Soft Matter

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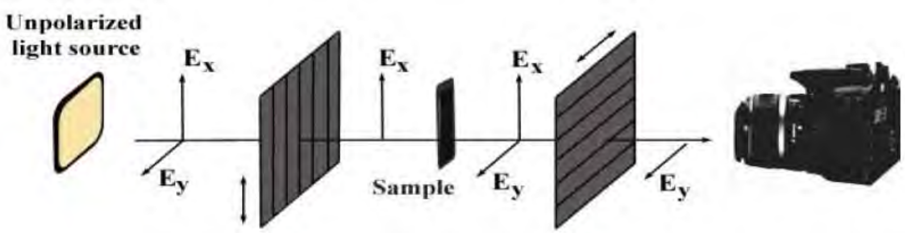
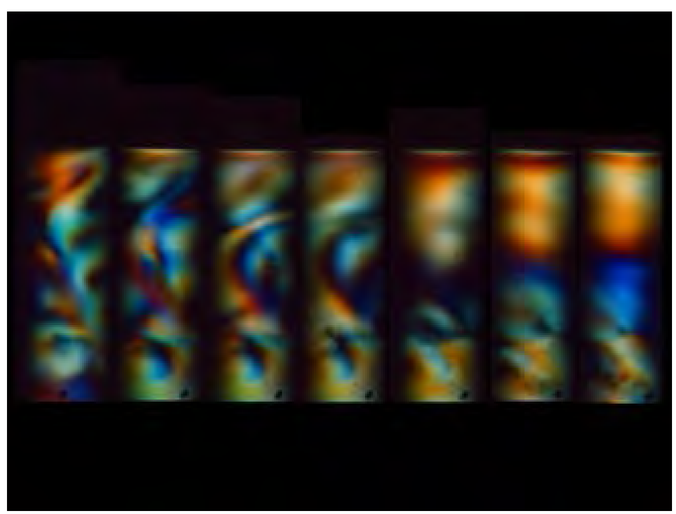
Orientational order in a glass of charged platelets with a concentration gradient

Cite this: *Soft Matter*, 2013, **9**, 9999

Elisabeth Lindbo Hansen,*[a] Sara Jabbari-Farouji,[b] Henrik Mauroy,[c] Tomás S. Plivelic,[d] Daniel Bonn[e] and Jon Otto Fossum[a]





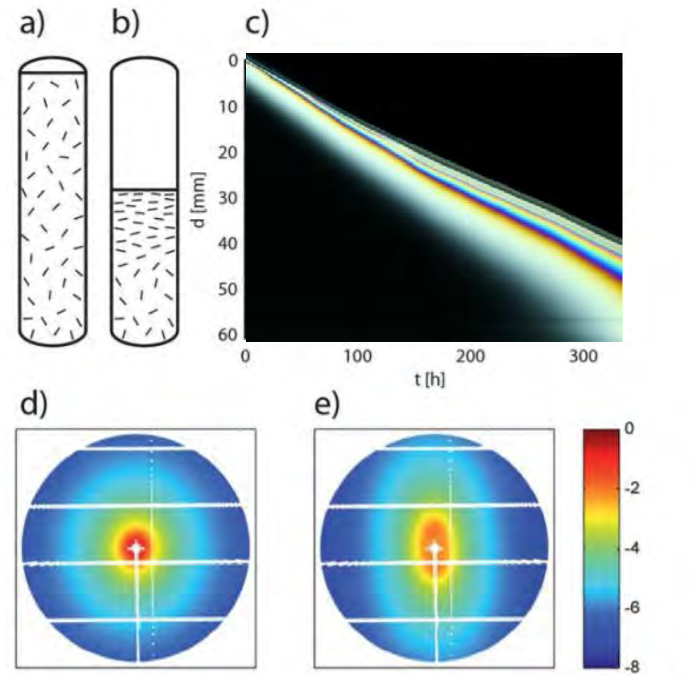
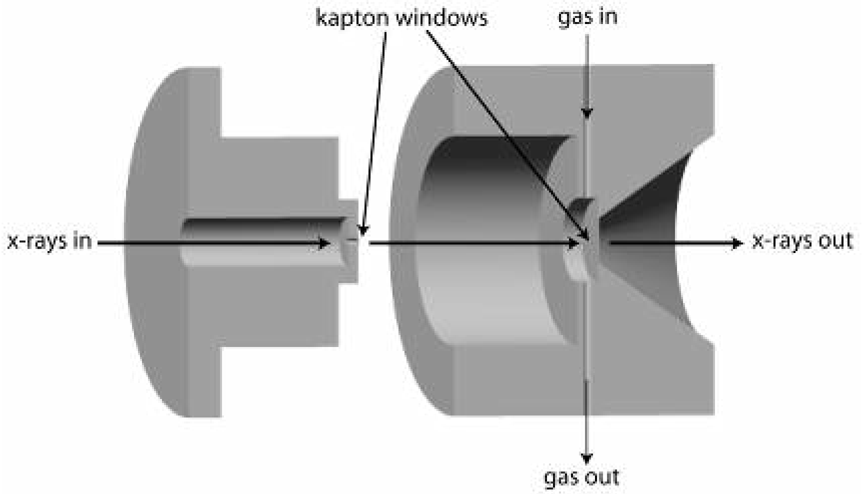
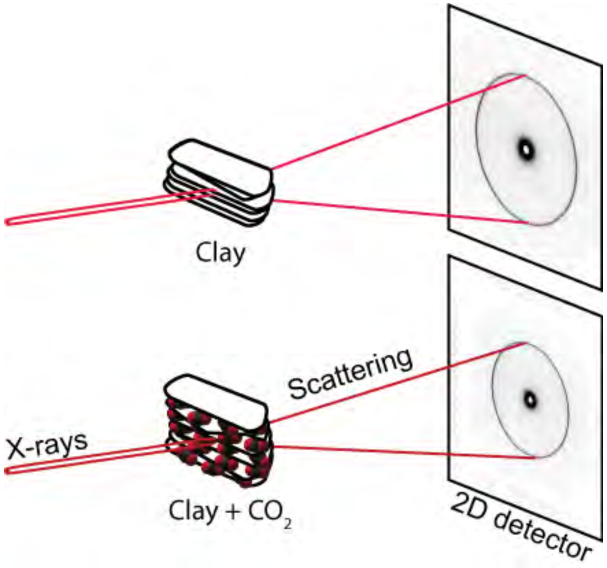


Fig. 2 a) Schematic of the structure of an isotropic Laponite glass and (b) of a Laponite glass with evaporation-induced orientational order. (c) A spatio-temporal plot of developing birefringence in an evaporating $C_w = 3.0$ wt% LRD sample, showing the central part of a capillary imaged at successive waiting times. Crossed linear polarizers were oriented at 45 deg with the vertical capillary axis. The thickness of the sample was $l = 2.65$ nm, so that 4[th] order magenta, appearing at the interface near the end of this time series, implies a $\Delta n = 8.3 \times 10^{-4}$. (d) SAXS pattern collected from the sample imaged in (c) at a distance of 10 mm from the interface, at the end of the time series, and (e) just below the interface.

Nano-scale tools:
AFM, Small-Angle X-ray Scattering: SAXS, etc.



Home made sample cell



X-ray synchrotron sources that we have used recently:

ESRF – Grenoble, France
LNLS – Campinas, Brasil
MaxIV Lab. – Lund, Sweden
PLS – Pohang, S-Korea
(In the past: BNL; APS – USA)
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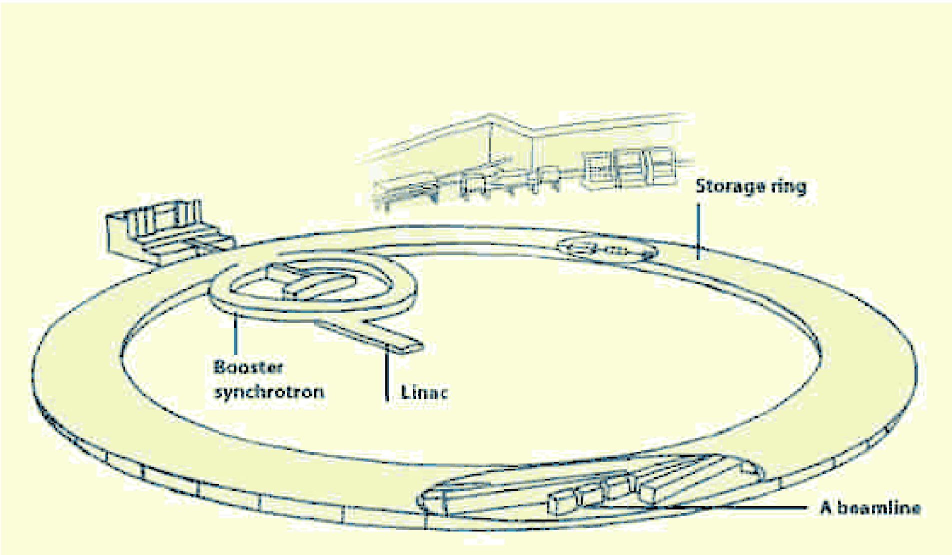
Neutrons in Norway:

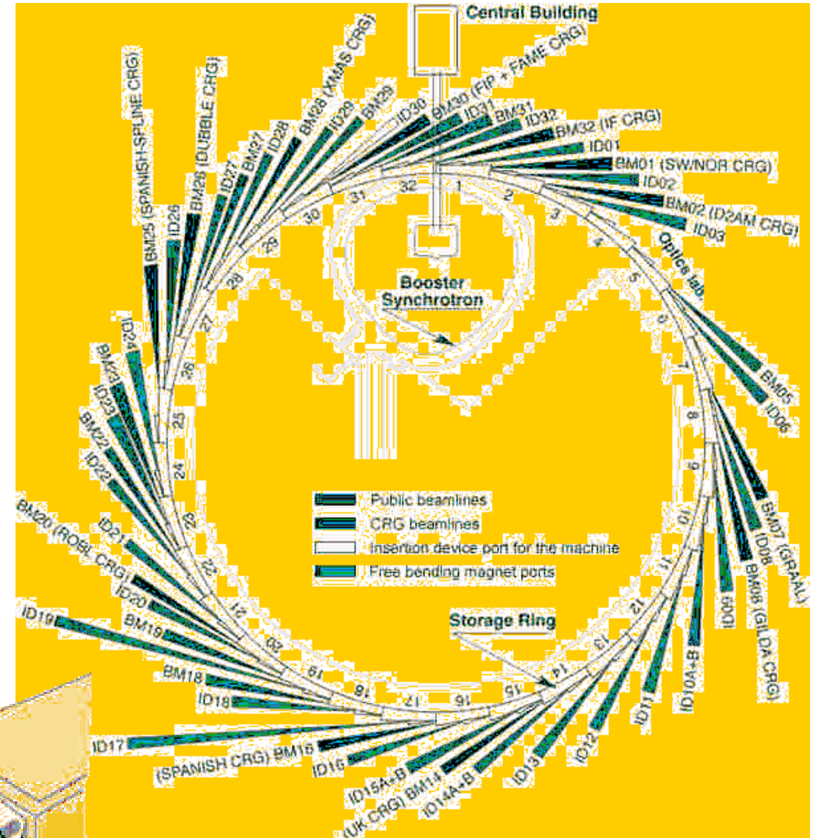
IFE – Kjeller, Norway

Jeep II reactor:

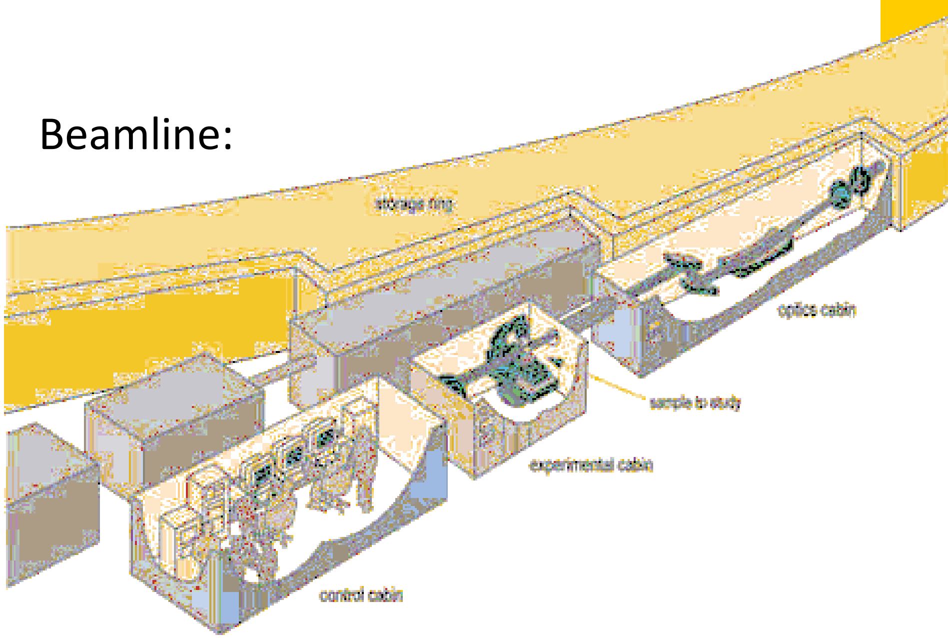
SANS at IFE:

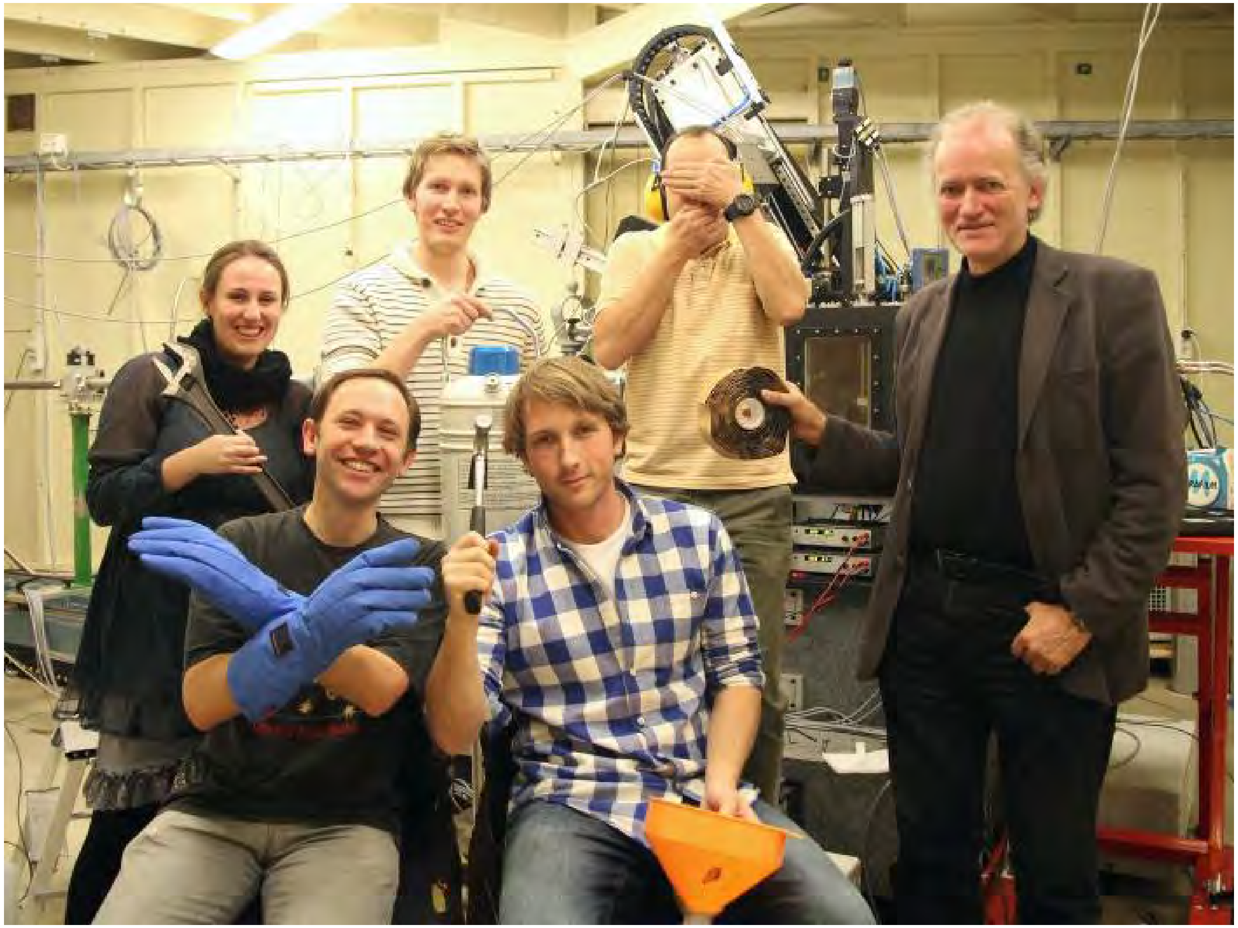
X-ray synchrotron sources:





Beamline:





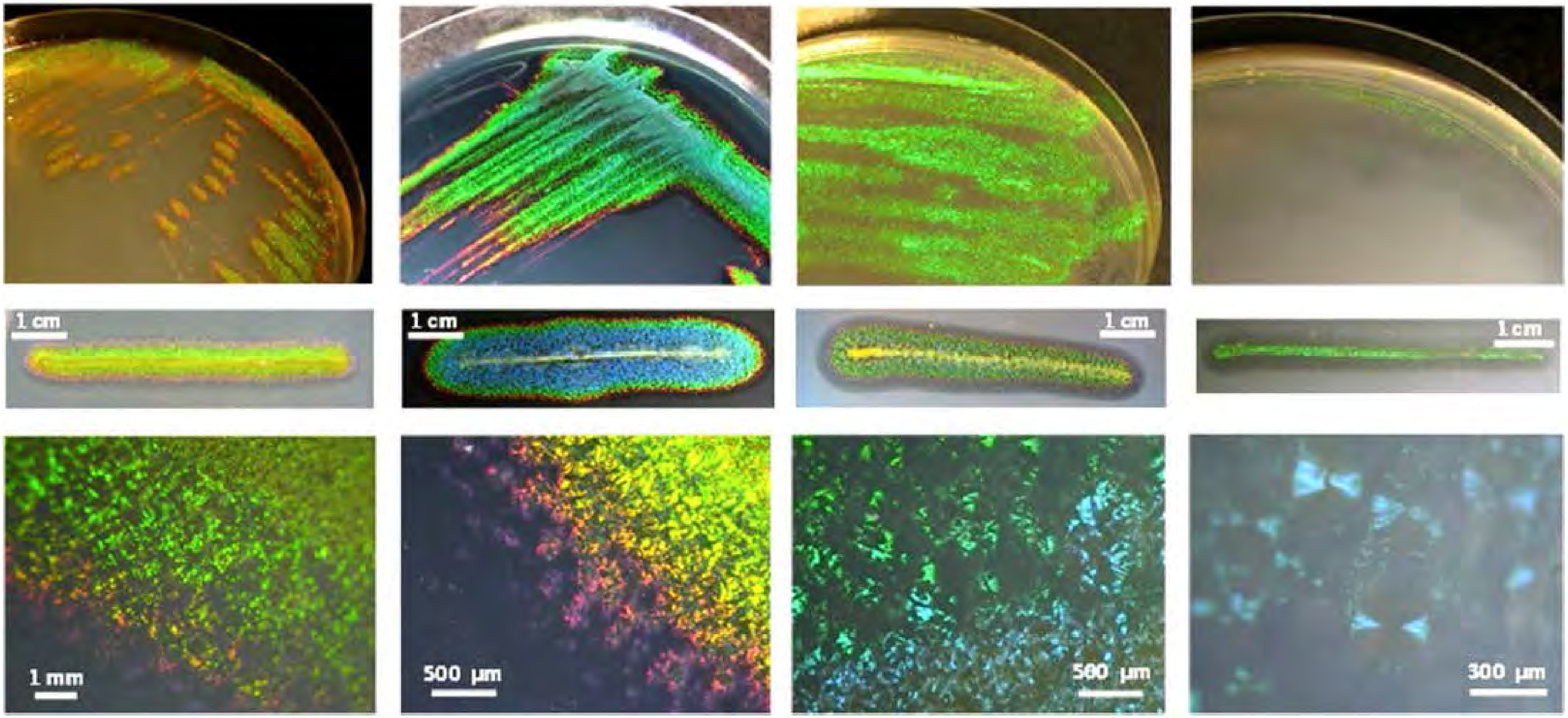
Elisabeth Erlend Davi

Tomás Henrik Jon Otto

Karin

Leander

Zbigniew



SCIENTIFIC REPORTS

OPEN

A unique self-organization of bacterial sub-communities creates iridescence in *Cellulophaga lytica* colony biofilms

Received: 30 July 2015
Accepted: 17 December 2015
Published: 28 January 2016

Betty Kientz[1,*], Stephen Luke[2], Peter Vukusic[2,*], Renaud Péteri[3,*], Cyrille Beaudry[3], Tristan Renault[4], David Simon[3], Tâm Mignot[5] & Eric Rosenfeld[1,*]




Flocking and swarming

Selected for a Viewpoint in *Physics*
PRL **110,** 228102 (2013) PHYSICAL REVIEW LETTERS week ending 31 MAY 2013

Fluid Dynamics of Bacterial Turbulence

Jörn Dunkel,[1] Sebastian Heidenreich,[2] Knut Drescher,[3] Henricus H. Wensink,[4] Markus Bär,[2] and Raymond E. Goldstein[1]

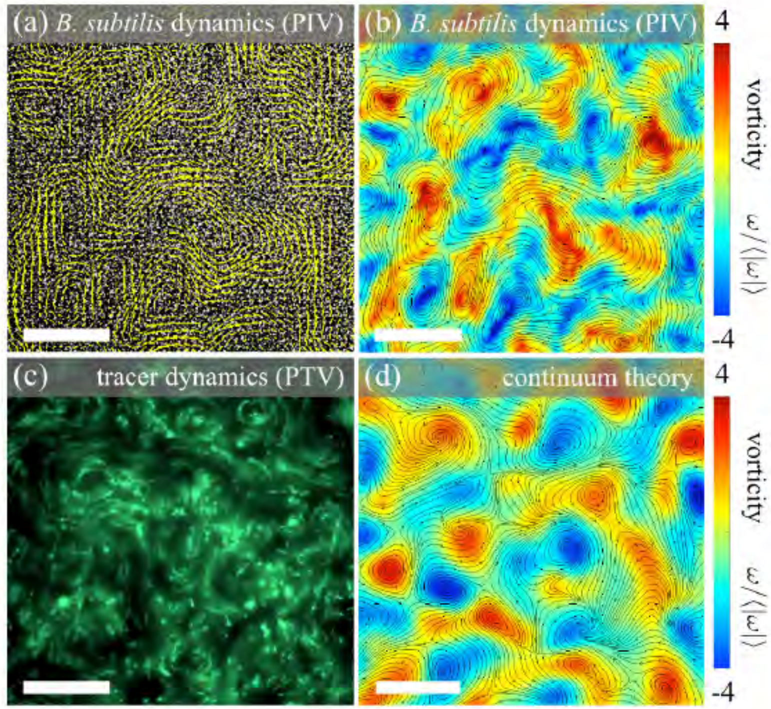


FIG. 1 (color online). Flow fields from experiments and simulations [38]. (a) Very dense homogeneous suspension of *B. subtilis* overlaid with the PIV flow field showing collective bacterial dynamics. Longest arrows correspond to velocity of 30 μm/s. (b) Streamlines and normalized vorticity field determined from PIV data in (a). (c) Turbulent "Lagrangian" flow of fluorescent tracer particles (false-color) in the same suspension, obtained by integrating emission signals over 1.5 s. (d) Partial snapshot of a 2D slice from a 3D simulation of the continuum model (parameters in Table I). Scale bars 70 μm.

Selected for a Viewpoint in *Physics*
PRL **110,** 228102 (2013) PHYSICAL REVIEW LETTERS week ending 31 MAY 2013

Fluid Dynamics of Bacterial Turbulence

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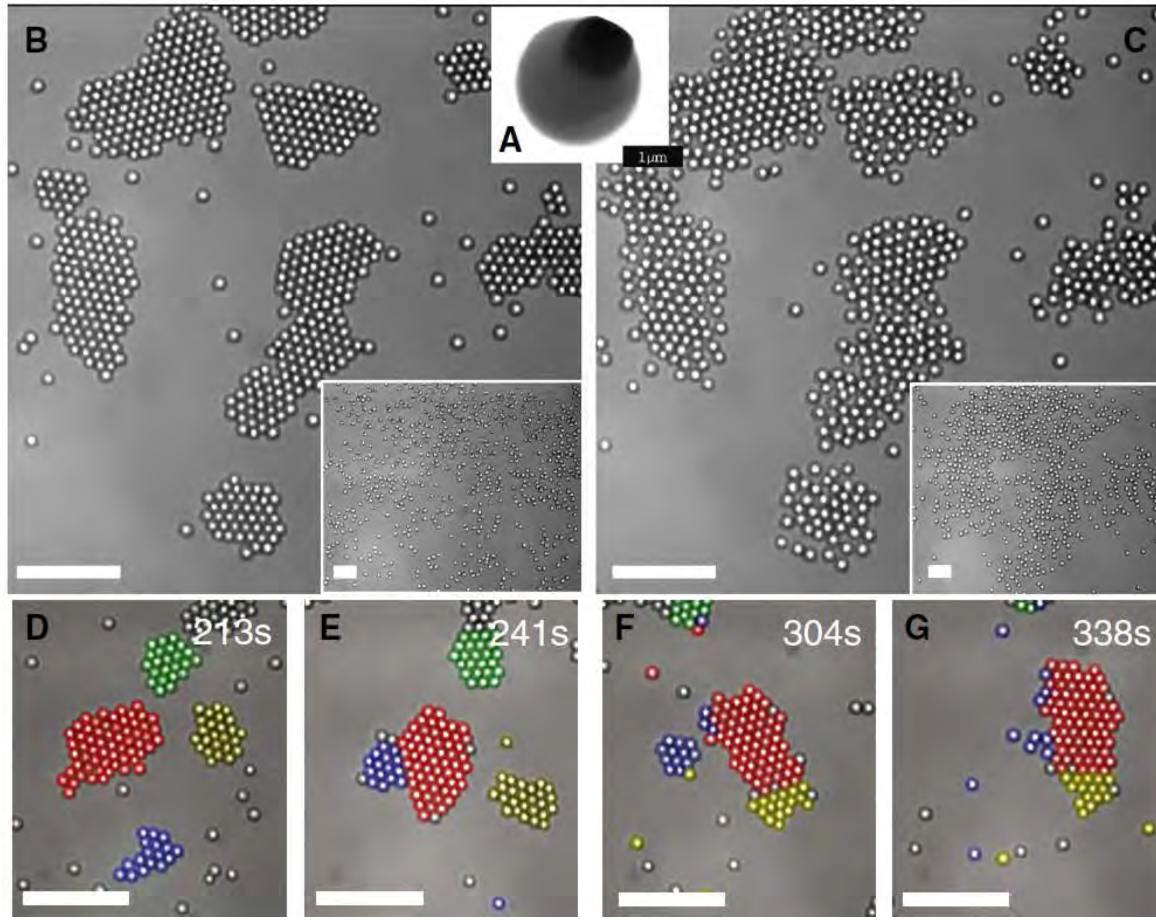
Science
AAAS

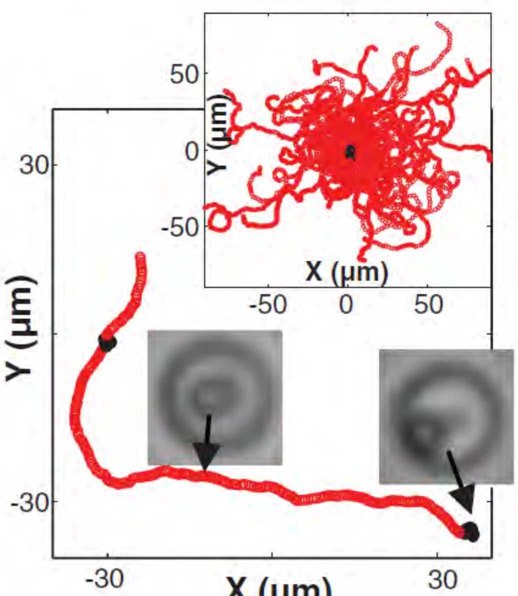
Living Crystals of Light-Activated Colloidal Surfers

Jeremie Palacci *et al.*

Science **339**, 936 (2013);
DOI: 10.1126/science.1230020

Fig. 1. (**A**) Scanning electron microscopy (SEM) of the bimaterial colloid: a TPM polymer colloidal sphere with protruding hematite cube (dark). (**B**) Living crystals assembled from a homogeneous distribution (inset) under illumination by blue light. (**C**) Living crystals melt by thermal diffusion when light is extinguished: Image shows system 10 s after blue light is turned off (inset, after 100 s). (**D** to **G**) The false colors show the time evolution of particles belonging to different clusters. The clusters are not static but rearrange, exchange particles, merge (D→F), break apart (E→F), or become unstable and explode (blue cluster, F→G). For (B) to (G), the scale bars indicate 10 μm. The solid area fraction is $\Phi_s \approx 0.14$.





A hematite cube protruding from a TPM polymer spheremoves on fixed glass substrate when exposed to blue light (red part of trace) and diffuses when the light is off (black part of trace). Initially, with no light, the hematite cube is oriented randomly (image, right) but rotates and faces downward toward the glass substrate when the light is turned on (image, left). The particle then surfs on the osmotic flow it induces between the substrate and itself. (Inset) A superposition of the trajectories of many particles with their origins aligned.

Living Crystals of Light-Activated Colloidal Surfers

Jeremie Palacci *et al.*
Science **339**, 936 (2013);
DOI: 10.1126/science.1230020

Phoretic and osmotic effects can conveniently be switched on and off by light.


1896. ANNALEN № 11.

der

PHYSIK UND CHEMIE.

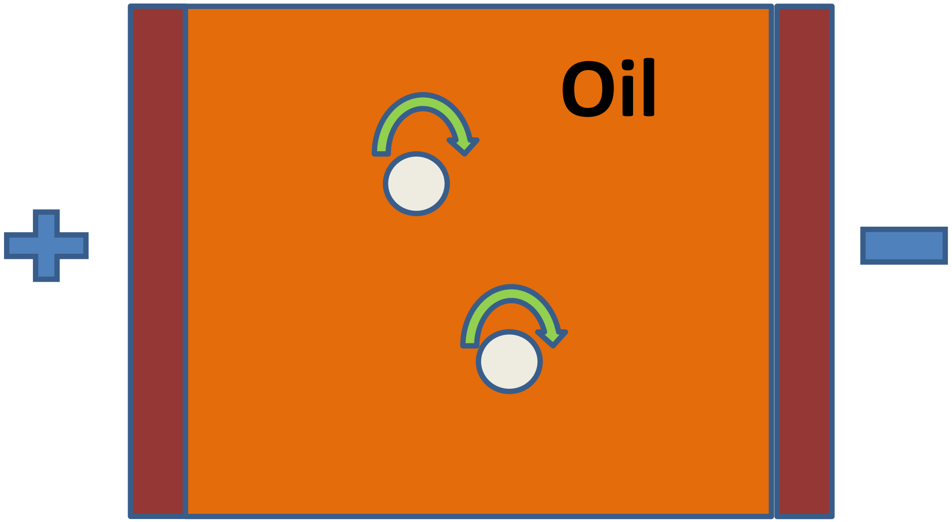
NEUE FOLGE. BAND 59.

1. Ueber Rotationen im constanten electrischen Felde; von G. Quincke.

Quincke rotation

Georg Hermann Quincke

Born	19 November 1834 Frankfurt (Oder)
Died	13 January 1924 (aged 89) Heidelberg
Nationality	German
Fields	Physics
Doctoral advisor	H. G. Magnus, F. E. Neumann
Doctoral students	K. F. Braun, P. Lenard

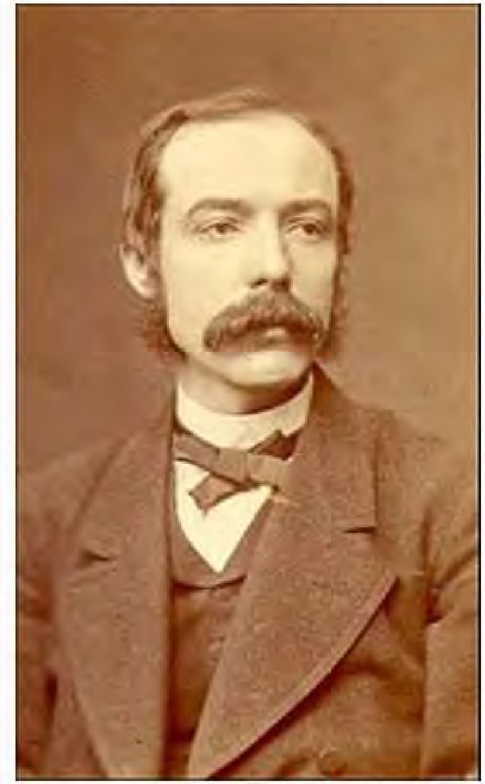


Small glass beads rotate spontaneously when immersed in liquids and subject to an electrostatic field

1. Threshold electric field
2. Rotation axis normal to the applied E-field

Quincke rotation

Georg Hermann Quincke



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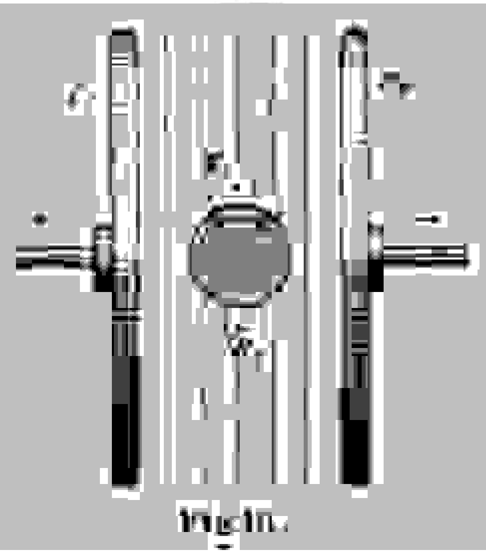
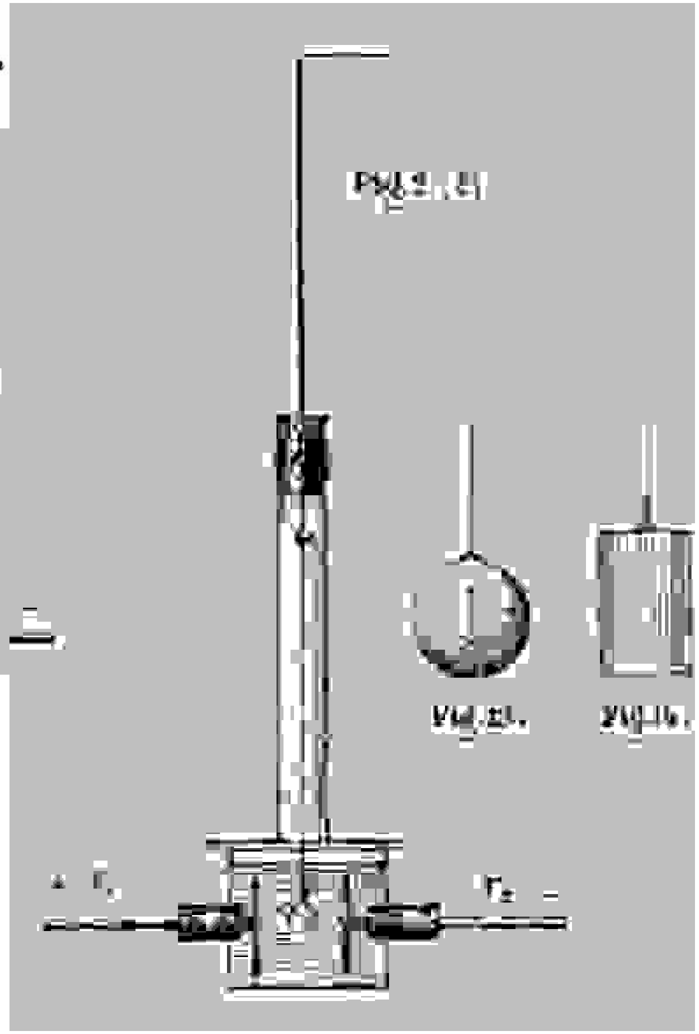
1896. ANNALEN DER PHYSIK UND CHEMIE. № 11.
NEUE FOLGE. BAND 59.

1. *Ueber Rotationen im constanten electrischen Felde; von G. Quincke.*[1])
(Hierzu Taf. V u. VI Fig. 1—38.)





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Doctoral students	K. F. Braun, P. Lenard

PHYSICAL REVIEW E 87, 043014 (2013)

Electrohydrodynamic interaction of spherical particles under Quincke rotation

Debasish Das and David Saintillan*
Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801, USA
(Received 3 March 2013; published 29 April 2013)

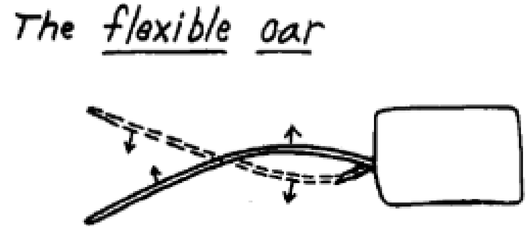
Interaction of Quincke rotating beads

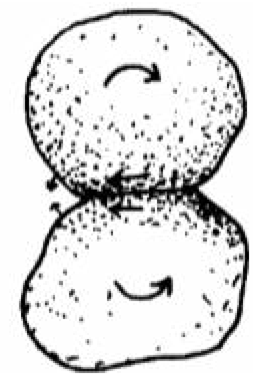
Life at low Reynolds number

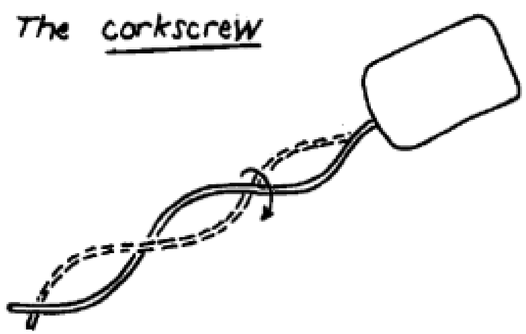
American Journal of Physics, Vol. 45, No. 1, January 1977

E. M. Purcell
Lyman Laboratory, Harvard University, Cambridge, Massachusetts 02138
(Received 12 June 1976)

Another animal might consist of two cells which were stuck together and were able to roll on one another by having some kind of attraction here while releasing there. That thing will "roll" along.







Counter-rotating rotors

Swimmers

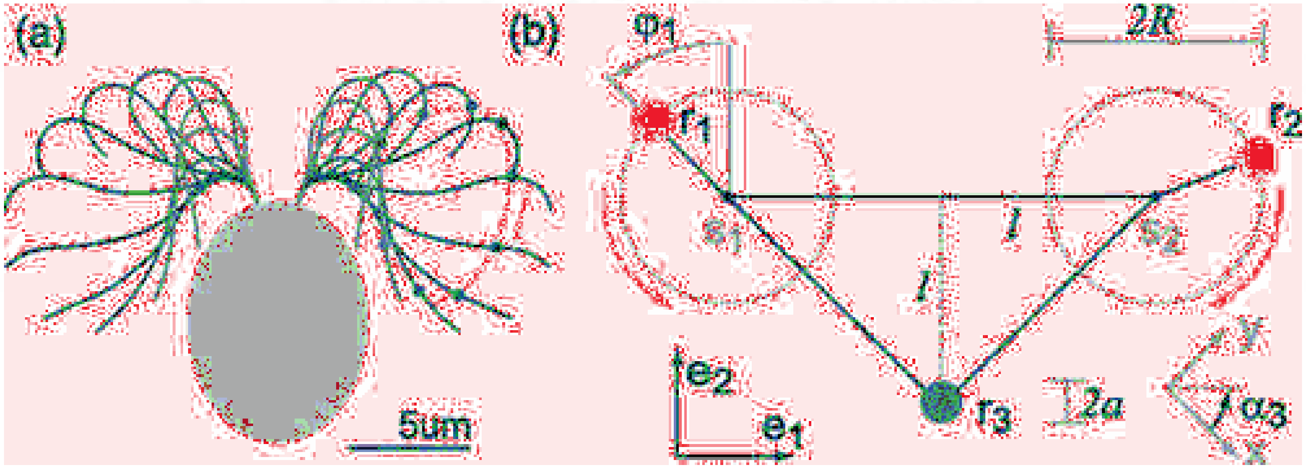
Chlamydomonas is a single-cell green alga about 10 micrometres in diameter that swims with two flagella.

Two-rotor bifilament swimmer: Chlamydomonas

Selected for a Viewpoint in *Physics*
PRL **109**, 138102 (2012) PHYSICAL REVIEW LETTERS week ending 28 SEPTEMBER 2012

Flagellar Synchronization Independent of Hydrodynamic Interactions

Benjamin M. Friedrich* and Frank Jülicher
Max Planck Institute for the Physics of Complex Systems, Nöthnitzer Straße 38, 01187 Dresden, Germany
(Received 7 June 2012; published 24 September 2012)



New Journal of Physics
The open access journal for physics

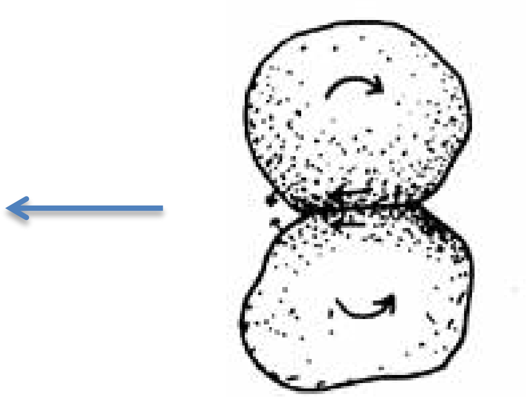
Phase-dependent forcing and synchronization in the three-sphere model of *Chlamydomonas*

Rachel R Bennett and Ramin Golestanian[1]
Rudolf Peierls Center for Theoretical Physics, University of Oxford, Oxford OX1 3NP, UK
E-mail: ramin.golestanian@physics.ox.ac.uk

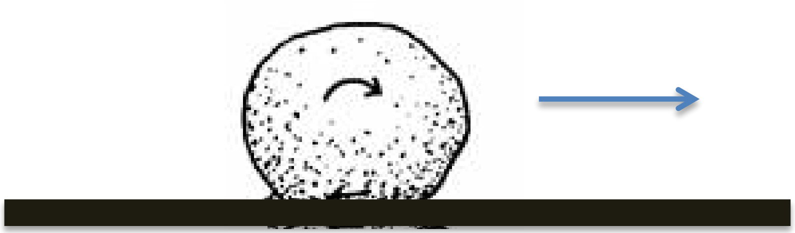
New Journal of Physics **15** (2013) 075028 (17pp)
Received 10 April 2013
Published 30 July 2013
Online at http://www.njp.org/
doi:10.1088/1367-2630/15/7/075028

Two-rotor model of bifilament swimmer

Pair rollers



Surface roller



Kicking off one another, or kicking of a surface

NATURE | LETTER

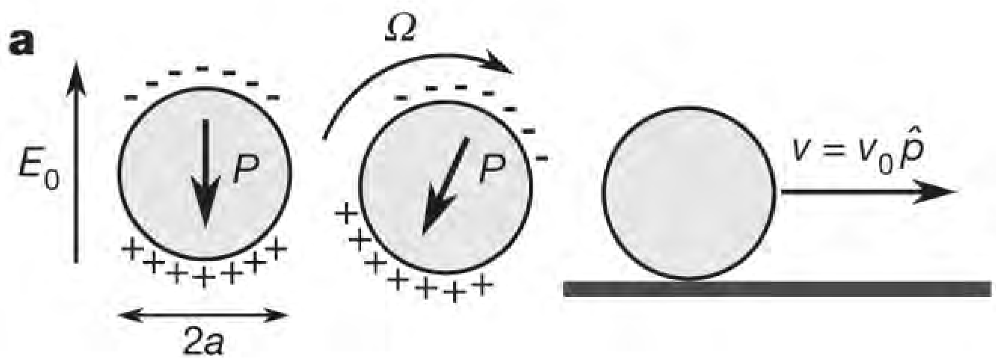
日本語要約

Emergence of macroscopic directed motion in populations of motile colloids

Antoine Bricard, Jean-Baptiste Caussin, Nicolas Desreumaux, Olivier Dauchot & Denis Bartolo

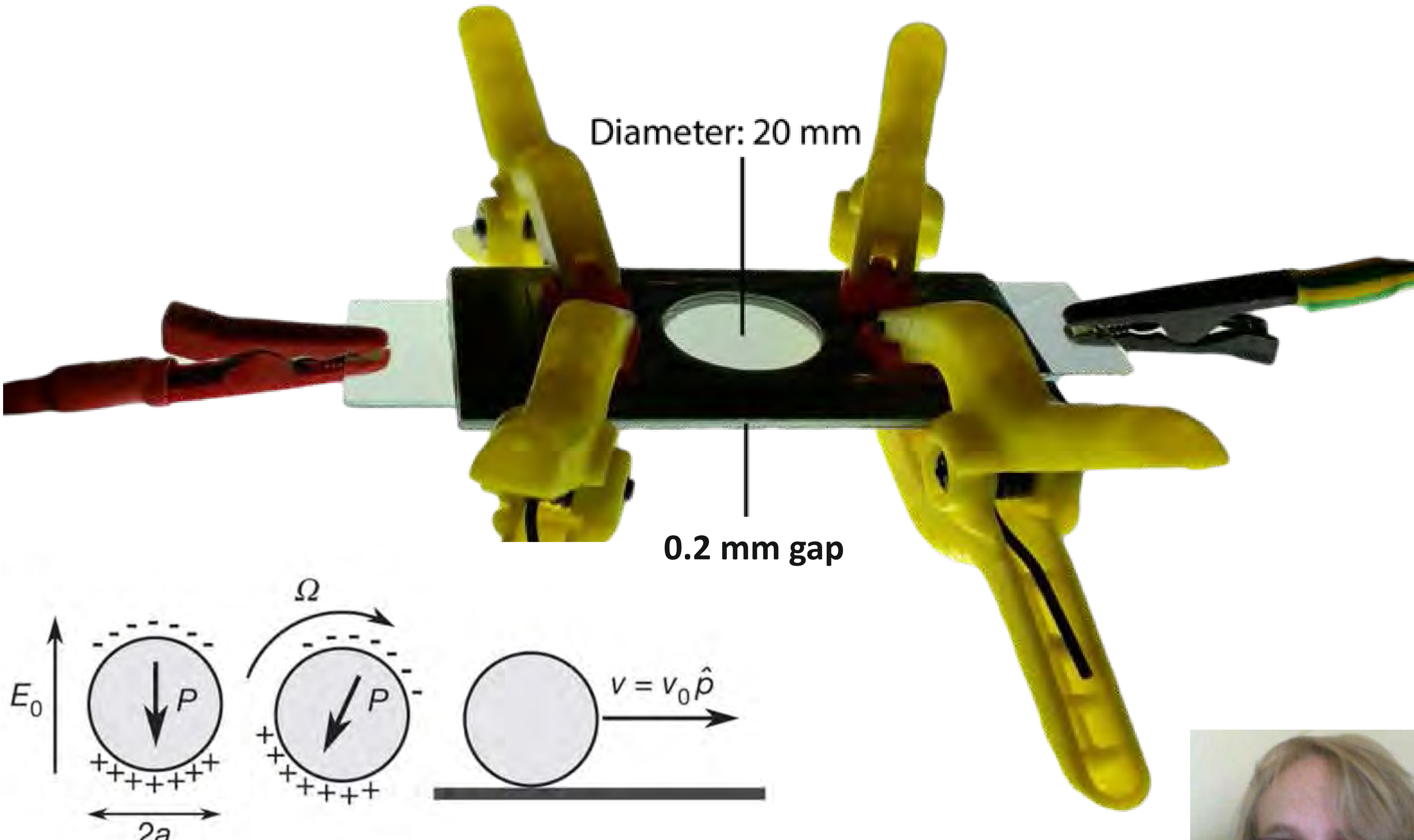
Affiliations | Contributions | Corresponding author

Nature **503**, 95–98 (07 November 2013) | doi:10.1038/nature12673
Received 17 May 2013 | Accepted 12 September 2013 | Published online 06 November 2013



Quincke rotating spheres interact and self-organize:

Hele-Shaw cell with ITO glass covers: suspension containg 30micron PS beads



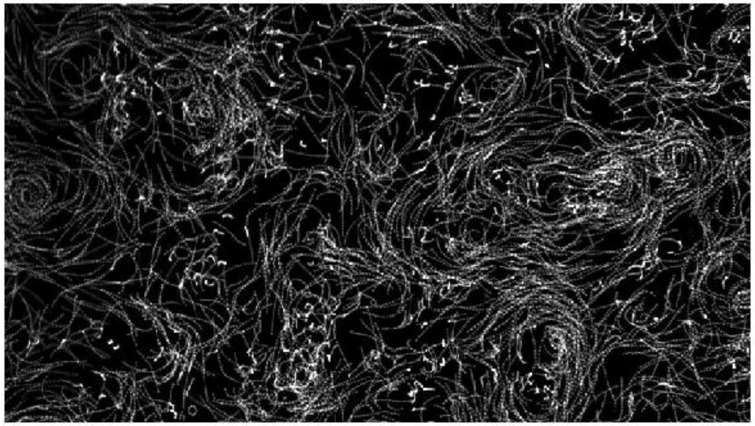
Experiments at NTNU Trondheim: Tommy Kristiansen

40μm 2250V/mm

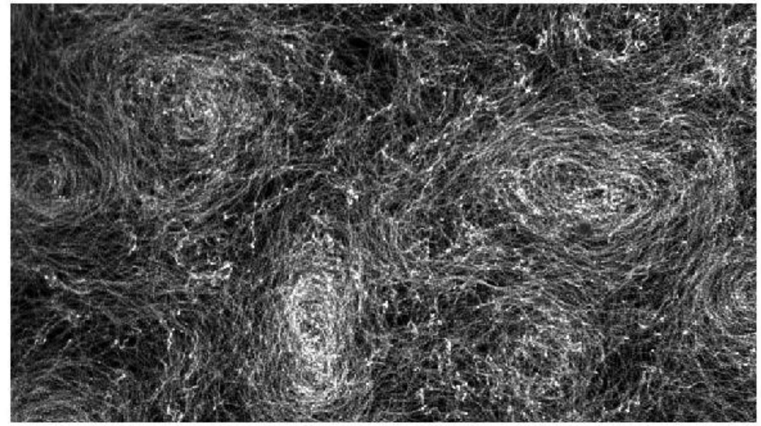
Fast moving quincke rollers

Streak photography night sky

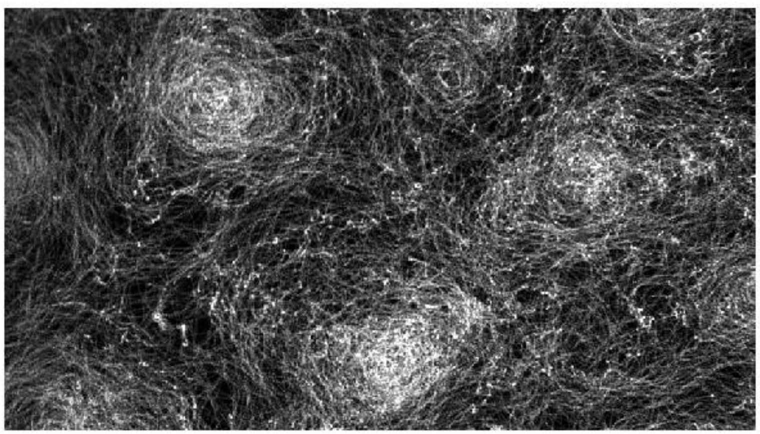
Streak photos of fast moving Quincke rollers: «Vortices»



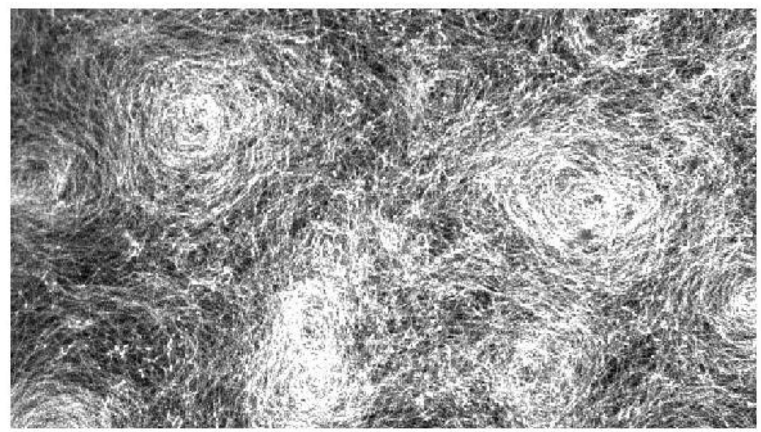
15 frames after 0 secs



100 frames after 3 secs



100 frames after 6 secs

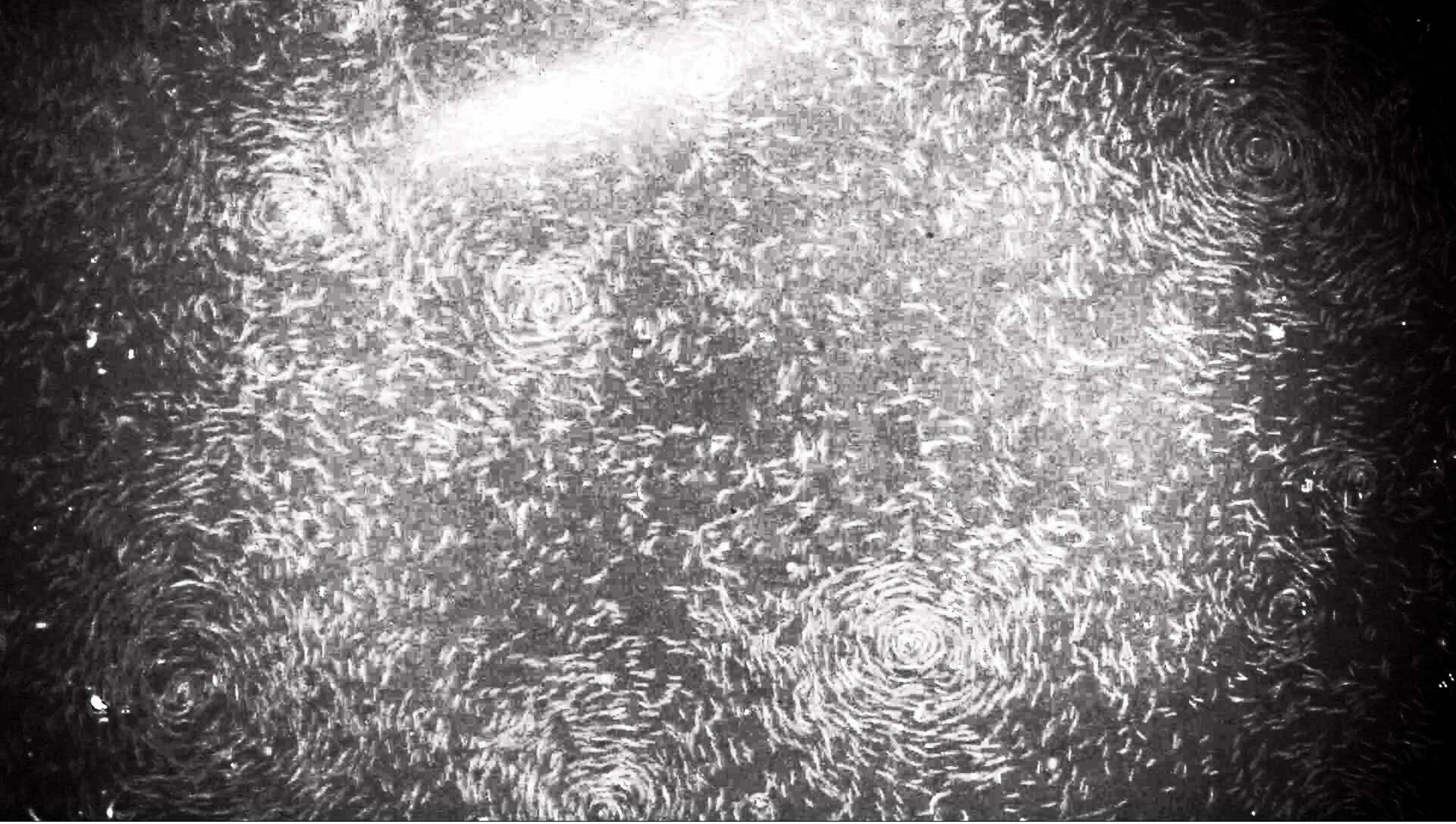


100 frames after 9 secs

Experiments at NTNU Trondheim: Tommy Kristiansen

30μm 1750V/mm

Zooming out: Fast moving quincke rollers



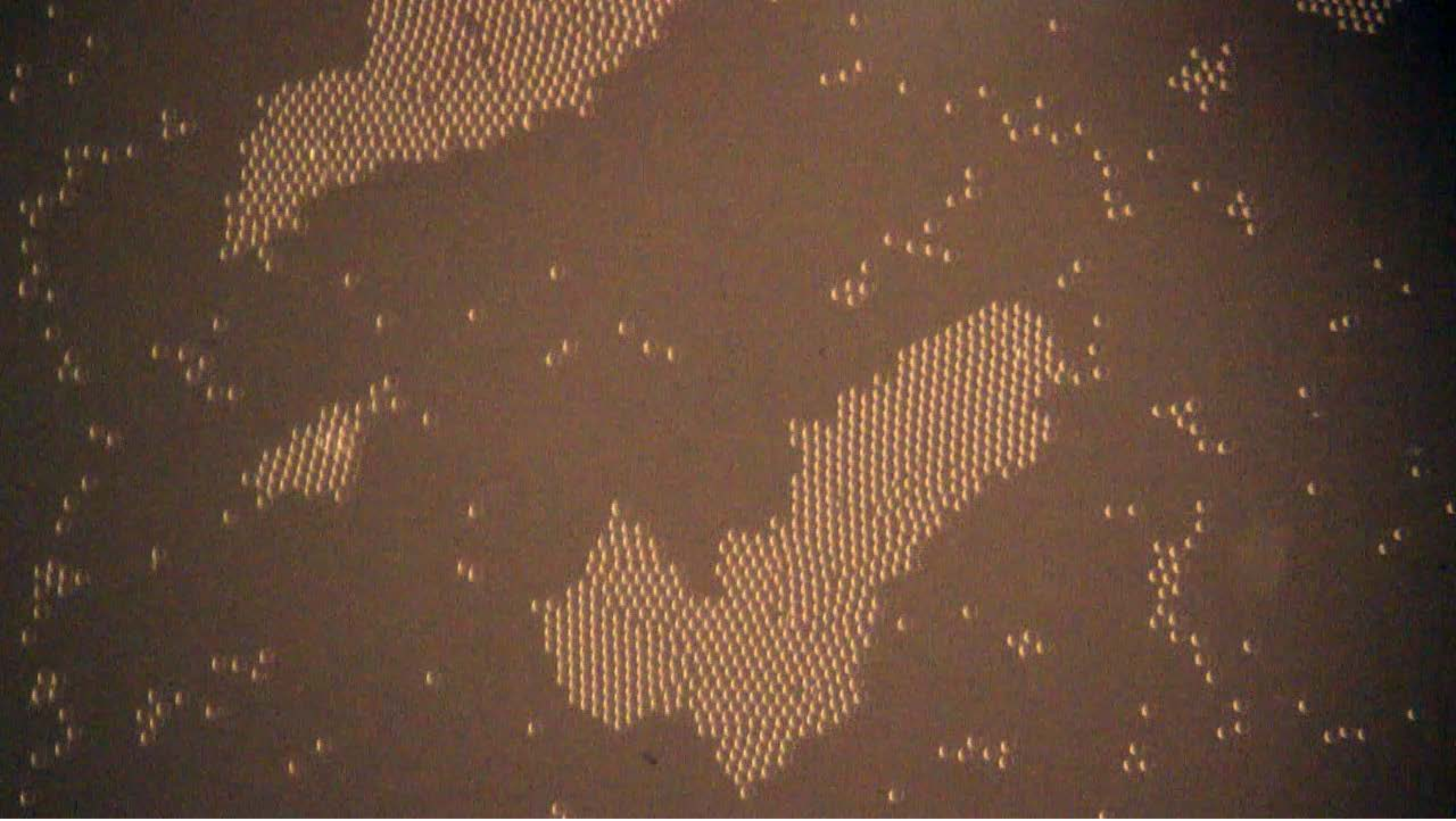
30μm   1750V/mm

Zooming out: Fast moving quincke rollers at half speed

Experiments at NTNU Trondheim: Tommy Kristiansen

30µm 1375V/mm 60fps «Living crystals «or active «entangled matter»

Experiments at NTNU Trondheim: Tommy Kristiansen

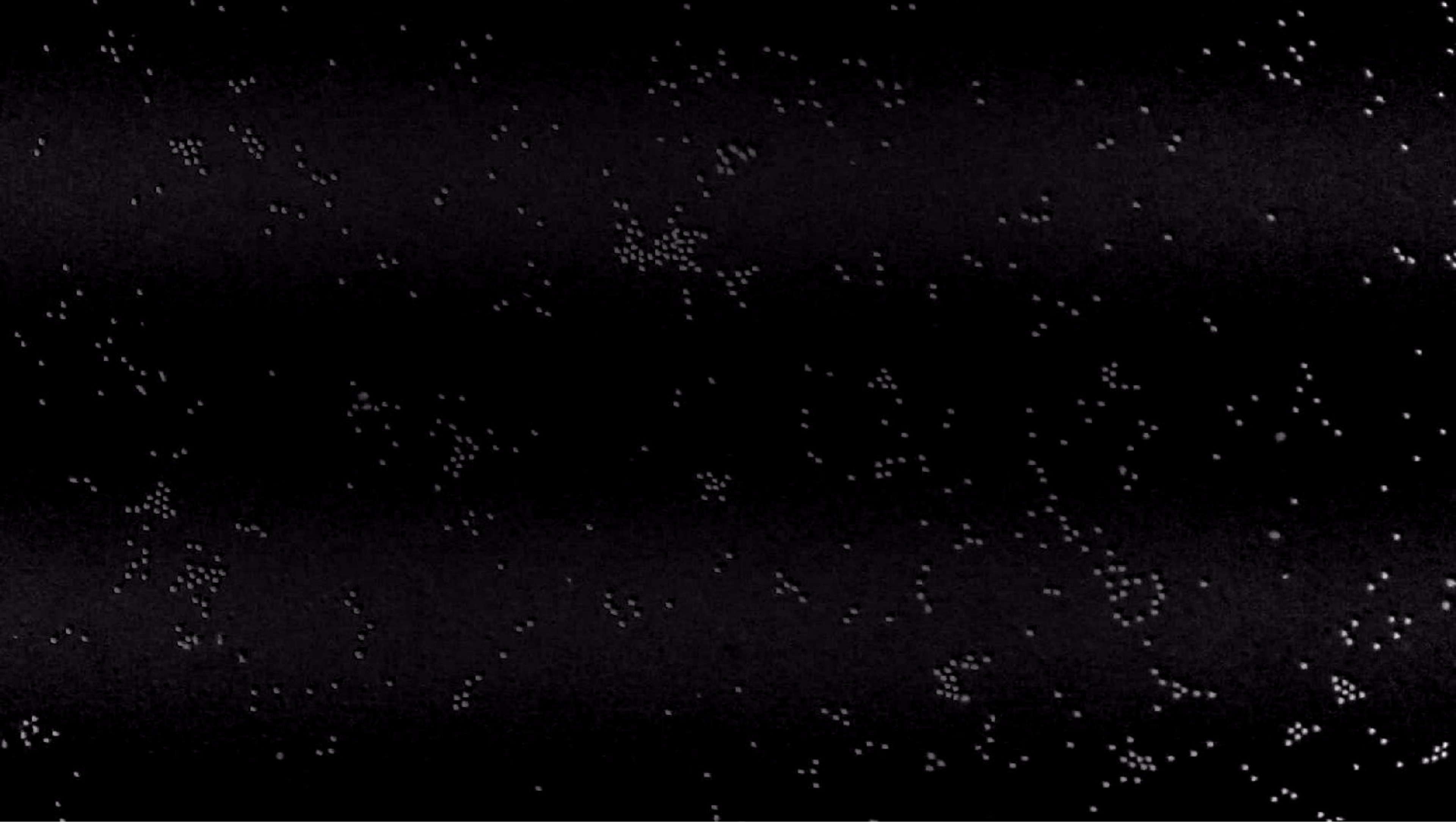


«Living crystals «or active «entangled matter»

Experiments at NTNU Trondheim: Tommy Kristiansen

40µm 1750V/mm «Living crystals «or active «entangled matter»

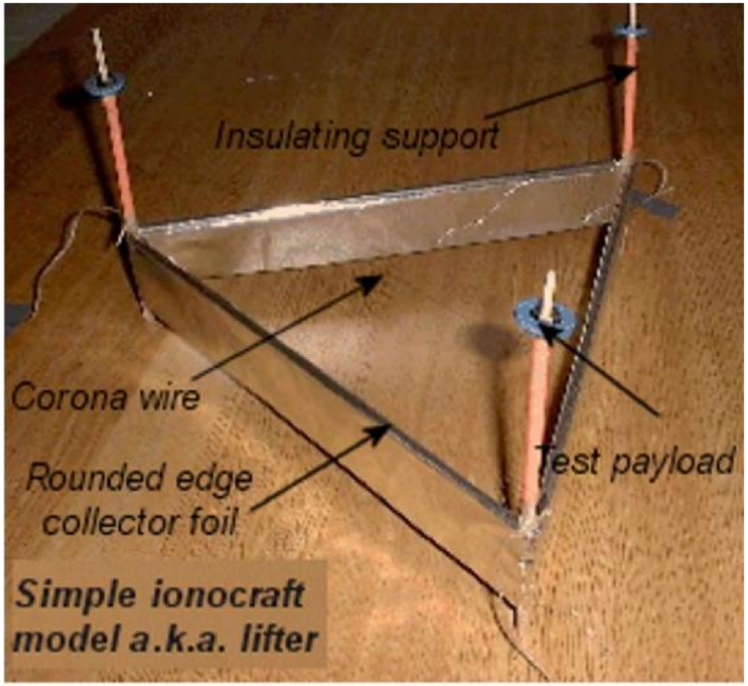
Experiments at NTNU Trondheim: Tommy Kristiansen



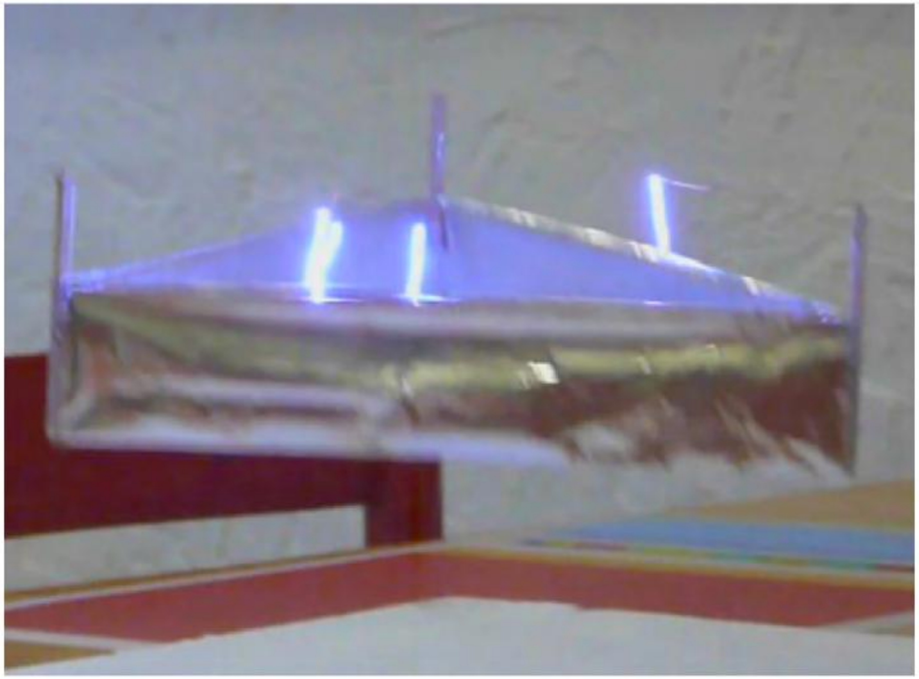
«Living crystals «or active «entangled matter»

Experiments at NTNU Trondheim: Tommy Kristiansen

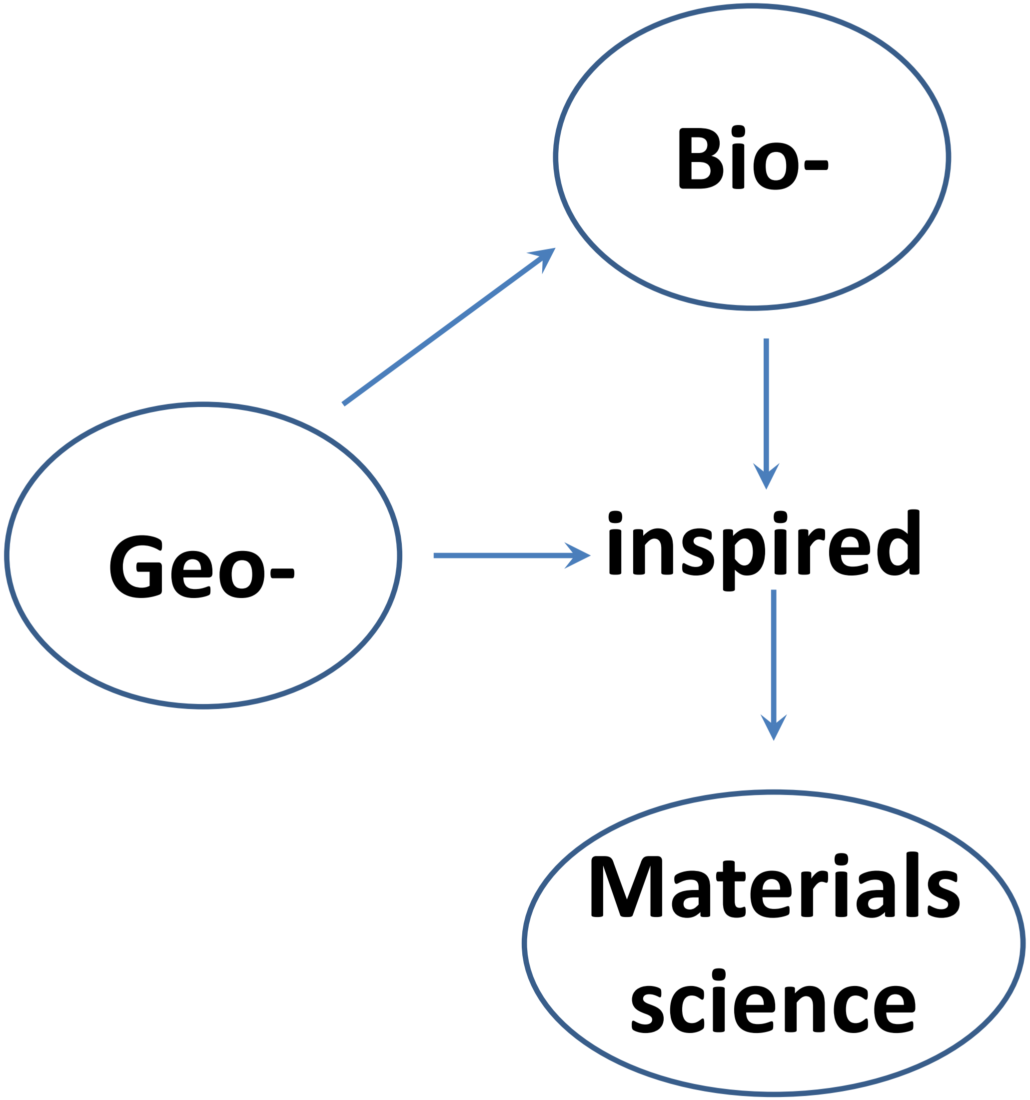
Elelctro-hydrodynamics at larger scale:
http://newatlas.com/mit-ionocraft/26908



Elements of an electrohydrodynamic lifter (Photo: Blaze Labs Research)


An electrohydrodynamic lifter in action (Photo: Anonymous59.)

MIT researchers study electro-hydrodynamic thrust
David Szondy David Szondy April 8, 2013


Bio-
Geo-
inspired
Materials science

NTNU

Biomaterials and Soft Materials Expand

Broader Impact Expand

Electronics, Magnetics and Photonics Expand

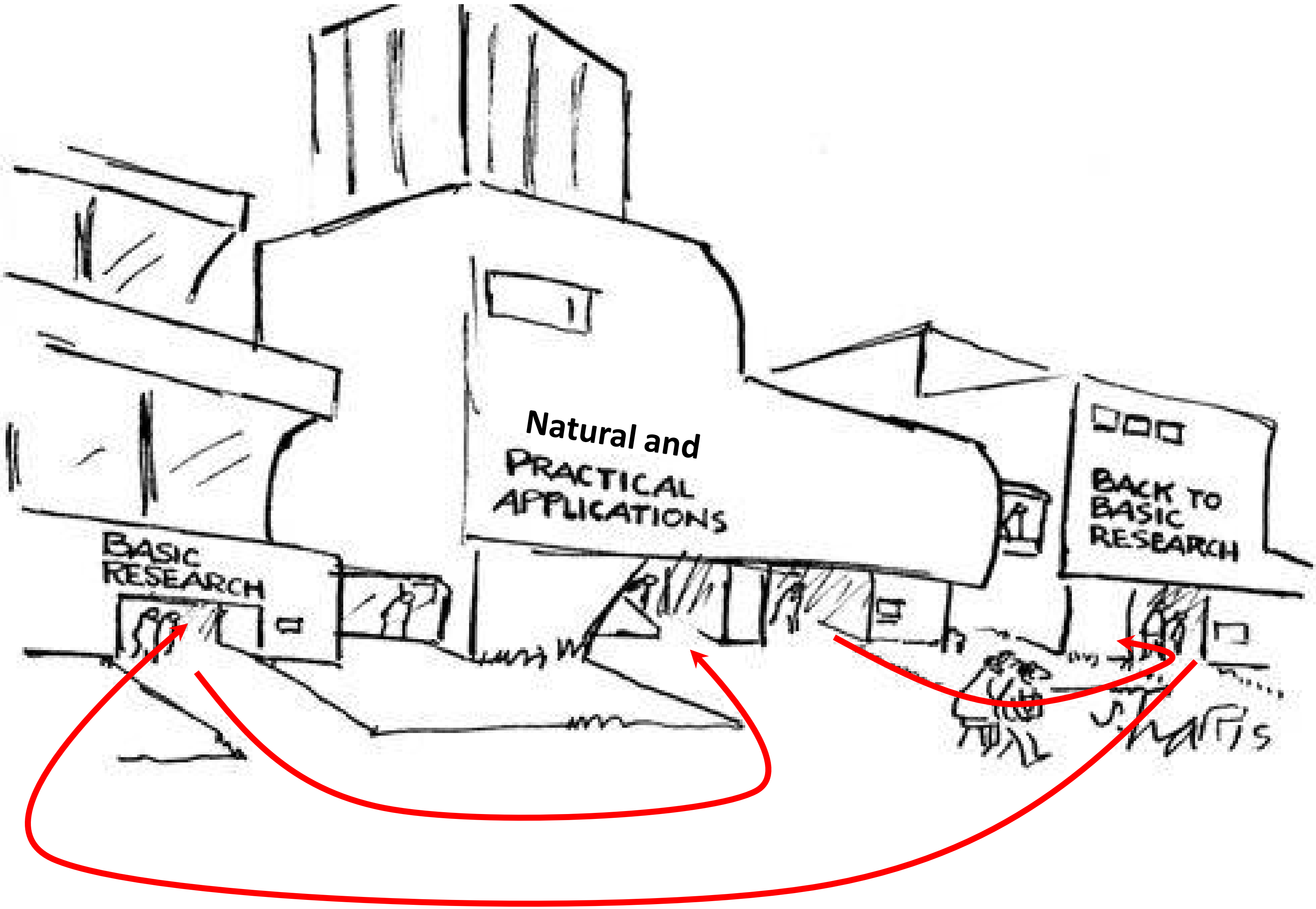
Energy and Sustainability Expand

Nanomaterials Expand

Processing and Manufacturing Expand

Theory, Characterization and Modeling Expand

BM01—Multiscale Mechanobiology and Biomechanics—Theory, Experiments, Computations
BM02—Multiphase Fluids for Materials Science—Droplets, Bubbles and Emulsions
BM03—Biological and Bioinspired Materials for Photonics and Electronics—From Living Organisms to Devices
BM04—Biomaterials for Regenerative Engineering
BM05—Polymer Gels in Materials Science—3D/4D Printing, Fundamentals and Applications
BM06—2D Nanomaterials in Health Care
BM07—Emerging Materials and Devices for Engineering Biological Function and Dynamics
BM08—Materials Design for Neural Interfaces
BM09—Stretchable Bioelectronics—From Sensor Skins to Implants and Soft Robots
BM10—Bioinspired Interfacial Materials with Superwettability
BM11—Modeling, Characterization, Fabrication and Applications of Advanced Biopolymers—Where Form Meets Function
BM12—Biomolecular Self-Assembly for Materials Design


Natural and
PRACTICAL
APPLICATIONS
BASIC
RESEARCH
BACK TO
BASIC
RESEARCH
S. HARRIS

We are curiosity driven. Very little industrial funding.

«HEY, SAM, THE BIG ROUND YELLOW THING CAME UP AGAIN»

3 lectures:

4th July:

Nanoscience of soft materials

5th July:

The physics of clay minerals: From the nano-scale to the geo-scale, and everything in between

6th July:

Basic physics of drops/emulsions, in relation to applications in EOR, cosmetics, foods etc