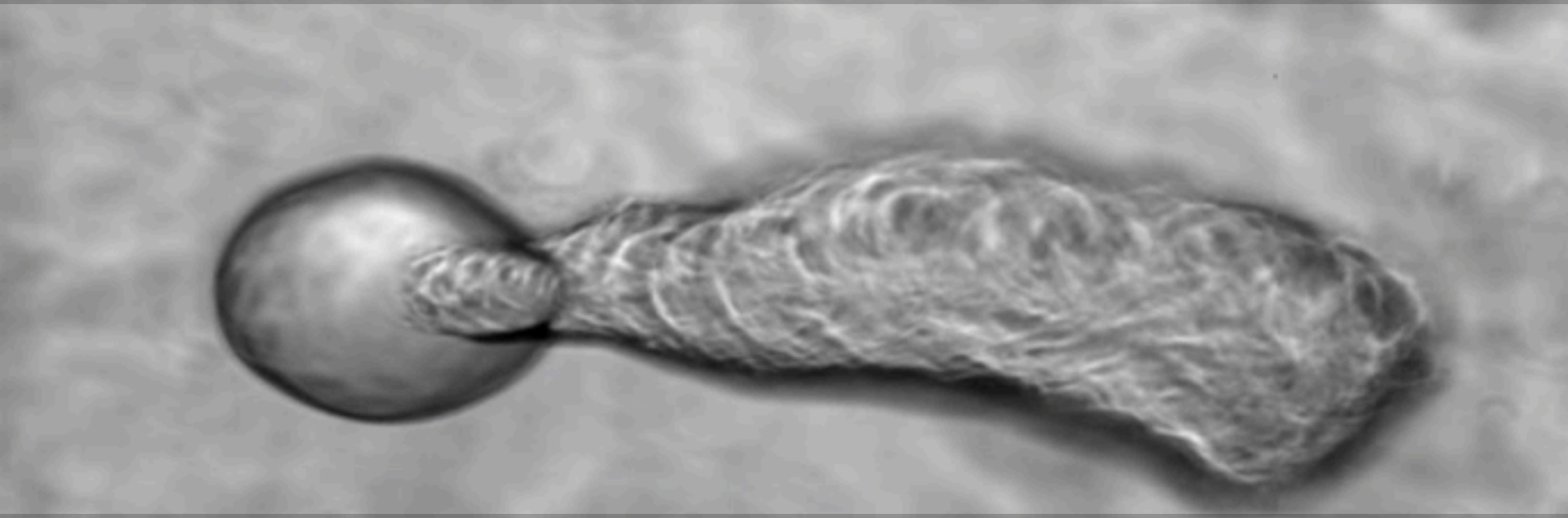
Range of life-like emergent morphologies & behaviours observed in Bütschli dynamic droplets



2nd International Conference on Morphological Computation ICMC2011

Rachel Armstrong, Senior TED Fellow

Senior Lecturer, The School of Architecture & Construction, University of Greenwich, London

Visiting Research Assistant, Centre for Fundamental Living Technology (FLinT), Southern University of Denmark

Evolution of Science

- How will the practice of science change in the next 10 years, 20 years?
- What is the vision for science?
- Current drivers for discovery currently need to operate within funding constraints provided by government, institutions and industry, whose interests are increasingly converging and where ‘the future’ is 3- 5 years away

NBIC

- Nano Bio Info Cogno (Roco & Bainbridge 2002)
- ‘To steer the research frontiers of a select group of cutting edge technosciences so that they ‘converge’ into a single unified science’ (Fuller, 2011)

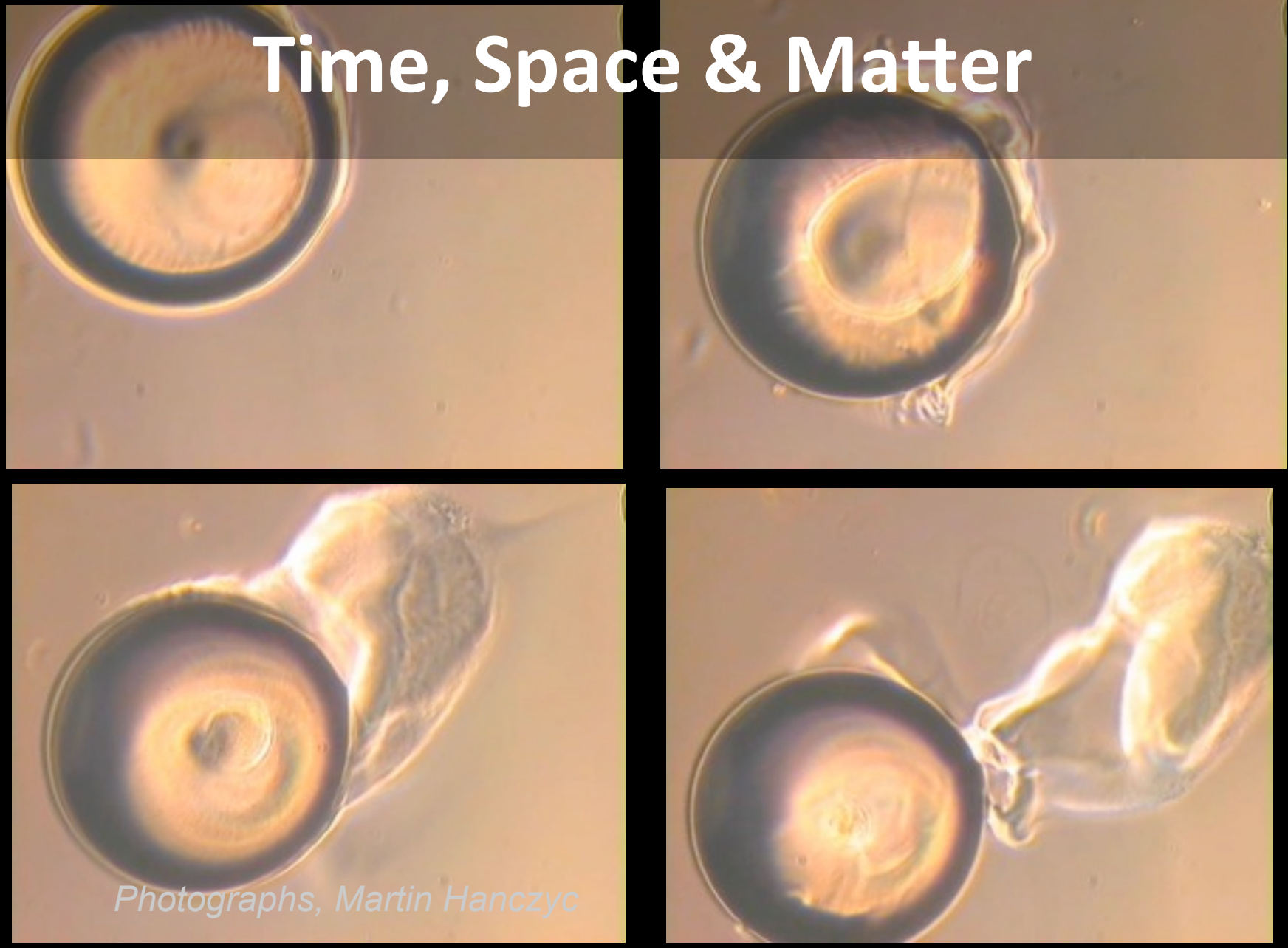
Consequences

- ‘Anticipatory governance’ – i.e. planning for both the production and the consumption of fundamental developments that have yet to occur (Fuller, 2011)
- Novel sense of science-by-public-relations (Fuller, 2011)

Research Context

- Interdisciplinary (chemistry, architectural design)
- Collaborative
- Different approaches to scientific content: blue-sky (theory), applied (use), design-led (reappropriation) & speculative (projection)
- Public outreach

Time, Space & Matter



Dynamic Droplet Systems

- Self-assembling agents that form high-energy interfaces
- Chemical potential combines with physical instabilities and fluid dynamics, to result in directed physical transport of chemicals or other physical phenomena

Bütschli Droplets

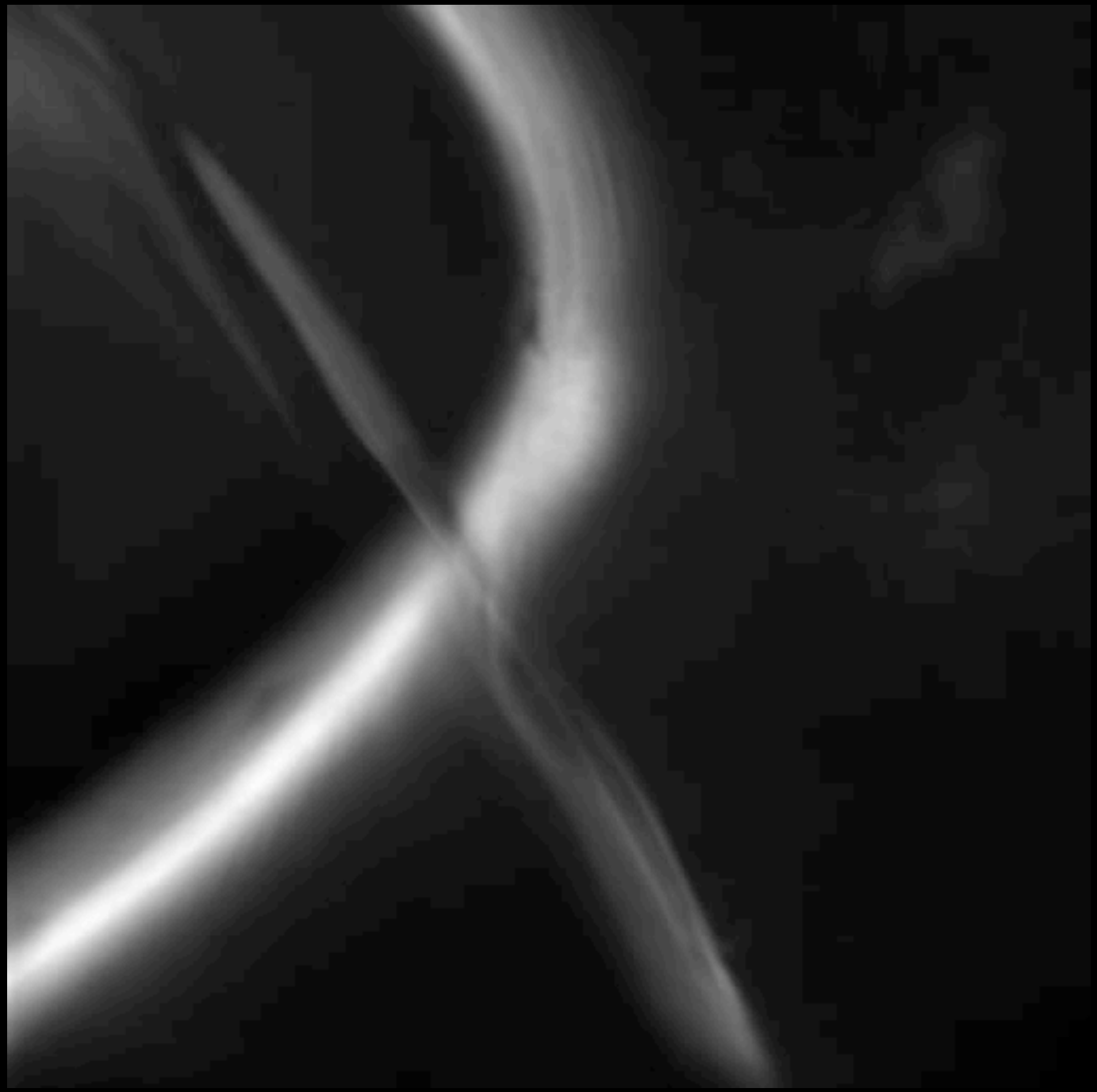
- Otto Bütschli (1848 – 1920)
- Professor of Zoology at Heidelberg
- Specialized in invertebrates , protozoa and insect development
- In 1892, Bütschli described structures with an amoeba-like movement formed by combining olive oil and potash – with pseudopodia that engulfed other particles – like living amoebae

Bütschli Protocol

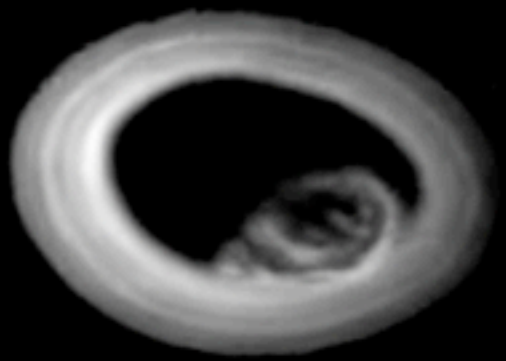
- Extra Virgin olive oil
- 3-5 M Sodium Hydroxide
- Saponification

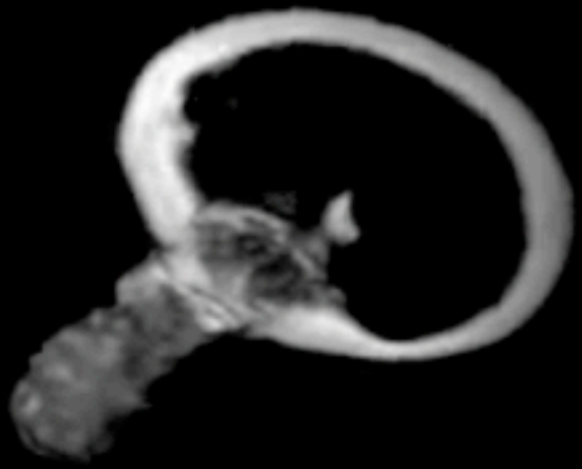
Fire & Ice

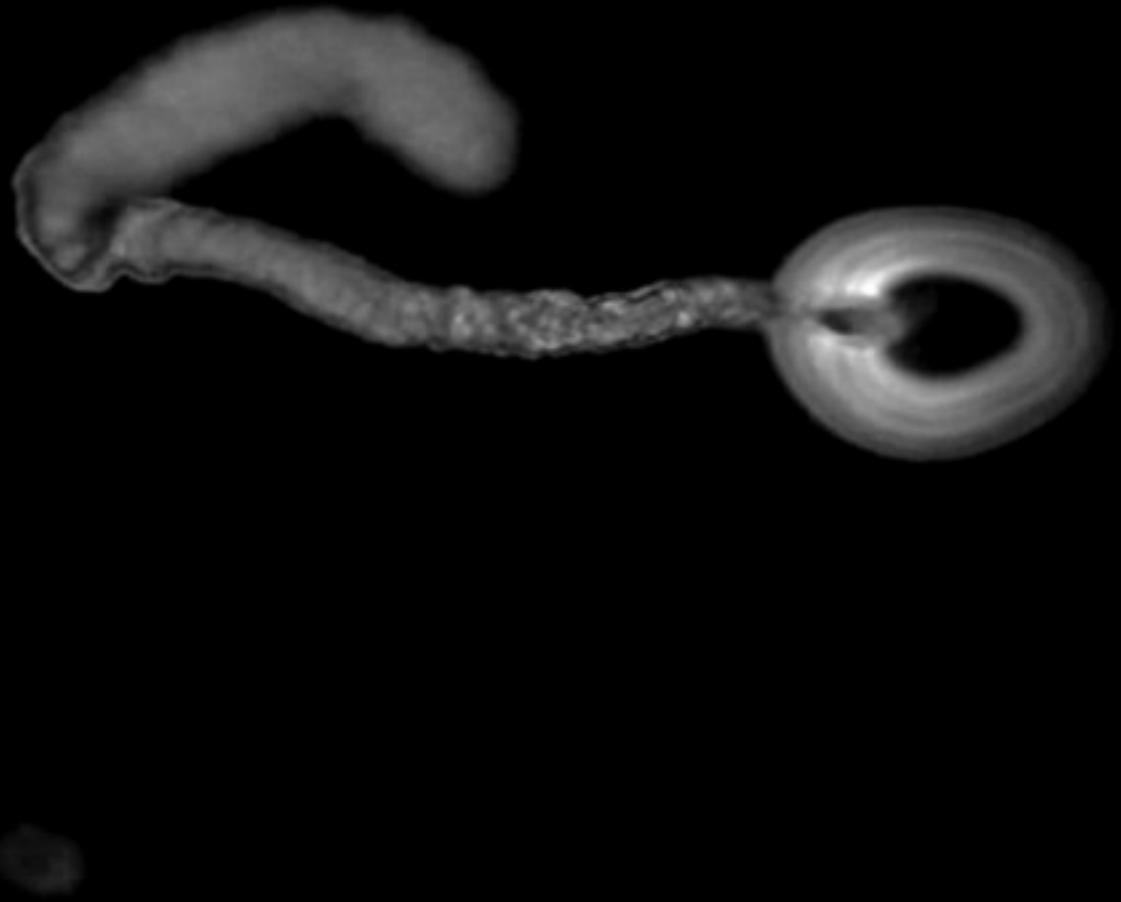
Shell

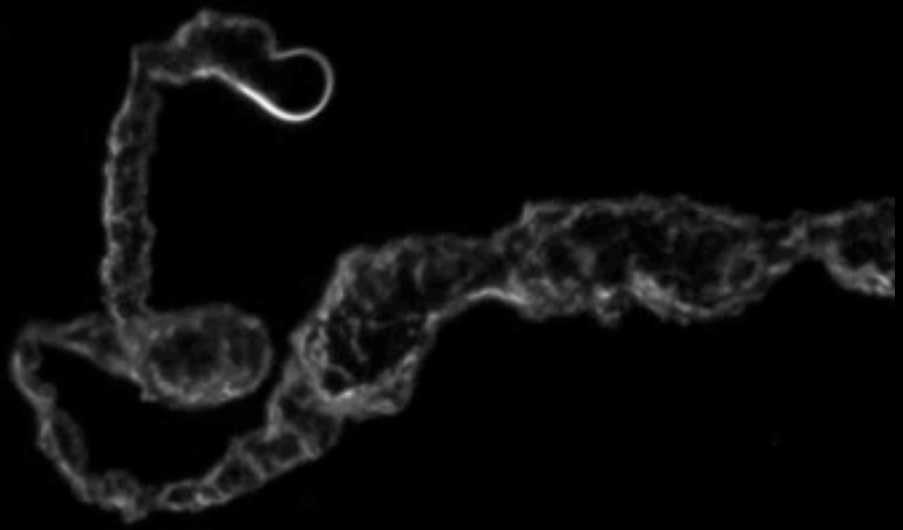


Droplet

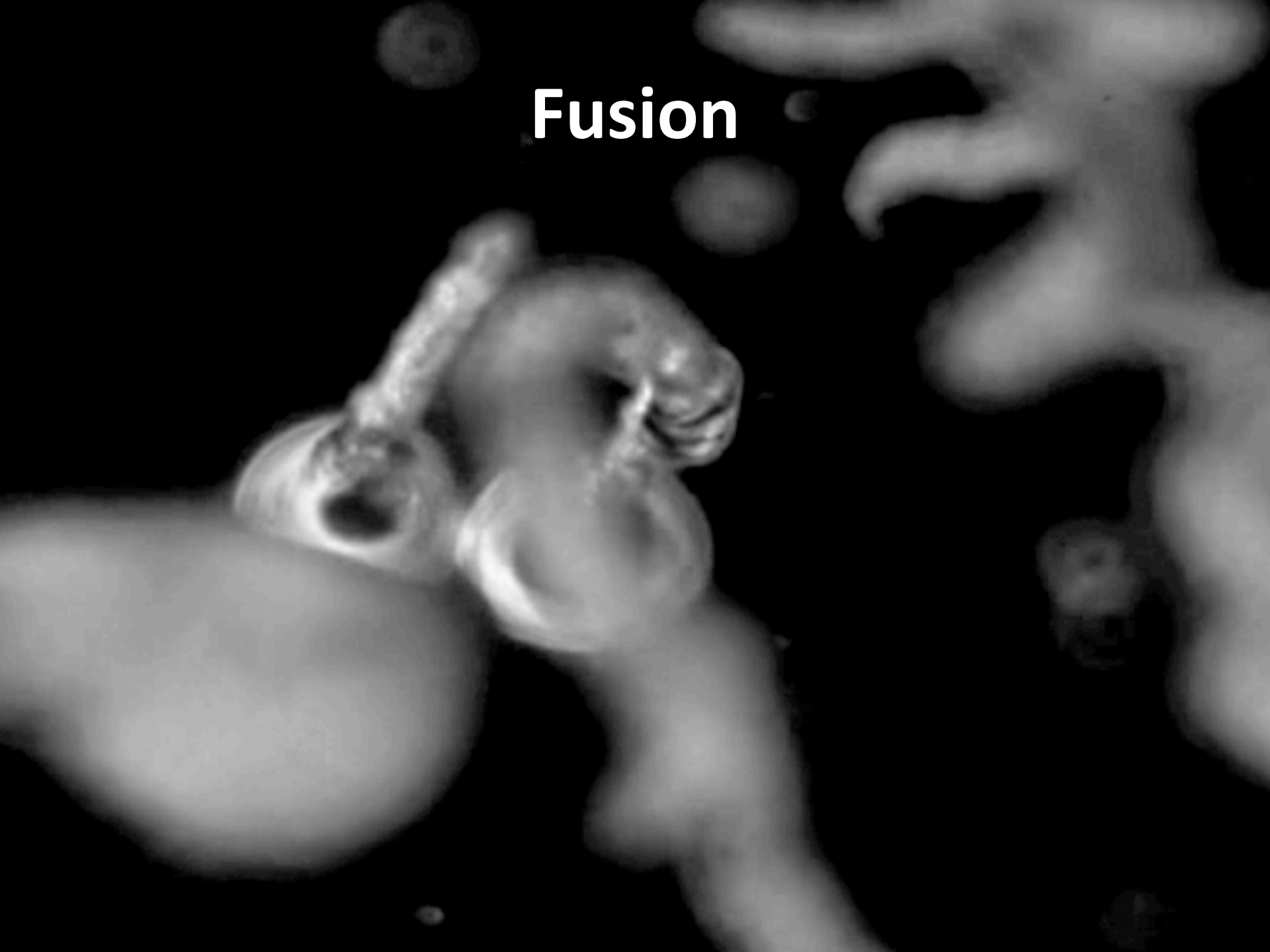




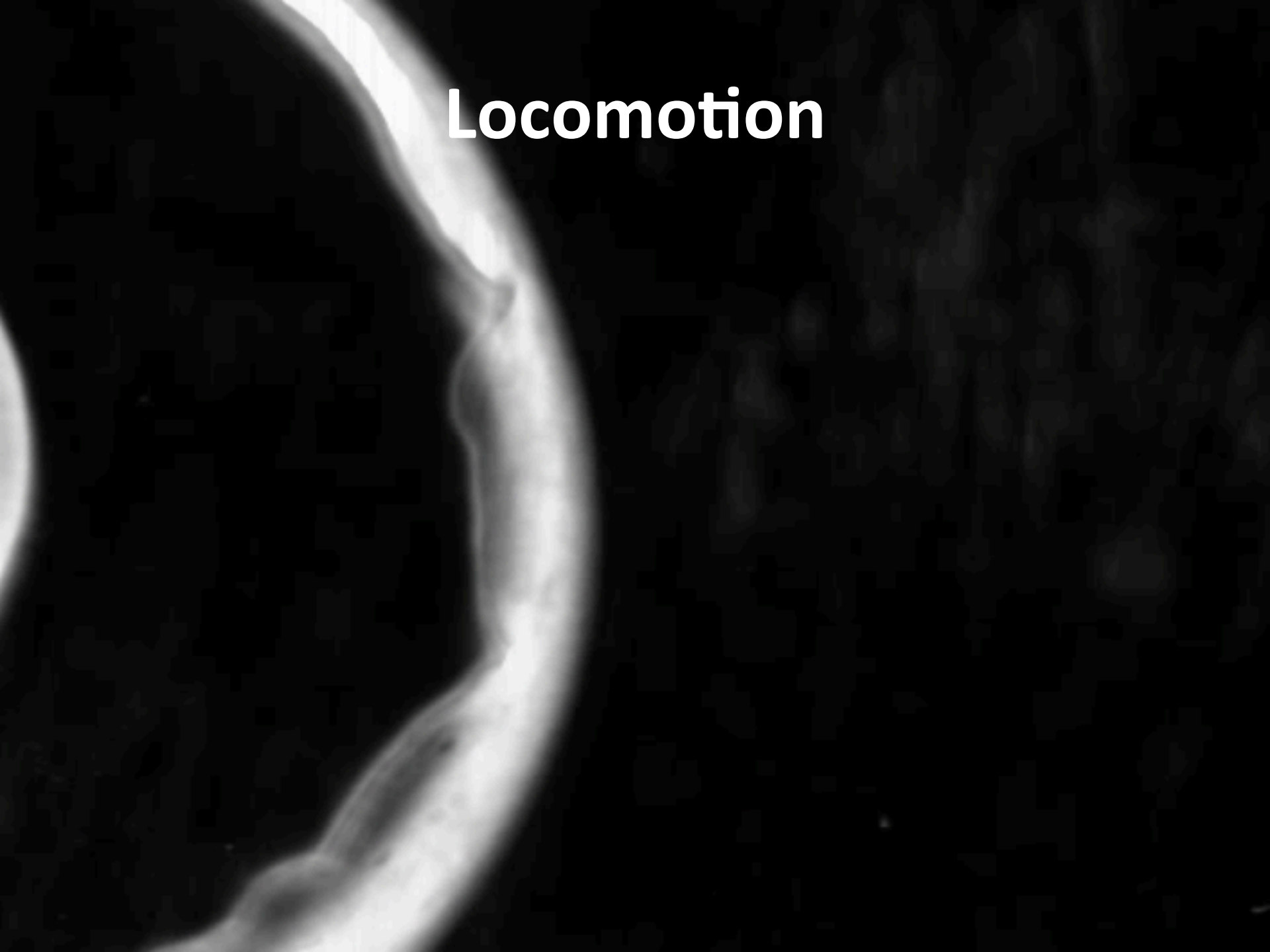




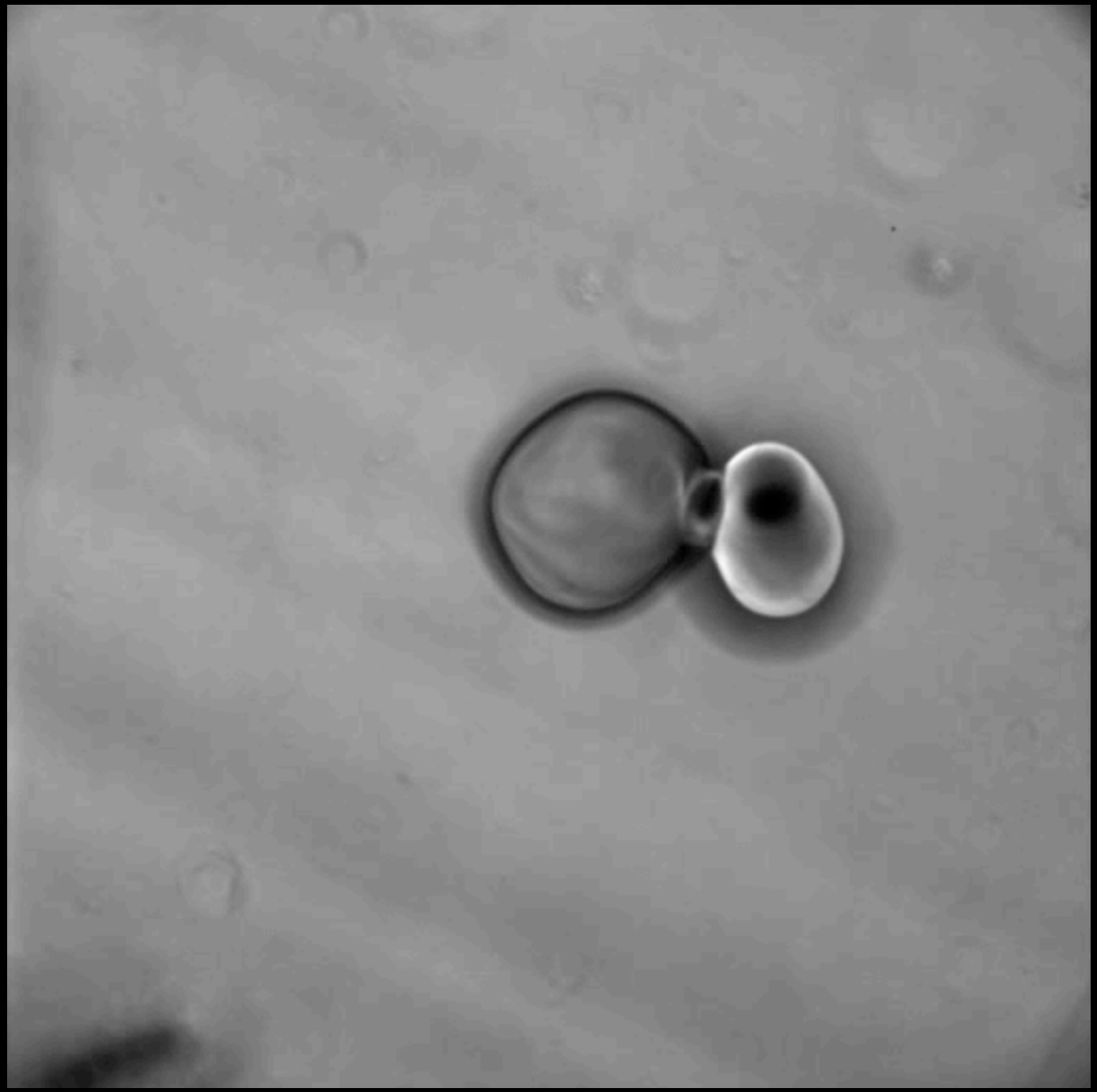
Fusion

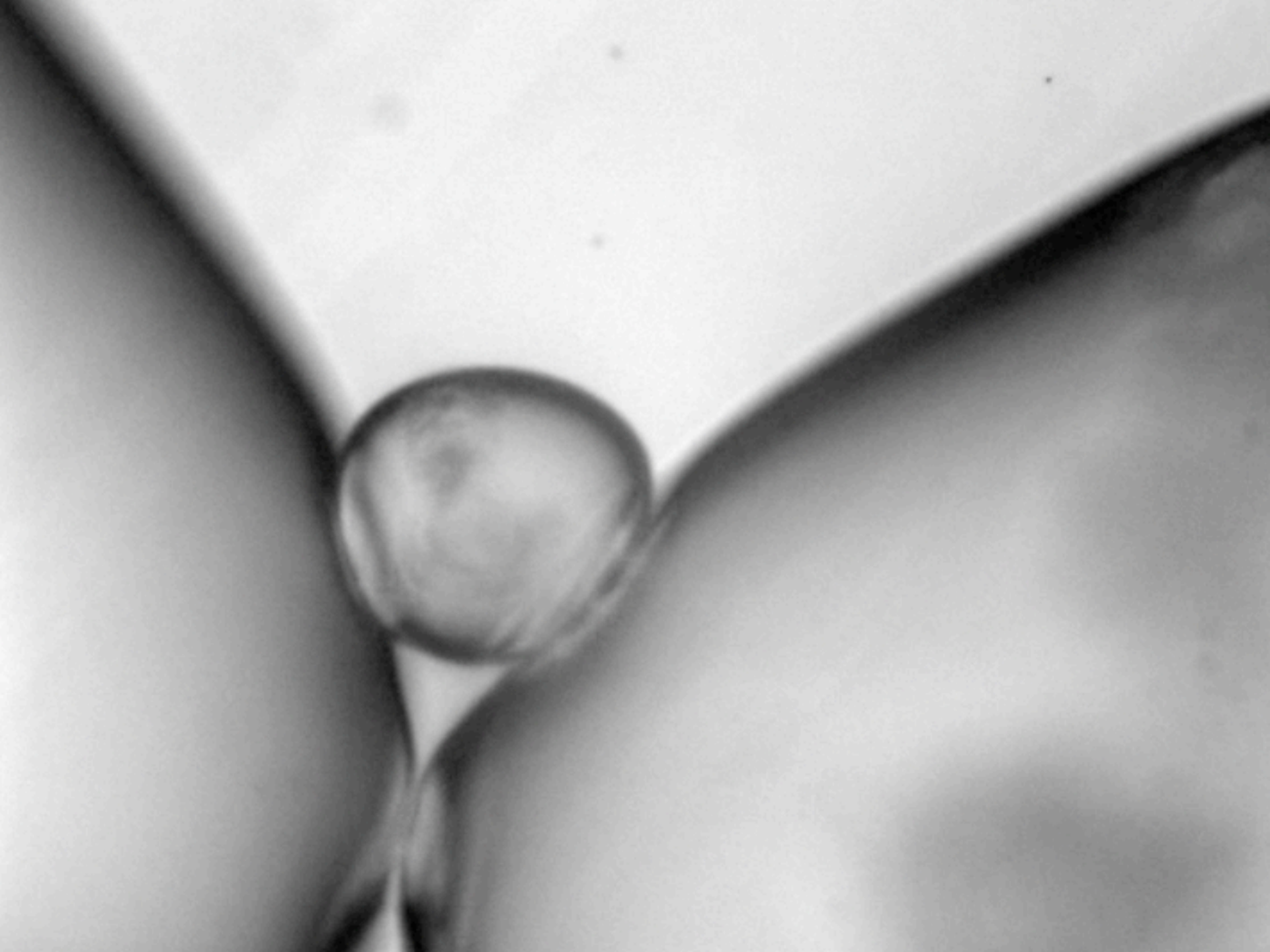


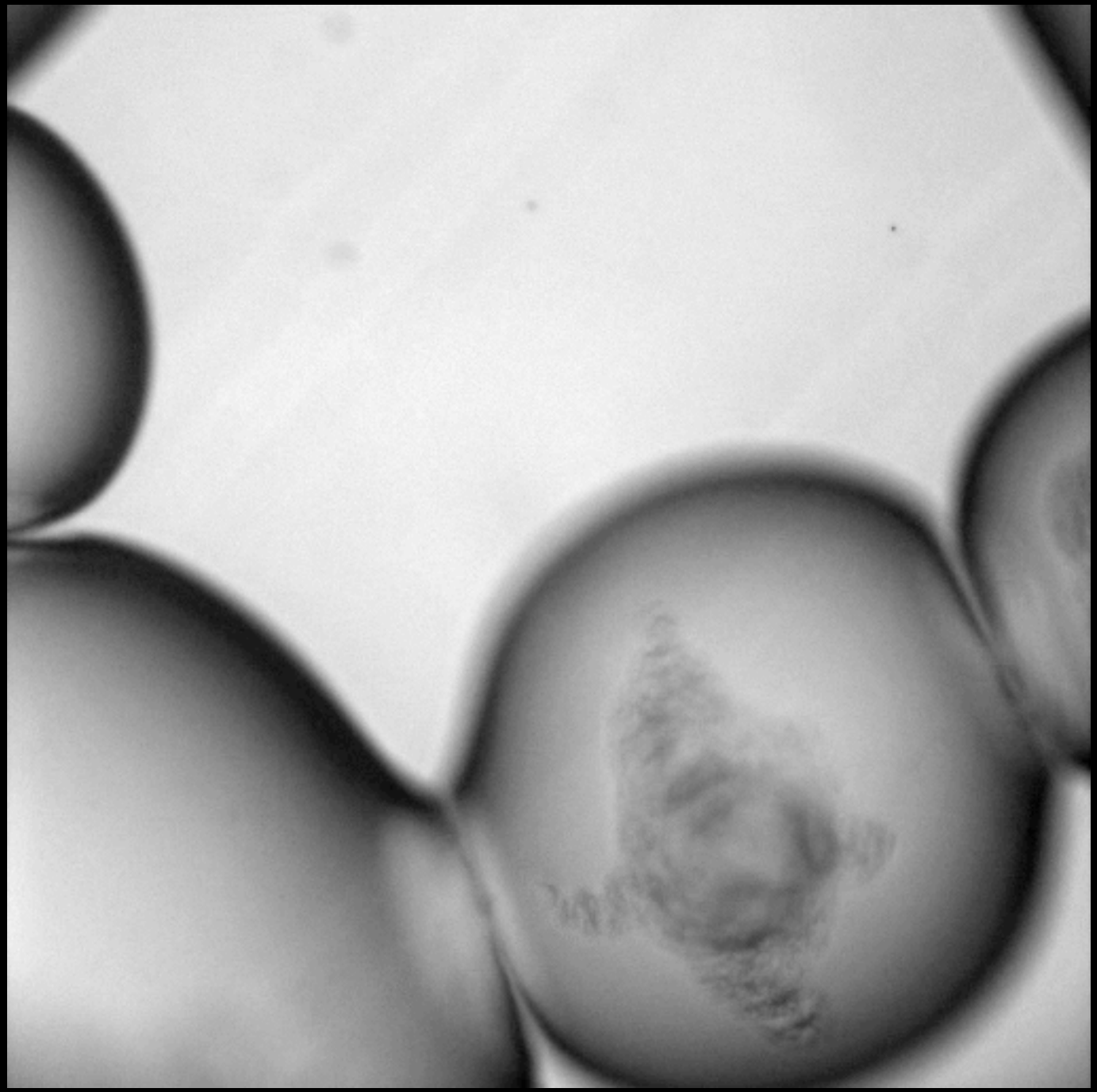
Locomotion



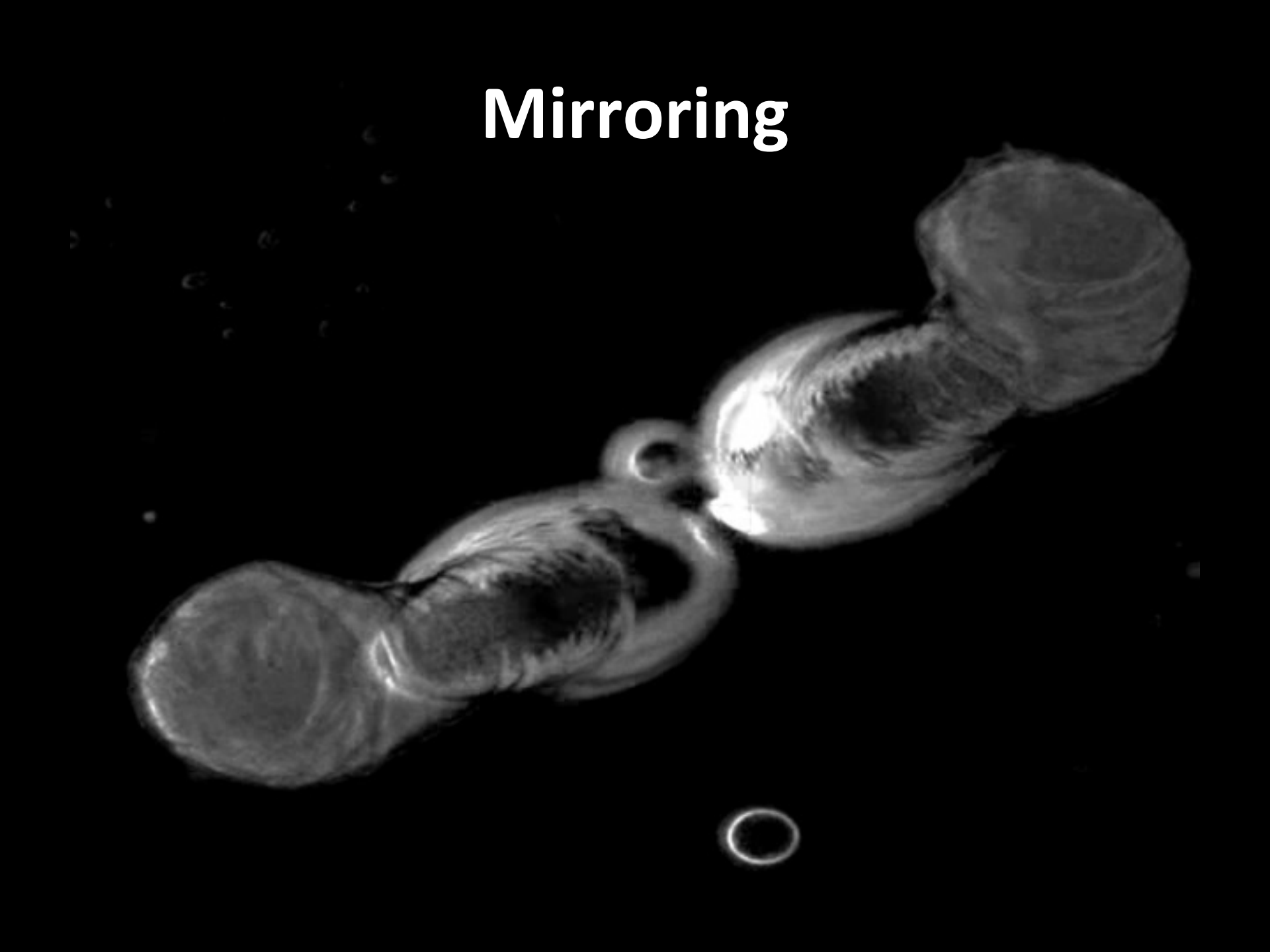
‘Interfacing’



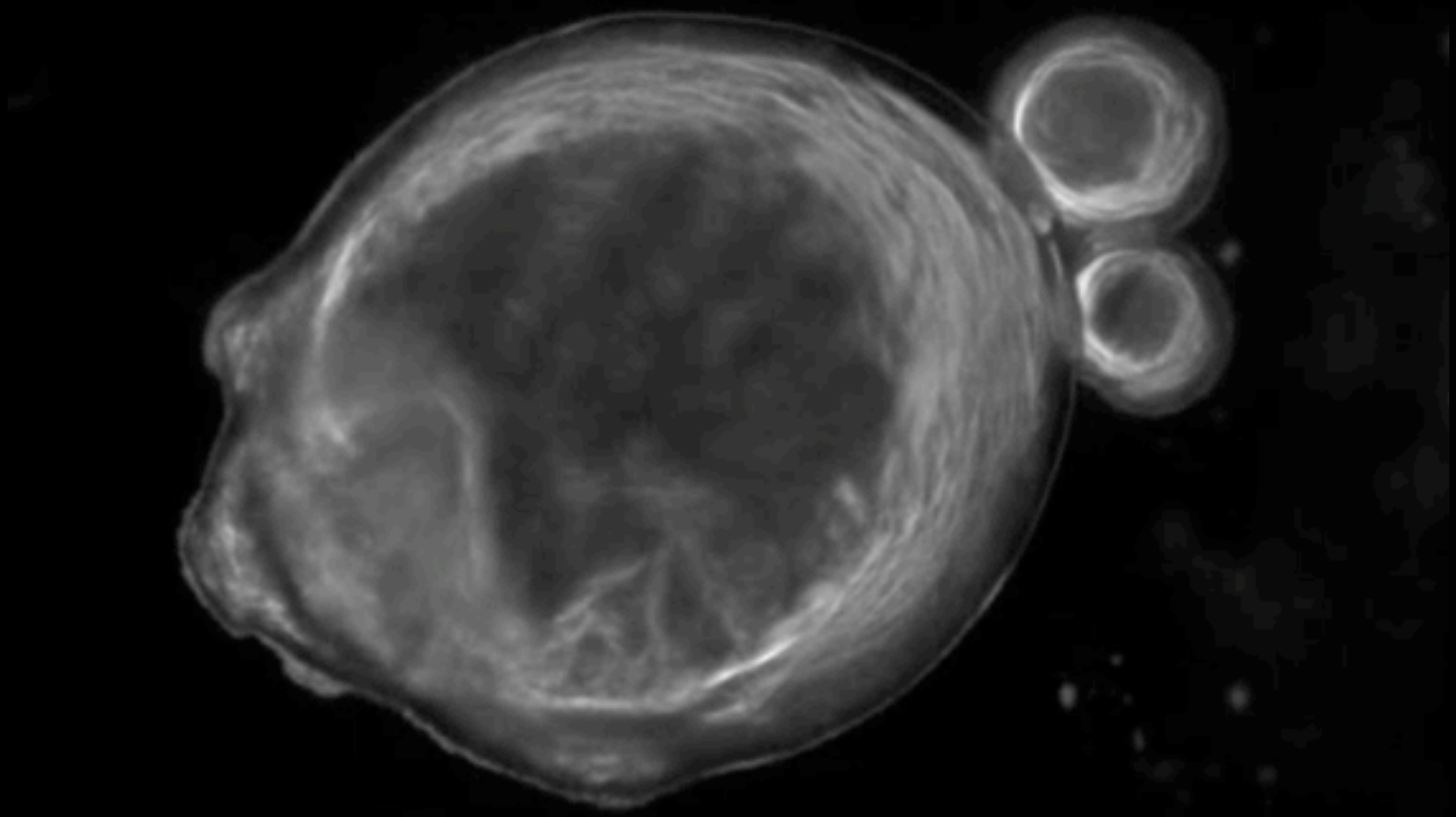


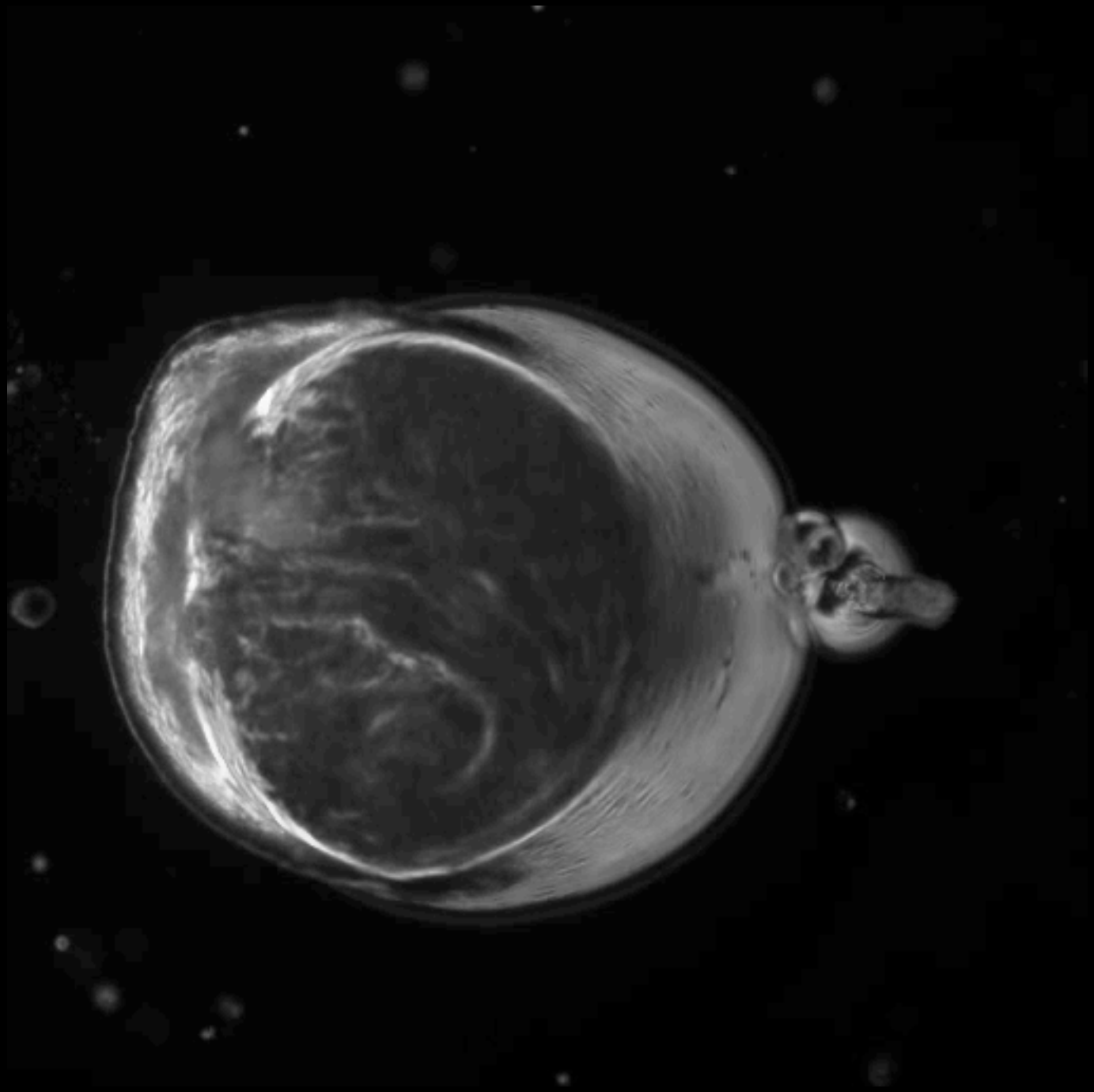


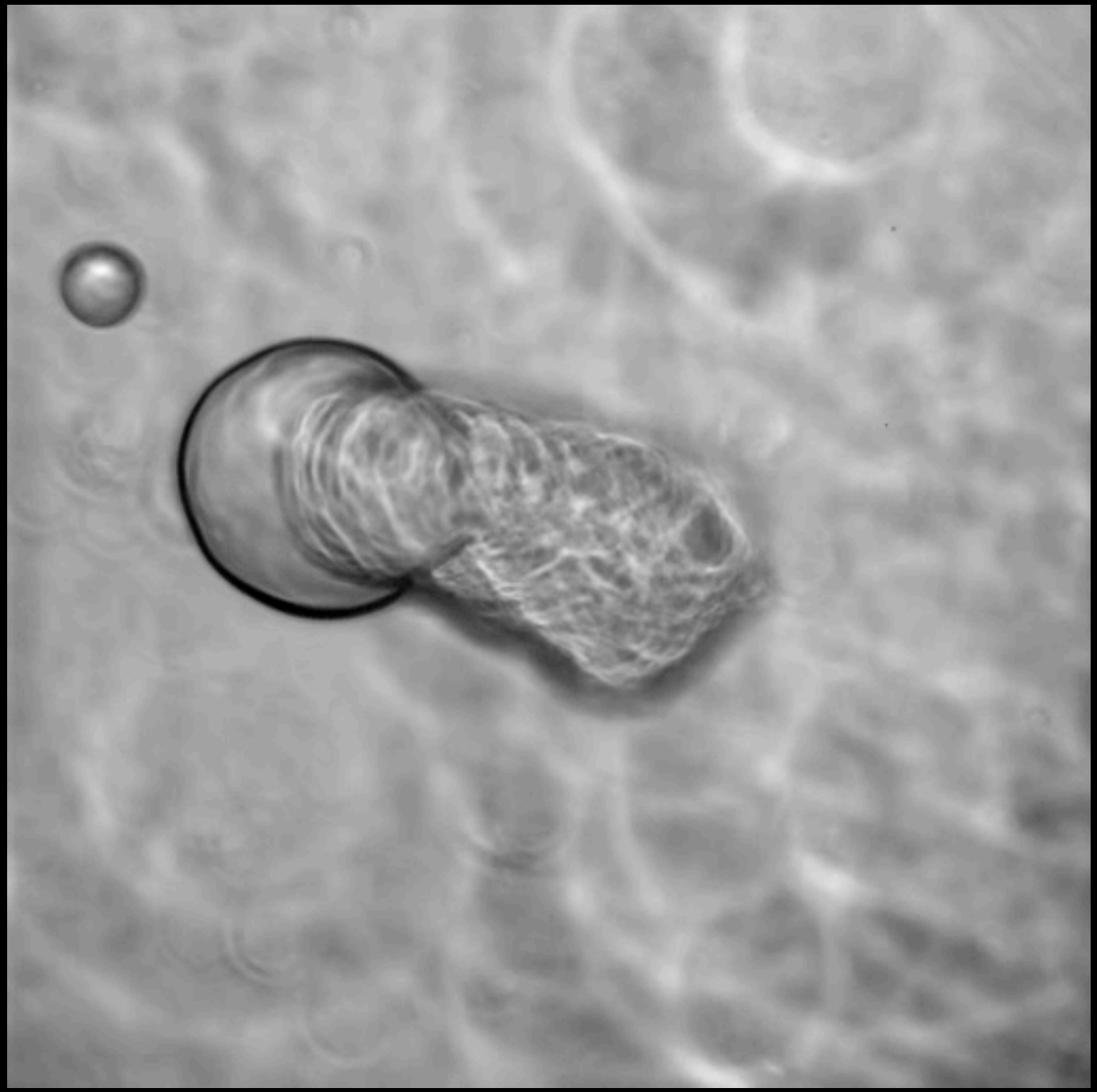
Mirroring



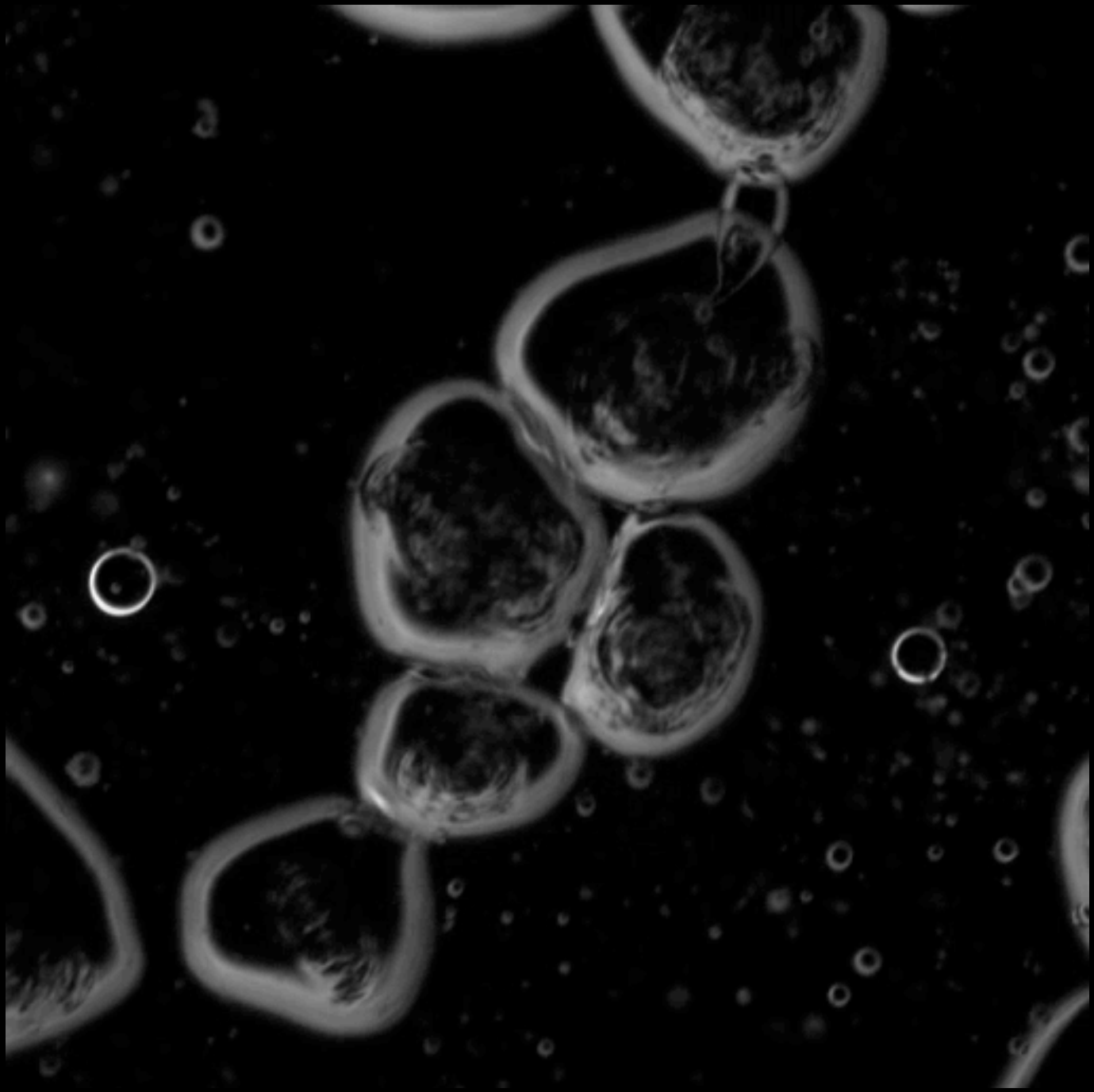
Satellite Phenomenon

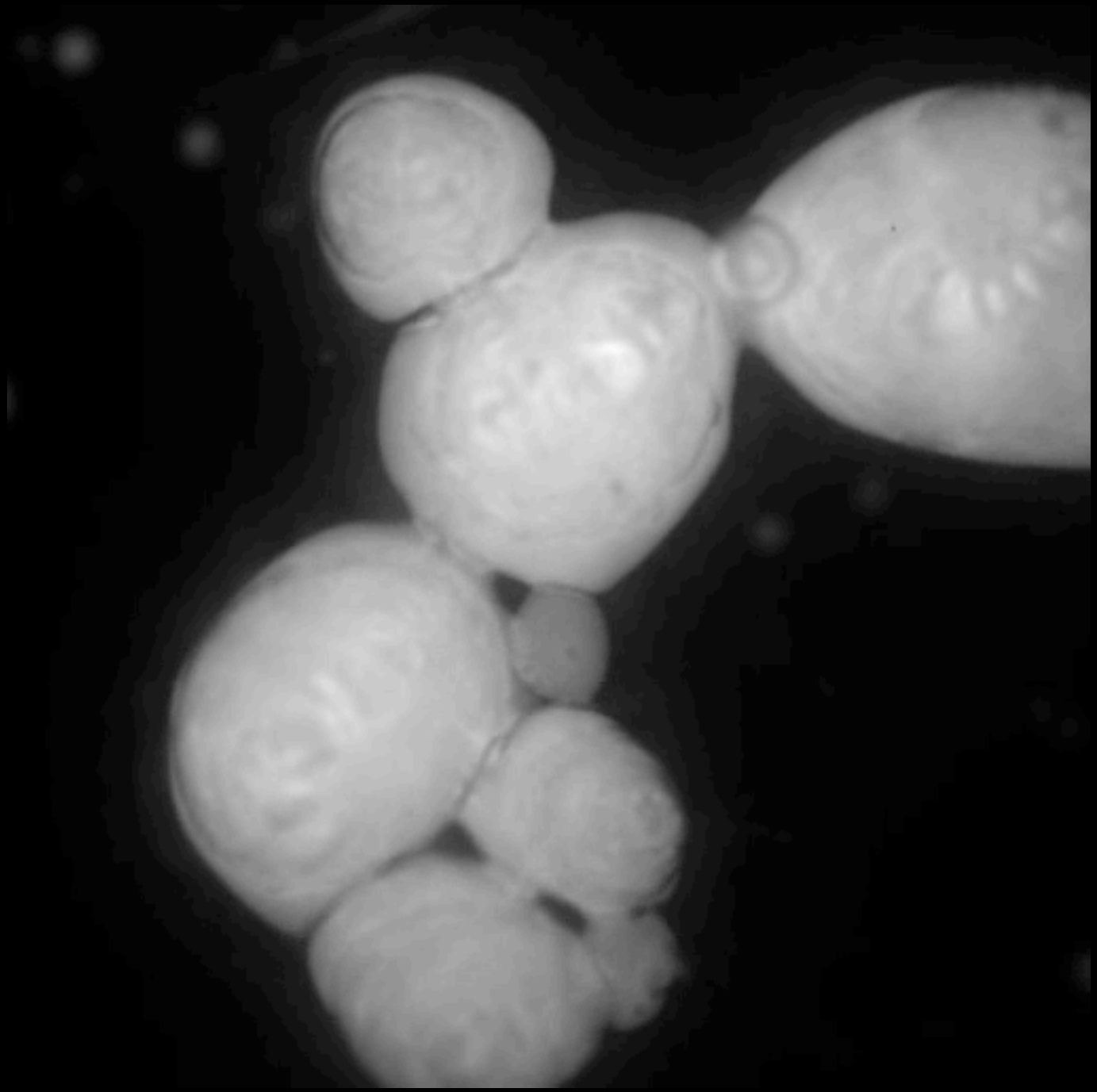




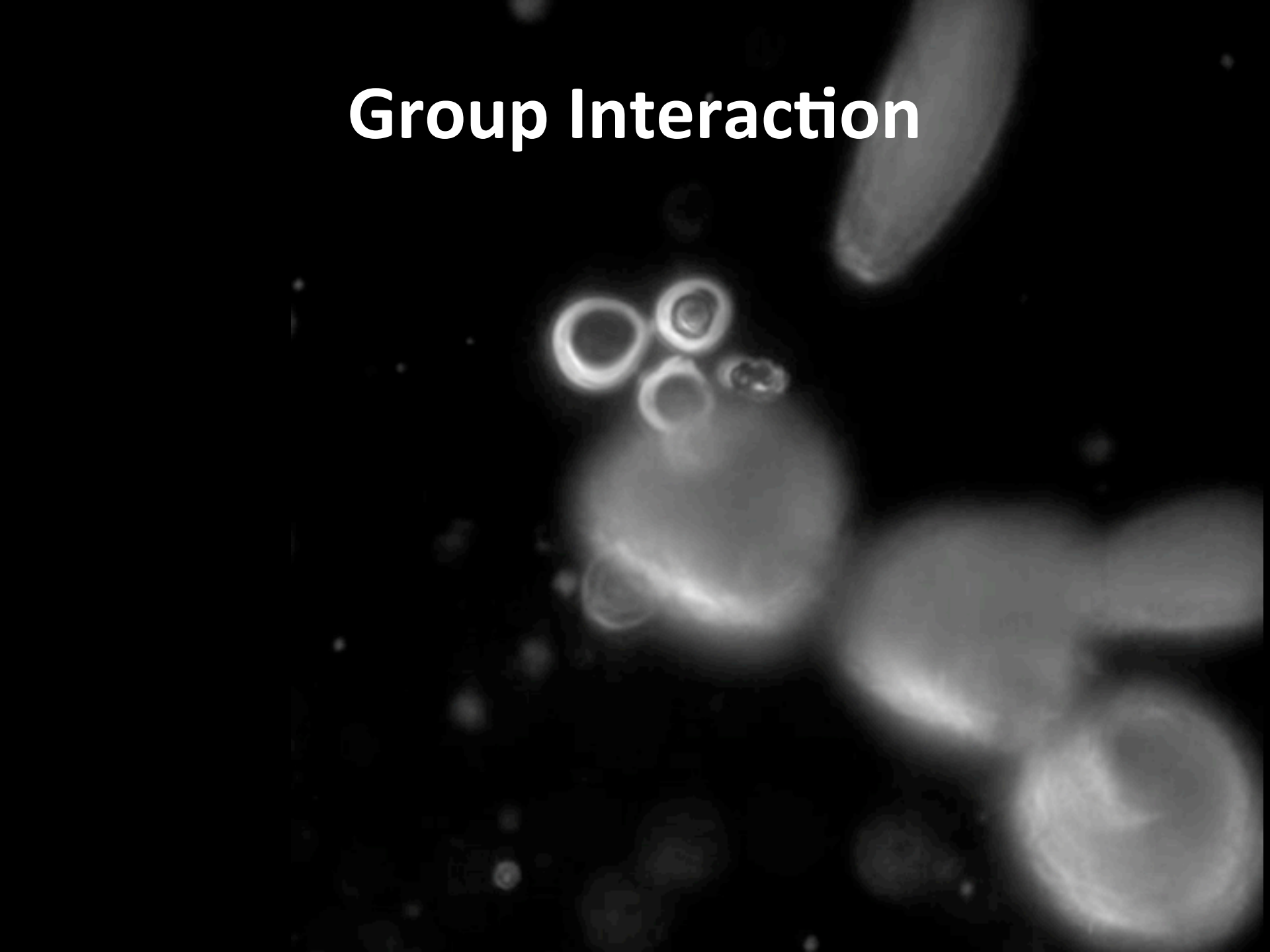


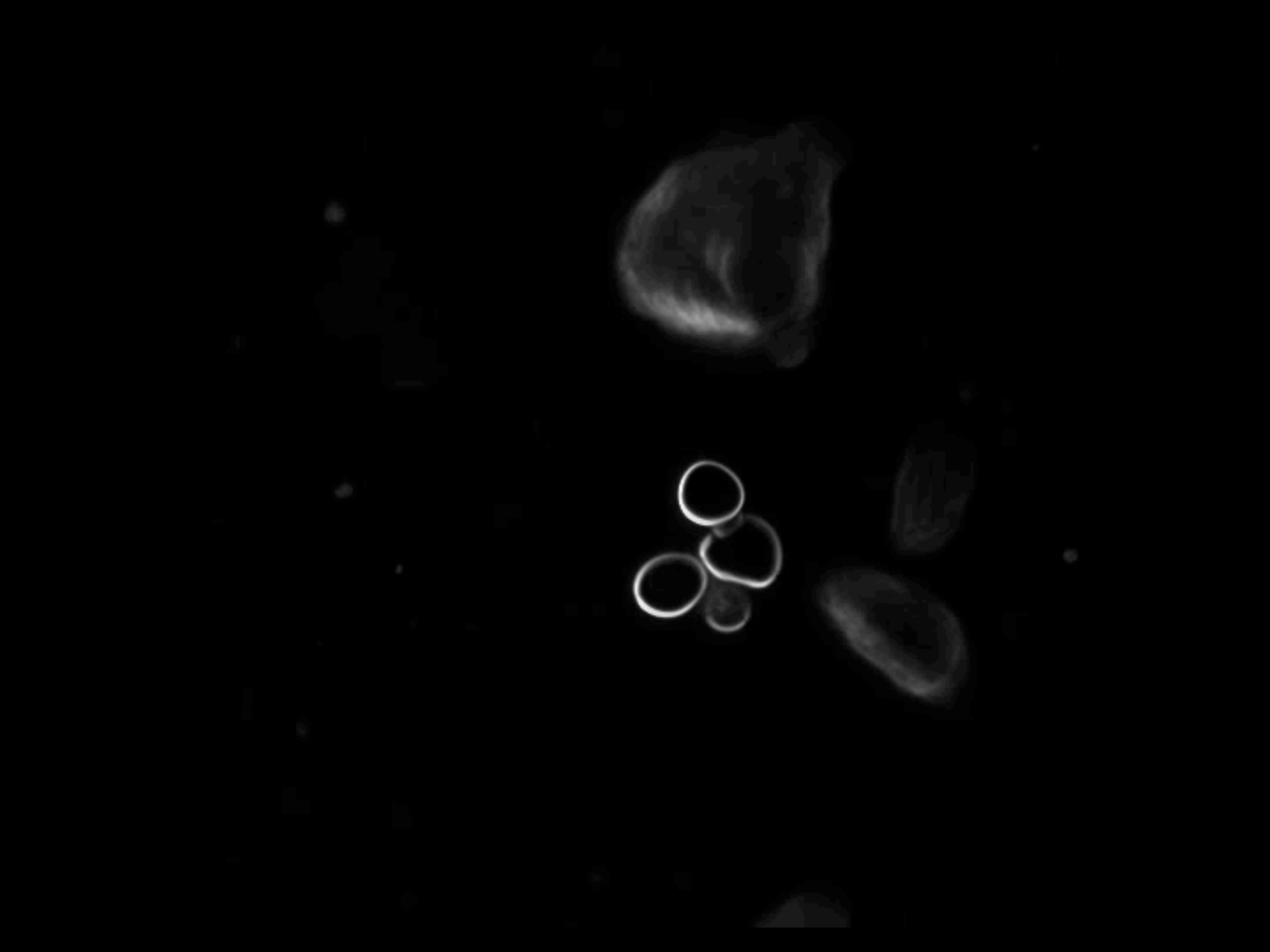
Chain

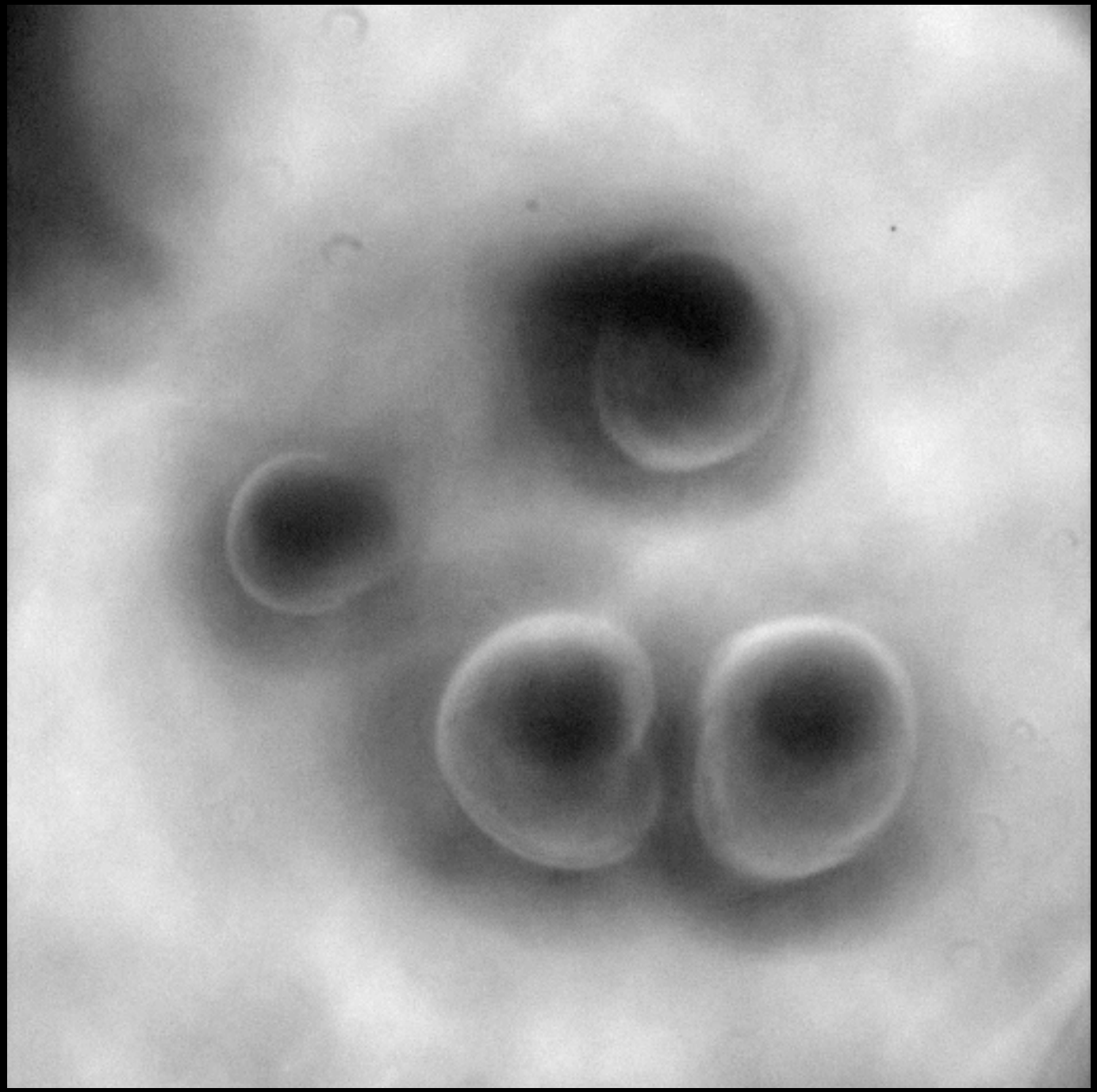




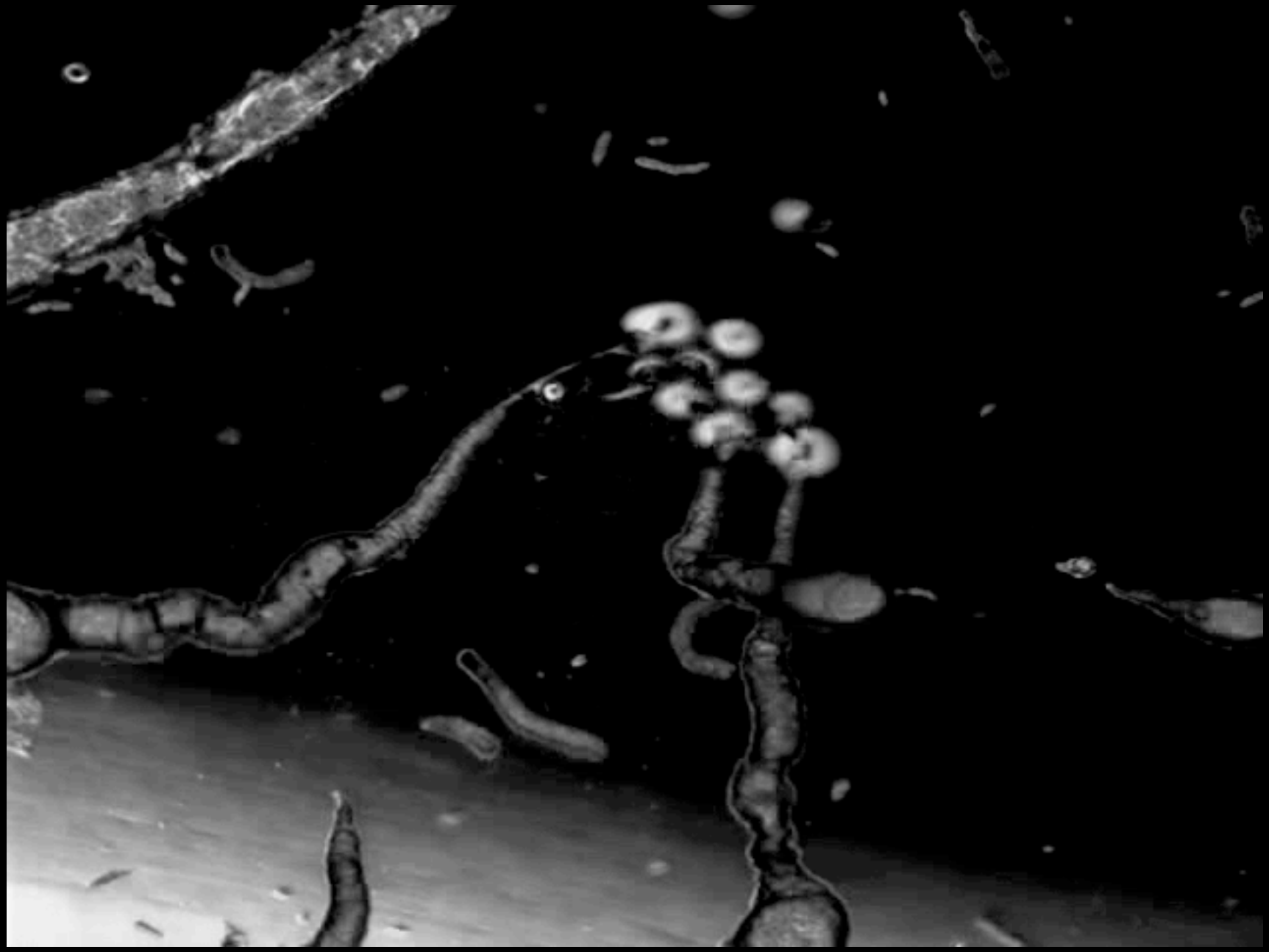
Group Interaction



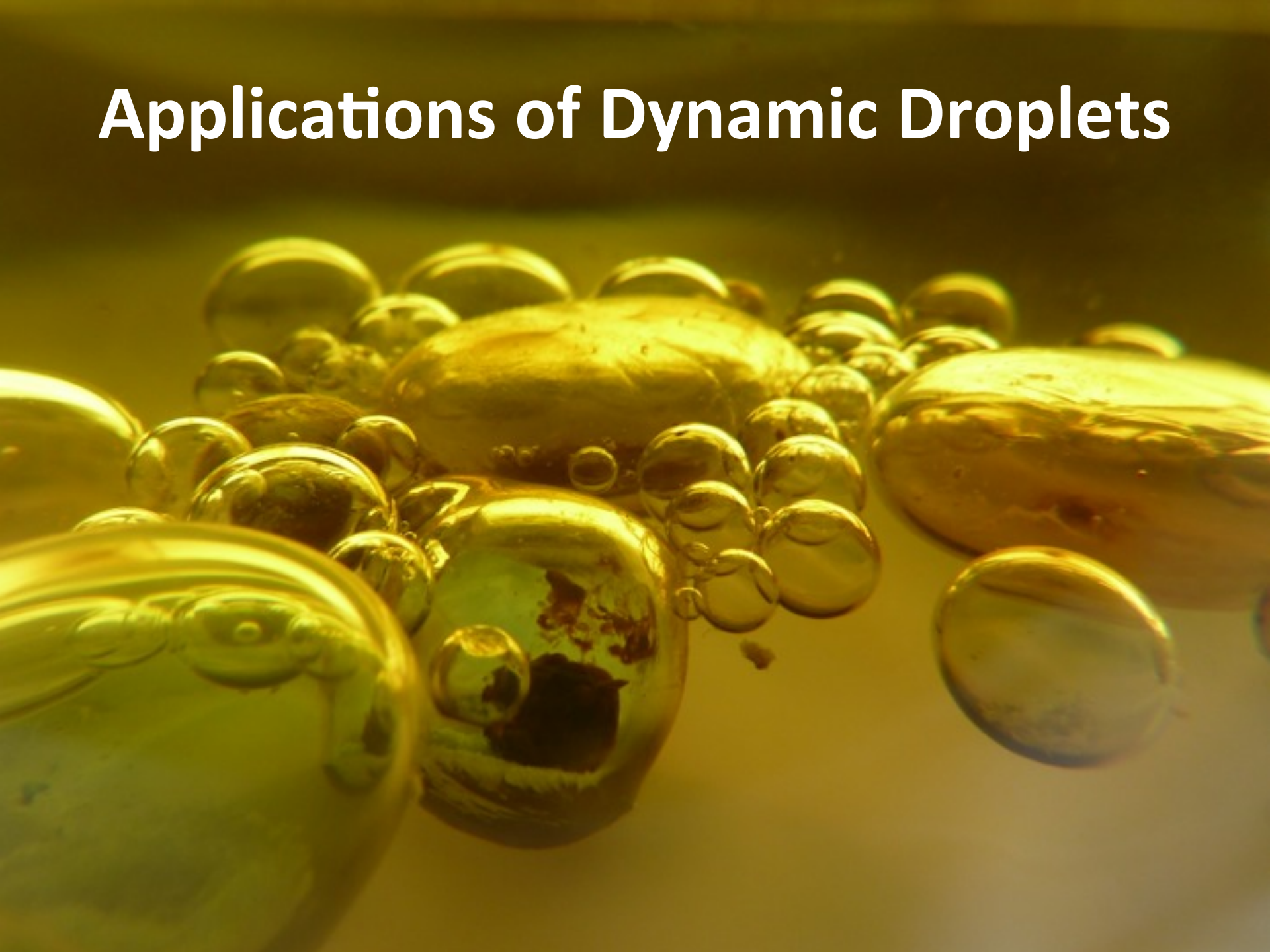




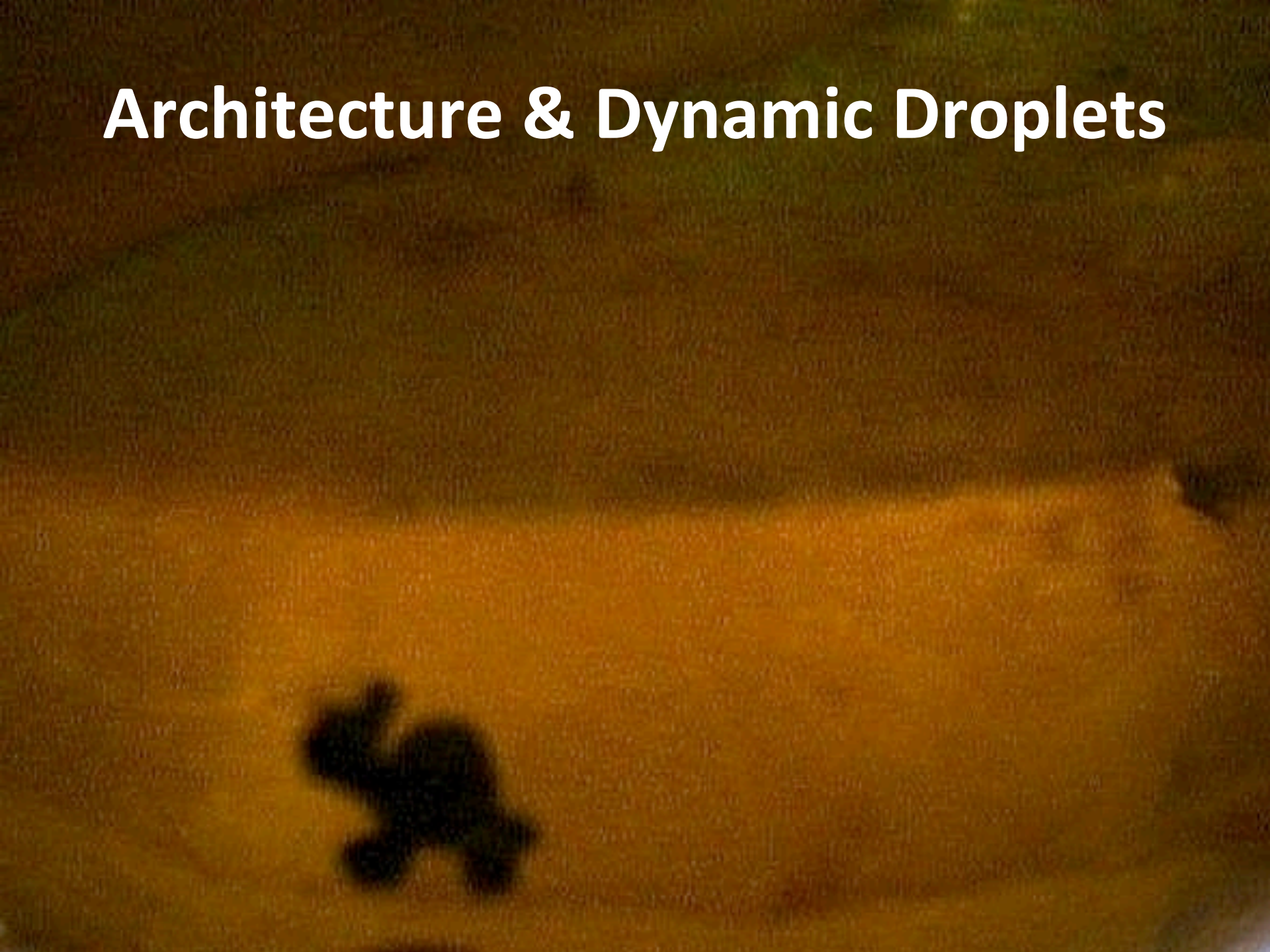
Unpredictability



Applications of Dynamic Droplets

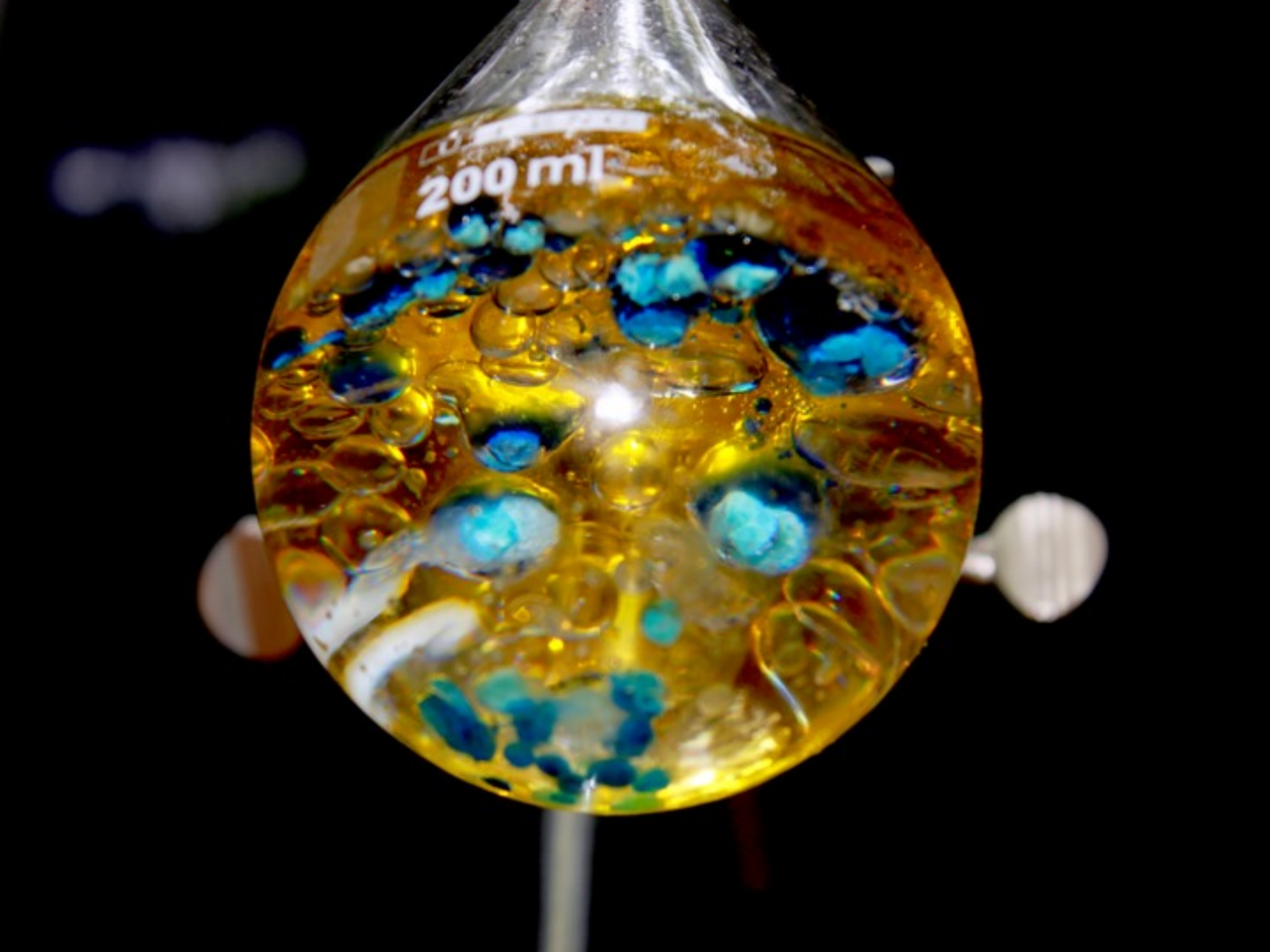


Architecture & Dynamic Droplets



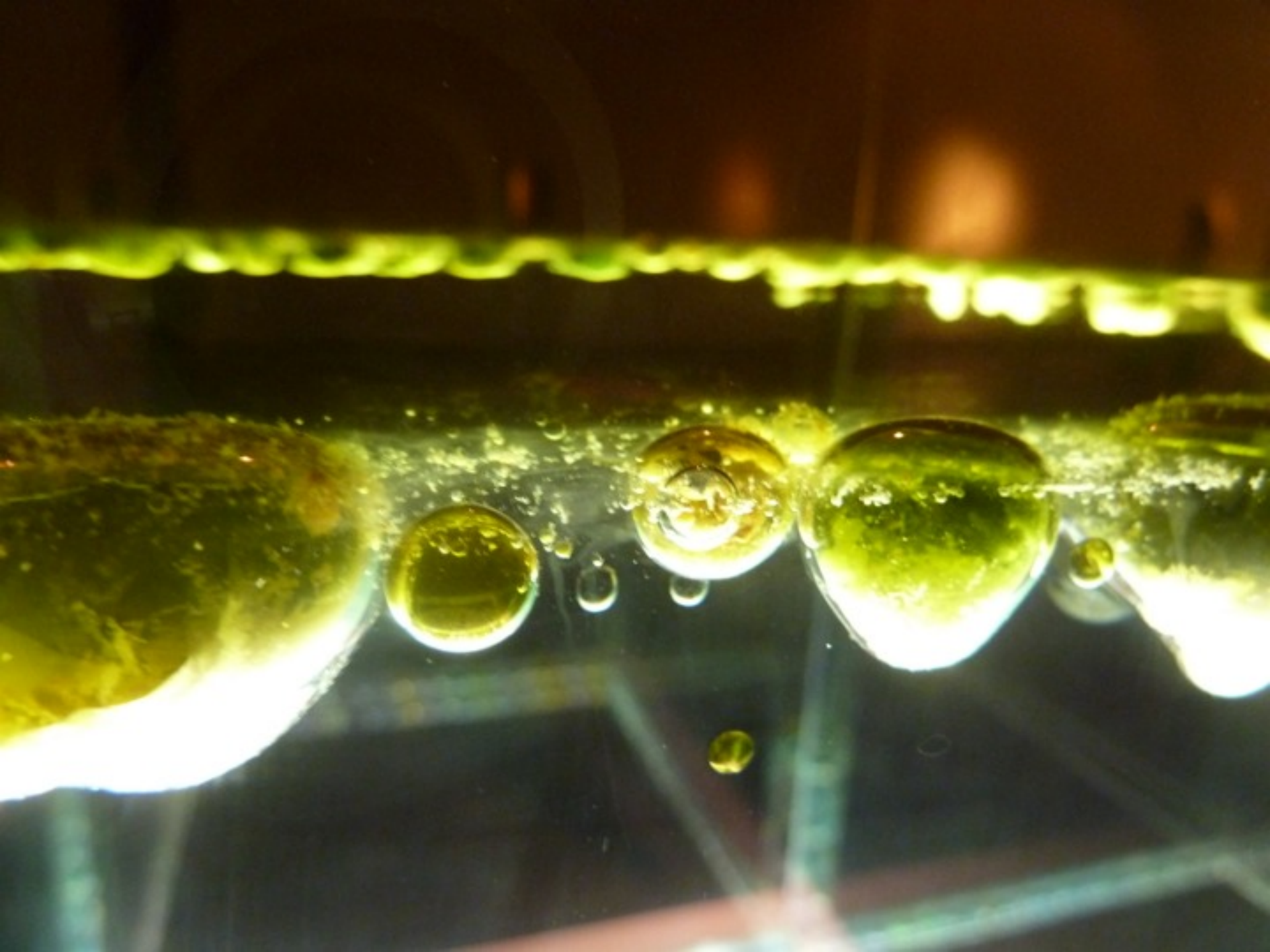

Modification of Bütschli Droplets

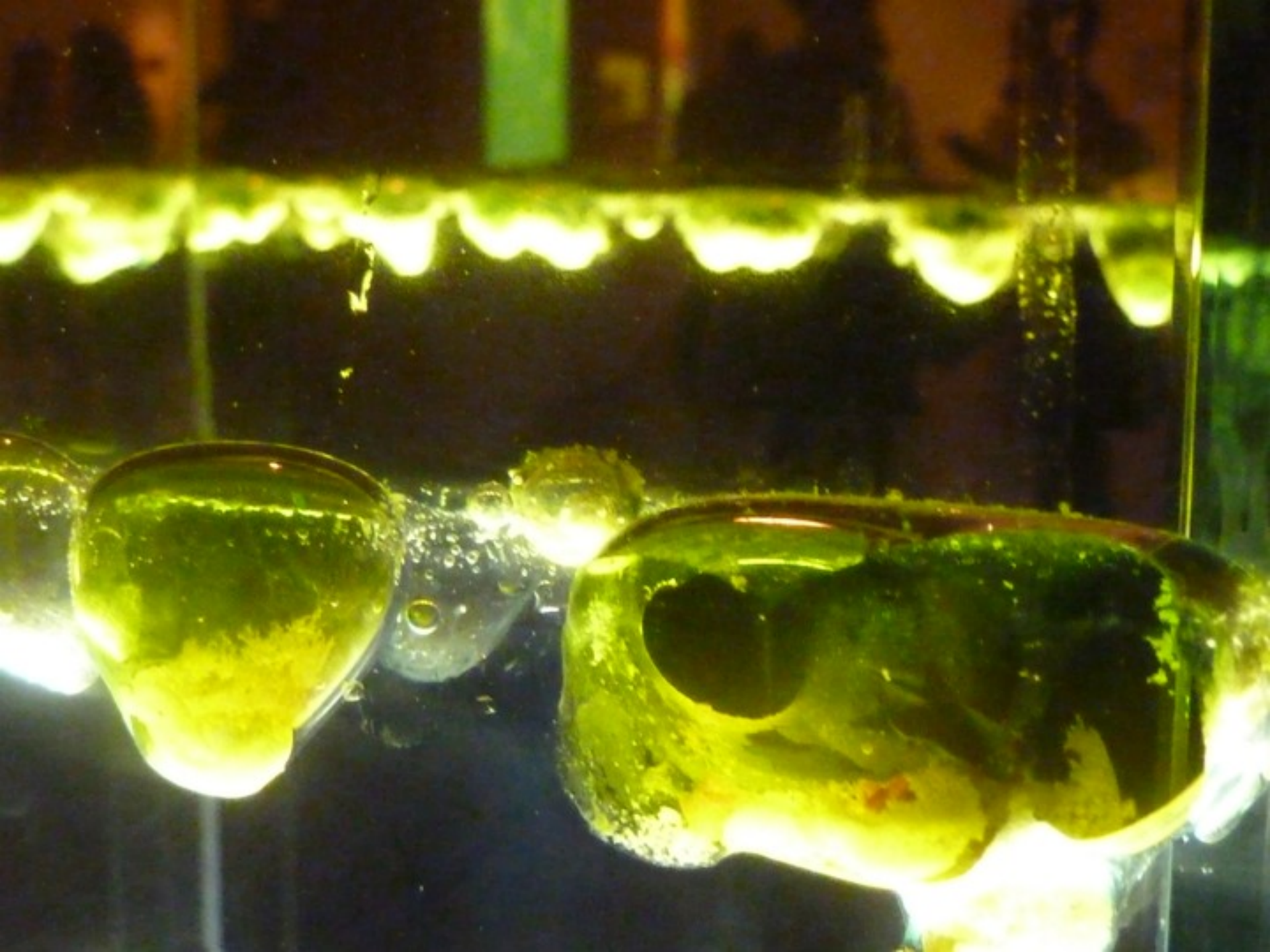
- Base layer of Diethyl Phenyl Phthalate
- Upper layer of olive oil
- 3M NaOH droplets introduced by hand

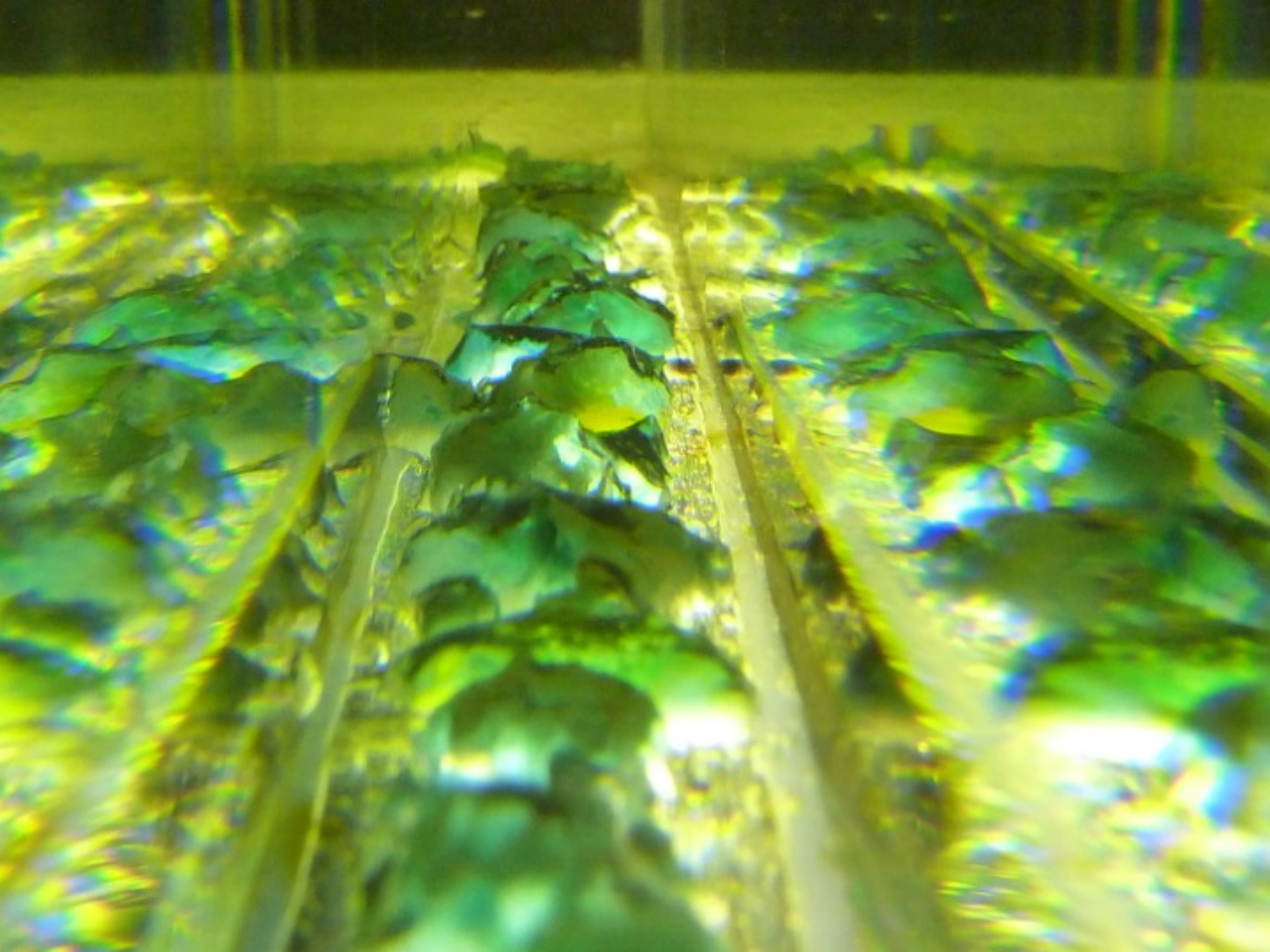

200 ml

Hylozoic Ground

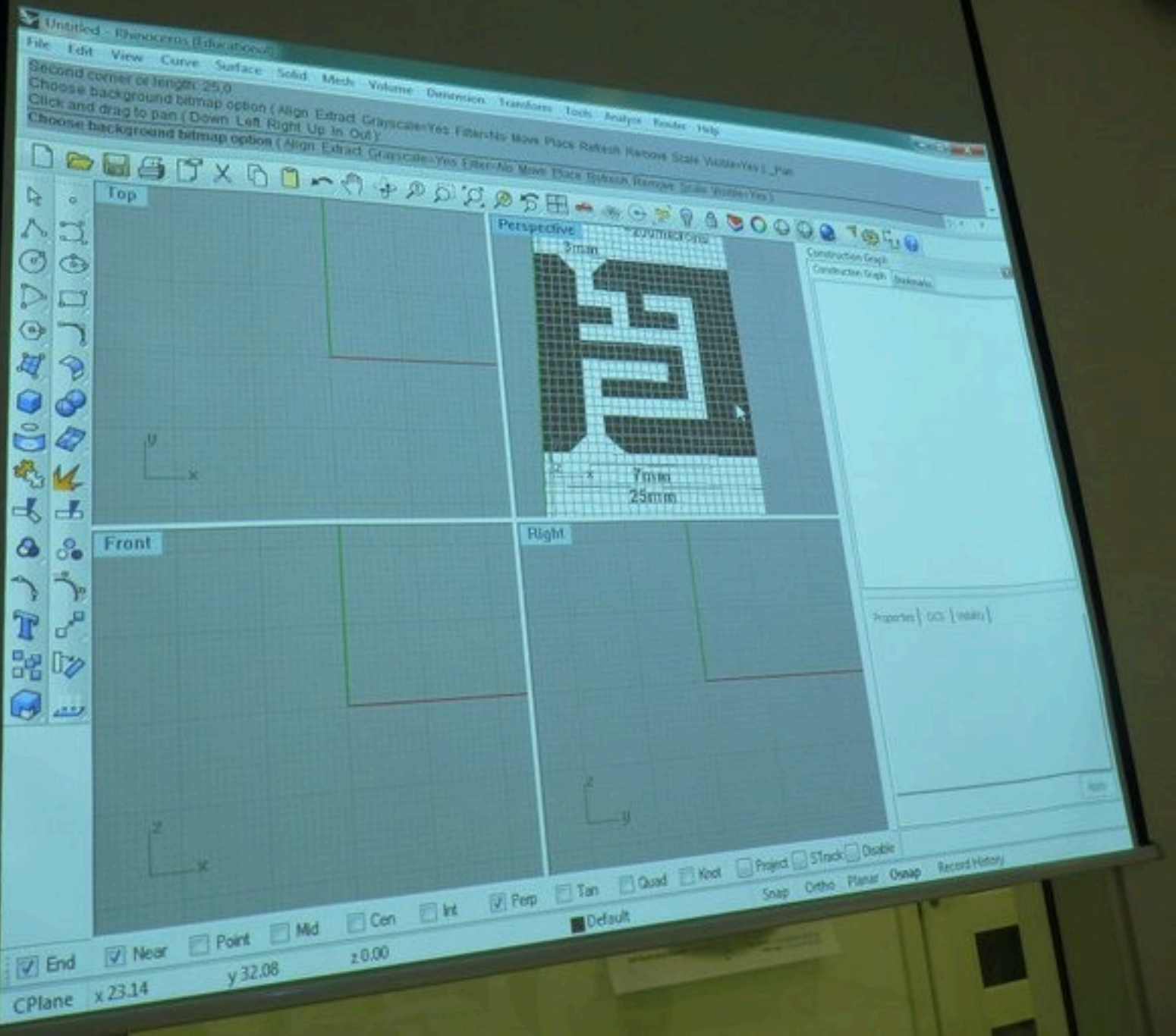

Natural History Museum, Vienna







WET Fab


Untitled - Rhinoceros (Education)
File Edit View Curve Surface Solid Mesh Volume Dimension Transform Tools Analyze Render Help
Second corner or length: 25.0
Choose background bitmap option (Align Extract Grayscale=Yes Filter=No Move Place Refresh Remove Scale Width=Yes): _Pan
Click and drag to pan (Down Left Right Up In Out):
Choose background bitmap option (Align Extract Grayscale=Yes Filter=No Move Place Refresh Remove Scale Width=Yes):
Top
Perspective
3mm
7mm
25mm
Front
Right
End Near Point Mid Cen Int Perp Tan Quad Knot Project STrack Disable
Default
Snap Ortho Planar Osnap Record History
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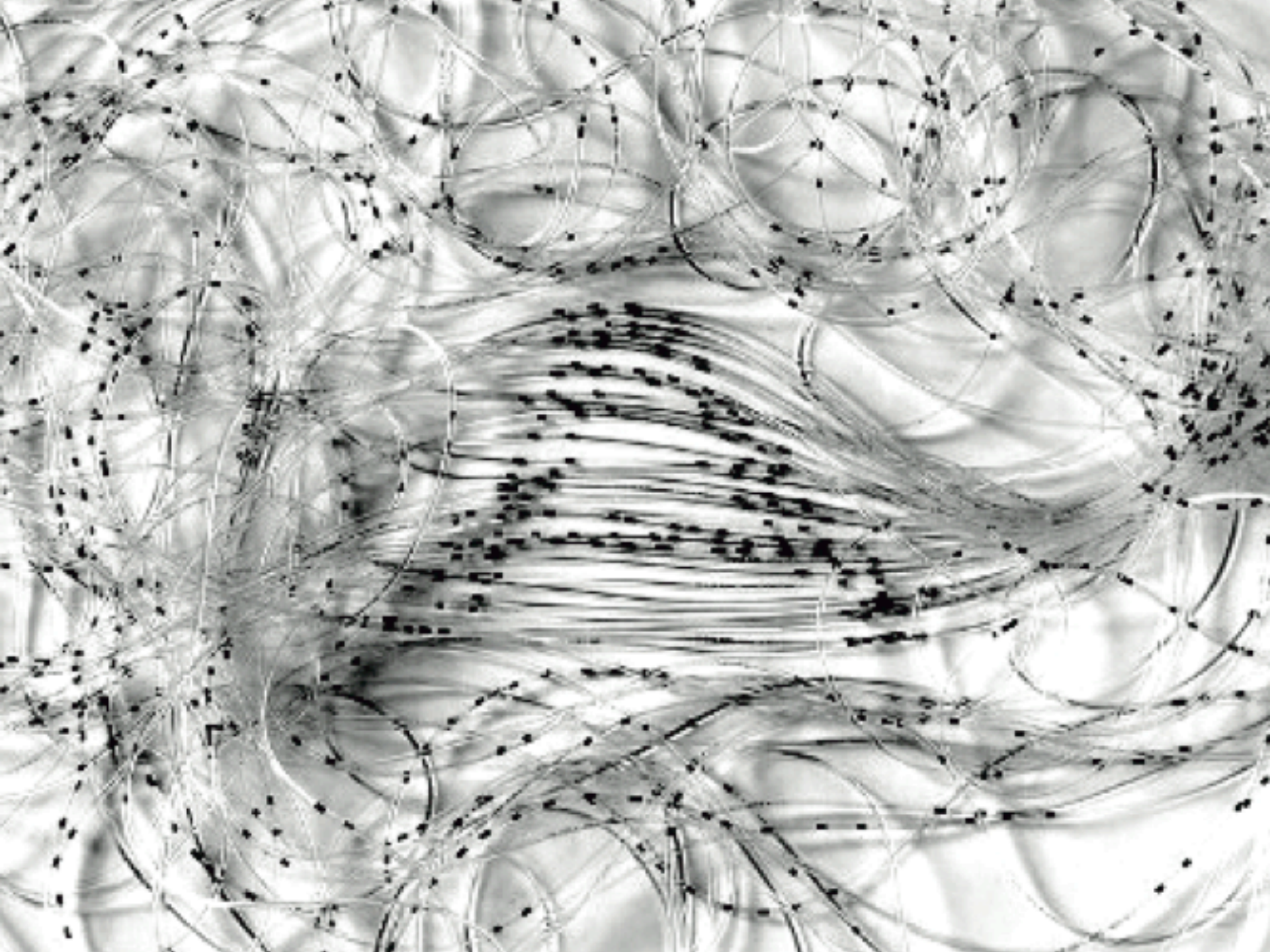
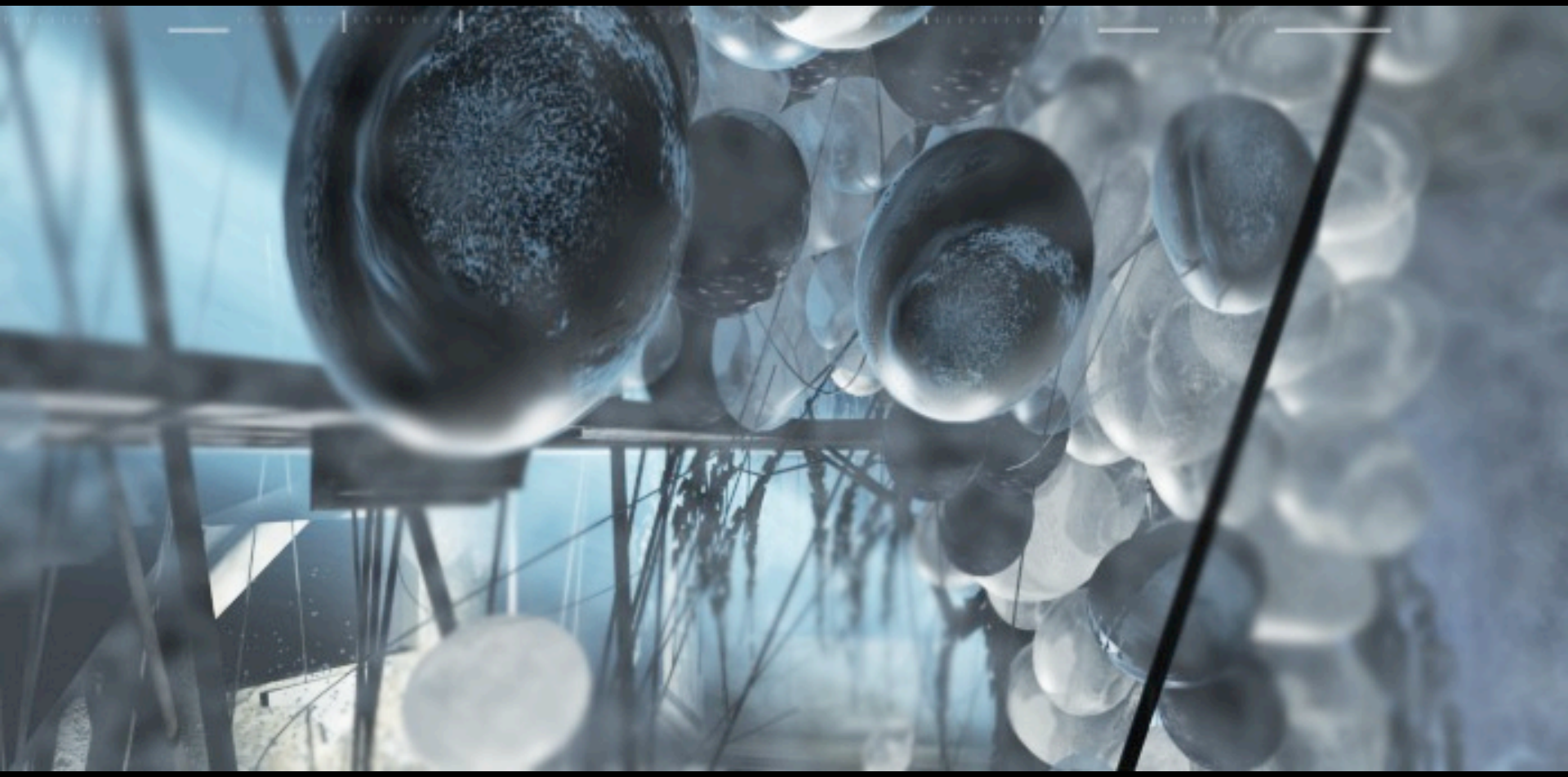


Speculative: Future Venice



Drawing, Christian Kerrigan

Drawing, Christian Kerrigan

Drawing, Christian Kerrigan

Drawing, Christian Kerrigan


Drawing, GMJ

Research Conclusions

- Bütschli droplets possess dynamic chemical and physical properties that possess embodied ‘computational’ qualities
- Possibility of harnessing chemical/ morphological parameters and combining with other information media
- Mathematical modeling of system needed
- Have applied potential in design/engineering

Future of Science?

- Complexity (new methods & tools needed)
- Collaborative (between scientific disciplines & with non-scientific disciplines)
- Communication (age of 'open' … everything … innovation, source, publishing & funding!)


The future is already here — it's just not very evenly distributed. William Gibson, 1993.

Thanks to:

- Neil Spiller, University of Greenwich
- AVATAR, University of Greenwich
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- ISSP, SDU
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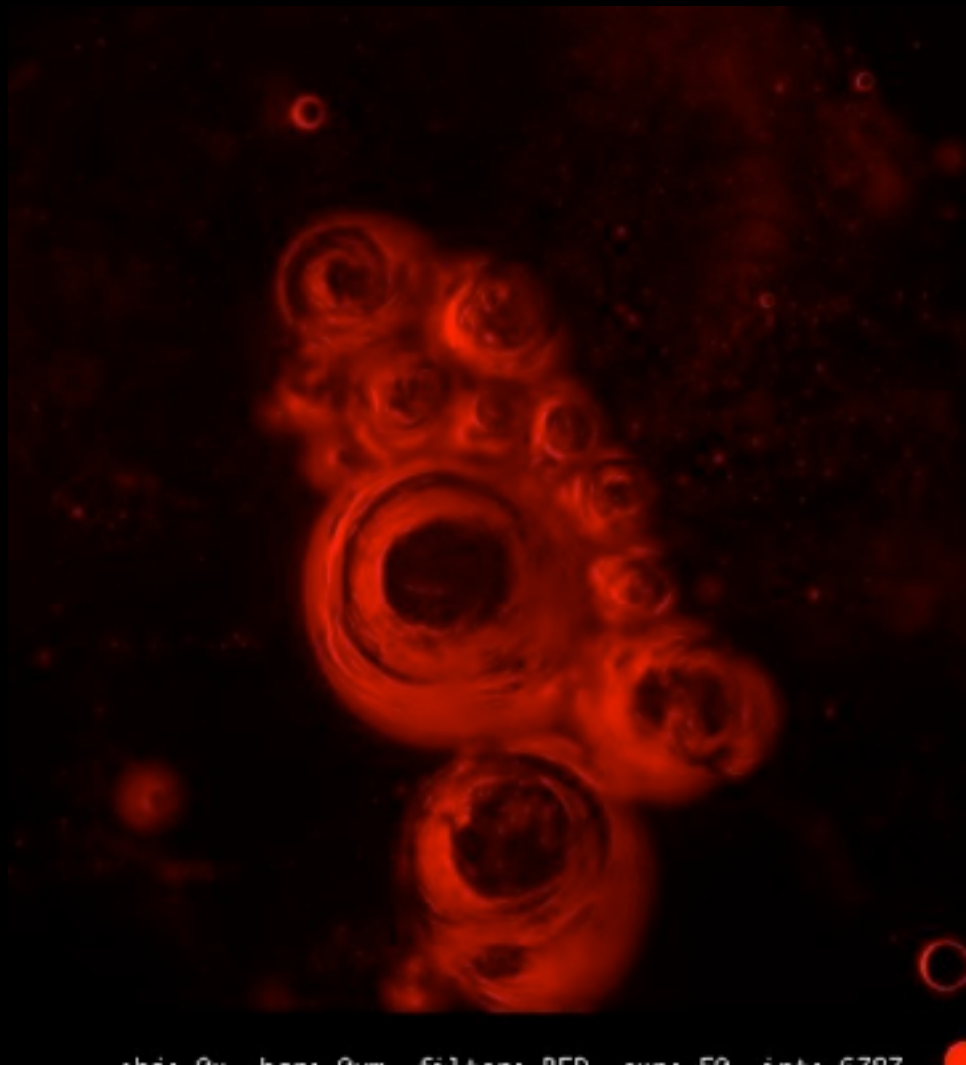
- Lee Cronin, University of Glasgow
- Cronin Group, University of Glasgow
- Uformia, Norway
- Fab At Home, USA
- Philip Beesley, University of Waterloo
- Christian Kerrigan, Astudio, London
- GMJ, London
- Julius Popp



Contact:

@livingarchitect

grayanat@yahoo.co.nz