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New appointments, vacancies, grants, prizes, and other news.

- This year, NWO and the Ministry of Education, Culture and Science, will make an additional 65.4 million euros available for the various Open Competitions for non-programmed research. Almost the entire extra budget will be awarded in 2022, in line with the wishes of the Minister of Education, Culture and Science, Robbert Dijkgraaf. Starting 2023, an additional 60 million euros of funding will be made structurally available for the Open Competitions.¹
- Submitting an application to NWO has become easier and less of a burden on researchers. The time it takes to process application procedures has to decrease. And the success rates in the open competition and the talent programme must be at least 25 percent. These are 3 of the 38 ambitions from NWO's new strategic plan 2023–2026. The new NWO strategy 'Science works!' was presented today to Robbert Dijkgraaf, Minister of Education, Culture and Science.²
- Anna Alemany (LUMC) and Paul Wieringa (MERLN Institute for Technology-Inspired Regenerative Medicine) receive an ERC Starting grant for their research proposals : "OviChip: Development of an Oviduct-on-a-Chip model", respectively.
- ERC Advanced Grant for Siewert-Jan Marrink for the project 'Computational Microscopy of Cells'
- Jorine Eeftens and Evan Spruijt obtained a voucher for Radboud's Interdisciplinary Research Platform to work towards quantification of material properties of intracellular condensates³.
- The EMBL Heidelberg is recruiting a new group leader who uses theoretical approaches to understand principles of biological complexity. Closing date: 11 September⁴.
- Nature announced four rising stars who are reshaping nanoscience; Sabina Caneva (TUD) is one of them⁵
- Vacancy for tenure track Assistant/Associate Professor Structural Biology-Electron Microscopy at Groningen University⁶.
- Vacancy in the lab of Sjoerd Stallinga TUD for a PhD position on 3D super-resolution microscopy⁷.
- Vacancies for a Tenure track position in Theoretical Biology and in Theoretical Developmental Biology⁸.
- Marvin Tanenbaum (Hubrecht institute) is appointed professor at the Dept. of Bionanoscience of the TU Delft.
- Maike Hansen (RU) has won one of two Descartes-Huygensprizes 2021. The prize will allow her to study behavior of HIV during viral latency and boost the cooperation between her lab and researchers from the Institut Cochin.⁹

¹ <https://www.nwo.nl/en/news/nwo-will-award-over-60-million-euros-additional-funding-non-programmed-research>

² <https://www.nwo.nl/en/news/science-works-nwo-announces-new-strategy-2023-2026>

³ <https://www.ru.nl/imm/@1358043/irp-vouchers-awarded-to-12-interdisciplinary/>

⁴ <https://www.embl.org/jobs/position/HD02226>

⁵ <https://www.nature.com/articles/d41586-022-02149-1>

⁶ <https://www.academictransfer.com/en/315367/tt-assistantassociate-professor-structural-biology-electron-microscopy-10-fte/>

⁷ <https://www.academictransfer.com/en/315528/phd-3d-super-resolution-microscopy/>

⁸ <https://tbb.bio.uu.nl/positions.html>

⁹ <https://institutfrancais.nl/nl/descartes-huygensprijs-aankondiging-van-de-winnaars-2021/>

Events, meetings, and workshops

What	When	Where	More information
Methods and Applications in Fluorescence (MAF) + FRET Satellite Meeting	11 – 14 September 2022	Göteborg, Sweden	https://maf2022.com/
NWO CHAINS 2022	21 and 22 September 2022	Koningshof, Velhoven	https://nwochains.nl/
The Leuven Protein Aggregation Meeting	21 – 23 September 2022	Leuven, Belgium	https://www.vibconferences.be/events/the-leuven-protein-aggregation-meeting#info
17th National Conference of Biophysics with International Participation (CNB 2022)	23 – 25 September 2022	Târgu Mureş, Romania	https://biofiz.umfst.ro/
NWO Biophysics 2022	10 and 11 October 2022	Koningshof, Velhoven	https://www.nwobiophysics.nl
Dutch Chromatin Meeting 2022	27 October 2022	LUMC, Leiden University	https://nvbmb.kncv.nl/chromatin-2022
workshop on "Engineering Life".	13 - 24 March 2023	Technical University of Munich	https://www.munich-iapbp.de/engineering-life
NWO Physics 2023	4 and 5 April 2022	Koningshof, Velhoven	https://www.nwo.nl/en/meetings/physics/veldhoven
EMBL Conference Chromatin and epigenetics	15 - 18 May 2023	EMBL Heidelberg and Virtual	https://www.embl.org/about/info/course-and-conference-office/events/chr23-01/

Open forum Physics of Life

During NWO Biophysics, the [Physics of Life Advisory Committee](#) will organise its annual meeting for research staff. We will have a Q&A with Ilja Arts, a member of the [NWO Domain Board Science](#), about the [new NWO strategy](#). The biophysics community can provide input for the implementation of this strategy by the Domain Science. This Q&A will be followed by a plenary discussion on the future of Physics of Life and, in particular, the forum function of NWO Biophysics for our research field.

To show that Physics of Life (PoL) has a broad constituency, it is important that we organise ourselves in a concrete way. This will benefit the field and you can use it to your advantage when finding appropriate funding, seeking new collaborations, or finding your way into the Dutch Physics of Life community.

The Advisory Committee's mission is to represent the scientists in our field, such that our opinions and experiences are optimally incorporated into NWO's policy and funding schemes. Science is continuously evolving and we aim to keep Physics of Life active, innovating, and well-funded. To strengthen our position, it is important to increase the number of registrations for the Physics of Life Research Community. Therefore, please spread the word and [register](#) as a member of our community.

In addition, the [NWO Advisory Committee Physics of Life](#) circulates a newsletter. This letter contains information about new group leaders, relevant calls, meetings, and granted projects related to our field. If you are a staff member and want to know more about the Advisory Committee or the Physics of Life Research Community you can contact [Naomi Chrispijn](#) or one of the Advisory Committee members.

The Advisory Committee Physics of Life:

- Prof. John van Noort (chair; LEI)
- Dr. Kristina Ganzinger (AMOLF)
- Prof. Lukas Kapitein (UU)
- Dr. Nicholas Kurniawan (TU/e)
- Prof. Patrick Onck (RUG)
- Prof. Peter Peters (MU)
- Dr. Greg Stephens (VU)
- Dr. Rifka Vlijm (RUG)

When and where

The Open forum Physics of Life takes place on Monday 10 October; 16.45 - 17.45; Baroniezaal NH Koningshof Veldhoven.

More info: <https://nwobiophysics.nl/open-forum-physics-life>

Registration deadline NWO Biophysics: 6 Sept 2022; go to: <https://www.nwobiophysics.nl/registration>

[Sign up for the Physics of Life Research Community](#)

[More information about the Physics of Life Research Community](#)

New colleagues

Anna Alemany (LUMC)

In my lab, we aim to develop quantitative tools to identify the physical laws underlying cell fate commitment. To achieve this, we combine single cell transcriptomics and lineage tracing with theoretical concepts from statistical physics.

I was “raised” as a single-molecule biophysicist under the supervision of Prof. Felix Ritort, in the University of Barcelona. There, we mechanically unfolded and folded nucleic acid molecules using optical tweezers and used transition state theory and fluctuation theorems to reconstruct the molecular free energy landscape. Our approaches allowed us to unravel the thermodynamic properties of molecular intermediate and misfolded states, which are **kinetic** states hardly ever observed in equilibrium conditions but can lead to fatal diseases in in vivo contexts.

The impact of fluctuations and kinetic states in molecular (un-)folding processes led me to ask whether we can understand cellular differentiation as a non-equilibrium process involving a sequence of cellular kinetic states. For this reason, during my postdoc I joined the van Oudenaarden Lab, in the Hubrecht Institute for Developmental Biology & Stem Cell Research (Utrecht). There, I learned how to combine single-cell omics protocols and developed data analysis approaches to characterize cellular states and the lineage relationships in cells isolated from the same tissue. Additionally, I became fascinated by our ability to differentiate stem cells at will.

Now, my ambition is to characterize fluctuations during development and differentiation, in both in vivo and in vitro systems, to unravel the existence of cellular kinetic states. If so, what are their roles and how can we regulate them?



Jan Lipfert (UU)

I am fascinated by how biological macromolecules (DNA, RNA, and proteins) adopt their three-dimensional shapes, make specific interactions, deform under external forces and torques, and undergo conformational transitions to carry out the biological functions they have evolved to do. My lab uses a range of biophysical tools, in particular single-molecule magnetic tweezers, AFM imaging, and solution X-ray scattering, to understand, manipulate, and harness the structure and mechanisms of these biological machines.

For my undergraduate, I studied physics and economics in Heidelberg (Germany) and continued with two Master's degrees in Uppsala (Sweden) and at the University of Illinois (USA). In 2008, I obtained my PhD from Stanford University (USA) using a combination of computer simulations, benchtop biochemistry, and small-angle X-ray scattering to study the structure, dynamics, and interactions of (membrane) proteins and RNAs. After my PhD, I moved to the Netherlands as a postdoc at the TU Delft with Nynke Dekker, where I learned all things magnetic tweezers, received a Veni grant, and first-hand witnessed the creation of the Bionanoscience Department. In 2013, I started my own lab at the LMU Munich, where I was also vice dean since 2018. In Munich, I taught –next to advanced biophysics courses– introductory physics to some 3000 undergraduate students, for which I received teaching prizes from the physics, chemistry, and biology departments.



My lab investigates the structure, dynamics, and function of nucleic acids and we have recently focused on nucleosome conformations and retroviral integration. In addition, we have pioneered approaches to study proteins in magnetic tweezers and investigate the force regulation of conformational transitions in proteins, which is the focus of a current ERC consolidator grant. During the pandemic, we have leveraged the assay to probe how the SARS coronavirus attaches to cells.

In 2022, my lab moved to Utrecht University, where I joined the Physics Department as Chair of Experimental Biophysics. I am excited to be back in the Netherlands I am looking forward to re-joining the amazing Dutch biophysics community!

Granted projects NWO

Vidi¹⁰

How and why cells split in two?

Dr. A. Chaigne, University of Utrecht.

When an animal develops, cells divide to increase the size of the organism. The textbook description of cell division ends with two cells completely separated from each other. However, I discovered that stem cells remain connected via a small tube, called a bridge, filled with proteins. The dismantlement of bridges is crucial to cell fate. Yet, we do not know much about what bridges do and how they are maintained or destroyed. With this project, I will elucidate the molecular mechanisms controlling bridge formation and dismantlement and how the switch between bridge maintenance and destruction controls cell fate transitions.

Do malaria parasites enhance their own transmission?

Dr. F.J.H. Hol, Radboud UMC

Unfortunately, mosquitoes are extremely good at spreading disease by biting people and transmitting parasites. However, we do not know if parasites make mosquitoes even more hungry for blood, and once in our body it is unclear how the parasite finds its way to the bloodstream. By developing new technologies, this research will unravel how interactions between mosquitoes and parasites shape malaria transmission.

Sequence the abnormality

Dr. Miao-Ping Chien, Erasmus MC

Tumors change over time. Abnormalities in chromosomes are a main cause for these progressive changes in the nature and composition of cells that make up a tumor. These changes can lead to therapy resistance in for instance glioblastoma, the deadliest brain cancer. Biophysicists develop a technology to identify rare cancer cells bearing severe chromosomal abnormalities and to study these cells at unprecedented resolution. They investigate the causes and consequences of abnormal chromosomes in glioblastoma and aim to generate information that can lead to improved treatment for glioblastoma.

Visualizing the dynamics of gene regulation

Dr. T.L. Lenstra, Netherlands Cancer Institute

Transcription factors turn on genes at the correct moment in the correct cell type. In this study, we will apply advanced microscopy techniques to visualize individual transcription factor molecules inside cells, while simultaneously measuring when genes are activated. The results will reveal how transient transcription factor binding to DNA regulates the dynamics of gene expression.

The internal dialogue: how our organs communicate via tiny nano-bubbles

Dr. F.J. Verweij, Utrecht University

Almost every cell in our body releases nanometer-sized extracellular vesicles (EV) that are essential for communication with other cells, located nearby or even at distant locations in our body. Yet, owing to their miniscule size, much of how these EVs behave in real life remains enigmatic. Using novel microscopy approaches and transparent fish, we will tap into this communication pathway to better understand the biology of EVs, and how they function in the healthy and diseased gut, in particular during cancer metastasis.

¹⁰ <https://www.nwo.nl/en/researchprogrammes/nwo-talent-programme/projects-vidi/vidi-2021>

Open Competition XS¹¹

Noise-reduction: an unconventional strategy to prevent antibiotic resistance

dr. M.K. (Maike) Hansen (Radboud University)

The emergence of antibiotic-resistant bacteria is one of the biggest threats to global food security, economic development, and health. A constantly increasing number of infections such as pneumonia tuberculosis, gonorrhoea and salmonellosis are becoming hard to treat due to antibiotic resistance. With antibiotic discovery stagnating, we must look for alternative solutions. One such solution is reducing so-called cellular noise. Noise is not just an involuntary consequence of biology, but bacteria harness noise as a diversification strategy to generate antibiotic tolerance. Here we propose a screen to identify noise-reducing agents that have the potential to prevent antibiotic resistance from developing.

A novel state-of-the-art intravital microscopy technique to track magnesium in the living kidney

dr. P.A (Pieter) Leermakers (Radboud University Medical Center)

Magnesium is an important nutrient for human body function. The amount of magnesium is tightly maintained, where the kidney is able to control how much magnesium is excreted into the urine and retained in the body. As it is currently impossible to look at this process inside living organisms, this project aims to develop a tailor-made state-of-the-art research technique that is able to study this process in living organisms for the first time ever. This technique will result in a magnitude of future applications, ranging from novel fundamental understanding of kidney function to identification of therapeutics that stimulate magnesium reabsorption.

Extreme soft-hard interfaces

dr. M.J. (Mohammad J.) Mirzaali (Delft University of Technology)

Interfacing extremely soft extremely hard materials (e.g., hydrogel-metal) is one of the unsolved fundamental challenges in engineering. Nature offers smart solutions (e.g., functional gradient, hierarchy) to addressing those challenges. Inspired by natural solutions, we will design and fabricate biomimetic and sustainable interfaces through hybrid multi-material 3D printing. These optimized interfaces will have applications in artificial tendon-bone reconstruction and beyond across many industries.

An atomistic view of living cells in hydrogel matrices

dr. A. (Anjali) Pandit (Leiden University)

Real-time analysis of metabolism and macromolecular structures in living cells would have tremendous benefits for disease diagnostics, drugs discovery and for optimizing microbial cell factories to produce specific compounds. NMR spectroscopy is a powerful, non-invasive technique for detection of various cell constituents however, live-cell applications have been limited to detection of soluble proteins and small molecules. We aim to overcome limitations using MAS solid-state NMR, and encapsulation of cells in hydrogel matrices for prolonged viability. If successful, the method will also provide a noninvasive way to characterize molecular structure and processes inside 3D bacterial biofilms or of gel-immobilized cellular organisms.

Scrutinising antiviral interactions in real-time at the single particle level

prof. dr. W.H. (Wouter) Roos (University of Groningen)

Viruses chronically infect hundreds of million people every year leading to a large casualty rate. To date, for many viruses there is still no cure available. Potential antivirals have emerged to provide treatment for some of these virus-caused chronic diseases. However, the exact mechanism of these antivirals is not known. The proposed research aims to provide a detailed model of the interactions of antivirals with single viral particles, using advanced microscopy techniques. The results from this research will drive improved designs of antiviral candidates to fight viral diseases.

¹¹ <https://www.nwo.nl/en/news/twenty-six-groundbreaking-research-projects-launched-open-competition-domain-science-xs-0>

Open Competition M^{12,13}

Pioneering chromatin: interaction of pioneer proteins with native, genomic nucleosomes

Dr Hugo van Ingen (UU)

Nucleosomes are the building blocks of chromatin and essential to switch off genes that are not needed by a cell. This way the identity of a cell, e.g. a liver vs. neuron cell, is determined. So-called pioneer proteins can however bind nucleosomes to activate these genes, thereby transforming cell types and even changing “adult” cells to stem cells. In this project, we will use NMR spectroscopy and biochemical techniques to unravel how pioneer proteins bind native, genomic nucleosomes. This will be useful to improve cell fate conversions and regenerative therapies.

Filming cell division using AI

Dr Rifka Vlijm (RUG)

During cell division each daughter cell should receive one DNA copy. Microtubules divide the DNA by pulling on it. Therefore, which microtubule binds to which DNA molecule is crucial. How the protein complex called corona organizes this binding remains a mystery as it is too small and dynamic to be detected by ordinary microscopes. The researcher solves this by imaging fixed cells in low- and high-resolution using a super-resolution-microscope. Next, low-resolution movies in living cells (=faster and less damaging) are translated into super-resolution using AI, to finally film how the corona ensures robust genome inheritance.

On the origin of cristae

Dr Taco Kooij (RUMC) & Prof. Laura van Niftrik (RU)

The inner membrane of mitochondria, the powerhouses of the cell, is characterized by invaginations, termed cristae. Malaria parasites harbour a single, unusual mitochondrion that lacks cristae during the pathogenic blood-infection. After formation of sexual-stage parasites, required for transmission to the mosquito vector, mitochondrial functioning changes dramatically and cristae are formed from scratch. The investigators will employ cutting-edge live- and electron microscopy to provide an unparalleled 4D-reconstruction of cristae formation in this unique biological system. By combining these insights with data on protein complexes, they will shed light on this validated antimalarial drug-target and on basic principles of cristae formation.

Exposing a motley enemy hidden under a smart blanket: elucidating *Candida albicans* biofilm formation using highly-sensitive fluorescence microscopy.

Dr Evelina Tutucci (VU)

Candida albicans is a commensal inhabitant of our flora found in the microbiome of 40-60% of healthy adults. In immunocompromised individuals, however, *C. albicans* overgrows, causing deadly systemic infections. Its virulence is linked to *albicans* ability to change its morphology and switch from a single cell form, to a filamentous form and to build-up multicellular drug-resistant structures called biofilms. How these morphological changes occur is still largely unclear, impairing the development of much-needed therapies. With this research, we develop highly sensitive fluorescence microscopy tools to elucidate the molecular events controlling how single pathogenic fungi change their morphology to build biofilms.

¹² <https://www.nwo.nl/en/news/fourteen-innovative-research-projects-launched-through-open-competition-domain-science-m-0>

¹³ <https://www.nwo.nl/en/news/twenty-six-innovative-research-projects-launched-through-open-competition-domain-science-m>

Open Competition XL¹⁴

On Form and Growth: Understanding microtubule structure and dynamics at the nanoscale

Main applicant: Prof. dr. A.S. Akhmanova (UU)
Co-applicants: Prof. dr. L.C. Kapitein (UU), Prof. dr. A.M. Dogterom (TUD), Dr. T. Zeev-Ben-Mordehai (UU), Dr. S.C. Howes (UU), Dr. A.J. Jakobi (TUD)

Microtubules are tiny cellular tubes, which form rails for transport inside cells, drive cell division and allow cells to move. Understanding microtubule organisation and function is important because microtubules are perturbed in different human diseases and can be targeted to treat cancer and inflammation. In this project, we will combine advanced light and electron microscopy techniques to better understand how the structure and dynamics of microtubules are related at the molecular scale and how this underlies their biological functions.

How do the first lineage decisions of cells take place during early embryogenesis?

Main applicant: Dr. H. Marks (RU)
Co-applicants: Prof. J.H. Kind (Hubrecht), Dr. T.L. Lenstra (NKI), Dr. R van Amerongen (UvA), Dr. ir. S.J. van Heeringen (RU)

How one cell, the fertilized egg, can faithfully develop into an organism with many different cell types is one of the most fascinating questions in biology. An important step takes place in the early embryo, when it is still a small clump of seemingly equal cells. A diverse team of top researchers will use detailed molecular analyses to investigate when and how these individual cells decide their future. This will provide fundamental new insight into how cells make decisions. It will also help with developing innovative strategies in cancer and stem cell research, and improve our understanding of developmental defects.

In search of the coronavirus Achilles' heel

Main applicant: Dr. D. Dulin (VU)
Co-applicants: Prof. dr. F.J.M. van Kuppeveld (UU), Prof. dr. ir. G.J.L. Wuite (VU), Prof. dr. W.H. Roos (RUG), Dr. R. Vlijm (RUG), Dr. M. Bauer (TUD), Dr. S.M. Depken (TUD), Dr. R.J. de Groot (UU)

COVID19 is the disease resulting from SARS-CoV-2 infection and is responsible for the ongoing pandemic. Though vaccines are available, we need to understand how the virus replicates within the cell in order to develop new antiviral drugs. New drugs will protect people against lengthy hospitalizations, long-COVID, and future new variants that make vaccinated people ill. We will investigate the coronavirus Achilles' heel, namely how coronaviruses multiply their genetic material and how genetic material is packed into new viral particles. We bring together an interdisciplinary team of biologists, experimental- and theoretical physicists to uncover the very early stages of coronavirus infection.

Unravelling proteins one by one with nanopores

Main applicant: Prof. dr. G.M. Maglia (RUG)
Co-applicants: Prof. dr. C. Dekker (TUD), Dr. S. Schmid (WUR)

Proteins are the workhorses in our cells. Yet, we still miss lots of information on these fundamental molecules of life. We will develop new nanopore technologies to tackle the main challenges in protein analysis: to count and identify proteins, to read off their basic code at the single-molecule level, and to resolve the temporal shape changes of individual proteins that underlies their function. Unravelling proteins one-by-one by resolving their sequence and functional dynamics provides extraordinary potential to radically advance our understanding of proteins.

¹⁴ <https://www.nwo.nl/en/news/twenty-one-innovative-research-projects-launched-through-open-competition-domain-science-xl>

Advanced bioengineering strategy for production of human miniature hearts

Prof. dr. P.C.J.J. Passier (UvT)

Co-applicants: Prof. G.J.C. Veenstra (RU), Dr. ing. J.N.

Post (UvT), Dr. JCH Leijten (UvT)

Cardiovascular diseases are the number one cause of death worldwide. Current animal and cell culture models are not accurate enough to sufficiently predict the efficacy and toxicity of drugs. In this research proposal, we use an ultra-high-throughput platform that allows us to encapsulate and culture human stem cells in hollow microgels. Using single cell analysis of regulatory pathways in combination with predictive computational modelling, we aim to differentiate cells into miniature hearts, resembling the structure and function of the human heart. This allows us to use a screening platform of human miniature hearts for studying heart disease and testing drugs.

For questions, ideas, announcements, new appointments, grants, and other news items, please contact:

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