



B CUBE - Center for Molecular Bioengineering

Dr. Veikko Geyer und Prof. Stefan Diez

Einweisung F Praktikum, Physik, TU Dresden

WS 2023/24



Lage: TU – Campus Johanstadt Tatzberg





CENTER FOR MOLECULAR AND CELLULAR
BIOENGINEERING (CMCB)

MEHR ERFAHREN

Unsere Institute

Biotechnologie

BIOTEC
Das biotechnologische Zentrum der Technischen Universität Dresden ist ein interdisziplinäres Zentrum für die Entwicklung neuer biotechnologischer Produkte und Verfahren. Die Forschung umfasst die Bereiche: **Genome engineering, Molekulare Maschinen, Gewebszüchtung, Bioinformatik**

Regenerative Therapien

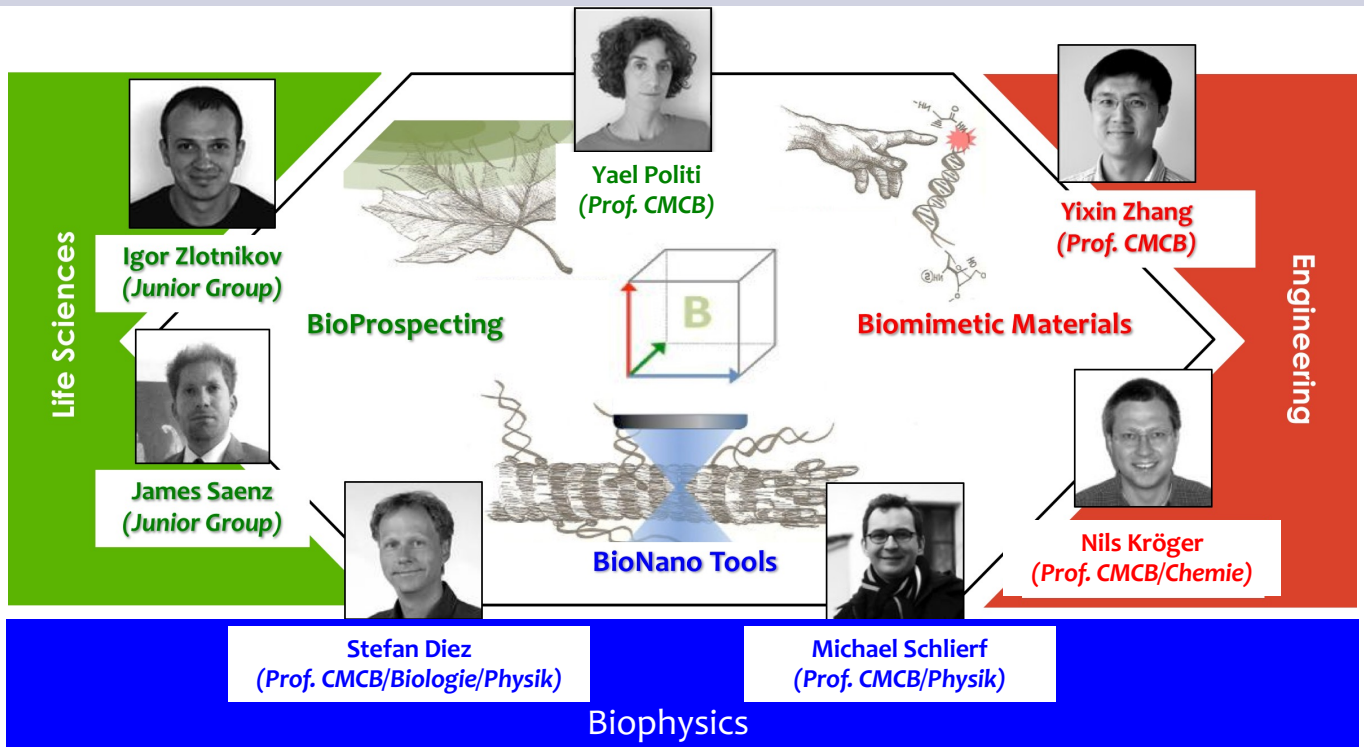
STTD
Stammzellen
Regeneration von Organen
Behandlungen:
- Alzheimer
- Leukämie
- Diabetes

Bioengineering

Eigenschaften der lebenden Materie auf molekularer Ebene
Inspiration für Entwicklung neuer Methoden, Materialien und Technologien

<https://tu-dresden.de/cmcb>

Von der Natur Lernen - "Bottom-up" Entwurf von Materialien mit neuen Funktionen

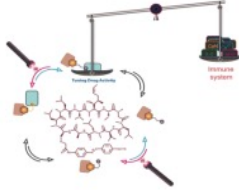


B CUBE Research Areas (1/2)

Prof. Yixin Zhang



Chemical methods for biological and medical research and application

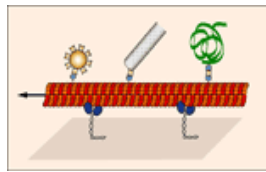


- Development of innovative technologies for high throughput drug discovery
- Increase specificity of compounds

Prof. Stefan Diez



Biomolecular transport systems in cell biology and nanotechnology

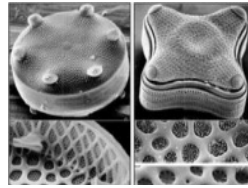


- Understand the functioning principles of biomolecular motors
- Reconstitute cellular transport systems in an artificial environment

Prof. Nils Kröger



Silica biomineralization and underwater adhesion

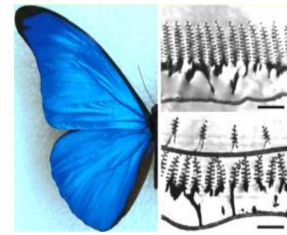


- Model system: species of diatoms
- Understand mechanisms of material biosynthesis and adhesion

Prof. Yael Politi



Bioprospecting



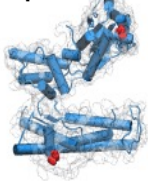
- Basic understanding of the cuticular material of insects at the molecular level
- Mechano-sensing in spiders

B CUBE Research Areas (2/2)

Prof. Michael Schlierf



Structure and mechanisms of single DNA molecules and proteins



- Understand DNA metabolism and replication on a molecular basis
- Development and application of single-molecule fluorescence techniques

Dr. James Saenz

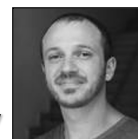


From Lipids to Life

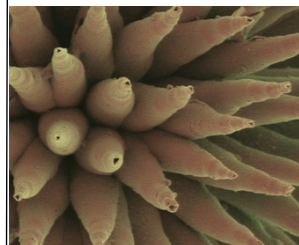


- What role did membranes play in the origin and evolution of the cell?
- What are the minimal features of a membrane that are necessary to support life?

Dr. Igor Zlotnikov

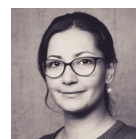


Multi-Scale Analysis

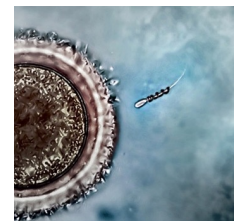


- Thermodynamic and Nanomechanical Aspects of Biomineralized Tissue Formation and Function

Dr. Mariana Sanchez



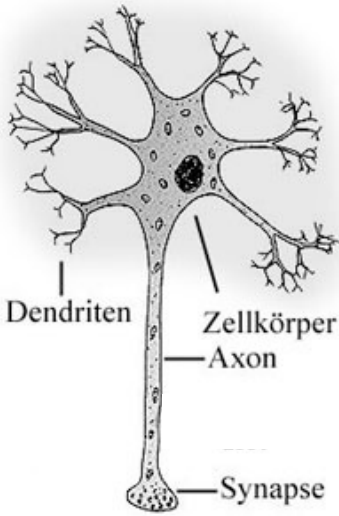
Micro- and Nanobiomedical Engineering



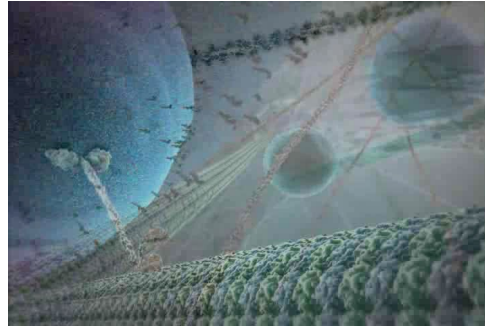
- Medical robots
- Smart Materials

Professur BioNano Tools: Stefan Diez

Molekulare Motoren



direct conversion of
chemical energy into
mechanical work



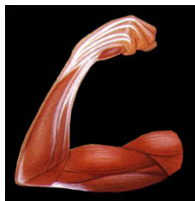
from: "The inner life of a cell"

Energiequelle
ATP Hydrolyse

8 nm Schritte

100 Schritte / s

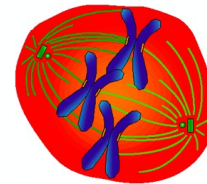
1 ATP / Schritt



muscle



sperm



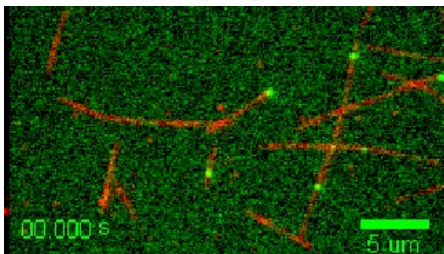
mitosis

Professur BioNano Tools: Stefan Diez

Molekulare Motoren

Molekularer Transport in Zellbiologie und Nanotechnologie

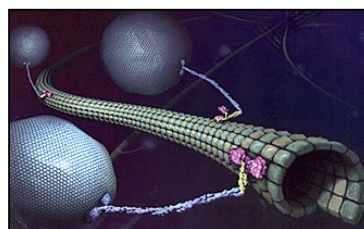
Biophysik



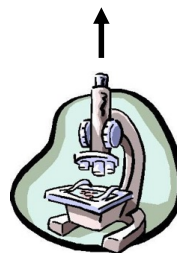
Einzelmolekülmikroskopie



**Molekulares Verständnis
zellulärer Transportprozesse**

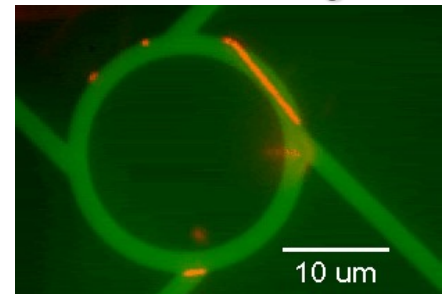


Molekulare Motoren



Optische
Methoden

Nanotechnologie



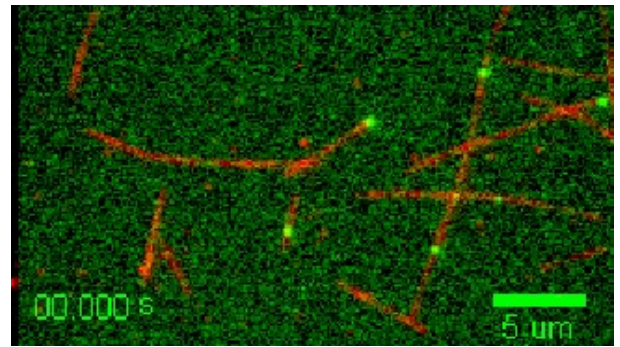
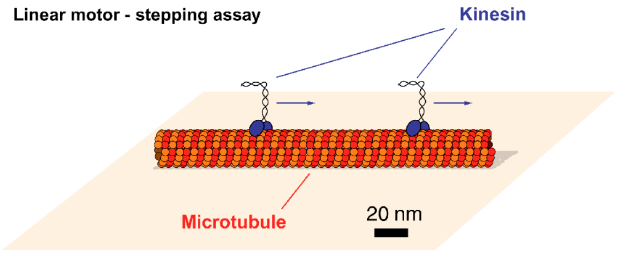
Biomolekül-gesteuerte
Transportsysteme



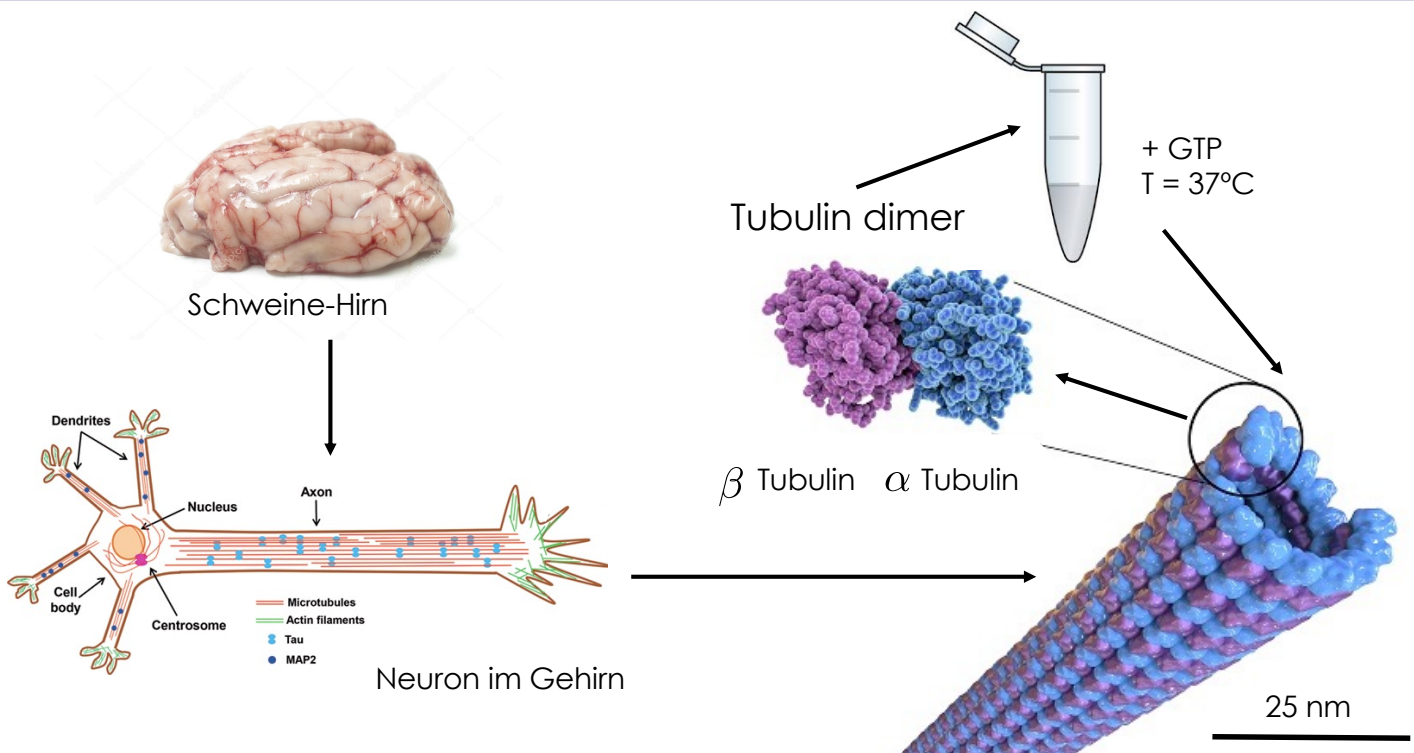
**Miniaturisierte
Detektionsmethoden**

Versuch MMC: Molekulare Motoren und (C)Zellskelett

Fluoreszenzmikroskopie

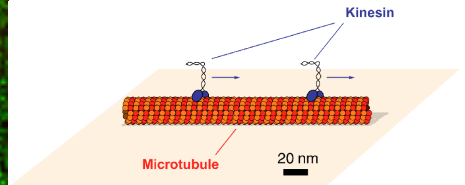
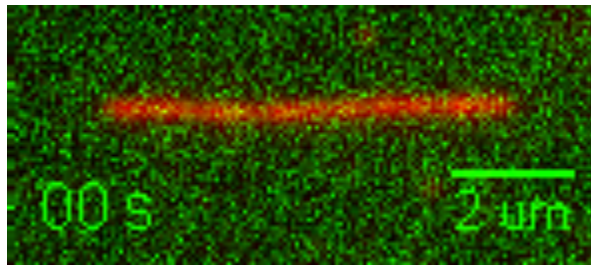


Versuch MMC: In vitro Polymerisation von Mikrotubuli



Versuch MMC: Molekulare Motoren im Stepping Assay

Einzelmolekül - TIRF Mikroskopie



GFP
Grün fluoreszierendes Protein

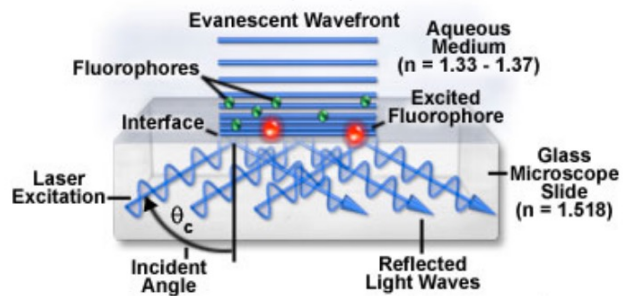


Kinesin 1

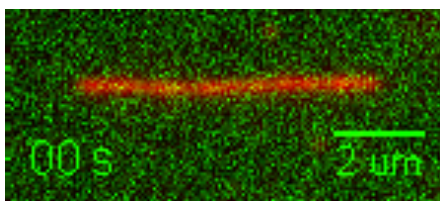
25 nm

(Kinesin grün, Microtubule rot)

Prinzip der Total-Internal
Fluorescence (TIRF) Microscopy

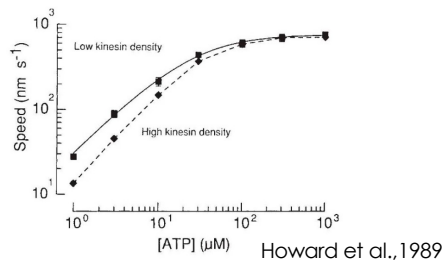


Versuch MMC: Analyse der Molekülbewegung

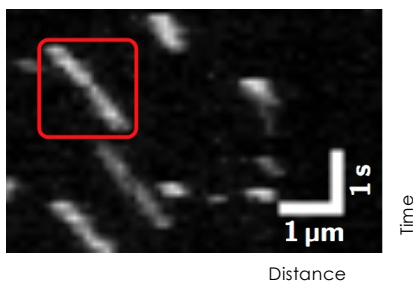
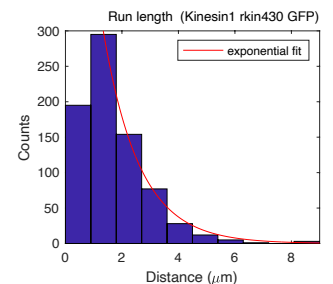


Einzelmolekül - TIRF Mikroskopie
(Kinesin grün, Microtubule rot)

Geschwindigkeit als Funktion
der ATP-Konzentration

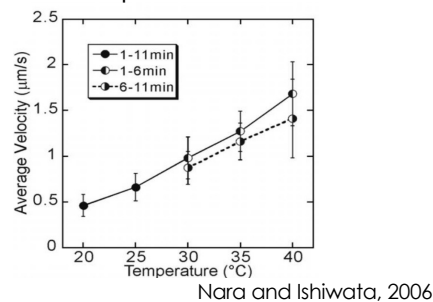


Molekül 'run length'

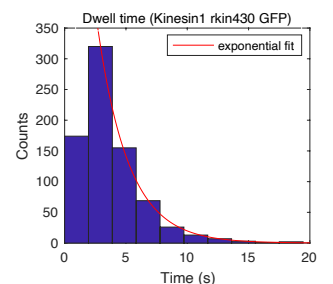


Kymograph der Molekülbewegung

Geschwindigkeit als Funktion
der Temperatur



Molekül 'dwell time'



Versuch MMC: Inhalte des Praktikums

- Aufbau und Durchführung eines **Einzelmolekülexperimentes** am TIRF Mikroskop
- **Bildanalyse** (Kymograph-Analyse / Einzelmolekül-Tracking)
- **Datenauswertung**
(theoretische Beschreibung der Datenverteilungen)
- **Vergleich unterschiedlicher Versuchsbedingungen**
(mittels statistischer Testverfahren)
- **Interpretation der Ergebnisse** in Bezug auf mechanischen Zyklus und Schrittmechanismus der Motoren

Versuch MMC: WS 2021

<https://tu-dresden.de/cmcb/bcube/forschungsgruppen/diez/teaching>

TEACHING
Winter Semester 2023/24

Physik-Fortgeschrittenenpraktikum: Versuch MMC
TUD advanced practical training for students of Physics (Biomolecular Motors: From Cellular Function to Nanotechnology)

TIME: Fridays, start: 8.55 am
PLACE: B CUBE, TU Dresden, Tatzberg 41, 01307 Dresden, [reception](#)
SUPERVISOR: Veikko Geyer

Versuchsanleitung
[References](#)

Fragen im Vorfeld:

Dr. Veikko Geyer
0351 / 463 43013 oder
veikko.geyer@tu-dresden.de

Versuch in Englisch: Anleitung, Testat, Durchführung & Protokoll




The screenshot shows the website's navigation menu on the left: Home, Research Groups, Teaching, Positions, Institutes, Conferences, and Links. The main content area features a central collage of biophysical images and three text blocks. The first block, titled 'DRESDEN is an exciting place for BIOPHYSICS', describes the expertise of research groups. The second, 'DRESDEN offers a wide spectrum of BIOPHYSICS', details the range of research topics and methods. The third, 'DRESDEN promotes BIOPHYSICS at several institutions', mentions interdisciplinary interactions and collaborative initiatives like the Technology Platform and Dresden Science Calendar. A footer note states: 'This webpage aims to provide an overview of the BIOPHYSICS activities in DRESDEN.'

<http://www.biophysics-dresden.de>

Soft Condensed Matter and Biological Physics

Vorlesende:

Prof. S. Diez, Prof. S. Grill, Prof. F. Jülicher
 Prof. J.-U. Sommer, Prof. K. Fahmy,
 Prof. L. Eng, Prof. A. Fery et al.

u. a.: Vorlesung über **Molekulare Motoren**, Start: 10.10.2023

| | | | | |
|------|-----|-----------------------|-----|----------|
| Diez | 2/0 | >Cellular Mashines II | VWm | Englisch |
|------|-----|-----------------------|-----|----------|

<https://tu-dresden.de/cmcb/bcube/forschungsgruppen/diez/teaching>



DRESDEN SCIENCE CALENDAR

ANKÜNDIGUNG WISSENSCHAFTLICHER VORTRÄGE IN DRESDEN



<http://science.dresden.de/calendar>

Kontakt

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Versuch MMC: WS 2022

Bachelor und Master Arbeiten möglich !