

# Raw Flows

Fluid Mattering  
in Arts and  
Research

Roman  
Kirschner (Ed.)

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# Foreword

## Roman Kirschner

Matter is in flux. Its flows can be encountered on different scales of space and time. The characteristics of these flows influence researchers in their active and direct material engagement. This publication investigates how fluidity and flow carve their specific paths into experimental practices and thinking patterns using examples from the arts, humanities and sciences.

The material property and general phenomenon of being fluid, is extraordinarily meaningful, as it represents a basic and irreducible principle of processuality, change and open-ended becoming. In many respects it is related to and involved in matter's generative aspects by bringing together substances, mixing them or helping them to react and transform.<sup>1</sup> Furthermore, it also supports catabolic tendencies in the sense that it facilitates the breakdown and decay of forms and the increase of entropy.<sup>2</sup> Thus, fluidity reminds us on the one hand that the world is in constant movement and on the other hand that this movement is irreversible. And although many aspects of becoming are subject to chance, and could therefore be seen in a fatalistic light, the world is nevertheless excitable and not just stuck in an eternal equilibrium.<sup>3</sup>

The French writer Francis Ponge gave an impressive account of two main aspects of fluidity in his short text on water, the most prominent and abundant fluid. First, he points out that gravity is its most efficient accomplice and vice, writing, "Forever lower: that seems to be its motto."<sup>4</sup> And on its travel downwards, so excellently facilitated by its formlessness, water circumvents, perforates, infiltrates and erodes.<sup>5</sup> And second, he states how it always escapes him and slips through his fingers. "[W]ater eludes me, eludes all definition, yet leaves its traces in my mind [...]."<sup>6</sup> Gravity's pull on a flexible mass and its conceptual elusiveness as a result of its constant rebellion against containment and fixation characterize fluidity's appearance.

The existential impact of all of these aspects and fluids' experiential richness can explain why fluidity and its mostly overlapping companion liquidity have become widely used metaphors that inextricably oscillate between fascination and threat.<sup>7</sup> But the challenge of *Raw Flows* is to deal with fluidity beyond its metaphorical use. What therefore seems crucial is to understand fluidity as a phenomenon that is first of all deeply rooted in the material world. It is from there that it draws its influence, pervasive power and heterogeneity in appearance.

This publication intends to enrich the experience and understanding of fluid phenomena, while not denying or omitting the importance of its metaphorical impact and scope. To achieve this goal, the authors concentrate on fluidity's material basis and wider materiality – in the sense of the network of material relations

that the stuff that brings forth or shows fluidity, unfolds or draws from. On a spectrum reaching from concrete substances through the manifold and heterogeneous entanglements of materiality to metaphors involving fluidity, metaphors are clearly at the opposite pole of stuff. Due to their derivative nature, metaphors can help verbalize aspects and parallels that would otherwise perhaps be inexpressible, yet they hardly reveal details about the actual phenomenon of fluidity itself. As for the more illuminating network of relations that materiality stands for, the authors of *Raw Flows* avoid using abstract notions of matter in order to ground it and rather start all investigations and descriptions from actual substances or stuff<sup>9</sup> wherever this was possible.

In this book, dealing with fluidity does not necessarily require dealing with wetness. Because not only liquids like the aforementioned water but also all kinds of amorphous materials, which are rheologically situated in between the aggregate states of solid and liquid, can show fluid behaviour. That is why polymers and even granular materials like diamond dust are featured in *Raw Flows*' contributions next to lubricants, watery solutions, blood, or photonic crystals in oily suspensions. The different flows of these materials, are being followed by the authors through different scales wherever they appear, for example as advection or shearing at the macro level, as the interplay between microstructures at the mesoscale, or as fluctuations and self-propulsions in even smaller areas. Thus, the presented experiences, ideas, concepts and drawn conclusions can stay as close as possible to actual phenomena and practices.

But as mentioned before, substances and stuff are also integrated in and inseparable from contexts and systems, be it a material milieu, a research environment, or a wider cultural/historical landscape. In their physical, chemical, biological and cultural embeddedness they are active or acted upon. In this setting, but more precisely as a result of both levels, the material basis and the wider context of materiality, fluidity appears and can be modified, adjusted, reconfigured in diverse ways. Furthermore, it is also an effect of both levels that fluidity allegedly contributes to the formation of knowledge structures and meaning.

## The paradox of polymorphosis

In Georges Didi-Huberman's text, *The Order of Material: Plasticities, Malaises, Survival*,<sup>9</sup> wax is the protagonist of his inquiries which reach from a

phenomenological approach to art historical nexuses and psychoanalytical interpretations. There, in accordance with the general approach used in this book, Didi-Huberman bemoans that materials always come second after form or mind in art history. Referring to Sartre's famous passage on viscosity in *Being and Nothingness*, where he describes material quality as *revelatory of being*,<sup>10</sup> Didi-Huberman sets out to weave a network of meanings around the viscosity of wax. He ascribes to viscosity a kind of activity and intrinsic power, which he calls the power of metamorphosis or polymorphosis.<sup>11</sup> This power draws from the paradox of wax's special position between being solid and liquid, as it can pass from one state to the other without much effort and within a small range of change in temperature and pressure. This ease of changing states facilitates its oscillation between incorporating a form and being formless and bridges the abstract contradiction between form and formlessness. Similarly, some materials appearing in this book play with this border between form and formlessness in their own way. They can, for example, keep their form only under sudden high pressure while the rest of the time, they are subject to a very slow flow, which tends to flatten them out. They are called non-Newtonian fluids, like Polyvinyl alcohol-based polymers or the silicone-based Silly Putty. Like liquids they have some short-range order at the atomic length scale but no long-range order that leads to this flow.<sup>12</sup> Not only by them but also by all of the fluid materials featured in this book, the traditional static understanding of materials gets categorically undermined. Their fluidity and fluidity in general cannot be understood in static terms, although snapshots or freeze frames can of course help in the approach or in understanding specific situations. Unfortunately though, still images fail to communicate the core feature, namely processuality, which can be further described by movement, continuity and the rich simultaneity and parallelism of happenings. The material interactions and propagating impulses on fluids from the outside can and do often lead to emerging patterns and forms like streams, waves, drops, splashes and turbulences. And these can vary significantly between different fluid substances—which characterizes them and makes them distinguishable. That is why the chemist and philosopher Jens Söntgen does not agree with the ascription of formlessness to liquids. He rather subsumes them, together with all other substances, under the term *Gebilde*,<sup>13</sup> a German term meaning that something has gone through a specific process of formation. And it is due to this process of formation that all stuff shows its very own and characteristic structure, its *Eigenformen*, which furthermore distinguishes it from the reductionist notion

of ideal substances or structural formulae that presume uniform aggregates of atoms and molecules. However, the forms of liquids, and this is also true for fluids, are ephemeral and not as long-lasting as those of solids. Their polymorphism, their back and forth movement between forms, happens at a more or less high speed, depending on their viscosity. The material properties and massive material interactions within fluid and even more so within liquid substances are the reason why it is so hard for the sciences to create a mathematical model that is not just a *perfect fluid*, which means that fluids are stripped of all of their peculiarities by omitting shear stresses, heat conduction, and viscosity. Thus, by not so much showing the current limits of computability but of formalization, fluidity undermines approaches of formal description. Beyond simulation and modeling, it is equally challenging to repeat the creation of the exact same forms and constellations in fluids given the amount of parameters that influence their formation in real space and time.

On the level of materiality, where conceptual and cultural influences interfere, the elusive phenomenon of fluidity is as difficult to grasp as on the formal and material levels. To cope with this fact, this book was initially thought of as a vessel in which the processuality of fluids might temporarily and carefully be trapped with the hope of not excluding and losing too much through its short-term containment. But the idea of a vessel proved to be inappropriate from the beginning as the initial concept of *Raw Flows* found itself in the middle of surprising outspills and overflows—some of the most common accidents that influence researchers in their everyday handling of flows. The number of examples was so abundant, their diversity so large, yet the vessel's ineptness so obvious on such different scales that the whole mass became untenable and overshot while its remaining flows got blocked.

Consequently, the most adequate approach beyond containment proved to be the use of an irregular and cross-disciplinary grid immersed in the material flows of the world at some selected locations with which to catch, extract, and evaluate ways of dealing with fluidity. This way it was possible to get insights into specialized, self-conscious practices which in their turn provided the backdrop for further exploration and discussion of the roles that fluidity and flow may play in relation to the epistemic, aesthetic and experiential. The grid's cross-disciplinarity was caused by the fact that, from the beginning, the focus was set on fluidity as a material property and phenomenon and not on some disciplinary homogeneity. The general endeavor started in the arts and especially in the art-based research

of the project *Liquid Things* with its epistemic interest derived from art production within the field of plastic arts. But due to the wide spectrum of fluidity, it branched out into a cross-disciplinary effort and now integrates contributions from disciplines as diverse as history of science, art history, fluid dynamics, design and cultural studies. The irregularity of the grid resulted from the aforementioned need to track fluidity through different materials, different scales, and different levels of materiality in order to capture its inherent dynamics and related research practices.

## The contributions

Most of the contributions to the book use contemporary or recent examples but they differ largely in their perspectives and scopes. The science historian Hans-Jörg Rheinberger opens the topic up wide by discussing liquid metaphors in scientific research including dynamics like meandering, turbulence, or influences, and behaviors facing obstacles. Subsequently, he concentrates more closely on large historical apparatuses from the early life sciences which he contrasts with the tiny amount of liquids they operate with and how. Additionally, he examines different boundary operations between soft/hard, wet/dry, and living/non-living in relation to specific research procedures.

From the perspective of cultural studies, Benjamin Steininger extends the issue of the interplay between machines and fluids by focusing on lubricants as transmitters of energy that also facilitate the kinetic closure of machines. He discusses the materiality, mediality, and agency of lubricants in the historical case study of Walter Oswald's search for optimal lubricity. As a curious fact, Oswald achieved the task of minimizing friction through a protective oily layer of active molecules that counter intuitively attack the surface of the adjacent metals they are supposed to preserve.

The art historian Inge Hinterwaldner investigates different roles which fluid or granular materials take in the studies of turbulence phenomena and flow analysis. Her thorough examination of different experimental setups brings her to the insight that the materials used as substrates, media or markers were not just protagonists or extras. Instead, their specific characteristics in the way they transport information turned them into objects of study in their own right.

The contribution of physicist and hydrodynamics specialist, Jean-Marc Chomaz, takes the reader from Hinterwaldner's room-sized experimental

setups to much larger scales. He starts from the idea of a *universal flow*, which he illustrates by discussing material flows of particles, photons and neutrinos through to the dynamic system of the universe. He thereby specifies phenomena such as structural formation processes of proto-stars or the cloud dynamics in the earth's atmosphere. Closer to our planet, he discusses exchanges between oceans and the atmosphere which also leads him to outlining the collaborative project, *Luminiferous Drift* developed together with the artist couple Evelina Domnitch and Dmitry Gelfand.

Evelina Domnitch and Dmitry Gelfand follow with a chapter about their project *Photonic Wind* on the fluidity of light, which can be evoked through a phenomenon known as photophoresis, light-induced levitation and migration of matter. Starting from earlier works on acoustic levitation they delve into the development process and the material experiences they encountered during their intricate work with diamond dust and photons in the nearly complete void of vacuum chambers. The outcome of their experiments for *Photonic Wind* were shown in the exhibition *Kontinuum* to which the following contributions also refer either directly or indirectly by describing preceding work processes, experiments and reflections.

Thus, with a few impressions from the Viennese gallery *Im Ersten*, in which *Kontinuum* was shown in early 2015, some glimpses on interim results of the research project *Liquid Things* are provided. These visual clues to the actual material experiences of the developed materials and their specific integrations into spatial installations can help readers to imagine the possible directions of impact in the following texts.

The artist and researcher, Roman Kirschner, investigates parallels, intersections and mutual catalyses between the dynamics of matter and imagination. Starting from an ecological approach into material and mental entanglements, he undertakes a preliminary exploration of material signs and investigates the outlines of a contemporary, non-romantic material imagination in a larger framework of matter/energy flows.

Subsequently, the art historian Esther Moñivas Mayor takes a close look at the project studio for *Liquid Things*, documenting practices and processes from a systemic yet experimental perspective. Moñivas's essay, which is based on her detailed, persistent observations and personal experiences during her collaboration period of more than six months, is guided by material properties. Her meandering narration reconstructs the interactions between (liquid) things, (diverse) people, (an ever changing) environment and (fluid) imaginations.

In the last contribution, which concludes the book, the architect and design researcher, Karmen Franinović, discusses research methods and techniques facing fluid and active materials. She examines the trans-disciplinary workshop *Material Aktiv Denken* to develop an understanding of the dynamic interactions between materials, environments and people, which resulted from probing different workshop conditions and theory-practice techniques merging material and conceptual processes. Finally, she proposes the notion of *fluid affordance*, which opens up to flows of materials and thoughts that escape the solidification of things and concepts.

The collected inquiries and arising questions aim at influencing ongoing discussions in art-based research and in the wider field of New Materialisms. Furthermore, this publication wants to put some of these arising issues into productive friction: the implications of thinking with and conceiving of continua instead of operating with parts/particles; knowledge structures in the making and in constant transformation; materials as qualitative and non-representational entities outside the framework of the expected; the activities of fluid materials themselves and within research processes; etc. The overall goal is to provide grounded insights into the complex phenomenon of fluidity to discuss exemplary historical and contemporary ways of dealing with fluidity and to set up an informed basis for contemporary art discourse and practice that can also feed back into other disciplines.

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- 2 Arnheim, Rudolf: *Entropy and Art. An essay on disorder and order*, University of California Press 1971
- 3 See e.g.: Prigogine, I., Stengers, I.: *Dynamics from Leibniz to Lucretius*, in: Serres, Michel: *Hermes. Literature, science, philosophy*, Johns Hopkins University Press 1982, p. 135-158
- 4 Ponge, Francis: *Water*, in: *The nature of things*, Red Dust 1995, p. 28; French original: "Toujours plus bas : telle semble être sa devise [...]" in: Ponge, Francis: *De l'eau*, in: *Le Parti pris des choses* (1942), Athlone Press 1979, p. 55
- 5 *ibid.*, p. 55
- 6 Ponge: *Water*, p. 29; French original: „[E]lle m'échappe, échappe à toute définition, mais laisse dans mon esprit [...] des traces [...]”.
- 7 e.g. the concepts of *cognitive fluidity* or *liquid modernity* in: Mithen, S.: *The prehistory of the mind*, Thames and Hudson 1996 and Bauman, Z.: *Liquid Modernity*, Polity Press 2000
- 8 The term *stuff* is used as in: Ruthenberg, K. et al. (eds.): *Stuff. The nature of chemical substance*, Königshausen und Neumann 2008
- 9 Didi-Huberman, Georges: *The Order of Material: Plasticities, malaises, survival* (Matlock, J, Trans.), in: Taylor, B. (ed.): *Sculpture And Psychoanalysis*. (195 - 212). Ashgate Publishing 2006
- 10 Sartre, Jean-Paul: *Being and Nothingness*, Routledge 1972, p. 600, cited after Didi-Huberman, p. 201
- 11 For another relevant perspective on viscosity in this context see DeLanda, Manuel: *Nonorganic Life*, in: Crary, J. et al. (eds.): *Incorporations (Zone 6)*, Zone 1992, p. 129-167
- 12 „Short range is defined as the first- or second-nearest neighbours of an atom. [...] fluids, such as water, have short-range order but lack long-range order." (At longer distances, the positions of the atoms become uncorrelated.) from Mahan, Gerald D.: *Crystal* in: *Encyclopaedia Britannica*, Retrieved Apr 16, 2016, from <http://www.britannica.com/science/crystal#ref506252>
- 13 Söntgen, Jens: *Stoffe und Dinge*, p. 8-11, Retrieved March 23, 2016, from [https://opus.bibliothek.uni-augsburg.de/opus4/files/1543/Soentgen\\_Stoffe\\_und\\_Dinge.pdf](https://opus.bibliothek.uni-augsburg.de/opus4/files/1543/Soentgen_Stoffe_und_Dinge.pdf); in an english text on *stuff*, *Gebilde* is inadequately translated as *characteristic structures*. See Soentgen, J.: *Stuff: A phenomenological definition*, p. 80-82, in: Ruthenberg 2008

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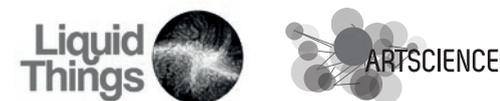
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**EVELINA DOMNITCH AND DMITRY GELFAND** create sensory immersion environments that merge physics, chemistry and computer science with uncanny philosophical practices. Having dismissed the use of recording and fixative media, their installations exist as ever-transforming phenomena offered for observation. In order to engage such ephemeral processes, the duo has collaborated with numerous scientific research facilities.

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This book is a result of the art-based research project *Liquid Things*. It gathers contributions from arts, history of science, fluid dynamics, design, art history and cultural studies. The inclusion of these fields offers a diversified perspective on the material property and general phenomenon of fluidity. Within this spectrum, the book explores fluidity's entanglement with becoming and change, asking which roles it plays in relation to the epistemic, the aesthetic and the experiential.

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