

Danny van der Haven

Academic experience

- 2024–2025 **PostDoc. Early-Career Fellow** **ETH Zürich**, Switzerland
Computational Mechanics of Building Materials group supervised by Prof. David Kammer
Investigating the symmetries and applicability of representative volume elements (RVEs) in granular matter. The goal is to connect particle-based computational methods, e.g. the discrete element method (DEM), to continuum methods, e.g. the finite element method (FEM), at a small fraction of the current computational cost, greatly improving the time and length scale of bottom-up simulations of granular materials. The entire research plan was my own proposal and was selected by the Collegium Helveticum at ETH Zürich from a competitive pool of applicants.
- 2021–2024 **PhD. Computational Methods in Materials Science** **University of Cambridge**, the United Kingdom
Macromolecular Materials Laboratory supervised by Prof. James A. Elliott
Thesis: "On the Compaction of Granular Matter; Continuum and Discrete Numerical Modelling"
I used computational methods (both continuum and discrete) to study the compaction process of pharmaceutical powders into tablets. My work was mainly computational (Mathematica, MATLAB, Python, and C++) but remained closely connected to experimental work (e.g. powder compression, mechanical testing, X-ray microCT). Selected notable results are: On the continuum scale, developed a stable and automated procedure for the parametrization of elasto-plastic constitutive models from experimental data. These parametrizations were then used for the finite element method (FEM) modeling of powder compaction. Subsequently devised a set of mixing rules to successfully predict constitutive model parameters for untested powders. On the single-particle scale, developed a new interaction method for the discrete element method (DEM) that enables arbitrary (incl. complex and concave) particle shapes by using level sets. X-ray microCT and probabilistic methods were used to reconstructed particle geometries of the powder, giving unique individual level-set particles. Finally, developed a novel analysis method and performed an experimental study on the static and kinetic friction between the porous tablets and the machine tooling during tablet ejection.
- 2020–2021 **MPhil. Scientific Computing, Distinction** **University of Cambridge**, the United Kingdom
Macromolecular Materials Laboratory supervised by Prof. James A. Elliott
Thesis: "Predictive modeling of pharmaceutical powder formulations: finite element simulations of the compaction of elastic/plastic binary mixtures"
- 2017–2020 **MSc. (Hons) Chemical Engineering, 8.0/10.0** **Eindhoven University of Technology**, the Netherlands
Self-Organizing Soft Matter group supervised by Prof. Ilja K. Voets
Thesis: "Improving super-resolution microscopy towards characterization of liquid interfaces"
- 2014–2017 **BSc. (Hons) Biomedical Technology, Distinction** **Eindhoven University of Technology**, the Netherlands
Self-Organizing Soft Matter group supervised by Prof. Ilja K. Voets
Thesis: "Synthesis, characterization, and substrate transport of polymer-encapsulated enzymes"

Extracurricular education

- 2022 **Data Pipelines Winter School** **University of Cambridge**, the United Kingdom
Selective winter school for data pipelines in Python in preparation for machine learning.
- 2020 **DEMOLab** **Innovation Lab**, the Netherlands
Accelerator program helping start-ups to polish their business case and optimize consumer fit. Participants need to pass a selection procedure to be allowed to enter.
- 2017–2020 **Complex Molecular Systems program** **Institute for Complex Molecular Systems**, the Netherlands
This competitive-entry extracurricular program prepares students for a successful career in research. Students follow guest lectures, scientific skills training, and several courses from other departments to stimulate interdisciplinarity. I chose computational physics courses.
- 2015–2020 **Honors program** **Eindhoven University of Technology**, the Netherlands
Students enrolled into the Honors program follow additional training on personal and professional development. They receive extra supervision and do over half a full-time year of extra course work.

Industry experience

- 2022–2024 **Industry research placement** (*3x 2.5 months, full-time*) **Novo Nordisk**, Denmark
Research placements during my PhD to gain a deeper understanding of pharmaceutical powder processing in industry. Worked in close collaboration with technicians and senior scientists. Developed multiple software tools that are now being used throughout the company.
- 2017–2020 **Co-founder of start-up** (*3 years, part-time*) **Ares Analytics**, the Netherlands
Founded a start-up company aiming to develop a sports wearable for the non-invasive estimation of lactic acid and CO₂ expulsion. Acquired research funding and performed a joint study between University Medical Center Utrecht and Eindhoven University of Technology involving human participants. Carried the responsibility for research planning, equipment management, acquiring ethical approval, negotiating research agreements, and acquiring funding.
- 2018–2019 **Research internship** (*5 months, full-time + 6 months, part-time*) **BASF**, Germany
Studied the demixing of monomeric and polymeric solutions using Dissipative Particle Dynamics, see publication in 2021. Also significantly contributed to a production major project, opening up new avenues for product and process development.
- 2017 **Research internship** (*2 months, part-time*) **Eindhoven University of Technology**, the Netherlands
Continuation of my BSc. thesis.
- 2015–2017 **Organisation of international student competition** **SensUs Organization**, the Netherlands
Assisted and later vice-chaired the organization of two editions of SensUs ([link](#)), the annual international student competition on biosensors for health. Responsibilities included chairing plenary meetings, managing day-to-day functioning of the organization, selection of a suitable biomarker, and setting up the measurement and assessment protocol during the competition.

Teaching experience

- 2023–2024 **Supervisor – Materials Science Part IB** **University of Cambridge**
Intensive small-group teaching that involves the discussing and teaching of course material for Materials Science in two groups of two students.
- Course demonstrator – Computational Physics** (*2x*) **University of Cambridge**
Created, supervised, and marked an assignment on the Ising Model for around 140 students.
- 2023 **Lecturer – Model fitting & data analysis** (*2x*) **University of Cambridge**
Introduction on standard data analysis techniques for postgraduate students. Rated high to very high quality based on student evaluations.
- Lecturer – From powder to pill, the importance of granular materials** **University of Cambridge**
Selective opportunity to introduce high school students to an academic field. The lecture is part of the HE+ program that aims to support students who are statistically less likely to progress to higher education.
- 2022–2024 **MSc. project supervisor** (*2x*) **University of Cambridge**
Day-to-day supervisor for two Master thesis projects.
- 2018–2020 **BSc. project supervisor** (*2x + 4x partially*) **Eindhoven University of Technology**
Day-to-day supervisor for one Bachelor thesis project and one Erasmus internship. Assisted with the supervision of another four Bachelor thesis projects.
- 2015–2018 **Student assistant & representative** **Eindhoven University of Technology**
Assisted with three course supervisions; organic chemistry, modelling, and physical chemistry. Acted as a spokesperson towards parents and prospective students.

Publications

- Single-particle geometries of pharmaceutical powders from X-ray tomography; a simple and deterministic characterisation method**
Dingeman L.H. van der Haven, Jan L. Andreasen, Umair Zafar, Ioannis S. Fragkopoulou, James A. Elliott, *submitted*
- 2024 **YADE - An extensible framework for the interactive simulation of multiscale, multiphase, and multiphysics discrete systems**
Vasileios Angelidakis, Katia Boschi, Karol Brzeziński, Robert A. Caulk, Bruno Chareyre, Carlos Andrés del Valle, Jérôme Duriez, Anton Gladky, Dingeman L.H. van der Haven, Janek Kozickik, Gerald Pekmezi, Luc Scholtès, Klaus Thoeni, *Computer Physics Communications*, 304 (2024): 109293. [link](#)
- Tablet ejection: a systematic comparison between force, static friction, and kinetic friction**
Dingeman L.H. van der Haven, René Jensen, Maria Mikoroni, Umair Zafar, James A. Elliott, Ioannis S. Fragkopoulou, *International Journal of Pharmaceutics*, 661 (2024): 124369. [link](#)
- Multi-component mixing and demixing model for predictive finite element modelling of pharmaceutical powder compaction**
Dingeman L.H. van der Haven, Maria Mikoroni, Andrew Megarry, Ioannis S. Fragkopoulou, James A. Elliott, *Advanced Powder Technology*, 35 (2024): 104513. [link](#)
- Volume-interacting level set discrete element method: the porosity and angle of repose of aspherical, angular, and concave particles**
Dingeman L.H. van der Haven, Ioannis S. Fragkopoulou, James A. Elliott, (invited) *Powder Technology*, *Powder Technology*, 433 (2024): 119295. [link](#)
- 2023 **A physically consistent Discrete Element Method for arbitrary shapes using Volume-interacting Level Sets**
Dingeman L.H. van der Haven, Ioannis S. Fragkopoulou, James A. Elliott, *Computer Methods in Applied Mechanics and Engineering*, 414 (2023): 116165. [link](#)
- 2022 **Predictive modelling of powder compaction for binary mixtures using the finite element method**
Dingeman L.H. van der Haven, Frederik H. Ørtoft, Kaisa Naelapää, Ioannis S. Fragkopoulou, James A. Elliott, *Powder Technology*, 403 (2022): 117381. [link](#)
- Parameterless detection of liquid-liquid interfaces with sub-micron resolution in single-molecule localization microscopy**
Dingeman L.H. van der Haven, Roderick P. Tas, Pim van der Hoorn, Remco van der Hofstad, Ilja K. Voets, *Journal of Colloid and Interface Science*, 620 (2022): 356-364. [link](#)
- 2021 **Closed-Form coexistence equation for phase separation of polymeric mixtures in dissipative particle dynamics**
Dingeman L.H. van der Haven, Stephan Köhler, Eduard Schreiner, Pieter J. in't Veld, *The Journal of Physical Chemistry B*, 125.27 (2021): 7485-7498. [link](#)

[Google Scholar](#) [ResearchGate](#) [ORCID](#) Reviewer for 2 publications

Grants & Awards

2024	Collegium Helveticum Early-Career Fellowship	\$ 100 000
	Cambridge Philosophical Society Travel Grant	\$ 530
	Armourers & Brasiers Gauntlet Trust Travel Grant	\$ 930
	Gordon Research Conference and Seminar Support Grant	\$ 580
	IOM3 travel grant	\$ 660
2022	Henry-Royce Equipment Grant	\$ 1 600
2020–2024	Sint Geertruidsleen Scholarship	\$ 13 100
2018	Stimulation Fund Metropolitan Region Eindhoven	\$ 61 000
2017	ASML Makers Award	100h consultancy + \$ 3 300
	Thermo Fisher Scientific Award	consultancy + \$ 1 600

Presentations & lectures

2024	Medelpharm (<i>invited</i> , link)	Webinar
	"Measuring static and kinetic friction in routine compaction cycles and their implications for formulation development"	
	Compaction Simulation Forum	International conference
2023	"Single-particle characterization of powders for direct use in DEM simulations"	
	Additionally, my supervisor Prof. James Elliott gave a keynote talk based entirely on my work.	
	ON-DEM Opening Conference	International conference
	"A comprehensive framework for obtaining particle shapes for DEM"	
	Dassault Systemes - BIOVIA (<i>invited</i>)	Webinar
	"Numerical modeling of the compaction of pharmaceutical powders using DEM and FEM"	
	Lennard-Jones Center showcase day	Local conference
	"The importance of particle shape in granular matter; an efficient method for simulating arbitrarily shaped particles"	
	International Congress on Particle Technology (Partec)	International conference
	"Measuring the elasticity of porous tablets for modeling direct powder compression"	
2022	DEM9	International conference
	"Modelling Complex Particle Shapes with the Volume-interacting Level-Set Discrete Element Method"	
	International Granulation Workshop	International conference
	"Volume-interacting Level Set Discrete Element Method: the Angle of Repose of Angular and Concave Particles"	
	Armourers & Brasiers' Cambridge Forum	Local conference
	"Going against the grain; unmixing powders"	
	Data Champion Forum	Local conference
	"Introduction to sensitive data"	
	Compaction Simulation Forum	International conference
	"Tablet ejection: a systematic comparison between force, static friction, and kinetic friction"	
2021	Edwards Center lent term meeting	Local conference
	"Detecting liquid-liquid interfaces in situ with sub-micron resolution"	
	Compaction Simulation Forum	International conference
	"Predictive modeling of powder compaction for mixtures using the finite element method"	
	9th World Congress on Particle Technology	International conference
2020	"Simulating the compaction of arbitrarily shaped particles with Level-Set DEM"	
	NAFEMS (<i>invited</i>)	International conference
2019	"An accurate finite-element representation of pharmaceutical powder compaction"	

Media exposure

2024	A hard tablet to crack (<i>cover page</i> , link)	IOM3 Magazine
	Article on formulation problems in pharmaceutical powders for tablet compaction. The IOM3 magazine is published on their website and sent to all members of the Institute of Materials, Minerals & Mining (IOM3) in the UK.	
2023	Data Diversity Podcast (link)	Unlocking Research
	A podcast discussing data sharing and sensitive data, recorded as part of my open-science advocacy at the University of Cambridge.	
2022	Counting dots to find the interface (link)	ICMS Highlights
	Article about our publication on the analysis of super-resolution microscopy data in the magazine of the Institute for Complex Molecular Systems (ICMS) at Eindhoven University of Technology.	
2017	TU/e-studenten willen verzuurde sportspieren vóór zijn (link)	Eindhovens Dagblad
	Article about our start-up in the regional newspaper. Translated title: "TU/e-students want to be ahead of acidified muscles during sports".	

Professional memberships

2024–Now **Open Network on Discrete Element Method Simulations (ON-DEM)**
2023–Now **Cambridge Philosophical Society**
2022–Now **Institute of Materials, Minerals & Mining (IOM3)**
2020–Now **Institute of Physics (IOP)**

Volunteering

2021–2024 **President of the Cambridge University Fujian White Crane Kung Fu & Tai Chi Society**
2022–2024 **Open Data Champion & representative for the School of Physical Sciences**
2021 **Scientific Computing course representative**
2017–2020 **Treasurer Scouting Schijndel** (*local scouts group*)