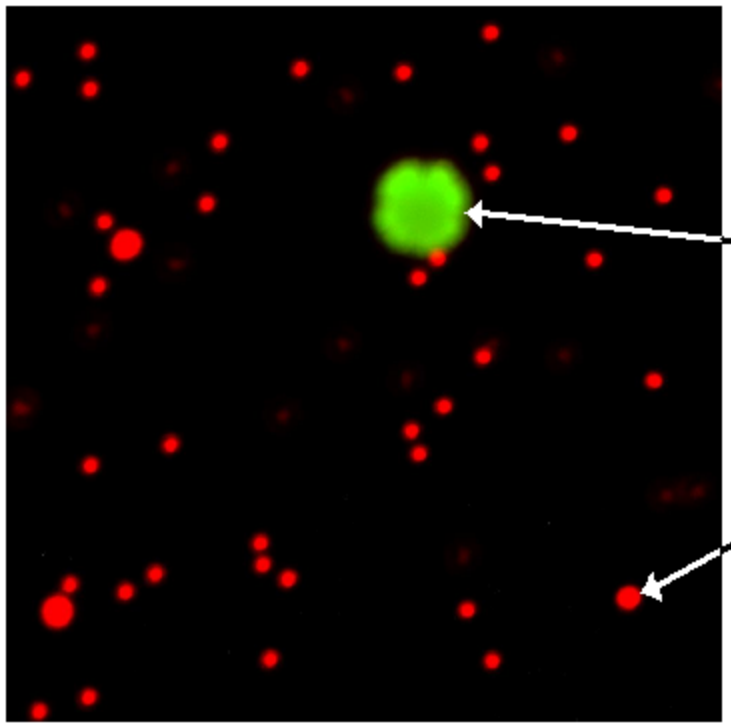


Image enhancement



1- Unsupervised classification using Feature Analyst (includes enhancement); 2- contrast stretching; 3- filtration; 4- unsupervised classification

Using fluorescent microspheres for calibration



Embedding microspheres in gel capsules: simulation of complex environments

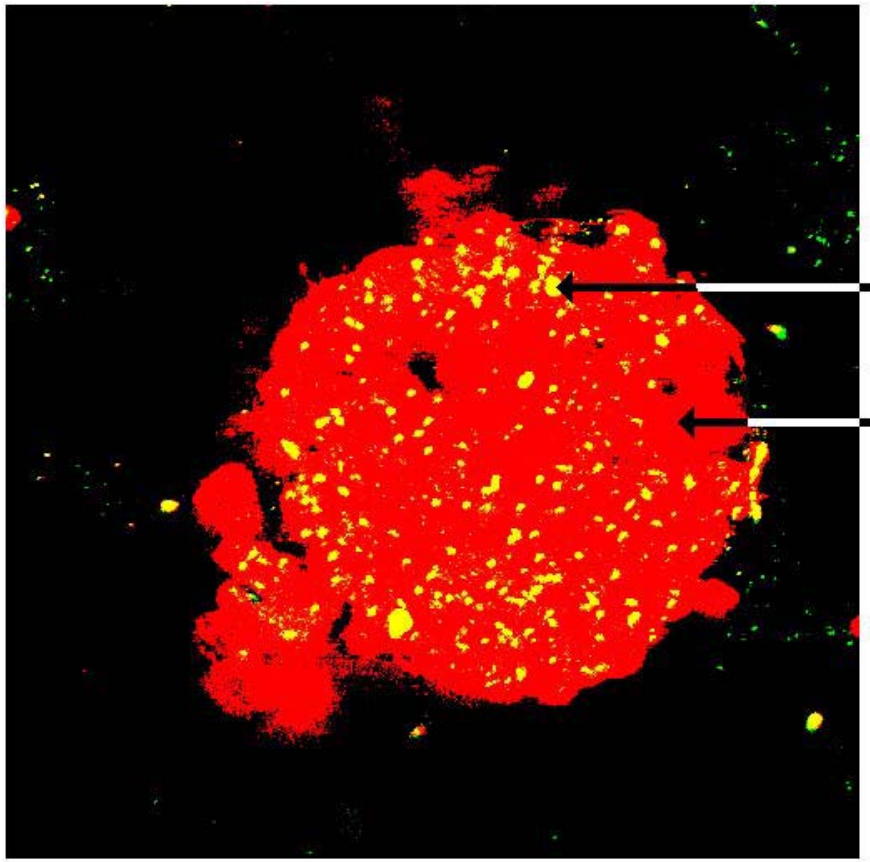
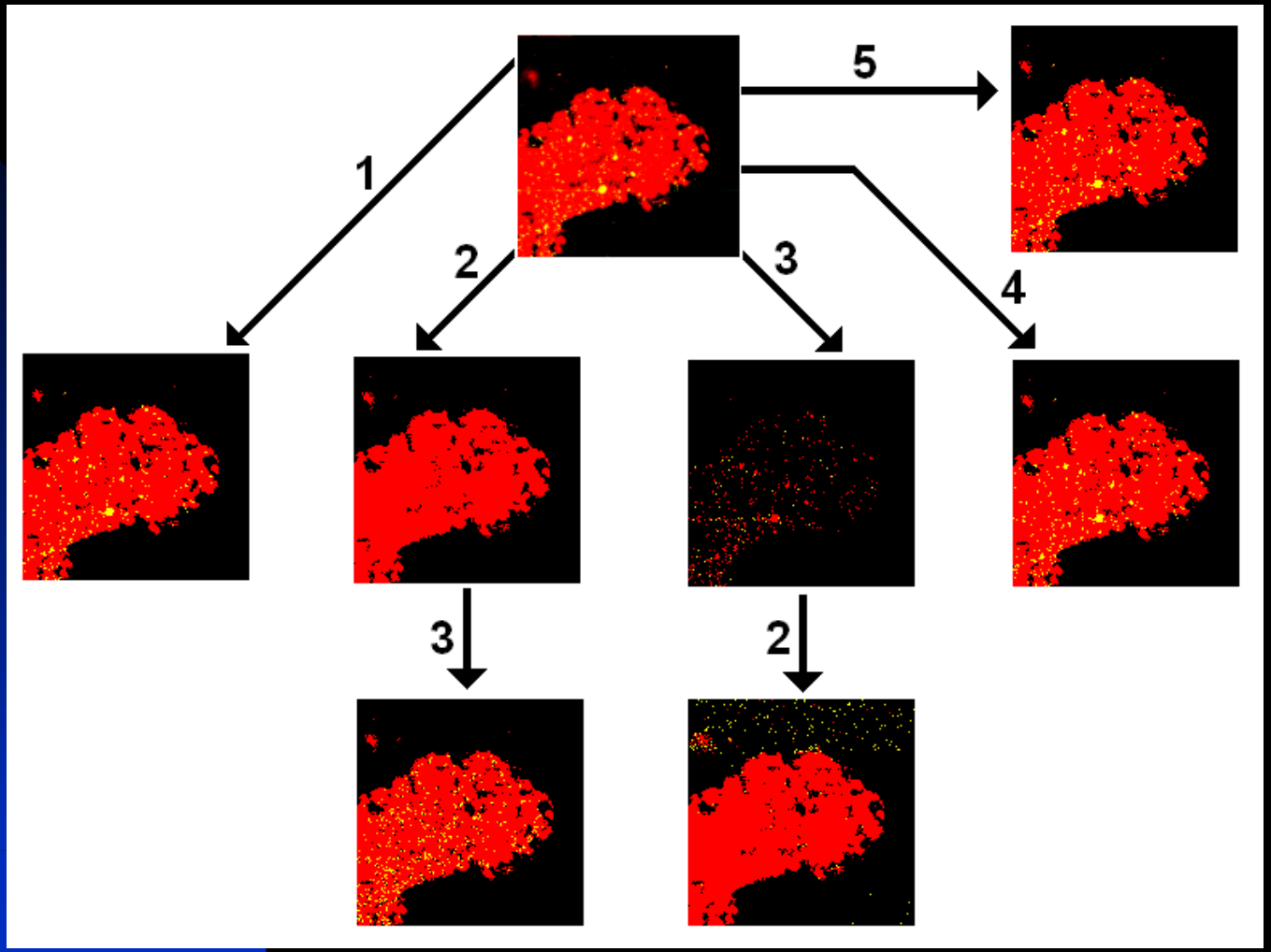


Image enhancement



1- Unsupervised classification using Feature Analyst (includes enhancement); 2- contrast stretching; 3- filtration; 4- unsupervised classification; 5- supervised classification