Professor Detlef Lohse
Chair of Physics of Fluids
Department of Science & Technology
University of Twente
The Netherlands

UNIVERSITY OF TWENTE.

World Cultural Council
Case Postale 8
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EXECUTIVE BOARD

FROM
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DATE
16-12-2020
OUR REFERENCE
CvB UIT – 4329/HtK

SUBJECT
Nomination Prof. Lohse for the World Award of Science

Dear members of the World Cultural Council,

The University of Twente has noted with great interest the Awards granted by the World Cultural Council. The Executive Board is nominating professor Detlef Lohse for the World Award of Science.

Our nomination is based on his contributions to the field of fluid dynamics, with groundbreaking achievements for the fundamental understanding of fluid dynamics, and with an open eye for the many applications that serve mankind and the importance of outreach and explanation of his work to a general audience.

As no one else Lohse combines brilliance on the fundamental side with a continuously open eye for applications with true benefits for the well-being of mankind. By combining experiments, theory, and numerical simulations, he has considerably narrowed the gap between what can be measured and what can be simulated ab initio, much faster than we had anticipated at the end of the last century. Lohse is also closing other gaps, bridging out into various neighboring disciplines, such as physics, geophysics, applied mathematics, chemical and mechanical engineering, micro- and nanotechnology, chemistry, colloidal science, catalysis, electrolysis, medicine, biology, computational and data science, among others. He has employed techniques, approaches and traditions from fluid dynamics to help to solve outstanding problems in these fields. Vice versa, he took these fields as inspiration to identify wonderful scientific questions in fluid dynamics. Indeed, he has majorly contributed to bridge the gap from academic fluid dynamics not only into traditional applications on large scales, such as in chemical and mechanical engineering, in the food industry, or in geophysics, but also into various new high-tech applications, whether they be in inkjet printing, immersion and XUV lithography, chemical diagnostics, and lab-on-a-chip microfluidics.

Characteristics of Lohse's work
Lohse's research interests cover fluid dynamics in a broad sense, with focus on turbulence and multiphase flow, micro- and nanofluidics, biomedical flow, and granular flow. The main characteristics of his work on fluid dynamics is the direct interaction between experiment, theory, and numerics. He is not method-driven, but problem-driven, and often had to acquire the required methods or knowledge from some neighboring field to solve some particular research question he had been obsessed with. This led to various fruitful interactions and collaborations with neighboring disciplines, such as mechanical and chemical engineering, mathematics, chemistry, acoustics, astrophysics, medicine, biology, and computer science.

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The length scales covered by his work range from sub-nanometer to astrophysical scales. Various of his subjects have an application perspective or even direct application. Lohse closely collaborates with many companies, among them Océ and ASML, with major joint grants. He and his co-workers also understand to visually present the scientific questions they are addressing and their results. This led to ten winning video entries to the Gallery of Fluid Motion from the American Physical Society, Division of Fluid Dynamics, and various television reports and newspaper articles on their work. It also makes Lohse's science very visual for laymen, with a positive effect on the outreach of science in general. Both popular and scientific media have reported on many of Lohse's publications.

Recognition

Lohse's most honorable recognitions are (i) the G. K. Batchelor Prize 2012 (awarded only every 4 years starting in 2008; Lohse was the first European prize winner), (ii) the Fluid Dynamics Prize of the American Physical Society 2017 (as the second but youngest prize winner ever and one of the few Europeans to receive it), (iii) the Balzan Prize 2018, and (iv) the Max-Planck Medal (2019) for extraordinary achievements in theoretical physics. For the last two prizes he was the only fluid dynamicist ever to receive those prizes. Further major prizes include the Spinoza Prize for his fundamental work (2005, the most prestigious prize in the Netherlands), the Simon-Stevin Prize (2008) awarded by the Dutch Technology Foundation STW for his more applied work (Lohse was the first to have received both), the AkzoNobel Prize (2012), the Physica Prize (2011), and the Election in the (American) National Academy of Engineering (NAE, 2017). He moreover is Member of the Dutch Academy of Science (KNAW, since 2005) and the Germany Academy of Science (Leopoldina, since 2002). He is also Member of the Dutch Academy for Technology and Innovation (AcTI, elected 2017), Fellow of the American Physical Society (2002) and the Institute of Physics (2004), Honorary Chair and Professor of Fluid Mechanics and Engineering at Tsinghua University, Bejing/China (since 2016), and Member of the Max Planck Society and External Member of the Max-Planck Institute for Dynamics and Self Organization in G¨ottingen (since 2015). The Max Planck Society also granted him and his team the only Max Planck Center on Fluid Dynamcis and the only Max Planck Center in the Netherlands. Among various Dutch, German, and European grants worth more than 60 M Euro, Lohse in particular received two of the extremely prestigious European Research Council (ERC) Advanced Grants, namely on "Physics of Boiling" (2.1 M Euro, 2010) and on "Diffusive droplet dynamics in liquid systems" (2.8 M Euro, 2017).

We also would like to mention Lohse's service to the fluid dynamics community. He is Editor for the two most prestigious journals in the field, namely Journal of Fluid Mechanics and Annual Review of Fluid Mechanics, next to being Editor of several other journals (see his CV). He has also served as Member and very often as Chair of various international and national scientific boards and councils. That he got chosen as Chair so many times reflects the trust the community has in his good judgement and his leading role in the field.

Inspiration for young scientists

In the period in Twente (now 21 years) Lohse has meanwhile graduated 86 PhD students and educated more than 60 postdocs. Out of his former PhD students and postdocs more than 40 are now tenured professors or CNRS Fellows (in France) and respected and visible members of the Physics of Fluids community all over the world. We stress that many of them are female. Indeed, early on Lohse has recognized the necessity of increasing the fraction of female role models in science and engineering and actively works on it.

Lohse made his Physics of Fluids group in Twente to one of the most visible places in fluid dynamics on a world-scale – a brand name for excellence and quality – and he and his "school" set the highest standards in the world, both on the fundamental and on the application side. He has an excellent taste of problems and a great intuition for interesting and relevant problems.

The versatility of Lohse as a scientist, combining advanced experimenting with theory and simulation, and his ability to solve practical problems with high-level science, make that he fully deserves the Albert Einstein World Award of Science for which I recommend him without hesitation.

The Executive Board,

Prof. Dr. T.T.M. Palstra,
Rector Magnificus

KONINKLIJKE NEDERLANDSE
AKADEMIE VAN WETENSCHAPPEN

ROYAL NETHERLANDS ACADEMY
OF ARTS AND SCIENCES

Amsterdam, 9 December 2019
Reference: FAO/3605

Contact: Jolanda Derks
Telephone: 020 551 0769

Subject: Nomination Albert Einstein World Award of Science

Dear Sir/ Madam,

On behalf of the Royal Netherlands Academy of Arts and Sciences I am pleased to support the nomination of Detlef Lohse for the prestigious Albert Einstein World Award of Science.

Detlef Lohse became a member of the Royal Netherlands Academy of Arts and Sciences in 2005 and is embedded in the Natural Sciences and Engineering domain of the Academy. He also is a member of The Council for Natural Sciences and Engineering. The council promotes policy for science and a research environment conducive to outstanding research in the natural sciences and engineering. It also promotes science for policy by ensuring that advances in the natural sciences and engineering are integrated into policy development.

Besides his contributions to the Academy Detlef Lohse is the internationally most outstanding researcher in the field of fluid dynamics– he is exceptional in his achievements in fluid dynamics, in the breath of his research programme (ranging from the most fundamental to application driven), and in boosting the careers of many researchers, senior as well as junior.

Fluid dynamics is a discipline with a long tradition, and many effects bear the name of some of the giants of mathematics and physics (e.g, Euler, Reynolds, Rayleigh, Von Karman, Taylor, Batchelor). Late last century, some researchers considered Fluids Dynamics as a field which had its heydays a century ago, and which is nowadays concerned mostly with applications. In my view, we really owe it primarily to Detlef Lohse that this field is nowadays again considered "cool" and intellectually challenging, in addition to relevant. Detlef has done so by his unique ability to uncover new and interesting science in an enormous range of problems, ranging from inkjet printing or snapping shrimps to sonoluminescence and the asymptotic scaling of thermal turbulence.

Lohse not only has a very good nose for interesting problems, he also directs all his energy and any relevant experimental, theoretical or numerical method at solving the relevant questions. He does so by involving both the young researchers in his group, and other senior colleagues from elsewhere, who often pay extended visits to his group. In short, I consider Lohse a role model and truly a modern giant of fluid dynamics.

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FAO/3605

Detlef Lohse's standing within the fluid dynamics community is underlined by the fact that he was awarded the Journal of Fluid Mechanics G. K. Batchelor Prize 2012– this is really the prime award of the international fluid dynamics community–and the 2017 Fluids Dynamics Prize of the American Physical Society.

I will not attempt to list here the great number of papers, grants, distinctions and awards which testify to Lohse's unique achievements, but rather would like to highlight some with a few personal remarks.

Detlef Lohse has singlehandedly built up an international group in Twente which is top-notch in all experiments, theory and numerics. This is really remarkable– most scientists excel in one of these, but Lohse is leading in all three. He is not method-driven, but is focused on the phenomena and concepts, and brings whatever is needed to bear at the problem at hand. This remarkable combination of strengths allows him to uncover interesting new phenomena and concepts at problems (like inkjet-printing or droplet stability) that others at first sight might think are 'too applied'.

Many of Lohse's breakthroughs build on this. An illustrative example is Lohse's work on thermally driven turbulence. The theory of turbulence has a long history in fluid dynamics too, starting with the work of Kraichnan over 80 years ago. Much of it is focused on deriving asymptotic scaling laws. However, with his former PhD advisor Grossmann, Lohse realized that it is important to distinguish various regimes, and to take into account the boundary effects. This work is one of the most cited, and is nowadays used as the conceptual framework for analyzing experiments and numerical simulations. For the latter, Lohse's group is also leading.

Two important pillars of Lohse's impact in fluid dynamics are his training of young researchers and his publication style. Detlef Lohse's group fosters an open and non-hierarchical research climate for students, postdocs and visitors alike. Detlef cares for his graduate students and postdocs and actively involves them in the research and in brainstorming about the results and the planning of future steps. This gives an enormous boost to them, and many have later obtained research positions at leading international centers. Moreover, many senior scientists, from Europe and elsewhere, are attracted to Twente for a longer visit; they find that this stimulates them to work on new topics and to start new collaborations. In a true sense of the word, Lohse has formed a school.

While many researchers these days focus on writing short publications in what are counted as high-impact journals, Lohse also takes the time to write longer review papers– he has written at least five of these– in which he gives an all-encompassing introduction and overview of a field. This is a service to science and to the community which unfortunately is undervalued these days. He also serves on many panels, (editorial) boards, thesis committees and the like.

In summary, Detlef Lohse is in every respect really "hors catégorie" in his achievements in fluid dynamics and beyond. The Royal Netherlands Academy of Arts and Sciences is therefore pleased to support the nomination of Detlef Lohse for the Albert Einstein World Award of Science.

Yours faithfully,

Prof. Wim van Saarloos
President

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December 10, 2019

Albert Einstein World Award of Science Committee
World Cultural Council

Dear Members of the Albert Einstein World Award of Science Committee,

I am delighted to support **Professor Detlef Lohse** for the 2020 Albert Einstein World Award of Science. The addition of his name to the distinguished list of past recipients of the Prize will maintain the consolidated tradition of excellence that it enshrines.

The Einstein Prize "was created as a means of recognition and encouragement for scientific and technological research and development." Very few scientists have advanced the the discipline of fluid mechanics and its applications to bringing "true benefit and wellbeing to mankind" as much as Professor Lohse.

From the Web of Science database, Lohse's citations have been well in excess of 1,000 per year already for many years and by now stand at more than 2000, with an h-index greater than 60 and nearly 500 papers. One's appreciation for his work, however, grows further by looking at a finer-grained picture beyond these raw data. While his focus has constantly been on basic science, he has always striven to relate the fundamental physics to experiment and observation in a quantitative way. In this way, his deep understanding of physics has been turned from a hypothesis into the incontrovertible – and beautiful – explanation of a dizzying array of phenomena.

Armed with his brilliant intuition about the role of boundary layers in Rayleigh-Bénard convection, he has gone on to derive quantitative predictions which have rationalized to a surprisingly accurate degree the Rayleigh-Bénard phase diagram doing away with decades of supposed "universal" scaling laws and other speculations. In some cases, his work even led to the identification of errors in previous experiments. By recognizing the deep connection between RB and Taylor-Couette flow, he was able to gain major new insights into the latter. He enlarged by orders of magnitude the parameter space previously explored and, in each new region, he produced theoretical results in virtually perfect agreement with data. This work is of enormous relevance for today's society's major problems, from climate change to energy.

Professor Lohse has pursued his intuition about the "burning" of polyatomic gases in a sonoluminescing bubble, with the implied major importance of noble gases, to the point of being able to provide parameter-free predictions in excellent agreement with experiment. This work, initiated when he was not quite 30, put to rest the wild speculations that had

plagued this subject for years.

His relentless focus on quantitative understanding has made his work very valuable to industry: he has a long-standing collaboration with Océ, a leading Dutch manufacturer of printing equipment, Bosch, Philips and others. His prestigious Simon Stevin Prize (0.5×10^6 euros) was awarded specifically for scientific work of industrial relevance.

He has contributed in the same way to all the other fields he has touched, including one of the the latest ones, nanobubbles. He has pursued this topic and its seemingly paradoxical experimental features with a brilliant series of experiments, simulations and analyses finally reaching a complete, simple and elegant explanation of the many puzzling observations. Most recently he has focused on hydrogen generation, another problem with an enormous potential for the world's energy.

Space limits prevent me from entering into any depth in these and the other areas to which he has brought such varied and seminal contributions. Let me just add some more raw data: 3 papers in the *Revs. Mod Phys.*, 2 in *Annu. Rev. Fluid Mech.*, 9 in *Nature/Science*, 85 in *J. Fluid Mech.*, 58 in *Phys. Fluids*, 10 in *PNAS*, 75 in *Phys. Rev. Lett.* and so forth. Furthermore, he has given over 500 seminars and invited lectures at scientific conferences.

Moving on to his many awards, I will start with the 2012 G.K. Batchelor Prize of the International Union of Theoretical and Applied Mechanics. This is the most prestigious prize in Fluid Dynamics, awarded every four years, and Professor Lohse is only its second recipient. He received no fewer than 6 nominations for the prize, an absolute record. In Holland he is a member of the Royal Academy of Sciences and has been knighted by the Queen. He has made a clean slate of all the Dutch scientific prizes, including the most prestigious ones, the Spinoza Prize (1.5×10^6 euros) and the Stevin Prize already mentioned. Last year he was awarded the Fluid Dynamics prize by the American Physical Society, the highest honor conferred by a society which counts among its members the absolute top scientists in this field. Last year he was also elected to the US National Academy of Engineering, one of the handful of non-American scientists elected every year.

Professor Lohse's research group has quickly risen to world fame for excellence of research and breadth of activities: so far, he has advised 75 PhD students (30 currently working under his guidance) and 55 post-doctoral fellows, many of them securing prestigious university positions in Europe and elsewhere. He has been able to support this large number of budding scientists and various other collaborators by securing grants for a total – so far – of more than 60 million euros.

And, finally, I must mention his major contributions beyond research. Professor Lohse is an editor for *J. Fluid Mech.* and a current or past associate editor for nearly a dozen other prestigious journals. He has been the chair of the American Physical Society committee

charged with finding a new general editor for the journal *Physical Review Letters*. He has been a member or chair of many of the American Physical Society committees, including the Executive Board of the Division of Fluid Dynamics, as well as those of other international organizations such as the Euromech Council, and he has been active in the organization of many conferences and workshops.

I am sure that you will receive many nominations of worthy candidates but, among them, I urge you to pay close attention to the exceptional achievements of Professor Lohse whose impact, level of activity and contributions to science and society are so remarkable and out of the ordinary.

Very sincerely,

Andrea Prosperetti
Distinguished Professor of
Mechanical Engineering
Member, US National Academy of
Engineering

Resume on the nomination of Detlef Lohse for the Albert Einstein World Award of Science

Fluid Dynamics is a science with more of 100 years of tradition, but at the same time in the last two decades it has become more topical than ever, with outstanding scientific questions and extremely relevant challenges for many applications. Indeed, it is nearly impossible to overestimate the relevance of fluid dynamics for mankind. We ourselves are systems far from equilibrium. This implies that everything flows – panta rhei. But the same holds for the ocean, the atmosphere, industrial plants in the chemical or food industry, power stations for energy supply, transportation devices like airplanes, cars, ships, or pipelines, or, on the small scale, bacteria or microfluidic devices and processes for medical diagnostics and the pharmaceutical industry. All these systems are far from equilibrium, which implies flow, whether it be blood circulation in the body and through the heart, or the flow in the ocean or in the atmosphere that determines and affects climate. Fluid dynamics is also essential for energy production, as in combustion, or in the hydrogen economy and the energy transition, such as in catalysis & electrolysis and for CO_2 storage, or for additive manufacturing, which is also relevant in the health sector for printing artificial tissue or organs. These are all huge challenges for mankind, to which fluid dynamics majorly contributes and will also have to contribute in the future. Today, fluid dynamics is multidisciplinary at its best, somewhere in between physics, geophysics, mechanical and chemical engineering, applied mathematics, and data and computer science, and ranging from the nanometer length scale to astrophysical length scales.

Solving outstanding problems in fluid dynamics

Not only the relevance, scope, and broadness of fluid dynamics and physics of fluids have tremendously increased over the last two decades, but also the progress in the field which has been truly impressive: In a sense, the last two decades have been the golden age of fluid dynamics, and it is **Detlef Lohse** who is the most pronounced representative of this golden age of fluid dynamics in which we are living.

Lohse has an excellent taste of problems and in his carrier has solved various outstanding and long-lasting research questions in fluid dynamics. Scientific achievements of outstanding importance are his explanation of single-bubble sonoluminescence, his deep understanding of the transport mechanisms in wall bounded turbulence (in particular in thermally driven turbulence and in shear-driven turbulence), his explanation of the counter-intuitive stability of surface nanobubbles, and his achievements in understanding droplet impact, droplet evaporation, and inkjet printing. We will now go in more detail into Lohse's main scientific findings and achievements in fluid dynamics.

Main scientific findings and achievements

Turbulence: Two paradigmatic systems in physics of fluids are Rayleigh-Bénard (RB) flow, the flow in a box heated from below and cooled from above, and Taylor-Couette (TC) flow, the flow between two coaxial, independently rotating cylinders. They serve has model systems for the fluid dynamics in the ocean, the atmosphere, the interior of Earth and of stars, or in process technology. Lohse has made major contributions in understanding both the global transport properties and the local flow characteristics of turbulent RB and TC flow. With his theory it can now be predicted how the heat respective momentum transfer depends on the control parameters. In fact, it had always been thought that the dependence of heat transfer on the applied temperature difference would be given by a power law. In 2000 Lohse predicted theoretically a more complicated dependence, which meanwhile has been confirmed experimentally. The theory is further worked out in several subsequent papers and this work created a boost of activity on turbulent Rayleigh-Bénard convection throughout the world – a subject which erroneously had considered to be already solved in the mid 90's. He also extended the theory and numerical simulations to thermohaline convection, which is of utmost relevance in the ocean and for climate related questions. – Next, he and his coworkers correctly predicted and later revealed through experiments (with the Twente Turbulent Taylor-Couette facility built for this purpose) and high-performance numerical simulations the transition to the so-called ultimate turbulent state with its enhanced transport properties, both in RB and in TC turbulence. He and his coworkers were also the first to experimentally and numerically explore and understand TC turbulence with co-and counter-rotating cylinders. – Last year, by exploring Taylor-Couette flow with rough walls, Lohse and his coworkers also showed the existence of a so-called "asymptotic ultimate regime" in which the scaling of the flux achieves the theoretically possible upper bound predicted by Robert Kraichnan (Albert Einstein's last postdoc) in 1962. Lohse and coworkers also wrote the Rev. Mod. Phys. (2009) and the Ann. Rev. Fluid Mech. (2010, 2016) review articles on RB and TC turbulence; all three articles are heavily cited.

Multiphase phase flow is of utmost importance in process technology, catalysis, the Fischer-Tropsch synthesis, in energy conversion, among many other applications. With the 8 meter high Twente turbulent water channel Lohse and colleagues have studied bubbly turbulence and turbulence with particles, accompanied by numerical simulations. They developed new experimental techniques to follow thousands of bubbles and particles

both in time and in three-dimensional space, allowing for a better understanding of the turbulent multiphase flow organization and the dynamics of particle and bubble clusters in these flows. He also shed light on the mechanism of bubbly drag reduction in turbulent flow, identifying the bubble deformability as a crucial condition for this phenomenon, with great bearing on fluid transport in pipelines and energy saving in naval transportation.

Inkjet printing: Lohse and coworkers have revealed the disturbing role of bubbles entrained into piezoacoustic ink channels and offered solutions to resolve this problem, which are meanwhile already used in high-end commercial inkjet printers. Lohse and coworkers also found the origin of the bubble entrainment, namely capillarity driven flow on the nozzle plate, and developed models for the droplet formation. Lohse's work on inkjet printing is both fundamental and applied at the same time.

Impact events: Lohse and coworkers have developed experimental methods and models to understand the impact of droplets on various substrates, including micro- and nanostructured ones and superheated & supercooled ones, focusing on heat exchange, splash formation, and droplet spreading and including droplets of suspensions. With his research on the impact of objects on free liquid surfaces, Lohse has elaborated the mechanism of the resulting observed jet formation, again by combining experiments, theory, and numerical simulations. The work again is relevant in various contexts, from geophysical ones to spray-cooling in industry to coating applications. Next, Lohse also illuminated tin droplet jetting and impact in the context of extreme ultraviolet (EUV) lithography, in a collaboration with ASML, the world's largest manufacturer of machines to produce wafers for the semiconductor industry.

Granular matter: Connected to impact is also Lohse's work on the granular dynamics after impact of objects on soft and fine granular matter, including the formation of a violent granular jet. These striking experiments can serve as model systems for the impact of astroids on a planet or for the vanishing of objects in dry quick sand. Lohse and coworkers have also made significant progress in understanding clustering in granular gases.

Wetting phenomena and droplet evaporation: Here Lohse's most important achievement has been to explain the counterintuitive stability of surface nanobubbles, which had been a great mystery ever since their discovery. He and his coworkers revealed through theory, numerics, and experiment that the long lifetime of surface nanobubbles is a consequence of both pinning of the contact line and gas oversaturation, leading to a stable balance between overpressure and Laplace pressure. Next, Lohse and coworkers revealed the temporal singularity in the evaporation of sessile droplets and the segregation in the evaporation of multicomponet droplets, with great bearing on various applicatons. Lohse also studied wetting and slip phenomena on micro- and nanostructured surfaces. Finally, he revealed the physics of so-called solar vapor-nanobubbles which emerge from illuminated plasmonic nanoparticles, highlightening the important role of the dissolved gas. Such bubbles have applications in therapeutics and in energy harvesting.

Single-bubble sonoluminescence, cavitation, and the sound of snapping shrimp: Single bubble sonoluminescence is a peculiar phenomenon found in the early 1990s in which sound energy is transferred into light energy: An acoustically driven micro-bubble can emit very short pulses of light. This phenomenon has fascinated various scientists, leading to wild speculations, including the prediction of table-top nuclear fusion and the breakdown of classical physics. Lohse and coworkers succeeded in quantitatively explaining single-bubble sonoluminescence, by developing and employing concepts from fluid dynamics, acoustics, chemistry, thermodynamics, and plasma physics. – As spin-off from his work on single bubble sonoluminescence, Lohse and coworkers have revealed the origin of the sound of snapping shrimp: It is nothing else but cavitation noise, i.e., the sound of a collapsing bubble. The origin of the noise had been a mystery for decades, but has now been revealed, thanks to Lohse's theoretical insight and high-speed imaging. Other spin-offs from Lohse's work on sonoluminescence is his work on cavitation, cavitation noise, cavitation damage, ultrasound cleaning, local drug & gene delivery, and sonochemistry, all with direct applications in mechanical and chemical engineering, medicine, and the high-tech industry.

Ultrasound diagnostics: Yet another spin-off from Lohse's work on single bubble sonoluminescence is his work on ultrasound diagnostics, where coated microbubbles are used as ultrasound contrast agents (UCAs). Building on his experience from sonoluminescence, Lohse and coworkers theoretically and experimentally analysed the UCA dynamics which significantly differs from that of "naked" bubbles and studied how such bubbles interact with cells. Their coated-bubble-model paper (J. Acoust. Soc. Am. 117, 3499 (2005)) is the most cited paper in J. Acoust. Soc. Am. since 2005 (out of more than 10000 articles). Here the main applications of Lohse's research are obviously in medicine, both in diagnostics, imaging, and therapy.

Short Curriculum Vitae

Personal information for Detlef Lohse

Born September 15, 1963, in Hamburg, Germany (German citizenship)
ResearcherID: B-4915-2013; ORCID-Number: 0000-0003-4138-2255 (or via Google Scholar)
URL of web site: http://pof.tnw.utwente.nl/

Education

Oct. 1989: Diploma in Physics, *University of Bonn* ("excellent"); subject of the Diploma thesis done at the *Kernforschungsanlage Jülich*: "Pion-Pion interaction"

May 1992: PhD thesis at the *University of Marburg* with Prof. Siegfried Grossmann on "Fully developed turbulence" ("summa cum laude")

May 1997: "Habilitation" in Theoretical Physics at the University of Marburg; subject of thesis: "Sonoluminescence: A hydrodynamic approach"

Professional Experience

Sep. 1993 – Oct. 1995: Postdoctorial Research Fellow at the James Franck Institute at the *University of Chicago*, working with Prof. Leo Kadanoff

Oct. 1995 – Feb. 1998: Research Assistant, Physics Department, *University of Marburg* (Germany)

Feb. 1998 – June 1998: *Heisenberg Fellow* of the Deutsche Forschungsgemeinschaft (DFG), Physics Department, *Ludwig-Maximilians University Munich* (Prof. Herbert Wagner)

from July 1998 on: *Chair of Physics of Fluids*, Department of Science & Technology, *University of Twente*, Enschede, The Netherlands

Research interests

Lohse's present research interests cover fluid dynamics and phyiscs of fluids in a broad sense, with focus on turbulence and multiphase flow, micro- and nanofluidics (bubbles, drops, inkjet printing, wetting), and granular & biomedical flow. He combines experimental, theoretical, and numerical methods and does both fundamental and more applied science and science with an application perspective.

Major Prizes and Honors

- Max-Planck Medal 2019 (German Physics Society DPG), for extraordinary achievements in theoretical physics
- Balzan Prize 2018, award by the Balzan Foundation (0.75 Mio Schweizer Franken, 2018), "for his exceptional contributions in the most diverse fields of fluid dynamics, such as the transition to turbulent regimes in the Rayleigh-Bénard convection, the study of multi-phase turbulent flow, sonoluminescence, the properties of bubbles and drops down to a microscopic level, micro- and nanofluidics".
- Fluid Dynamics Prize of the American Physical Society (APS, 10 k$, 2017), "for profound and wide-ranging contributions to our understanding of fluid turbulence, multiphase flow, and granular flows; for outstanding contributions to the teaching and training of future fluid dynamicists; and for long-standing service to the international fluid dynamics community."
- Member of the National Academy of Engineering (NAE) of the United States of America (elected 2017)
- European Research Council (ERC) Advanced Grant on "Diffusive droplet dynamics in liquid systems" (2.8 M€, 2017)
- Max-Planck-Center Twente for Complex Fluid Dynamics (15 M€, 2016-2025)
- Appointment as Honorary Chair and Professor of Fluid Mechanics and Engineering at Tsinghua University, Bejing/China (2016-2020)
- Member of the Max Planck Society and External Member of the Max-Planck Institute for Dynamics and Self Organization in Göttingen (2015)
- NWO Zwaartekracht: Dutch Center for Multiscale Catalytic Energy Conversion (MCEC, 31.9 M€, 2014-2024)
- George K. Batchelor Prize (Fluid Dynamics Prize) of the International Union of Theoretical and Applied Mechanics (IUTAM) and of Journal of Fluid Mechanics/Cambridge University Press (25 k$, 2012)
- AkzoNobel Science Award (50 k€, 2012)
- Member of the Koninklijke Hollandsche Maatschappij der Wetenschappen (2012)
- Physica-Prize of the Dutch Physics Society (NNV) (2011)
- European Research Council (ERC) Advanced Grant on "Physics of Boiling" (2.1 M€, 2010)

- Knighted by the Dutch Queen: Ridder in de Orde van de Nederlandse Leeuw (April 2010)
- Simon-Stevin-Meesterschap Prize 2009, awarded by STW for application-orientated Science (0.5 M€)
- Spinoza Prize 2005 (highest distinction in Dutch science) awarded by NWO (1.5 M€)
- Member of the Royal Dutch Academy of Science (KNAW, elected April 2005)
- Honorary University Professor of University of Twente (since 2005, later extended to lifetime)
- Fellow of the Institute of Physics, IOP (elected in Aug. 2004)
- Fellow of the American Physical Society, Division of Fluid Dynamics (elected in Sep. 2002): "For his decisive role in unraveling the mystery of single-bubble sonoluminescence and his ingenuity in developing scaling arguments for turbulent thermal convection."
- Member of the German Academy of Sciences "Leopoldina" (elected in April 2002)
- Heinz Maier-Leibnitz-Preis (best young researcher in Germany, 25 kDM, 1997), awarded by German Science Foundation and Minister of Science
- Heisenberg Fellowship awarded (1997, German Science Foundation DFG).
- Member of "Studienstiftung des Deutschen Volkes" (Foundation for the most excellent students) since 1985

Supervision of PhD students and Postdocs

86 PhD students graduated under Lohse's (co-)supervison, 30 present PhD students, 60 Postdocs 1998-2019. Various of Lohse's PhD students, postdocs, and of the Physics of Fluids Master students received national and international prizes for their theses and work. Presently, more than 40 of Lohse's former PhD students and postdocs hold professorships (or equivalent tenured research positions) all over the world.

Publications

More than *570 publications* in refereed scientific journals, including *3 Reviews of Modern Physics*, *2 Annual Reviews of Fluid Mechanics*, *9 Nature/Science* papers, *6 Nature/Science daughter* papers, *12 PNAS*, *81 Physical Review Letters*, *105 Journal of Fluid Mechanics*, *63 Physics of Fluids/Physical Review Fluids*, *5 ACS Nano*, *53 Langmuir/Soft Matter*, and *2 Physics Today* articles, including one Cover article.
Both popular media (including the *New York Times*, the *Washington Post*, *BBC*, *National Geographic*) and scientifc media (including *Science, Nature, Nature Physics, Physics Today, Physics World, Physics News Update, and Science News*) have reported on various of Lohse's publications; for details see the publication list.

Colloquia and invited lectures at conferences

About 580 talks at scientific meetings and seminars, including about 100 Plenary Lectures at major international conferences (including APS-DFD, Euromech, ICTAM, STATPHYS, Colloid & Interface Conferences, Cavitation & Multiphase Flow Conferences, Turbulence & Shear Flow Phenomena Conference, Gordon Conferences) and 100 general colloquia talks in Physics, Mechanical & Chemical Engineering, Chemistry, and Mathematics Departments.

Editorial Boards (selection)

- Editor and Member Editorial Board of *Journal of Fluid Mechanics* 2007-... (Cambridge University Press)
- Member of the Editorial Board of *Annual Reviews of Fluid Mechanics* 2008, 2014, 2016-2020
- Associate Editor of *Science Advances* 2019 - ... (AAAS)
- Editor and Member Editorial Board of *Physica D* 2003-2015 (Elsevier), *Nonlinearity* 2002-2015 (IOP), *J. Stat. Mech.: Theory & Experiment (JSTAT)* 2003-... (IOP), and *European Physical Journal B* 2004-2007 (Springer)
- Editorial Board of *Physical Review E* 2003-2008 (American Physical Society), *Journal of Turbulence* 2003-2019, *Zeitschrift für Naturforschung A* 2015-... (de Gruyter) (IOP), and *Physik Journal* 2011-2016 (Springer)
- Occasional Editor for the *Proceedings National Academy of Science (PNAS)* 2015-...

International Scientific Boards (selection)

- Elected "Member at Large" of the American Physical Society (APS) – Division of Fluid Dynamics (DFD) Executive Board (2011-2014, 2015-2019)
- Vice-Chair and Chair of the APS-DFD Selection Committee for the Fluid Dynamics Prize (2018-2020)
- Chairman of the IUTAM Fluid Mechanics Panel (2016-2020)
- Member Excellence Commission and Committee of Experts for the Excellence Strategy of the German Science Foundation (DFG) (2016-2020), appointed by German Minister of Science
- Chair of the APS Selection Committee for the Leading Editor in Chief of Physical Review Fluids (2017)
- Member of the APS Selection Committee for the Leading Editor in Chief of Physical Review Letters (2013)
- Elected Member of the Euromech Council (2004-2010)

- Member (2003-2009) & Chairman (2009-2017) of Euromech-Board for the "Euromech Turbulence Conf."
- Member of the Euromech Fluid Dynamics Prize committee (2006-2013)
- Member (2005-2007) & Chairman (2007) of APS-DFD "Publications and Media Committee"
- Member of the APS-DFD "Fluid-Dynamics Prize committee" (2009-2010)
- Member of the Francois Frenkiel Award Committee of APS-DFD (2003-2005)

National Scientific Boards (selection)
- Member of the Board of FOM (National Science Foundation for Physical Sciences, 2003-2014) and of the Executive Board of FOM (2007-2014), Vice-Chair of FOM from 2012 on
- Member of the Academy (KNAW) Jury for the selection of new Academy of Science members (2012-2018)
- Chairman of the FOM group on Fluid Dynamics (2002-2008) and Member of the FOM steering group on Phenomenological Physics (2002-2007)
- Programme Director for in total five FOM programs, namely on Physics of granular matter (2003-2015), Contact line control during wetting and dewetting (2009-2015), Towards ultimate turbulence (2013-2019), Fundamental fluid dynamics challenges of extreme ultraviolet lithography (2013-2019), Fundamental fluid dynamics challenges in inkjet printing (2016-2022)
- Chairman of the NWO-VICI-grant panel (2006)
- Member of the Board of the Dutch Physical Society (NNV, 2002-2005)
- Member (2002-2008) & Chairman (2015-...) of (Scientific) Advisory Board of Lorentz-Center, Leiden
- Department Chair of the Physics Department within the Faculty for Science and Technology (2003-2006)

Conference & Meeting Organization and Service to the Community (selection)
Organizator and Co-organizator of various Euromech & IUTAM Colloquia, APS-DFD Minisymposia, Les Houches & Lorentz Center Workshops, Heraeus & FOM Conferences in Europe & USA; Conference (Co-)Chair Flow14 (450 participants) & Droplets 2015 (220 participants); organizer of various Summer Schools; Steering committee and Programme Commission for the general FOM Conference (>1600 participants); Coordinator of EU Research Network on "Nonideal Turbulence" (7 nodes), ...
Lohse in addition again and again sets up major collaborations, consortia, and collaborative grants. Recent examples are the Max Planck Center Twente for Complex Fluid Dynamics (2016-2026) and the Dutch NWO programs on "Fundamental fluid dynamic challenges in piezo-acoustic inkjet printing" (2016-2022), on "Fundamental Fluid Dynamics Challenges of Extreme Ultraviolet Lithography" (2013-2019), on "Ultimate Turbulence" (2013-2019), and on "Water quality in martime hydrodynamics" (2019-2024).

Collaborations with industry, start-up companies, and patents (selection)
Close collaboration with Océ (now part of Cannon) on inkjet printing from 2001 on and with ASML on immersion and XUV lithography from 2010 on. Further collaborations with Shell, AkzoNobel, Bracco, Corus, Bosch, Medspray, LAM, TNO, DSM, Philips, and other companies on turbulent two-phase flow, bubbles, ultrasound diagnostics, cleaning, droplet solidification, free surface flow, and various other projects. Furthermore, four start-up companies were started out of Lohse's group. Finally, Lohse filed three patents.

Summary of key numbers (November 2019)
- ResearcherID: B-4915-2013
- Number of published refereed papers: 570
- Hirsch-index (Google Scholar): H = 95
- Hirsch-index (Web of Science): H = 76
- m-index = H/(# of years after PhD) = 3.5 respective 2.8
- Citations in 2018: 3650 (Google Scholar) respective 2600 (Web of Science)
- Total citations: $\sim$ 31600 respective $\sim$21500
- Average citations/article: 38.1 (Web of Science)
- MNCS-citation index 2004-2014: 2.73 (1.0 is world average)
- i10-index 432 (376 since 2014)
- Number of (present) PhD students in Lohse's PoF group: 40
- Number of finished PhD theses supervised: 86
- Cumulative number of postdocs (1999-2019): 60
- Total external funding received as PI since arrival in Twente (1998): 65 M€

Ten most relevant publications of Detlef Lohse

The main characteristics of Lohse's work is the direct interaction between experiment, theory, and numerical simulations. These methods are often applied in combination to one particular problem. He is not method-driven, but problem-driven, and often had to acquire the required methods or knowledge from some neighboring field to solve some particular research question he had been obsessed with. This led to various fruitful interactions and collaborations with neighboring disciplines, such as mechanical and chemical engineering, mathematics, chemistry, acoustics, astrophysics, medicine, biology, and computer science. Various of his subjects have an "application perspective". E.g., his work has majorly contributed to overcome fundamental challenges in piezo-acoustic inkjet printing and in lithography and had great bearing on open questions in geophysical fluid dynamics, process technology, diagnostics, and medical technology. He himself laid out the philosophy and characteristics of his work in his very nice general audience review article: Detlef Lohse, "Bubble puzzles: From fundamentals to applications", Phys. Rev. Fluids 3, 110504 (2018) [42 pages].

The length scales covered by his work range from sub-nanometer to astrophysical scales, i.e. basically all length scales of fluid dynamics. This reflects in publications in a huge variety of journals, ranging from the sub-nanoscale such as ACS-Nano and bridging the gap to chemistry with publications in journals like Lab on a Chip (on the microscale) or Chemical Engineering Science (on large scales) up to geophysical and even astrophysical scales, leading to publications in Geophysical Research Letters and Astronomy and Astrophysics. Another cross-section of his work goes from publications in Biophysical Journal and more medical journals like Ultrasound in Medicine & Biology to Journal of Computational Science. Lohse's core journals however have always remained Physical Review Letters (the prime journal in physics) and Journal of Fluid Mechanics (the best journal in fluid dynamics).

Contents-wise, on the macroscale, his most relevant publications and contributions are on turbulence and two-phase flow, and on the micro- and nanoscale on bubble dynamics, single bubble sonoluminescence, surface nanobubbles and surface nanodroplets, and on ink-jet printing. Obviously, various other papers could have been chosen. Note that the ten chosen publications are not necessarily the most cited publications.

Turbulence and two-phase flow

1. Siegfried Grossmann and Detlef Lohse,
   Scaling in thermal convection: A unifying view,
   J. Fluid Mech. 407, 27-56 (2000).
   The paper is the 3rd but most cited J. Fluid Mech. since 2000. The offered theory in this paper has now become the generally accepted theory on thermal convection. However, the ideas of this paper conceptionally go much beyond.

2. Guenter Ahlers, Siegfried Grossmann, and Detlef Lohse,
   Heat transfer and large scale dynamics in turbulent Rayleigh-Bénard convection,
   Rev. Mod. Phys. 81, 503-538 (2009).
   Web of Science identified this paper as "highly cited paper", having received enough citations to place it in the top 1% of papers in its academic field (May 2016). It is the standard reference in the field, cited more than 900 times.

3. Detlef Lohse and Ke-Qing Xia,
   Small-scale properties of turbulent Rayleigh-Bénard convection,
   Annu. Rev. Fluid Mech. 42, 335 - 364 (2010).
   Web of Science identified this paper as "highly cited paper", having received enough citations to place it in the top 1% of papers in its academic field (May 2016).

Single bubble sonoluminescence and bubble dynamics

4. Detlef Lohse, Michael Brenner, Todd F. Dupont, Sascha Hilgenfeldt, and Blaine Johnston,
   Sonoluminescing air bubbles rectify argon,
   Phys. Rev. Lett. 78, 1359-1362 (1997);
   see also:

   – Physics Today 50, Number 8, page 9 (August 1997)

The paper has solved the mystery of stable single bubble sonoluminescence, identifying chemical reactions inside the bubble as essential and thus also the role of Argon to stabilize the bubble.

5. Michel Versluis, Anna von der Heydt, B. Schmitz, and Detlef Lohse,
   How snapping shrimp snap: through cavitating bubbles,
   Science 289, 2114-2117 (2000);
   see also:
   - Kathryn Brown, "For Certain Shrimp, Life's a Snap," "News of the Week", Science 289, 2020-2021 (2000)
   - "Science News" 158 (2000)

   The paper solves the long-standing question on the origin of the sound of snapping shrimp.

6. Michael Brenner, Sascha Hilgenfeldt, and Detlef Lohse,
   Single bubble sonoluminescence,
   Rev. Mod. Phys. 74, 425-484 (2002).
   This paper attracted about 1000 citations and has been the standard review in the field for more than 1.5 decades.

7. Philippe Marmottant, Sander van der Meer, Michel Versluis, Nico de Jong, Sascha Hilgenfeldt, and Detlef Lohse,
   A model for large amplitude oscillations of coated bubbles accounting for buckling and rupture,
   J. Acoust. Soc. Am. 118, 3499-3505 (2005).
   This paper has attracted about 550 citations and is the most cited article of that journal since its publication date.

Surface nanobubbles and surface nanodroplets

8. Detlef Lohse and Xuehua Zhang,
   Surface nanobubbles and nanodroplets,
   Rev. Mod. Phys. 87, 981-1035 (2015);
   see also the Cover of that issue.
   This paper has solved the surface nanobubble mystery and has become the standard reference on the subject. It has already attracted about 350 citations in such a short time. Web of Science identified this paper as "hot paper", having received enough citations to place it in the top 0.1% of papers in its academic field (May 2016); later it was also identified as "highly cited paper".

Impact events

9. Tuan Tran, Hendrik J. J. Staat, Andrea Prosperetti, Chao Sun, and Detlef Lohse,
   Drop impact on superheated surfaces,
   Phys. Rev. Lett. 108, 036101 (2012) [5 pages].
   The paper opened up the new field of the dynamic Leidenfrost effect. Web of Science identified it as "highly cited paper".

Inkjet printing

10. Arjan van der Bos, Mark-Jan van der Meulen, Theo Driessen, Marc van den Berg, Hans Reinten, Herman Wijshoff, Michel Versluis, and Detlef Lohse,
    Velocity profile inside piezoacoustic inkjet droplets in flight: Comparison between experiment and numerical simulation,
    Phys. Rev. Applied 1, 014004 (2014) [9 pages];
    see also:
    - 'Drop everything', 'Nature' Image of the Year 2014, Nature 516, 309 (18/25 December 2014).
    - 'Fast imaging captures falling droplets', Nature Research Highlights, Nature 142 (507), 142 (2014).
    - 'Droplets caught at high speed', by Michael Schirber, Physics 10, 1103 (2014).

Detlef Lohse: List of publications

2019

1. Yaxing Li, Christian Diddens, Pengyu Lv, Herman Wijshoff, Michel Versluis, and Detlef Lohse,
Gravitational effect in evaporating binary microdroplets,
Phys. Rev. Lett. 122, 114501 (2019) [6 pages].

2. Yanshen Li, Chr. Diddens, Andrea Prosperetti, K.L. Chong, Xuehua Zhang, and Detlef Lohse,
A bouncing oil droplet in a stratified liquid and its sudden death,
Phys. Rev. Lett. 122, 154502 (2019) [6 pages];
see also:

   - Nature Research Highlight (25/4/2019), "How a droplet in a tube leaps upward again and again", https://www.nature.com/articles/d41586-019-01302-7
   - Physics, Synopsis: "Drops bounce inside liquids", April 17, 2019; https://physics.aps.org/synopsis-for/10.1103/PhysRevLett.122.154502
   - Katharina Krämer, "Mystery of bouncing droplet that drops dead solved", Chemistry World, 26.4.2019.

3. Xiaojue Zhu, Varghese Mathai, R.J.A.M. Stevens, Roberto Verzicco, and Detlef Lohse,
Reply on a comment on "Transition to the ultimate regime in two-dimensional Rayleigh-Bénard convection",
Phys. Rev. Lett. 123, in press (2019).

4. Anaïs Gauthier, Christian Diddens, Rémi Provillec, Detlef Lohse, and Devaraj van der Meer,
Inverse Leidenfrost effect: self-propelled drops gliding on a cold bath,
Proc. Nat. Acad. Sci. 116, 1174-1179 (2019).

5. Sijija Lyu, Vargese Mathai, Yujij Wang, B. Sobac, Pierre Colinet, Detlef Lohse, and Chao Sun,
Final fate of a Leidenfrost droplet: Explosion or takeoff,
Science Advances 5, eaav8081 (2019);
see also "The final fate of Leidenfrost droplets", Science News, May 6, 2019.

6. Huanshu Tan, Sanghyuk Wooh, Hans-Jürgen Butt, Xuehua Zhang, and Detlef Lohse,
Porous supraparticle assembly through self-lubricating evaporating colloidal ouzo drops,
Nature Communications 10, 478 (2019) [8 pages].

7. Maziyar Jalaal, Dave Kemper, and Detlef Lohse,
Viscoplastic water entry,
J. Fluid Mech. 864, 596-613 (2019).

8. Xiaojue Zhu, Richard J. A. M. Stevens, Olga Shishkina, Roberto Verzicco, and Detlef Lohse,
$Nu \sim Ra^{1/2}$ scaling enabled by multi-scale wall roughness in Rayleigh-Bénard turbulence,
J. Fluid Mech. 869, R4 (2019) [13 pages];
see also:

   - Ke-Qing Xia, Focus on Fluids, "Tuning heat transport via boundary layer topographies", J. Fluid Mech. 876, 1-4 (2019).

9. Huanshu Tan, Christian Diddens, Ali Akash Mohammed, Junyi Li, Michel Versluis, Xuehua Zhang, and Detlef Lohse,
Microdroplets nucleation by dissolution of a multicomponent drop in a host liquid,
J. Fluid Mech. 870, 217-246 (2019).

10. Alvaro Moreno-Soto, O. Enriquez, Andrea Prosperetti, Detlef Lohse, and Devaraj van der Meer,
Transition to convection in single bubble diffusive growth,
J. Fluid Mech. 871, 332-349 (2019).

11. Pieter Berghout, Xiaojue Zhu, D. Chung, Roberto Verzicco, R.J.A.M. Stevens, and Detlef Lohse,
Direct numerical simulations of Taylor-Couette turbulence: the effect of sand grain roughness,
J. Fluid Mech. 873, 260-286 (2019).

12. Hechuan Jiang, Xiaojue Zhu, Varghese Mathai, Xianjun Yang, Roberto Verzicco, Detlef Lohse, and Chao Sun,
Convective heat transfer along ratchet surfaces in vertical convection,
J. Fluid Mech. 873, 1055-1071 (2019).

13. Andreas Froitzheim, Rodrigo Ezeta, Sebastian Merbold, Sander G. Huisman, Chao Sun, Detlef Lohse, and Christoph Egbers,
Small-scale statistics of momentum transport and underlying large-scale flow structures in turbulent Taylor-Couette flow,
J. Fluid Mech. 876, 733-765 (2019).

14. Maziyar Jalaal, Martin Klein Schaarsberg, Claas-Willem Visser, and Detlef Lohse,
Laser-induced forward transfer of viscoplastic fluids,
J. Fluid Mech. 880, 497-513 (2019).

15. Rodrigo Ezeta, Dennis Bakhuis, Sander G. Huisman, Chao Sun, and Detlef Lohse,
Drag reduction in boiling Taylor-Couette turbulence,
J. Fluid Mech. 881, 104-118 (2019).

16. Zhen-Hua Wan, Ping Wei, Roberto Verzicco, Detlef Lohse, Guenter Ahlers, and Richard J. A. M. Stevens,
Effect of sidewall on heat transfer and flow structure in RayleighBnard convection,
J. Fluid Mech. 881, 218-243 (2019).

17. Alvaro Moreno Soto, Detlef Lohse, and Devaraj van der Meer,
Diffusive growth of successive bubbles in confinement,
J. Fluid Mech. 882, A6 (2020) [17 pages].

18. Dennis Bakhuis, Rodrigo Ezeta, Pieter Berghout, Pim A. Bullee, Dominic Tai, Daniel Chung, Roberto Verzicco, Detlef Lohse, Sander G. Huisman, and Chao Sun,
Controlling secondary flow in Taylor-Couette turbulence through spanwise-varying roughness,
J. Fluid Mech. 882, A15 (2020) [23 pages].

19. Marise V. Gielen, Riëlle de Ruiter, Robin B. Koldeweij, Detlef Lohse, Jacco H. Snoeijer, and Hanneke Gelderblom,
Solidification of liquid metal drops during impact,
J. Fluid Mech. 883, A32 (2020) [20 pages].

20. Pim A. Bullee, Ruben A. Verschoof, Dennis Bakhuis, Sander G. Huisman, Chao Sun, Rob G. H. Lammertink, and Detlef Lohse,
Bubbly drag reduction using a superhydrophobic inner cylinder in Taylor-Couette turbulence,
J. Fluid Mech. 883, A61 (2020) [24 pages].

21. Dennis Bakhuis, Varghese Mathai, Ruben A. Verschoof, Rodrigo Ezeta, Detlef Lohse, Sander Huisman, and Chao Sun,
Statistics of rigid fibers in strongly sheared turbulence,
Phys. Rev. Fluids 4, 072301(R) (2019) [9 pages];
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22. Michael MacDonald, Nicholas Hutchins, Detlef Lohse, and Daniel Chung,
Heat transfer in rough-wall turbulent thermal convection in the ultimate regime,
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23. Kim M. J. Alards, Rudie P. J. Kunnen, Richard J. A. M. Stevens, Detlef Lohse, Federico Toschi, and Herman J. H. Clercx,
Sharp transitions in rotating turbulent convection: Lagrangian acceleration statistics reveal a second critical Rossby number,
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24. Arjan Fraters, Marc van den Berg, Youri de Loore, Hans Reinten, Herman Wijshoff, Detlef Lohse, Michel Versluis, and Tim Segers,
Inkjet nozzle failure by heterogeneous nucleation: bubble entrainment, cavitation, and diffusive growth,
Phys. Rev. Applied 12, in press (2019) [9 pages];
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25. Utkarsh Jain, Maziyar Jalaal, Detlef Lohse, and Devaraj van der Meer,
Deep pool water-impacts of viscous oil droplets,
Soft Matter 15, 4629-4638 (2019); see also the Cover of that issue.

26. Haitao Yu, Pallav Kant, Brendan Dyett, Detlef Lohse, and Xuehua Zhang,
Splitting droplets through coalescence of two different three-phase contact lines,
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28. Jose M. Encarnacion Escobar, D. Garcia-Gonzalez , I. Devic, Xuehua Zhang, and Detlef Lohse,
Morphology of evaporating sessile microdroplets on lyophilic elliptical patches,
Langmuir 35, 2099-2105 (2019).

29. Ivan Devic, Jose M. Encarnacion Escobar, and Detlef Lohse,
Equilibrium drop shapes on a tilted substrate with a chemical step,
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30. Wojciech Kwiecinski, Tim Segers, Sjoerd van der Werf, Arie van Houselt, Detlef Lohse, Harold J. W. Zandvliet, and Stefan Kooij,
Evaporation of dilute sodium dodecyl sulfate droplets on a hydrophobic substrate,
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31. Binglin Zeng, Yuliang Wang, Xuehua Zhang, and Detlef Lohse,
Solvent exchange in a Hele-Shaw cell: Universality of surface nanodroplet nucleation,
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32. Xiaolai Li, Yuliang Wang, Mikhail E. Zaytsev, Guillaume Lajoinie, Hai Le The, Johan G. Bomer, Jan C. T. Eijkel, Harold J. W. Zandvliet, Xuehua Zhang, and Detlef Lohse,
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J. Phys. Chem. C 123, 23586-23593 (2019).

33. Maziyar Jalaal, Shuai Li, Martin Klein Schaarsberg, Yigong Qin, and Detlef Lohse,
Destructive mechanisms in laser induced forward transfer,
Appl. Phys. Lett. 114, 213703 (2019) [6 pages].

34. Biljana Gvozdic, On-Yu Dung, Dennis P. M. van Gils, Gert-Wim H. Bruggert, Chao Sun, Detlef Lohse, and Sander G. Huisman,
Twente mass and heat transfer water tunnel: Temperature controlled turbulent multiphase channel flow with heat and mass transfer,
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35. Elise Almerasa, Varghese Mathai, Chao Sun, Detlef Lohse,
Mixing induced by a bubble swarm rising through incident turbulence,
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36. Robin G. Geitenbeek, Jeroen C. Vollenbroek, Hannah M. H. Weijgertze, Corentin B. M. Tregouet, Anne-Eva Nieuwelink, Chris L. Kennedy, Bert M. Weckhuysen, Detlef Lohse, Alfons van Blaaderen, Albert van den Berg, Mathieu Odijk, and Andries Meijerink,
Luminescence thermometry for in situ temperature measurements in microfluidic devices,
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37. Arjan Fraters, Tim Segers, Marc van den Berg, Hans Reinten, Herman Wijshoff, Detlef Lohse, and Michel Versluis,
Shortwave infrared imaging setup to study entrained air bubble dynamics in a MEMS?based piezo?acoustic inkjet printhead,
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J. Electrochem. Soc. 166, E280-E285 (2019).

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40. Jiangtao Lu, Xiaojue Zhu, E.A.J.F. Peters, Roberto Verzicco, Detlef Lohse, and J.A.M. Kuipers,
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    https://m.phys.org/news/2018-02-d-cells.html
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51. Shantanu Maheshwari, Martin van der Hoef, Javier Rodriguez-Rodriguez, and Detlef Lohse,
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