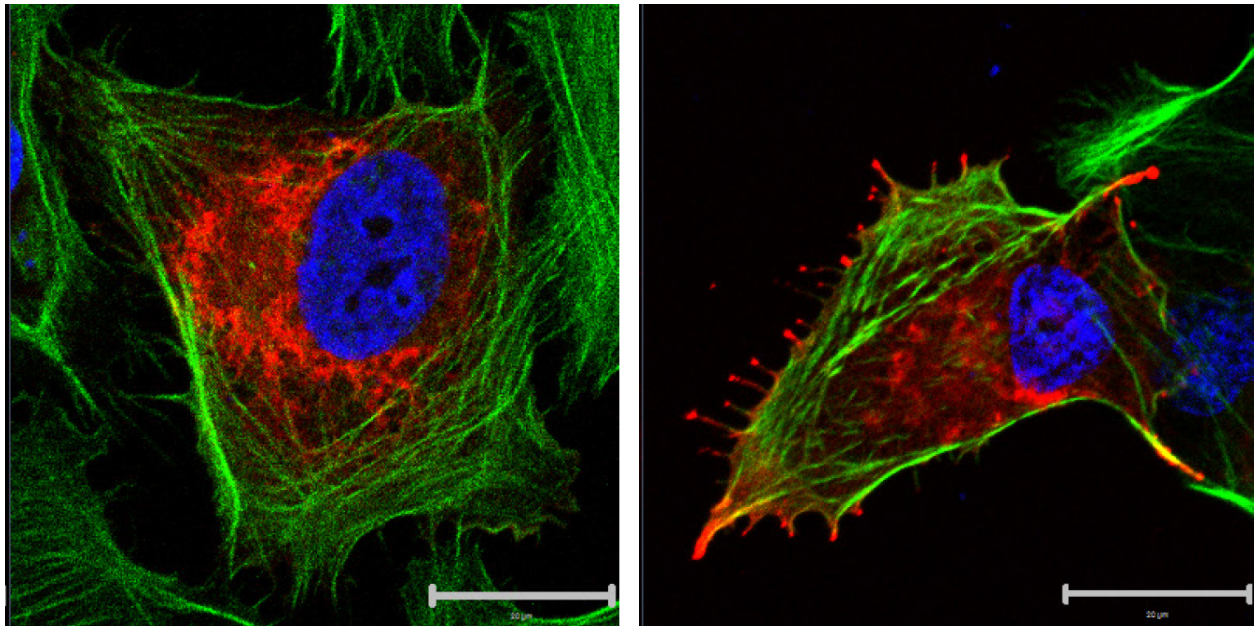


138021: Biomolecular Machines
Lecturer: Associate Professor Arnon Henn
Thursday 12:30 - 14:30 Emerson 4-17
Email: arnon.henn@technion.ac.il
Office hours: Thursday 16:00 to 17:00, Biology, 504



Fluorescence microscopy images of the actin cytoskeleton (green), and myosin (red) of WT cells (left) and cells under starvation condition (right) showing the complex actin network and myosin translocation that takes place during cellular adaptation (Courtesy of Boris Shneyer, Henn's Lab).

The cytoskeleton and its molecular motors are the infrastructure that carries out all the traffic, dynamics, cellular transport and migration of cells. Every year new functions of molecular motors are being revealed and yet there are many new challenges and unknown to be exposed. In cells, hundreds of nanoscale molecular motors transverse on these highways of actin and microtubules filaments using chemical energy which power their mechanical work. Cellular biology, kinetics, thermodynamics, polymer physics, and many more disciplines are utilized to study the dynamics and action of mechanism of the cytoskeleton and its molecular motors. We will be focusing on new functions of actin in the nucleus in transcription, DNA repair and chromosomal organization as well as organelles transport in the cell such as mitochondria, lysosomes and exosomes. This will be towards better understanding of their physiological functions in cells and the molecular mechanism by which they transverse over a long distance.

138021: Biomolecular Machines Syllabus:

All course attendees must be present in all lectures - **obligatory**

20% Participation in class **discussions**

40% Verbal **presentation** of project seminar

40% Project submission in **writings**

Lecture 1: Myosins & Actin cellular functions

1. Cellular functions of motors
2. Cytoskeleton
3. Molecular motors of the cytoskeleton

Lecture 2: Platforms

1. Actin: structure and function, dynamics, polymers physics
2. MT: structure and function, dynamics

Lecture 3: General principals of molecular motors

1. Why movement and why directional? On the origin of motility and mobility
2. Molecular scales dimension and times.
3. General architecture and design of molecular motors
4. Is this the prefect design of motors?

Lecture 4: Mechanical and chemical forces

1. Mechanical forces acting on molecules in the cell
2. Mass, stiffness, damping of proteins

Lecture 5: Organelle transport regulation

1. Different cell types
2. Different motors
3. Cargo make up

Lecture 6: Discussion Group I

Selected literature: Most essential publication list

Lecture 7: Discussion Group II

Selected literature: Most important publication list

Lecture 8: Discussion Group III

Selected literature: Recent breakthrough publication list

Lecture 9: Discussion Group IV

Selected literature: Unnoticed breakthrough publication list

Lectures 10 to 12: Seminar presentations