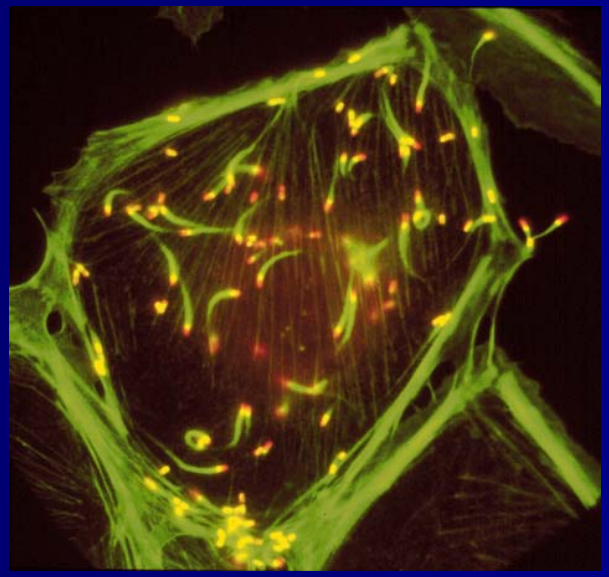
Experimental Studies of the Structure and Dynamics of Actin Networks



W. Losert

TREND 2003

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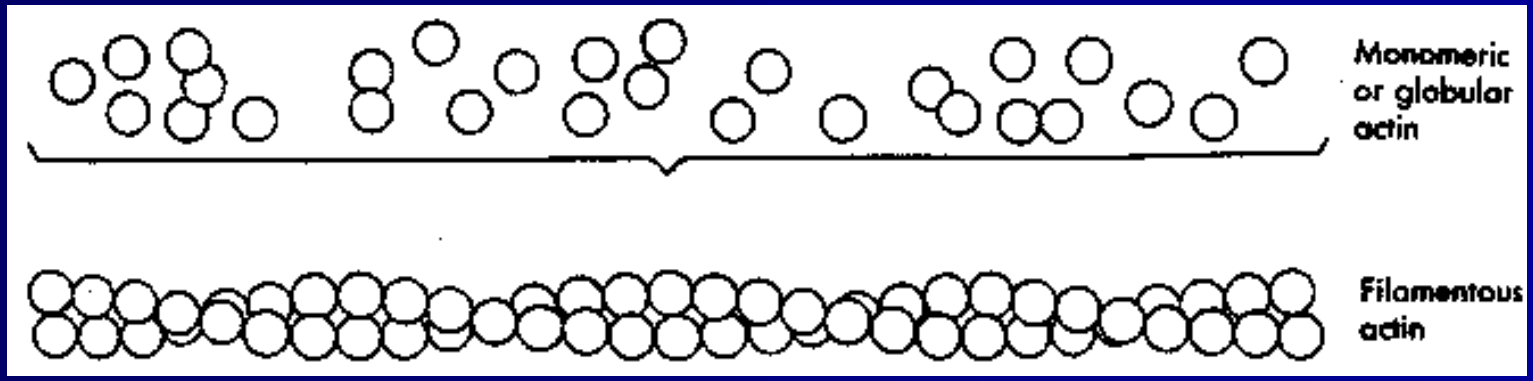
Overview

- The Importance of Actin Networks
- Experimental Methods – Optical Manipulation
- Particle Tracking
- Movies of Experiments
- Results and Conclusions
- Question and Answer Session

The Importance of Actin

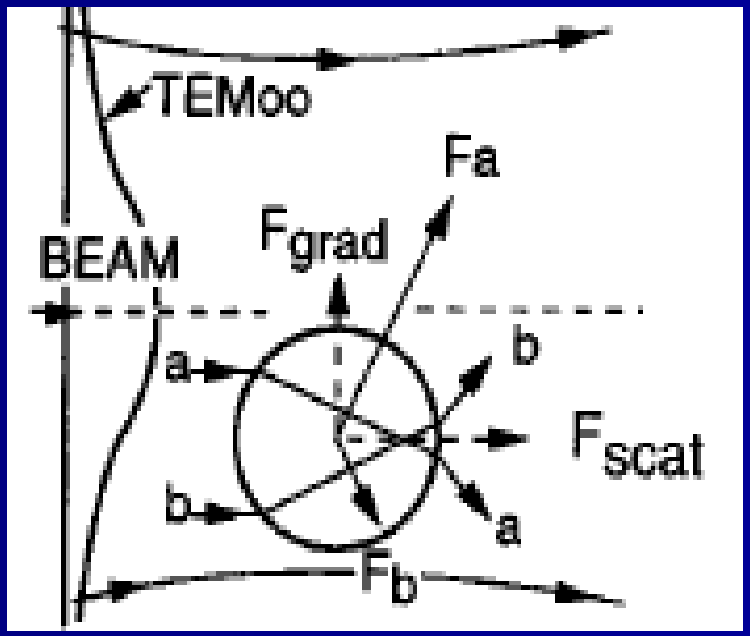


- Actin comprises about 15 % of the human cytoskeleton
- Actin contributes to cell differentiation, locomotion, and

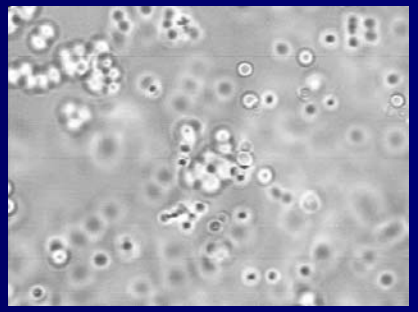
Experimental Methods – Optical Trapping

- **Biological molecules and Colloidal particles of a specific Index of refraction can be Optically trapped in the waist Of a Gaussian (TEM_{00}) beam.**

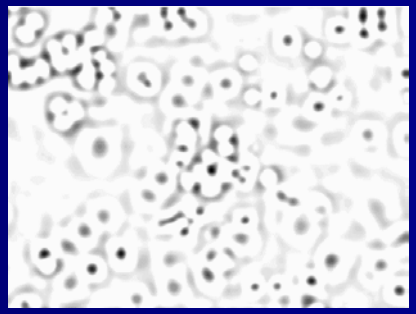
- **A Holographic Laser Tweezer Array is used to generate 200 independent optical traps that can be modified in real time**



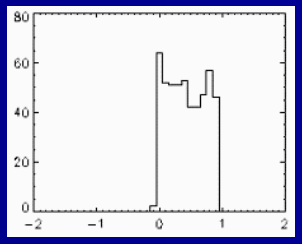
Particle Tracking



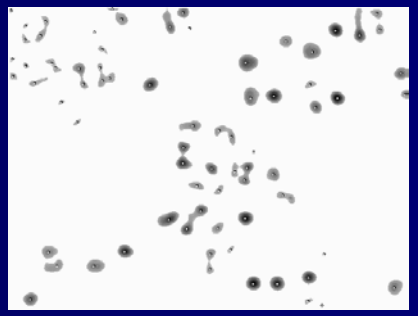
Original image



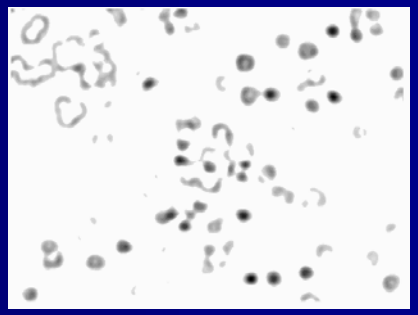
Bandwidth filters applied



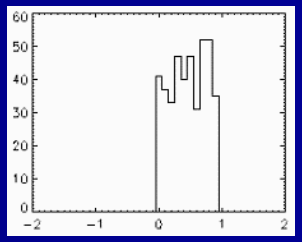
Fractional x position



Particle tracking activated

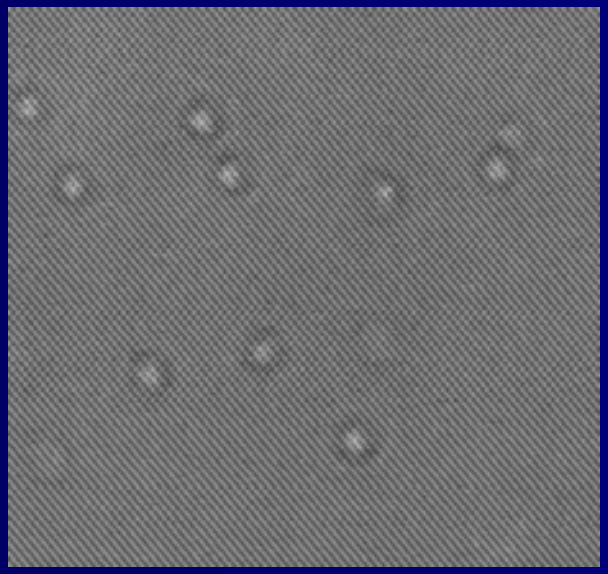


Threshold applied to remove noise

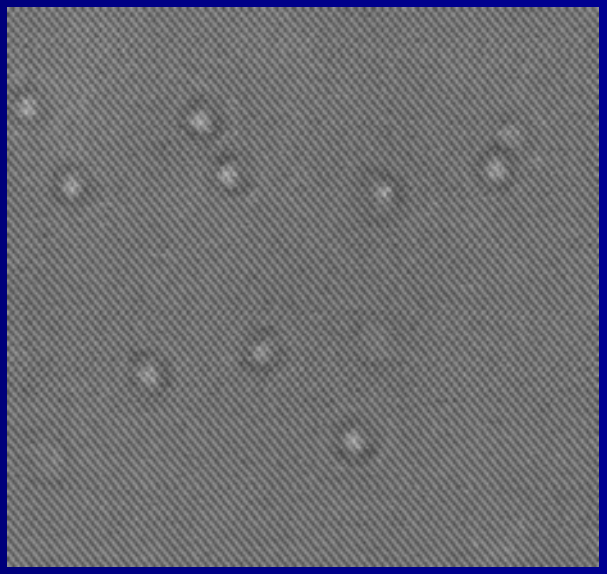


Fractional y position

Movies of Experiments

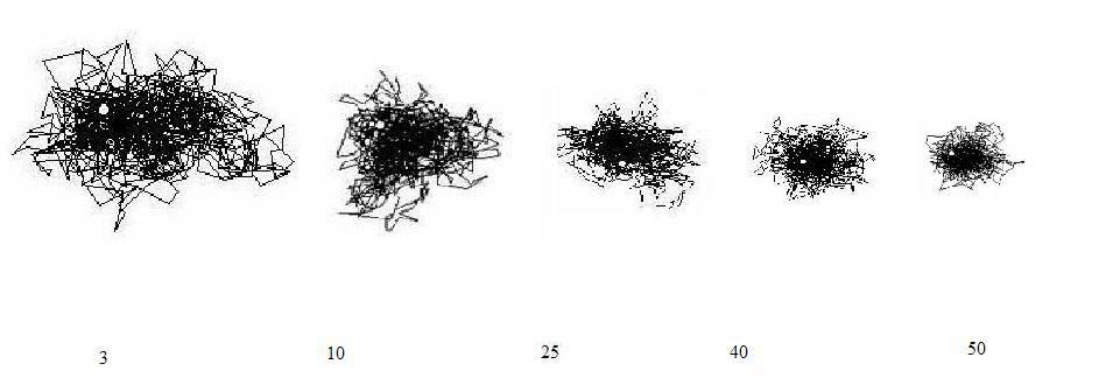


Brownian motion



Recoil

Results and Conclusions



- Samples prepared with 1.8 mg/mL of rabbit muscle actin polymerize at ~15oC. The amount of spheres affects the shape of The polymerization curve, but not the floor temperature.
- Particle tracking is best achieved with 2 um carboxylate-modified spheres.
- Actin networks heal radially inward at a specific rate after being damaged. Further experiments will elucidate the different healing properties when a network is damaged mechanically or optically.