AiR

ART IN RESEARCH

Science, like art, results from a subtle balance between emotion and reason, regularities and surprises, light and shadows.

Jean-Philippe Bouchaud, Académie des Sciences

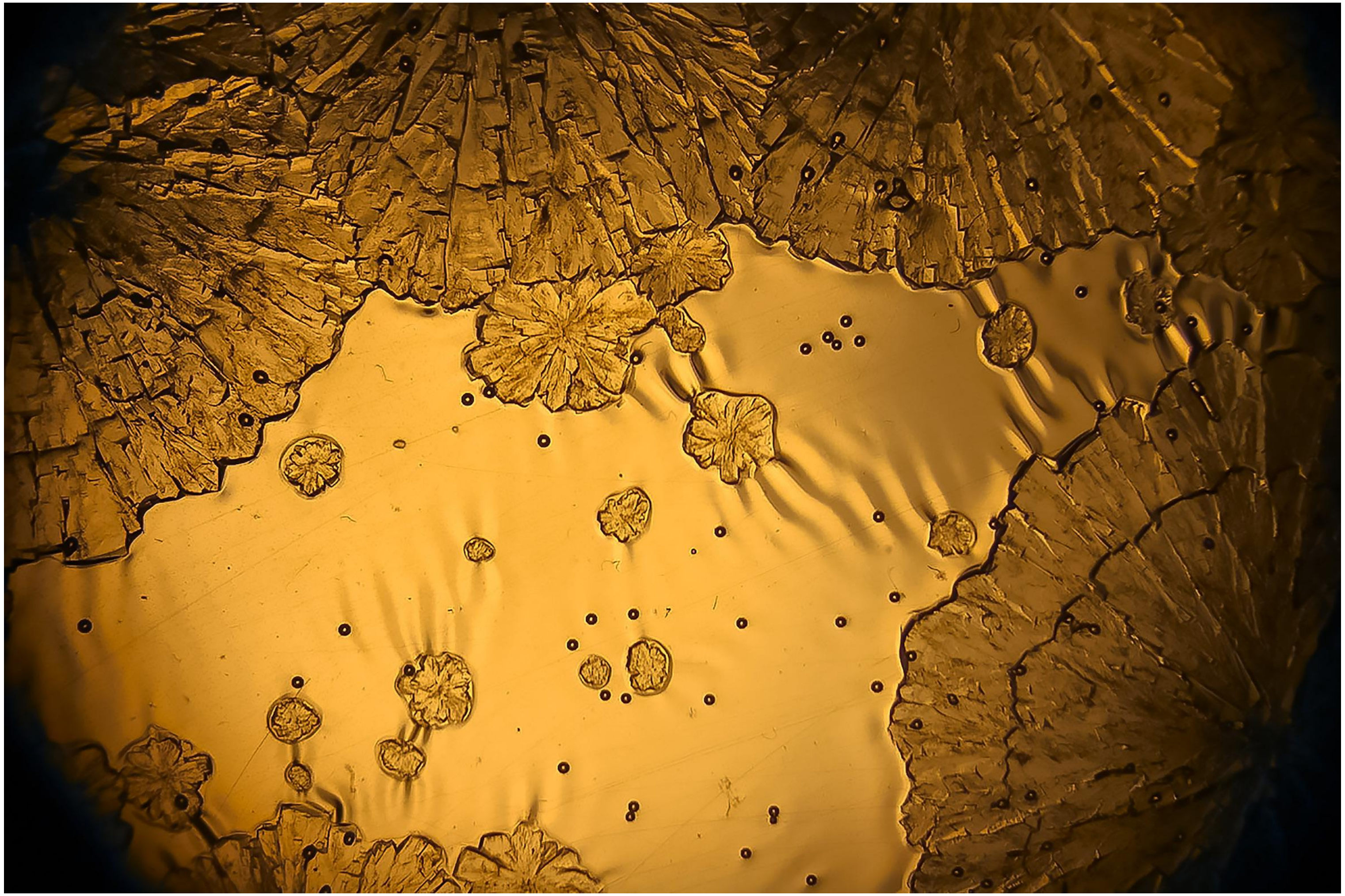
THE AIR PROJECT

Born in 2017, AiR - Art in Research is the first art gallery dedicated to scientific photography. With the aim of revealing unsuspected beauty in scientific research, we want to show the world how intriguing, mysterious and harmonious photographs taken by scientists in the context of their work can be. In addition, one can directly help funding research by purchasing one or several of our artworks.

Photography plays a crucial role in today's scientific research: various imaging techniques, such as microscopy, are now used in physics, biology, medicine, earth science, and even mathematics. Some of the researchers we support really step into artists' shoes, while others simply capture instants of beauty reminiscent of the fragile and delicate harmony of nature. Sometimes by revealing the invisible, and other times by playing with the scales of observation, our photographs are at the same time surrounded by mystery and witnesses to an undeniable truth.

Bearing in mind that art is a formidable vector of communication, we organize exhibitions, conferences, and school interventions to arouse children's scientific and artistic curiosity. Science has the power to fascinate everyone, one just has to know how to tell the story: at AiR, we choose to tell it with pictures.

ARTWORKS

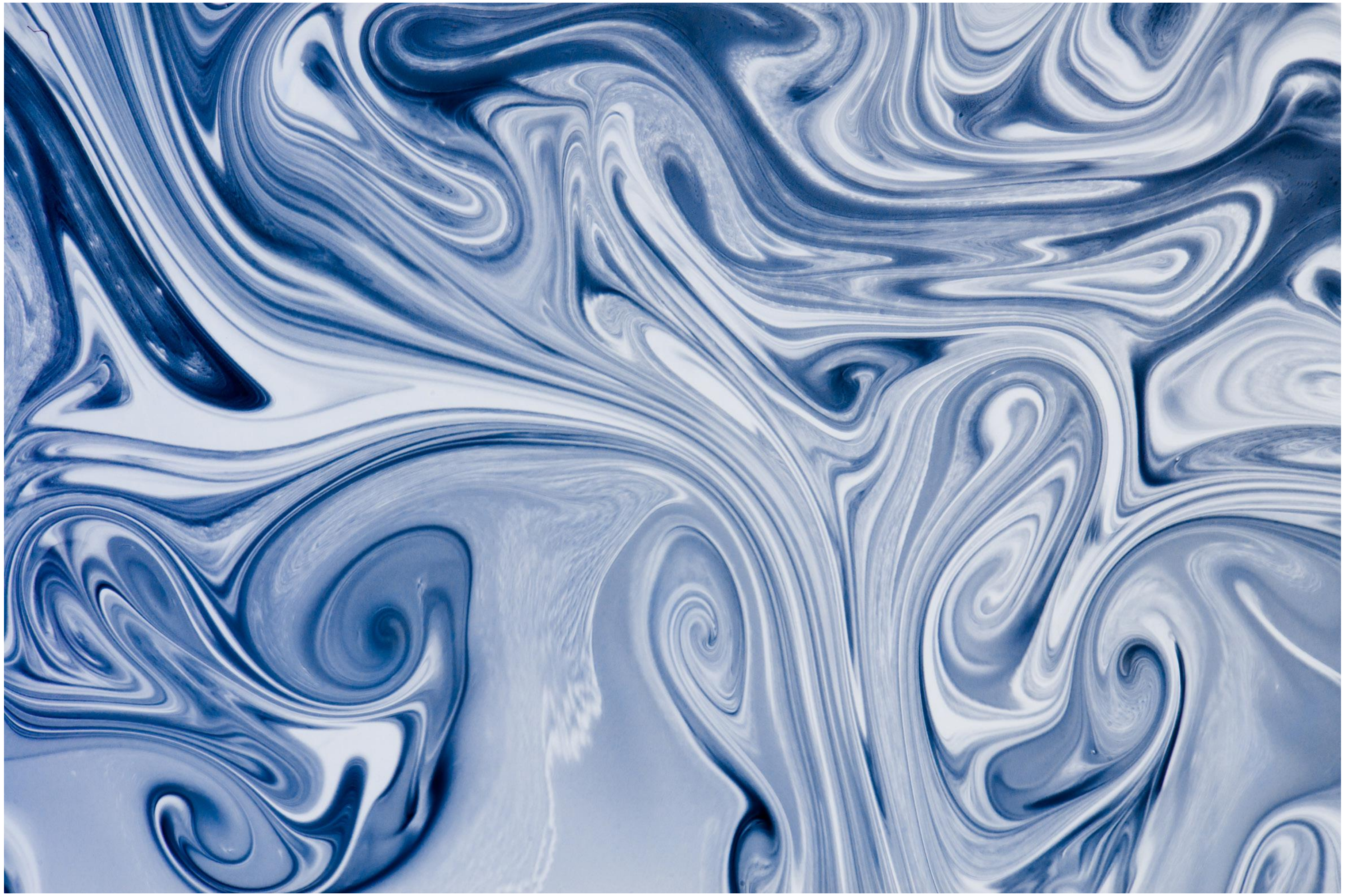


Sweet crystallization I,
by Eric Falcon & Claude Laroche

Anyone who drinks sweet tea or coffee is familiar with the dissolution of sugar in water. The reappearance of sugar itself from the latter solution however gets much less press. To better observe this phenomenon, take a drop of sweet water, place it under your microscope - or else borrow one from your neighbour - and warm up your sample. Wait a few minutes and you will then see the first crystalline fragments at the nucleation points. On this shot, the two phases, solid and liquid, coexist before the first expands inexorably, without mercy for the second.

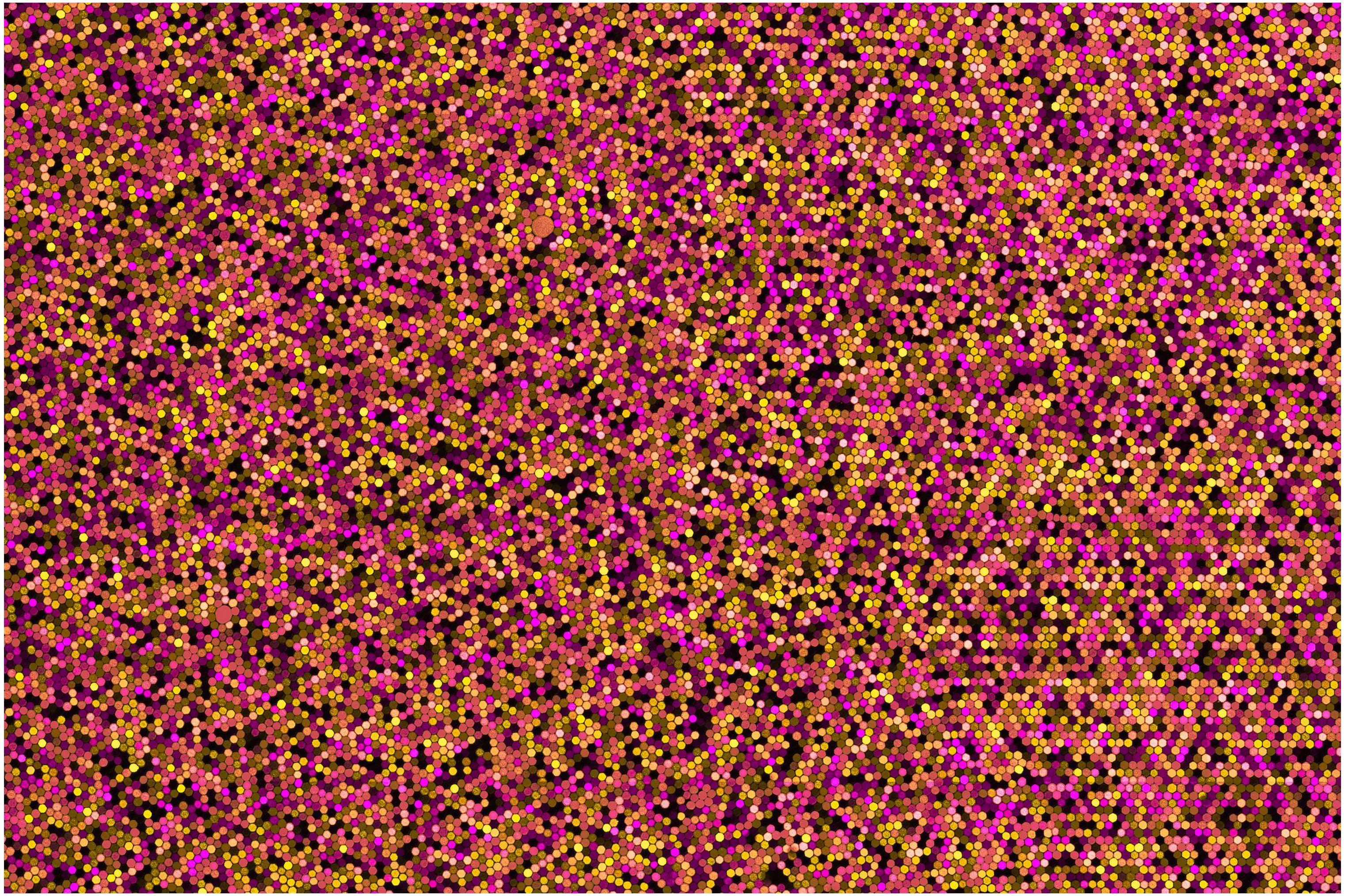
Frozen Sun,
by Alexandre Darmon

It’s the end of the day. Alexander decides to leave the microscopy room after some long hours spent observing his microdroplets of liquid crystals. He turns off his microscope as the last rays of the winter sun enter the laboratory. The urge takes him to take a last look at his sample. He witnesses a moment of harmony that he will not let slip: the natural, grazing light, that of the setting sun, gives to this micrometric droplet the appearance of a frozen sun.



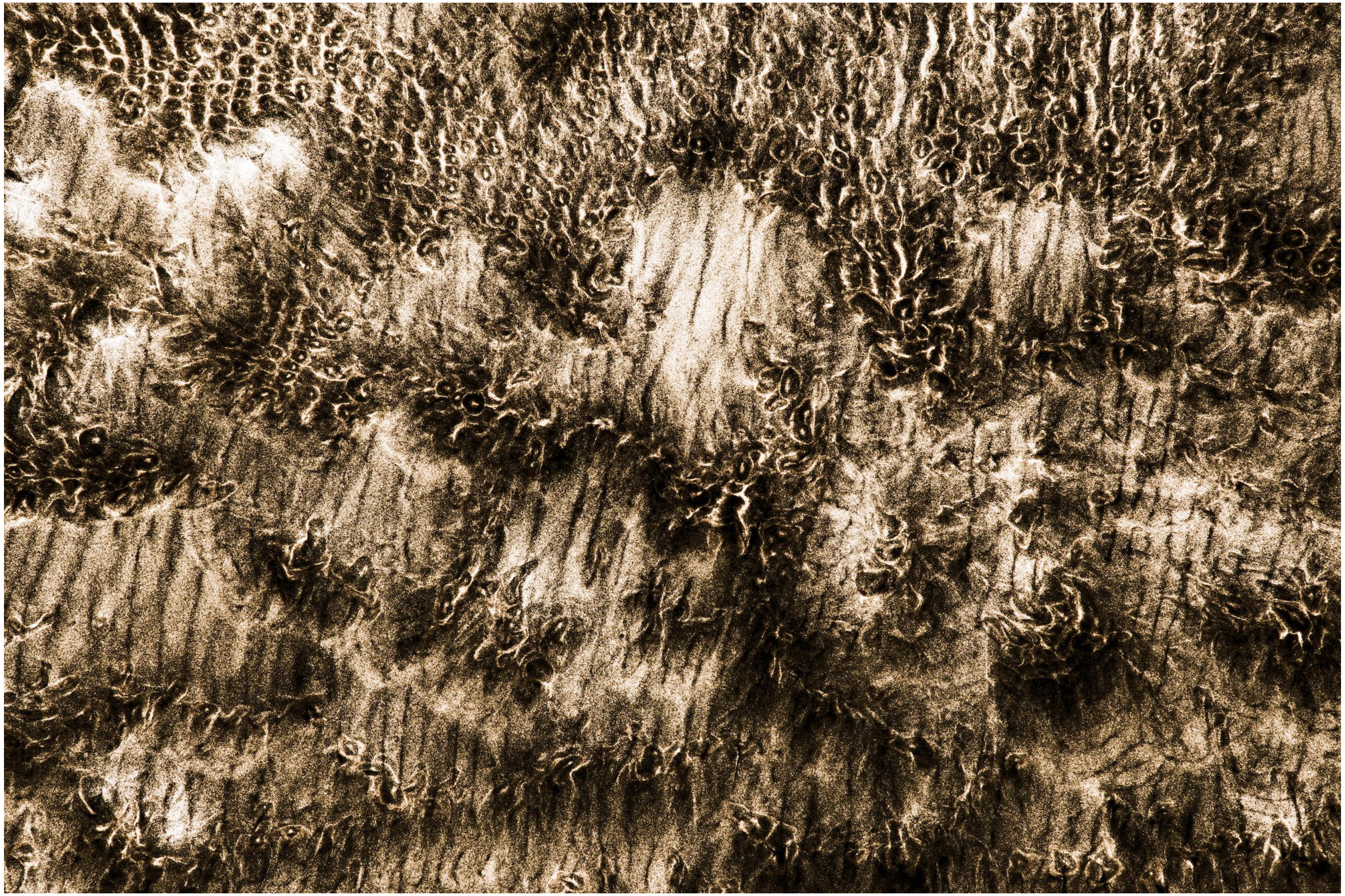
Volutes I,
by Matthieu Roché

A surfactant is an agent capable of modifying the rigidity of a liquid interface. When you inject locally a mixture of olive oil and surfactant at the surface of water, the magic operates in a spectacular manner. The difference in surface tension induced by the incoming concoction leads to surface flows, to which the Italian physicist Carlo Marangoni gave his name. These displacements of fluid give birth to harmonious volutes that waltz with each other.



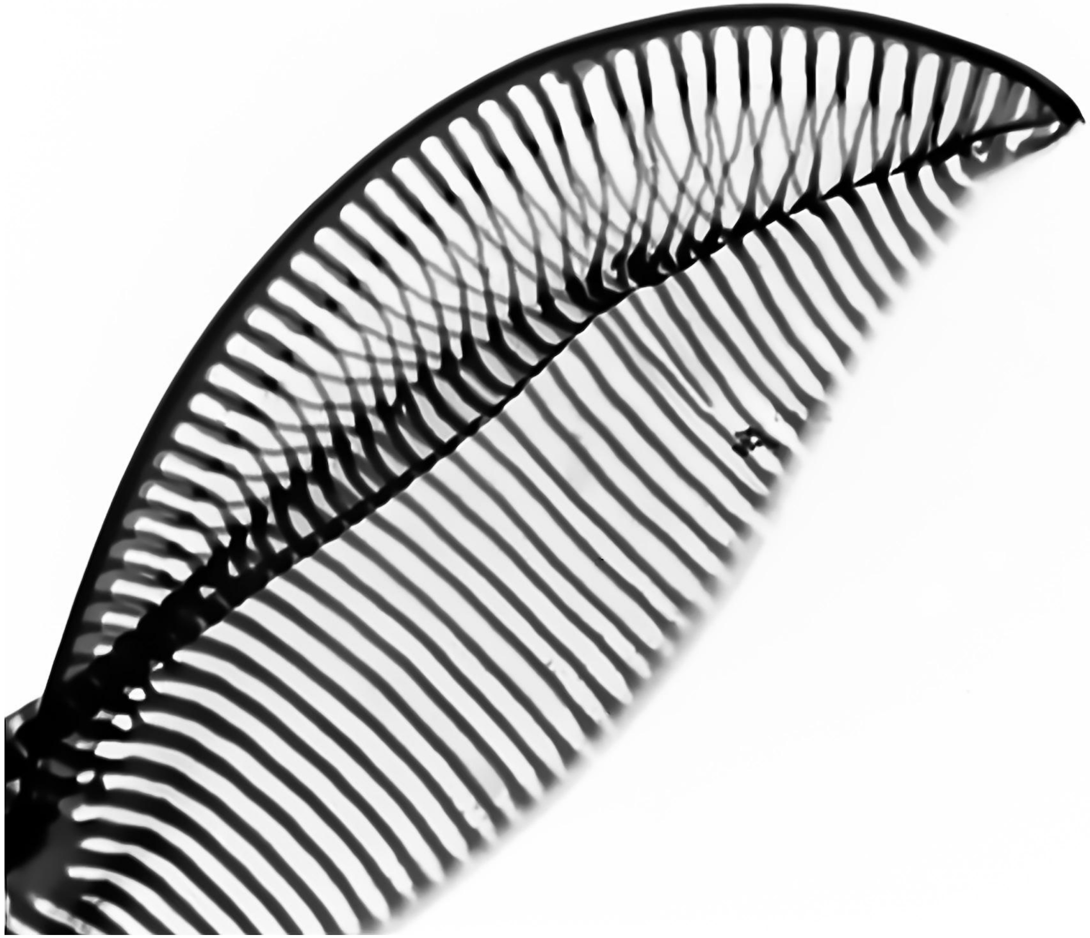
DNA Patchwork II,
by Yannick Rondelez

This photographic assemblage could as well be the collaborative work of a pointillist painter and a contemporary artist. In fact, nearly fifty thousand drops filled with DNA and fluorescent tracers populate this high resolution canvas. Observed under the microscope, the chromatic data resulting from the expression of the tracers allows one to obtain information on the DNA present in each of these microdrops. This innovative method is promising for the bio-medical world and could eventually become an essential tool for diagnosis.



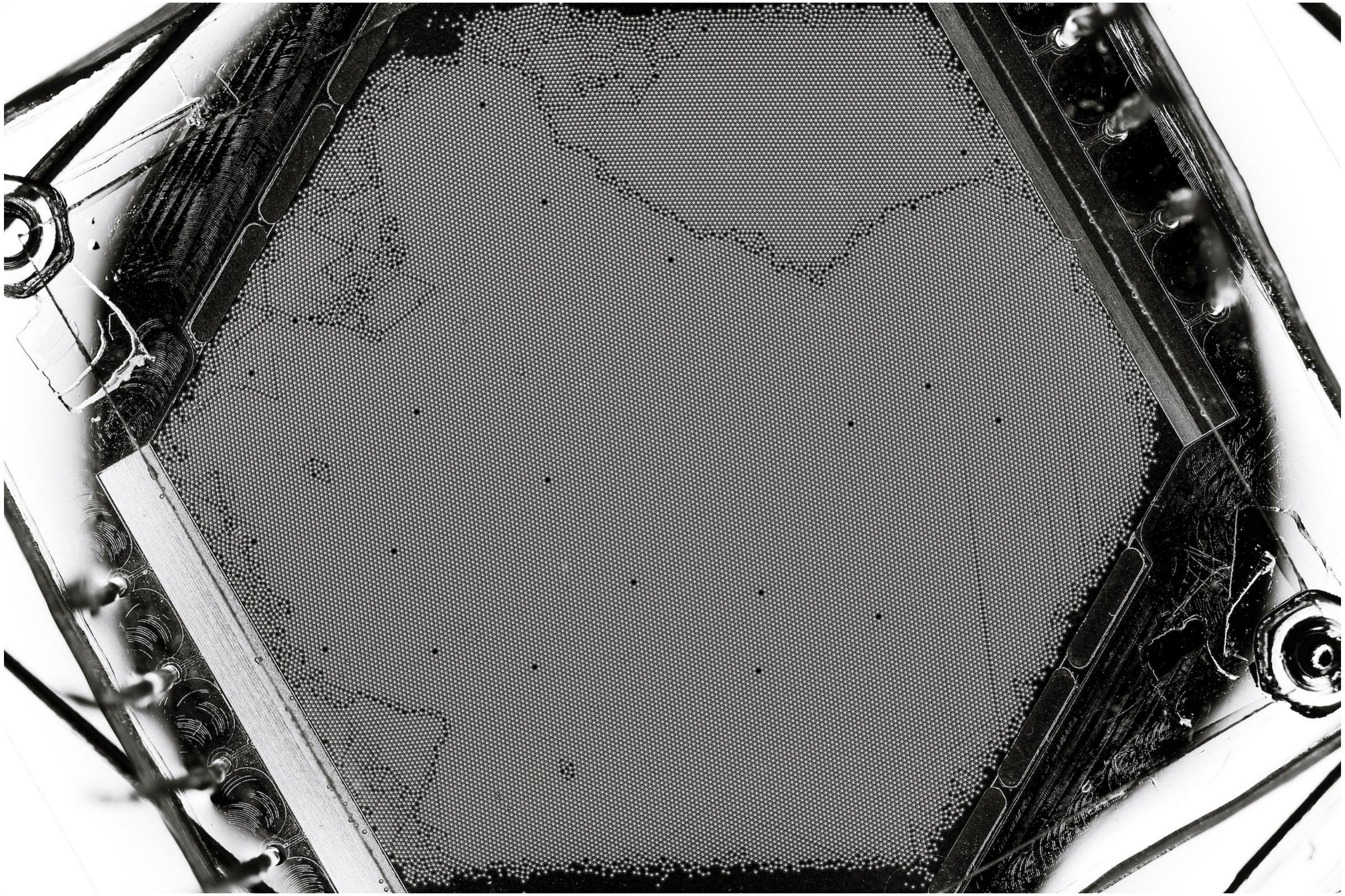
Golden convection,
by Benjamin Thiria

After a few seconds sunbathing under the heat of a halogen lamp, the metallic paint sample sets in motion. At the origin of these swirls is the thermal convection. The vertical temperature gradient causes displacements of matter within the golden fluid. This physical phenomenon, known to hydrodynamicists, geologists or even meteorologists as Rayleigh-Bénard instability, explains the rough and tormented appearance of the liquid surface.



Parisian diatom,
by Pascal Jean Lopez

Have you ever wondered about the type of creatures that inhabit the waters of our cities? Pascal has, and the answer is before our eyes. This microorganism, observed under a transmission electron microscope and whose size does not exceed twenty microns, belongs to the family of Parisian diatoms. The skeleton of this microscopic alga is made of silica, the hardest material in the world. The parallel between the bone structure of this bacillariophyta and the capillary network of a leaf is rather striking. But the forms are not the only thing that these plants share: just like the trees that populate our forests, these algae are essential for our survival since they alone produce nearly a quarter of the oxygen we consume. Ready, steady, breathe.

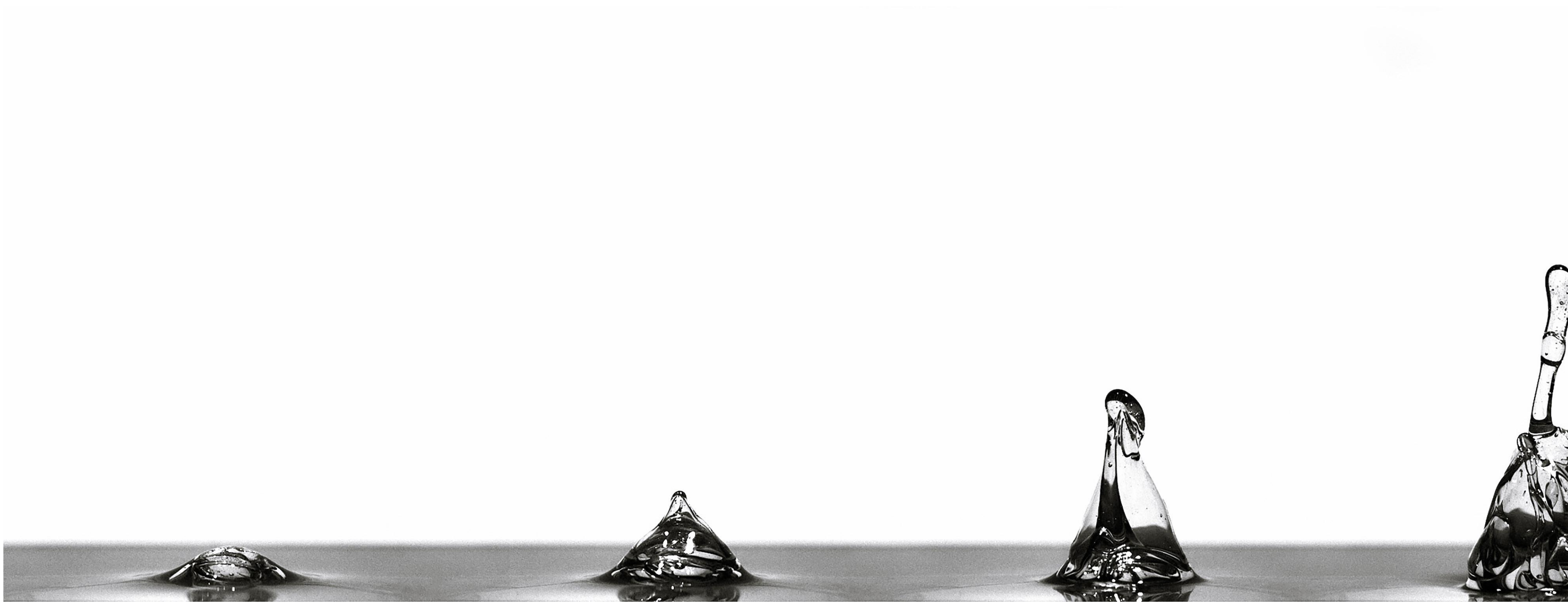


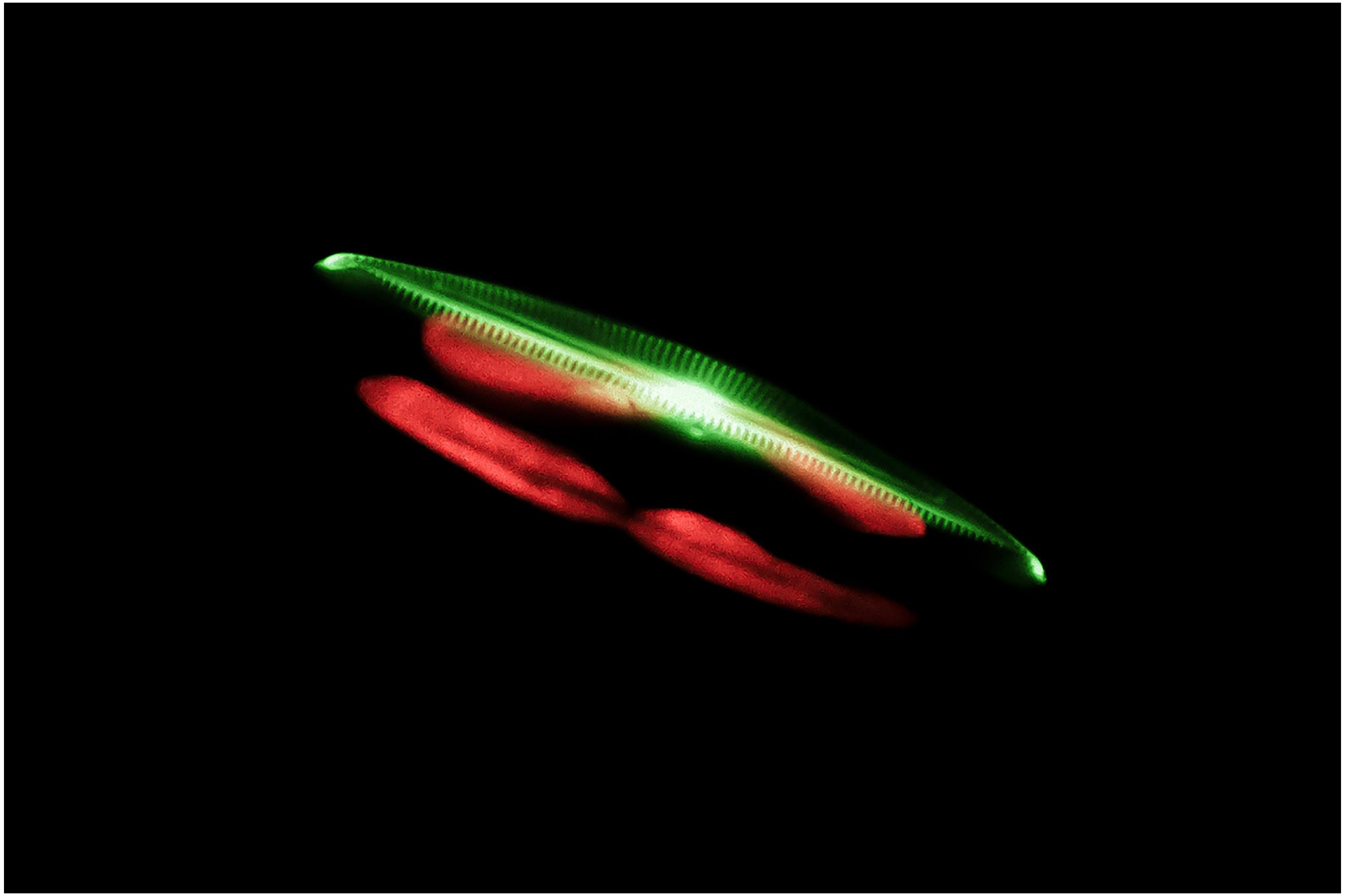
Bubble crystal,
by Nicolas Taccoen & Charles Baroud

Thirty thousand micro-bubbles, each not wider than a hair, are here gathered to form a nearly perfect crystalline lattice. This two-dimensional crystal is fragile, ephemeral. The bubbles are not fixed, they move, slide, sometimes burst. Here, the finesse and detail of the crystalline patterns contrast with the raw and rough look of the experimental setup. Bolts and traces of milling machine outside the hexagonal cell remind us that we are indeed facing a real experiment.

Liquid jet,
by Thomas Séon

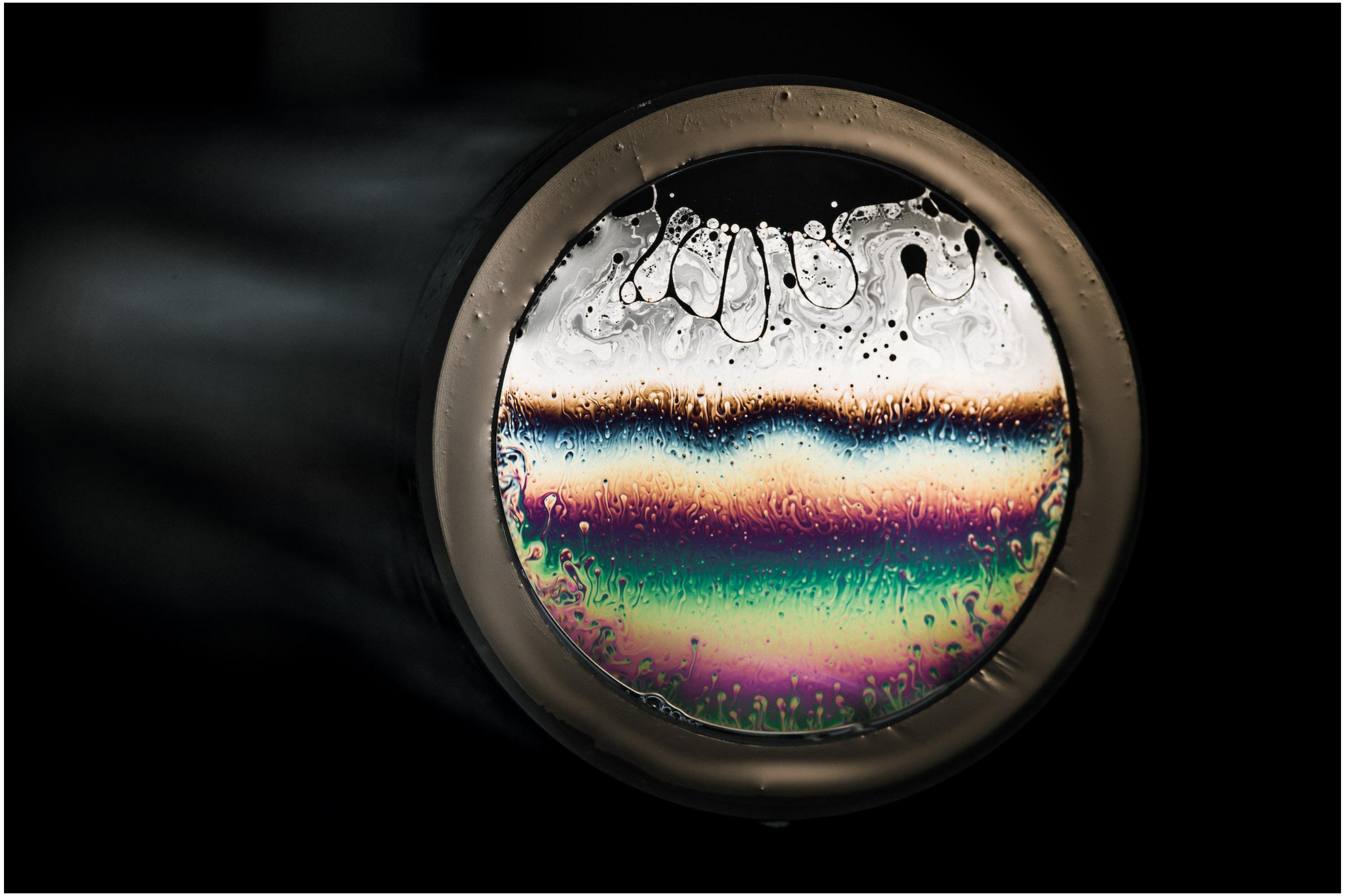
Some consider that Etienne-Jules Marey's chrono-photographs represent the beginning of scientific photography. The movement is broken down into a succession of shots that are subsequently reassembled. This technique is still widely used today by scientists who see it as a way to freeze the movement in a discrete way. Here, it is the jet generated by the explosion of an air bubble at the surface of a thick liquid that gives rise to this panoramic realization.





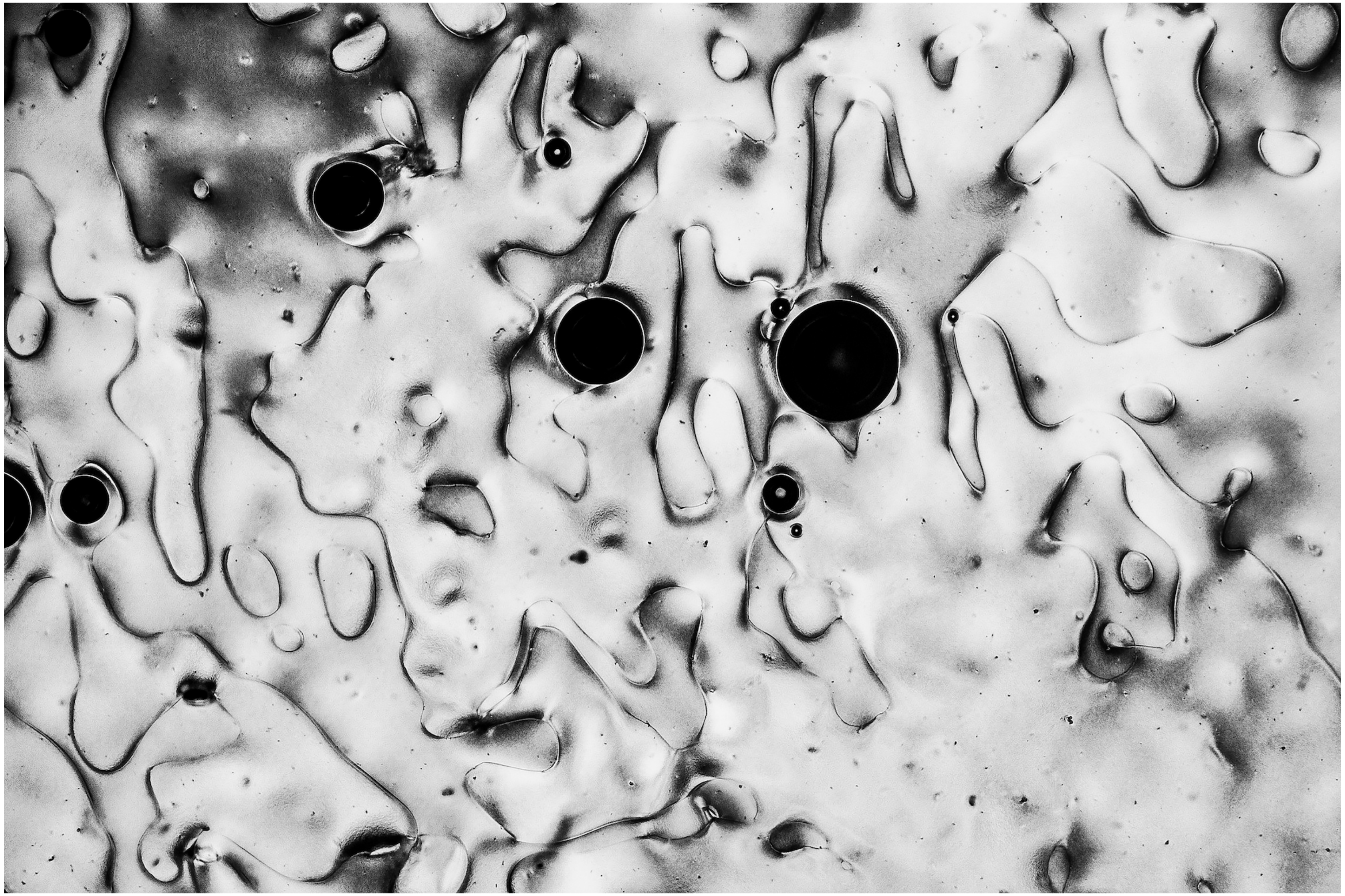
Diatoms, mother and daughter
by Pascal Jean Lopez

This microorganism observed by fluorescence microscopy belongs to the family of diatoms known as pennate. Its size does not exceed a few microns. The skeleton of this microscopic alga is made of silica, the hardest material in the world. The mechanisms of formation of this bone structure remain only partially understood and this photograph, taken during the phase of cell division, brings yet an additional stone to the building. The intrinsic beauty of this microscopic object serves, to our knowledge, no particular function except to anchor in our minds the fond memory of a perfectly symmetrical body.



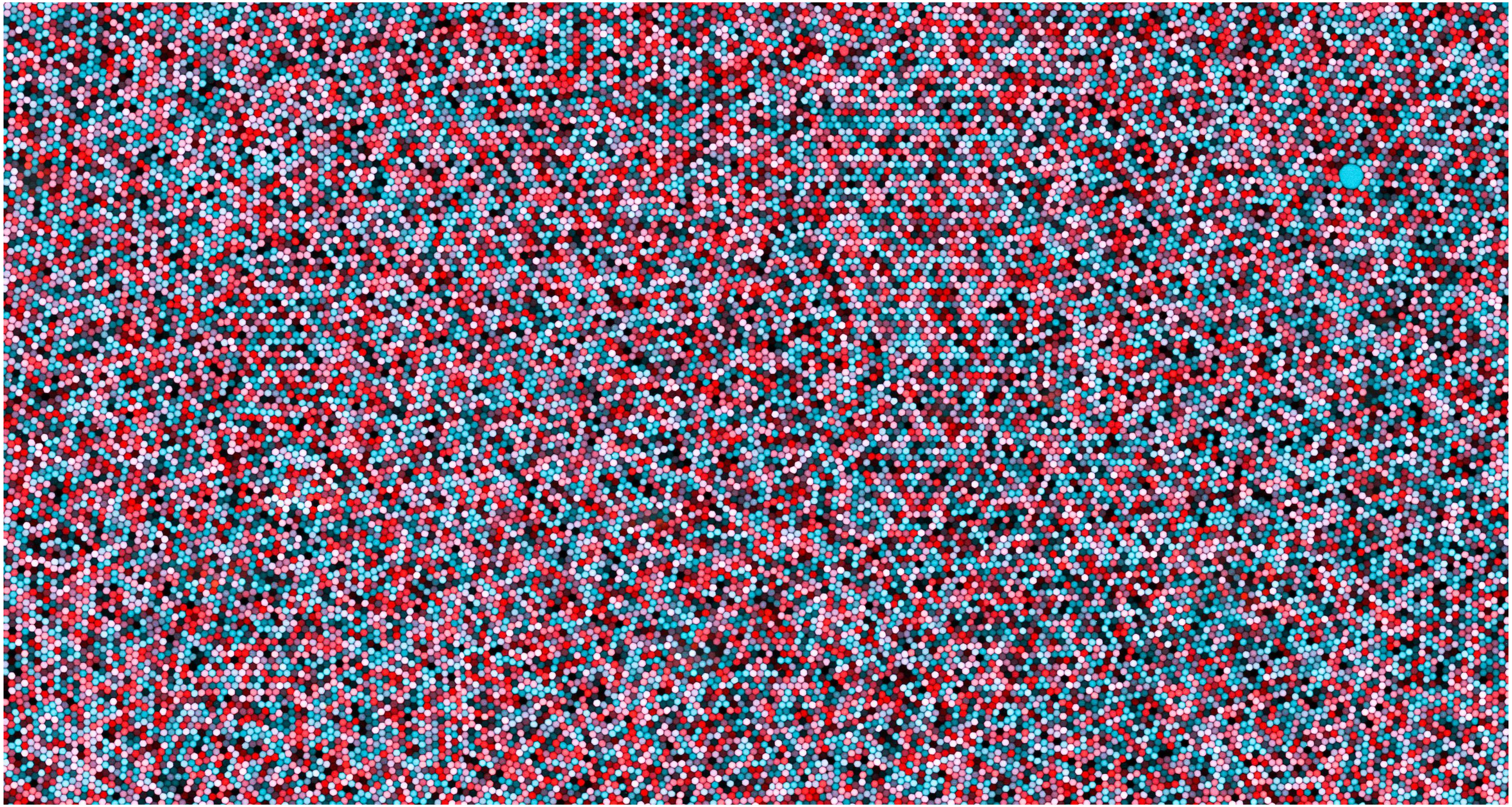
A quick break,
by Florence Elias

What happens to a soap film placed at the end of a tube in which musical waves travel? It dances, naturally. The sound propagating through the cylinder has a spectacular effect on the soap film and makes it vibrate, stir, swirl. In this image, the film can catch a quick breath, although it is clear that it has not yet recovered from its last dance. It tries to regain strength before engaging again in a frenzied waltz to the sound of Bizet's Habanera.



Nematic tears,
by Alexandre Darmon

The elongated molecules that compose a nematic liquid crystal tend to align with each other. But here, an external disturbance brings trouble and the energy provided by this agitation disturbs the local order. The liquid crystal must then face the appearance of defects in the orientation of its molecules. These defects take the form of threads, nêma in Greek, from which the phase takes its name. Taken with a polarizing microscope, this photograph also reveals the presence of air bubbles whose sphericity is, at these scales, almost perfect.



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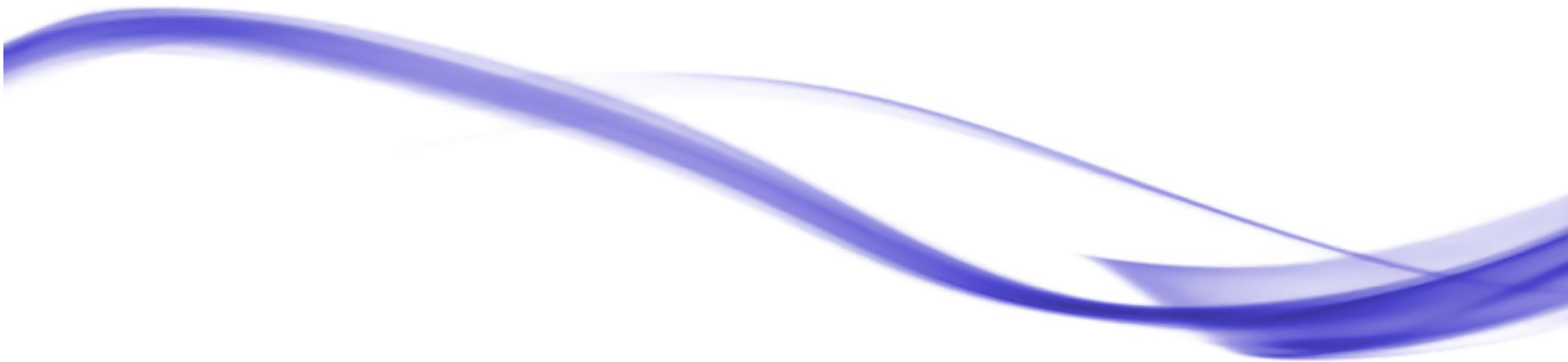
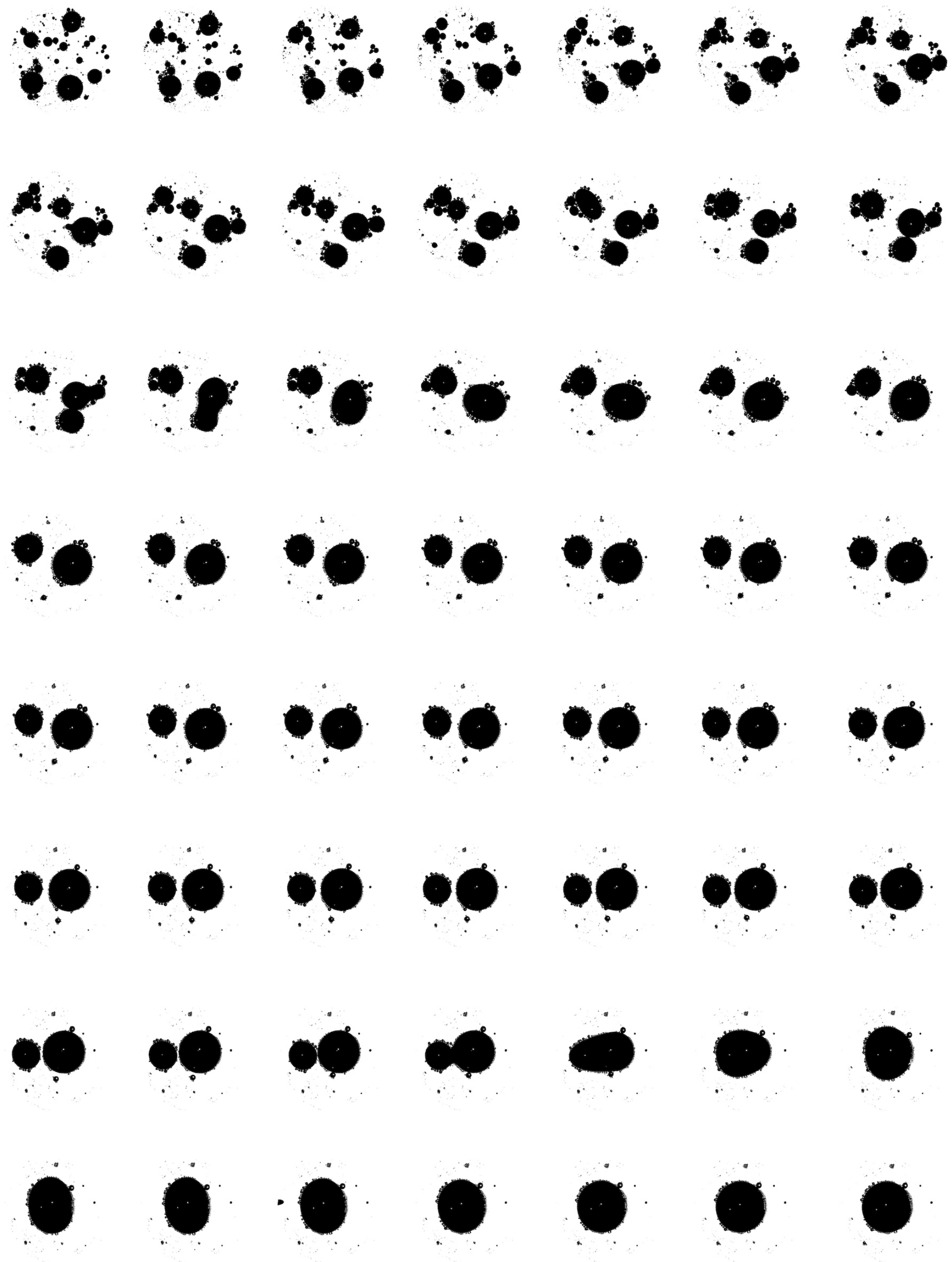


Wake I,
by José-Eduardo Wesfreid & Sophie Goujon-Durand

A spherical obstacle in rotational motion is in the path of a liquid that flows from right to left. In order to better visualize the movements of the fluid particles, a dye is injected upstream of the orbicular obstruction. The jet goes around the spinning obstacle as best as it can but does not come out unscathed. The flow immediately behind the rounded dam is destabilized and takes the form of a helix, seen in this image as an oscillating and delicate brushstroke.

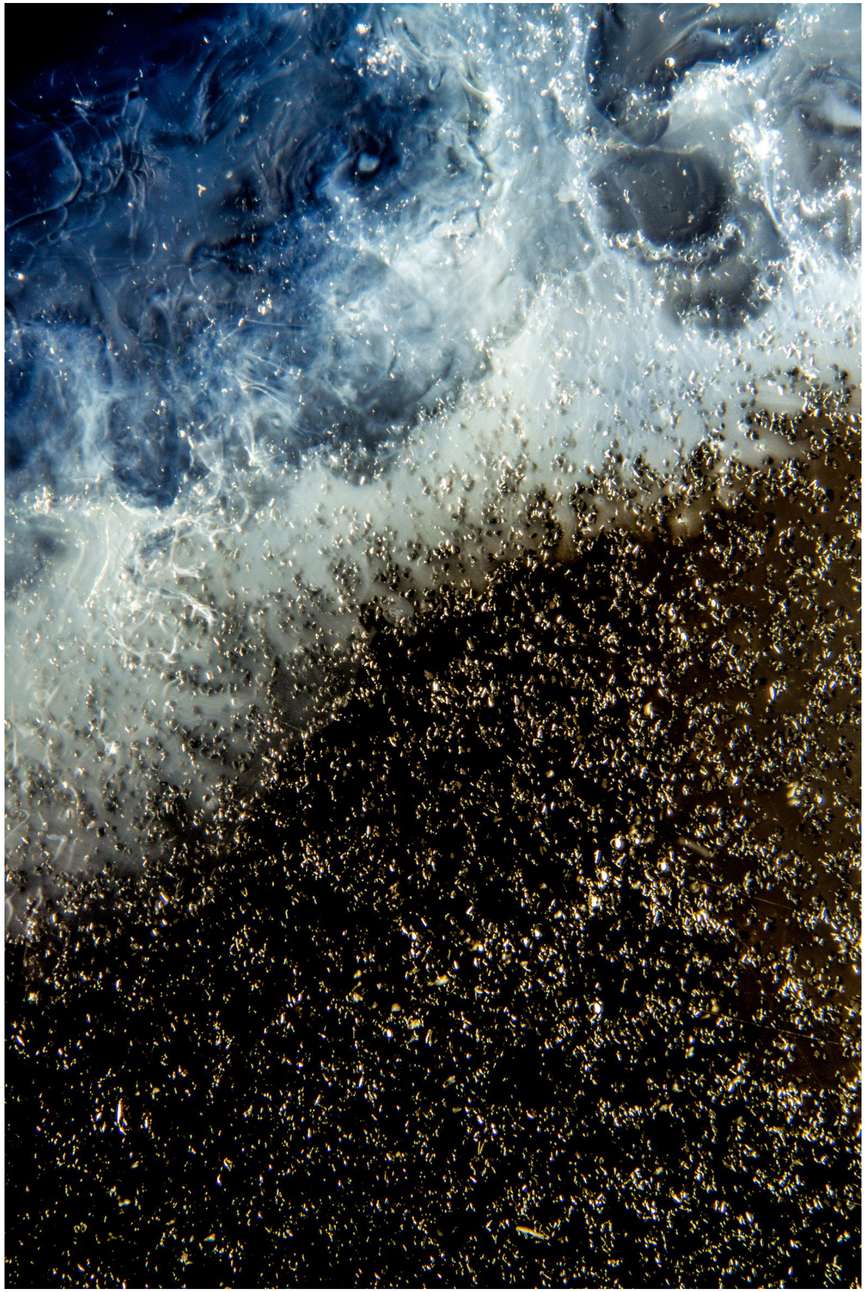
Liquid turmoil,
by Eric Falcon & Claude Laroche

A tank filled with water is vibrated vertically at a frequency of a few hertz. The fluid undergoes sudden accelerations that give birth to surface waves. This instability, to which the famous Faraday gave its name, is revealed dramatically by the circular lighting that cages the vibrating cell. Three images taken from above at increasing frequencies, three frozen moments of troubled water, set side by side to witness a growing ardor and turmoil.



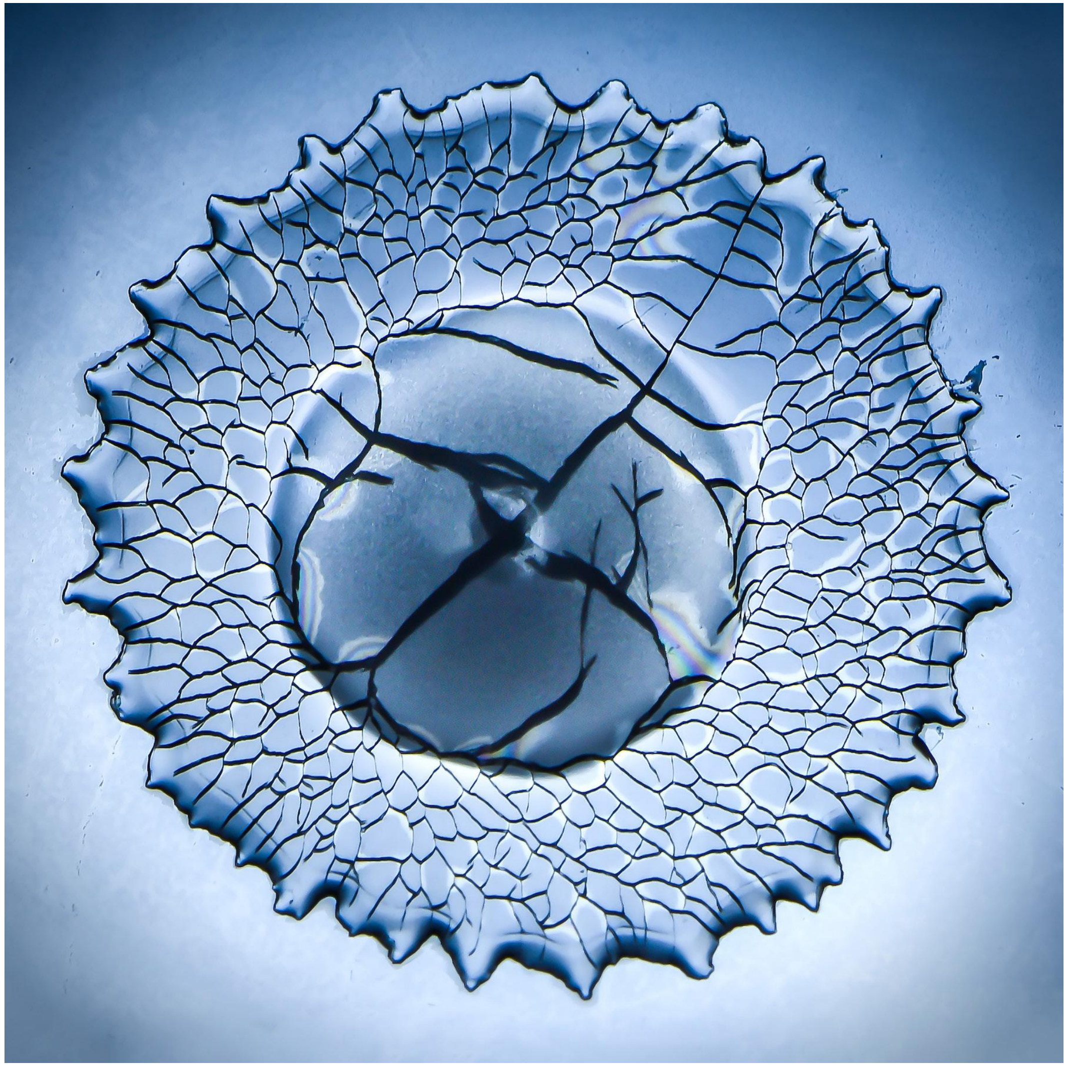
Coalescence,
by Benjamin Thiria

A mixture of water and oil is shaken. At the end of this severe test, a multitude of oil droplets, an unstable emulsion condemned to coalescence. Images of the sample, taken every ten seconds, are assembled in this achromatic mosaic to follow the phenomenon over time. The oil pearls merge two by two to form, ultimately, one and the same entity. On some shots, one sees distorted drops, oblong forms testifying to a recent fusion. Very small satellite drops tend to encircle the larger ones while waiting for their inevitable fate.



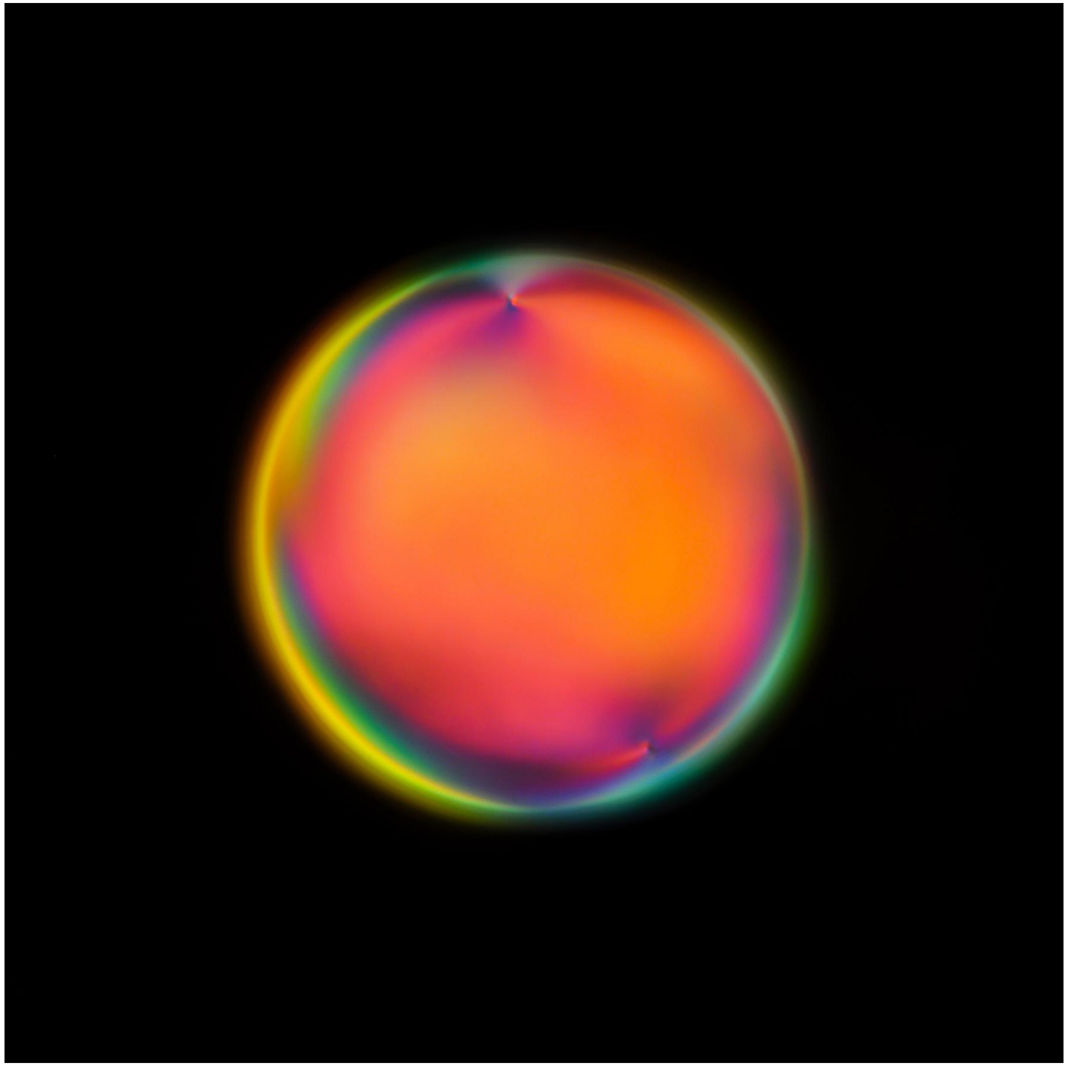
Binocular revelation,
by Benjamin Thiria

One would easily imagine this photograph among the famous pictures of Yann-Arthus Bertrand's book « The Earth seen from the sky ». However, we are brought back to reality when we learn that it was actually produced with a binocular microscope, and not from a helicopter. It is in fact a drop containing millions of micro-particles in suspension which, before our eyes, dries. The evaporation front, which at first glance seemed to separate land from sea, moves and leaves behind, like a coffee ring, millions of encrusted particles.



Crack patterns,
by Virgile Thiévenaz & Thomas Séon

A water droplet falls on a silicon substrate cooled down at -36°C. The drop spreads under its weight, and the thin layer of water in contact with the solid freezes almost instantly. However, a liquid layer is resistant to the threatening cold and retracts under the effect of surface tension to form a spherical cap. The cold slowly penetrates the deformed drop which sees its volume increase by storing elastic energy. When the stress becomes too strong, the drop cracks and fractures are unavoidable.

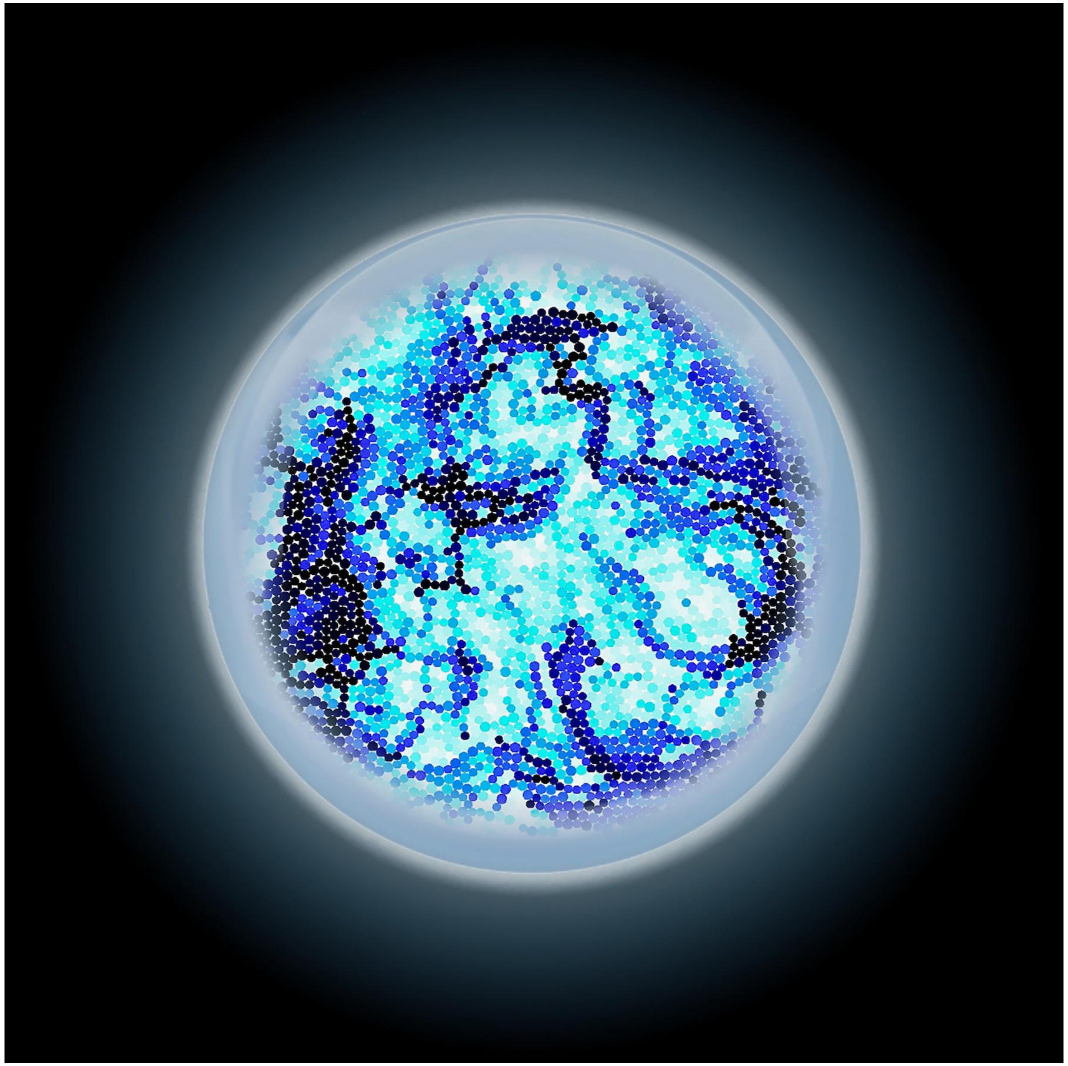


GJ 504b,
by Alexandre Darmon

Looking at liquid crystals through the microscope is like observing the stars through the telescope. The scale is different, but the magic is just the same. This image could contain the new pink planet GJ 504b discovered by NASA in 2013. However, the size of this object is microscopic and its diameter does not exceed 0.1 mm. The local order of the elongated molecules composing the liquid crystal is frustrated in this curved geometry, as evidenced by the optical singularities located at the two poles of the sphere.

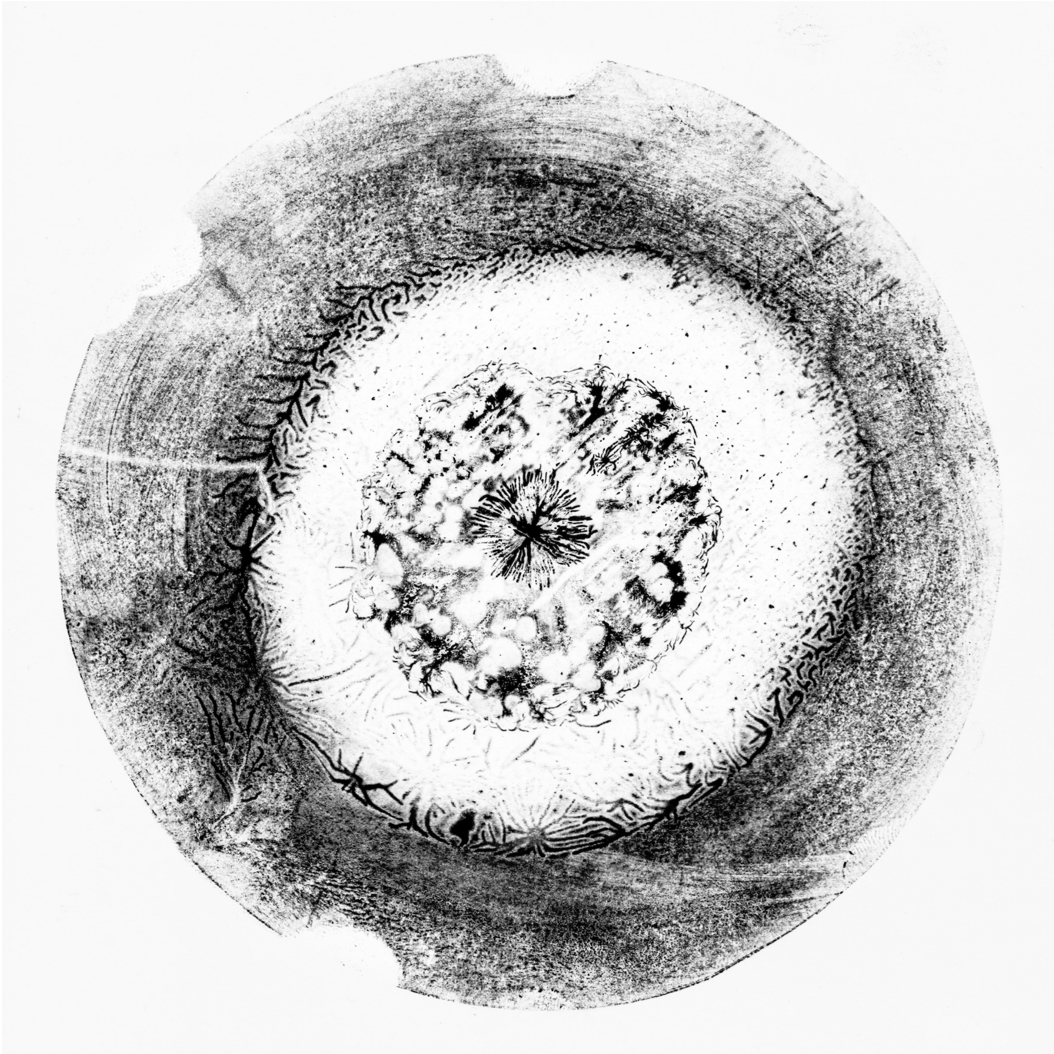
NaN Mosaic,
by Raphaël Candelier

Accidents often produce the most elegant images. After attempting to numerically simulate the density of particles in a solid, Raphael quickly realizes his machine is playing a trick on him. The presence of white attests a lack of scientific information: "Not a Number", or "NaN", replies his computer when he asks about the surprising pallor of these polygons. We will thus learn nothing about the physics of the phenomenon; but the mosaic of Spanish colors subsequently displayed does undoubtedly not deprive us from enchantment.



Dynamical heterogeneities I,
by Raphaël Candelier

Everyday life experience tells us that glasses share the rigidity of crystalline solids. However, a closer look at the molecular arrangement of the vitreous state reveals that it is actually closer to that of a liquid. The truth is as often halfway. The structure of the glass results from a combination of “liquid” molecules which are free to move (in white on the image), and “solid” molecules locked in a cage by their nearest neighbors (in black). These dynamical heterogeneities appear clearly on this image produced on a computer from a real experience.

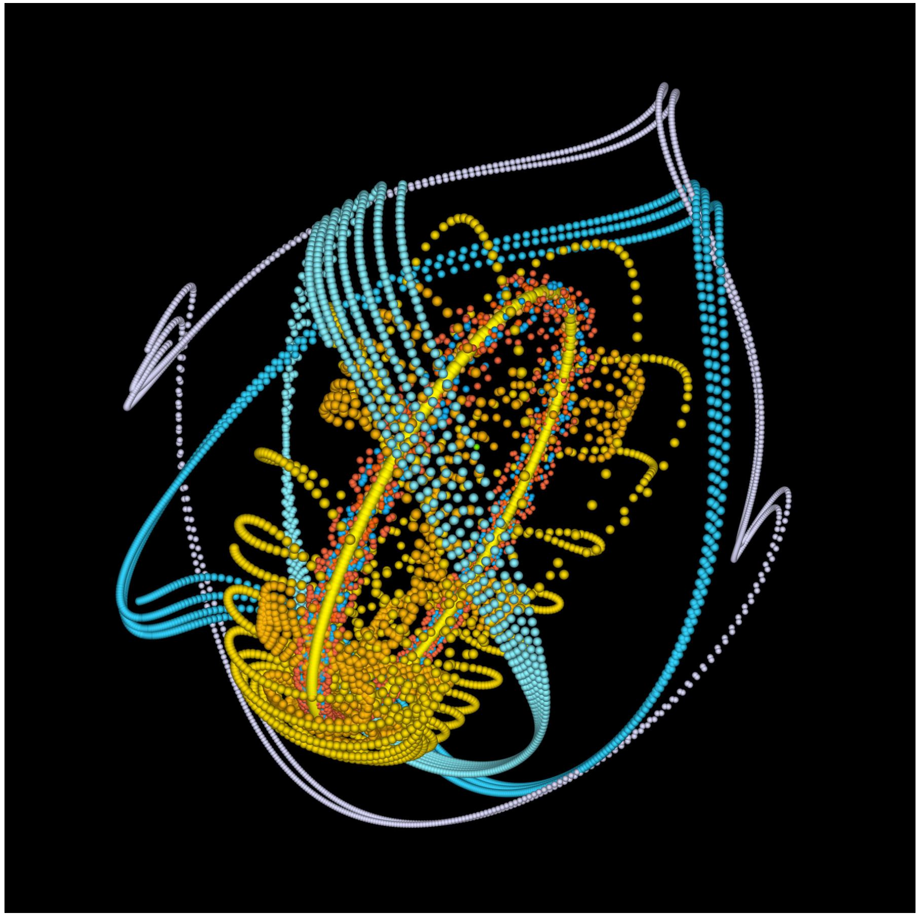


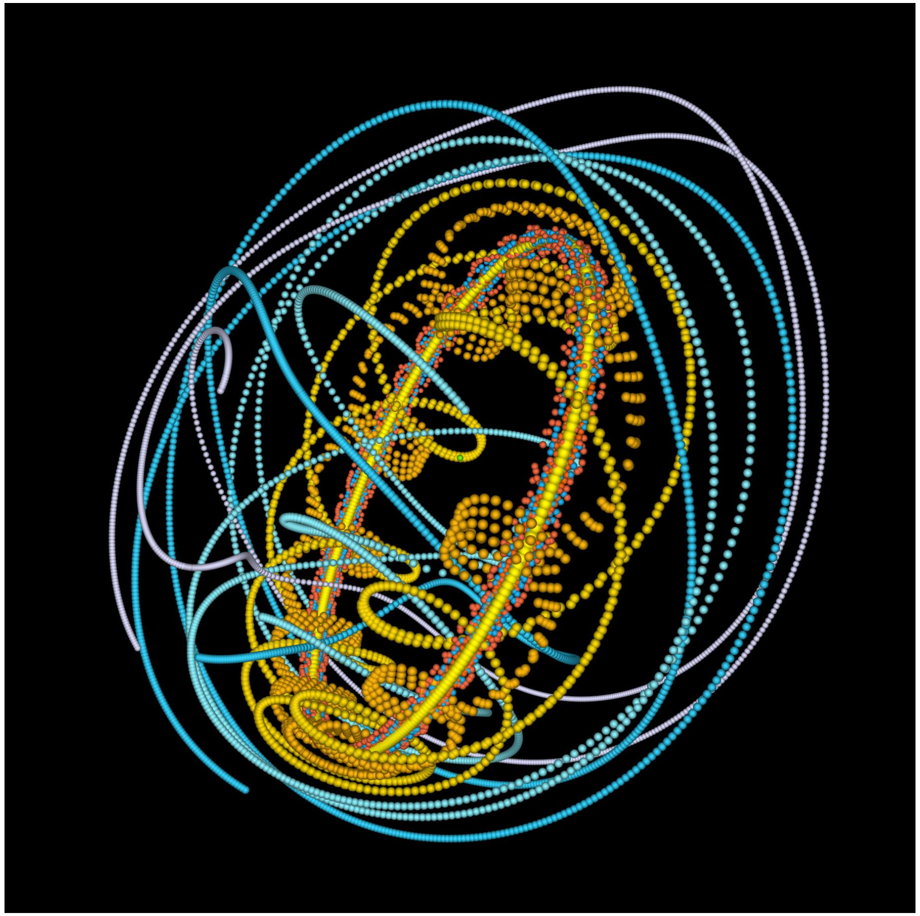
Struck by lightning,
by Benjamin Thiria

Reproducing the impact of lightning in one's laboratory may seem, at first glance, a peculiar undertaking. On the other hand, when the result displayed gives this kind of pattern – called Lichtenberg figures – one can certainly approve the approach. Here, toner powder is used as a tracer when an electrostatic discharge is sent to the surface of the insulating material. This ephemeral tattoo, which we would like to see last forever, could be swept away in a single gust of wind.

Julia in the quaternions,
by Jean-François Colonna

"Three-dimensional section in a Julia set computed in the quaternions." The striking roughness of the preceding words teaches us, once again, that a short sentence is not necessarily intelligible. Here is an attempt to clarify: a Julia set is a fractal object, a structure whose patterns are repeated identically regardless of the scale of observation. This feature is known as self-similarity. Just as the ramifications of your blood vessels, the relief of your Romanesco broccoli, or the crystals of a snowflake. But displayed in a particular space, that of the quaternions, Julia's self-similarity is no longer obvious at all. To tell the truth, in this four-dimensional space made of hypercomplex numbers, nothing is actually simple.





Celestial Mechanics I & II,
by Jean-François Colonna

The Sun turns around an immobile Earth, while Mars retrogrades throughout the year. Or so we thought. The epicycles of Ptolemy have long been the model describing these observations. In reality it is a deceptive illusion due to the fact that we are studying moving bodies around the Sun, being ourselves dragged into this great round. The series Celestial Mechanics shows what our eyes would have shown us if the trajectory of our planet was different from what is, particularly outside the plane of the ecliptic.

ARTISTS-RESEARCHERS

YANNICK RONDELEZ

Unconventionnal is the least one could say about Yannick's journey. Yannick began his academic career with a doctorate in chemistry devoted to the study of artificial enzymes at the University Paris Descartes. He then flew off to Japan for a post-doctorate in biophysics at the University of Tokyo. He focused his research on molecular motors: nanometric workers ensuring mechanical tasks in living cells. At this point, Yannick decides to take a year off to travel around the world. After crossing the Kamchatka peninsula on foot, he decides to cross Africa by bike. In 2009, he publishes "L'Afrique à l'envers : Du Cap au Caire, à vélo" published at Les Sources du Maica. Upon his return, he worked as a journalist for a while and became a consultant in technological creativity and innovation. Eventually, Yannick returns to research and enters the CNRS at the Franco-Japanese laboratory of the University of Tokyo. Since 2008 Yannick has been interested in DNA-based molecular programming. He uses the tools of synthetic chemistry to process information. He joins the ESPCI Paris in 2016 to create his own research group within the Gulliver laboratory. Today, he is also interested in the development of diagnostic tools for the detection of enzymes. Yannick truly values the importance of graphic representation, essential for him to interpret the data. The aesthetic component is omnipresent in his research; the images he produces must leave a mark, impact: "I like to add an aesthetic value to a successful experiment », he says.

BENJAMIN THIRIA

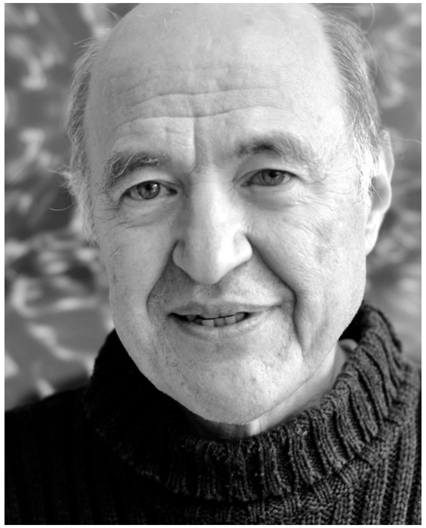
Benjamin’s scientific journey began at ESPCI Paris where he did his PhD on hydrodynamic instabilities. He had the opportunity to expand his knowledge of fluid mechanics, in particular turbulence, during his post-doctorate. He then left France for the United States, New York University, where he focused on a topic that still keeps him busy today: biomimicry. The idea of understanding, taking inspiration from and reproducing in the laboratory what nature has put millions of years to build fascinated him. In 2009, Benjamin formed his own research group around this topic: swimming fish, flying insects, collective behavior in animals, are typical examples of subjects he wanted to investigate in his laboratory. With Raphaël Candelier, which we also count among our artist-researchers, part of his research is now dedicated to social interactions between fish. Benjamin has been practicing photography since he was 18, and has never really stopped expressing his art since. He likes simplicity, minimalism. “I like photographs that arouse one’s curiosity. What interests me is the mystery surrounding an image”, he confides. Benjamin discovered scientific photography during his PhD and found quickly the depth he was looking for. Benjamin is an esthete who gives a graphic dimension to everything related to his research. “The scientific message is greatly served when wrapped in an elegant package”, says Benjamin who, undoubtedly, shares the philosophy of AiR.

RAPHAËL CANDELIER

For Raphael, it all began during an internship in Japan in behavioral neuroscience, more precisely psycho-acoustics. After obtaining a master's degree in cognitive science, Raphael flew off to Italy to study the collective dynamics of starlings, whose flight has been fascinating passers-by at Rome's railway station for many years. He then returned to France to do a PhD in statistical physics. But after defending his thesis Raphael comes back to his first love, neuroscience, to investigate the mechano-sensorial issue of fingerprints. He is currently working as a researcher in the Jean Perrin laboratory where he studies flows of information in the brain of the transparent zebrafish. Raphaël attaches great importance to graphic representation in his results. He is always looking for the most visual, the most relevant, the most harmonious." I only understand when I see, [...] I'm sure of nothing until I've seen it", he confesses.

FLORENCE ELIAS

Florence is interested in the physics of our daily lives, from soap films to shaving cream. From her Ph.D. until her position as a permanent researcher in Paris, her work has been devoted to the physics of magnetic and soapy foams. Her research activities notably led her to take interest into the acoustics of these bubbly media: what physico-chemical factors influence the propagation of sound in a foam? Can certain frequencies be attenuated for the benefit of others when sound waves pass through the medium? So many questions that have motivated Florence in the past years. The potential applications of her research are numerous, especially for filtering and sound isolation. Florence is now working with marine biologists to understand the formation mechanisms of marine mosses: linked to the rapid growth of microscopic algae, they are found every year on our shores. The visual aspect of experiments is extremely important to Florence. The beauty of scientific objects has been a driving force, a guide for her career choices. "I try to [...] communicate scientific messages with interactive and visual experiences," she says. In short, in full accordance with the philosophy of AiR.



JEAN-FRANÇOIS COLONNA

In 1970, after graduating from the Ecole Nationale Supérieure des Télécommunications (ENST), Jean-François ran the research division in a joint laboratory between ENST and Ecole Polytechnique (X). While the development of computers were still at a very early stage, Jean-François was a pioneer: he notably designed softwares dedicated to computer-assisted teaching (operating system, file structure management, text editors, graphical software, etc.). All this with a computer with 32 KB of RAM and 1.5 MB of hard drive! Pierre Vasseur, back then director of research at X and aware of the potential offered by images in the field of scientific communication, brought him to the Center for Applied Mathematics run by Jean-Claude Nédélec. Jean-François then focused almost exclusively on scientific visualization. He thought deeply about the proper ways to represent numerical calculations, and became a valuable adviser in computer imaging for many researchers at Ecole Polytechnique. Passionate about Flemish painting, Jean-François puts all his knowledge at the service of artistic creation. In his fifty-year-long career, he produced several thousand images and animations on his computer. They are the fruit of a subtle blend of imagination and mathematical reality; his creativity knows no limit. Jean-François is also very attached to scientific diffusion. He gave countless lectures and interventions in schools, where he used his images to raise awareness about the importance of fundamental research: "It's not by modernizing the candle that we invented the electric bulbs », he confides with humor.

PASCAL JEAN LOPEZ

Pascal is fascinated by the growth of shapes in nature. He began his academic career with a thesis at the Ecole Normale Supérieure in Paris where he studied the regulation and expression of genes in bacteria. After a short experience at the Harvard Medical School and a post-doc in Heidelberg, Germany, Pascal joins the CNRS to build his own research team. He is interested in the growth and evolution of shapes in diatoms which are microscopic algae found in all waters of the world. In 2010, he joins the National Museum of Natural History and orientates his research towards bio-mineralization, particularly on the mechanisms of skeletal formation in corals or molluscs. Part of his research is still devoted to the study of the diatom structure, but with a notable particularity: Pascal studies and meticulously maps the diatoms present in Parisian water! He is able, according to the species he observes under his microscope, to identify the neighbourhood from which the sample comes. But Pascal has more than a string to his bow, and his research knows no boundaries. Supported by the CNRS, he creates in 2016 a Man-Environment Observatory in Guadeloupe. The idea is to study the evolution of the socio-ecosystem in response to a so-called “structuring” fact: the harbour extension of Point-à-Pitre. Pascal wonders about the intrinsic aesthetics of the objects he photographs. “It’s probably their inessential beauty that fascinates me. In contrast to male butterflies that display their most beautiful colors in order to attract females, diatoms are beautiful by nature, even if they do not need to. It’s fascinating! » He admits enthusiastically. Pascal spends long hours sublimating these micro-organisms: “it is a way for me to pay tribute to these wonderful creatures”.

MATTHIEU ROCHÉ

Although Matthieu seemed to be destined for quantum mechanics, he decided to substitute the aesthetics of visual experiences for the abstraction of invisible objects. It was during a course on hydrodynamic instabilities that he decided to follow the path of fluid mechanics. During his PhD in Bordeaux, Matthieu worked on the destabilization of liquid crystal drops. After a short experience at the Institut de Physique de Rennes, he crossed the Atlantic to work alongside Professor Howard Stone at Princeton University. It is when his colleague Arnaud Saint-Jalmes paid him a visit that he discovered the surface flow experiment that keeps him busy today. Ready to leave the laboratory after several unsuccessful attempts, the two researchers decided to empty the sample into the sink. Surprisingly enough, they observed volutes, precious witnesses of the phenomenon they were initially looking for. At the frontier between fluid mechanics and physico-chemistry at interfaces, Matthieu developed the experiment and pushed it to its limits. He quickly found applications that attracted the attention of companies wanting to test their chemical formulations in cosmetics or the oil industry. He joined the CNRS in 2014 after a second post-doctorate at the Laboratoire de Physique du Solide in Orsay. Matthieu enjoys using everyday objects to illustrate the complexity of the phenomena he is studying. He attaches great importance to the aesthetics of soft matter: "Not only is it beautiful, but many of the phenomena that surround us in everyday life are still misunderstood to this day," he says.

ERIC FALCON

During his PhD, Eric worked on granular media and in particular on the propagation of sound in a network of beads. After a year spent at Ecole Normale Supérieure as a contingent scientist, he worked at the National Center for Space Studies (CNES) and made his experiments travel in a rocket to study their behavior under micro-gravity. Eric then joined the CNRS at Ecole Normale Supérieure in Lyon where he contributed in particular to a deeper understanding of the Branly effect. This mechanism - at the basis of the first wireless telecommunications between Paris and London in the 1880s - had been widely used but only little understood. In 2005, he joined the Laboratory Matières et Systèmes Complexes and formed his own research group on topics related to wave turbulence. But space never really left Eric. Today, he works with the astronaut Thomas Pesquet on experiments carried out in weightlessness, and coordinates an international team working on the design of an instrument to study granular media aboard the International Space Station. Beyond its fundamental interests, this study would allow to solve practical problems such as drilling under low gravity or sanding faced by the Rovers on Mars. Eric regularly takes part in events combining Arts and Sciences. With his friend and colleague Claude Laroche, they take great pleasure in sublimating and magnifying the scientific objects they investigate.

THOMAS SÉON

During his PhD at the FAST laboratory at Paris-Sud University, Thomas focused on hydrodynamic instabilities and was particularly interested in turbulent mixtures induced by gravity. He then flew off to Chile where he did a post-doctorate at the University of Santiago. His research was devoted to the study of Faraday's instability which appears when one forces the vibration of a liquid interface at high frequency and high amplitude. His journey on the other side of the Atlantic continued in Canada for a second post-doctorate where he investigated the dynamics of fluid mixing. Finally, he joined the Jean Perrin laboratory at the Pierre et Marie Curie University where he obtained a position as a CNRS researcher. Today, he focuses primarily on immiscible fluids, and is particularly interested in the destabilization mechanisms of bubbles at interfaces. Thomas spends long hours making his experiments appear as elegant as possible, and tries to capture those moments of harmony with his camera. "My work, and the way I represent it, must be a reflection of my personality," he says.

CHARLES BAROUD

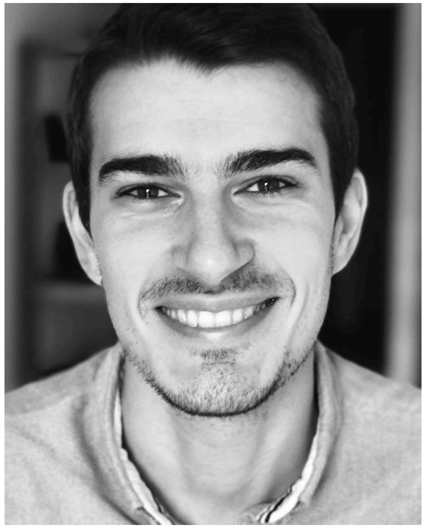
Charles's scientific career began in Austin, Texas, where he did a PhD in fluid mechanics on turbulent flows. He then came to Europe to do his post-doc at the Ecole Normale Supérieure in Paris. In 2002, Charles obtained a researcher/lecturer position at Ecole Polytechnique where he set up his own research team to work on fluid flows at very small scales: microfluidics. Transportation of bubbles and drops or modeling of micro-channel networks mimicking the functioning of the lungs are two examples of Charles' achievements. He also developed technological tools allowing the manipulation of drops in these micro-channels. In 2012, his tools found practical applications in cell biology and gave a new direction to his research. Since December 2017, Charles has been leading a bio-engineering team between Ecole Polytechnique and Institut Pasteur. Although biology is now at the heart of his research activities, Charles is a physicist and each of his experiments is an opportunity for him to question the underlying physical phenomena. The visual aspect of fluid mechanics experiments has fascinated Charles since he was a student. He likes the science "that you can see with your own eyes". Charles tells us he is color-blind, which he sees as a benefit to his research. He uses mostly black and white in his images and this allows him to take a particular look at his research: "I'm not distracted by colors and naturally am much more sensitive to shapes and movement, ubiquitous in fluid mechanics".

JOSÉ-EDUARDO WESFREID

After studying physics in Buenos Aires, Argentina, José-Eduardo flew off to Saclay, France where he did his PhD on the Rayleigh-Bénard convection, a hydrodynamic instability well known to meteorologists. He then joined the Laboratory Physics and Mechanics of Heterogeneous Media at ESPCI Paris. Today Emeritus Research Director at the CNRS, José-Eduardo has worked throughout his career on instabilities in fluid mechanics, chaos and turbulence. His work, mainly experimental, focuses on the destabilization of fluids when passing around an obstacle. He has notably developed optical methods for visualization and measurement in fluid mechanics. He has also worked as a scientific consultant for Schlumberger and met Sophie Goujon-Durand on this occasion. Together, they were working on the design of a flowmeter; a subject for fundamental research was born out of an industrial interest.
José-Eduardo has developed a genuine interest in the history of science and the role of visualization in fluid mechanics. Hydrodynamics is a "science on a human scale", he likes "the expressive richness of the image". He is also very attached to scientific popularization. He has been the scientific secretary of a series of exhibitions on Chaos that took place in Barcelona or in the Palais de la Découverte in Paris. José-Eduardo also evokes the "temptation of pure aesthetics" in his experiments: "Although my experiments are naturally designed on the basis of scientific relevance, I am always amazed by the beauty of flows in fluid mechanics."

SOPHIE GOUJON-DURAND

Sophie studied physics at the Polytechnic School in Warsaw and did her PhD on hydrodynamic instabilities. She then came to France to become an engineer at the Schlumberger research center in Montrouge. After 18 years in the industry, Sophie joined academia and became a lecturer-researcher at the University Paris-Est Créteil. Her experience at Schlumberger allowed her to keep an industrial look at her research, a feature particularly appreciated by her new colleagues. She never lost sight of the potential applications in the experiments she implemented. She met José-Eduardo Wesfreid on the occasion of an industrial mission at Schlumberger to design a flow-meter. Since then, they have never stopped working together. They are particularly interested in the wakes of fluids flowing around objects of variable geometry. They have also developed the theme of "active control": how to amplify or destroy, in a controlled way, vortices that form behind obstacles? Sophie often gives the example of the Tacoma Narrows Bridge in the United States, which in 1940 began to oscillate dramatically (video): "What people ignore is that the bridge entered into resonance because of the vortices formed behind the beams beaten by the wind!", she says.



ALEXANDRE DARMON

After graduating from Ecole Centrale de Lyon and Imperial College London, Alexandre took a year off from his scientific career to discover and photograph the world. Back in Paris he's then determined to focus on fundamental research. After a master's degree in physics at the Ecole Normale Supérieure in Paris, he did a PhD at ESPCI Paris where he specialized in liquid crystals. He was particularly interested in the intricate behavior of these elongated molecules when they are placed on curved surfaces. Alexandre developed a real fascination for these objects that interact with light in such a spectacular manner. This is actually why liquid crystals are extensively used in screens and displays. "Looking at liquid crystals through a microscope is like looking at the stars through a telescope. The scales are different, but the magic is just the same", he says. Alexandre has long been passionate about photography (www.alexandredarmon.com). With liquid crystals, his microscope and three years ahead of him, Alexandre found the ideal playground to let his creativity flourish. It was during a stay in Kyoto that he found a way to combine his passion for photography with his love of science. Alexandre creates AiR - Art in Research and now devotes all his energy to promoting scientific research through images.

The AiR project reminds us, more than ever, that nature is the greatest artist.

Cédric Villani, Fields Medal

ART IN RESEARCH

The artworks presented here correspond to the collection displayed at la Reine Blanche in Paris, scene of Arts and Sciences, from February 11 to May 19, 2018. La Reine Blanche is a place of independent culture which, in a logic of the hybridization of expressive forms and decompartmentalization of disciplines, wishes to seize the scientific discourse to make it intelligible to all audiences.

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