

Programme of the Burgers Symposium 2022

8th and 9th June 2022, Hotel De Werelt in Lunteren



BS22 Organizing Committee

Chair: Ruud Henkes

Support: Caroline Legierse (jmburgerscentrum@tudelft.nl)

Members: Alvaro Marin, Daniel Tam, Dominik Krug, Hanneke Gelderblom, Marjolein van der Linden, Tim Peeters, Valeria Garbin, Woutijn Baars, Yali Tang

2022 Burgers Lecture by Prof. Dan Henningson

"Large scale numerical experiments of pitching wings and the role of laminar-turbulent transition"

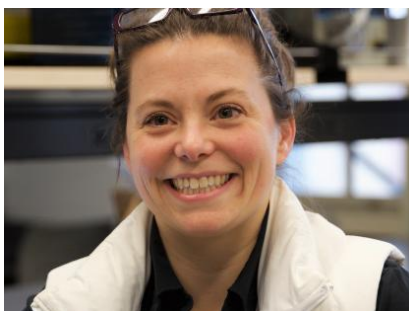


Professor Henningson obtained his MSc in 1985 at the Massachusetts Institute of Technology and his PhD in 1988 at KTH Stockholm. Thereafter he first worked as a researcher at the Aeronautical Research Institute of Sweden (FFA) and then as Professor of Fluid Mechanics at KTH. He has been a member of IUTAM and editor of the Journal of Fluid Mechanics. He has numerous publications on the stability and transition of boundary layers, including a book with Peter Schmid (KAUST). The research was focused on the development and application

of higher-order finite difference methods for Direct Numerical Simulations of transition and turbulence. Investigated was the optimal growth of disturbances, using control theory for distributed parameter systems. Feedback control theory is used to design controllers and estimators. Adjoint methods are used to obtain the optimal design for hybrid laminar flow control wings.

Evening Lecture by Prof. Brooke Flammang

"Fins in Flow: Fish-Fluid Interactions"



Dr. Brooke Flammang is an Associate Professor in the Federated Department of Biology at the New Jersey Institute of Technology and Rutgers University. Her laboratory focuses on evolutionary comparative biomechanics, performance as a driver for selection of functional morphology, and bioinspired technologies derived from the physics underlying biological phenomena. Areas of particular interest include fish locomotion, both swimming and walking, and underwater adhesive

mechanisms. She also holds appointments as a Faculty Seminar Associate at Columbia University and an Associate of Ichthyology in the Museum of Comparative Zoology at Harvard University.

The lecture builds on the fact that there are approximately 35,000 known species of fishes, among which are exhibited a broad diversity in body and fin morphologies. Variation in morphology and material properties of fish fins and bodies allow them to interact with their environment in a multitude of ways to achieve a range of behavioral performance effects. Herein Brooke Flammang will discuss the use of fluid dynamic analysis of swimming fishes for visualization and quantification of the effects of fin size, shape, compliance, number, and position towards lift and thrust generation. This work has not only expanded our understanding of selective performance in the evolution of fishes, but has opened the door to many new bioinspired technologies as well.

KIVI Hoogendoorn Fluid Mechanics Award for dr. ir. Sina Tajfirooz



Sina Tajfirooz defended his PhD thesis on 22nd February 2021 at Eindhoven University of Technology, with promotors prof. dr. J.G.M. Kuerten, and dr. Ir. J.C.H. Zeegers. The thesis is entitled: “Numerical methods for dynamics of particles in magnetized liquids”. The thesis discusses recycling methods for the plastics that pollute our environment, which are based on magnetic density separation. An efficient computational framework for MDS has been developed, supported by carefully designed experiments. The prize will be awarded at the Symposium, where the winner will also give a presentation on his thesis work.

Wednesday 8th June 2022

09:30 – 10:30 Registration with coffee/tea

10:30 – 10:40 Opening in Room “Air”

Hans Meerman – Opening by the Board of the Burgerscentrum

Ruud Henkes – Welcome by the Scientific Director of the Burgerscentrum

10:40 – 11:30 Burgers Lecture in Room “Air”

Prof. Dan Henningson – The 2022 Burgers Lecture “Large scale numerical experiments of pitching wings and the role of laminar-turbulent transition”

11:30 – 12:30 Parallel Sessions

Room “Air” – Multiphase Flow 1 (Chair: Valeria Garbin)

Marco DePaoli (UT Physics of Fluids – Detlef Lohse): Influence of reservoir properties on the dynamics of a migrating current of carbon dioxide

Martijn de Munck (TU/e - Multi-Scale Modelling of Multi-Phase Flows – Frank Peeters): Experimental investigation of fluidized bed drying

Matheus Martinez Garcia (TUD - Transport Phenomena – Luis Portela): Flow pattern transitions in swirling gas-liquid flows

Amirhossein Eghbalmanesh (TU/e - Multi-Scale Modelling of Multi-Phase Flows - Maïke Baltussen): Hydrodynamics of laminar fluid flow in spherical and cylindrical packed beds

Mohamed Elerian (TUD - Dredging Engineering - Rudy Helmons): Modelling of Deep Sea Mining generated turbidity currents

Room “Water” – Droplets & Bubbles 1 (Chair: Hanneke Gelderblom)

Luuk Blaauw (UT Physics of Fluids – Sander Huisman): Effects of salinity on bubbly drag reduction

Lijun Thayyil Raju (UT Physics of Fluids – Xuehua Zhang): Surface properties of colloidal particles affect self-assembly in evaporating self-lubricating droplets

Suriyaprakash Senthilkumar (TUD - Complex Fluid Processing- Lorenzo Botto): Buckling of a monolayer of plate-like particles trapped at a fluid-fluid interface

Vatsal Sanjay (UT - Physics of Fluids- Detlef Lohse): Drop impact on viscous liquid films

Özlem Kap (UT - Physics of Complex Fluids - Frieder Mugele): Spreading of volatile oils on swelling hydrophobic polymer brush layers

12:30 – 13:30 Lunch

13:30 – 14:30 Parallel Sessions

Room “Air” – Environmental Flow (Chair: Woutijn Baars)

Pengxu Zou (TUD - Environmental Fluid Mechanics- Wim Uijttewaal): Dynamic response of a submerged floating tunnel subject to hydraulic loading

Joost Kranenburg (UT - Marine and fluvial systems- Geert Campmans): Modelling sediment transport under breaking waves on the beach

Gil Wang (TUD - Ship Hydrodynamics- Sebastian Schreier): The circular economy of retired ships – Floating breakwaters and gap resonance

Erwin Luesink (UT - Mathematics of Multiscale Modeling and Simulation- Bernard Geurts): Structure-preserving methods for geophysical flows – theory and applications

Marco Rozendaal (TUD - Mathematical Physics- Yoei Dijkstra): The relationship between linearized 3D and 2DH models in tidally dominated estuaries

Room “Water” – Reactive Flow (Chair: Yali Tang)

Yu Wang (TU/e - Power and Flow- Bart Somers): Spray combustion of fast-pyrolysis bio-oils

Jesse Hameete (TU/e - Power and Flow- Nico Dam): Particle resolved hyperspectral temperature measurements in metal dust flames

Mohamad Fathi (TUD - Aerodynamics- Stefan Hickel): Simulation of high-pressure reacting flows using multiphase thermodynamics and transport models

Mohammad Kojourimanesh (TU/e - Power and Flow- Philip de Goeij): Innovative compact broadband muffler as the robust and efficient solution for thermo-acoustic problems

Yalin Wang (TU/e - Power and Flow- Rob Bastiaans): Experimental and numerical study of the laminar burning velocity and pollutant emissions of the mixture gas of methane and carbon dioxide

14:30 – 15:30 Parallel Sessions

Room “Air” – Multiphase Flow 2 (Chair: Tim Peeters)

Wouter Peerbooms (TUD - Multiphase Systems- Wim-Paul Breugem): Influence of solid friction on the rheology of dense suspensions in pressure-driven channel flow

Ralf Reinartz (TU/e - Fluids and Flows- Gianluca Di Staso): Thermophoretic force on micron-sized particles in rarefied gas conditions

Martin Assen (UT - Physics of Fluids- Dominik Krug): On the dynamics of freely rising cylinders with centre of mass offset

Dario M. Balice (TU/e - Chemical Process Intensification- Ivo Roghair): CFD modelling of droplet permeability in fluidized beds

Haoyu Li (TUD - Fluid Mechanics- Ruud Henkes): Liquid-liquid flow in a pipe with waves and turbulence

Room “Water” – Droplets & Bubbles 2 (Chair: Alvaro Marin)

Edgar Ortega Roano (UT - Physics of Fluids- Devaraj van der Meer): Disk impact onto a liquid containing gas and vapour bubbles

Aled Meulenbroek (TU/e - Power and Flow- Bert Vreman): Competing Marangoni effects form a stagnant cap on the interface of a hydrogen bubble attached to a microelectrode

Martin Essink (UT - Physics of Fluids- Jacco Snoeijer): How substrate stiffness and thickness affect wetting angles

Nagaraj Nagalingam (TUD - Complex Fluid Processing- Remco Hartkamp): Exploring laser induced thermos-cavitation for primary nucleation control

Muhammad Saeed Saleem (UT - Physics of Fluids- Guillaume Lajoinie): Vapour bubble dynamics of superheated water-in-oil droplets

15:30 – 16:00 Coffee / Tea

16:00 – 16:30 One-minute pitches in Room “Air” (Chair: Hanneke Gelderblom / Alvaro Marin)

16:30 – 17:30 Poster Session in Room “Fire”

17:30 – 18:30 Drinks in Room “Fire”

18:30 – 20:00 Symposium Dinner

20:30 – 21:30 Celebration Address and Evening Lecture (Chair: Ruud Henkes)

Prof. Brooke Flammang - Fins in Flow: Fish-Fluid Interactions

21:30 End first symposium day

Thursday 9th June 2022

09:00 – 10:30 Plenary Session in Room “Air”

Presentations by New Staff Members (Chair: Alvaro Marin / Hanneke Gelderblom)

Angeliki Laskari (TUD - Multiphase Systems): Turbulence in single and multiphase flows for sustainable oceans

Woutijn Baars (TUD - Aerodynamics): Towards turbulent skin friction control by way of understanding inner-outer interactions

Corinna Maass (UT - Physics of Fluids): Active droplets

Wilko Rohlfs (UT - Thermal Engineering): Modelling surface tension driven flows with OpenFoam: Why artificial interface compression fails

XiaoCheng Mi (TU/e - Power & Flow): Iron powders - A carbon-free circular fuel - and their unique combustion physics

Maja Rücker (TU/e - Energy Technology): Zooming into flow dynamics in subsurface reservoirs – the role of nano-scale fluid films

10:30 – 11:00 Coffee / Tea

11:00 – 11:55 Plenary Session in Room “Air” (Chair: Marjolein van der Linden)

Varsha Kapoerchan (NWO): NWO Science

Fluid Flow in Industry:

Pablo Oliveira (ASML): Validation of contact line dynamics CFD model for immersion lithography applications

Ruben Verschoof (DEMCON Multiphysics): Fluid flow in medical product development

Daniel van Odyck (Tata Steel): Numerical modelling and validation of mould flow

11:55 – 12:30 Parallel Sessions

Room “Air” – Multiphase Flow 3 (Chair: Tim Peeters)

Timo van Overveld (TU/e - Fluids and Flows- Duran Matute): Particle pair dynamics under oscillating flows

Udhav U. Gawandalkar (TUD - Multiphase Systems- Christian Poelma): Time-resolved X-ray densitometry of bubbly shock waves in a cavitating venturi

Keerthivasan Rajamani (UT - Thermal Engineering- Theo van der Meer): A simple low frequency magnetic pump design that enables magneto-caloric refrigerator with no moving parts

Room “Water” – Computational Methods (Chair: Yali Tang)

Chris Schoutrop (TU/e - Elementary Processes in Gas Discharges- Jan van Dijk): Near-equilibrium approximation for advection-diffusion-reaction systems in plasmas

Timo Plath (UT - Multiscale Mechanics- Thomas Weinhart): Population balance method and adaptive reconstruction of density functions via quadrature method of moments

Vijai Kumar Suriyababu (TUD - Numerical Analysis- Kees Vuik): An improved higher-order surface reconstruction algorithm

12:30 – 13:30 Lunch

13:30 – 15:00 Parallel Sessions

Room “Air” – Aerodynamics & Turbulence (Chair: Dominik Krug)

Lili Xia (TU/e - Building Physics- Alessio Ricci): The efficiency of mechanical ventilation system and air cleaning to reduce the aerosol concentration in indoor spaces

Robert Hartmann (UT - Physics of Fluids- Roberto Verzicco): Optimal heat transport in rotating Rayleigh-Bénard convection at large Rayleigh numbers

Jatinder Goyal (TUD - Aeroacoustics- Francesco Avallone): Aerodynamic and aeroacoustic characteristics of an isolated propeller in energy-harvesting conditions compared to conventional propulsive conditions

Laura Botero Bolívar (UT - Engineering Fluid Dynamics- L. de Santana): Study of the development of a boundary layer over a NACA 0008 airfoil by measuring the unsteady surface pressure

Rafael Diez Sanhueza (TUD - Energy Technology- Jurriaan Peeters): Machine learning for the prediction of the local drag forces and heat transfer rates in turbulent flows past rough surfaces

Anja Stieren (UT - Physics of Fluids- Richard Stevens): Impact of wind farm wakes on downstream wind farms

Jordi Casacuberta Puig (TUD - Aerodynamics- Marios Kotsonis): Laminar-turbulent transition mechanisms of forward facing-step flows in crossflow

Room “Water” – Microfluidics & Biological Flow (Chair: Daniel Tam)

Nicole Timmerhuis (UT - Soft Matter, Fluidics and Interfaces - Jeffery Wood): Diffusio-osmosis induced by a catalytic reaction at the wall

Emma Hinderink (TUD - Product and Process Engineering- Volkert van Steijn): Coalescence propagation in concentrated emulsions flowing through constrictions

Nathan Blanken (UT - Physics of Fluids- Guillaume Lajoinie): Nonlinear bubble dynamics for deep-learning-based ultrasound imaging super-resolution

Ratnadeep Pramanik (RUG - Computational Mechanics & Numerical Mathematics- Roel Verstappen): Symmetry-breaking mechanisms in a jellyfish-inspired magnetically-controlled soft robotic swimmer

Camille Le Roy (WUR - Experimental Zoology- Florian Muijres): Adaptive evolution of flight in Morpho butterflies

Antoine Cribellier (WUR - Experimental Zoology- Florian Muijres): How do flying malaria mosquitoes escape from being swatted?

Junaid Mehmood (TUD - Fluid Mechanics- Daniel Tam): A numerical and experimental investigation into pair-wise interactions between green algae

15:00 – 15:30 Plenary Closure Session in Room “Air” (Chair: Ruud Henkes)

2021 KIVI Hoogendoorn Fluid Mechanics Award (Laudatio & Presentation)

2 Young Scientist Awards for Best Oral Presentation

Burgers Gallery Award for Best Poster

Burgers Gallery Award for Best Movie

15:30 hr End of Burgers Symposium 2022

Burgers Gallery

(8th June in Room “Fire”)

Posters from Industry:

Edwin Poorte (Troyka Innovation): Technological Innovation with Fluid Mechanics

Mark Roest and Werner Kramer (Vortech): Data assimilation for flow problems

Peter Veenstra (Shell): Fluid Flow in Shell

Poster: In Memoriam Henk Tennekes

Posters from University:

Adhyanth Giri Ajay (TUD - Wind Energy): The future of vertical - axis wind turbines: X-ROTOR

Akankshya Majhi (WUR - Physical Chemistry and Soft Matter): Coupling flow directions in emulsions with wall roughness

Alessandro Ballatore (TU/e - Power and Flow): LES of under-expanded H₂ jets for engine applications

Ali Rezaei (UT - Physics of Fluids): The interplay between phospholipid coated microbubbles and viscoelastic medium

Alireza Ghasemi (UT – Thermal Engineering): Numerical methods in acoustic characterisation of a swirl burner

Amin Ebrahimi (TUD - Transport Phenomena): Molten metal flow behaviour in laser melting

Arnab Ghosh (TU/e - Fluids and Flows): Effective force stabilising technique for the immersed boundary method

Ashkan Ghanbarzadeh Dagheyan (UT - Physics of Fluids): Ultrasound Vector Flow Imaging for capturing Dean flow and swirling flow in in-vitro models

Benjamin van Elburg (UT - Physics of Fluids): Feedback-controlled microbubble generator producing one million monodisperse bubbles per second

Bersku Erkal (UT - Thermal Engineering): Cyclone burner

Burak Akdeniz (UT - Soft Matter, Fluidics and Interfaces): Zeta potential correction in dead-end pore

Calum Thomas Ryan (TU/e - Fluids and Flows): Particle Image Velocimetry in plasma-fluid interactions

Cem Bingol (TU/e - Fluids and Flows): Investigation of salt intrusion and mitigation measures with CFD

Charlotte Nawijn (UT - Physics of Fluids): Characterization of protein-and-nanoparticle-stabilized microbubbles for controlled ultrasound-triggered drug release

Daniël Faasen (UT - Physics of Fluids): Onset of convective dissolution in a vertical cylindrical cell

David Bensason (TUD - Wind Energy): A new player in the water: the X-Rotor turbine

Dawid Surdeko (UT - Physics of Fluids): High frequency liquid rheometry through crevice bubble oscillations

Esra Uksul (TUD - Multiphase Systems): How predictable are surface waves in a towing tank? – An experimental assessment

Faeze Khalighi (TU/e - Power and Flow): Effects of flow rate around the bubble on ohmic resistance and tertiary current density distribution in alkaline water electrolysis

Fernanda Leticia dos Santos (UT - Engineering Fluid Dynamics): Modeling the dissipation range of the turbulence spectrum

Giulia Zoppini (TUD - Aerodynamics): Control of stationary crossflow instabilities through destructive interference

Giulio Ortali (TU/e - Fluids and Flows): Towards a numerical proof of turbulence closure

Guru Sreevanshu Yerragolam (UT - Physics of Fluids): Scaling relations for heat and momentum transport in sheared turbulent thermal convection

Hadi Mirgolbabaee (UT - Physics of Fluids): Influence of iliac anatomy on developing possible limb occlusion after EVAR using Anaconda endograft - an invitro study

Hao-Ran Liu (UT - Physics of Fluids): Turbulent Rayleigh-Bénard convection with bubbles attached to the plate

Haris Shahzad (TUD - Aerodynamics): Turbulence over acoustic liners - An aerodynamic perspective

Heng Li (TUD - Complex Fluid Processing): Sedimentation of bidisperse and polydisperse suspensions: a Stokesian dynamics study

Intesaaf Ashraf (WUR - Experimental Zoology Group): Mosquito flight in turbulent airflow

Jan Siemen Smink (UT - Engineering Fluid Dynamics): Generalized strategy for power minimization in branched fluidic networks for simple and complex flow regimes

Jens Kasper (UT - Physics of Fluids): Impact of negative geostrophic shear on wind farm performance

Jesse Reijtenbagh (TUD - Fluid Mechanics): Scaling of drag forces on an accelerating plate

Jesse Hofsteenge (UT - Thermal Engineering): Performance of FGM in bluff-body stabilized H₂-CO diffusion flame

Jochem Meijer (UT - Physics of Fluids): Thin film mediated deformation of droplet during cryopreservation

Jorn Kloosterman (TU/e - Fluids and Flows): Self-agglomeration of collagen during droplet evaporation

Lenin Moises Flores Ramirez (TU/e - Fluids and Flows): Asymmetric vertical transport in weakly forced shallow flows

Lennart van de Velde (UT - Physics of Fluids): The Supera interwoven nitinol stent as a flow diverting device in popliteal aneurysms

Leon Rosseau (TU/e - Chemical Process Intensification): 3D-printed baffled logpile structures: from 2D simulation to full-scale cylindrical module

Lina Nikolaidou (TUD - Multiphase Systems): Effect of incoming boundary layer characteristics on an air layer within a liquid turbulent boundary layer

Manuel Campero Jurado (TUD - Numerical Analysis): Structure-preserving trigonometric polar splines spaces

Miguel Angel Quetzeri Santiago (UT - Mesoscale Chemical Systems): Impact of a microfluidic jet on a pendant droplet

Minkush Kansal (UT - Physics of Fluids): Contact line motion of viscoelastic fluids

Muhammad Ahmed Hanif (UT - Physics of Fluids): Granular dam-break: the role of particle shape

Peng Qin (TU/e - Building Physics): 3D RANS simulations on the DrivAer car model: the impact of computational grid parameters and domain size

Pim Waasdorp (UT - Physics of Fluids): Transport of a passive scalar in multiphase turbulence

Prasansha Rastogi (UT - Engineering Fluid Dynamics): Deposition offset of printed foam strands in direct bubble writing

Rens Stigter (TUD - Fluid Mechanics): Measurements of the microbubble size distribution in a flow using interferometry

Rui Yang (UT - Physics of Fluids): Topography of melting solid in turbulent convection

Rutger Hebbink (UT – Engineering Fluid Dynamics): Nasal tidal flow-volume curves: a novel method to monitor COPD

Sahar Pourandi (UT - Multiscale Mechanics Group): DEM simulation of particle mixing in horizontal Stirred Bed Reactors

Sara Navarro Arredondo (UT - Thermal Engineering): Experimental study of a double swirl burner operating in the lean regime for aero gas turbine applications

Sriram Ramanathan (UT - Thermal Engineering): Efficient spray drying in a novel configuration of a milk dryer

Stefano Onofri (UT - Multiscale Mechanics): Numerical simulations of liquid bridges between colloids

Timothy Chan (UT - Physics of Fluids): Deficiencies of bubble—particle collision models in light of point-particle simulations in homogeneous isotropic turbulence

Twan Wilting (TU/e - Fluids and Flows): Collective motion of Escherichia coli bacteria near the contact line of an evaporating drop

Uddalok Sen (UT - Physics of Fluids): Elastocapillary Worthington jets

Vishal Venkatesh (UT - Thermal Engineering): Numerical investigation of electrostatically charged water sprays

Xiaolin Wu (TUD - Transport Phenomena): Hemodynamic study of a patient-specific intracranial aneurysm: comparative assessment of Tomographic PIV, Stereoscopic PIV, In Vivo MRI and Computational Fluid Dynamics

Yavuz Emre Kamis (TUD - Multiphase Systems): Breakup of a spiralling jet by finite amplitude perturbations

Yee Li Fan (UT - Physics of Fluids): Controlling the stability of the air-water interface below an impacting disc

Yibo Chen (UT - Physics of Fluids): Buoyancy-driven attraction of active droplets

Yiqing Sun (TU/e - Microsystems): Tumor - Lymph Node - on Chip