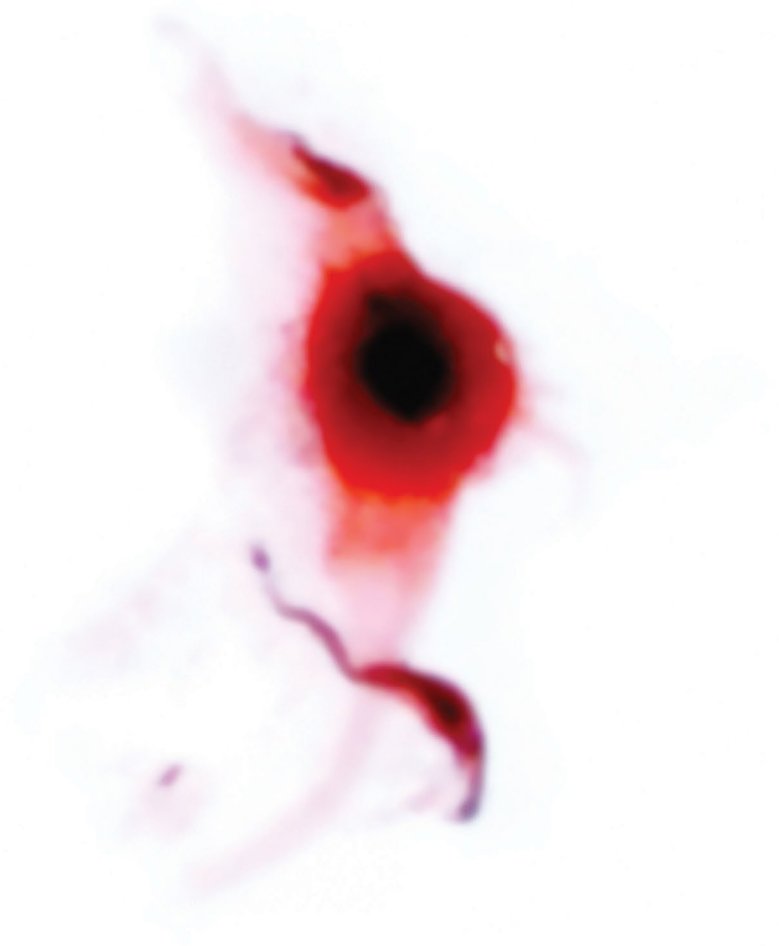


arts of vulnerability

Queering leaks in artistic research and bioart

Margherita Pevere



stability

Urine Extract
dripped

Epithelial cells
growing in FBS
Resins +
Slug mucin

at the sketch
of the loop

my body
exhibits the
stability
organism

now

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Arts of vulnerability

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Q.V.E.R.B.

Abstract

The dissertation addresses artistic practice that combines the manipulation of organic and living matter with biotechnology (bioart) with a more-than-human theoretical framework of feminist studies, queer studies and environmental humanities.

At the heart of the research there are the two bioart works *Semina Aeternitatis* (2019) and *Wombs* (2018–2021). *Semina Aeternitatis* manipulates individual memories through a series of biotechnological procedures and genetic engineering of bacteria. The series *Wombs* (*W.01*, *W.02*, *W.03*) addresses sex, gender and hormonal contraception from an ecological perspective. I realized both artworks in collaboration with international scientific laboratories. Placing the artworks at its heart makes this dissertation a contribution to the field of artistic research.

After giving insights into the realization of the artworks, I offer the two concepts ‘arts of vulnerability’ (AoV) and ‘poetics of uncontainability’ (PoU). These interrelated concepts illuminate different aspects of engaging and making art with unstable, living materials. The concepts emerge as aesthetic instances rooted in the art practice but, through the queerfeminist theoretical framework, become ethical and epistemic tools to deal with the more-than-human in unstable times.

Die Dissertation befasst sich mit künstlerischer Praxis, deren Fokus auf der Manipulation organischer und lebender Materie durch Biotechnologie liegt (daher oft als Biokunst bezeichnet, aus dem Englischen "bioart") und diese innerhalb eines mehr-als-menschlichen theoretischen Rahmens von feministischen Studien, Queer Studies und Environmental Humanities verortet.

Im Zentrum der Forschung stehen die beiden Biokunstarbeiten *Semina Aeternitatis* (2019) und *Wombs* (2018–2021). *Semina Aeternitatis* verarbeitet individuelle Erinnerungen mithilfe einer Reihe biotechnologischer Verfahren und Gentechnik an Bakterien. Die Serie *Wombs* (*W.01*, *W.02*, *W.03*) thematisiert Sex, Gender und hormonelle Verhütung aus ökologischer Perspektive. Beide Kunstwerke wurden in Zusammenarbeit mit internationalen wissenschaftlichen Laboratorien realisiert. Als Mittelpunkt dieser Dissertation werden diese beiden Kunstwerke zu einem Beitrag zur künstlerischen Forschung.

Nachdem ich Einblicke in die Realisierung der Kunstwerke gegeben habe, schlage ich die beiden Konzepte 'arts of vulnerability' (AoV; zu Deutsch: Kunst der Verletzlichkeit) und 'poetics of uncontainability' (PoU; zu Deutsch: Poetik der Unkontrollierbarkeit) vor. Sie stehen miteinander in Verbindung, beleuchten aber verschiedene Aspekte der Auseinandersetzung und der künstlerischen Arbeit mit instabilen, lebenden Materialien. Die Konzepte entstehen damit als ästhetische Instanzen, die in der Kunstpraxis verwurzelt sind, werden aber durch den queerfeministischen theoretischen Rahmen zu ethischen und epistemischen Werkzeugen für die Auseinandersetzung mit dem Mehr-als-menschlichen in instabilen Zeiten.

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8 **W**hy excitement to publish this dissertation goes hand-in-hand with my gratitude to those who enabled it. First, I would like to thank my advisors Helena Sederholm, Marietta Radomska, and Kira O'Reilly for their wisdom and impulse in the various phases of the research, and Helena Sederholm in particular for her guidance as supervisor. I am grateful to the Finnish Education Agency and Kone Foundation for the research grants (including the Supplementary COVID-19 Funding of Kone Foundation). For their generous and rigorous reviews, I am indebted to Tarsh Bates, Christine Daigle and Polona Tratnik.

Realizing the artworks *Wombs* and *Semina Aeternitatis* saw solitary moments but also a vivid exchange with Mirela Alistar and Gjino Šutić (UR Institute). KONTEJNER | bureau of contemporary art praxis and Susanne Jaschko curated the artworks' production with exemplary dedication. The European Media Art Platforms EMARE programme gave context and means for *W.02* and *W.03*; the Kunsthalle Rostock and the University of Rostock for *Semina Aeternitatis*. I thank Edith Müller-Rieckmann for Lotte.

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Networks and venues like the Finnish Bioart Society and Art Laboratory Berlin are sources of blooming inspiration. The Queer Death Studies Network and the Eco-and Bioart Lab host fertile dialogues that I hope will continue in the future. My artist group Fronte Vacuo shaped irreplaceable alliances in imagining and making radical art.

Keeping a clear mind and healthy working habits was possible thanks to my coach Antonella Mediati, and to Aalto psychologists Maria Törnroos and Paula Sjöblom.

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This thesis was written on a Dell XPS15 mounting Linux Mint Cinnamon. I will be forever thankful to the open source community for reminding me, every day, that things can be done differently.

Finally, this thesis celebrates Nina, Tequila, Nella, Aprilio, Juri, Lotte, Sinša, Opi, Branko, and my nameless plant companions who taught me that which I could never learn by words.

Glossary

10 While literature, lineage and discussion are provided in the various chapters, this glossary offers a succinct definition of how key terms are intended in the dissertation.

vulnerability: site of exposure. A normative understanding of vulnerability would identify it as a failure or lack of protection. This dissertation builds upon feminist and queer scholarship to acknowledge vulnerability as a site with fertile potential once it becomes a guiding principle in relations.

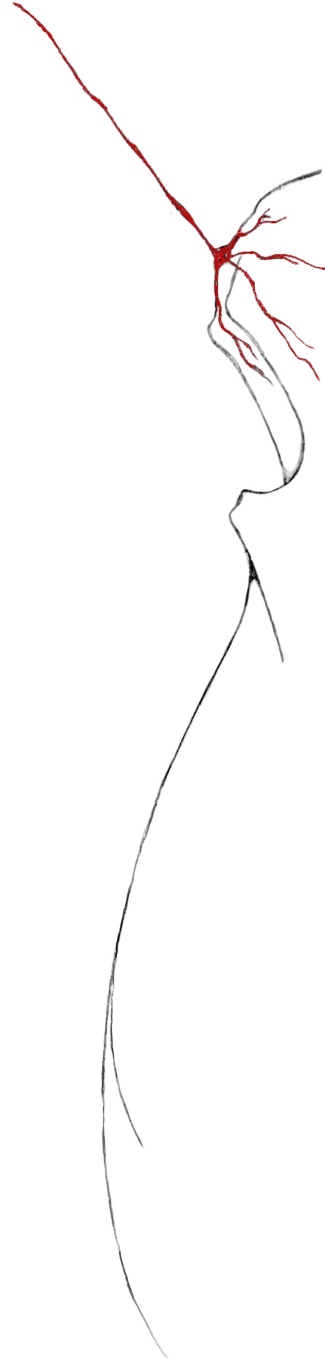
uncontainability: a resistance to containment. Uncontainability shows recalcitrant matters and their agentialities. Uncontainability defies normative frames.

bioart (also biological arts): artistic practice engaging with the manipulation of bodily matter, organisms, their parts, the relationships between them, or biological and symbiotic processes — with various degrees of biotechnology involved. It takes into account materials and processes and also political and aesthetic complexities.

leak: that which is unintentionally lost or admitted through a hole, a crack, a pore, a spill. Those are leaks across materialities, but also across knowledge, disciplines and theoretical frameworks. An instance of leaking: the exceedance of that which cannot be fully contained (as in the concept of uncontainable life), but also that which is (initially) at odds with the rest (as in queer theorizing). The term emerged from bioart practice with wet materials and from feminist theorizing.

arts of vulnerability (AoV): one of the two concepts offered by this dissertation. It understands a queer way to engage with the leaky and the uncontainable and make art out of it. At the same time, it invokes ‘arts’ as a way of doing things, a skill that can be acquired, in arts and beyond. It becomes an artistic and ethical tool to deal with leaky matters. AoV entails a call to action that, inheriting feminist and queer positions, does not shy away from the lack of closure and rather takes it as a point of departure for doing things differently. AoV is plural: arts, and cannot be singular, for there is not a univocal mode of doing it and rather appreciates multiplicity.

poetics of uncontainability (PoU): the second concept offered by this dissertation. PoU is a celebration of unsettled integrity. It is ‘poetics’ since it is a style of art-making, a way of using elements and materials, and a fashion of weaving narratives and aesthetics together that honours leakiness and vulnerability. PoU has emerged from reflecting upon bioart practice through feminist and queer ideas — the leak, the non/living, vulnerability and ‘to queer/queering’ as a process.



Situating the research: the cut and the leak

(introduction)

This research is wet, leaky and vulnerable. It is wet, leaky and vulnerable because of the materiality of the artworks, practices and methods. It is wet, leaky and vulnerable because it follows a non-linear path and weaves together different ways of producing knowledge through art: bioart practice, feminist and queer studies, and artistic research. This work is somehow in-between all these. It leaks.

At the heart of the research there are the two artworks *Semina Aeternitatis* (2019) and *Wombs* (2018–2021). *Semina Aeternitatis* manipulates individual memories through a series of biotechnological procedures and genetic editing of bacteria. The series *Wombs* (W.01, W.02, W.03) addresses sex, gender and hormonal contraception from an ecological perspective. I understand both pieces as ‘bioart’ works, for they are realized by manipulating organic matter through biotechnology. The artworks were produced in collaboration with international scientific laboratories (Biofilia – Base for Biological Arts at Aalto University, Finland; the Institute of Experimental Gene Therapy and Cancer Research at the University of Rostock, Germany; and the independent laboratory Universal Research Institute, Croatia).

Placing artistic practice at the heart of this dissertation makes it a contribution to the field of artistic research. While developed through artistic practice, a theoretical framework of feminist and queer studies around embodiment and ecologies sustains the inquiry. The research manifests through the artworks shown in exhibitions; presentations at conferences; published essays; and this dissertation.

This dissertation is not about art only. Art shaped it. However, its contribution moves from art practice towards more theoretical premises and the other way around in a leaky exchange. The main contributions of this dissertation are the concepts of ‘arts of vulnerability’ (AoV) and ‘poetics of uncontainability’ (PoU). The two concepts emerge from encountering vulnerable matters and relationalities in the artworks. While being inter-related, AoV and PoU illuminate different aspects of these relationalities.

For ‘arts of vulnerability’ I understand ‘a queer way to engage with the leak and the uncontainable’ and make art out of it. It invokes ‘arts’ as a way of doing things, a skill that can be acquired, in arts and beyond. It becomes an artistic and ethical tool to deal with leaky matters. Arts of vulnerability entails a call to action that, inheriting feminist and queer positions, does not shy away from the lack of closure and rather takes it as a point of departure for doing things differently.

For ‘poetics of uncontainability’, I understand ‘a celebration of unsettled integrity’. It is poetics since it is a style of art-making, a way of using elements and materials, and a fashion of weaving narratives and aesthetics together. Poetics of uncontainability marks *Wombs* and *Semina Aeternitatis* as both artworks, each in its own terms, shape a scenery of entities that refuse to find definitive collocations.

This research started as an inquiry into what may emerge from addressing bioart practice (more about this soon) with a theoretical framework of queer and feminist studies. For its traditional links with the areas of art and technology or media art, bioart has richly been addressed in terms of media art histories and (bio)technological experimentation for art. Such historiographies, written both by art historians as well as by artists themselves, constitute a relevant basis for my endeavour. However, possible dialogues between bioart and queer and feminist scholarship focusing on ecology and environment remain less explored.

I draw on this angle for a discussion that acknowledges genealogies but also creates unusual connections. What emerges is a landscape of references with a certain transgression of established trajectories; readers may note how resources that are meaningful from other perspectives are not included here. By no means this landscape aims to be exhaustive and is

rather as “a well reflected provisional cut” (Lykke 2018: 28), where the ‘cut’ defines a transversal intervention across diverse disciplines.

Before I present my cut of the field, a comment is necessary, for I speak as an artist. To me, art remains elusive about definitions and adamant in its enigma, with ramified roots and ambivalences. Art remains uncontainable, to use with a pinch of poetic freedom a term that will return in this text (Radomska 2016): there is always something that defies definitions, opens to different traditions, and leaks into other realms. The cut presented here is situated in the muddy waters of the practice and draws from the irreducibility to singular historiographies or definitions. The cut is, therefore, meant to remain leaky.

This work aims to contribute to the intersection of artistic research, art history, feminist and queer studies, and environmental humanities. To speak to and through these diverse fields, I combine a hands-on approach in the artworks (their realization and exhibition) with an ongoing exchange with scholarly contexts (conferences, publications, panels and alike). With a similar transversal approach, I trace what those ideas mobilize across disciplines to follow their meanings from diverse perspectives.

A fundamental idea that sustains this work at several levels, including the transgression of disciplinary boundaries, is that of ‘leak’. With ‘leak/to leak’ — understood as noun (leak/leaks) and verb (‘to leak’) — I refer to matters, concepts and relations that are not containable. I borrow the figuration of ‘leaks’ from feminist philosopher Margrit Shildrick with regard to embodiment (Shildrick 1997) and environmental humanities scholar Myra J Hird with regard to environment (Hird 2013).

By criss-crossing the two figurations, I refer fluidly to bodies of humans and bodies of knowledge as in Shildrick and to environmental bodies as in Hird. In their respective works, these bodies — that normative thinking aim to be controlled — remain fundamentally leaky (bodies undergoing assisted reproduction in Shildrick and landfills in Hird). Thus, they challenge the Western idea of the rational, self-enclosed subject (in Shildrick) and the possible control over ‘that which is still called Nature’ (Pevere 2018a).

The leaks across embodiment and environment are here amplified by the legacy of queer theorizing for its refusal to comply with — and indeed its intention to erode — established categories and binaries (Ah-king & Hayward 2014; Cohen 2013; Giffney & Hird 2008; Mortimer-Sandilands & Erickson 2010; Morton 2010; Radomska et al 2019). Importantly, queer theorizing unlatches further bodies and knowledge from the classical binary feminine vs masculine. It then extends this thinking to ecology and ‘nature’, unearthing widespread binary biases that lurk in Western understanding of ‘that which is still called nature’. The leak, thus, reveals its fundamentally queer character.

Leaks (of bodies, ecologies, and knowledge) mark the artworks *Wombs* and *Semina Aeternitatis*, but also become methods for this research. However, the material and methods chosen for the realization of the artworks extend to the way the research is conducted. In this dissertation, leaks become an epistemic tool — to produce knowledge and shape understandings — that is not contained within the boundaries of a single discipline.

By weaving different epistemologies (ways of producing knowledge) together, this research is not about art only. But neither is it about humans only. In fact, its artworks and ideas refuse to be understood in human terms only. *Semina Aeternitatis* and *Wombs* involve various organisms that are set in relation by troublesome encounters — encounters that reveal mutual, yet uneven, vulnerabilities. Readers shall meet different strands of bacteria, horses, slugs and humans, but also cell cultures (of slugs and humans). The encounters happen one-to-one, like in the case of a girl and a cart horse (in *Semina Aeternitatis*) or mediated by technoscientific machineries (as in *W.02*). Those encounters are made possible by queer interplays of matters and desires which are often enacted by bioscientific means, as in the case of bacterial DNA strands (*Semina Aeternitatis*) or sexual hormones (*Wombs*).

This research is indebted to lines of contemporary thought that question how the ‘human’ has been considered detached, privileged and in opposition to putative others of Greek and Christian philosophical legacy. While this primacy is still lurking in mainstream or popular narrations, the humanities have widely reconfigured what human may be. These reconfigurations are problematized in a lexicon that plays with

I use the term ‘human’ with the awareness that it should never be a catch-all term, nor indicate all humans on earth (Haraway 2015; Moore 2016; Pevere 2018).

the term and signifiers (post-, a-, non-, more-than-). Relevantly, ‘posthuman’ critically incorporates the pervading technoscientific and machinic intricacies (Hayles 1999; Braidotti 2013). It thus presents human bodies in ongoing interaction and mutual affect with cultural, organizational, algorithmic, living, nonhuman and technological entities. To challenge human centrality and erode human privilege at planetary scales, feminist philosopher Patricia MacCormack has offered the concept of ‘ahuman’ (MacCormack 2012, 2020).

While these lines of research are indebted to the outlined philosophical landscape, this dissertation adopts the term ‘more-than-human’ for it suggests how the human is but one element of an irreducible complexity including ecosystems and symbionts that exceed and surpass it the human — whatever that may be (Abram 1997; Whatmore 2002). There is — always — something more to it. By opting for the more-than-human, this work frames its bioscientific contents from an ecological perspective. At the same time, it welcomes the complexity of being an organism with posthumanist characteristics and ahuman longings.

The complexity that this dissertation is about involves more-than-human matters that are radically diverse. There are bacteria, slugs, a horse. There are two types of cell cultures and two strands of bacteria. There is knowledge (and artistic practice) shaped by biotechnology and scientific knowledge. There are different types of incubators, an electroporation device, microscopes, micropipettes, borosilicate glassware. There are scientific papers and catalogue texts. The arising more-than-human complexity sketches a non-linear web where, following posthumanist, feminist and queer lines, old-fashioned dichotomies such as nature vs culture or culture vs science lose certainty. Is a body with a womb under hormonal treatment (as in *Wombs*) considered natural? What is the status of a genetically engineered bacterial strain, whose culture has been killed in order to be exhibited (as in *Semina Aeternitatis*)?

To grapple with these questions, my reflection draws from feminist science and technology studies, which critically address how knowledge is shaped by the interplay of culture, science and materialities, and expose the politics thereof (Haraway 1991, 2008; Shildrick 1997; Barad 2007; Schrader 2010; Mehrabi 2016; Neimanis 2017; Radomska 2018). From this landscape, my inquiry borrows the idea of how bodies (more-than-human

bodies and bodies of knowledge) interact with various elements and how this interaction shapes both.

Shildrick reviews bodies as a social construct that intersect scientific knowledge and how this knowledge is appropriated by cultural and ethical canons (Shildrick 1997). Feminist philosopher Karen Barad examines how scientific knowledge is forged by the intra-action on technoscientific materialities and sociocultural factors (Barad 2007). In Barad's agential realism, "(b)odies do not simply take their paces in their works. They are not simply situated in, or located in, particular environments. Rather, 'environments' and 'bodies' are intra-actively co-constituted. Bodies ('human', 'environmental', or 'otherwise') are integral 'parts' of, or dynamic reconfiguring of, what is" (idem: 170). Bodies are thus not a given, but a morphing emergence that responds, and affects its own environment.

This research is thus shaped by the intra-action, or agential capacity, between the intention of the artist/researcher, the context of realization, collaborations across disciplines, materials that resist, various organisms, biotech equipment, literature — and even pandemic. These various entities shape and populate a mobile fabric. This mobility is determined by lively differentials of power as much as material agency and how they converge in time and space. This dissertation emerges from these encounters, mutual affects and unfoldings. Three fundamental theoretical positions will come later in the text. These are the biophilosophy of life by feminist philosopher Marietta Radomska; 'response-ability' by science and technology scholar Astrid Schrader; and 'trans-corporeality' by environmental humanities scholar Stacy Alaimo. Each with a specific focus, they all point at the interplay of matters across environments (artistic in Radomska, experimental in Schrader, ecological in Alaimo) and how bodies determine specific sets of relationalities in these environments.

In experimental settings, Schrader comments on the complex life of a microorganism that is toxic to fish and kills great amounts in certain conditions (Schrader 2010). As the organism's life cycle and toxicity depend on multiple interlinked environmental and physiological factors, it is arduous to provide univocal experimental evidence for the mechanisms of toxicity. Causality, one of the fundamental notions in science, dissipates in complexity. In Schrader's account, the more-than-human resists human knowledge and adequate understanding of responsibility is needed. 'Re-

1
sponse-ability' is, in Schrader's terms, not restricted to one element only but rather is directed to the extended phenomenon. It takes into account the capability of the more-than-human to resist or respond to a certain experimental setting, affect it, and therefore affect the knowledge that is produced.

In this dissertation, response-ability is directed to the matters that are investigated, namely the experiments and thematics of the artworks *Semina Aeternitatis* and *Wombs*. But it is also directed towards specific aspects of entities in the works, such as how a slug may react to steroid hormones. More importantly, perhaps, is to note how these artworks act as more-than-human elements that offer their specific complexity to be investigated in the dissertation, but also resist and respond to the inquiry, thus affecting it in turn.

In different terms, Radomska accounts for the complexity raised by bioart works from a biophilosophical perspective (Radomska 2016, 2018, 2020). She magnifies how the specificity of bioart works depends on the technology that supports them, but exists in the cultural, artistic and scientific fabric they mobilize. While biophilosophy is generally understood as the philosophy concerned with biological life, she adopts a non-essentialist engagement. She embraces Eugene Thacker's distinction between biophilosophy and philosophy of biology to overcome dualistic oppositions such as life vs death, organic vs inorganic, human vs nonhuman, and clear-cut boundaries between species (Radomska 2016: 18). Thacker's biophilosophy offers an non-essentialist focus on that which "transforms life" (ibidem): multiplicities of networks, relations and becomings. Radomska builds on this through a Deleuzian feminist and posthumanist approach to pursue a refusal of human exceptionalism and, thus, a rethinking of ethics beyond human-only terms.

Drawing on this articulation, the concept of the non/living points at how bioart works challenge established understandings of life based on its putative essence. Rather, bioart manifests processes that are intrinsically uncontainable, extend across materialities and processes, show life and death entanglements, and thus exceed singularities and frames. The slash in the term 'non/living' points at those entwinements of processes and materialities. The non/living describes bioart works, but can be applied to

other instances that fall outside classical understandings of life, such as viruses, viroids, prions and protocells.

“In the context of bioart, the body [. . .] is exposed not as self-contained, sealed, and autonomous, but, instead, as ‘leaky’ (Shildrick 1997), open, vulnerable, and entangled in a set of relationalities with its ‘naturalcultural’ (Haraway 2008) environment” (Radomska 2018). A non/living reading of bioart takes into account entanglements and materialities of diverse kinds — organic and inorganic, biotechnological, cultural, more-than-human — to expand on their becomings, leakiness and vulnerability.

Building upon these discussions of the interplay of knowledges, this dissertation offers bioart practice as a possible access point to unpack, unravel or come to terms with more-than-human complexities. *Wombs* and *Semina Aeternitatis* rely on specific manipulation of biological matter by biotechnological means. Each of the experimental endeavours in the research was successful, however the aim of the research is not only to provide fragments of viable scientific knowledge (Alistar & Pevere 2020). Importantly, those experimental endeavours are occasions to think with and through the more-than-human bodies encountered in this research. I return to this point in Chapter 6.

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Understanding materiality beyond biological determinisms allows me to discuss leaky bodies and vulnerabilities not as metaphors but with a situated and response-able engagement with them. The artworks I realized are writing companions and ways of writing and thinking through, as mentioned above. It is the hours I spent pipetting, controlling possible contaminations of cell cultures, washing glass vessels and replacing culture media that made me write these pages.

The engagement with those writing companions expands from the experiments in the laboratory (and their more-than-human fabric) to the more-than-human fabric described by the artworks, where bodies and environments are interpenetrated. In this regard, I refer to the concept of ‘trans-corporeality’ offered by Alaimo (2009, 2010, 2016). Emerging from the environmental humanities, trans-corporeality magnifies the corporeal interconnection of humans and environment. The concept invokes the interplay of environmental, political, and economic systems but also the access to scientific knowledge as necessary to understand the scope of

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such interconnections. Simultaneously, it acknowledges how political and economic power affect (and sometimes distort) scientific and environmental stances (2009: 23).

Trans-corporeality helps ‘thinking across bodies’ and ‘various bodily natures’ (2010: 2) and understands bodies as physically “penetrated by substances and forces that can never be accounted for” (2016: 5) such as plastic, chemicals and other ‘untraceable currents’ (idem: 113). The concept brings to the fore the movement across bodies and spaces and, thus, “opens up a mobile space that acknowledges the often unpredictable and unwanted actions of human bodies, nonhuman creatures, ecological systems, chemical agents, and other actors” (2010: 2).

Although Alaimo does not conceptualize leaks explicitly, trans-corporeality addresses the inherent permeability of more-than-human bodies to their environments. Furthermore, “[a]lthough the recognition of trans-corporeality begins with human bodies in their environments, tracing substantial interchanges reveals the permeability of the human, dissolving the outline of the subject” (idem: 112). The human becomes thus one possible starting point, with the purpose of disrupting the human exceptionalism of Western origin. Trans-corporeality contests the idea of a transcendent, master human subject by magnifying interconnections and interchanges as fundamental modes of being that exceed and dissolve human-only dimensions.

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Astrida Neimanis offers the concept of hydrocommons to describe fluids and their flows as the way bodies are interpenetrated into each other, and foregrounds materialities above human enterprise (Neimanis 2017). By referring to ‘bodies of water’, Neimanis’ hydrofeminism shapes a planetary osmotic landscape that connects deep underground water reserves, phlegm and blood, breast milk, rain, and urban waterways. In this landscape, subjects are a swirl that coagulates temporarily and then flows again into broader circulations (Neimanis 2012). This work dialogues with Neimanis’ figuration, yet rather than contemplating how the bodies of water shape the interconnection, it engages with the spills, the leaks.

To a certain extent this work ‘begins with the human’ in order to transgress and dissolve it. For instance, *Wombs* moves from the individual experience with hormonal contraceptives to peruse the space between

sexuality and environment with the help of hermaphroditic slugs. Similarly, other artworks reviewed in the dissertation look at (mostly) human bodies in more-than-human terms.

In a similar way, the overall architecture of the dissertation moves from access points through what can be seen as human concerns (sexuality, transience, even art-making perhaps) to more-than-human relationalities. In so doing, these relationalities retain the corporeal trait of Alaimo's point. None of the troublesome encounters stay where they begin. Rather, they open to broader fields of discussion. For instance, *Wombs* acknowledges the social implication of contraception, but opens from there to a dimension where individual choices are addressed from an environmental and multi-species perspective.

This dissertation finds its context in times of radically changing ecologies and environmental disruption (IPBES 2019; IPCC 2021). A comprehensive discussion of these phenomena exceeds the scope of a dissertation², however they define when and where this research happens — and why. In this context of change and disruption, the convergence of bioart, queer and feminist studies, and environmental humanities becomes significant in the tentative undoing, or at least re-imagining, of ways of inhabiting the planet. Arts of vulnerability and poetics of uncontainability are not a nostalgic quest for pristine nature, but a response to an urgency. The convergence of art, environmental humanities and feminist theorizing has a tradition [see, among others, Alaimo (2016) and Chapter 1]. This work hopes to contribute to the field with the perspective of an artist working through bioart and performance.

However, I also acknowledge that my perspective is one of an author from the Global North. I am aware of the implications this has in terms of institutional access, resource exploitation and historical responsibility, which also exceed the space of a dissertation. However, acknowledging them helps erode the implicit forgetfulness of how different human cohorts have different responsibilities on and experience different consequences of environmental disruption.

² See *Vulnerability as a Queer Art* (Pevere 2022) for an expanded discussion.

Fluids

I imagine the research as a bodily part — perhaps an organ, perhaps a symbiont — that I get to know during the process. While I was articulating the structure and table of contents of this dissertation, I referred to the drawings and sketches I did for the artworks as a way to visualize how this body (of knowledge) was made. What emerges is the drawing that can be seen close to the table of contents and then, mapped in different parts, in the various chapters. Drawing accompanied the writing as a way to think with and through my materials. Aesthetically, the drawing refers to one of the preliminary sketches for *Wombs*, which was presented in publications (Pevere 2020a, 2020b) and catalogues (Pevere 2019).

The table of contents of this dissertation manifests this non-linearity: it eventually fits the format expected for a doctoral dissertation, however it came to me in the form of a fleshy entity, an organ, part of a body. Certain parts of it were inextricable, such as the fluids that permeate it, or the leaks. The 'organ/symbiont' is part of a larger entity which corresponds with the landscape of topics outlined in the previous section. The 'provisional cut', to say it with Lykke's words, allows extrication of this research from its broader context. Knowing something about a part may help understand the whole. The 'organ/symbiont' remains immersed in its broader context. Its folds are permeated by three main theoretical 'fluids' that circulate and connect outward. The three fluids are: 1) artistic research; 2) feminist posthumanities; and 3) queer studies. Before addressing each of them, I explain how the allegory of the fluids has emerged from the research itself.

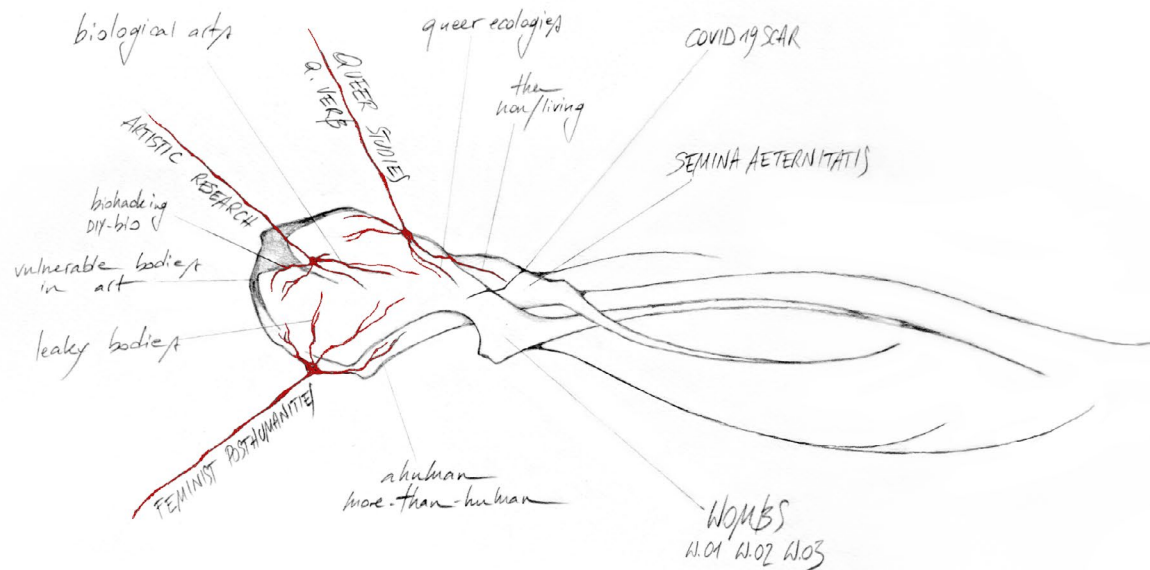
The allegory of the fluids is inspired by *Wombs* and *Semina Aeternitatis*, which involve living biological matter of different kinds and biotechnologies. 'Wet' is intended here not as that which characterizes life as opposed to death, or biological vs technological, but rather as a dimension in which matter of different kinds (cell cultures, reagents, molecules, nutrients, cell incubators) and material processes (biological, technological) intertwine.

'Wet work' characterized the realization of *Wombs* and *Semina Aeternitatis*. 'Wet work' is carried out in a 'wet lab', a setting where experiments involve liquids for biological or chemical reactions. A 'dry lab', instead, relies mostly on computational modelling. The three laboratories where I conducted the research are wet labs.

Fluids circulate, permeate, create osmosis and sometimes leak. The various processes of pipetting microlitres of reagents for microbiological work, replacing culture medium for cells, biochemical reactions triggered by hormones in my body: at different scales, each of these processes implies a negotiation with potential and very real leaks. The bodily experience of working with fluid and leaky materiality is the substrate of the present dissertation. Working with fluids and their potential leaks becomes a methodological choice, as I explain in Chapter 2.

In the drawing that maps the research, the three fluids are carried by vessels to the folds of the organ/symbiont, nourishing and inspiring the methodology. They sustain the literature review and pose the substrate for the discussion. Artworks and theoretical fluids grip and interpenetrate each other. As they permeate the research, those fluids are in osmotic exchange with each other for they mutually affect how things are done and why.

There are some overlaps across the fluids, such as between feminist and queer studies or feminist posthumanities and artistic research. However, referring to them as distinct areas is a “way to acknowledge each one’s genealogy and the kind of politics such origin mobilizes”³. Each offers a specific approach to knowledge that marks this research, as outlined in the next pages. Nevertheless, the different theoretical fluids flow into each other in many of the resources chosen for this work, for instance in their intersection with environmental humanities. For this reason, I adopt the wording ‘queerfeminist’ for convergences and ‘feminist studies’ and ‘queer studies’ where the distinction is relevant.



This introduction features an outline of the fluid of artistic research for it defines the academic field of this dissertation. Rather than proceeding with the other fluids, this introduction provides an overview of the field of bioart to outline where the artworks *Semina Aeternitatis* and *Wombs* are located within the broader field of contemporary art. The choice of introducing artistic research and biological studies in the introduction (Chapter 1) and queer and feminist studies in the literature review (Chapter 3) is functional. It brings to the fore bioart practice as a way of knowledge production, practised here within the context of a PhD in artistic research. Artistic research and biological

³ I am grateful to Prof Lykke for exposing the importance of this choice during the seminar ‘Queer Death Studies — Analyzing and Resisting Necropower’ at the InterGender Consortium and Research School in Interdisciplinary Gender Studies at Linköping University, Sweden, in 2020.

art practice are intertwined: I conducted artistic research through biological art, and practised biological art as artistic research. Such framing poses the substrate to the discussion, on queer and feminist terms, of vulnerabilities, and how to make art out of them.

Artistic research

This dissertation wishes to offer possible answers to some of the many ‘how to’ questions in arts. To do so, it combines the practice of biological arts and queerfeminist theorizing. Throughout the process I maintain the perspective of the artist and the researcher conjointly, which characterizes this work as artistic research (AR). That means that I made artworks (in collaboration with others, because one rarely works alone), addressed their aesthetic and technical aspects, and engaged with possible readings of these in relation to other artworks and chosen scholarship. What emerges from this process are the two concepts of ‘arts of vulnerability’ (AoV) and ‘poetics of uncontainability’ (PoU) as stances to more-than-human relations and knowledge production in art.

26 ‘Artistic research’ refers to a relatively young field in academia and spans across artistic areas, practices and vocabularies in their diverse ramifications (Busch 2009; Leavy 2018, 2020). “The spectrum of that which can be manifested under the term artistic research is broad and certainly not homogeneous” (Mäkelä et al 2011: 3). Scholarship has vastly engaged with the attempt to define what AR is, what it does, and how it is done (Biggs & Karlsson 2011; Borgdorff 2006, 2011; Candy 2006; Gray & Malins 1993; Hannula et al 2005, 2013; Henke et al 2019; Leavy 2018, 2020; Mäkelä et al 2011; Sullivan 2006). In the words of Finnish phenomenologist Juha Varto: “Artistic praxis is a precondition for artistic research” (Varto 2018: 10).

With a pinch of irony, Mika Hannula, Juha Suoranta and Tere Vadén summarize the complex endeavour of artistic research with the effective equation:

$$\begin{aligned}
& \text{“artistic research} \\
& \quad = \\
& \text{artistic process (acts inside the practice)} \\
& \quad + \\
& \text{arguing for a point of view (contextual, interpretive, conceptual,} \\
& \quad \text{narrative work)” (Hannula et al 2013: 16)}
\end{aligned}$$

The equation aims to show the artistic process is key to research and extends to both fieldwork and methodology.

In simple words, AR does what its name says: it is research of the artistic kind. Its maker is the practising artist, like the practising scientist is the maker of scientific research: “the researcher works as an insider, a participant in the practice” (ibidem). Yet, each element of the term — artistic and research — spark a series of fertile frictions with the otherwise multifaceted areas defined with the same words — art and research — as the literature mentioned above outlines.

I speak from the perspective of an artist: I will always argue that all kinds of art practice entail experimentation, innovation and research — at aesthetic, discursive, political and technical levels. Besides this, the term ‘artistic research’ was used in art before being employed to define the academic field (Argan 1965). What marks AR is a specific level of contextualization and theorizing by the artist-researcher themselves who adopts and sometimes contests academic practice (Borgdorff 2011). Such explication is only apparently resolute, though. It taps into multiple questions that are destined to remain open, including: what counts as art (and other creative practices)? what is the role of the artwork and its perception? what about the relationship between artworks and writing? It exceeds the purpose of this research to unpack them all and I refer to the literature cited above for a thorough discussion.

Diversity within the field is driven not only by artistic practice and theoretical framework at play — in this case, biological arts, feminist and queer studies, and environmental humanities — but also by cultural and geographical areas (Mäkelä et al 2011; Suominen et al 2017) or institutional policies (Anoff et al 2015). Some classifying terms have been proposed and adopted such as practice-based, practice-led, arts-based research, research for the arts, etc. (Borgdorff 2006; Busch 2009; Candy 2006; ; Mäkelä et al 2011; Sullivan 2006). While some ‘traditions’ are already recognizable, it must be noted that classifications and boundaries are continuously redefined (Varto 2018: 11). This doctoral research was conducted at Aalto University, which situates the work within the Nordic context. Fieldwork (namely the realization and exhibition of the artworks *Semina Aeternitatis* and *Wombs*) was conducted partly in Germany, for an exhibition of experimental art and artistic research and in collaboration with a

scientific research institute which had no previous experience with modes and concepts of AR. Part of the fieldwork was conducted in Croatia in collaboration with an artistic venue and independent research lab with extensive experience in the field. Therefore, whereas the framework of the research can be ascribed to the Nordic tradition in AR, it cannot be fully contained within it.

The terms ‘practice-led’ and ‘practice-based’ are used differently in different contexts: what is meant with practice-based somewhere is indicated by practice-led elsewhere (Mäkelä et al 2011: 3). In the Finnish context, practice-led has been “adopted to highlight the active role of professional practice in the research process” (idem: 4). This research would fall into the category of practice-led research as intended in Finnish terms. While I acknowledge how this discussion is fertile for the field and specifications between practice-based vs practice-led are useful in certain contexts, they fit too tight for the purpose of this specific project. This project addresses the implications of artistic work with biomatter and biotechnology from a feminist and queer perspective, and is rooted in the practice. I could develop the concepts presented on these printed pages thanks to the gestures, observations and manipulations conducted during the realization of the artworks. Is this research led by, or is it based on the practice? In all honesty, and despite all my best efforts, I could never answer this question. It’s a question (for me) not to be answered by the offered classifications. This research is made through art; it is done “inside the practice” (Hannula et al 2013); art (artistic practice) made this research. Hence, I adopt the wording artistic research, without addenda.

I offer my contribution to a discipline, artistic research, that is aware of its mobility and positions as independent from — yet in dialogue with — more established scientific fields. This research brought me from AR towards some of those established scientific fields. I worked as an artist in collaboration with scientists and used what are usually considered scientific means for artistic purposes. Already the formulation of these sentences reveals one of the reverberating binaries I encountered in the process, namely the distinction between ‘art’ and ‘science’ in Western culture.

As a practitioner trained in different (humanistic) disciplines and who has been working with technical tools ranging from economic analysis to photography and bioscience in my career, I must admit a certain uneasiness

in addressing the disciplinary borders of the kind of work I conduct, and sometimes find it even pretentious. Nevertheless, this perception clashes with institutionalized rules or protocols, as the moment I step into a biolab my presence is considered that of an artist (which I am, undoubtedly).

Before I give an overview of the field of bioart in the next section, it is useful to note how such practice is situated in a broader field that historically operates along and across disciplinary borders between art and science. Such a distinction is and remains a slippery yet fertile paradigm, with the caution that ‘art’ and ‘science’ are both vast, articulate and diverse fields that cannot be collapsed into univocal definitions. However, ‘art’ and ‘science’ still today refer to different trainings, markets, careers (inside and outside academia) and also research methods, epistemologies and interests.

The matter is complex and this brief recognition points to its vastness and entanglements to situate this research in a field that is, still today, movable and debated. Specifically, I refer to areas that notably cross disciplinary borders as AR, as the previous section outlines. This research is nourished by the work of the many scholars that have contributed to feminist science and technology studies and questioned openly the interplay of science and society in knowledge production. Furthermore, this research is indebted to the many “artists and designers [who] are testing and contesting scientific method, subject matter and the framing of theories and concepts” (Beloff 2020). The field is not limited to collaborations between art and life sciences, but extends to physics, mathematics, data analysis, and so on.

The cultural value of this division was seminally addressed by chemist and novelist Charles P Snow in the lecture *The Two Cultures* in 1959, published later as a book (Snow 1998). Snow addressed what he identified as “two polar groups” between scientists and intellectuals (idem: 3) and how mutual biases affected relationships between the two in everyday life, in culture and in research. In the discussion that followed, arts have been ascribed to the intellectual sphere together with other humanities. The divide addressed by Snow runs along the lines of ancient Western dualisms such as spirit vs matter, mind vs body, or human vs nature.

While such a divide is lingering, it must be noted how extensive research fields have problematized the interrelations between humanities and sciences, notably in science and technology studies, feminist science and technology studies, and science history. Conversely, it is worth noting how phenomena that in the past were considered subjective or social, such as psychology, have been demonstrated to be linked to physiological (ie, scientific) elements. Similarly, Western art is studied by enterprises that match aesthetic with technical and scientific aspects, such as the notorious Bauhaus in Germany in the 1920s.

In practice, ‘artists’ and ‘scientists’ often mix elements. Examples are the chemical understanding necessary for painters to combine pigments, or the mathematical skills that are key for coding in the digital arts. Conversely, ‘scientists’ often refer to their creative resources in experimental processes or the aesthetic aspects of microscope images and other materials in their work. There are extensive examples of scientists who then use their skills in art-making (and sometimes achieve artistic acknowledgement), and of artists who regularly collaborate with scientists.

At this point it is useful to mention how different terms have been suggested to indicate the cooperation between ‘artists’ and ‘scientists’, such as ‘art&science’ or ‘artscience’. With a reference to Snow, Nora Sørensen Vaage (2015) suggests overcoming binary terms for they reinstate ancient divides and may thus risk occluding the diversity of practices and potential of what is between. Literature about collaboration is flourishing with the contributions of scholars and art historians addressing the cultural and aesthetic implications of this convergence (Bello 2020; Capucci 2008; Hauser et al 2003; Reichle 2009; Rogers 2022; Vaage 2015). Others have meant to show the potential of this kind of collaboration from an institutional perspective (Scott 2010; Schnugg 2019; Rillig et al 2021).

With regard to artists working through bioscientific means there are numerous contributions by artists themselves (Adamatzky & Schubert 2015; Alistar & Pevere 2020; Anker & Nelkin 2004; Bates 2018; Groth et al 2020; Kratz 2013; MacKenzie 2017; Schubert 2017; Zurr & Catts 2004; Żyniewicz 2017). Aware of the different epistemologies at play, artists reformulate science paradigms for questions that transgress disciplinary borders. Sometimes, novel scientific knowledge emerges from the input of the artist (Rillig et al 2019).

Different definitions have been suggested to identify possible ways of collaborating or working across disciplines: intra-, multi-, cross-, inter-, or transdisciplinary. Drawing on the work of Bsarab Nicolescu (2014), Alexander Refsum Jensenius offers a classification that considers the differences across disciplines and the degree of integration between them (2016). Whereas his analysis refers to collaborative enterprises, it can be extended to individual approaches in research. In his classification, a transdisciplinary approach is one that offers a “unity of intellectual frameworks beyond disciplinary perspectives” (Groth et al 2020). Nicolescu’s passionate work retains claims of universality and therefore contradicts the epistemic framework of this research in certain points, which is anchored in specificity and situatedness. Nevertheless, ‘transdisciplinarity’ remains the most adequate wording for the approach of this work. Rather than focusing on the boundaries of disciplines, he pledges for their dissipation based on an “axiom of universal interdependence” where things are interconnected and interdependent (Nicolescu 2014: 195).

To conclude, this work acknowledges paradigms, discourses and practices that are specific to the disciplinary fields it crosses through. This introduction serves to cut the field and at the same time acknowledge diverse genealogies and aspirations. I am an artist and art practice is the substrate for this work. Yet this research shows possible ways in which art can contribute to a discussion that transgresses art’s disciplinary borders. This is possible because it articulates ideas that are specific to each area, as for instance in the bioscientific aspects of the artworks, or the nuances of the word ‘queer’. By weaving them through art, this research carves a space that exceeds disciplinary borders and is inscribed in the lineage of the practitioners who pursued this before.

Bioart matters: an artistic background

This dissertation is about more-than-human leaks and vulnerabilities, which emerged in the context of AR conducted via bioart from a queer and feminist perspective. But what is bioart? To situate my work in the field, this section identifies major influences and streams, bridging some established historiographies with perhaps less referred references.

Before I present my cut of the field, a remark is necessary regarding how the naming of the field itself is mobile: this denotes diversity and open-

ness, but also possible frictions and divergent understandings. Previous literature has extensively attempted to map the field by naming it (Capucci 2008; Gessert 2011; Kac 2007; Mitchell 2010; Radomska 2016). The term ‘bio art’ was first used by Eduard Kac in the ‘90s in relation to his work featuring microchip implants (Kac 2020). Some variations of the term exist, such as ‘biological art’ (Biofilia n.d.); ‘bioart’ (Bioart Society, n.d.); and ‘Bio Art’ both capitalized (Kac 2007; School of Visual Arts New York City 2020) and not (Gessert 2010). Some authors suggest further distinctions based on the kind of technology adopted (Beloff et al 2012; Capucci 2008; Gessert 2011; Hauser 2005). However, some practitioners find that the terms mentioned above sit too tight for their practice (Schubert 2017: 10) or the diversity of the field (Krapan 2020), while others find it too broad. Another term suggested is ‘hybrid arts’ (Rapp 2020)⁴.

In this text, I adopt ‘biological art’ and ‘bioart’, used as synonyms and with no capitalization. With them I refer to artistic practice engaging with the manipulation of bodily matter, organisms, their parts, the relationships between them, or biological and symbiotic processes — with various degrees of biotechnology involved. My perspective resonates with others that take into account both materials and processes, and the political and aesthetic complexities they mobilize (Beloff et al 2012; Hauser 2005; Mitchell 2010; Radomska 2016).

The materials of bioart (biomatter and biotechnological matter) are thus living entities or fragments of them: bodily matter of more-than-human origin, bacteria, plants, fungi, cells. The processes involved are symbiotic, biochemical, entanglements of life and death, and it is from here that Radomska develops the concept of the ‘non/living’ (Radomska 2016, 2018). Processes and materials are directly manipulated and not presented to the audience by means of mere representation (Hauser 2005; Mitchell 2010)⁵. Bioart ‘matters’ (intended here as a verb) and mobilizes complexities of biopolitical, necropolitical, ecological and symbiotic kinds.

Central to my understanding and naming of the field is the concept of the non/living offered by Radomska. As I describe earlier, the non/living focuses on the complexity

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⁴ The term ‘hybrid arts’ was used, amongst others, as one of the categories in the Prix Ars Electronica, the award by renowned festival Ars Electronica. In 2019 the category was renamed into Artificial Intelligence & Life Art.

⁵ Robert Mitchell refers to ‘vitalist tactics’ for artworks that directly engage with and present the materiality of biotechnology, in contrast to ‘prophylactic tactics’ which represent the topics by means of non-biotechnological media such as painting or sculpture (Mitchell 2010).

1

and entanglements of life processes rather than, for instance, the augmentation of (human) life through biotechnology, or the adoption of technology as artistic novelty. Rather, bioart works magnify a space of indeterminacy that is dependent on the technoscientific means that support the works, and includes and shapes the artwork’s cultural and aesthetic fabric.

Readers should note that bioart works do not necessarily involve the physical tools of biolaboratories for their realization. Rather, it relies on life sciences, sometimes contests them, and often adopts biotechnological devices. To clarify this idea, let me refer to one of the first artworks framed as bioart: the Iris series by George Gessert. In his work, Gessert intervened onto the flower genome by means of traditional breeding techniques. His work couples a refined knowledge of plant genetics and physiology with a critical take on cultural history of desires and markets that come with plant domestication (Gessert 2007, 2010). The realization of the work did not involve machineries, but employed scientific understanding and a critique thereof to materially engage with the genome of flowers. However, biolab equipment remains necessary for many artworks, including *Semina Aeternitatis* and *Wombs*. These artworks require specialized infrastructure, knowledge, and support both during the realization as well as in the exhibition. Works like Gessert’s Iris series and others that require biotech machineries are not in opposition. Rather, they are different degrees on a continuum made of the non/living interplay of matters.

More-than-human matters, body matters and technology matters have catalysed artistic fascinations across genres. The literary work of Mary Shelley is one among such fascinations, and so is the certainly more quoted work by artist Leonardo da Vinci. While such fascinations have permeated Western art across centuries, bioart emerges around the end of the 20th century at the confluence of interlined strands in arts and culture⁶. Gessert identifies a notable precedent in a show organized by photographer Edward Steichen at the Museum of Modern Art in New York in 1938. Steichen presented selected breeds of *Delphinium*, a decorative plant he successfully bred himself, as artworks in an exhibition (Gessert 2011). The show became a classical reference for the history of bioart for it is the first work featuring genome manipulation.

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⁶ For a critique of the Western bias in bioart, see the essay *Illuminating multiplicity: Against the unbearable whiteness of bioart* (Davis et al 2020).

Beside this notable precedent, the manipulation of bodily matters, the relationship with more-than-human matters, and a critical take on how (bio)technology matters have all been of interest before they converged in biological arts. Performance and body art, new media art, and to some extent environmental art — and the overlapping thereof — anticipated those concerns. My overview takes into account how these streams flow across genres. In many cases, artistic strategies defy easy categorization and leak into multiple areas, as is the case, for instance, with the oeuvres of Stelarc, Ana Mendieta, Joseph Beuys, or Kira O'Reilly.

Similarly, leaks happen within and across the trajectories presented here. While these trajectories help map influences and contact points across artistic positions, they are not meant as resolute cuts. Quite the contrary: what is relevant is the potential of art to transgress clear cuts. Especially a general distinction between “artists that are concerned with the environment, and artists whose work focuses on the human as subject matter” (Beloff 2019; Beloff et al 2012) has helped shift the focus from human-only realms and point at how ecology and natural phenomena have been major concerns in art. Certain artworks are and remain concerned with human matters. However, other works undermine such categorization as they contest putative sealed borders of the human. This happens, for instance, in the bacterial bodyscapes by Sonja Bäümel, the CandidaHomo ecologies by Tarsh Bates, and human-slug encounters in *Wombs*.

More-than-human matters

That which is still called nature has been variously celebrated, represented and manipulated in Western culture throughout history. European examples are Renaissance painter Giorgione's Venetian landscapes; the Romantic tension in German painter Caspar David Friedrich's work; or the linguistic experimentation of Italian poet Andrea Zanzotto. In the 20th century, artists have intervened on the materiality of more-than-human matters rather than representing them.

In the 60s and 70s, land art rose to prominence with sometimes large-scale transformations of landscape. A conceptual attitude marked works such as *Sun Tunnels* by Nancy Holt (1973–76) or *The Lightning Field* by Walter de Maria (1977). With a stronger ecological intent, artists such as Patricia Johanson, Jackie Brookner and Alan Sonfist accounted for ecological

processes in their art. Growing ecological awareness paved the way for artistic expressions that directly engaged with the environment, as in the show *Fragile Ecologies* curated by Barbara Matilsky in 1992 (Spaid 2002).

The term ‘arte povera’ (Italian lit. ‘poor art’) was suggested by art historian Germano Celant to refer to the bare-bones and rough materiality of works directly engaging with materials (Raleigh & Celant 1970). Artists from the arte povera employed coal, steel and rubber, but also whole trees and living animals. Giuseppe Penone created a series of monumental trees that he carved, burned, or covered in golden leaf. His piece *Pane alfabeto* (1969) directly addressed anthropocentrism. Penone baked a loaf of bread containing non-edible letters and placed it outside: birds came and ate the bread, but left the letters aside.

Inter-specific relations catalysed symbolism and rough proximity (Aloi 2012). Joseph Beuys reworks the traumatized social space of post-holocaust Germany through the reconstitution of a forest — a founding trope in German national narrative — in *7000 Oaks* (1982). On other occasions, animals shared the stage with performers as in the pieces with real or evoked dogs by Oleg Kulik and *Falling Asleep With a Pig* by Kira O'Reilly (2009). In the latter, O'Reilly reformulates the experience of working with pig cells during a residency at the SymbioticA by sharing the intimacy of falling asleep with a living pig. In recent years, Mirko Nikolić delved into “minoritarian ecologies” to perform “eco-aesthetic assemblages” hosting “plants, molecules of carbon dioxide, sheep, and earth” (Nikolić 2017: 3).

Not only macro-worlds (such as landscapes and environments) or large-scale organisms (such as animals and plants) have been in focus. Finnish artist Antero Kare employed bacteria in a series of ‘living pieces’ by microbes and chemicals since 1985. The substrate of his exhibited pieces is practice in science labs, which he visited as an artist (Beloff 2019). In his exhibitions, dog and swan-like sculptures are left to develop bacterial blooms with the purpose of biological investigations.

Body matters

The manipulation of (human) bodies and bodily matter (blood, flesh, sperm, sweat) has been explored in what is commonly referred to as

performance and body art⁷. Through diverse strategies, performance and body artworks challenge normativities surrounding (human) bodies in society with regard to roles, power, gender, sexuality, ability, oppression. By exposing, manipulating, hurting their bodies, performance artists have viscerally manifested the discursive character of what a body is and the politics exerted upon it — with strong resonances with feminist critique (Blackmann 2008; Haraway 1991; Shildrick 1997).

Relationalities and their meaning in the social space were the focus of a number of artists throughout the second half of the 20th century. From the 60s onwards, a strand of feminist performers addressed relationalities and gender roles. Among them, Carolee Schneemann, Cindy Sherman, and Gina Pane used the body as direct expressive medium — both in flesh (as in Pane) and staged (as in Sherman). Ana Mendieta engaged with the environment to address power dynamics in gender roles as a symptom of the broader exploitative system of the Western and colonialist world (*Siluetas Series* 1973–1980). Kirsten Justesen shaped an articulated landscape of bodies in space with ephemeral materials like ice.

The interweaving of biomedicine, desires, and normativities instigated several works with different focuses. The plastic surgeries by ORLAN brought together body modification and social expectations, whereas the works of Zoran Todorović and Ive Tabar address biopolitics and intimacy. Medicalized and disabled bodies and desires were thematized by Bob Flanagan and Sheree Rose, and more recently by Martin O’Brien. Conflated interventions on the body and sex practices have been used to express queer desires and contest gender normativities by Rocío Boliver, Ron Athey and Franko B.

From another perspective, biotechnology has been employed to manifest the amplification of bodies and their intrinsic dramaturgical potential, as in the obsolescent bodies by Stelarc. Configurations of bodies, machines and sound become dramaturgical tools in the work by Marco Donnarumma (Donnarumma 2015), while Yann Marussich stages silent bodily dramaturgies. For *Bleu Remix* (2007), Marussich ingested methylene blue, a bioreagent used to stain tissues and make them visible under micro-

7
Once again, terminologies are mobile. While I acknowledge the diversity of the field, I adopt the terms performance art and body art as they remain immediately accessible

8
The concept echoes Marshall McLuhan’s famous formulation “the medium is the message” (McLuhan 1964).

scope. In the performance, methylene blue was excreted with the artist’s sweat (Hauser 2020).

Technology matters

The critical fascination for and engagement with technology and science has historically marked media art practice (as an artistic field) and media theory (as a theoretical area). The terms ‘media arts’ and ‘new media arts’ somehow overlap, although the first includes early experimentations with television and video and the latter focuses rather on digital technologies. (New) media art is marked by critique, manipulation and creation of technology. Coding, data, robotics, the world wide web, processed images and sounds, circuitry: while these progressively became pervasive in the everyday life of lay people, media art has spurred critical reflection on their political, ethical and epistemic implications (Broadhurst 2007; Cook 2016; Fuller 2007; Kittler 1999). To this belongs rethinking of what ‘human’ is in a time when subjectivity, space and communication are re-configured or expanded by interface-mediated experiences, silica-based infrastructures and technoscientific knowledge.

A rethinking of what ‘life’ and ‘nature’ are through technology has been contextually widely addressed by artists and scholars. Silica-based entities (such as algorithms and autonomous machines) have challenged carbon-based understanding of what life is (Capucci 2008). Extended through, corresponded by, and overlapped with digital technology, corporeality is rethought and concepts such as ‘biomedia’ emerge: biology has become the medium⁸ (Thacker 2003). New media artist Roy Ascott speaks of a “post-biological era” in which “technology, creatively and wisely applied, assists us in creating new ideas of self and society, just as the physical and biological sciences provide us with new models and metaphors of being” (Ascott 1997). Media theorist Vilém Flusser envisioned potential future worlds based on technological innovation (Flusser n.d.), as biology and biotechnology open spaces of “almost mythical models of life’s unrealized possibilities” (Flusser 2012: 12)⁹.

Technoscience becomes a medium for art (Reichle 2009); art becomes biotech (Hauser et al 2003) or techno-organic (Beloff 2019: 219). Such appropriation of (bio)

9
My visit to the Vilém Flusser Archive in Berlin gifted me with a find that suggests mutual interest and influences between media theory and what later was labelled as transgenic art. A letter to Flusser by Eduardo Kac interestingly suggests how, before Kac’s genome-based works, his attention was directed to language and holography as a novel way to experiment with this kind of art (Kac 1991).

technology and technoscience ramifies and matters along and through more-than-human and body matters (Hauser 2006). Emerging topics are how this appropriation shapes understandings of the human and its relationships with the machinic. Contextually, how the organic shapes and affects this relationship comes to the fore (Hauser 2020).

A short comment about the places where bioart is made is useful to give a sense of the rich diversity of practices. These include academic laboratories that have been established to host art such as SymbioticA (Perth, AU) and Biofilia – Base for Biological Arts (Espoo, FI). Other laboratories host artists in long-term collaborations, or for specific projects like the IEGT

(Rostock, DE). Some art centres feature biolab to support the production of artworks, such as Kapelica Gallery (Ljubljana, SI) and WAAG (Amsterdam, NL). Beyond the constellation of laboratories in institutional contexts there are nomadic grassroots networks like Hackteria or independent spaces like TopLab (Berlin, DE) and UR Institute (Dubrovnik and Zagreb, HR), where I worked for the realization of *Wombs*. Spaces of the latter kind host practices that criss-cross citizen participation and the collaboration between scientists and audience. Their practice is often referred to with terms such as ‘citizen science’, ‘DIY bio’ or ‘DIWO bio’ (Do-It-Yourself and Do-It-With-Others respectively), or ‘biohacking’¹⁰.

Matter matters

Media art and performance art share a direct engagement with the materials and topics rather than with their representation. Media artists have been tweaking, hacking, coding, connecting circuits and creating experimental digital systems for sound, video, interaction, web-based interventions, robotics. Similarly, performance and body art is art made with bodies, not about bodies. Even though photography has a privileged link to performance art, for it can capture the ephemeral character of the artwork (Vason 2019), performance and body art happens between the body of the artist and the audience. Bioart practice is anchored in the materiality

¹⁰ The term biohacking is a compound where ‘bio’ refers to biosciences and biotechnology, and ‘hacking’ refers to the re-appropriation of technology. Once again, though, words are mobile. Some push the term towards “human advancement, performance and longevity” (Biohacking Conference 2023). Others, instead, embrace a reading more oriented to ideas of common good rather than individual benefit. These go back to a creatively critical attitude towards technology linked to social engagement, activism, and resourceful challenge of the establishment and power structures embedded in technology. My understanding of biohacking embraces the second. For a review of the field, see Vaage (2017).

¹¹ Among the first artists to work with what became bioart are Suzanne Anker, Beatriz da Costa, Joe Davis, Marta de Menezes, Eduardo Kac, Antero Kare, George Gessert, Kira O’Reilly, Julia Reodica, Reiner Maria Matysik, Adam Zaretsky, and artist groups Art Orienté Object (AOO), Critical Art Ensemble, and The Tissue Culture and Arts (TC&A) Project. Many of them are still active today.

of cells or molecules and a hands-on approach rather than their representation via painting, sculpture or photography.

Bio-fictional manifestations such as chimera-sculptures, DNA-portraits, chromosome-paintings or mutant-depicting digital photo-tricks are no more examples of Bio Art than Claude Monet’s impressionistic paintings could be classified as ‘Water Lily Art’ or ‘Cathedral Art’. (Hauser 2005: 182)

The artworks and concepts presented above share some concerns with, and somehow pave the way to, bioart practice by anticipating focal points and lines of research. Manipulations of bodily matters (of human and more-than-human kinds), interest in ecologies and the environment, and a critical approach to (bio)technology converge, in diverse articulations and intensities in the 1990s and early 2000s¹¹. At the core of the early works was the enmeshment of organic matter and biotechnology and their potential for manipulating and altering nature, and their ethical and biopolitical implications.

Some artists used genetic editing to address how the increasing pervasiveness of biotechnology in contemporary society challenges the perception of what is considered nature, and its biopolitical and ethical implications. *Microvenus* (1986) by Joe Davis is based on code translation between digital code, based on 0-1 digits, and the four letters corresponding to the nucleotides composing strands of deoxyribonucleic acid (DNA). Davis synthesized a plasmid — a circular strand of bacterial DNA — whose code corresponds to a stylized symbol of fertility. Eduardo Kac relied on a similar technique for the interactive piece *Genesis* (1998–99), for which he encoded an excerpt from the biblical text *Genesis*. The genetically engineered bacteria were exhibited in an interactive environment where the audience could control the emission of ultraviolet (UV) light¹² emission onto bacterial colonies. UV light induced mutation on bacterial DNA, including the plasmid with the Bible excerpt, which was thus modified “by human action”. Kac then employed genetic editing for *GFP Bunny* (2000), a piece that became con-

¹² Ultraviolet is an electromagnetic emission whose frequency lies outside the spectrum visible to the human eye. UV light is a standard method of visualizing results of genetic engineering: usually, a fluorescent protein is included in the plasmid to be added to bacterial genome through a procedure called transformation. In the procedure, some bacteria are successfully transformed, others are not. Placed under a UV light source, the genetically modified bacteria glow, while those for which transformation was not successful do not glow: in this way it is easy to discern which new bacterial colonies contain the desired plasmid. This procedure is the basis of a number of genetic engineering applications, from experiment to vaccine production. At the same time, UV light damages the molecular bonds in DNA, thus inducing mutations or death of cells. In humans, excessive exposure to UV light from the sun can lead to skin cancer.

troversial with regard to the ethical perception of genetic manipulations and animal welfare¹³. A synthetic plasmid was used in *Semina Aeternitatis* with a different code conversion technique, bacterial strain, and aesthetic intention.

Biopolitics and ethics were addressed through provocative interventions in the work by Adam Zaretsky and the collaborations between Critical Art Ensemble and Beatriz da Costa. In their work, biotechnological protocols were reconfigured with irony outside the biolab space to challenge the audience's perception of risk and the ethics surrounding biotech practice (Mitchell 2010; Tratnik 2020; Vaage 2016). *Nature'* (1999–2000) by Marta de Menezes interrogates what is considered 'nature' by presenting butterflies modified by herself. De Menezes cauterized locally the pupa, which led, in mature individuals, to wing patterns different than those of 'natural' butterflies (de Menezes 2003).

The series *Victimless Utopia* by TC&A Project problematizes cultured tissues, whose production relies on the controversial bioreagent fetal bovine serum (FBS). FBS is blood serum extracted from bovine fetuses and is

a basic reagent in biolaboratories for its properties that contribute to cellular reproduction. As of today, no valid alternatives are commercially distributed. *Victimless Utopia* combines a speculative design approach with the materiality of bioart for the production of leather and meat with no animal killing, while simultaneously pointing at the hypocrisy of bioreagents produced through animal exploitation.

In two famous episodes, the exhibition of the work was troubled by fungal contamination (Mori Art Museum 2009) and tissue outgrow (Schwartz & Antonelli 2008). As I expand in Chapter 3, these episodes are crucial to the development of the concepts of the non/living and uncontrollable life. The uncontrolled manifestation of fungal contamination is a sign of decay, whereas tissue outgrow manifests uncontrollability of the otherwise expectedly controlled life processes of bioart pieces. These processes disrupt the contained space of the artwork, “[affect] its value (as an artwork that is ‘supposed to’ look a certain

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A different reading of the GFP rabbit *Alba* may draw upon the concept of buzz suggested by David Joselit (2013). With little concern for materiality, Joselit argues that the public discussion, reception and sometimes polarization created by art is a manifestation of art itself. Such a concept seems to be particularly fitting in times of post-truths and proliferation of online arguments. The artist's website states that the rabbit was presented to the audience in 2000 (Kac n.d.). The flow of controversy, artefacts, drawings, talks, articles, and a famous colour photograph of the rabbit — whose green glow may look like digital manipulation — continues still today. Before any misunderstanding: I trust *Alba* existed. My point here is that the artwork reverberated in a 'buzz', after Joselit, that does not even have to do with the fact whether the artwork existed or not.

way) and subsequently [turn] the piece into waste”, thus manifesting the complex spectrum of relationalities — desired and non-desired — of processes otherwise attributed to life or decay (Radomska 2016: 187).

Some among the artists mentioned gathered to publish a joint Bio Art Manifesto (Kac et al 2017). Despite coming almost two decades after their early endeavours, the manifesto raises points which are still topical to society and art, such as the manipulation of biological processes and what is defined through dualistic oppositions as “the interplay between the human and the nonhuman, the living and the nonliving, the natural and the artificial” (ibidem). The manifesto received moderate attention from the public, but it is of interest to acknowledge how it outlines artistic intentions. At the same time, the choice not to involve practitioners active in recent and current years may result in a lost opportunity to update, expand and review those intentions with emerging trajectories.

Since the early works, bioart “has grown to intervene and hack interactions with other species and living matter outside traditional biolab scenarios and areas of expertise” (Bello 2020). In recent years, the initial questions about how biotechnology transforms nature have been expanded beyond the human. It would be wrong to argue that the question left the stage completely, but rather that it opened to a wider spectrum of relationalities. Human centrality and uniqueness have been somehow eroded: relations among species (humans included), more-than-human agencies and multiple ecologies have received increased attention from artists. This erosion has taken place along different streams.

On the one hand, a focus on relationalities has allowed artists to explore the human body in its multiple ecologies, as in the works on skin bacteria landscapes by Sonja Bäümel, the works on *CandidaHomo* commensality by Tarsh Bates, and the microbiome mappings by François-Joseph La-pointe. On the other hand, multi-species relationalities with plants and animals have been extensively explored too. Artists bartaku (Vandeput 2021) and Špela Petrič create poetics of vegetal entanglements. Theresa Schubert explores fungal agency and forest realms (Meyer & Rapp 2020; Rapp 2019; Schubert 2017), whereas Saša Spačal creates a series of empathic microbial works (Spačal 2017). Intimacies between humans and non-humans have been the red thread of Maja Smrekar's series *K-9 Topo-*

logy, and aquatic ecosystems are at the centre of the *Aquatocene* project by Robertina Šebjanić.

The last decade has seen an array of artists employing non/living matter obtained from their own bodies for their artworks. Instead of working with standard cell lines¹⁴, artists have isolated different kinds of cells or other bodily matter and manipulated them in a variety of ways. Smrekar created a dog-human hybrid with an egg cell from her body and somatic cells from one of her dogs in *K-9 Topology*. Karolina Żyniewicz performs a meticulous exploration of cellular death of her liminal self in *safe suicide*. Guy Ben-Ari transformed his skin cells into stem cells, which were then differentiated into neuronal cells used in the synthesizer of *cellF*. In *mEat me* (2020), Schubert performs a public auto-cannibalistic feast based on muscle cells obtained from her thighs accompanied by an AI-mediated officiant. Bates used her blood in agar plates for *Surface Dynamics of Adhesion* (2015), de Menezes performed crossed cell immortalization and skin grafting with Luís Graça in *Anti-Marta* (2018). I review the latter two in Chapter 3.

Clearly, each of the mentioned artworks has a specific focus and methods. Nevertheless, their diversity brings to the fore entanglements of body matter, more-than-human matter, and technology matter. Those works shape a continuum made of more-than-human, body and technological matters. Many of these works, to say it with Alaimo, ‘begin with the human’ to trespass or transgress the human. In this sense, *Wombs* and *Semina Aeternitatis* make no exception and are both situated along this continuum.

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¹⁴ Cells in established cell lines reproduce beyond what would occur spontaneously. The fact that cells reproduce continuously allows researchers to use the same cell line in different moments and places, thus enabling the comparability of experiments. A variety of cell lines exist. Among the most used cell lines are HeLa cells, whose name comes from Henrietta Lacks. Cervical cancer cells were taken in biopsy from Henrietta, who later died of cancer. The episode sparked controversy as no consent was asked, while the cells became a worldwide standard (Skloot 2010).

Chapter summaries

This dissertation is structured in six chapters and one postscript. Each part corresponds to certain folds and fluids of the organ/symbiont in the drawing introduced earlier. Therefore, the drawing returns at the beginning of each chapter with an indication of which folds or fluids are subsequently addressed.

Chapter 2 Methodology reprises some themes mentioned in this introduction to outline the interplay between

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artistic research (AR), the idea of ‘leaks as methods’, and the making of bioart. It contextually outlines how this research walks the trajectories of methodological openness suggested by Hannula, Suoranta and Vadén (Hannula et al 2005, 2013) and self-reflectivity (Mäkelä et al 2011). Regarding the latter, the chapter expands on the relevance of situating the research and the different nuances this term has in AR and feminist scholarship (Haraway 1988, 1991b; Lykke 2010; Shildrick 1997). The chapter also presents a questionnaire I submitted to collaborating scientists about the transdisciplinary collaboration.

Chapter 3 Leaky, vulnerable bodies trails leaky and vulnerable bodies in art and scholarship. It dives into the second theoretical fluid of the research — feminist posthumanities — to seek understandings of bodies as inherently leaky and vulnerable entities (Butler 2004; Daigle 2018; Shildrick 1997). The chapter clarifies how leaks are understood beyond the feminine to undo conventional couplings between feminine and unruliness as opposed to accomplished male canons. At the same time, it opens to a more-than-human dimension through discussion of environmental leaks (Hird 2013) and vulnerability (Alaimo 2009).

The section continues with the third theoretical fluid of the research: queer studies. Firstly, I embrace the theorization of queer ecologies (Barad & Strong 2009; Hird 2008; Mortimer-Sandilands & Erickson 2010) to “undo normative entanglements and fashion alternative imaginaries” (Giffney & Hird 2008: 4). This reading undermines the categorization of nature as distinct from the human and inscribed within the polarity of pure vs contaminated, while also eroding the narrative of nature as feminine and motherly. Secondly, I borrow the understanding of the word ‘queer’ as a verb — ‘to queer / queering’ — and as a method suggested by queer ecology studies and expanded further by the emerging field of queer death studies (Radomska et al 2019, 2020). To understand ‘to queer’ as a verb allows one to think differently about more-than-human intimacies in the context of environmental disruption.

Leaky and vulnerable bodies are not contained within theory, though. The chapter continues by engagement with four artworks from the fields of biological art and performance art that may contribute to the discussion about leakiness and vulnerability. The selection focuses on pieces that unsettle integrity and by so doing manifest radical vulnerability. The four

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works are *Surface Dynamics of Adhesion* (2015) by Bates; *Anti-Marta* (2018) by de Menezes; *Incorruptible Flesh* (1996–2013) by Athey; *Succour* (2002) by O'Reilly. Their authors are practitioners who have placed the irrefutable dance with boundaries at the core of their practice. Through different modes, aesthetics and contexts, these works present bodies that are open, permeable, and therefore defy borders that are culturally assigned. By so doing, they reveal an inherent vulnerability of bodies of more-than-human kinds.

The trajectories fleshed out in the first two chapters (Methodology and Leaky, Vulnerable Bodies) pose the substrate for thinking through art practice as a quest for openings, rather than for accomplished truths. On such premises, Chapter 4 *Fleshy folds: the artworks in the research* accounts for the realization and exhibition of *Semina Aeternitatis* and *Wombs*, which are the core of this research. Conceived at different stages of the PhD, the artworks address the overarching themes of vulnerability and leakiness by different means. The chapter features journal annotations, sketches, and visual materials of both process and exhibition.

Semina Aeternitatis addresses transience and the nostalgic lure of individual memories through DNA data encoding and genetic engineering. The transcript of a woman's childhood memory is synthesized into a DNA molecule and becomes, via genetic engineering, part of the genome of biofilm-producing bacteria. The exhibit comprises a chimeric sculpture with a horse skull and fleshy folds of microbial cellulose obtained from genetically engineered bacteria, and a research desk. The piece was realized for the show *Experiment Zukunft (Experiment Future)* at the Kunsthalle Rostock (DE) in collaboration with Prof Mirela Alistar and the Institute of Experimental Gene Therapy and Cancer Research (IEGT).

Wombs ponders possible environmental implications of hormonal contraceptives by weaving together the leaky character of my body and of more-than-human others. It develops as a series with three interconnected chapters (*W.01*, *W.02*, *W.03*) featuring organisms that reproduce asexually (bacteria) in *W.01* or are hermaphroditic (terrestrial slugs) in *W.02* and *W.03*. The plural form of the title refers to multiple possibilities of embodiment and manifestations of bodies and of the artwork. *Wombs* is a space of possibilities that exceeds the actual organ to look at various negotiations with one's sexuality and the environment. *W.03* features a photographic

series from a performance for camera. *W.01* and *W.02* are non/living pieces manifested as hybrid extra-bodily organs. The piece was realized at KONTEJNER | bureau of contemporary art praxis, Zagreb (HR), in collaboration with UR Institute, Dubrovnik (HR).

Chapter 5 *Leaks* serves as a rhythmic interlude between the description of key theories, methods and artworks and before the discussion of the findings. The chapter presents a series of written sketches, each depicting a moment of leaky encounters throughout the research. These include experimental procedures in the lab; more-than-human others in the artworks; unexpected conversations with collaborating scientists. The chapter's style employs unfinished notes and poetic writing to give space to the unruly knowledge in the artistic research process. It thus presents ruptures and spills that resist to be ordered in linear writing, and yet bear a potential of novel knowledge. Readers will encounter some elements that have been reworked elsewhere in the text and some others that intersect with the trajectory of the dissertation, but leaked from the discussion. Chapter 5 has a dedicated graphic layout that emphasizes the 'leakiness' of this writing with respect to the rest of the text. Each page features one short text, with a dedicated graphic layout, as if it were exceeding / leaking from the text body structure.

Chapter 6 *Reclaiming vulnerabilities* reprises concepts and artworks presented in the previous chapters. At its core is the discussion of the main contribution of the dissertation: the ideas 'arts of vulnerability' (AoV) and 'poetics of uncontainability' (PoU), woven through my individual artistic practice and the artwork landscape introduced previously. Uncontainability and vulnerability marked the research at various stages and even catalysed its process, research questions and findings. AoV and PoU are articulated through the biopolitical character of the artworks to look at how the relations between different subjectivities are inherently unequal.

Bioart practice is an invitation and a responsibility in negotiating with life, death and different subjectivities. What emerges is that the fabric of vulnerabilities demands a distributed responsiveness — a fabric enacted by the artwork but transcending its boundaries. Artistic research and bioart have become practices of queering that which was previously known, reclaiming vulnerability and making art out of it. The chapter features a

comment on the art and science collaboration based on the questionnaire submitted to the scientists.

I named Chapter 7 *Openings* rather than ‘Conclusions’ to indicate how research does not have an end point, but rather serves to unpack and illuminate research questions. The chapter reviews my proposition of reclaiming vulnerabilities and making art out of them. I assess how the elements of the research interplayed and forged PoU and AoV, and revisit how concepts born inside art — and situated in bioart practice — have the hope to become an epistemic tool beyond art.

The Covid-19 scar is a necessary postscript, as most of this dissertation was written during the extended lockdowns and moments of uncertainty during the worldwide pandemic. I briefly comment on how the pandemic affected the research, and trace possible resonances between bioart practice and the pandemic’s implications. Such a postscript is meant to remain a short take, and not a thorough discussion, for opening this aspect would lead my discussion astray. It leaks from my research, and was perhaps the most important leak of all. Similarly to what I have been doing with all the other leaks and vulnerabilities, I reclaim it and make it manifest, for pretending that nothing happened would contradict the careful situating of the research. Like all other leaks and vulnerabilities, it calls for negotiation: my choice in this case is to point at it and make it manifest, without losing the direction of my overall work. Who knows, it may perhaps become material for future research.



2_Researching as an artist

(Methodology)

This research was conducted as artistic research (AR) through biological art practice in different contexts. This dissertation emerges from the realization of *Semina Aeternitatis* and *Wombs*: by so doing, it confronts itself with the sometimes enigmatic and unpredictable character of art-making, the one that combines advanced skills and mastery of techniques with the elusiveness of the creative process:

The arts do not proceed according to a strict method (met'hodos) along a pre-determined trajectory, but rather in the form of leaps, digressions, and detours which continually generate new and unexpected counter-expressions, and do not set a goal for their non-linear 'experiments'. (Henke et al 2019: 13)

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Considering the enigmatic character of art-making, this chapter attempts to unpack some of the 'hows' of this research. To do so, it explains how its process included a diversity of methods. On one hand, such diversity can be ascribed to how bioart combines a variety of instances (from bio-lab work to aesthetic choices for the exhibit) and to the transdisciplinary character of my individual work.

On the other hand, such diversity draws from an understanding of AR as an 'undisciplined' discipline based on the 'methodological abundance' described by Hannula, Suoranta and Vadén (2013: 21). 'Undisciplined' should not be understood as an unorganized or random practice, but rather as a non-prescriptive approach that resists fixed categorizations. This approach couples the diversity of art with the deconstruction of knowle-

dge production based, amongst others and in particular for the Finnish context area where this research was conducted, on Paul Feyerabend's philosophical legacy. I return to this point soon.

This chapter addresses methodological choices at different levels of the work, moving progressively from theoretical and epistemic aspects towards more practical ones. It opens with some reflections on the methodological abundance of AR and the situatedness of feminist legacy. A following section is dedicated to the ideas of leaks and leakiness, why they are relevant to and how they shape the methodology. This section includes an epistemic discussion of the methods to specify the connections between practice and theory and how methods affect not only the ways knowledge is produced, but also what kind of knowledge.

While it is possible to present this as a somehow ordered methodological account, it should be reminded that each of the fluids contributes to countering linear narratives, clear cuts, or systematizations. This research has been planned, reviewed, implemented, and discussed iteratively, but it has never been a linear process. In fact, it proceeded through leaps and leaks, and the artistic process was at its core with its inherent dose of unpredictability and resistance to prescriptions.

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The first section prepares the ground for the presentation of the methodological choices regarding the combination of art and science, and how they guided the realization of the artworks. Note that technical and production aspects regarding the artworks are included in Chapter 4, rather than here, for they are specific to each project. A comment on writing as a fundamental aspect of AR concludes the chapter.

On the methodological abundance of AR

The introduction (Chapter 1) outlines a landscape of AR and positions my work within the Scandinavian and Finnish context. Some of the scholars who contributed to shaping the field (Hannula et al 2005, 2013; Varto 2018) refer to Paul Feyerabend's philosophical work regarding knowledge production in natural sciences. Feyerabend contests the idea of a transversally valid method (Feyerabend 1975). His notoriously provocative work is contextualized in the tumultuous changes of Western society after 1968 and the fierce debate he engaged in with other philosophers of science,

including Karl Popper and Thomas Kuhn. His deconstruction of scientific knowledge is based on the idea that research lacks a uniform, universal method. Therefore, research cannot be prescriptive and is rather marked by the interplay between primarily unformalized methodologies and contextual and material conditions (Kidd 2011). Within such a framework, Feyerabend's dramatic statement 'anything goes' is a reminder of how "things must stay open and potential" throughout the research process (Hannula et al 2013: 5).

Varto and Hannula, Suoranta and Vadén draw on Feyerabend's positions to discuss the autonomy of artistic research as a form of knowledge production that is independent from other established disciplines¹⁵. Following Feyerabend's objection to scientific tradition as "an authority on knowledge" (Varto 2018: 16), they counter the idea of possible hierarchies among types of knowledge with the metaphor 'democracy of experiences' (Hannula et al 2005). In their view, such a 'democracy' leads to a more diverse perspective on reality. Drawing on the need for diversity within knowledge and embracing Feyerabend's 'anything goes' statement, a methodological approach based on plurality is offered. Hannula, Suoranta and Vadén (2005) term this 'methodological abundance' while and Biggs and Karlsson (2011: 46) refer to 'methodological pluralism'. Although abundance and pluralism are not synonyms of 'anything goes', they reinforce a non-prescriptive character of AR methodology: "anything can be used as a material" (Varto 2018: 107). After all, anything can become art if used for art.

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This research was conducted as AR in different contexts of art and science collaboration by means of biological art practice. This practice involved working as an artist in three biological laboratories. *Semina Aeternitatis* was realized using bioinformatics and genetic editing of a bacterial strain. *Wombs* involved self-experimentation, cell culture, sculpture, performance. During the research process, I drew and wrote in my research journal and also planned exhibitions. I discussed contracts and schedules and arranged purchases of materials. All these methods and gestures tap into multiple registers and contexts. Although this methodological multiplicity may sound familiar to art and science and bioart practitioners, it should not be reduced to a prescriptive methodology.

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In one of his doctoral seminars which I had the fortune to attend before his retirement, Prof Juha Varto invited the participants to reflect on if and how AR should try to accomplish the disciplinary parameters of other established disciplines, notably natural sciences.

To conclude, the methodology of this research draws on literature which avoids prescriptions or ready-to-follow user manuals, and emphasizes the artist's skills and responsibility for their individual artistic process, which becomes the foundation and methodological vehicle (Borgdorff 2011: 44) of the research. According to Varto, AR "is a type of qualitative research in which the research object is approached through methods of artistic practice" (2018: 19). In simple words, art-making is the way to conduct research. It is shaped by "material choices, other agents involved, equipment, steps taken by experience, criteria for decisions, choices, corrections, experiments" (idem: 131). Art practice is thus a method of research: this research adopted as a main method the manipulations of biological matter by scientific means for artistic purposes.

... and its situatedness

Readers should note the convergence of two 'fluids' permeating this research — AR and feminist theorizing — on a relevant aspect of knowledge production. Both fields, through different paths, are concerned with the postmodernist critique of science, power and knowledge (Lykke 2010; Shildrick 1997; Varto 2018). Along these lines, both feminist studies and AR unlatch themselves from the assumption of a universally valid and disembodied form of knowledge. They do so from different perspectives and I address this here to specify the feminist approach of this dissertation.

Scholarship around AR highlights abundance, freedom and multiplicity (of subjects, topics and methods) as key features of the field¹⁶; at the same time, authors converge on how AR is and should be singular, but also contextualized and situated (Borgdorff 2011; Hannula et al 2013). Hence, singularity of AR derives from the singularity of artistic practice. Because of the singularity of artistic practice, the author's hand and voice is always present and recognizable from others' — even when the same methods and materials are used and when references are evident. Varto often stresses how practitioner and artworks are inextricably interconnected:

Practices are always first person practices, my practices. The practitioner is so deeply involved in his or her practice that the boundaries between them are unclear: others may adopt the same practice, but the original practitioner characterises the

¹⁶ Similarly, feminist and queer studies insist on the morphing character of their fields, see Giffney and O'Rourke (2009) and Lykke (2010). The space of a dissertation does not accommodate a comprehensive mapping of the respective genealogies but I refer to the mentioned texts for a broader discussion.

practice, the practice characterises the practitioner, and practice always belongs to the original practitioners. (Varto 2018: 31)

Regarding the knowledge produced through AR, Varto defends the artist's freedom and the responsibility that comes with it. In his view, responsibility relies on the artist's skills — that are, fundamentally, individual (idem: 36). Following his thought, the responsibility that comes with individual skills is an epistemic responsibility: it is such epistemic responsibility that steers the research. It is through the artist's skills that methods are adopted, research is done, and knowledge is created.

While they underline the individual character of AR, the authors presented in the previous section avoid suggesting the work of the artist as a solitary enterprise that takes place romantically detached from the rest of the world. In fact, they frame AR as an endeavour that always happens in a context. For them, context implies the artistic and academic environments and discourses, but also broader cultural and historical context. Such framing, contextualization, and situating, provides relevance to the research and responsibility to its freedom. It also provides the lens through which to look at the research. It is within a context that Hannula, Suoranta and Vadén interpret Feyerabend's statement 'anything goes'. By providing context, a practice emerges along with its ethical or material boundaries, key questions, as well as 'demands and internal gravity' (Hannula et al 2013: 5).

With a slightly different angle, Borgdorff observes how artistic practice and research are generated through interactions with their 'relevant surrounding'. Borgdorff identifies the surrounding of AR as a morphing field that spans across and brings together art and academia. He observes how "works of art and artistic practices are not self-contained; they are situated and embedded" in history, culture, and art discourses (Borgdorff 2006: 10; 2011: 47). As artist and artworks are interconnected within 'relevant surroundings' the research should be also critical and reflective towards such situatedness and embeddedness.

While the positions discussed above mention situatedness as a key feature of AR, they strangely enough skirt around the politics of location, which is a characteristic of feminist theorizing (Haraway 1988, 1991; Lykke 2010; Shildrick 1997). It must be said that there are different

approaches to the politics of location in knowledge production. I shall refer to the concept of situated knowledge as formulated by Haraway (1988, 1991) and discussed by Lykke (2010) because, as I will explain, it reclaims accountability while acknowledging that different positions (and privileges) mark how and what kind of knowledge is produced.

As gender studies scholar Nina Lykke points out, postmodern philosophers of science (including Feyerabend) and feminist theorists of politics of location share the idea that the knower is always participant in the world that is analysed (Lykke 2010: 5). The knower is involved in the way knowledge is produced, which in turn will always imply a certain degree of subjectivity. As a consequence, knowledge — including science and in this case AR — becomes a form of narration. Some postmodern scholars extend this position to a fundamental relativism, because on such premises any stories can be told.

Following Lykke, this point became problematic for feminist theorizing because the critique to universalism and privilege (in society, in knowledge production, etc.) should not give way to the exact opposite, where all positions are equal. Core to the feminist scholarship is diversity, the unearthing of privileges and ‘breaking up ideas of sameness’ (idem: 3). This sustains the critique to Western science as performed by men, that does not consider diversity of bodies, for instance, and is assumed as universally valid knowledge. Within such framework, the idea that any position is equal to another is a contradiction (Haraway 1988). A feminist ethics and politics problematization requires a different and more nuanced approach.

By offering the concept of ‘situated knowledge’, Haraway challenges one of the tenets of positivist science, which is the assumption of a neutral, contextless and disembodied knower, which she names ‘god-trick’ (Haraway 1991: 191). In her discussion of the politics of location in knowledge production, Lykke reminds us how Haraway’s background in science forged her concern to suggest an alternative understanding of objectivity. “I would like a doctrine of embodied objectivity that accommodates paradoxical and critical feminist science projects: Feminist objectivity means quite simply situated knowledges” (Haraway 1988: 581). What Haraway critiques is an all-encompassing perspective and always valid paradigms, while at the same time restoring the possibility that knowledge can be effective and debatable. To do so, Haraway makes the knower accountable for the knowledge produced and asks for a “conscious reflection of

her or his situatedness and research technologies” (Lykke 2010: 6). What situated knowledge implies is a “*partially objective* knowledge” (ibidem, italic mine). Such knowledge is accountable and valid from the embodied positioning the knower has “in time, space, body” and — importantly — “historical power relations” (ibidem). Situated knowledge enables to avoid god-tricks and relativism. It manifests the ethical implications of knowledge and makes it accountable because of how and by whom it is produced.

Leaks as methods

“Working with fluids and their potential leaks is a methodological choice”: as outlined in the introduction, this research develops through openings and leaks. Openings and leaks of more-than-human bodies marked the realization of the artworks while allowing the flow of knowledge and ideas, and the other way round. Adopting leaks as methods reveals vulnerabilities of different kinds, which this dissertation is about.

Such a methodological choice emerged through the process rather being set at the beginning of the research. In fact, I started the research with the plan to work through biological arts in international contexts, engage with sexuality and death in the artworks, and build my theorizing upon feminist and queer resources. Contextually, both the process of artistic creation as well as the exhibited artworks were meant to play a relevant role, to test my ideas inside the laboratory and with the public.

During this process the matters I was working with started to reclaim their role in the research: as in the response-able framing described by Schrader, those matters put me inside the process. In their diversity, bacterial cultures, high-end electroporators or DIY bioreactors, bioreagents and alike imply a variable degree of biotechnological dependence on scientific knowledge. For instance, the terrarium which hosted Branko the slug was realized with simple techniques but a certain grade of understanding of slug physiology was required to supply appropriate moisture, food, ventilation. That specific terrarium exists only within the framework of *Wombs*. Within such a biotechnological spectrum, the high-end bioreactors used for the transformed bacteria in *Semina Aeternitatis* have a higher degree of biotechnological proficiency than the DIY bioreactor in *W.03*, although the latter reinterprets the function of the first.

These diverse materialities and their diverse dependence upon biotechnological processes and machineries presented me with various negotiations with potential and real leaks. Both potential and real leaks have been present throughout the research: for instance, the work in the biolab requests an ongoing negotiation with fluids, such as in the gestures of pipetting microlitres of bioreagents or plating cell cultures. These gestures require an advanced attunement to the equipment to avoid spills, leaks, and contamination which may lead to potentially ‘failed’ experiments. Leaks are potentially always present. At the same time, what under certain circumstances counts as a failed experiment may spur other understandings or ideas that would otherwise not emerge. Leaks are potentially always present and meaningful.

Leaks mark the making of the artworks: for instance, in the moment of electroporation in *Semina Aeternitatis*, when the bacterial membrane opens to allow plasmids to enter (see Chapter 4). Importantly, leaks also mark the artworks’ poetics: both *Semina Aeternitatis* as well as *Wombs* are about bodies that are permeable. In *Wombs*, my body is permeable to progesterin molecules, but also other organisms in the environment are — thus shaping a potential mutual leakiness. In this way, leaks were present in the practice and in the narrative of the artworks. Moreover, both *Semina Aeternitatis* and *Wombs* are non/living artworks: their life and death processes flow into each other beyond divides but may embody what Radomska describes as uncontainable life.

These instances converged towards a figuration of leaks. Leak is intended here as that which is accidentally lost or admitted through a hole, crack, pore, spill. Those are leaks across materialities, but also across knowledge, disciplines and theoretical frameworks. An instance of leaking: the exceedance of that which cannot be fully contained (as in the concept of uncontainable life), but also that which is (initially) at odds with the rest (as in queer theorizing).

The uncontainable character of non/living entities (cells, bioreagents, bodies under hormonal treatment) extends to the way ideas emerge from the research process and then to how these pages are written. In fact, the metaphor of the ‘fluids’ (which I use to describe how the theoretical framework and practice come together and mutually affect each other in a non-linear manner) stems from the

¹⁷ This point finds a reference in the concept of ‘différance’ by Jacques Derrida, according to which events and their nuances emerge from the act of recounting them (Derrida 1968). A further essential reference is the contribution by Karen Barad in using concepts from physics for feminist studies (Barad 2007).

engagement of leaks. Queerfeminist scholarship, which I engage with in the following chapter, flows into the practice by problematizing normativities and binaries. Similarly, the engagement with organic and biotechnological entities in the artistic creation respond to and unpack further what ‘queer’ (as a verb) may mean if applied beyond its primal concern of sexuality and gender. Such a process is leaky in the sense that putative boundaries between artistic gesture and theoretical work flow into each other, circulate across the various parts of the research, and refuse to be contained.

Leaks, thus, become methods as an idea to think and practice through. Leaks mark the realization of the artworks, shape their poetics but also guide the way knowledge emerges from the realization. Such a methodological approach invites a focus on that which unexpectedly emerges from and queers the process. It implies welcoming multiplicity and openness, and assembles together elements that otherwise may seem at odds with each other (such as a terrarium and an electroporation machine). The idea of leaks creates an uncontainable, recalcitrant landscape of relations that refuse to sit within assigned categorization and are, instead, always on the verge of transgressing them. Through a queer move, leaks become something to reclaim and to make art with — a method — rather than something to be protected.

While the idea of leaks as methods emerged contextually to the research, it can be expanded by referring to the discussion of ‘concepts as methods’ by Claire Colebrook (Colebrook 2017), Hillevi Lenz Taguchi (Lenz Taguchi 2016), and Elizabeth Adams St. Pierre (Lenz Taguchi & St. Pierre 2017), which draw upon the theorizing by Gilles Deleuze and Felix Guattari (Deleuze & Guattari 1994). The idea of ‘concepts as methods’ draws on the understanding that a concept is ‘an act of thought’ which ‘speaks the event’ rather than ‘the essence of things’ (idem: 21)¹⁷.

A dialogue with their work helps situate this research within a broader discussion on research methodology in feminist studies. It is also possible to use this resonance to connect with discussion about methods in AR mentioned earlier:

[A] recurring concern [...] was how to ‘do research’ using, for example, postconstructionist, posthumanist, and new feminist material/empirical approaches theorized in the humanities which are enabled by an ethico-onto-epistemological arrangement that does not begin with the cogi-

to of pre-existing, formalized, systematized, instrumental empirical social science research methodologies commonly used in educational and social science inquiry (eg, quantitative, qualitative, mixed methodologies). (Lenz Taguchi & St. Pierre 2017: 643)

Colebrook, Lenz Taguchi and St. Pierre's discussion builds upon the creative power of concepts and deconstruction enacted by words as something that directs actions and steers relationalities. Applied to a method, the concept thus steers the research and "produces [...] a multifaceted 'identity'" (Lenz Taguchi 2016: 213). Lenz Taguchi and St. Pierre apply Colebrook's prompt to think 'the concept as a method' to educational and social science to challenge pre-existing formalized methodologies (ibidem). However, this comes with awareness of the diversity that may result when this approach is adopted by different scholars or within different disciplines (in Deleuzoguattarian terms, 'deterritorialized').

Concepts 'create orientations for thinking' (Colebrook 2017: 654) rather than being the symbolic representations of meanings or phenomena. Lenz Taguchi develops these ideas while working on the concept of 'Neuro(n)' in education, neuroscience and philosophy of the mind. The context is different than that of this dissertation, however it is useful to look at how Lenz Taguchi employs the idea of concept as method to refine the meaning of 'leaks' for this research. Lenz Taguchi notes how the Neuro(n) transgresses the initial scientific meaning to form novel relations with "other components of the philosophical concept" (Lenz Taguchi 2016: 215). By thinking through the concept of 'Neuro(n)', previous established theories and recent practice come together again, reformulated in a novel manner (in Deleuzoguattarian terms, 'reterritorialized').

Thinking along the lines of Colebrook, Lenz Taguchi and St. Pierre, leaks become methods in the way they reconfigure relationalities across the elements of this research. Crucially, leaks become a way to look at these relationalities. The uncontainability of the non/living, of bodies and environments, and the flows across art practice and theorizing, become the specific character of this research. Simultaneously, leaks are the way those elements are related to each other by being accidentally lost or admitted through a pore or a spill. Leaks, then, further challenges the idea that flows can be completely controlled, as in the case of the electroporation, or the careful pipetting with the ever-present risk of spill.

To conclude, what do 'leaks as methods' do to this research? Adopting leaks as methods is an ethical and epistemic choice; it is (bio)political and aesthetic as it forges artistic decisions and the knowledge that emerges from them. Leaks enable a critical yet compassionate engagement with openings and resistance and, importantly, reveal vulnerabilities linked. Leaking across bioart practice and feminist scholarship in a queer move, leaks become something to reclaim and to make art with — a method — rather than something to be protected.

Practising bioart

This research was conducted as AR via bioart practice and different art and science collaborations. Following the previous sections about high-level approaches, this section comments on practical aspects of bioart and how the laboratory collaborations were established. A detailed account of how the works are realized is presented in Chapter 4, whereas an overarching account of the research methods is offered here. In fact, while crucial aspects of the works happen in the biolab, others happen somewhere else. To realize the artworks, I worked partly in the studio, partly in the biolab, and eventually in the exhibition venues. This diversity depends upon the process and tools needed.

My studio in Berlin hosted planning, realizing prototypes, and preparing elements of the exhibits — such as the skull and materials on the research desk in *Semina Aeternitatis*, the glassware in *W.01* and the extra-bodily organ in *W.02*. In the studio I prepared biological materials that did not require tools that are available only in institutional biolabs, or are biosafety compliant — such as wild types of *Acetobacter*. I worked with wild strains for *W.01* and carried out research to optimize culture conditions in my studio in Berlin, which is equipped with a basic biolab bench. Genetically engineered bacteria were handled only in the lab and autoclaved before the exhibition.

The research featured collaboration with the biological laboratory Biofilia at Aalto University; the independent lab UR Institute; and the IEGT at Rostock University. Collaborations were established for the purpose of the research in the case of Biofilia, and the realization of one specific artwork in the case of the other two. I addressed Biofilia before starting the rese-

arch, took part in seminars and activities there, and conducted individual research in my capacity as a PhD candidate at Aalto.

To realize *Semina Aeternitatis* I addressed the IEGT and UR Institute through the art network. Curator Susanne Jaschko invited me to produce one artwork for the exhibition *Experiment Future* therefore we looked for a suitable lab within the ecosystem of the University of Rostock. She identified the IEGT and established the collaboration. I invited Prof Alistar to work with me on the project after previous collaborations in the citizen science and biohacking scene in Berlin. To realize *W.02* and *W.03* I applied for art grants and received support from the EMAP/EMARE programme. I established collaboration with UR Institute before the application.

The collaboration with the three labs varied. Firstly, the time available differed greatly — from five weeks all together at the IEGT, to iterative sessions at Biofilia during the PhD years, to two months at UR Institute and then the reprise of the work two years later. Secondly, these labs have different degrees of familiarity and experience with bioart or art and science in general: Biofilia is the institutional lab devoted to this kind of practice; UR Institute is an independent lab linked to art and the biohacking and citizen science scenes; and the IEGT hosted an art and science collaboration for the first time with this project.

To understand how the collaboration was received by the scientists, I invited the four most involved collaborators to give feedback on the experience. I submitted a questionnaire with five open questions after the collaboration ended¹⁸. I based this on a previous qualitative investigation about art and science collaborations I published in a co-authored article (Groth et al 2020), where questions were based on preliminary informal conversation to understand possible areas of interest. Following this example, I formulated the questionnaire based on informal conversations with the collaborators. Such informal conversations suggested potential leaks and possible new understanding about this kind of practice, both on my side as an artist as well as on the scientists' side. I sent the questionnaires after the collaboration ended to enable a certain distance and explore what has potentially remained. The questions were formulated as open questions to enable respondents to draw freely on their experience. Three of the four scientists sent their answers.

As I have outlined, conducting transdisciplinary research through bioart involves several layers: the research questions and theoretical framework; the aesthetic and technical aspects of the work; the practicalities of collaboration including schedules and funding; and navigating contexts with a diverse familiarity with this kind of practice. The practical work with non/living matter takes place once all these other context-related aspects are set. Of course there can be overlaps, for instance preliminary tests and research can (and should) be conducted before the collaboration is established, yet the hands-on work is not an abstract entity unattached from contexts. Rather, it happens within a context. As an artist and researcher, one finds themselves dealing with aspects that are not apparent in the artwork but are sometimes the conditions required for the artwork to manifest.

Chapter 4 accounts for the realization of the artworks, thus I invite readers to refer to it for details. However, drawing on the multiplicity of methods introduced above, it may be useful to comment again on how the multiplicity of methods may be understood as a methodological framework for bioart practice. For *Semina Aeternitatis* I employed bioinformatics and genetic editing of a bacterial strain. For *Wombs*, I employed self-experimentation, cell culture, sculpture, performance. I drew and wrote. I planned exhibitions, negotiated contracts and sorted out logistics. Clearly this research highlights certain aspects above others in order to focus on the research problem. Whereas it cannot be reduced to a strictly prescriptive methodology, for each project may require context-dependent choices and differ for specific scientific methods employed, I can conclude my methodological account by remarking how those different levels interplay. Acknowledging how they interplay and choosing how to cut the research becomes part of the process.

Continuing to reflect on how contexts are part of the artwork's fabric, this research must be framed in the specific pandemic context of 2020 and 2021. I concluded the artworks in 2019 and in the original plans I should have exposed my ideas to the audience in exhibitions planned for the following year. Importantly, my ideas about vulnerabilities should have been tested with the audience, to understand how the artworks may expose audiences' vulnerabilities — and see their vulnerabilities exposed by audiences. The first show of a work may be busy

¹⁸
The full questionnaire is included in the Appendix.

with the challenges of the first set-up and often leave no room to conduct further research, for instance through questionnaires or target conversations. Therefore, I planned these in follow-up shows.

The possibility of further physical exhibitions was hindered by the COVID-19 pandemic, which started a few months after I realized the works. While some parts of the series *Wombs* (W.01 and W.03) were exhibited on a few occasions¹⁹, the non/living installations W.02 and *Semina Aeternitatis* were exhibited twice and only once respectively. I presented both wor-

ks in various online talks and conferences. This led to an uneven opportunity for feedback from audience and peers, and also did not allow me to test and review my ideas for the presentation of the works in a comparable manner. For this reason, I opted to focus my discussion on the process, rather than on the shows. However, I did include three exhibitions in my account, but without the possibility of expanding systematically on audience experience.

On writing

A brief comment on writing is necessary here. Writing marks artistic research, and certain kinds of writing has marked this research project. A full account on the current

debate on the role of writing in AR exceeds the scope of this dissertation, yet it is useful to comment a few elements. AR presents a self-reflective, critical mode of contextualizing one's own practice regarding a research problem: it involves "both experimentation and participation in practice AND the interpretation of that practice" (Borgdorff 2006: 13). Such self-reflective and critical contextualization takes place through the development and dissemination of artworks and writing that address and are discussed by academic audiences (but not only). Practice, and writing. No differently than in other disciplinary traditions, "writing is simultaneously thinking and doing, both observing the world and creating it" (Hannula et al 2005: 40). Knowledge is produced and shared through the realization of

artworks as well as the writing of the artist/researcher. The person who writes is also the maker.

Writing is nothing new to artists: artists have always been writing about, for, and through their art as a way of inquiring, discussing, seeking financial support, and presenting their work (Stiles 2012; De Preester 2013). Writing in AR, though, calls for authorship and reflexivity that shape an "episteme that is characterized by embodied knowledge though art-making" (Varto 2018: 60). The relationship between writing and practice has been addressed as 'push and pull tensions' between written theory and theory in practice that mutually inform each other (Horton 2020). For James Quinn, writing AR could be understood like other "hybridized methodologies" (Quinn 2020).

What is relevant for this research project is that writing has taken place in a multitude of ways. There was writing in the concept development, multiple drafts, several funding applications, communication with peers and advisers, conference papers, academic publications, written documentation of the artistic components, this dissertation, but also artwork descriptions, poetic writing, exhibition catalogues, and a good amount of lab journals and scientific protocols. Readers may find that some of these modes of writing resonate with what happens in their own field, such as journal articles and funding applications; some may find the combination of scientific protocols, texts for art catalogue, and journal articles somehow unique. All these 'writings' involve different registers and modes — a scientific protocol is quite different from a text for an exhibition catalogue or a journal paper.

Such multiplicity matters (for) the research. What is presented in these very pages is a piece of writing with the aims and structure of a PhD dissertation, reviewed by my advisers, and submitted to reviewers. This writing could never be on this very page without the many pages of bio-protocols written for *Semina Aeternitatis* and *Wombs*, nor without the texts written for art catalogues. There have been multiple 'writings' and the combination of such multiplicity make this research readable.

¹⁹ *The Camille Diaries. New Artistic Positions on M/Otherhood, Life and Care, Art Laboratory Berlin (DE); Mondes Multiples, Bandit Mages, Bourges (FR), online show; Outré: Encounters with Non/living Things, V1 & V2 Galleries at Väre | Aalto University, Espoo (FI), all in 2020.*

Research Journals



This chapter addresses weaves together **UTROBE**

of the work, moving progressively from

practical aspects ones. It opens with some

INSTALACIJA

and -the situatedness of feminist legacy

leak and leakiness, why they are relevant

This section includes an epistemic discourse

between practice and theory and how it

but also what kind of knowledge.

While it is possible to present this as a

reminded how each one of the fluids circulates

systematizations. This research has been

iteratively, but it has never been a linear

and the artistic process was at its core

to prescriptions.

The first section prepares the ground for

regarding the combination art and science

artworks. To this regard I shall note that

artworks are included in Chapter 4, rather

comment on writing as fundamental as

Rad Utrobe razmatra moje vlastito, žensko tijelo, čija je propusna materija nosilac s okolijem uzimanjem hormonske kontracepcije. Puževi su hibernički u istraživanju unutarnjih i vanjskih ekologija utjelovljene želje. U inženjerski izvan tjelesni organ ugošćuje dvije stanične kulture u hibridnom ginalne epitelne stanice i stanice jajašca puža dijele medij za rast, koji izvode ples dvaju organizama na staničnoj razini.

U hibridnom ekosustavu instalacije, ove dvije vrste stanica ponašaju se oje stanice se dijele i maleni komadići izvan tjelesnog tkiva postaju vidljivi uge strane, puževe stanice se ne dijele: žive su, ali ostaju nepomične t je ljudskim spolnim hormonima i utječe na iskonsku biokemijsku komunikaciju. Što bi se dogodilo da su hormoni puža u igri?

Rad Utrobe promatra tijelo kao biokemijskog kiborga: hormonska kontrola spolne organe na način da sprječava trudnoću, čime postaje sasvim nealnosti. Nadalje, kontracepcija upisuje moje vlastito iskustvo u biopopolje, prodirući u ekosustav kroz urin, pokreće endokrine sustave čija uloga id postavlja pitanje kako bi to utjecalo na hermafroditске puževe te kako se našašanje puževa moglo utjecati na ljudsko tijelo. Na taj način potiče kritički skursao kontracepciji i seksualnosti kao isključivo ženskih, ljudskih iskustva u vlastito tijelo."

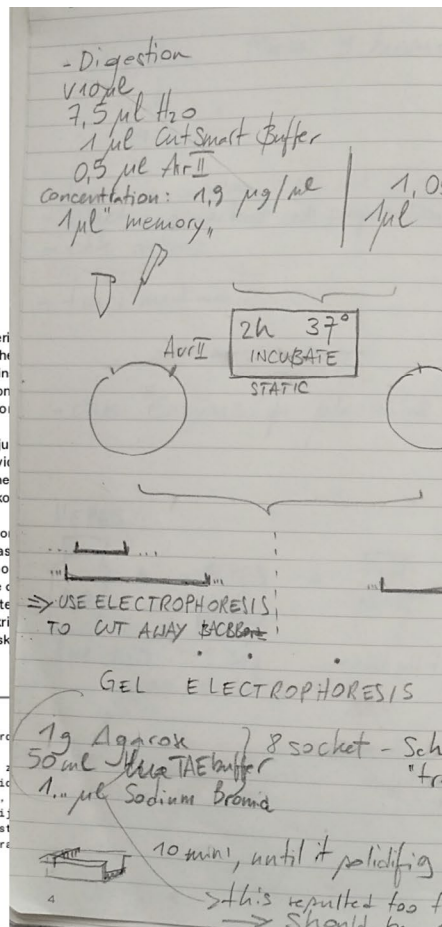
Projekt je ostvaren u sklopu projekta EMAP - European Media Art Platform tijekom rezidencije u KONTEJNER-u, podršku Europske unije kroz program Kreativna Europa.

Produkcija: Josipa Vukelić, Jurica Mlinarec (KONTEJNER)

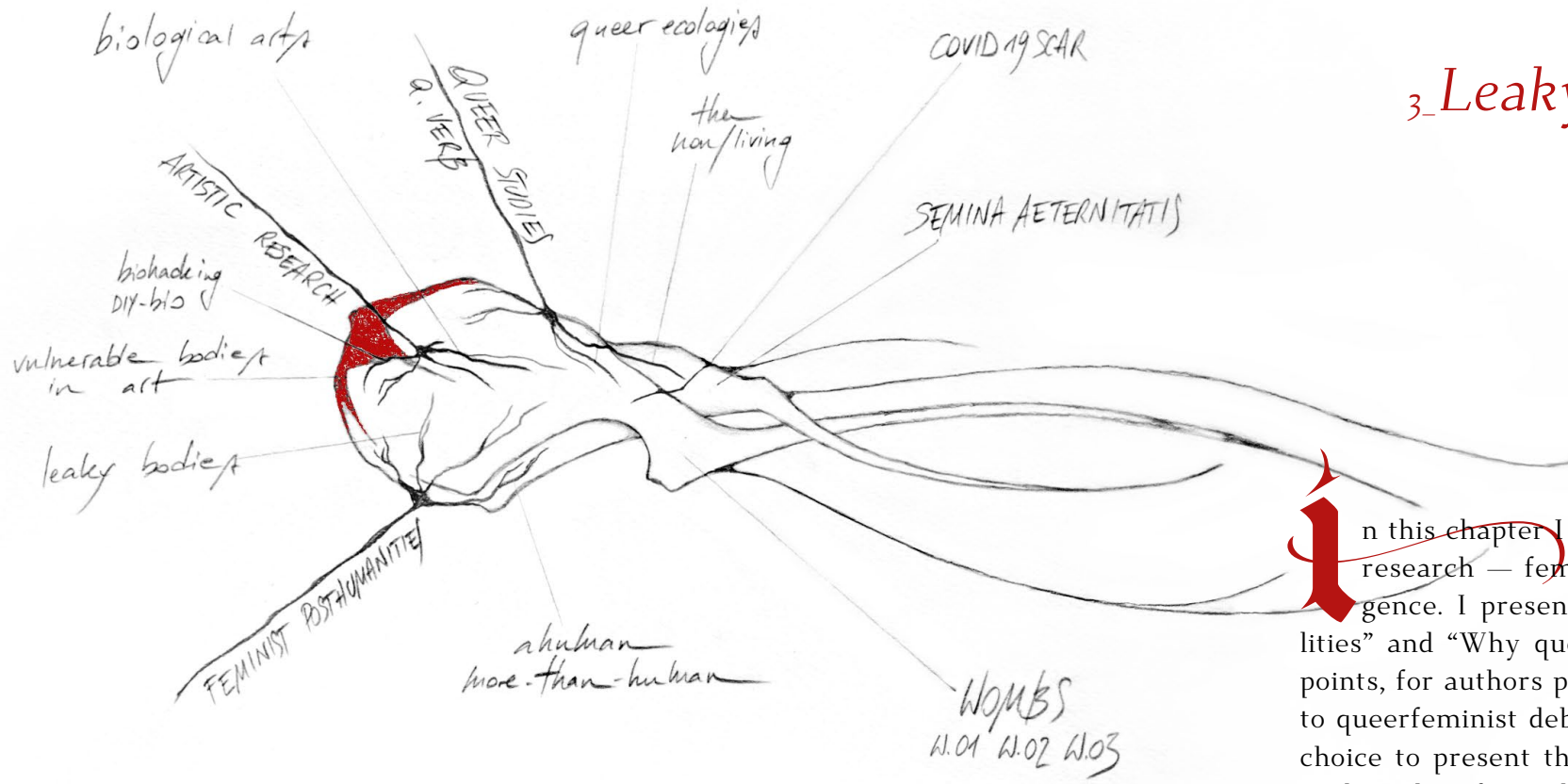
Fotografije: Sanjin Kaštelan, Margerita Koši, Margherita Pevere

Staklopuhanje: Ivanka Pašalić - Udruga "Stakleni svijet"

Biotehnoški savjetnik: Ivo Šutić - UR Institute of Biotechnology, eliminarno istraživanje ovedeno na laboratoriju ofilisa - bazi za biološke istraživanja i etnosti. Sveučilište



Examples of various writing modes from the research. From left to right: dissertation editing in a text editor; excerpt from the catalogue of Extravagant Bodies (in Croatian), note on a research journal for Semina Aeternitatis



3_Leaky, vulnerable bodies

In this chapter I dive into the two other fluids that flow through this research — feminist studies and queer studies — and their convergence. I present them in two sections called “Feminist vulnerabilities” and “Why queer, which queer?”. The sections intersect at many points, for authors presented in the first are also significant contributors to queerfeminist debate (Butler, Alaimo, Hird, Radomska). However, my choice to present them under different lights has various reasons. One is that identifying different threads, however imbricated, helps specify the different genealogies, as in Lykke’s suggestion mentioned in the introduction. It also acknowledges that they are not synonyms and that the respective fields have varied relationships and sometimes oppositions. So, the convergence and overlaps borrowed here can be referred to as queerfeminist, while I refer to the specific genealogies as feminist or queer. Some of the works presented in the section about vulnerabilities were not necessarily intended as queerfeminist contributions at the time they were published, although the authors have later become significant contributors in this area. For this reason, their work returns in both sections. Another reason is that presenting the two areas as converging streams outlines how discussion about vulnerabilities has a tradition in feminist and queerfeminist literature and, therefore, positions my contribution as a queerfeminist one.

Following the theoretical overview, I engage with four art pieces that manifest an irrefutable dance with bodily borders: bioart works *Surface Dynamics of Adhesion* (2015) by Bates and *Anti-Marta* (2018) by de Menezes, the performance cycle *Incorruptible Flesh* (1996–2013) by Athey — or

better, a recurrent element of the cycle — and the performance *Succour* (2002) by O'Reilly. Once I have explicated my selection of these pieces, I engage with each of them, outlining differences and resonances. Different in scope, materials and contexts, all works reveal leaky, queering, uncontrollable bodies and vulnerabilities of more-than-human kinds. I draw on the vulnerabilities they present to discuss them through the queerfeminist framework outlined in the next pages.

Feminist vulnerability

Feminist thinkers have extensively engaged with kinds of vulnerability that mark the fact of being alive, embodied, and entangled in social and physical relationships. My discussion draws on the analysis offered by Margrit Shildrick (2002), Judith Butler (2004), Simone Drichel (2013) and Christine Daigle (2018). Their different perspectives trace vulnerability as historically latched to fear of 'the other' and the potential of being hurt by 'the other'. At social and political levels, vulnerability has been framed in the narrative of a sovereign state, and hence employed to mobilize protective discourses of security. These positions are then complemented by contributions that openly address more-than-human spectra through the work by Alaimo (2009, 2016) and Hird (2013) in the environmental humanities.

In the opening essay to a special issue of *SubStance Journal* with the encompassing title 'Vulnerabilities', Simone Drichel reviews a spectrum of fields including, among others, psychoanalysis, politics, social discourse, and gender studies (Drichel 2013). The review shows how vulnerability is conventionally "too quickly and exclusively" (idem: 7) understood as "openness and exposure to threat and violation" (idem: 5) and therefore mobilizes "a range of biopolitical discourses of security and resilience" (ibidem). Following Butler, Drichel takes on the metaphor of the frame as "normative arenas": that which "falls outside the frame furnished by the norm" is condemned to a kind of shadowy existence "as a relentless double whose ontology cannot be secured" (idem: 6). In their work, it is possible to encounter others that are monstrous (Shildrick) or terrorists (Butler). My analysis responds to their critique of 'openness' and 'exposure' as the traits that potentially make something capable of being hurt by some 'other' — where the other depends on the context.

Shildrick anticipates these lines of thought in an empathic deconstruction of the monstrous as the radical other (Shildrick 2002). Her analysis draws from the observation of how monsters and others are socially constructed. They reveal to 'us' our own vulnerability because they embody it, the monster reminds us of something that is considered a 'failure'. Shildrick draws on encounters with disabilities and illnesses (including the AIDS epidemic, which uncannily anticipates viral vulnerability of these early 2020s) as occasions of encountering one's own vulnerability, and so questions the assumption of a normatively embodied self:

[V]ulnerability, an existential state that may belong to any one of us [...], is characterised as a negative attribute, a failure of self-protection[...]. As such it is, like the notion of the monstrous, largely projected on to the other and held at bay lest it undermine the security of closure and self-sufficiency. [...] what is at issue is the permeability of the boundaries that guarantee the normatively embodied self. (Shildrick 2002: 1)

Shildrick's work on vulnerability should be framed within her deconstruction of understandings of bodies and identities as self-enclosed, self-sustained entities. It develops ideas already explored in her earlier book *Leaky bodies and boundaries* (1997), aimed at reconfiguring ideas of bodies beyond Western rationalist normativity. Normativity itself is, in Shildrick's work, at stake: vulnerability is that which disrupts the self as understood by Western paradigms. "My purpose is to reconfigure vulnerability, not as an intrinsic quality of an existing subject, but as an inalienable condition of becoming" (idem: 85). It gains thus the generative character of something that is set in motion.

Importantly, Shildrick carefully dissects the strategies of othering as those ways employed socially to separate those who do not comply to the parameters of a Western idealized subject (the disabled, the sick, the woman, the homosexual. . .).

The ethical moment is a matter not of closure but of radical openness to the multiple possibilities for becoming. We are neither the one nor the other; neither the selfsame nor simply different. Rather, the requirement is that we should position ourselves among others, claiming no special authority, but without eschewing responsibility either. (Shildrick 1997: 212)

Certain subjects and communities are made ‘others’ because they embody or remind of possible vulnerabilities and failures and therefore should be kept at bay. With such a move, Shildrick’s discussion brings the features attributed to ‘the other’ back to where they belong: the self. Removing vulnerability from the self and attributing it to someone else applies a distinction between those who embody the normal and those who embody ‘the monster’. Once this normative classification is stripped away, it becomes possible to encounter the ‘vulnerable self’ in the title of her book *Embodying the Monster: Encounters with the Vulnerable Self*.

Othering is also at the heart of Judith Butler’s political dissection of violence, politics, and grief (and grievability) that followed the 9/11 trauma in the United States (Butler 2004). The attacks publicly exposed the vulnerability of the United States, thus challenging both national sentiments as well as geopolitical aspirations. Consequently, they spurred fiery debates about national security of and terrorism towards the mythologically invulnerable North American country. The wars and related torture episodes that followed are harnessed by Butler as grounds to unpack the underlying questions “who counts as human? Whose life counts as life?” (idem: 2). In her analysis, vulnerability is at the base of the dehumanization of those considered as ‘other’ (woman, person of colour, disabled, migrant, not-heterosexual. . .), and who, within the specific historical context of post-9/11, become a plague to be exterminated, something against which society must be immunized, made invulnerable again.

The body implies mortality, vulnerability, agency: the skin and the flesh expose us to the gaze of others, but also to touch, and to violence, and bodies put us at risk of becoming the agency and instrument of all these as well. Although we struggle for rights over our own bodies, the very bodies for which we struggle are not quite ever only our own. (Butler 2004: 26)

Whereas Butler’s analysis is situated in post-9/11 USA, when a nation that considered itself impregnable was shocked to its foundation with the first attack within their borders in all the nation’s history, Butler sapiently weaves grief and grievability with (allegedly dangerous) otherness and frames of protection and containment. To disrupt the militarized frames of control and normativity, Butler calls for “perceiving and recognizing” vulnerability as to “come into play in an ethical encounter” (idem: 43).

Daigle²⁰ builds upon Butler’s discussion and on Alaimo’s ‘new materialist’ interpenetration of bodies and environments (Daigle 2018). She stresses the etymological root of ‘vulnerability’ (Latin ‘vulnus’: wound, combined with ‘ability, capability’) with a hyphen: “vulner-abilité” [vulner-ability], to stress the potential entailed in the composite word. Daigle contextually develops her discussion from an understanding of the human as in permanent exchange with experiences and materialities. She names such a trait ‘transjectivity’ and links it to Alaimo’s trans-corporeality. Core to her discussion is the elision of the negative connotation associated with vulnerability. Namely, she offers a vocabulary that removes the ‘wound’ (vulnus), while it preserves the link to inter- and intra-connectedness. The (human) subject becomes “transsubjectif et transobjectif” [trans-subjective and trans-objective].

Daigle’s attention lies in shifting from the term’s negative connotation towards its capability. She acknowledges how permeability makes “all beings” vulnerable (idem: 10), but rather than with a mere negative understanding, her work reclaims a novel type of responsibility. Moreover, “cette vulnérabilité est nécessaire et doit être célébrée” [“this vulnerability is necessary and should be celebrated”, translation mine].

Pondering upon the work by Shildrick, Daigle, Drichel, and Butler, it becomes meaningful to note that they all weave their critique from understandings of vulnerability that are generally (normatively) considered negative and offer a possibly generative reading. In fact, their analysis dissects how negative normative understandings have guided discrimination, exploitation, or differential grievability. “(V)ulnerability is being associated, rather too quickly and exclusively, with openness to wounding and violence, and therefore with the need for impermeable, shielding boundaries. It has become trapped, in Butler’s words, in a ‘frame of war’ that guides common interpretation of what vulnerability means, allowing to see only certain aspects of vulnerability and foreclosing others” (Drichel 2013: 7). Such a passage illuminates generalized negative interpretations and encourages us to see aspects that are usually overlooked.

In the artworks analysed later in this chapter, vulnerability acts along resonating lines. It is exactly a wound and an underlying exposure that enables the narrative of the work. Without anticipating too much, the artworks

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A monograph with the title Posthumanist vulnerability: An affirmative ethics by Daigle is currently in preparation for Bloomsbury.

manifest vulnerabilities that exist at molecular levels, or inhabit symbiotic commensalities, and offer wounds and penetration as empathic/erotic moments. Importantly, they all present wounds that are not violent, but rather meditative; acts of love and offering. Drichel aims to reconfigure vulnerability, to seek for its potentiality and, after Shildrick, to reconfigure it “as a condition of becoming” (Shildrick 2002: 1).

With a move yielding political and ethical implications towards the more-than-human, Alaimo links vulnerability to the idea of trans-corporeality (Alaimo 2009; 2016). This move takes the inherent exposure and interconnection of ‘various bodily natures’, in Alaimo’s words, as the trigger for a reclamation. Alaimo reviews performances of the last decades through the lens of environmental disruption to note how, through different strategies, those artworks harness exposed skin to convey vulnerability. While not all the artworks reviewed have explicit activist intentions, many of them are planned as interventions to steer the public regarding environmental issues. In her analysis, the naked skin becomes a metaphor and a site to express vulnerability but revisits its potential as a site of political protest. Vulnerability becomes thus ‘insurgent’ for it recognizes “our material interconnection with the wider environment that impels ethical and political responses” (Alaimo 2009: 26).

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Alaimo’s discussion carefully takes into consideration certain mainstream positions about climate change that reinstate “a rather troubling binary between universal (masculine) scientific knowledge and the marked vulnerability of impoverished women” (idem: 30). Alaimo warns about a dualistic conflation of feminine with vulnerability as opposed to the scientific, rational, masculine gaze. This would result on one hand in an exclusion of queer instances and, on the other hand, risk identifying nature as a resource to be administered, normed (and eventually exploited). She seeks responses that challenge hegemonic exploitations and, contextually, binaries and heteronormativity.

Perhaps it is possible to foster an insurgent vulnerability that does not entrench gender polarities but instead endorses biodiversity, cultural diversity, and sexual diversity, and recognizes that we all inhabit transcorporeal interchanges, processes, and flows. We can promote sustainable practices of revolt and care, protest and pleasure. (Alaimo 2009: 33)

Hird suggests an environmental ethics of vulnerability that contemplates the asymmetrical vulnerabilities of humans and non-humans in environmental relationships (Hird 2013). Reflecting on waste and landfill leachate (decomposing liquid mass of various origin), Hird argues that vulnerability implies many unknowns (such as those that emerge from unprecedented mixes of organic and toxic compounds in leachate) and is distributed across the now and the future. An environmental ethics considers geological and organic processes that exceed human timescales, therefore showing the inadequacy of current policies in waste management.

Importantly, Hird’s discussion draws on a technical understanding of the leak — implied in the waste management term ‘leachate’ — and its fundamental uncontainability to propose a heightened responsibility. It is of particular interest how Hird stresses that which is not known and that which will happen in the future. There is knowledge, also scientific knowledge, but it never fully covers the complexity presented by landfills, their leachates and the vulnerabilities they stir. “The science and engineering of landfills is all about making sure waste doesn’t leak. Leachate — putrescible and organic material transported by water — does just this: it leaks” (Hird 2013: 107). Waste management presents with huge variations across the world, for there are great differentials in interests, infrastructures, and public awareness. However, even when waste management technologies are most advanced, landfills may defy control. And when they do, they present humans and environments with variable degrees of unknown, for which unprecedented ethical responses are needed.

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The introduction presents the concepts of uncontainability and non/living as the foundation of Radomska’s biophilosophy of bioart. Observing how “bioart works embody vulnerability (that is intrinsic to all beings)” (Radomska 2017: 377), such framework takes bioart works as examples of life processes that are intrinsically uncontainable and extend across the entanglements of material processes (Radomska 2016: 50). Vulnerability is linked thus with uncontainability — a resistance to containment that defies normative frames.

Non/living artworks expose their naturalcultural fabric and magnify the uncontainable material interplay of substances in the space of a biotechnologically supported artwork. The focus on life and death processes (and their entanglements) reveals vulnerabilities. Bioart works are prime sites

of observation of those processes, however they happen also in different places and at different scales. Their resistance to be contained manifests vulnerable entanglements and potentialities that may also illuminate further dynamics.

The concepts I weave in this dissertation build on those discussions of leaks and vulnerability that, among the ones presented here, exceed human-only realms. Each in their own terms, the authors mentioned in the previous pages indicate a possibility to emancipate vulnerability from negative or normative attributions, and rather look at it as a site of encounter or becoming. What I am after, though, is how vulnerability may open to a more-than-human spectrum: this is where the work by Shildrick, Alaimo, Hird and Radomska becomes relevant. There are the contagious encounters in Shildrick. There are leaks and chemical-microbial emergencies in Hird. There are global phenomena like climate change as in Alaimo. There are non/living artworks in Radomska. These authors engage to variable degrees with technical and scientific knowledge, to formulate a vocabulary of uncontainability, leaks and vulnerability that manifests material and trans-corporeal implications.

74 At a different scale, bioart responds to the convergence of materialities, vulnerabilities and kinds of knowledge. Clearly, the contained setting of a biolaboratory differs from a landfill or global environmental shifts in terms of scale, variability and complexity — it is not possible here to trace a comprehensive comparison between such different settings. However, I would like to highlight the convergence of kinds of knowledge. This convergence makes it possible to ‘think across bodies’, to use Alaimo’s term, and inquire about potential meanings that transgress human-only concerns while acknowledging their social and political instances.

To conclude, vulnerability emerges as an ambiguous state of exposure and encounters that resists univocal ethical reading. It may entail potential risks, as in Hird’s environmental ethics, but also reclaims possible encounters, as in Shildrick. As in biophilosophy of bioart, vulnerability entwines (the artwork) in a set of relationalities and positions the non/living in a naturalcultural fabric. Simultaneously, the non/living and its vulnerable root reveals a radically open character of bodies and relations, a recalcitrance to control and containment. Vulnerability becomes insurgent in the moment it harnesses the power to steer actions and challenge the matrix

of environmental exploitation. It emerges as a disruptive element, that exceeds frames and normativities, that which falls outside the norm — that which queers.

Why queer, and which queer?²¹

This dissertation intercepts streams of feminist and queer studies in their interest in unlatching embodiment, desire and sexuality from biological essentialism. This interest has evolved from the convergent acknowledgement that what is generally known about bodies, desire and sexuality depends on an interplay of individual, sociopolitical and scientific aspects. The same goes for that which is still called nature. Importantly, those two streams intersect also at the commitment, or at least interest, to challenge established powers and oppressions inflicted to those (human and more-than-human) that are marginalized.

In one of the works that most helped shaping the ideas of this dissertation, Shildrick accurately reviews how “the body, as we know it, is a fabrication, organised not according to an historically progressive discovery of the real, but as an always insecure and inconsistent artefact” (Shildrick 1997: 13). The book features Western scientific illustrations from the past that depict anatomies in ways that, to today’s knowledge, are ‘wrong’, but 75 which constituted scientific reference in the time they were made. Those anatomical drawings represent bodies in normative terms, where the female body was considered deviant or faulted in respect to the male one — thus legitimizing women’s subordinate role in society. By presenting the body as a construct, Shildrick — and others along this line — traces the social, political, ethical implications of how scientific knowledge shapes what is understood as the human body. Contextually, she also traces how implicit binaries have shaped the way science understands bodies and the consequences thereof at social level.

From a not-too-distant angle, the resources in environmental humanities that I adopt critique environmental exploitation, but carefully avoid equating nature with the feminine or the motherly, to steer clear of the female/male divide. Equations such as human=rational vs nature=irrational have historically allowed the consideration of nature as a resource to be exploited, administered or idealized. At another level,

²¹ I am thankful to Mathias Klitgård for this intelligent question during a queer death studies seminar in Autumn 2020.

equating nature with the motherly feminine reinstates role expectations that remain anchored in binaries and are prescriptive: the mother who protects, nurtures, shelters; the woman that becomes mother; nature who ought to protect humans. Among the authors my work dialogues with, Alaimo argues “for conceptions of nature that do not serve as foundations for gender essentialisms, racist taxonomies, or heteronormativity” (Alaimo 2016: 12).

To summarize, what I borrow from queer and feminist endeavours about environment and embodiment converge in understandings that are rooted in the exchange with science and society, but refuse biological determinisms. Rather, they unpack how these understandings emerge and look at the complexities that resist normativities while challenging power dynamics. This is precisely where queer studies intersect the trajectory of this research and offer a more nuanced discussion of the interplay between art, ecologies and theory.

Patricia MacCormack finds crystalline words to identify the queer stance borrowed by this dissertation: “Queer theory works not to exchange binaries of masculinity/femininity, hetero/homo or even human/nonhuman but to theorise the spaces between and the mobilisation of categories of identity through desire” (MacCormack 2009: 111, *italic mine*). What counts is to expand the focus onto what falls outside pre-established categories that otherwise administer ‘how to be’ (idem: 115). That which does not comply with either/or reclaims attention. As the intent of this research is trailing leaks and vulnerabilities in bioart and learning what to do with them, the queer approach described by MacCormack suggests possible readings of leaks and vulnerabilities that surpass negative readings (as in the resources discussed in the previous section), but also use them to “mobilise categories and open spaces between”.

The origin of such mobilization of categories in queer studies can be traced back to the internal debate in the field of gay and lesbian studies. The debate was spurred by the necessity to transgress and transcend what, at the time, became a standard way of referring to non-heterosexual relationships for it was discriminating those who did not comply with gay or lesbian identities (de Lauretis 1991). Historically, therefore, sexuality and gender are and remain primary concerns of queer studies, in all their ramifications.

However, with time, the idea itself of ‘queer’ has expanded and flourished in trajectories that “[describe] a horizon of possibility whose precise extent and heterogeneous scope cannot in principle be delimited in advance” (Halperin 1995: 79). Shared by the diverse trajectories, though, is a persistent challenge of dominant positions and a resistance to what Michael Warner describes as “a resistance to regimes of the normal” (Warner 1993 xxvi, in Dell’Aversano 2010: 74). A queer matrix helps trace when ideas about ‘how things should be’ are underpinned by normative expectations. Normativities can thus be exposed in their disciplinary purposes and exploitative consequences.

In my understanding, the value of these lines of thought is how they reveal power dynamics that otherwise justify exploitation and discrimination based on supremacy. By opening up the spectrum of possibility, queer defuses the very principle of supremacy of one above others, for a myriad of possibilities are revealed and there is not ‘one’ that stands out and gains extraordinary rights. In so doing, there is a call to “undo normative entanglements and fashion alternative imaginaries” (Giffney & Hird 2008: 4). Having briefly outlined how queer studies intercept and nurture this research, I now steer closer towards those queer contributions that support the core ideas of my discussion, namely queer ecology and queer death studies.

Queer ecology addresses ecological issues beyond human/nature divides. In parallel, it also reviews how sexual behaviours in nature present a variety that far exceeds what is presented as ‘natural’ in heteronormative narrations. Consequently, an undoing of fundamental binaries debunks biases towards certain sexual behaviours considered ‘unnatural’ — and therefore discriminated against. The early texts appear as a contribution to the ecofeminism debate with the work of scholars like Catriona Sandilands (1994) and Greta Gaard (1997).

Sandilands makes a point to “to queer nature itself”, not as a way to list contributions by non-heterosexuals, but rather to use ‘queer’ as a verb to “interrogate relations of knowledge and power” and question normative uses of nature (Sandilands 1994: 22). “The inclusion of ‘queer’ into environmental politics must involve not so much a noun as *an adjective and a verb*” (ibidem, *italic mine*). Queer, thus, ceases to be only an identifier and becomes an action. The matter is not only to recognize non-binary models

applied to nature and environments or to give access to queer identities. Queering nature implies rethinking it.

Queer ecologies has become a fertile ground of enquiry (Ah-king & Hayward 2014; Barad & Strong 2009; Bates 2019; Chen 2012; Cohen 2013; Giffney & Hird 2008; Mortimer-Sandilands & Erickson 2010; Morton 2010). Drawing on the erosion of binaries regarding sexuality and gender, it proposes “a new practice of ecological knowledges, spaces, and politics that places central attention on challenging hetero-ecologies from the perspective of non-normative sexual and gender positions” (Mortimer-Sandilands & Erickson 2010: 22). Some lines in the discussion include reproductive behaviour, desire, kinship, the representation of nature in culture and science, environmental politics, and multi-species entanglements.

Next to the rethinking of (N)ature, however, what is poignant to this research is how the early call by Sandilands to use queer as a verb has persisted: “Queer, then, is both a noun and a verb” (Mortimer-Sandilands & Erickson 2010: 5). Queer is offered not only as an indicator of identities that fall outside normative terms and categories — and therefore advocate for their representation and inclusion. Rather, it is presented as a maker of change, an enabler of potentials marked by self-reflectivity and celebrating diversity.

The call to use queer as a verb has been responded to by the emerging field of queer death studies (Radomska et al 2019, 2020; MacCormack 2020; Petricola 2021; Lykke 2022). In a similar fashion as queer ecologies, queer death studies draw from the necessity of thinking (and mattering) death and mourning from within queer communities. Simultaneously, ‘to queer’ holds its potential as “a verb / an adverb that describes the processes of going beyond and unsettling (subverting, exceeding) binaries and normativities” (Radomska et al 2019: 6). Queer death studies extends the endeavour of queer ecologies to undo human exceptionalism and expand the focus from the established discourse about death as the loss of human others.

Applied to death, dying and mourning, queer death studies aim at rethinking these concepts beyond classical oppositions such as life vs death, and look at processualities and implications that remain otherwise muted. Death, even when of human companions, is thought through the social

and material implications of queer identities, but furthermore probed in more-than-human material becomings after death (Lykke 2021). To queer death — in a similar fashion as to queer ecologies — opens to a space of possibilities and inquiry.

Drawing on the positions offered by queer ecologies and queer death studies, queer becomes “both a process and a methodology” (Radomska et al 2019: 6, italic in the original). To some readers, the suggestion of ‘a’ process and methodology may sound singular — and possibly contradict the multiplicity summoned by the endeavour of queer studies. I would stress here how this formulation entails an exhortation that cannot be reduced to singularities. Scholars clearly outline the vocal multiplicity of the field and state how queer entails an “expansive impulse that allows us to think about potential differences” (Harper et al 1990: 30). The exhortation in “a process and a methodology” is towards openings: it retains the radical interest towards that which is not compliant to established norms, with an attention to those (human and more-than-human) that have been historically underprivileged.

Before I conclude this section, I would like to return to the idea of the ‘non/living’, which sets to a minutious analysis of matters that extend across and beyond life and death processes in bioart works. Rather than opting for either/or solutions, it problematizes the exceedance of bioart works beyond classical understandings of life and death: what results is how those classical understandings are inadequate to comprehend complexity.

The non/living is not only what defies normative definitions of life and death, but also what “exceeds the frames of singular entities, to which it was originally ascribed” (Radomska 2017: 387). While acknowledging the biotechnological facts that support bio artworks, Radomska unpacks their intrinsic leakiness and potential of excess (Pevere 2022). The non/living intersects the interest of queer ecology for it thinks of life and death entanglement across species and beyond human-only terms and defies a univocal categorization of materiality. The non/living exposes spaces of indeterminacy that refuse to fall within established categories and opens to unorthodox methods of analysis.

At this point, it is useful to trace queer potentials of the readings of vulnerabilities outlined earlier. There is a specific convergence between the fields explored, which can be referred to as queerfeminist. So, what may be the meaning of queerfeminist vulnerabilities in philosophy and art? And especially what may it mean to look at queerfeminist vulnerabilities through art practices that materially deal with more-than-human bodies? And why is such kind of practice meaningful to illuminate the value of vulnerability in contemporary society?

Similarly to ‘insurgent vulnerability’ and ‘vulner-ability’, queerfeminist vulnerability expands onto its generative traits. It refuses any negative attribution and reclaims a space of non-compliance. It magnifies enmeshments and relationalities and exceeds binary readings in terms of good/bad. It acknowledges the possibility of harm as pervasive but offers a nuanced reading of power relations. So, it does not flatten diversity but rather acknowledges it in all its complexity. Such ideas harbour a generative potential which refuses to comply with normativity. It seeks for meanings that illuminate positions and possibilities that otherwise fall outside or remain hidden. It is a call to action: it responds to the -ability part of vulner-abilité, and to the prompt in the verb ‘to queer’.

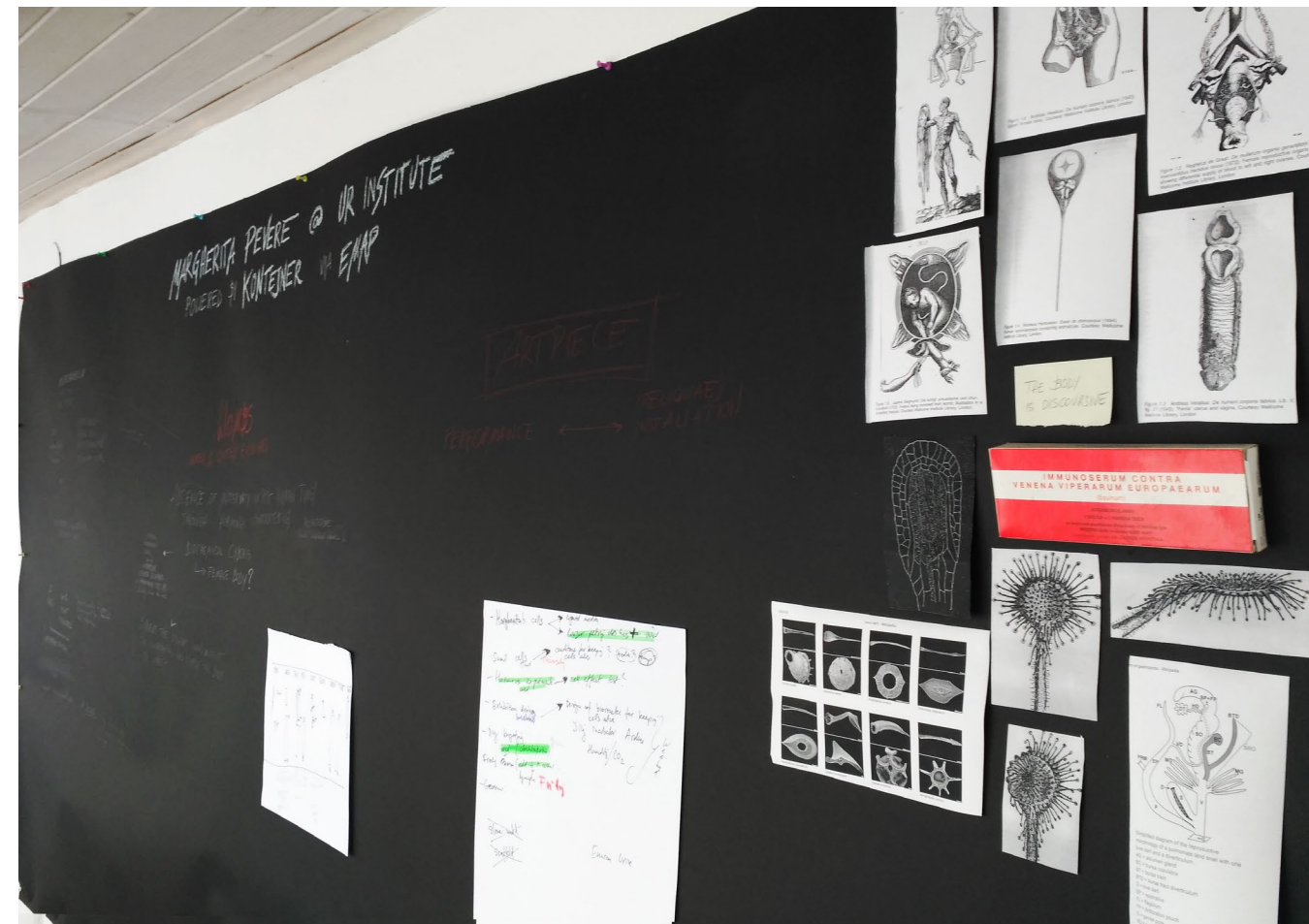
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Leaky, vulnerable bodies in art

Following the theoretical outline in the previous pages, this section engages with four artworks which present a negotiation with bodies and borders by resisting normativities as they include desires, wounds, commensalities across bioart and performance art. The works are *Surface Dynamics of Adhesion* by Bates; *Anti-Marta* by de Menezes; a recurrent passage in the cycle *Incorruptible Flesh* by Athey; and *Succour* by O’Reilly. The four works manifest and celebrate different kinds of vulnerability and uncontainability which are fertile to a queerfeminist discussion.

The selection of the artworks has been guided by a quest for elements that unsettle integrity of bodies. Each work, each with its own strategies, recounts bodies that cannot be fully enclosed or separated by others. They dive into openings, exposure and wounds as possible sites of encounter. The works ‘begin with the human’, yet they contest and pierce the integrity of what is normatively thought to be human, and open to a dimension of excess and leaks. Below I outline how I selected the works across

Detail of the blackboard during the EMAP/EMARE residency. From top right: photocopies of the scientific illustrations from the book *Leaky Bodies and Boundaries* by Shildrick; pictures of love darts and the anatomy of slug sexual organs; drawings of carnivorous plants by Charles Darwin found online; vintage horse-blood serum used as antidote against snake bites; bioprotocols; mindmaps.



two areas — bioart and performance art — that have significant contact points but are independent fields, each with articulate lineage and internal diversity. After a closer look at each piece, I weave my ideas across their differences and resonances.

The selection of leaky, vulnerable bodies in biological art presented here builds upon fundamental questions of bioart addressing the biotechnological manipulation of living matter (Catts & Zurr 2002) and the relationships between species (Bates 2015). I selected two works that hint at more-than-human scenarios by employing self-experimentation and biological materials extracted from the artist's body. *Surface Dynamics of Adhesion* addresses the human body as a space of commensality, whereas *Anti-Marta* celebrates molecular agencialities within a human-to-human relationship. Both works 'begin with the human', as a space where the observation starts, without installing any hierarchy. They erode any human-only centrality, question how knowledge is produced, and present bodies that are, by all means, more-than-human.

Similarly, my selection of leaky, vulnerable bodies in performance art touches upon lines reverberating along the history of the field: the challenging of normative understandings of the body, taboos and relationalities. *Incorruptible Flesh* and *Succour* emerge from a scene of radical body art that employed blood-letting and body modification as artistic means. The medicalization of the body is present in both. While acknowledging these lines as fundamental elements of Athey and O'Reilly's work, my discussion focuses on how the two works harness leaks and uncontainability to challenge bodily borders, enabling a discussion that leaks across biological arts and performance. *Incorruptible Flesh* stages a ritual of offering that conflates desire, grief and exposition, whereas *Succour* is a public meditation on bodily borders. Both pieces 'begin with the human', yet, by letting the human ooze and leak, they unsettle its integrity.

The four works are discussed on the basis of different materials. I experienced both *Anti-Marta* and *Surface Dynamics of Adhesion*, and the discussion of the works is based on literature and my individual experiences. The discussion of *Incorruptible Flesh* and *Succour* is based on literature and documentation and interviews available online. This introduces a discrepancy with the character of performance art as live acts to be experienced. There is a chasm between how the work is meant to be experienced

in the author's intentions and the way I could access it (Auslander 2006; Jones 1997; Rounthwaite 2011). While I acknowledge this chasm, both works offer access points to vulnerabilities that are valuable for my research. Performance art scholar Amelia Jones reminds how "there is no possibility of an unmediated relationship to any kind of cultural product", and whereas the live experience may give specific knowledges and phenomenological relations, "a documentary exchange is equally intersubjective" (Jones 1997: 12).

Surface Dynamics of Adhesion by Tarsh Bates

Surface Dynamics of Adhesion (2015) is one of the works artist and scholar Tarsh Bates created in a research on 'co-evolution' and 'commensality' between humans and *Candida albicans*. *C. albicans*, commonly named 'thrush', is one yeast among myriads of organisms "dwelling in the complex ecologies of the human body" (Bates 2018: 1). Commonly present in the human microbiome, occasionally *C. albicans* triggers infections. The whitish discoloration that follows an infection influences the common imagery, linking *Candida* to an unpleasant (and sometimes debilitating) condition. Bates' work methodically queers the *Candida*Homo ecology (idem: 3) by expanding on the commensality of *C. albicans* and its complex reproductive behaviour through biological lab practice and a series of artworks.

Surface Dynamics of Adhesion features a series of rectangular agar plates with blood agar (obtained from the human artist) that are inoculated with *Candida* colonies and encased in acrylic frames. The stencil pattern evokes both the first scientific drawings of the organism as well as wallpaper motifs from the same epoch as the drawings (Bates 2015). Initially invisible, the colonies grow during the exhibition and eventually overgrow the patterns in flocky surfaces. The exhibit is completed with furniture that reminds of a bourgeois interior, a place for conversation. Yet, the apparent 'representationalism' of the layered visual references (Rapp 2019: 3) is unsettled by the subtle manifestation of *Candida*, that exceeds the patterns. The double geometrical encasing gives a sense of rhythm to the exhibit, and the organic scrollwork is melodic. Discipline and uncontainability are at play.

On different occasions, Bates realized the work with different strains of *Candida* yeast, according to local regulations on the public display of

organisms classified as Safety Level 1 or 2 (Rapp 2019: 4). The acrylic glass frames both protect the yeast colonies from contamination, but also contain them from potential leaks into the exhibition space. For the vast majority of humans, minor exposure to thrush would not be dangerous — yeast being already part of the human microbiome. However, the yeast is widely considered a pathogen: something dangerous, to be contained. Moreover, for certain individuals minor exposition may cause discomfort, and the artist ensures safety by containing the agar plates and by exhibiting informative signs on biosafety measures.

I saw the artwork at the exhibition *Nonhuman Subjectivities. The Other Selves. On the Phenomenon of the Microbiome*, curated by Regine Rapp and Christian de Lutz at the independent art space Art Laboratory Berlin (Rapp & de Lutz 2016)²². I accessed the piece after diving through the crowd attending the opening: *Surface Dynamics of Adhesion* was displayed at the end of a small, elongated room. Some members of the audience were sitting on the sofa by the plates, engaging in conversation. The patterns were already discernible, and disciplined. I visited the show again after some days: the colonies had overgrown their place, flocks accumulated, the patterns were still intelligible but unruly, excessive, covering almost the whole surface.

Anti-Marta by Marta de Menezes

Anti-Marta (2018) is part of a trilogy by bioartist Marta de Menezes in collaboration with immunologist Luís Graça. The work reflects on bonds and identity between the authors, who are long-term partners in art, research and life. For *Anti-Marta*, de Menezes and Graça underwent a parallel skin transplant on the forearm: two small, circular grafts with skin from the other person and from themselves respectively. The allogeneic skin graft was eventually rejected by the recipients' bodies, falling off and leaving a circular scar than the other one. The rejection of the graft left a double mark: scars on the forearm skin and an invisible mark on the immune system. The piece touches on themes that reverberate across all de Menezes' oeuvre, such as the nature/culture divide (*Nature?* 1999–2000), the relationship between art and science, and reflections about identity.

The piece addresses how the immune system, in the artist's view, discerns between the self and the not-self²³, thus keeping at bay that which

is recognized as other even in a long-term partnership. This 'defence mechanism' means finding a suitable donor in transplants is crucial to avoid adverse reactions²⁴. In *Anti-Marta*, the skin is rejected but a permanent mark remains: "the rejection of skin led to the production of molecules (antibodies) that forever will be able to identify the other, like the acquisition of a sixth sense that can be visualized through the isolation of appropriate antibodies" (de Menezes 2020).

The piece elaborates on the fleeting sense of maintaining one's identity, although it opens to possible marks that others may leave — both in interpersonal relations, but also between "an artist and a scientist, who demonstrate the connection between the two disciplines while maintaining their uniqueness" (Kontejner Bureau of Contemporary Art Praxis 2019: 132). In the intention of the author, the piece speaks about bonds and a strong sense of identity (ibidem), which, in her words "is not a fixed thing" (High et al 2020).

The rigorous exhibition set-up of *Anti-Marta* comprises two video elements: a top projection on a desk and, next to it, a double interview on two monitors side-by-side. The video projected onto the desk shows documentation of the surgery. Two chairs are available for visitors to sit at the desk and place their forearm under the projection, so the surgery looks as if it were performed on the attendant's forearm. The double interview with de Menezes and Graça is displayed on the monitors with a non-linear editing, which interweaves de Menezes and Graça's words as in a musical counterpoint.

I visited the piece at the international art festival *Ars Electronica* 2018 (Linz, Austria) and at *Extravagant Bodies Extravagant Love* Festival organized by KONTEJNER | bureau of contemporary art praxis in 2019, where I presented *Wombs W.02* and *W.03*. On another occasion, I had a unique, personal experience with the piece. During an informal conversation with de Menezes, I expressed the desire to pat the scars on her forearm, and she kindly agreed. It was a brief touch. The soft forearm skin and

²² The shows featured works by Bates, Francois-Joseph La-pointe, Joana Ricou, and Saša Spačal with Mirjan Švagelj and Anil Podgornik.

²³ Current discussions in immunology are shifting from seeing the immune system as a defensive system to one of 'passport control agents' and bouncers [who] know who to let in and who to keep out. The immune system is a composite product of the holobiont, and it is not simply fighting anything that is "not self" (Gilbert 2017: M82). However, not having discussed this point with the artist, I maintain my discussion along the way the work is presented and report this other view for the sake of completion.

²⁴ Human Leucocyte Antigens (HLAs) are the specific antigens that indicate compatibility in tissue typing.

the turgid scars on a body which I have no intimacy with offered themselves to my fingertips with a sort of gentle generosity.

Differently than with Bates' piece, no wetware is exhibited. Nevertheless, the display conveys an unsettling sense of intimacy with the work's materiality. The piece 'happens' elsewhere, not in the exhibition space, but on the artists' forearm and immune system. Yet, the exhibition vocabulary invites the audience to a direct engagement and intimacy. The strong poetic content of the piece (of loving bonds and scars) is pierced by the frank depiction of the surgery, which some visitors find repulsive. The materiality of flesh on what becomes a surgical table through the video projection is countered by the conversation piece screened on the monitors.

The piece reveals an opening, a change that happens with the skin graft. It is not only the visible scars, with different textures between the graft from the same donor and the allogeneic one. The allogeneic skin graft, in absence of immune suppressant drugs, is rejected and the anti-genes will forever be able to identify the other. This molecule-small change in anti-gens reveals a vulnerability that is not the one signalled by a scar. The self is 'protected', but a readjustment is necessary.

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Incorruptible Flesh by Ron Athey

Incorruptible Flesh by Athey is a cycle of four meditations on the Catholic trope of the incorruptible bodies of saints (Pacitti Company & Athey 2014). The series set off as a collaboration between Athey and Lawrence Steger, who died of AIDS after the first iteration of *Incorruptible Flesh* (*A Work in Progress*) (1996). Athey reopened the cycle after a decade with solo and collaborative pieces (*Incorruptible Flesh: Dissociative Sparkle*, 2006, *Incorruptible Flesh: Perpetual Wound*, 2007; *Incorruptible Flesh: Messianic Remains*, 2013). The cycle takes on long-term elements in Athey's oeuvre: queer desire and sex, death, flesh, bodily fluids, BDSM practices, and religion. These tropes are reformulated by evoking the religious display of embalmed corpses covered in wax of the Catholic tradition (*Incorruptible Flesh: Messianic Remains* by Athey 2013) in the flesh of a 'living corpse', as Athey refers to his HIV+ body (Johnson 2008: 508). Care and veneration are bound together with faith, healing, and grieving rituals (Doyle 2013a: 56).

3

In this text, I consider the quasi-offering exposition of the body in the four pieces of the series, although enacted in different modes. Other elements are unique to each of the four manifestations, with regard to collaboration, dramaturgy, treatment of genitals, costumes (Doyle 2013a; Hoetger 2014). The exposition was originally the last scene from the first instalment of the *Incorruptible Flesh* cycle, and became a starting point for the following chapters, a decade after the initial one²⁵. The exposition is evocatively staged: the artist is latched naked on a metal bed frame, his face pierced by hooks tied to an extremity of the frame; a baseball bat penetrates his anus.

Latched, penetrated, pierced: the body is quasi-submissive (Pacitti Company & Athey 2014) and offered to be anointed by grease or lubricant. Importantly, whereas in *Work in Progress* and *Perpetual Wound* the anointment was performed by Athey's collaborators (Lawrence Steger and Dominic Johnson respectively), in *Dissociative Sparkle* and *Messianic Remains* the audience is invited to do so with their hands. The gesture of anointment conflates veneration and care, sexuality and healing (Doyle 2013b: 56) that operates along two directions. On the one hand, there is a direct reference to the relationship between "sick men and caregivers" that populated death beds in a signifier of the years of the AIDS pandemic (Johnson 2008), as multitudes of gay men were taken care of by members of other queer communities. On the other hand, it recalls the Catholic veneration of sacred reliquiae and sacramental objects, which sees multitudes of believers flocking to touch, kiss such objects.

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Through the multi-layered references and exposition of a HIV+ body, *Incorruptible Flesh* reminds of an in-flesh transfiguration. Athey plays with the chasm between a body presented to be incorruptible, but such exposition and offering presents a body that is already remains — a living corpse (Johnson 2008: 508). The self-exposition is merciless and renders the body vulnerable to the audience which is invited to soothe, caress and anoint (Jones 2020: 17). "Mary Richards similarly describes Athey as an antiphalliac artist who re-presents his body as penetrable, leaking, and vulnerable" (Doyle 2013a: 49). What is presented is a venerable and vulnerable body that is to be adored, taken care of, and anointed. It is simultaneously unpuncturable, majestic, and pierced, perforated, penetrated multiple times.

²⁵ Lawrence Steger, Athey's collaborator in the first piece, died of AIDS three years after the collaboration. The second piece begins where Athey and Steger 'left it': a reprise that voices loss and grief (Doyle 2013a: 56).

Succour by Kira O'Reilly

A diagonal cut on the skin, repeated. Each cut is framed by a square in a grid of micropore tape that extends over the whole surface of the body. Skin becomes slightly puffy in the squares; the rigorous yet delicate medical tape pattern is soon to be punctured by trickles of blood, a red trace and a darker spot. *Succour* (2002) by O'Reilly maps a topography of grace and pain on the borders of the body. In so doing, the performance brings together tropes of medical practices — explored through live acts and biotechnology practice — and explorations around 'The Body', as the artist herself puts it (O'Reilly, n.d).

Perforation of the skin is a strategy that has accompanied different pieces of the artist, aided by animals in *Bad Humours/Affected* (1998), a co-performer as in *Wet Cup* (2001), the audience as in *Untitled Action: Bomb Shelter* (2004) — in a vocabulary that encompasses intimacy, mercilessness, trust. *Succour* is of a body in a meditative self-exploration and introspection that happens on the skin. The naked body sits on a white (or white-covered) chair; white is the cotton gauze used to wipe blood from the skin — an evanescent blood print on canvas; whitish to beige is the micropore tape. The scalpel and tray are made of steel. The layout looks simple, but is studded with references to art history and the results are almost pictorial, but with neither drama nor grandeur. Rather, there is humble intensity and elegance.

When each square is marked with a cut, the artist removes the grid of medical tape as if it were a skin — like a 'flayed skin' (O'Reilly & Vason 2017: 362). The part of the performance visible to the public is over. However the skin, the permeable border, is active; the cicatrization process begins and stretches into daily life, wounds heal until the next iteration of the piece. Sometimes wounds tear in unexpected moments: blood prints on canvas (O'Reilly 2008).

The repeated iteration of *Succour* created an unfinished and rhythmical scar landscape on the artist's body that is celebrated on the embossed cover of a recent monograph (Curtis & Hargreaves 2018). In O'Reilly's words, scars "both document a history of the work and are, indeed, part of the work — collapsing the differences between 'making' and 'performing'" (Klein n.d.). Importantly, the piece provided the entry point to biotechnological explorations through the encounter with bioartist Oron Catts and

O'Reilly's subsequent engagement with cell culture at SymbioticA at the University of Western Australia (O'Brien 2014: 86).

The work extends beyond the space of the exhibited piece and creates a controlled series of tensions across rhythmical elements (the slash, the square, the grid), the methodic exploration and the rivulet of blood. Each slash lets something from inside emerge to the outside. Blood becomes visible, present, agent. A body that is cut open (Bago et al 2010).

Concluding remarks

The four works presented recount of bodily entities that are exposed, pierced, penetrated. None is ever self-enclosed: the works flourish in the vulnerabilities that they manifest. All the works include various degrees of self-experimentation as the artists work with the materiality of their own bodies. Bates produces agar plates with her own blood to host *Candida* intimacies. De Menezes and Graça undergo mutual skin transplants as a poetic take on their bond in life, resulting in forearm scars and an intervention on their individual immune systems. Athey offers his orifices to penetration, his skin to piercing hooks and his flesh to the touch of the audience and other performers (mediated by latex gloves and lubricant). O'Reilly explores volumes, surfaces and depths of her body by slashing it with a metal blade, allowing what is inside to surface.

By different means, the works explore, disrupt and reconfigure borders with an approach that couples self-experimentation with feminist situatedness: one can say something from the timespace they inhabit, from their body. At the same time, the works approach human entities with the purpose to reconfigure them and thus disrupt assumptions about self-enclosure and exceptionalism. Yes, the works all involve human bodies, and the artists' bodies specifically. But not only. In fact, they hint at openings, let emerge what is inside, host commensalities and offer uncontainabilities in the presented bodies.

The artworks were realized in different moments and contexts. Looking closer at the differences between them allows the weaving of threads of leaks and vulnerabilities with more precision. As mentioned earlier, the works were realized in either performance art or biological art fields, two partially overlapping fields with specific discourses, presentation modes,

environments, and scholarship. Notably, the role of the artist's body is specifically addressed in each field. It remains my intention here not to focus on the artist's bodies in the pieces, but to look at what openings, leaks and vulnerabilities the works suggest.

The ways the works are presented are also linked to the specific vocabularies of biological art and performance art. The two performances happen with a choreographed intervention of the author before an audience gathered in an art space. Both bioart works see the authors elided from their exhibits, instead featuring a configuration of objects, which, in part, originate from the authors. Bates exhibits a non/living piece along with furniture to create; de Menezes presents a video installation (while scars and immune systems operate from within her and Graça's flesh) and furniture. Besides this, the bioart works are prepared within bioscientific settings.

Most artworks invoke participation from the audience through diverse strategies: *Incorruptible Flesh* encourages attendees touch and anoint the exposed body; *Anti-Marta* invites visitors to identify themselves with the surgical procedure by placing their arm under the projection on the desk; *Surface Dynamics of Adhesion* offers a setting for conversation. Although I did not experience *Incorruptible Flesh* in person, I did wonder what it would be like to touch and anoint the performer's body. What could I offer to him? Would my touch soothe pain, would my pain be soothed? I did stretch my arm under the projection in *Anti-Marta* and watched the surgery from beginning to end. The projection superimposed pixels and stitches, the cold desk of the installation felt uncomfortable and out of place while the surgeons carried out the procedure. I sat on the couch alone by the blood agar plates while *Candida* cultures were still at their early stage. While sitting there, the patterns looked promising yet uncertain, with whitish tufts. Someone approached and asked if they could sit, interrupting my musing and asking for human-to-human conversation.

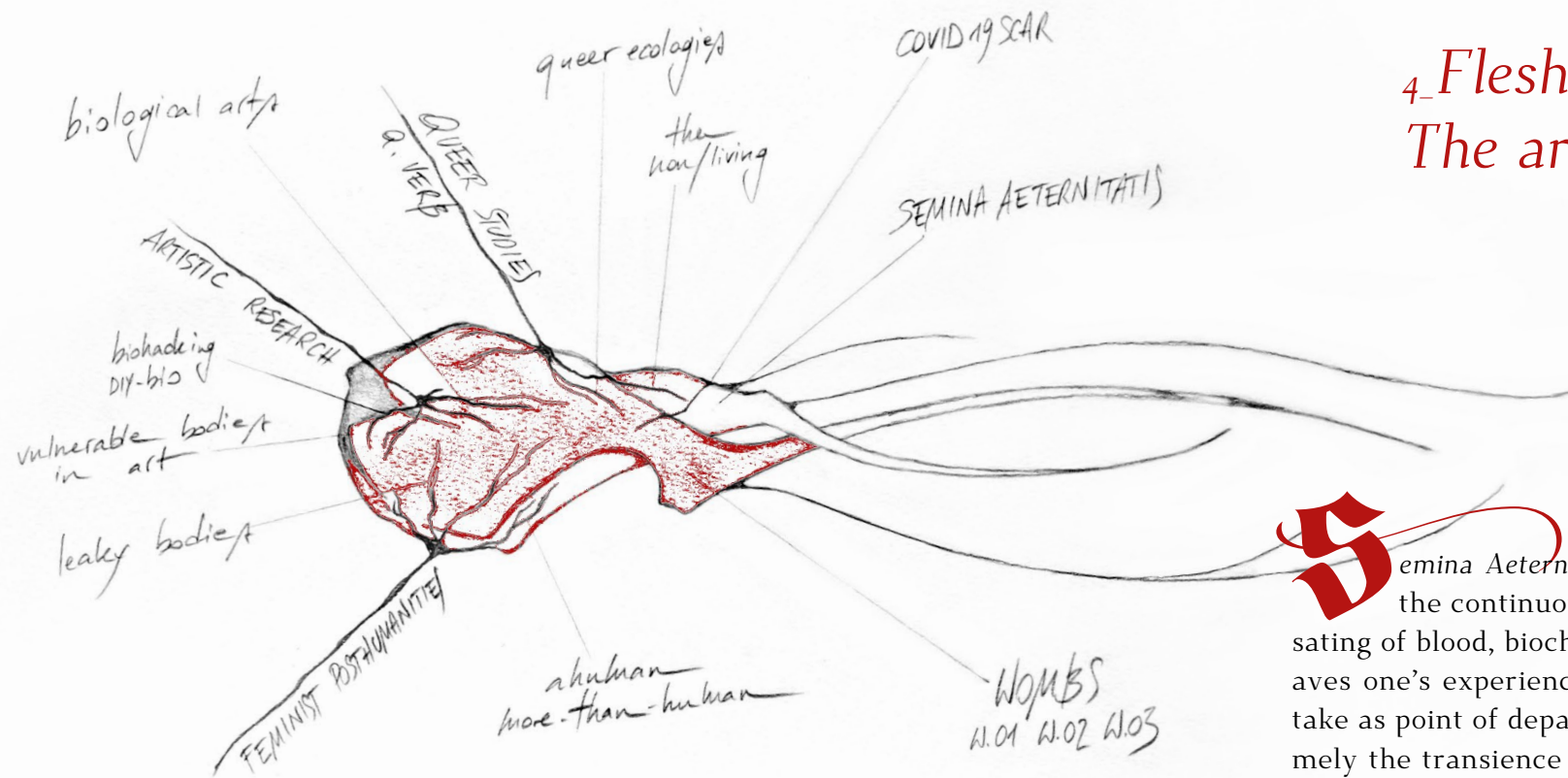
Distinctions between the two bioart works *Surface Dynamics of Adhesion* and *Anti-Marta* and the two performances *Succour* and *Incorruptible Flesh* are indicative of narratives and poetics specific to each work, so looking at these will help carve the space for my discussion on the elements that unsettle integrities. *Incorruptible Flesh* and *Succour* both operate through touch: the audience's soothing touch in the first and the performer's cuts

in the latter. By so doing, they create intimacies and inscribe the relationship between performer and audience within registers of proximity and voyeurism. The gaze enables the audience to access the vulnerable body in *Succour*, while gaze and collective anointment lead to the encounter in *Incorruptible Flesh*. *Surface Dynamics of Adhesion* and *Anti-Marta* also play with touch, although indirectly. The first is encased in protective frames, explicitly preventing any direct contact. *Anti-Marta* exposes the visitor to an explicit superimposition of the surgery procedure onto their arm: an evoked touch. A real touch, meanwhile, allowed me to experience the work on the artist's forearm on an informal occasion.

The four works invited me as a viewer into their poetic spaces — two in real life (*Anti-Marta* and *Surface Dynamics of Adhesion*) and two mediated by documentation, literature and my own imagination (*Succour* and *Incorruptible Flesh*). This discrepancy makes me a vulnerable observer for my experience of the two live acts would be different in real life, yet I have been prompted to reflect on the generative meaning of this discrepancy. The material poetics stirred engagement, desire, empathy beyond physical presence.

In the previous paragraphs I traced a landscape of leaks and vulnerabilities that show the potential of that which is uncontainable. From such a landscape, I borrow both the resistance to normativities and the inclination for excess in order to conceptualize leaks and vulnerability as mobilizers. Each in its own terms, all the artworks present sites of potential harm (the cut, the exposed mortal remains, the skin graft, *Candida* cultures) but rework them into sites of encounter. Leaks and vulnerabilities are exposed and offered to the audience. That which exceeds, that which leaks, gains the stage and catalyses becomings.

Drawing on the understandings of queer as a verb and method, leaks and vulnerabilities become that which queers the artworks and this research. Such a move allows me to keep the attention on the dimension of the opening, the lack of closure, which becomes manifest as an inherent attribute and intentional process; inhabiting the lack of closure is an ethical stance. It becomes possible to think of the artworks (made by myself and others) as grounds for queering and objects to queer.



4 Fleshy folds: The artworks in the research

Semina Aeternitatis and Wombs stem from the observation of how the continuous inflow and outflow of fluids, shedding of skin, pulsating of blood, biochemical communication across organs and glands weaves one's experience into a larger trans-corporeal fabric. The artworks take as point of departure what could be considered human concerns, namely the transience of memory (*Semina Aeternitatis*) and sexuality (*Wombs*). Seen from more-than-human perspectives, these concerns reveal a multitude of vulnerabilities that transgress individual or social realms. The artworks magnify how this interweaving may happen by engaging with elements that exceed (leaks) a human-only dimension.

Between 2016 and 2018 I carried out preliminary research for both works at Biofilia – Base for Biological Arts at Aalto University, but developed each work outside Aalto in different contexts and with separate funding. This chapter accounts not only for how the artworks were realized and exhibited, but also considers context and production aspects and what subjects — human or nonhuman — are involved.

To address the question ‘how to make art with...?’ which underlies practice-based PhD research, it may be useful to consider aspects such as where the piece is realized, how the collaboration with different laboratories is established, what challenges and openings may emerge, and how all these may contribute to the piece. Therefore, this chapter adopts a self-reflective and critical approach method and features journal annotations (in turquoise) and visual documentation of the exhibition.

Semina Aeternitatis takes on transience and nostalgic individual memories through DNA data encoding and genetic engineering. The transcript of a woman's childhood memory is synthesized into a DNA molecule and becomes, via genetic engineering, part of the genome of biofilm-producing bacteria. The exhibit comprises a chimeric sculpture and a research desk. The piece was realized for *Experiment Future* at the Kunsthalle Rostock in collaboration with Prof Alistar and the IEGT.

The series *Wombs* (W.01, W.02., W.03) ponders possible environmental implications of hormonal contraceptives by weaving together the leaky characters of my body, bacteria and slugs. It manifests as two non/living pieces (W.01 and W.02) and a photographic series from a performance for camera (W.03). The work was realized at KONTEJNER | bureau of contemporary art praxis in collaboration with UR Institute.

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Previous works involved DNA data conversion. *Microvenus* by Joe Davis (1986) featured a fertility symbol added to the genome of *E coli* bacteria; Eduardo Kac encoded an excerpt of the *Book of Genesis* in *Genesis* (1998–1999). In *Music of the Spheres* (2015), Charlotte Jarvis playfully dispersed DNA copies of a sonata through soap bubbles infused with the molecule.

Semina Aeternitatis 2019

Credits

Margherita Pevere: concept, bioprotocols, installation
Prof Mirela Alistar: algorithmic development, bioprotocols
Edith Müller-Rieckmann: recollection of childhood memory
Kim Maillet: studio assistant
Preliminary research at Biofilia
Institute of Experimental Gene Therapy and Cancer Research (IEGT): scientific partner
Produced by the University of Rostock and Kunsthalle Rostock for *Experiment Future*, curated by Dr Susanne Jaschko
Centogene: financial support
IEGT Research group: Prof Brigitte Pützer, Dr Ottmar Hergenröder, Dr Alf Spitschak, Dr Styliani Logotheti, Dr Toni Schumacher, Anja Stoll, Ingrid Winkler, Christin Richter, Stefan Marquardt, Prabir Dhar, José Dinis da Silva Faustino
www.margheritapevere.com/artwork/seminaaeternitatis/

Semina Aeternitatis wonders how the life and death of a biotech chimera may spur reflection on temporality and transience. The piece assembles in a non/living entity the possibility of storing digital data on DNA, performativity and leakiness of organic and inorganic matter, and the evanescence of individual memory. It interrogates the promises of long-term DNA data storage as well as the Western idea of eternity: its Latin title evokes Christian terminology meaning 'seeds of eternity' or 'people of eternity'.

For the piece, an old woman's childhood memory recollection is converted to genetic code through a custom algorithm. The code is manufactured into a plasmid — a circular DNA strand. The plasmid is inserted into biofilm-producing *Komagataeibacter rhaeticus* (*K rhaeticus*, genus *Acetobacter*) bacteria cells via a procedure called electroporation²⁶. By doing so, chimeric bacterial bodies carry traces of the woman's transient memory as plasmid fragments.

K rhaeticus colonies created in the laboratory for *Semina Aeternitatis* were cultured to obtain the biofilm for the installation. In compliance with European regulations on genetically modified organisms which confine genetically engineered organisms to the laboratory (Federal Ministry of Justice and Consumer Protection Statement 2013), biofilm is sterilized before the show: international law frames the life and death of the non/living chimera in *Semina Aeternitatis*. The artwork materializes in the bacteria growing in the laboratory and becomes

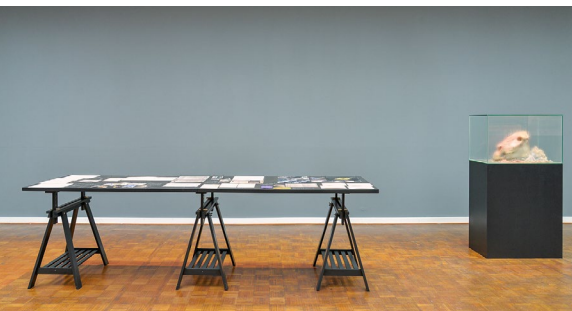
an installation in the exhibition space after sterilization. The exhibit features a chimeric sculpture of a horse skull and biofilm in a glass cabinet with a controlled condensation process. Next to the cabinet, a research desk presents notes, pictures, and the original and encoded versions of the text.

Recent research on DNA data storage suggests this technology may offer a possible solution to ‘digital decay’, the corruption of data stored on digital drives. Currently, the

only solution to digital decay is to make copies on other drives: a time and resource devouring process that offers only a provisional solution. Digital decay jeopardizes both corporate data banks as well as individual files in a shared destiny of transience. However, uneven access to resources between individuals and corporations means that data stored on personal drives is more likely to be lost than corporate data. The compactness and longevity of DNA molecules seem to offer a promising alternative (Grass et al 2015: 2522), although such technology is far from being error free²⁷ and is, for the time being, costly.

Semina Aeternitatis plays with the paradox of entrusting a cherished memory to a living organism, aware of the friction between the precision of DNA encoding and the lively transience of in vivo data storage. The piece embraces the nostalgic lure of individual memory to spur reflection on temporality and vulnerability. For this reason, the woman who would ‘donate’ her memory for the project was carefully chosen as described in the following sections. Aesthetically, the work celebrates sensuality and the instability of biological matter.

Installation view.
Left: the research desk.
Right: the chimeric sculpture



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²⁷ Nor does it necessarily present a smaller environmental footprint than storage on digital drives.

4

Early studies for the piece took place between 2016 and 2018. In a series of performances I invited audience members to sit at a desk with me and asked them about a meaningful memory they would like to keep forever. Answers addressed mostly intimate memories, such as deaths and births of beloved ones, childhood memories, formative or traumatic episodes. I took note of the answers on large sheets of paper or on artist’s books I made with dried bacterial biofilm. These early studies resulted in three artist’s books called *Books of Memories*.

Semina Aeternitatis: context of realization

Research on laboratory methods for cultivating bacteria of the *Acetobacter* group was carried out at Biofilia and in my Berlin studio. The commission for the show *Experiment Future* enabled the realization of the work. *Experiment Future* was the first exhibition of experimental art in the region and was initiated by the University of Rostock and the Kunsthalle Rostock for the historical celebration of the city and the university. Some of the works in the show, including *Semina Aeternitatis*, were produced for the occasion in collaboration with laboratories of the University of Rostock.

Edith serves tea on fine Chinese pottery.
Rostock, December 2018



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The site-specific character of the exhibition aimed at engaging with the Rostock natural environment, the town, and academic community. While Prof Mirela Alistar and I had already collaborated on previous citizen science projects in Berlin, finding a partner laboratory in Rostock was a longer process which led us to the Institute of Experimental Gene Therapy and Cancer Research just four months before the exhibition opening.

The IEGT research focuses on advanced gene therapy against cancer and experimental viral vectors. The facility features laboratories with Security Level (SL) 1, 2 and 3. *Semina Aeternitatis* was the first art and science project hosted by the IEGT, a context which was a fertile ground for testing my experience and ideas in transdisciplinary collaboration. Prof Alistar and I worked under the supervision of Dr Ottmar Herchenröder and Dr Alf Spitschak and with the guidance of lab assistant Anja Stoll. Other

researchers who were not directly involved in the project shifted from initial hesitation to curious interaction and generous scientific mentoring.

Semina Aeternitatis celebrates transience and longing, suggesting an expanded temporality. How to identify a volunteer who would donate a fragment of their own transience? Should it be more than one individual, like the first performative manifestations of the work? What age should the person be? Curator Dr Susanne Jaschko and I searched for someone whose personal experience might embody a connection between local histories and other temporalities.

The Mecklenburg-Vorpommern region is characterized by an ageing population and the University of Rostock is involved with age-related research. Susanne and I addressed the Department of Ageing of Individuals and Society of the University of Rostock and the local Deutsche Alzheimer Gesellschaft (Alzheimer's Society) to explore possible collaborations. Both institutions replied positively and distributed an internal call, but no candidate showed up. Eventually, we met Edith Müller-Rieckmann through Susanne's extended network four months before the exhibition, in time for the algorithmic development, plasmid manufacturing and experimental procedure.

Acetobacter

Microbial cellulose²⁸ is a natural polymer produced by a variety of bacteria and micro algae. Its ambiguous, leaking materiality reminds of skin and flesh. Fibrils of cellulose extruded from the pores of bacterial cell membranes bind together and form a biofilm, an intricate three-dimensional structure encasing the colony. Biofilms mediate human relations to bacteria; their main purpose for the bacteria seems to be protection of the colony. In case of bacterial strains that are harmful for humans — for instance pathogens infecting wounds or medical instruments such as catheters — biofilm shelters bacteria from antibiotics, making infection more difficult to eradicate. Conversely, biofilm produced by non-pathogenic strains is used in food and consumer goods production as well as in biomedical applications for its unique mechanical properties (Pevere 2018b: 138).

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Artists and designers have been exploring microbial cellulose for design purposes, as with Suzanne Lee. Works by Karolina Żyniewicz and Alanna Lynch look at the symbiotic culture of Acetobacter and yeast as a shared care project or at its effects on the human microbiome.

Microbial cellulose has accompanied recent works of mine, such as the series of *Skin Studies* (2018) and the performance *Eingeweide* (Donnarumma & Pevere 2018). In workshops I have given to artists and scientists, hands-on sessions catalyse discussion on abjection, intimacy, normativity, and agency.

Living matter is growing, leaking, active. After one inoculates the growth medium, bacteria begin populating it. This phase is invisible to the naked eye. After a couple of days, the interface between liquid medium and air corrugates in a different way than usual: an imperceptible transparent film forms on the surface of the medium. The film slowly grows thicker, becomes more present. Bacteria remain invisible, yet one can see the result of their metabolism and thus knows the colony is busy, active, while organisms communicate via the molecular feedback system we call quorum sensing [. . .]

There is an inherent ambiguity in the materiality of microbial cellulose. Its resemblance to flesh may trigger abjection, or, conversely, uncanny intimacy. It is a living material which prompts a reconsideration of the notion of medium in artistic practice. In nature, living matter is entangled with unpredictable relationships, it lives and dies according to emerging conditions. In the studio or in the laboratory, living matter requires control of its artificial environment. It requires that one does not mess with its space and needs and, at the same time, it requires care in order to maintain a suitable environment. Living matter creates a mutual bond of attention and need. It's a symbiont, a slave, a companion. (Pevere 2018b: 140)

I previously worked with wild varieties of *Acetobacter*. For *Semina Aeternitatis* I received a stab of the *K rhaeticus* strain from the Tom Ellis Lab (Imperial College London). *K rhaeticus* is not a standard laboratory organism: literature mostly refers to methods of increased biofilm production, with the Tom Ellis Lab and only a few others publishing genetic engineering of the strain (Florea et al 2016: 1).

“Trot like a mare!”

I met Edith at her place in Rostock on a dusky afternoon in December 2018. She is an 80-year-old former neurologist, whose clinical work involved research on premature children: her protocols ensured survival until

adulthood of many of her patients and are now milestones in the field. The last time I met her at the Kunsthalle, she brought me photographs of a mobile-like object she had built with rope for her premature patients years ago. The mobile was mounted above the cradle or inside the incubator so the child could touch and play with it and stimulate their haptic and neural activity. “Look, this is my bioart,” Edith said, smiling.

The way Edith speaks of her patients, and how she stimulated their sensory development, reminds me of the movie Land of Silence and Darkness by Werner Herzog.

Edith carefully picked a memory that was not transformed by further reworking. It was the first time she had shared it with someone, decades after it took place. With her consent, I recorded the interview on my mobile phone. Her story recounted a formative episode from her

childhood: the first time she was sent home alone, at the age of five, riding the family’s work mare, named Lotte. Initially a shocking experience, the mild stubbornness and tenacity of Lotte’s trot became a lifelong lesson for her. What follows is the original transcript of the interview with Edith. For the readers’ convenience, the original German version is in the left column and the English translation is on the right:

Eine Erinnerung, die erst durch Ihre Email rasch in meinem Gedächtnis auftauchte: Als etwa fünfjähriges Mädchen wurde ich im grellen Sonnenschein eines Sommers auf den Rücken eines Pferdes gesetzt. Ich sei groß genug und müsse nicht in Begleitung von der Feldarbeit zum Bauernhaus zurück – das Pferd kennt den Weg.

Aus dieser Schocksituation fragte ich:

„Wie kann ich denn auf dem Rücken des Pferdes wissen, dass ich nicht runterfalle?“ und mein Großvater sagte: „Diese Antwort kannst du selbst geben. “Ich betrachtete das Pferd, es war eine schwerblütige Stute und hieß Lotte. Ich kannte das Pferd, das sehr bedächtig trabend ging, und sagte: Ich wickel’ mir die lange Haare von der Mähne um die Hände und kann dann, selbst wenn ich falle, niemals runterfallen. Ich habe es laut geschrien. Da lacht er, setzte mich aufs Pferd, und ich habe das getan und kam am Bauernhaus ohne Zwischenfall an. Lotte ging vorsichtig und langsam trabend mit mir. Auf mein zukünftiges Leben bezogen, habe ich zu dem Zeitpunkt beschlossen (zunächst gab es natürlich einige Tage immer wieder Erinnerung an dieses Geschehen, aber man spricht nicht mehr mit mir darüber – so etwas ist in der Bauerngesellschaft alles ganz normal): „Ich muss immer wie eine Stute traben!“ Und so hab ich mein Leben bewältigt. Niemals hat jemand mit mir wieder darüber gesprochen. Aber immer war für mich präsent (und es gab viele dramatische Situationen: mein Mann ist sehr früh gestorben, die Kinder waren klein und so weiter): Trabe wie eine Stute!

A memory that resurfaced only after your email: as a five-year-old girl they put me on the back of a horse in bright summer sunshine. They said I was then old enough and didn’t need someone to accompany me back to the farmhouse – the horse knew the way.

From the shock of the situation I asked: “How do I know that I will not fall from the horse’s back?”, and my grandfather said: “You can answer this question yourself”. I looked at the horse; it was a phlegmatic mare called Lotte. I knew the horse, who used to trot thoughtfully, and said: “I will wrap the long mane around my hands and so, even if I fall, I cannot fall off. I screamed it out loud. He laughed, put me on the horse, and I did what I said and arrived at the farmhouse without falling off. Lotte trotted carefully and slowly with me.

With regard to my future life, this was when I decided (At first, the memory of this episode came to my mind over and over in the following days, but no one ever addressed it with me – as it is quite usual in rural society.): I must trot like a mare! And so I mastered my life. It was always present for me –(and there were many dramatic situations: my husband passed away soon, the kids were small and so on): Trot like a mare!

German language features relatively long words in comparison to English. While the project intention implied encoding and adding to bacterial genome the whole text and not a short excerpt, this posed a challenge for two reasons. The first reason was pragmatic: to limit the price of the DNA sequence to be ordered. The second reason was technical: longer sequences tend to be less stable when mounted on a plasmid than shorter ones, especially if not previously tested. To optimize space and the resulting length of the desired DNA string, I edited the German text to achieve a more concise version which kept the poetic tone of the original.

Upon Prof Alistar's suggestion, I also included two further adjustments to limit the translation to common letters, without capitals or special characters. The first adjustment was to opt for the grammatically accepted equivalents between the vowels ä ü ö with the corresponding vowel+e, as in

ä → ae; ü → ue; ö → oe

The second adjustment was a grammatical transgression: I replaced all capital letters with lowercase letters, including nouns and after full stops, as in

Pferd (horse) → pferd

eine erinnerung, die erst durch ihre email rasch in meinem gedächtnis auftauchte: als etwa fuenfjaehriges maedchen wurde ich im grellen sonnenschein eines sommers auf den ruecken eines pferdes gesetzt. ich sei gross genug und muesse nicht in begleitung von der feldarbeit zum bauernhaus zurueck, das pferd kennt den weg. aus dieser schocksituation fragte ich: wie kann ich denn auf dem ruecken des pferdes wissen, dass ich nicht runterfalle? mein grossvater sagte: diese antwort kannst du selbst geben. ich betrachtete das pferd, es war eine schwerbluetige stute und hiess lotte. ich kannte das pferd, das sehr bedaechtig trabend ging, und sagte: ich wickel mir die lange haare von der maehne um die haende und kann dann, selbst wenn ich falle, niemals runterfallen. ich habe es laut geschrien. da lacht er, setzte mich aufs pferd, und ich habe das getan und kam am bauernhaus ohne zwischenfall an. lotte ging vorsichtig und langsam trabend mit mir. auf mein zukuenftiges leben bezogen, habe ich zu dem zeitpunkt beschlossen: ich muss wie eine stute traben! so hab ich mein leben bewaeltigt. immer war fuer mich praesent, und es gab viele dramatische situationen: trabe wie eine stute!

Prof Alistar developed the encoding algorithm for the German language. What follows is the final sequence of the original text „Trabe wie eine Stute“:

AAGGAATTAATTAAGGCCTCCTAGGTACGTGCGCTGTCAGTACACA-
TAGCTCACGCTAGAGTATCTCTACACAGCGATCATCATATCTCTCACT-
GAGTGAGCAGTAGATCAGCGCTGTAGCATGTAGTATCTGATGCATCTA-
TCTGCTACGCAGTCATACGTGCGTCATCTAGCGAGATGCACTATCT-
GCACGCGTGCTGATGCTGTCATGCACATGATAGTGAGCATATAGA-
CATGATGCTACATCAGCGCACTGCGCATGAGCATCACACGCTGCA-
GACTGCATAGATCAGTAGTCACATCAGTCATGCACTCTCGCTCA-
TACATCTGCGATAGCTCTCACAGTAGTGAGCAGTACTGCTCGAGCT-
GTCGTCGTGTATGATGAGCAGTGTGCGTGACAGACAGATGTACGCA-
GCGTACATATGATCATCTGCTAGCGATGTCAGCAGCTGCAGCGAT-
GCAGAGATACATCTGAGCGCGACAGACTGTATGATACGTGCGCA-
GCTAGACTGCATAGCTCTCACATCAGACTGTGCTGTGCGTCTGCAC-
GAGATCGTTCGCTCATCATCACGTGAGTCTGAGCAGCAGCAGCTCGA-
TACAGCGACTGAGCGTGAGATCGATCACACATCATCACAGTGTAGT-
GAGCATATCGTATGACTATAGTCTACACGTGCGATACAGTCAGAGTGA-
GCAGTGCTCTCACTGATCTGCATAGTAGAGCATCAGTCGCGTATGT-
GACTCAGCGTCATCGACATGATATAGCTATCTGCATCACATCAGTCT-
GATAGCTCACACTATCTAGAGTATCTCTGCATGATCGAGTCATGCGA-
TCTCTGAGACTGTATATGCGCTCTCACGCAGATGTGTGCGACTCTGA-
TGCTGTGCTGAGAGTATATGATAGCTGATGAGTGAGCTGCTCGCTC-
GATGACGCACTGTGCATGTACTGCTATGAGCATCAGCATCGATGT-
GTGACGACAGATCTATGCTCATAACGCGCTCTAGCATATATGACGACA-
GATGAGAGCGTGTGCTGCAGCGATGCAGAGATACTGCTCAGATATA-
GTGAGTCACGCAGAGATATGATCGAGTCATGCGATCTCTGTGCTGA-
GCACGTGCTGCTGTATCTACAGAGATGCATCATCAGTAGTGAGCA-
GTGTAGTGAGCATATCTGAGCGTGCACTGAGCATGCAGTAGTA-
TAGACACGCTAGCACGTATGAGTCTGAGCAGCAGCAGAGTGATGCA-
TATAGCTGATGATGCTAGCACACTCGCATCTCTACACATCACAGCATA-
TGCGATGTCATCTGATGTGAGACTGCACACATGATGTGAGAGATATCA-
TCACTACGACATCATATCTAGCGTTCGCGTGTCTCAGTAGTGAGCAGTC-
GCGCACTGATGCTATCTGCACACATATATCTCTGCATGATCGAGTCAT-
GCGATCTCTCTACAGCGCAGCTCATATGCTGATCACGTATGTGATGA-
GTGAGCTGCGCGATCGACTACTGTGTGCGTAGTCACAGCAGCACT-
GTGCGCGCTCACGCTCTGAGATACACATCATCAGACGATGATGTGC-
GCGTCTCAGTAGTGAGCAGAGTCATGTGTGCACACAGAGATGCATCA-
GTCTAGCATGTCAGAGAGACGCTCTCATGCAGCTGCTGTCTGATCA-
GTGCGGAGATGCACTATCTGCACGTGATCATAGCTGCACTATACAGA-

GCTCGACGTGACTCTACAGATACAGAGCTGCTGCAGTCATATAGACA-
 TGACGACAGATGAGCACGTCGCTCGATAGTATCGATACTGATCTCTA-
 CACAGACGCATATCGATATCTCATGCATGATCACAGAGTGAGCAGT-
 GCTCTCACTGATCGATGCATAGATATGTGAGCGTCATCTCTACACA-
 GAGCATGCGTGAGATATCTGTATCTCAGAGTCATGTGTGCTCTCAT-
 GTGTGAGTATCATCACTACGACATCATATCTGCGCGTGTGCTACTA-
 TCTGCTCATGCATCGTGTCTACAGTGTATACTGCATCGTGCTGA-
 GCTCACGCATATAGCTCATGCATCGTGTATAGAGCTACTATCT-
 GCTCTGCATAGTGTGATATGATCTACATGATATGTGAGTCACATCTA-
 TCTGATCGTGTATAGAGCTCTCATGCTCGTGACAGTGCATATCACT-
 GAGACGCTGCTGTGCGTCTGCACACAGTCACGACAGATGATGCT-
 GTCATGCAGCTAGACTGCATAGCTCTCTCGTGAGCGTGAGATCGTC-
 GCTCATCTCATGCGACACAGAGATGCATCAGACTGTGCGCATATGA-
 GCGTGAGATCTCGATGCGATGATGCGATGACTATGCTGTGTCAGT-
 GAGCATGATATGATCTGCTGTGCGCTAGATCATAACGACAGAT-
 GTATCATGCATCGTGTGATGCGCGAGATCTACTGCTGCGCACACA-
 GACTACGCTAGCTCTATCTGCTCAGCAGTAGTGAGCATAACGACTGAGC-
 GTGAGATCTACATGTGACTGCTGCACTGCTGCGATCATGTGCGGTGA-
 GATCGATACATATCGATACTGACTCTGATGCTGTGATGCTAGCACGTA-
 TACTCAGCGAGTCTGTGTATCATGCACGTCGATATGATCTACACGA-
 CACGCAGTCGCGTCTGATGAGTCACGCTCGTGAGATGCACTATATC-
 GTCGCTCATCGAGCTGTGAGAGCGTCATCGAGCACGTGCGTCTAGC-
 GTGAGTCATATCGACACATCTATCTGACGATGATGATGATACAGACA-
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 GCATGTGCTGTATGCGAGTATCTGTATCTCAGCGCAGCTCGATGCGA-
 CAGAGTGACGCGACGCGCTCTCTGATGCGATGCATGTACATCTATCT-
 GCGCTGCTACATAGCGCATGCGTAGCAGTGCCTGAGTGCAGCACTGA-
 TGCGACACAGATGTACACAGCGTACATATCATCATAGCGCACACTCGC-
 GCCCTAGGCCCGGGGAATTCAAGGAA

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Horses

While not intentionally sought, the episode between Edith and Lotte has a link to my own experience. I grew up with three horses in a semi-rural context and I owe those animals for various moments of vulnerability, fear, and trust. Expanding fully on this connection exceeds the focus of this research, however a comment is necessary here. It was possible for me to understand the fabric of trust, intimacy, and negotiation in Edith's story in part thanks to what these experiences taught me as a child. For instance, in certain moments, I imagined to be injured in some fantastic adventure, laid with my belly on the back of the horse (rather than sitting), let the bridles hang loose, and let the animal walk home without me guiding it. My experience is different from Edith's because the horses in my experience were companion animals, not cart horses. I was playing, not working in the fields like her. I was about twelve and used to ride horses smaller in size than in Edith's memory, which is different to being a five-year-old and spurred to ride, for the first time, a cart horse. At the same time, this experience made me understand precisely what was meant with the words "The horse knows the way (home)", and also appreciate the shock of a first time.

In another moment, I had to relearn how to trust the horse after an accident. My horse tripped unintentionally on my face causing a major trauma, but luckily with no skull injuries. It left a wound on my cheek with a scar still visible today, altering my facial muscles and giving a marked asymmetry to my face. When it happened, I knew the trip was an accident (indeed the horse had a surprised expression when he saw me bleeding). At the same time, the shock provoked a fissure in what used to be a relationship of trust and intimacy between the horse and myself. I was aware of the potential damage between us, and had to gain my strength and resourcefulness to heal the relationship. I did so by visiting the horse the day after the hospital, my face swollen, aching and stitched. I remember the initial reluctance on my side, and then how touching his mane allowed the trauma to start healing. The scar on my face remains like a memory engraved on my flesh.

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Lab work: code, molecules, membranes

At a biotechnological level, *Semina Aeternitatis* combines computer engineering techniques for encoding purposes with genetic engineering protocols for *K. rhaeticus*. The following section is based on the publication I co-authored with Prof. Alistar (Alistar & Pevere 2020). To go from the transcript of the story to bacteria carrying it in their bodies, four phases were necessary: (1) encode the transcript into a DNA sequence, (2) mount the resulting DNA sequence onto a specially designed plasmid, (3) insert the plasmid into bacterial bodies via genetic engineering procedures, and (4) culture *K rhaeticus* to obtain biofilm.

(1) Encoding the childhood story into a DNA sequence

Prof Alistar designed a custom algorithm that converted letters of the alphabet to a ‘dictionary’ of trits (number with base 3) with features to optimize the result. One of the features was to remove the capitalized words for names and beginnings of sentences. She then adapted the existing Goldman algorithm (Goldman et al 2013) to go from trits to a sequence on base 4 for the four DNA nucleotides represented by the letters ACTG for adenine, cytosine, thymine and guanine.

106 The original German text:

“eine erinnerung, die erst durch ihre email rasch in meinem ...”

resulted in a sequence of nucleotides:

“TACGTGCGCTGTCAGTACACATAGCTCACGCTAGACACAGAGACGC-GCTGTCAGCAGCACAT ...”

(2) Plasmid design

The resulting nucleotide sequence needed to be mounted onto a plasmid to be inserted into the bacterial bodies. Plasmids are circular strands of DNA and are bacteria-specific. Prior to the experimental work, we used the software SnapGene to plan and design our cloning strategy in silico. Based on the available sequence information, we could generate the plasmid maps and estimated the sizes of DNA fragments to control the correct ligation and orientation of the storyDNA in our plasmids. Our

molecules were ready to be manufactured: we ordered our insert storyDNA from GeneArt (Thermo Fisher Scientific) and the plasmid backbone pSEVA331Bb from the plasmid repository Addgene²⁹. Special measures were taken to ensure the procedure of assembling both — the ligation procedure — would happen without altering the insert. pSEVA331Bb was delivered in an *E coli* agar stab; storyDNA in 5µl H₂O solution.

(3) Genetic engineering procedures

To prepare the insert storyDNA and plasmid backbone pSEVA331Bb for ligation, both need to be ‘amplified’: *E coli* cultures with each plasmid were grown overnight and processed in the morning to extract and purify the desired molecule. Via gel electrophoresis and specific enzymes, backbone and insert were isolated and prepared for ligation. Ligation binds the exact strands of backbone and insert, yet the procedure required some redundancy. We tested three concentrations and obtained 30 colonies of *E coli*. We extracted the desired final plasmid and checked its length with electrophoresis: samples 10 and 13 showed the desired length. The final step was electroporation: an electrical shock opened small holes in the bacterial membrane, allowing the plasmid to enter into *K rhaeticus*. We adapted an existing bioprotocol (Florea et al 2016) to prepare the cells to receive a controlled electrical shock. Electrocompetent bacterial cells in glycerol solution contained in conductive vials were placed into an electroporator device for an electrical shock of 1.8 V.

Electroporation is an anticlimactic procedure: the plasmid is added to a small amount of inoculated growth medium in a conductive vial. The pulse is not perceivable.

(4) Culture of *K rhaeticus*

To confirm we selected only transformed *K rhaeticus*, we cultured it in an antibiotic solution. The four successful cultures were inoculated into progressively larger volumes: from millilitres to litres. Eventually, cultures were inoculated in 30 x 40 cm trays to grow the biofilm for the installation. Before leaving the lab, the biofilm was autoclaved and placed under preservative.

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²⁹ pSEVA331Bb was a gift from Tom Ellis: Addgene plasmid #78269 <http://n2t.net/addgene:78269>; RRID:Addgene_78269

Working across two different bacteria strains — *E coli* and *K rhaeticus* — meant accounting for different volumes and time scales. Reagents to extract, purify, and ligate plasmid and DNA sequence were mixed in nano-metric volumes. The storyDNA³⁰ was delivered in 5µl H₂O solution: a volume that was hardly noticeable in the vial. For *K rhaeticus*, I prepared litres of culture medium. In optimal conditions, *E coli* cell division happens about every 20 minutes; *K rhaeticus* takes hours.

Accommodating these different scales introduced diverse uncertainties: for instance, reaching the desired optical density (a method of measuring the number of bacteria in a vial that relies on a light beam refracted through the transparent walls of the vial) took days instead of hours. The first trial was not successful and a second iteration was necessary, which extended the experiment by a few days. Once again, the work with biological material exposed the uncertainty and unpredictability of art practice and research. Material processes required negotiation with the performativity of matter; human plans are never only human.

A (sterilized) non/living piece and a research desk

The exhibition piece features a chimeric sculpture with a horse skull and biofilm in a glass cabinet with controlled condensation. Next to the cabinet, a three-metre-long table shows visual material from the research process. Context contributed to the creation of this particular artwork, such as international laws on genetically modified organisms; the narrow timeframe for artistic development after the collaboration with the laboratory was confirmed; and the unfeasibility of special maintenance to artwork at the Kunsthalle. While exhibiting living material was excluded, the uniquely wet materiality of the biofilm evoked liveliness.

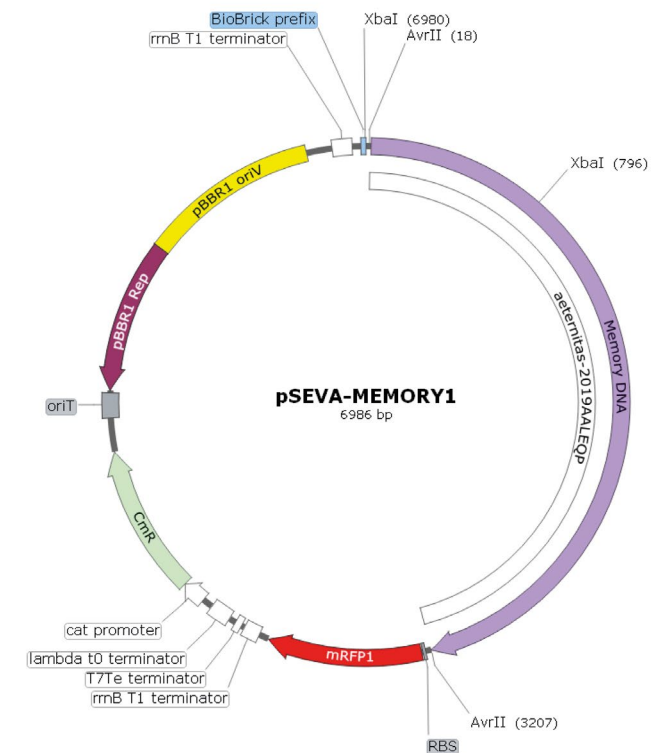
The chimeric sculpture developed around one element at the heart of the narrative: the horse. The horse's presence manifests through a skull as long-lasting biological remains, traversed by tensions across size and materiality. I received a degreased skull from a breeder of Andalusian horses, and refined its degreasing in my Berlin studio via H₂O₂ baths and scrubbing. The smooth, hard surface of the skull was combined with leaky, fleshy folds of biofilm. A preservative ensured the sculpture's

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How to name our molecule?
Dr Alf Spitschak labelled it 'MemoryDNA' when placing the order to GeneArt (Thermo Fisher Scientific), as seen in the pictures. I adopted Prof Alistar's suggestion of 'story-DNA' to avoid misunderstandings arising from the different meanings of the English term 'memory' in computer science and psychology.

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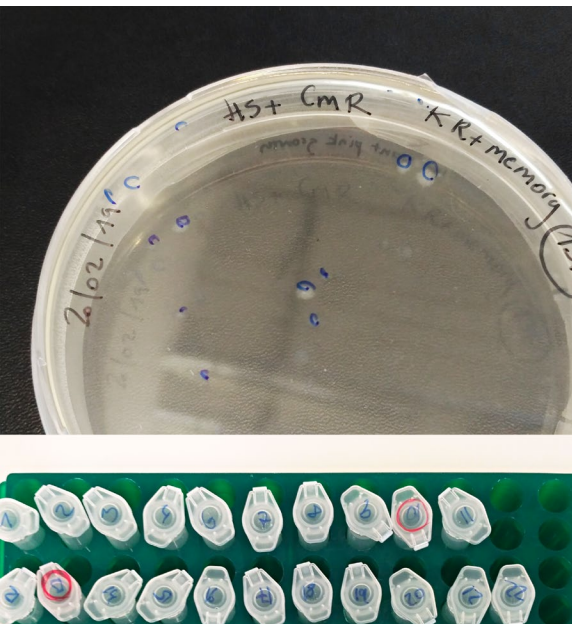
Plasmid diagram. (picture by Dr. Alf Spitschak).
The purple section corresponds to the transcript of the story converted to DNA sequence



sterility. Controlled moisture in the glass cabinet created condensation and dripping, to convey a sense of liveliness and an ongoing breathing process.

Petri dish with colonies of transformed *K. rhaeticus*

Vials containing the ligated plasmid (marked in red)



How to manifest the complex procedure behind the piece without borrowing the aesthetics of biotechnical equipment? How to invite the audience into the hybrid area of artistic research between poetics and experiments? Drawing on these questions, I presented the experimental process on a 'research desk' hosting materials produced during the process. Materials were annotated and arranged to entwine bioprotocols and poetics: pages from the research journal, microscope images of biofilm, gel electrophoresis prints with positive clones, plasmid maps, the transcript and its encoded version, algorithm formulae, and pencil drawings of horses and plasmids. Materials were pinned with needles like on a temporary board, to convey the non-linearity of research but also how memory is never fixed, but unstable and transient.

Exhibiting Semina Aeternitatis

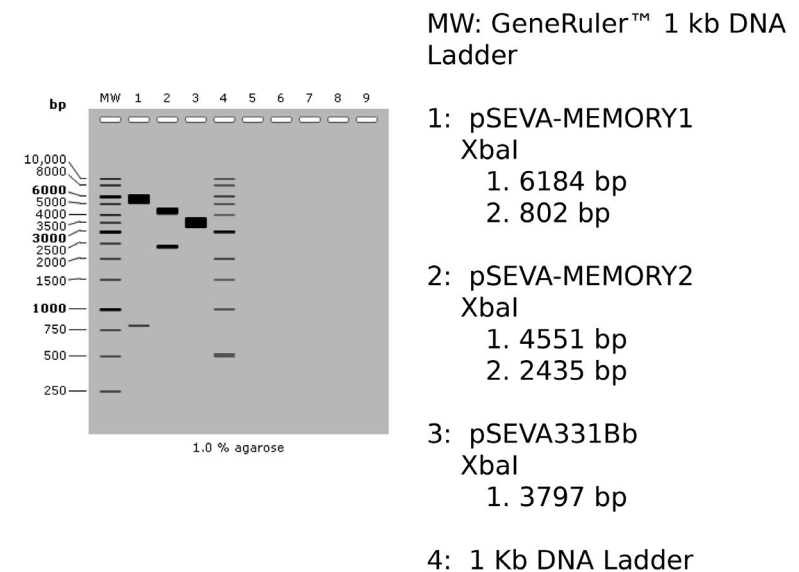
Following the work at the IEGT the piece was exhibited at *Experiment Future*. The

show brought together artists, citizens and scientists for a transdisciplinary look at possible future scenarios. It presented works by 18 contributors including Susanna Hertrich and Shintaro Miyazaki, Erich Berger and Mari Keto, Robertina Šebjanić, and Jenny Brockmann.

Semina Aeternitatis was exhibited in a large room with other installations, paintings, and speculative projects. The audience encountered the piece directly after the stairs that connected the ground floor to the first floor. The research desk welcomed the audience into the artwork space, offering drawings and research materials as a manifestation of the research

Simulation of the restriction enzyme which treated pSEVA plasmid with inserted storyDNA in one (MEMORY₁) or the other (MEMORY₂) orientation and the expected fragment sizes after electrophoresis (to separate DNA of different size to analyse them). This step was done after electroporating *K. rhaeticus* bacteria and extracting their plasmid DNA to verify the presence of "positive" clones to produce the biofilm with the storyDNA. (picture by Dr. Alf Spitschak)

Control digestion with XbaI (CutSmart buffer)



process behind the piece. The desk guides the visitor's gaze towards the glass cabinet with the chimeric sculpture placed onto a pedestal. The leaky interplay of bone and biofilm was unstable, yet controlled. Dripping and evaporation continued in the confined space of the cabinet.

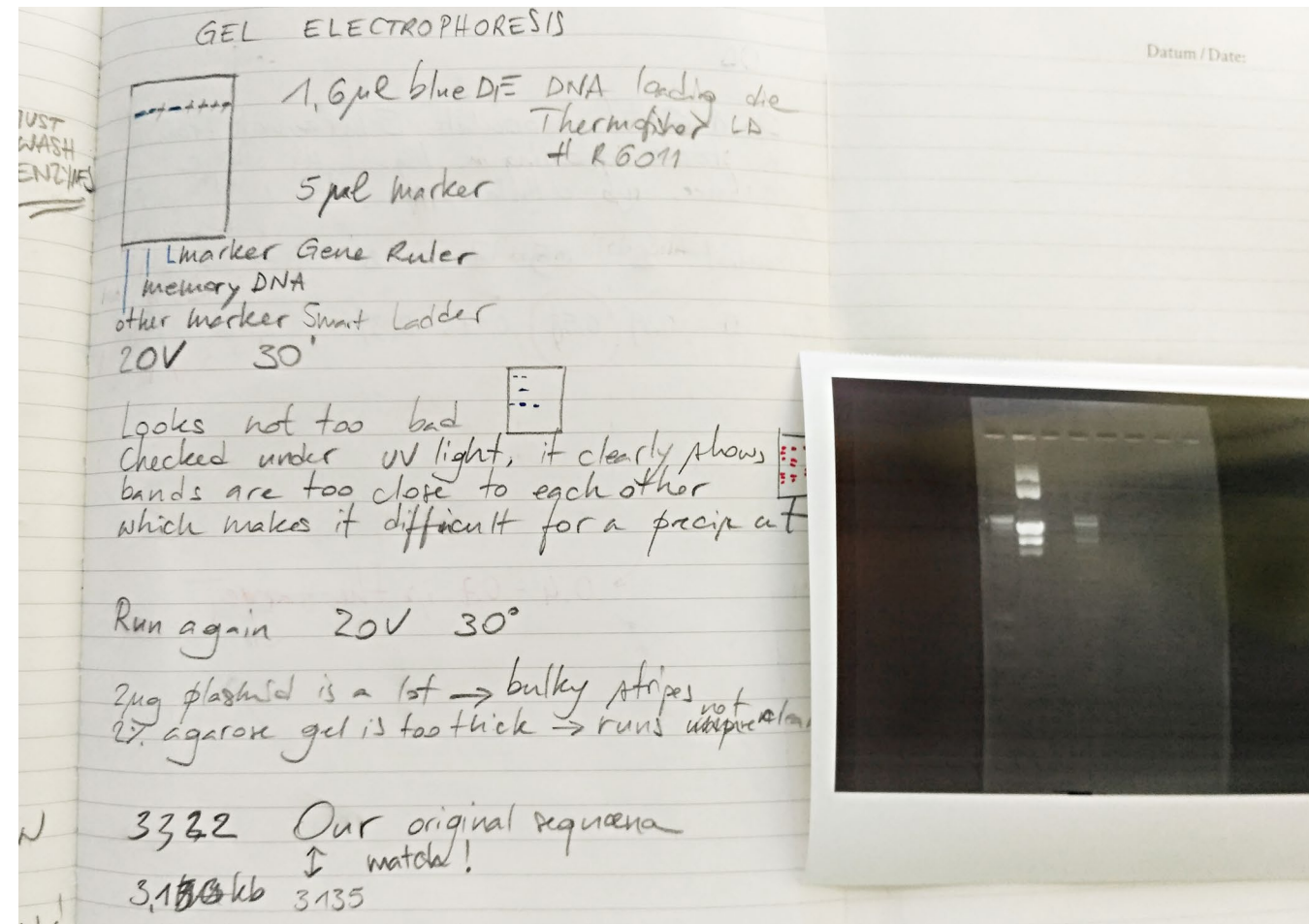
Today, the piece is preserved as disassembled elements. Part of it is in my studio: the biofilm in a sealed container under a preservative and a

test tube containing copies of the plasmid is stored in the fridge. Part of it is at the IEGT: a vial containing copies of the plasmid and a further vial containing frozen *K rhaeticus* with the memory plasmid. The bacterial chimera lives only in the biological laboratory, its living process frozen under ice.

Vials containing the custom DNA sequence (left) and the plasmid from Addgene.



Picture of the lab journal showing the result of the gel electrophoresis procedure, confirming that clones 10 and 13 were successfully transformed.



Wombs
2018-2021

Credits

Margherita Pevere: concept, realization, performance, bio-protocols

Gjino Šutić (UR Institute): biotechnological advisor

Jurica Mlinarec, Josipa Vukelić (KONTEJNER): production managers

Maja Bačić; Sanjin Kaštelan, Margarita Koši: photography

Ivanka Pašalić: (Association Staklenj svjet): flameworking

Matija Pavlic, Filippo Vogliazzo: sculpture-making support

Tanja Minarik, Ivan Šardi: video

Slug eggs were provided by Dr Heike Reise, Senckenberg Museum of Natural History Görlitz

Preliminary research and W.01 realized at Biofilia

W.02 and W.03 realized in the framework of the European Media Art Platforms EMARE program at KONTEJNER | bureau of contemporary art praxis, co-funded by the Creative Europe Programme of the European Union

www.margheritapevere.com/artwork/Wombs/

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The series *Wombs* meditates on sexuality and hormonal contraception from an environmental, more-than-human perspective and features three interconnected interventions of bioart and performance: *W.01* and *W.02* are non/living installations; *W.03* is a photographic series from a performance for camera.

W.01 features hanging organ-like scientific glassware hosting biofilm-producing bacterial colonies. Its culture medium is infused with an extract of my urine containing hormone metabolites and other residues, which I obtained by adapting older methods of hormone extraction (Schöneshöfer & Fenner 1981). For *W.02*, I worked with cells from my vaginal epithelium and cells from slug eggs. I tested various culture conditions which accommodate both cell types and set them in a hybrid culture which is part of the installation.

4

In *W.02* and *W.03*, terrestrial slugs are hermaphroditic allies in the exploration. In the non/living piece *W.02*, a sculptural extra-bodily organ with a DIY incubator hosts vaginal epithelial cells and slug egg cells in the same culture vessel. The photographic series *W.03* recounts a performance for camera with a slug named Branko, where I offered stillness by laying on the floor while Branko slid over my skin in a silent interplay of mucus, texture, bones, cavities.

Wombs stems from an apparently simple gesture that accompanies the sexual life of many: taking ‘the pill’. One of many contraceptive methods, its daily ritual often accompanies relationships between people with different sex organs (United Nations, Department of Economic and Social Affairs 2015); its superficial familiarity mediates desires and fears surrounding it.

The project reclaims the importance of hormonal contraception and therapy, while acknowledging the complex history and social rights movements behind them. It also reminds of how access to and availability of hormonal contraceptives are a matter of privilege still today. Importantly, it acknowledges how the biases of medicine regarding non-male bodies affected the kinds of hormonal contraceptives available today and the biopolitical implications thereof (Pevere 2022). Depending on its chemical composition, the tiny white pellet that many, including myself, swallow daily activates controlled feedbacks in the endocrine system and modulates glands and organs. In my case, the daily intake of progestin — a synthetic steroid hormone which mimics progesterone — prevents pregnancy by thickening cervical mucus, hindering sperm from entering the womb, and by stopping ovulation. Despite having a womb, my body does not menstruate: the progestin-only contraceptive does not induce bleeding, unlike most estrogen-based pills taken with interruption. The work transgresses this individual experience and expands on more-than-human, more-than-subjective experiences.

The gynaecologist presents me a poster with illustrations about contraceptive methods. We discuss my lifestyle and I point at the picture of the method that seems most fitting to it. How does ‘the pill’ modulate sexual organs, how does the specific composition of the pill I take act? The gynaecologist reassures me of its contraceptive reliability. When I ask for more details, I realize from the flicker in the doctor’s eyes that time is running short: the next patient is already waiting outside.

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Sex steroids in hormonal contraceptives modulate human sexual organs to prevent pregnancy. Yet, the same molecules may trigger the endocrine system of other organisms. On that basis, *Wombs* wonders how the progestin-based contraceptive I take may link my body to other, more-than-human bodies. By doing so, the project aims at a critical rethinking of sexuality and contraception as a human-only experience enclosed in one's own body, and thus helps to reframe discourses on sexuality and contraception beyond human terms.

Entangled in multifold bonds of medical care, exploitation, and mutual vulnerability, mammals, amphibians and fish are invisibly present in the hormonal modulation of human bodies as well as other animals' bodies³¹. Rodents are used in research; horses in the production of hormones (Raside 2017: 449). The estrogen-triggered ovulation of the frog *Xenopus laevis* caused the animal to be used in early pregnancy tests and, later, as a model organism in research (Kirksey et al 2016: 37).

Water organisms are exposed to mammalian steroid hormones which wash into ecosystems mostly through farming wastewater (Shore & Shemesh 2016; Adeel et al 2017; Combarnous & Diep Nguyen 2019). Next to synthetic hormones, other manufactured molecules that mimic naturally existing hormones and are released into ecosystems are called endocrine disrupting chemicals (EDCs). EDCs affect both plants and animals (including humans) by interfering with organisms in multifold ways (Jobling et al 2003; Frye et al 2012; Schug et al 2011). The phenomenon is increasingly threatening environments, and research has increasingly focused on understanding the widespread implications of this invisible pollution. While

the topic has reached the public arena, queer scholarship has pointed at the normative biases that mark its public reception (Ah-king & Hayward 2014). To open to ecologies of sex beyond human normative binaries within landscapes of more-than-human entanglements, *Wombs* involves bacteria and slugs: bacteria reproduce asexually by cellular division; terrestrial slugs are mostly hermaphroditic.

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³¹ In recent years, artists have addressed the interplay across hormones and bodies through multiple strategies. Eben Kirksey re-enacted the early pregnancy test in *The Xenopus Pregnancy Test*. An activist, hacking attitude characterizes more recent works by the GynePunk collective, *Mary Maggic*, and *Aliens in Green*, whereas Špela Petrič looks at plants. Molecular pollution is the focus of *aqua_forensic* by Robertina Šebjanič and Gjino Šutić and *Epicurean Endocrinology* by Byron Rich and Liz Flyntz.

Wombs: context of realization

Preliminary research was carried out at Biofilia, on whose basis I realized *W.01*. Funding to expand the series with *W.02* and *W.03* was secured through a successful application to the 2018 call of the European Media Art Platform's EMAP/EMARE programme, supported by the Creative Europe Programme of the European Union. EMAP/EMARE connects artists and venues to produce and disseminate artworks. I applied to the programme with the intention of working with KONTEJNER | bureau of contemporary art praxis for the curatorial focus on contemporary taboos though body, science and technology.

The scientific partner of the project is the independent research laboratory UR Institute, founded and directed by biotechnologist and artist Gjino Šutić. UR Institute hosts educational projects with a record of art and science collaborations with a biohacking attitude. The residency articulated in two phases: I worked for one month in the lab at UR Institute and for the art piece development, spent one month at the Art Academy in Zagreb.

As Chapter 8 *The Covid-19 Scar* explains, after the autumn 2019 exhibition in Zagreb it became impossible to display *W.02* elsewhere due to the extended lockdowns, travel restrictions and cancellations of public events that resulted from the pandemic. That also meant that I was prevented to work further on the cell batches as planned. To avoid the work being lost, KONTEJNER and UR Institute organized a follow-up residency in Dubrovnik, followed by an exhibition of the complete series. The pictures in this document are mostly from this occasion.

Distorted glassware for W.02.



Slugs

Terrestrial slugs are a ubiquitous species in the decomposers' ecological niche³². Only a few predators — such as porcupines, bugs, and cannibalistic snails — dare to deal with slug slime. Among humans, slugs bear the stigma of an unattractive, useless organism and are mostly considered a crop pest to be exterminated. When I talk to the audience about my project, audiences show diverse reactions to slugs. Some people recoil, and some describe how slugs are killed in gardens — lured and drowned in beer traps, or dehydrated in salt traps. Others find, instead, that slugs are 'cute'.

Gastropods display a variety of elaborate mating behaviours, such as hanging from a thick mucus entwined in the choreography of *Limax maximus* (leopard slug); extruding penial glands of *Deroceras* that extend towards the partner's; or shooting love darts into the partner's body as in *Philomycus carolinianus*. Were I to perform slug mating rituals, how would my body react to love darts?

Extensive literature addresses the ability of molluscs (including gastropods) to absorb vertebrate steroid hormones, in particular with regard to the field of endocrine disruption are water snails and slugs (Jobling et al 2003; Zou 2019). Less is known about terrestrial slugs, although the physiology of the animal is comparable. Previous research suggests that in hermaphroditic gastropods different vertebrate steroid hormones may activate different parts of the reproductive system (Kruatrachue et al 1996). Recent comparative studies point at how the absorption of steroids by molluscs may be an indicator of exposure (for instance in water environments), rather than assuming an endocrinological role (Scott 2018), while others report that while there have been indications that sex steroids are active in gastropods, the question remains unresolved (Zou 2019: 473). However, for gastropods (in particular in aquatic environments) that remain fundamentally exposed to EDC, hormones and chemicals in general, clarification is sought (ibidem).

In 2019 I built two terraria for slugs I collected from the neighbourhood. In Dubrovnik I collected brown slugs, all about five centimetres long. In Zagreb, the terrarium hosted one 18 cm long leopard slug I encountered in one of my first evenings there. I named the leopard slug Bran-

³² Artist Paul Hurley took the invertebrates' point of view in his metamorphic performances *Becoming-slug and Becoming-snail* (2003-2005). Katja Aglert interrogates the perception of the Spanish slug as an invasive species (2014), while Maximilian Prüfer's series show slug aesthetics in filigree-like snail trail works.

ko. In 2021, I observed the development of slug eggs received from Dr Reise.

Lab work: cells and bodily fluids

The character of the lab work for *W.01* and *W.02* was investigative and open-ended rather than pursuing the completion of a specific experiment, so as to leave room for the observation of biological material. In both cases, I combined established scientific protocols with DIY techniques based on existing literature. The laboratory work followed four main directions: (1) basic methodologies of hormone extraction from urine (for *W.01*); (2) human epithelial cell extraction and culture; (3) slug cell extraction and culture; and (4) realization of a custom-made cell incubator (for *W.02*).

I prepare egg cells and tissue for cell culture. During the dissection of a 4 cm long slug, the slug's non-living body excreted so much slime I could hardly control the scalpel. I explore Branko. Although I rarely touch it, I observe it. What may happen if I expose my body to its exploration? I wonder how to include its point of view in the process and manifest it in the exhibition space. Branko creeps out at night for food, and hides most of the day. It eats melon, but ignores lettuce. Its moist body extends and contracts. It is repellent and sensuous at the same time.

For *W.01* I worked in Biofilia. Research aimed at gaining insights into how sexual hormones regulated ovulation and reproduction, and understanding the principles of hormone extraction and purification from urine. While today's hormone extraction methods rely on advanced techniques, I searched for basic methods I could replicate with a relatively easy set-up.

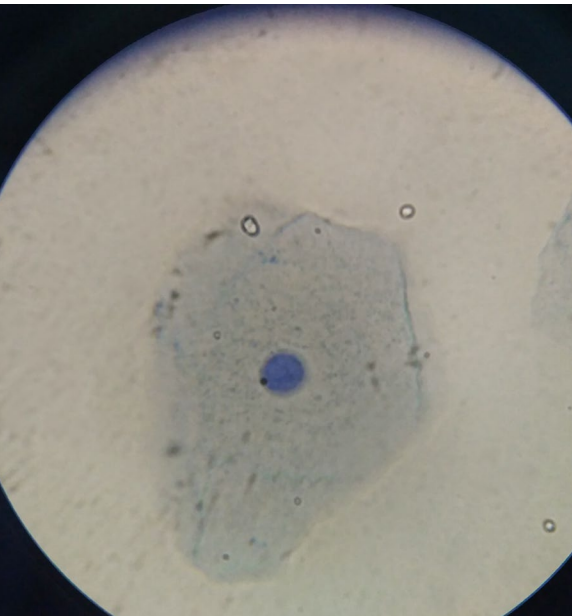
The experiments aimed to obtain urine extract containing hormone metabolites. My work focused on solid phase extraction and liquid column chromatography based on Schöneshöfer & Fenner (1981). Chromatography is a widely used technique for separating different elements in a liquid with a solvent (gas or liquid), based on the distribution of molecules with certain features. For this property, chromatography allows the isolation of desired molecules in specific portions of the experimental substrate.

I collected the first urine in the morning in a sterile container. In the lab, I ran the protocols on several columns. I collected the resulting liquid sample in test tubes, dried it, and stored it ready to be mixed with the bacterial culture medium in the installation.

For *W.02*, I worked at UR Institute facilities in 2019 and 2021. The work done in 2021 was based on the experiments of 2019, with some improvements regarding both the harvesting of vaginal cells and of cells from slug eggs.

Both in 2019 and 2021, I harvested vaginal epithelial cells by gently scraping my vaginal lining with a plastic spatula. I performed this action in a separate room next to the biolab, and placed the scrape in a sterile

Single epithelial cell under microscope, 2019.



container. In the lab, I transferred the scraped matter to centrifuge tubes, added a PBS buffer and proceeded with a combination of centrifuge and rinsing with buffer to remove the vaginal mucus from the sample. Finally, I added antifungals and antibiotics to suppress the vaginal flora and rinsed the pellet before setting it to culture. Cells reacted positively to the culture setting, dividing abundantly and creating tissue chunks that were visible with the naked eye: small whitish fragments on the bottom of the culture vessel. I looked at them through the microscope lens; was it my body that I was looking at? The cells formed an extra-cellular matrix; filaments that connect tissue fragments.

Cells were cultured under different growth conditions and FBS concentrations over a period of 4 weeks. The cells responded well to the experimental culture setting and divided. In my observations, a different fetal bovine serum (FBS) concentration corresponded to different cell growth rates: 0% FBS kept cell metabolic rates inactive; 1% FBS maintained metabolic activity; 10% FBS stimulated metabolic activity and growth; 40% triggered cell division for 4–6 weeks, after which the cells stopped dividing. I tested glass and plastic containers, different temperatures, scaffolds, and static and agitated cultures.

In 2019, slugs and slug eggs were collected in the vicinity of the lab. Slug cells were obtained by slicing slug eggs or from one dissected specimen.

Cells were cultured under different growth conditions for 4 weeks. The stem cells obtained from sliced eggs did not divide: they were alive, but did not display signs of growth. Cells harvested from slug eggs also do not divide. I did not have the chance to test their metabolic activity, so I cannot say more about how they were alive. I wonder how this apparent stillness is a manifestation of agencies which I could not access. Cells from the slug mantle quickly became contaminated and we discarded them. A modified version of Grace's Insect Medium with pH adjustment provided a better culture medium.

The ethical question arising from the dissection of an animal within an art project is wide and manifold, even when the same animal is commonly killed in a variety of ways by gardeners. In conversations I had while developing the project, people told me of how they kill slugs without manifesting any ethical questioning. They even indulge in sharing details without me asking for them. Yet, the idea of dissecting a slug for an art project triggered reactions in some, suggesting how art has the capacity to magnify areas of frictions but also different standards. I will return on this in Chapter 6.

In 2021, I received slug eggs of two different species (*Deroceras invadens* and *Arion hortensis*) from Dr Heike Reise of the Senckenberg Museum of Natural History Görlitz (DE). The eggs of *D. invadens* are transparent and, under the microscope, allow a view inside as the egg develops. I opened the egg shells with a gentle chlorine bath at early stages of development and cultivated them according to the protocols developed in 2019.

From the initial batches of slug and human cells, I created several batches and used some to test suitable conditions for the hybrid culture. Eventually, I froze the remaining batches under glycerol to store for future exhibitions.

For *W.02*, I built the first prototype of a DIY incubator in 2019. The incubator followed basic principles of controlled humidity and temperature by employing a Styrofoam box and an electrical thermostat which regulated temperature by switching an incandescent lightbulb on and off. Instead of using a CO₂ controlled environment, the acidity level of the culture was adjusted by adding HEPES buffer or by replacing the culture medium.

Tendrils and extra-bodily organs

“The aesthetic of *W.01* and *W.02* evokes extra-bodily organs rather than technoscientific imaginaries: they are fleshy, distorted, to a certain extent obscene” (Pevere 2022). I imagined the pieces as extra-bodily organs suspended in the space.

For *W.01*, I employed a series of glassware objects from my personal collection, glassware hanging from a canopy of translucent silicone tubes. The installation floats in the space, its whitish tendrils stretching out above the visitors’ heads and across the exhibition space. Inside the glassware, pigmented microbial cellulose host a living bacterial culture in an environment infused with the urine extract. The translucency of the glass and silicone creates a strong contrast with the flesh-like interior of the glassware.

I designed the aesthetics of *W.02* taking inspirations from the anatomy of human and slug sexual organs. “Tendrils grip on the ceiling and sustain a gestating body which contains the DIY incubator. Inside, organ-like distorted scientific glassware hosts the hybrid human–slug cell culture” (Pevere 2022). Its aesthetic plays further with the

contrast between fleshy materiality and glassy transparency. Its outer surface is rough, glistening, red, whereas the inside of the incubator is filled with soft light and the gleaming curves of the glassware.

The series underwent some improvements following the first exhibition. In the current version of *W.02*, a glass flap on the installation allows the visitor to look inside the incubator. I did not include a microscope to magnify the cells with the intention to offer the audience an enigmatic engagement with the biomatter. Rather, I placed a Fresnel lens (a flat, lightweight lens) to distort the vision of the inside: the visitor may tilt or move to find their best visual angle. While the visitor moves, the Fresnel

lens creates an optical distortion, resulting in flowing lines and uncontrollable shapes. Looking closely, however, small cell chunks and their whitish haze can be seen inside the glassware.

KONTEJNER and I looked into the possibility of ordering custom-made glassware, but that was too expensive. One of the manufacturers we addressed declined the collaboration because “contraception and abortion clash against his Catholic values”. Eventually, we met Ivanka Pašalić, a former veterinary researcher in a pharmaceutical company now working as a craft glassblower. I purchased a batch of secondhand glassware, with the same shape of those used in *W.01* but smaller, and worked with Ivanka for four days.

The glassware I purchased is of two kinds: one heavier — older — and one lighter. You see the difference under the flame. Glassblowing requires body memory. Glass has a body memory too; some marks are visible after remelting. Cracks can be mended, but may reappear after some time. Deflate, shoulder, torsion. Each piece contracts and deflates under its own weight.

In 2019, I cast the outer part in silicone through the traditional technique of clay moulding followed by plaster casting. During this phase, I received the help of sculptor Matija Pavlic. Reddish flesh tones and whitish streaks were achieved by layering differently toned silicone in the mould.

After the first exhibition of *W.02*, a few improvements were needed. I remade the incubator part with both aesthetic and practical improvements, and a simplified hanging system. In 2021, I completely redesigned and remade the part of the installation hosting the incubator. With the help of media designer Christian Schmidts, I designed a polygonal shape cut in transparent Plexiglas. An important aspect of the design was to improve the opening for the visitor to look inside, allow access for maintenance, and accommodate the flap to close the installation and thus create a protected environment. This required careful design to make it suit the overall organic shape of the installation.

Once the polygon was assembled, I proceeded to work on the final form of the installation with the support of sculptor Filippo Vogliazzo. The first step was to mount layers of polyurethane foam onto the Plexiglas polygon. The foam is a classical sculpture material which is also used in thermal insulation, thus meeting both the aesthetic and insulation needs of the piece. Once the polyurethane foam was assembled, I sculpted it into

Detail from the flameworking session with Ivanka Pašalić.
Distorted glassware cools on plates.



its final shape by carving and sanding. I then treated the sculpture with natural latex for its final finish, applied with hands. This second version is lighter, more stable and easier to assemble. Importantly, it allows an easier access to the inside of the chamber with a lid that can be opened and closed with screws.

I prepared the performance for camera *W.03* with photographer Sanjin Kaštelan. Including the preparation, it took a couple of hours. I stretched a piece of fabric on the coarse wooden floor, took the leopard slug Branko from the terrarium and placed it onto my back. Lying on the floor with the slug, I watched it explore the space of my skin. Branko felt heavier than it seemed and, contrary to my expectation, was not 'shy' and did not hide; rather its slimy soft body was fully stretched. I felt some aversion, even after all the time I had spent observing and feeding it. The slug reclaimed the surface of my skin with silvery trails. Aversion dissipated into

When I placed the last mould in the courtyard outside the studio to dry overnight, I saw two leopard slugs circling around each other close to the moulds: they were beginning their mating ritual

a silent interplay of mucus, skin texture, bones and cavities. When I left Zagreb, we released Branko in the yard.

In post-production, I cropped Sanjin's pictures, blew up textures and lumps until

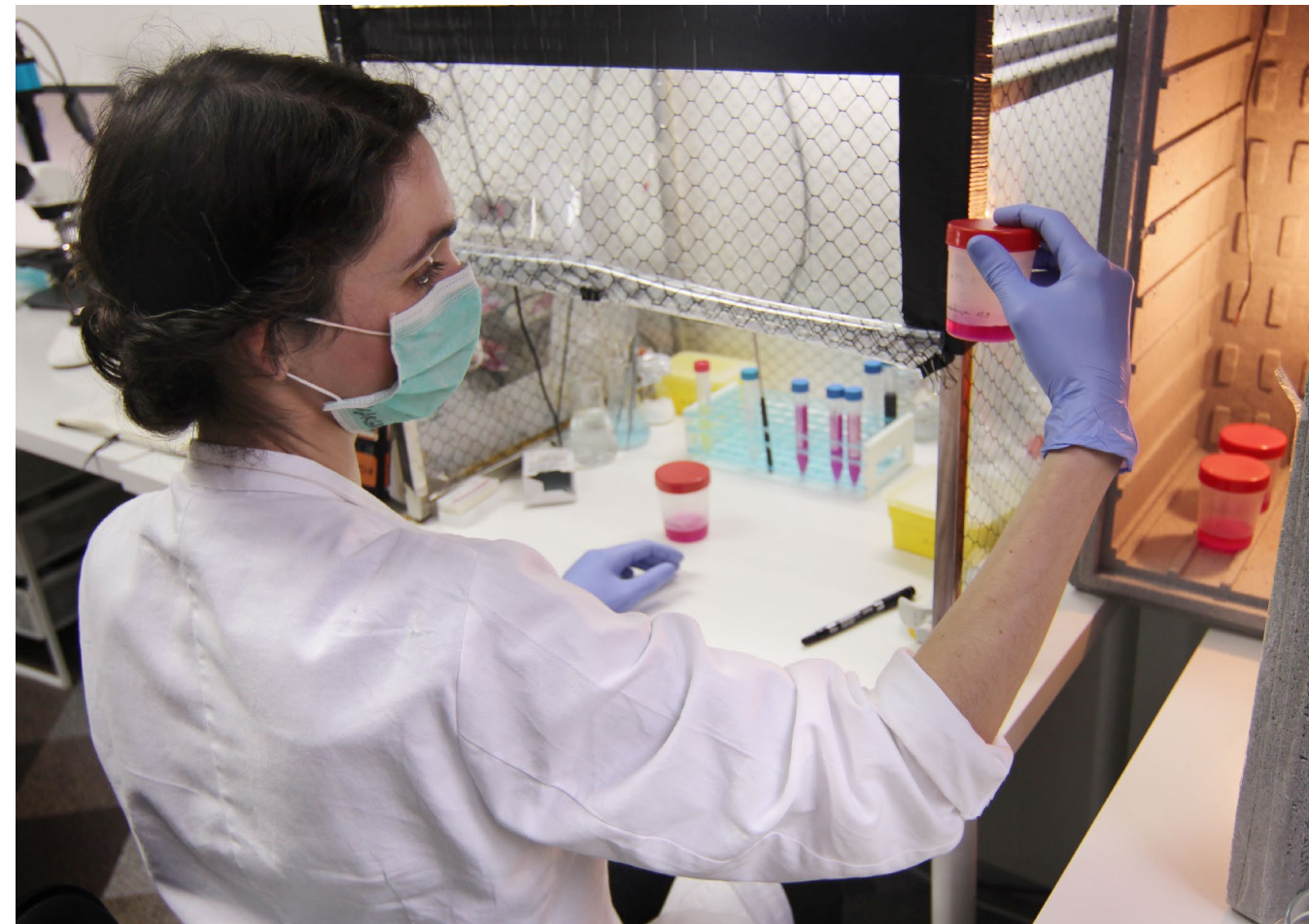
they became abstract landscapes. The pictures are exhibited in rectangular frameless Plexiglass encasings that I designed. The transparent encasings evoke the material interplay of *W.01* and *W.02* and hang from metal hooks.

Exhibiting Wombs

While different instances of the series were exhibited, for the purpose of this dissertation I focus on the two shows where *W.02* was displayed.

The first was *Extravagant Bodies: Extravagant Love*, curated by Klara Petrović, Luja Šimunović, and Stahl Stenslie at Hala V of the Nikola Tesla Technical Museum in Zagreb in 2019. *Extravagant Bodies* is a triennial show that deals with social demarcations of normal and pathological, be they concerned with corporeality, appearance, sexuality or lifestyle. The show featured works by about 40 international artists, including Marta de Menezes, Anna Dumitriu, Branko Milisković, Jaden J. A. Hastings, Beth Stephens & Annie Sprinkle, and Julischka Stengele.

Lab work in 2019. Photo by Margarita Kosi.



The second was a solo show organized by UR Institute in Dubrovnik following the residency in 2021, and was curated by Gjino Šutić and myself. It was the first iteration of a programme of residencies and shows initiated by UR Institute with topics ranging from ecology and citizen science to transdisciplinary collaboration. In this show, the whole series *Wombs* was on display: *W.01*, *W.02*, *W.03*, a sketch, and a video corner with the video documentation to give a comprehensive insight into the project.

Seeing the works in these different contexts gave me the opportunity to reflect on how the various instances of the series ‘work’ in the spaces. At *Extravagant Bodies* in 2019 I exhibited *W.02* with the prints of *W.03* (attached to the wall with no frames), along with pieces of wood with slug trails from Branko’s terrarium. At UR Institute in 2021 I showed the whole series, including a sketch and all the framed pictures from *W.03*.

Both shows played with the idea of the multiple that is present in the series’ title, however in Zagreb *W.02* was the central piece. Exhibiting the complete series magnifies the multiplicity in the work and creates a non-linear narrative of encounters. The more-than-human entities in the work (organisms, cells, repurposed scientific equipment) drift from the inquisitive gaze and rather give the feeling of a crawling garden of leaks and flesh.

Concluding remarks

Wombs and *Semina Aeternitatis* overlap to a certain extent, yet they present thematic and methodological differences. The works were realized in an international context following preliminary research at Biofilia. Funding was granted for each work separately with consequent differences in timing, context and collaboration, which in turn influenced both lab practice and development of the exhibited piece.

Semina Aeternitatis was realized for a first-of-its-kind show in Rostock and as a first collaboration with a cancer research facility. I was an alien at the IEGT, a hybrid. My tight schedule may have left little room for familiarizing across disciplinary differences, however informal conversations revealed significant openings. *Wombs* was realized in collaboration with an independent lab and an art venue with notable experience with transdisciplinary work.

The lab practice had different approaches in *Wombs* and *Semina Aeternitatis*. The latter aimed at completing a precise experiment and therefore retained a goal-oriented approach. The lab work in *Wombs* was, to a certain extent, investigative and open-ended. Lab practice in *Semina Aeternitatis* aligned with established paradigms, materials, procedures, and compliance to the schedule and allowances of a cancer research facility. In *Wombs*, some established procedures were intentionally tweaked and denuded, and bioprotocols partially unpacked via DIY methods (Vaage 2017).

The pieces are exhibited as composite installations. The main element of *Semina Aeternitatis* is a chimeric sculpture featuring biological material, which dialogues with elements from the research process (the research desk) or points at the others’ point of view (the wood with slug trails). However, for *Semina Aeternitatis*, GMO biofilm is sterilized, whereas in *Wombs* cells are exhibited alive. The works have been realized inside scientific laboratories, exhibited in a sculptural form in the exhibition spaces, and remain — disassembled — in different places for future shows.

Cells are stored at UR Institute in Dubrovnik, bacteria at the IEGT in Rostock, while the installations are stored in crates in my studio in Berlin. Their different materialities require different conditions: the components of the installations need a dry space that can accommodate their size, whereas cells and bacteria are frozen in vials under controlled humidity and temperature. When the works are requested for future shows, these elements will be shipped, change setting and come together again. They will encounter my manipulation again, new contexts and unpredictable challenges. While cells and bacteria are shipped with adequate measures, will they survive the travel? Will external factors delay their shipment? Some venues will have the capacity to establish collaboration with biolabs

W.02, about to upgrade the incubator in my studio in 2021. In the background, the Plexiglass polygon. In the foreground, the foam used as both insulator and sculpting material.

W.02, detail of the latex drying. Applied on the polygon and foam, 2021.



for cell work. Other venues may be interested in the glassware of *W.02* or the pictures of *W.03*. Beside these variable factors, unpredictable events like the recent pandemic may affect the presentation of the artworks to the audience.

Both works hybridize more-than-human vulnerabilities (about transience in *Semina Aeternitatis*, sexuality in *Wombs*) with the vulnerability of more-than-human others, as both *K rhaeticus* and slugs have been little investigated in regard to the questions underpinning the works. One may argue that the artworks do not offer direct answers to the questions. Rather, they debunk expectations and expose them to an abrasive rethinking. They show openings and overlaps that weave together an ethical and aesthetic fabric of instability of (biological) matter and minuscule biopolitics. More-than-human bodies are folded open to flows both intentional (ie, genetic engineering in *Semina Aeternitatis*) and unintentional (ie, slug mucus and extra-cellular matrix in *Wombs*).

During the realization of the artworks, some questions emerged that may be worth investigating in the future. For *Semina Aeternitatis*, for instance, the time available did not allow us to extract DNA from genetically modified *K rhaeticus* and decode its text. Did any mutations take place? Was the text modified through mutations, and if so, how? It may be worth exploring to what extent autoclaving affects the plasmid trapped in the microbial cellulose sheets used for the sculptural piece.

Slugs bring into *Wombs* an area of indeterminacy that is artistically fertile. Their hermaphroditism challenges normative human binaries and allows exploration of the ‘body with a womb’ beyond classifying is as ‘either female or male’. Rather, what is at play are hormonal implications, correspondences and discrepancy. Thematically, the work taps into a field studded with open questions and resists resolved scientific paradigms. The project acknowledges how the debate is still open about whether gastropods respond to vertebrate steroids, and how less is known about terrestrial slugs than other aquatic gastropods. Rather, the lack of resolute answers is a reminder of how knowledge is shaped by sometimes contrasting findings, lack of data, and an ongoing process of revision.

W.02, preparing the mould with clay, Zagreb 2019. Photo by Sanjin Kaštelan.



132-133

Semina Aeternitatis: The Book of memories, made with biofilm obtained from a wildtype of *Acetobacter*. Microbial biofilm, paper, cardboard, ink. 2018

Plasmid study. Pencil on Paper, 2019

Macro photography of transformed *K. rhaeticus* colonies on agar plates. The reddish tone indicates successful transformation, for the plasmid contained a red fluorescent protein. Microscope image of biofilm produced by non-transformed *K. rhaeticus*.

134-135

Detail of the chimeric sculpture. Biofilm folds on the skull.

Detail of the research desk in the exhibition, with pictures from the transformation process. Detail of condensation on the glass cabinet.

136-137

Detail of the research desk exhibited at *Experiment Future*, with pictures from the text-to-code conversion and petri dish with bacterial colonies.

Detail of the research desk, with studies of horses and plasmids. All drawings are pencil on paper.

138-139

Fragments of microbial cellulose in liquid medium.

140-141

Wombs: Preliminary study, pencil on inkjet print, 27 x 18 cm, 2018

Slug egg under microscope, 2021.

Detail of wood pieces from the terrarium I built in 2019. Silvery slug trails are visible.

142-143

Epithelial cells forming tissue under microscope, 2019.

Dried epithelial cells, preserved after the show.

Slug mucus under microscope, 2021. Slug mucus has an inherent thickness and retains volume under the microscope glass, thus allowing flows that become visible thanks to methylene blue staining.

Slug cells under microscope, 2021. Slug egg cells tend to stick to mucus filaments.

144-145

W.01, detail, 2018.

W.02, 2021. Photo by Maja Bačić.

146-147

Preliminary study, pencil on inkjet print, 27 x 18 cm, 2018.

W.02, detail of the glassware seen through the Fresnel lens, which creates the distortion effect. Photo by Maja Bačić.

148-149

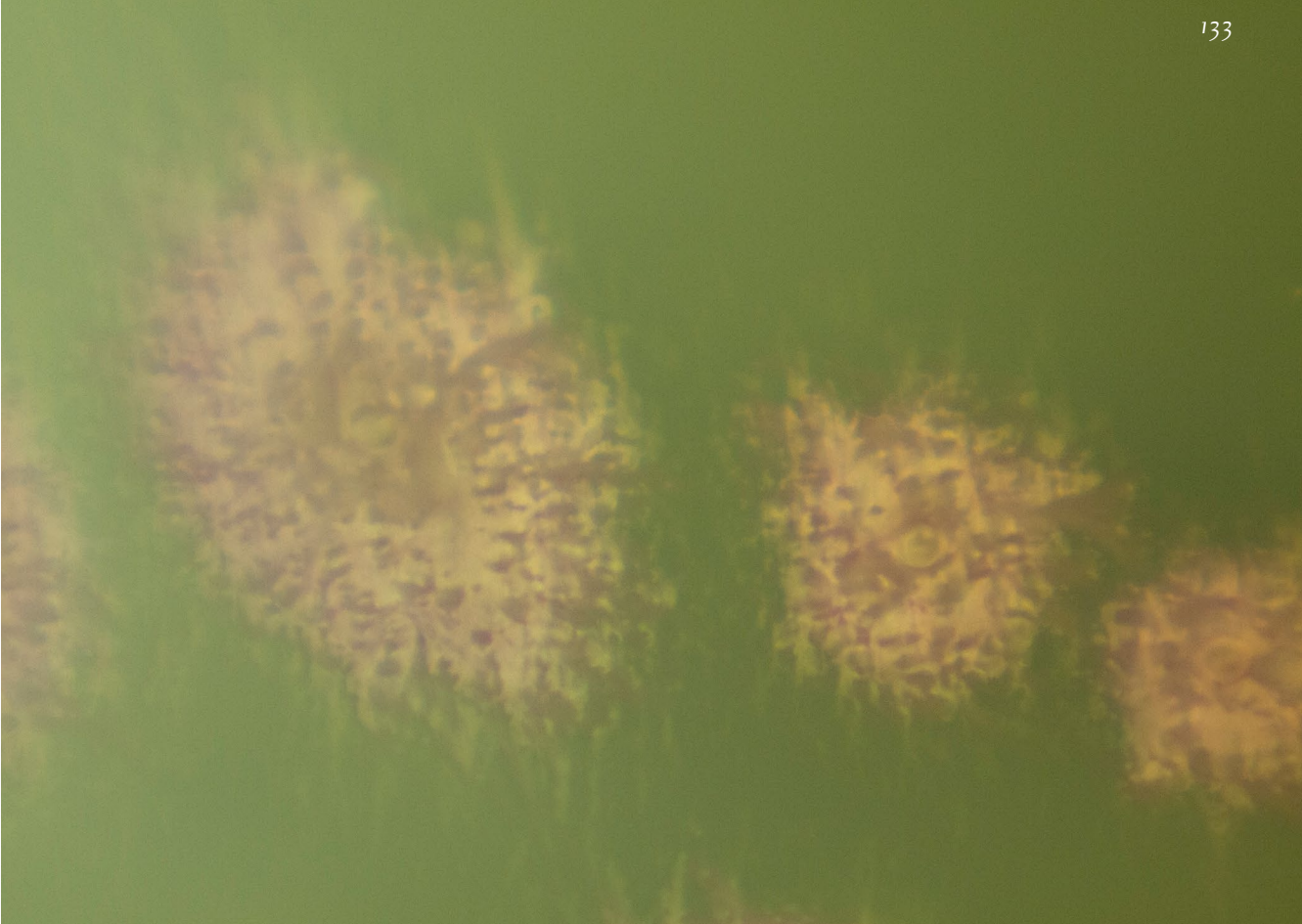
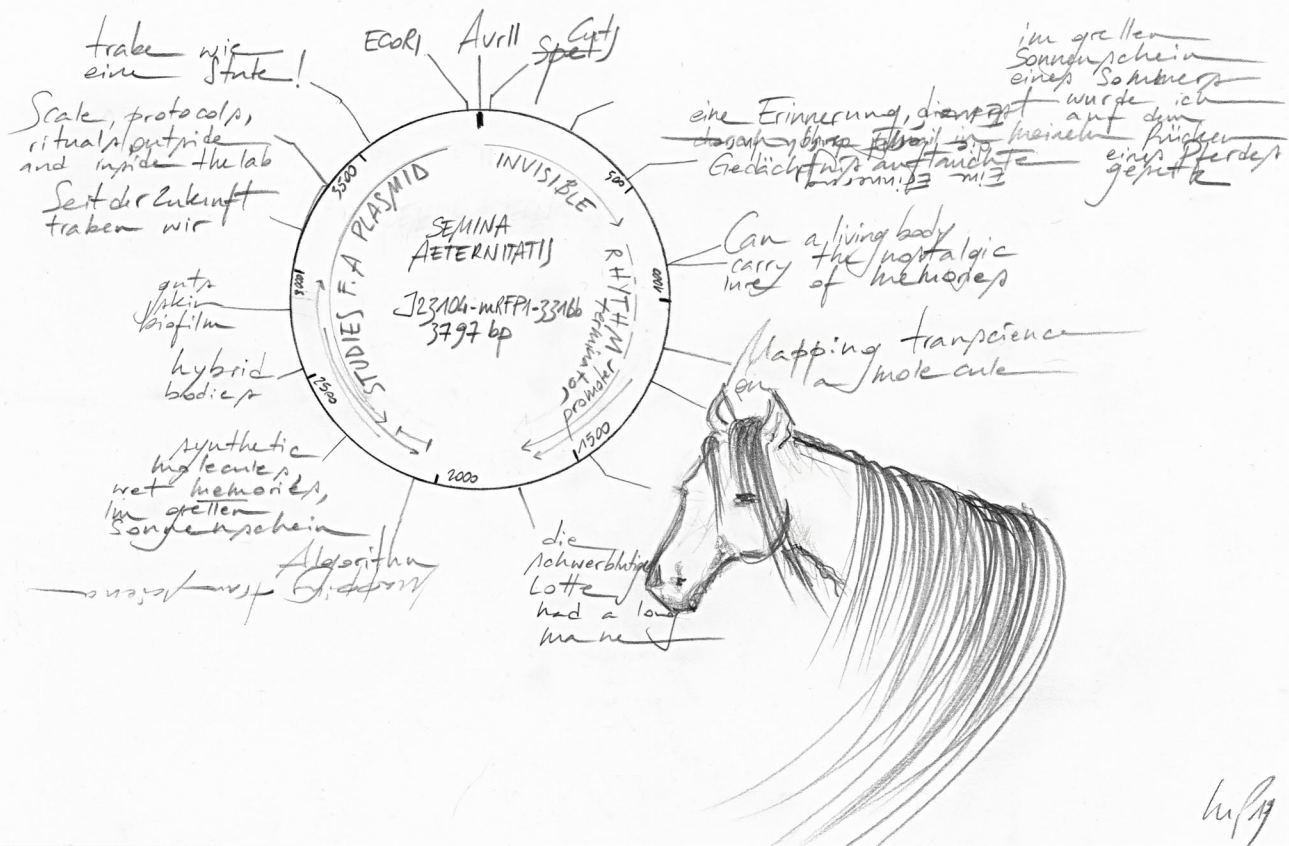
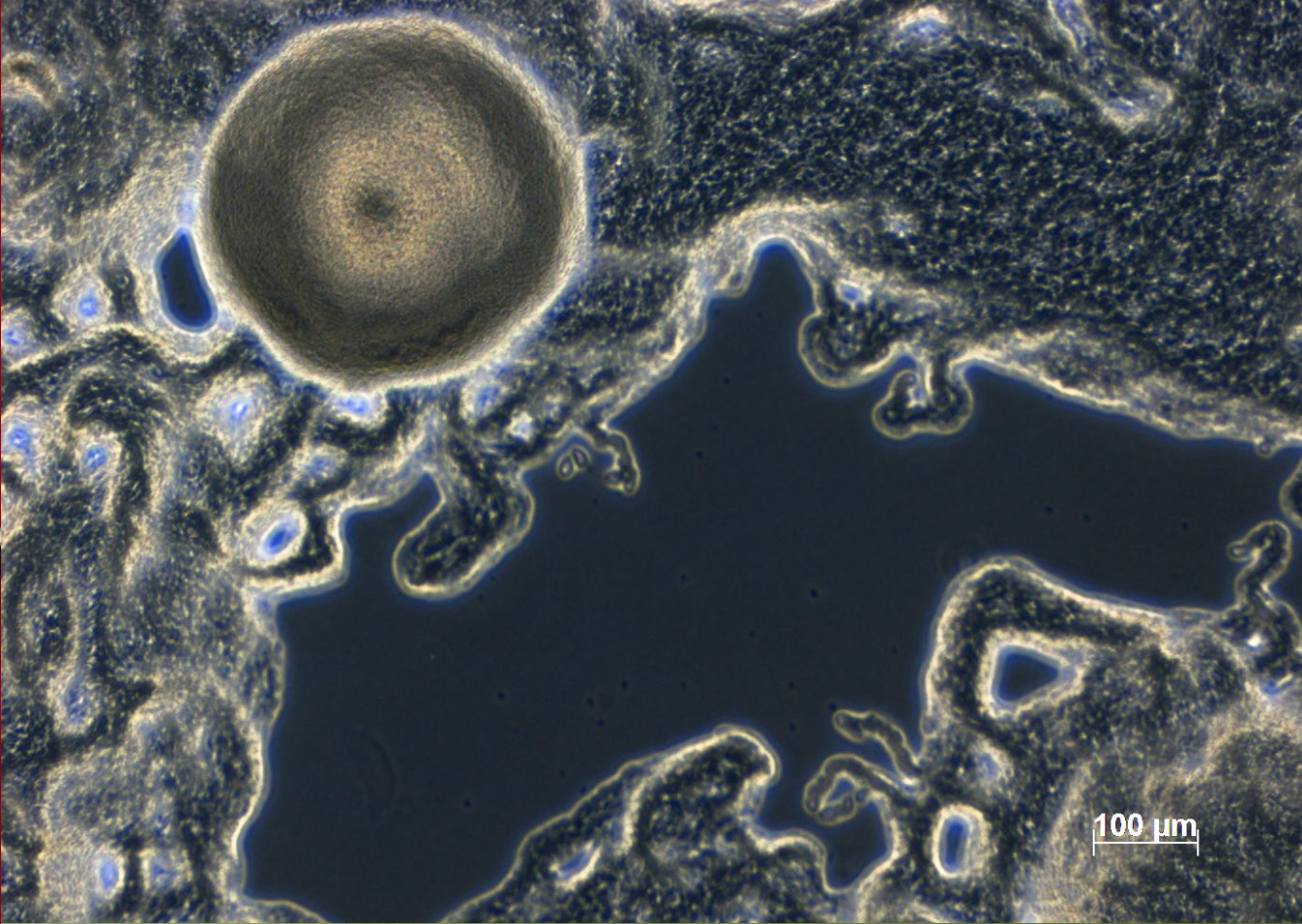
W.03, exhibition view at Art Laboratory Berlin. Photo by Tim Deussen

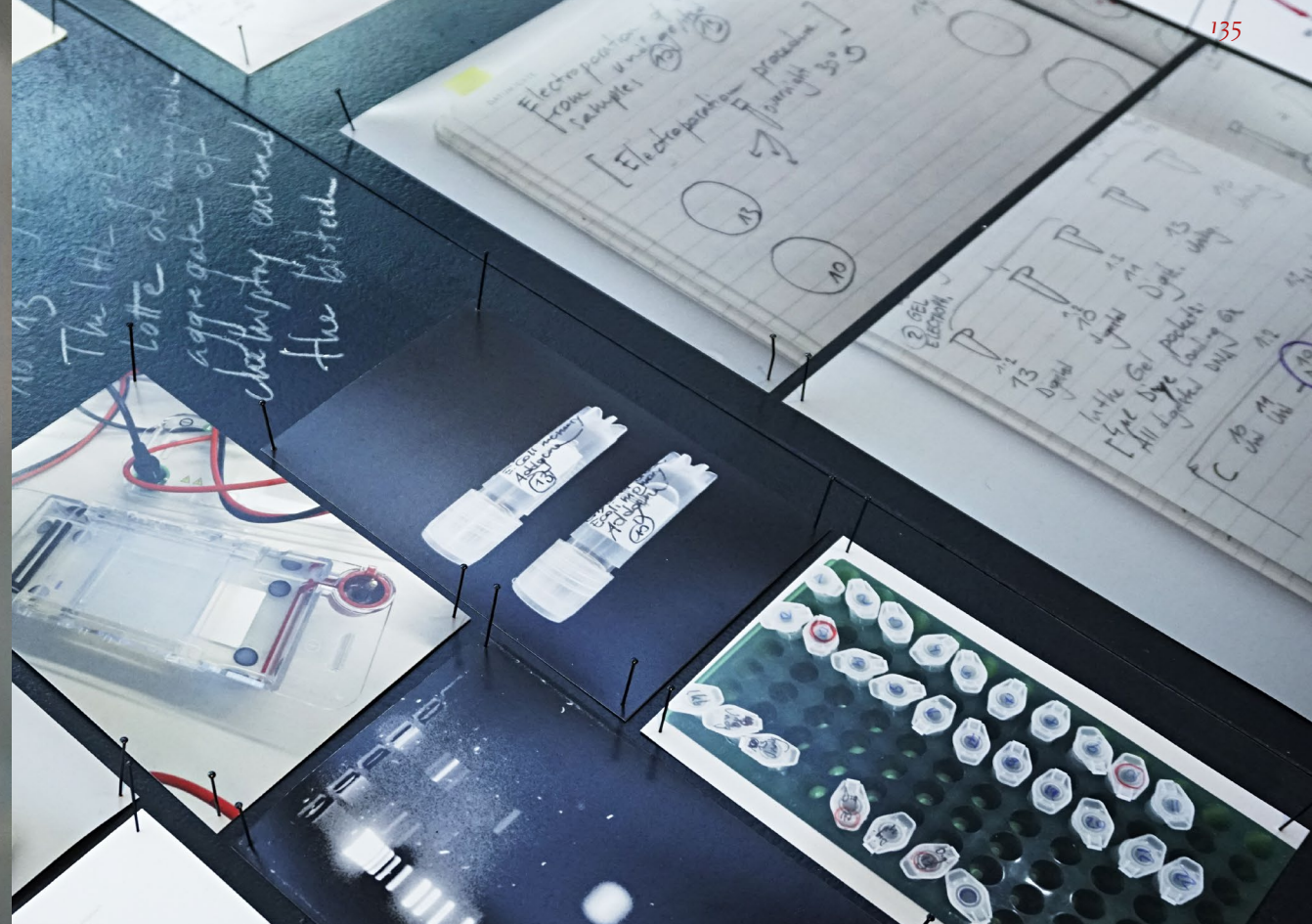
W.02, detail of the glassware with the culture of slug and human cells. Photo by Maja Bačić. Exhibition view at UR institute (2021). In the foreground W.02 (detail); in the background W.03. Photo by Maja Bačić.

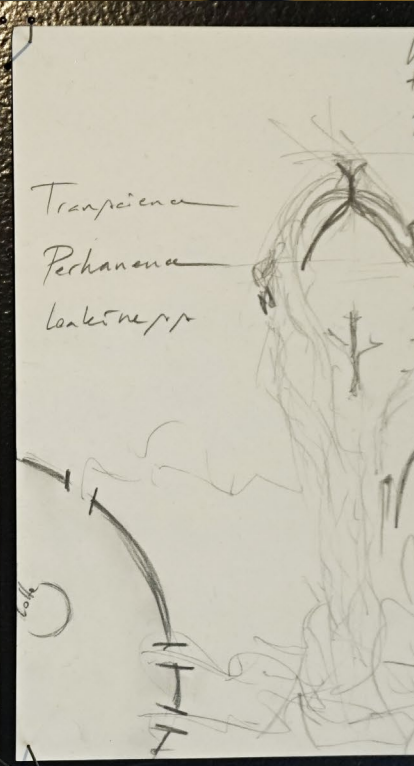
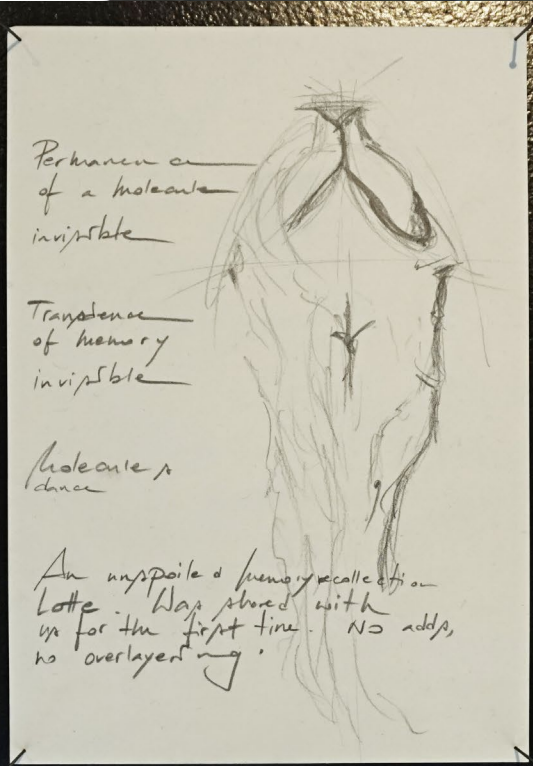
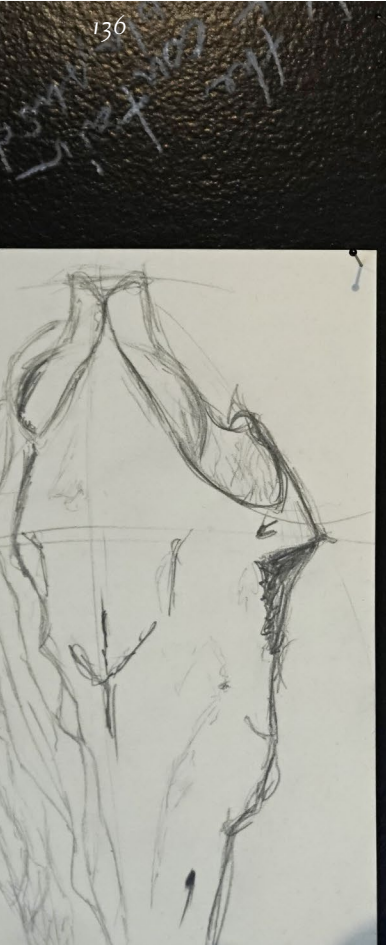
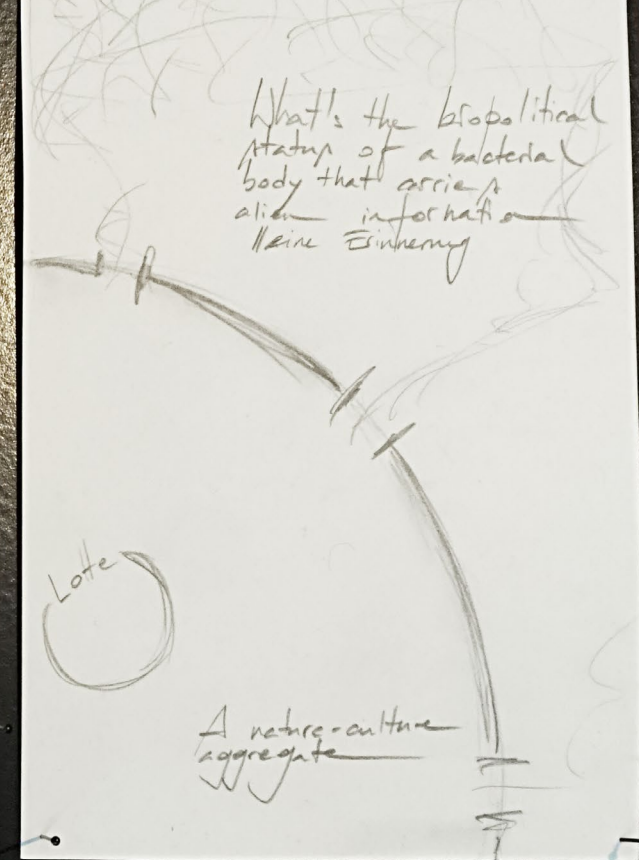
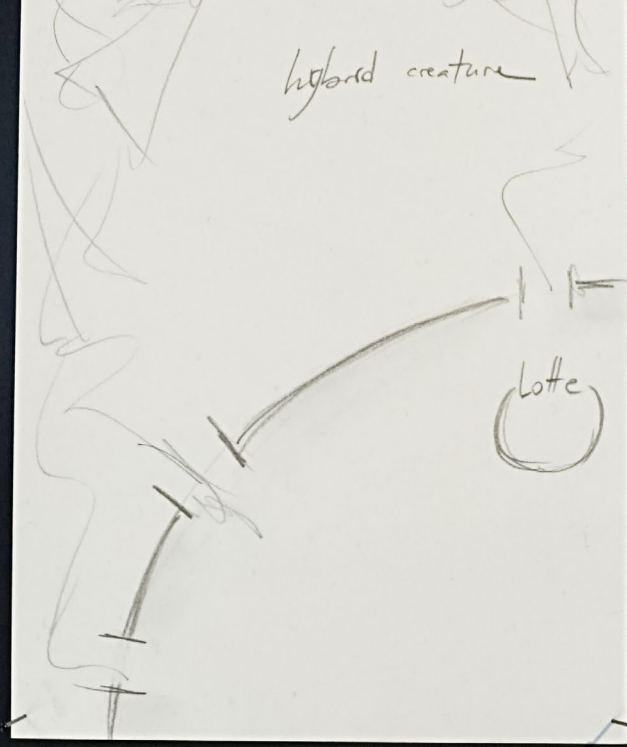
Exhibition view at UR institute. Photo by Maja Bačić.

150-155

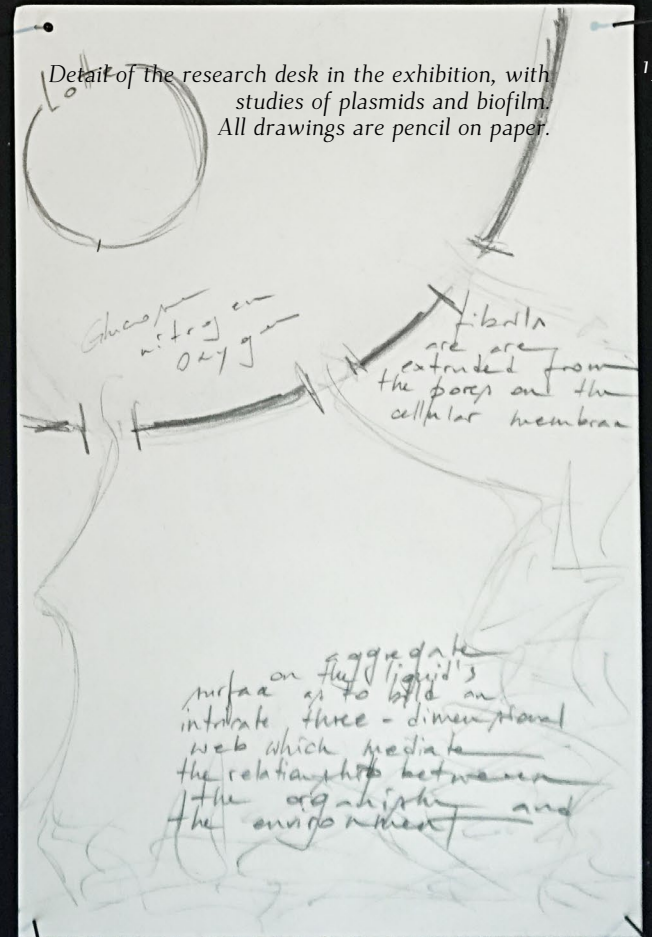
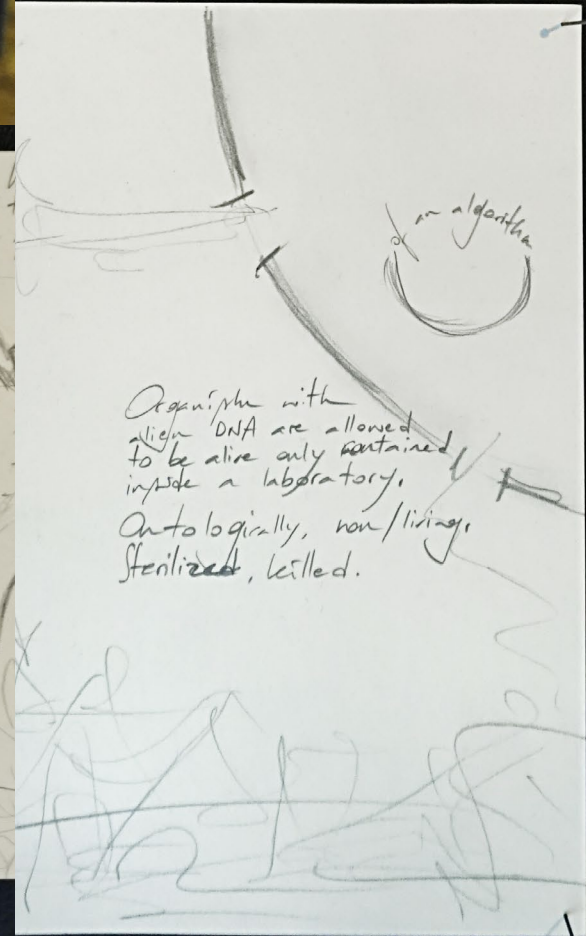
W.03. Pictures by Sanjin Kaštelan



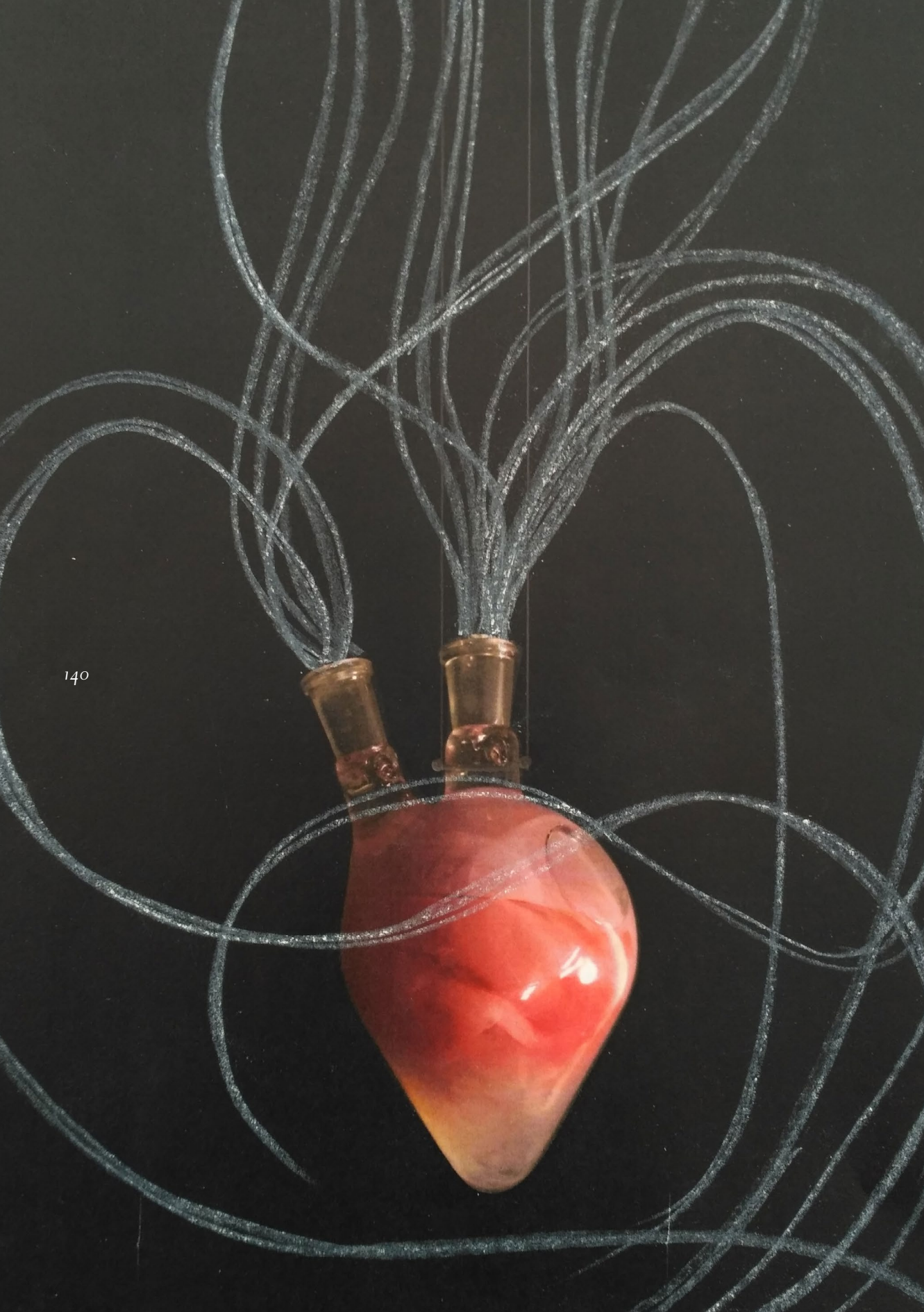




Invisible presence of a molecule



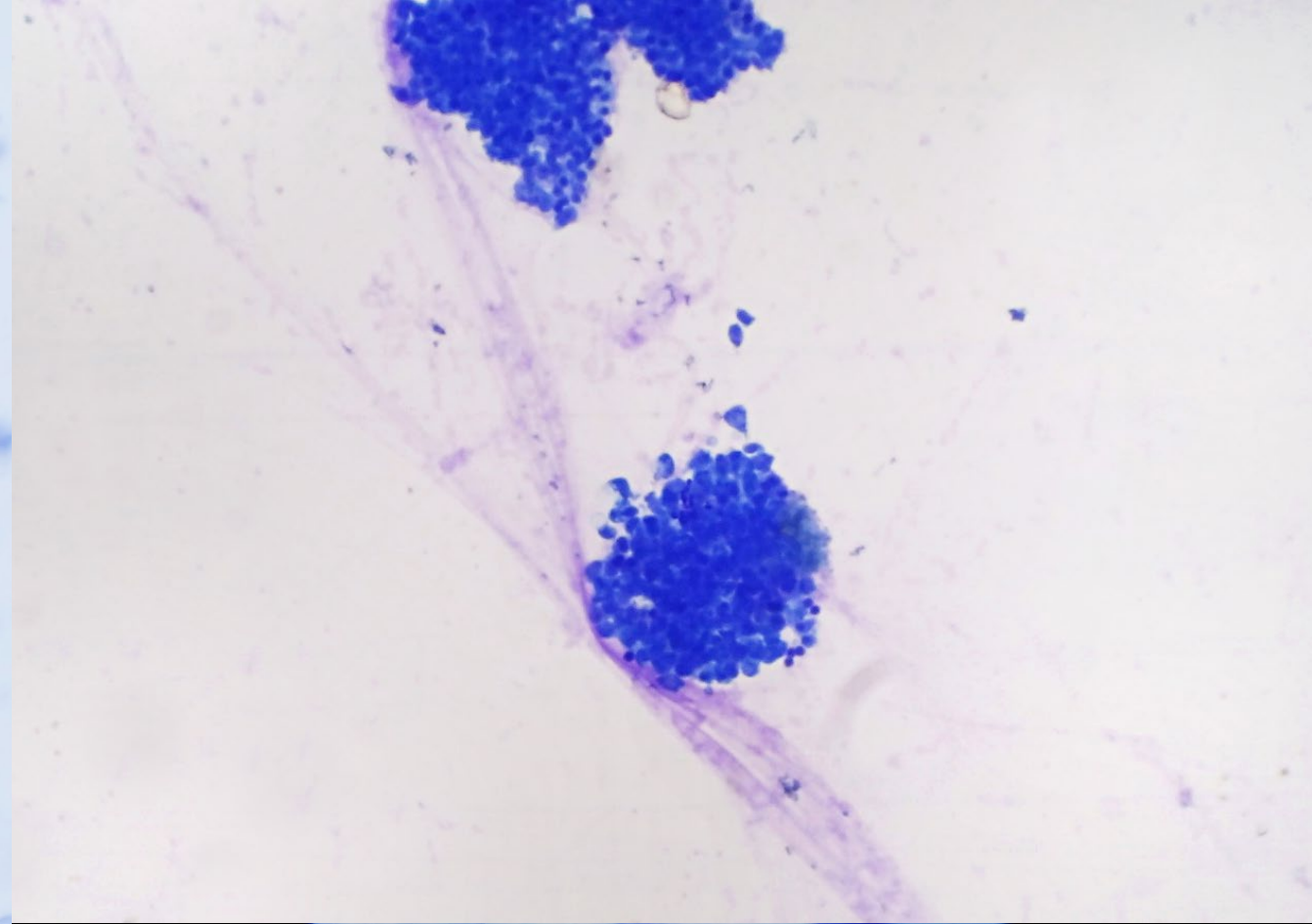
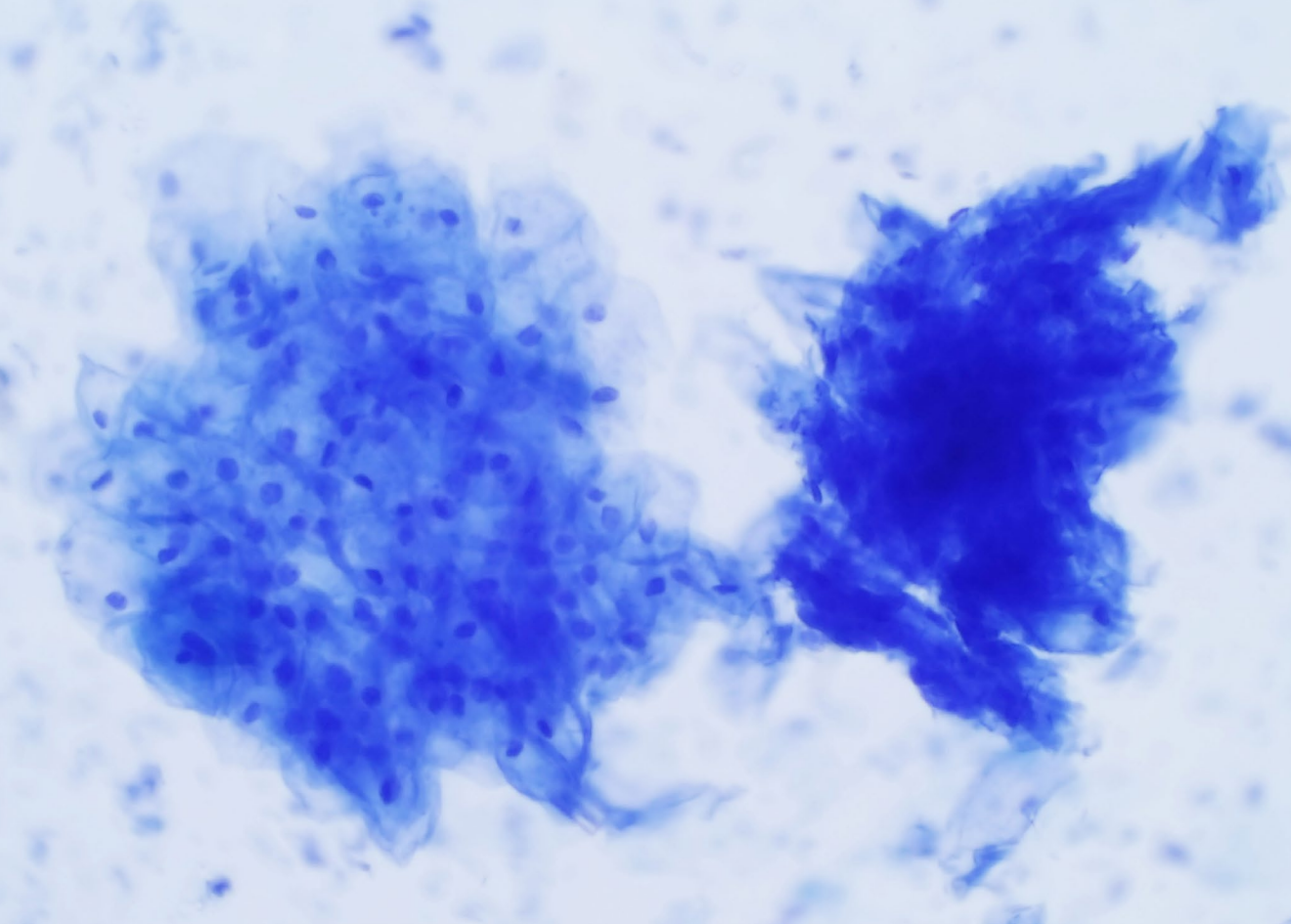




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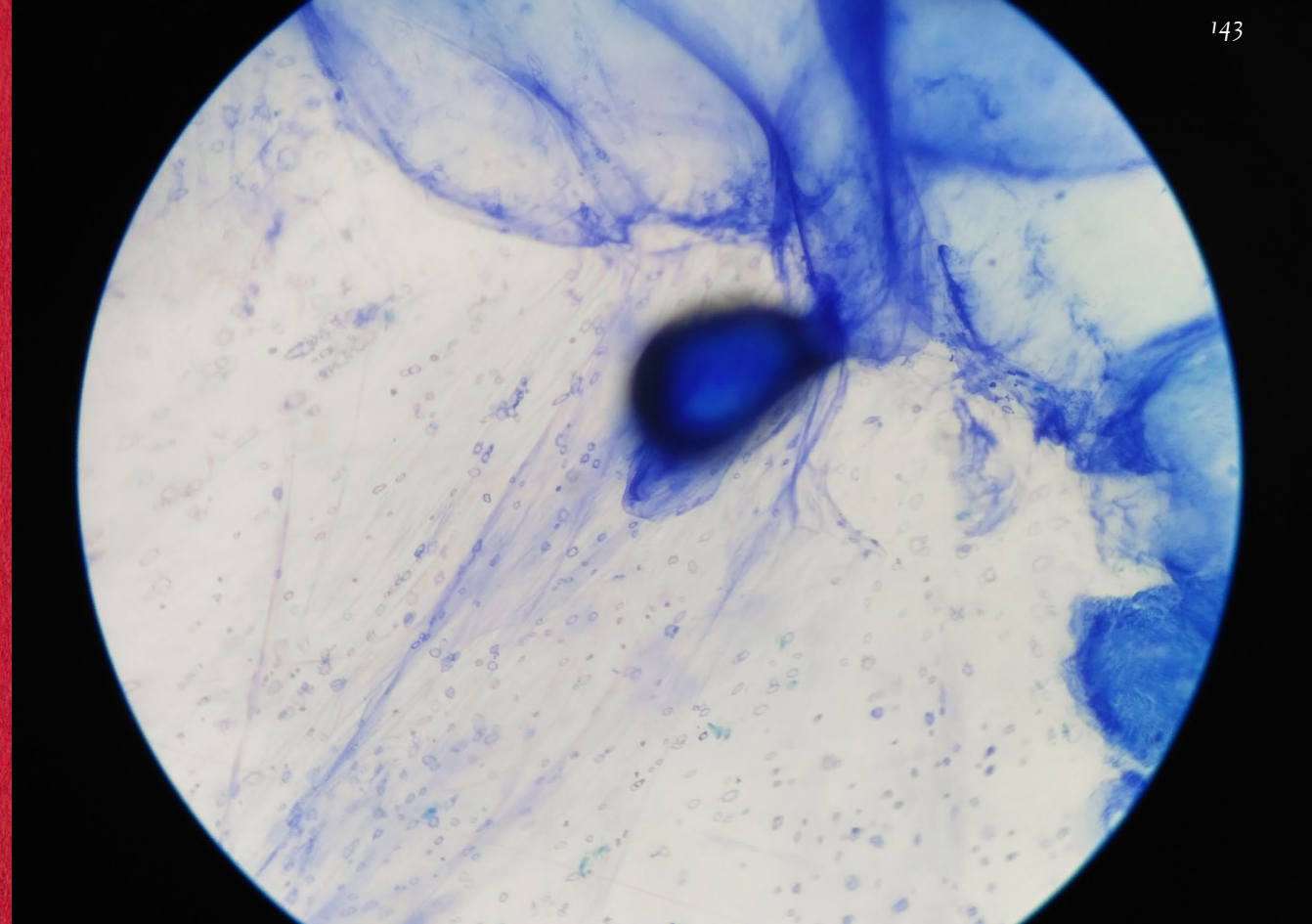
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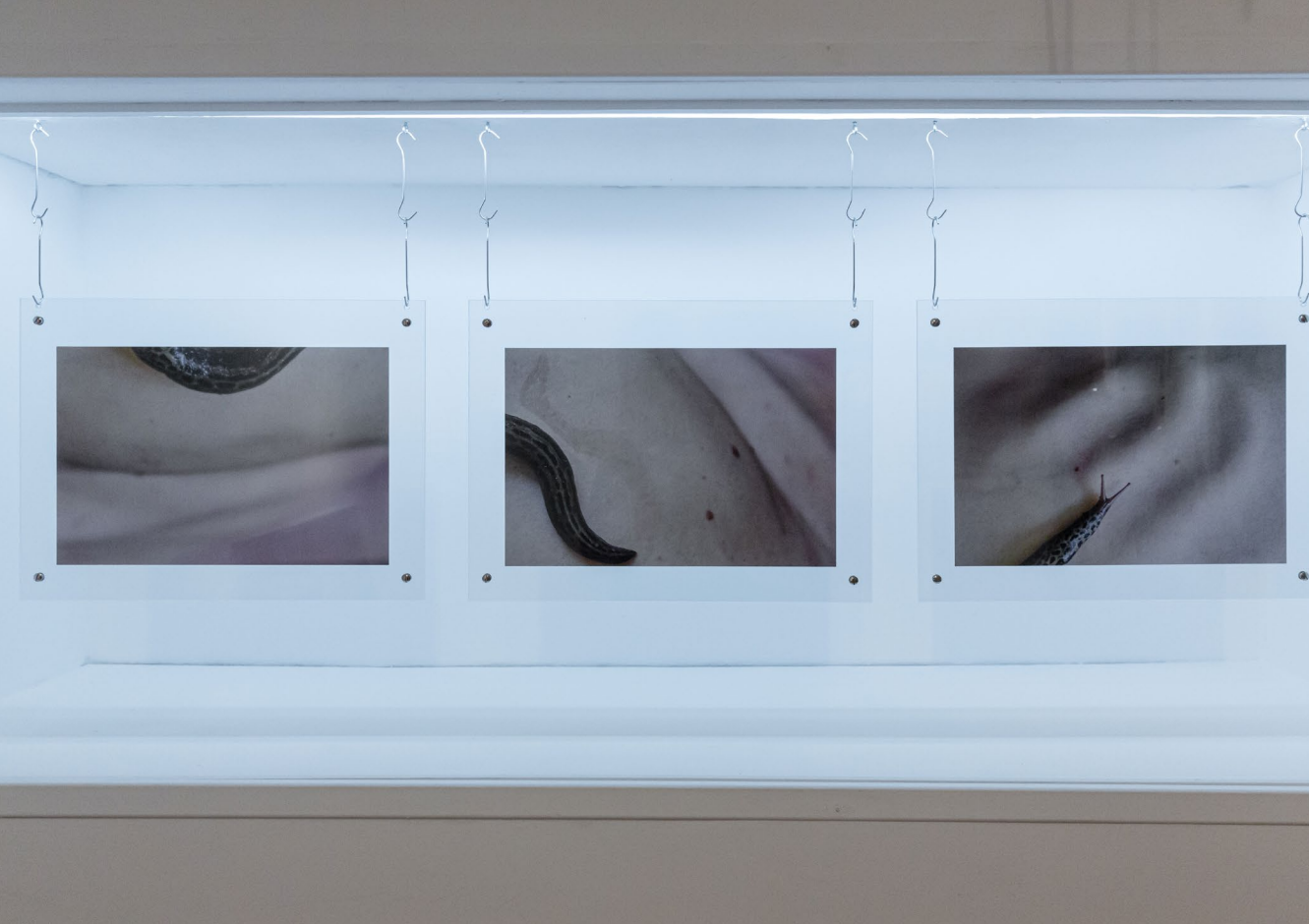




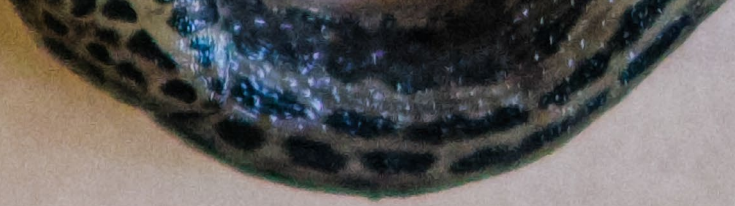
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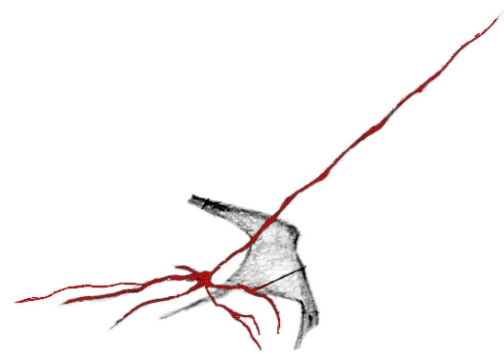








5_Leaks



Leak ^{/li:k/}
verb

[no object] (of a container or covering) accidentally lose or admit contents, especially liquid or gas, through a hole or crack

[w/ adverbial of direction] (of liquid, gas, etc.) be accidentally lost or admitted through a hole or crack in a container or covering.

noun

a hole in a container or covering through which contents may accidentally pass.

an instance of leaking

an intentional disclosure of something secret or private.

(leak, OED online, 2022)

Each of the following sketches refer to a leaky encounter in the research. They present ruptures and spills bearing potentials of novel knowledge and thus were revelatory moments in the process. They are presented as vignettes to emphasize the feeling of suspension and spill in the flow of thought they created.

Leak #1 // Electroporation

The moment when you actually do the transformation is anticlimactic. That steers a different feeling than finishing a piece of code and seeing things (on screen or robotic or sound) moving. Or when you take a cast out from a mould and you finally see it. Nothing is there to be seen. The electroporator, the machine where the procedure takes place, does not even make any particular noise despite the electrical input. No light flash, no hum.

In this moment, bacterial cells are shocked and holes are opened in their membrane. The vial contains a mixture of bacterial growth medium, bacteria, and a solution containing the desired plasmids. Holes in the membranes open, plasmids flow into bacterial bodies. After the shock, bacteria should be placed in a growth medium rich in nutrients, allowing the membranes to heal.

Leak #2 // Temporalities

Working with non/living matter requires — and teaches! — you to accommodate the time of the other. You need to adjust to it. Not always can you steer it.

You can prepare the substrate or culture medium, create what you assume are good conditions for the other to thrive. ‘Optimal’ is always relative. You don’t ‘make’, you may perhaps ‘make things happen’. It’s an orchestration, a negotiation.

You wait.

The excitement every time you see that something is growing.

Leak #3 // "It Leaks"

In the long quest for leaky and vulnerable bodies that led me to write these pages, I had a revelation during an artist talk by Bates at TopLab, an independent art and citizen science space in Berlin, in 2016. She presented her work with *Candida albicans* and cared to explain to the audience the effects of thrush infection, as many of the male attendees were not familiar with it.

The explanation was concluded with the comment: "It leaks".

Tarsh accompanied the words with a vague hand motion, somewhere mid-air, emulating the dynamics and feeling of something that percolates, her fingers closing together while her hand moved slightly downwards. The movement of a drop shaping up and falling down. *Candida* does not drop. Such movement created intimacy, unsettlement, made me vulnerable.

I started pondering about the balance between symbionts and that which defies control — and leaks. I thought about how my personal experience with *Candida* followed antibiotic treatments (more microbial commensality at play!), and how the moist white guest between my legs called for attention. I honestly cannot remember whether Bates' presentation indulged in those details. I was immersed in thoughts of leaks and control, reflecting how they are so much present in biological art practice.

Processuality marks both symbiosis as well as biological art practice. Rather than stopping a thrush infection, one has to negotiate with it. Similarly, working with biomatter requires a good degree of attunement and patient steering and negotiation. While immersed in such musing, I imagined how it would be to assume the position of *Candida*: a thrush infection may then look like a raving feast, the leak becomes a Dionysian excess. While those *Candida* musings remained latent in the years that followed, leaks and vulnerability have continued to permeate my research.

Leak #4 // Branko

The slug escaped its terrarium.

I built the terrarium carefully. I used a secondhand glass aquarium covered with a dense mesh, kept in place by tape. I purchased soft soil, as urban is hard and dry, and planted grass from the garden. I added a glass full of water to ensure moisture.

I placed some pieces of old logs collected in the woods nearby my place, soaked in water. For moisture and ambience. I fed the slug peeled fruit and vegetables (pesticide-free). Melon was among the favourite meals. I kept the terrarium in a dark spot. When the heatwave arrived, I brought the terrarium to my apartment, which was cooler than the studio. I brought it back to the studio after the heatwave. The slug forced the mesh.

Right, mesh does not offer much grip for the tape, even a slug can force it. I was worried for Branko roaming in the studio.

I placed a sign on the door to invite visitors to mind their steps.

Detail of the terrarium with loose mesh after Branko escaped.



Leak #5 // Menses

The body that I am does not leak.

The body I am leaks, even though I do not menstruate.

Leak #6 // "By looking at you, I changed my mind"

The comment reached me unexpectedly.

During my residency there were some moments of exchange, I gave a presentation about my project and the field of bioart. Researchers were kind, helped me whenever I needed, yet somehow reserved. I felt like a strange guest, some hybrid. I cannot remember what I was doing when the scientist said those words, something like cleaning up the workbench after an experiment, or taking notes. It was straightforward:

*"I have always considered *E coli* as a tool for research.*

After seeing the way you work in the lab, I started seeing it as a living being."

Then someone else arrived in the room, and there has been no occasion to follow-up on this comment.

Leak #7 // Pipetting

I have steady hands, trained in many years of art practice with materials that required direct and precise manipulation.

However, some spills happened.

What I do remember is the physical strain directed at steering the process with no leaks. Leaks are potentially always there.

Leak #8 // Borosilicate Glass

Scientific borosilicate glassware reminds me of extra-bodily organs: bulging curves, rounded shapes, necks, mouths. Vessels and valves.

Rounded lines and hollow mass become heavier and less abstract when glassware contains culture medium.

Sculptural objects mediate the negotiation with uncontrollable life in the lab. Inoculation and autoclaving are the periphery of uncontainability.

Leak #9 // Branko II

I took Branko out of the terrarium and placed it onto my back.

I lay on the floor of the studio and let the slug slide on my back. Contrary to my expectations, the slug is not shy at all.

It contracts and extends its body and leaves silvery trails.

It is heavier than one may think.

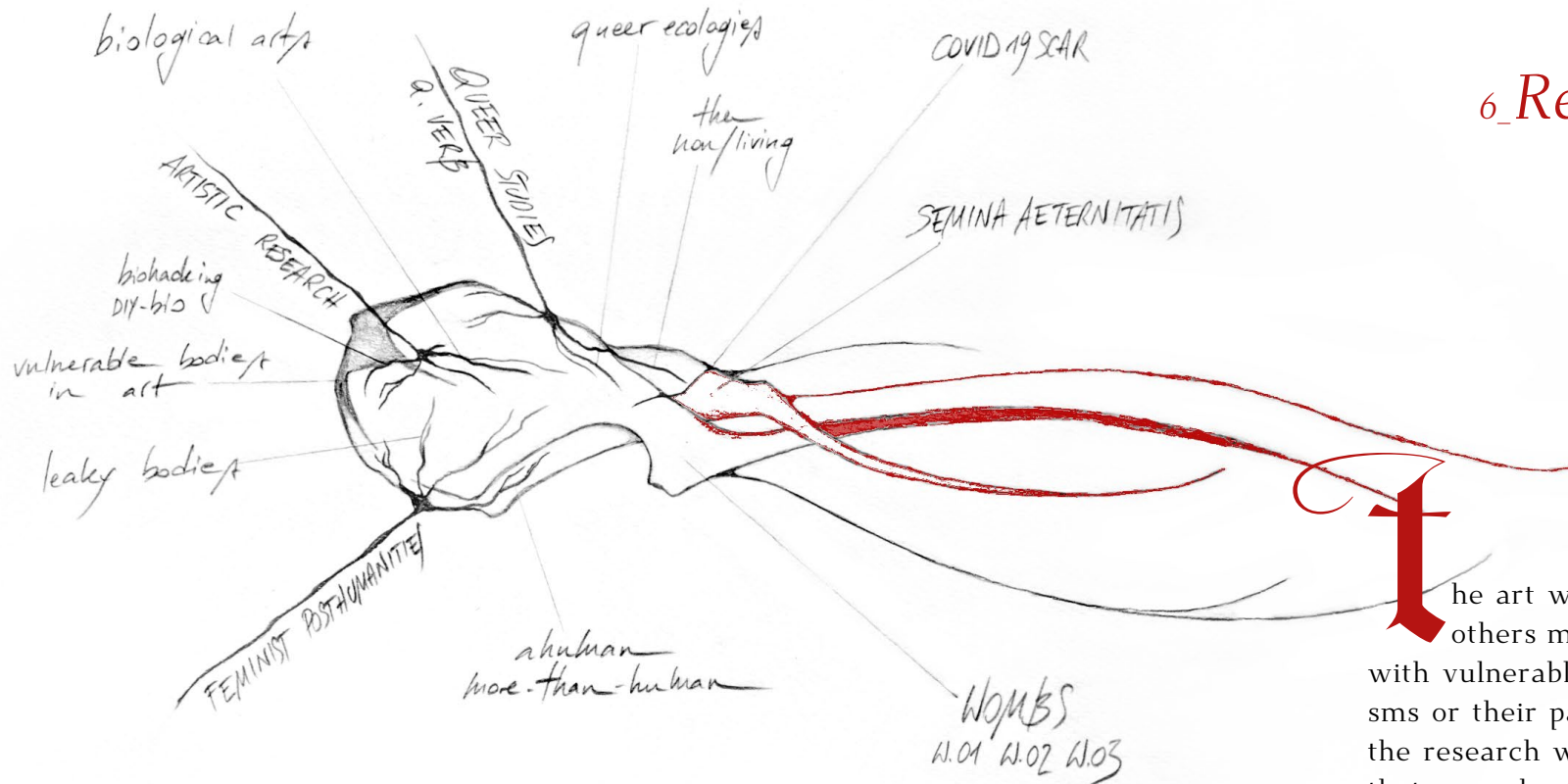
Leak #10 // Cell Culture

I learn to read the status of cell culture quite quickly.

The colour of the pH is a rapid indicator. The body gets attuned to the space of the microscope, my short-sighted eyes get used to the binocular. I still prefer using the binocular more than the monitor. It is a different mediation.

Human epithelial cells are larger.

6_Reclaiming vulnerabilities



The art which has guided me here — art which I made; art which others made; art which others wrote about — opens to encounters with vulnerable and leaky entities. These entities are artworks, organisms or their parts, but also pieces of knowledge that leaked throughout the research with some occasional gushes. I have encountered plasmids that cross bacterial membranes for an electrical shock; *Wombs* that do not menstruate; molecules that are metabolized and secreted; slug bodies whose only defence is slime; epithelial cells and extra-cellular matrix. I have sculpted an extra-bodily organ which hosts a hybrid cell culture. I have meditated upon *CandidaHomo* ecologies, allogeneic skin grafts, bodies cut open or exposed in their mortality. I have engaged with concepts that become methods, and adjectives that become verbs.

Each of such entities has its own specificities. Some of them involve the displacement of membranes, like the electroporation in *Semina Aeternitatis* or the skin graft in *Anti-Marta*. Some of them are physiological processes like the hormonal metabolism or the excretion of slug slime in *Wombs*. Some are induced, like the electroporation or the hormonal modulation of organs and glands. Some are contemplative moments of improbable intimacy, like the exposure of non/living remains in *Incorruptible Flesh* or Branko's cautious inspection of skin in *W.03*.

Such diversity opens a multidimensional spectrum and allows a discussion across differences, and engages with leaks both as methods as well as materials to work with. In their diversity, all the vulnerable and un-

containable entities point at an inherent exuberance, a resistance to be contained. I sought to engage with this resistance and lack of closure to understand what was possible to do with them, artistically and philosophically. Engaging with the lack of closure became a way to queer (intended as a verb) the framework what I was doing as an artist working with non/living and more-than-human matter.

The four works in Chapter 3 shape a space where I am an observer-participant to their unfoldings in the exhibition space (in real life and through documentation). This is a different kind of participation than when I am, together with other organisms and tools, involved in the creation. I can speak of the artworks by other artists based on what I saw and read and how it affected me. I attended their presentations and they invited me into their poetic dimension, which this research reads in an inquiry on vulnerability and uncontainability.

In the case of *Semina Aeternitatis* and *Wombs*, instead, I was surrounded by context, materials, organisms during their creation and exhibition. A posthuman understanding of the process indicates how the creation has a variable degree of entanglements where the human is never alone nor independent from context and relationalities. The aesthetic of *Wombs* owes to the encounter with Branko as much as to my preliminary sketches. Although I cannot claim that it was Branko's intention to co-author the piece, certainly the slug mattered to the development of the work.

This dissertation is about art-making from the perspective of a practising artist. Throughout the creative process I encountered different vulnerabilities that are not always present in the exhibited works. So, weaving a discussion around leaks, vulnerability and uncontainability that takes into account both my first-hand experience in art-making and the experience of other artworks allows reflection at different levels and nuances. This chapter unpacks these thoughts by engaging with all the artworks in this research. The discussion flows along their diversity and leaks; it also outlines how the works differentiate from each other to avoid the risk of generalizing art and science practice. The discussion sets off with *Wombs* and *Semina Aeternitatis*. While Chapter 4 accounts for their realization and context, this chapter discusses the queerfeminist vulnerabilities that emerge from the material and poetic fabric of the artworks. The discussion then extends to the works in Chapter 3 and the vulnerabilities they manifest.

After this, I expand on that which has emerged, namely the two concepts of poetics of uncontainability and arts of vulnerability. These are rooted in art practice and linked with each other, but remain distinct, and I offer the second concept as a possible ethical and epistemic tool. This chapter closes with a discussion of the questionnaire submitted to the collaborating scientists.

While *Semina Aeternitatis* and *Wombs* have different narratives, they both present openings of different kinds which emerged during the process. I understand these openings as vulnerabilities. They are sites of encounter, of touch, of intimacy, of leaks. These emerged in the work with non/living matter and in their narrative. It is useful, at this point, to differentiate between the narrative presented in the exhibition (such as possible environmental implications of hormonal contraception and the encounter with slugs in *Wombs*), and those elements that set this narrative in motion, namely my experience of hormonal contraception. The latter fades to the background as the final artwork is not about personal experiences, although I use material from my experience to create the artwork. For this reason, a distinction helps a more nuanced discussion. Before I move to the discussion of vulnerabilities I encountered in the work with non/living matter, I would like to engage with those in the works' narrative.

In certain cases, the openings are potential sites of shock, or harm, like the girl on the carthorse in *Semina Aeternitatis*. In other cases private details are exposed, such as the personal memory shared for the first time in *Semina Aeternitatis* or the reflection on hormonal contraception in *Wombs*. These biographical elements function as starting points for the creative process to expand the narrative beyond a specific individual experience. In *Semina Aeternitatis* there is an element from a stranger's biography; in *Wombs* from mine. In both cases, these elements set in motion a more-than-human narrative that cannot be contained in the experience of the human participant. The artworks 'start with the human. . .' but evolve into a dense relationality where the human is but one element together with other animals, bacteria, cells, bioscientific equipment, and pieces of knowledge. These biographical points of departure create a space of intimacy and encounter — of vulnerability — that magnifies the permeability of assigned borders.

Semina Aeternitatis features an encounter with a stranger who gifts me a treasured childhood memory. The memory recounts of a shocking yet formative episode with a cart horse, where the woman (a young girl at the time) must learn self-confidence when facing an unaccompanied ride. I offer my role as an artist to collect the memory of that cherished moment and treasure it through the artistic process. Thus, the work weaves intimacy across different generations, as it sees myself as an adult, a woman in her eighties, and the memory of her as a five-year-old child. When I met Edith Müller-Rieckmann for the interview, I did not know what story she would share. I did, though, express my interest in meaningful memories and the wish to project them in a long-lasting future. Her choice struck me for the twofold resonance with the work's narrative. Firstly, it connects to the narrative of permanence and evanescence of the piece, which I develop by creating an organism whose genome stores traces of someone's memories. Edith's story intersects this narrative and amplifies its temporal dynamics. As an old woman, she looks back at her childhood. She focuses on a moment of transition where she learnt something which then stayed with her through her whole life: "Trabe wie eine Stute!" ("Trot like a mare!"). She learnt it from her own fear and desire to come home safe, and from her grandfather, who spurred her to find her own answer. But she also learnt it from the mare Lotte, whose mild determination became Edith's trait and inner motivation afterwards. In Edith's story, there is a look back and a projection forward: a double movement in time which resonates with the work's narrative of erosion and permanence.

A further layer opens in the relationship with the animal. The child was familiar with the mare's calm character, yet for the first time she had to ride home unaccompanied. The first reactions were fear and shock, triggering the resourceful coiling of the mare's mane around her wrists and holding it tight with her hands. They eventually arrived home safe. Lotte knew the way. It is in this movement between shock, resourcefulness, trust, and resolution that the formative episode takes place. As I recount in Chapter 4, there is an unintentional resonance between Edith Müller-Rieckmann's experience and mine. Despite the difference in context and kind of relationship with the horse, I could understand precisely what was meant by "The horse knows the way (home)", appreciate the shock of a first time, and what it means to relearn to trust an animal.

Before addressing the narrative in *Wombs*, I would like to bring up a further vulnerability in Edith's story: she intentionally picks a memory which, in her own words, she never shared with others until then. It is a personal story which accompanied her whole life, privately and without verbalization. It is impossible for me to know whether and how this memory transformed since the episode, for instance if elements were added or removed. However, what counts is her intention to offer a 'primal' memory to the project. Following the interview, what Edith refers to as an 'untouched' memory was reworked in several steps, first outside the laboratory (such as transcribing the initial audio sample and the conversion of the transcript to a sequence of DNA bases) and then in the laboratory (assembling the plasmid and the transformation of bacteria). This is what the process received from the encounter between Edith and the artist/researcher.

While the narrative of *Wombs* walks along different lines, it also picks real-life details as a point of departure for an investigation of more-than-human matters, perusing the space between sexuality, embodiment and environment. The realization of the artwork involves the use of the artist's bodily material. This element creates a connection to the four artworks in Chapter 3. The work is not about myself, but starts from myself to reflect on possible environmental implications of personal choices like, in this case, hormonal contraception.

Wombs offers a queer narrative, for the project was set in motion by the fact of being a pansexual individual and a body with a womb, sexually active, currently in a heterosexual relationship and intentioned to be child-free. While not being at the centre of the piece, this fabric is relevant for two reasons. Firstly, it leads to the negotiation with the desire to not become pregnant, and thus the necessity of choosing a contraceptive method. Secondly, it connects to how, in previous relationships which involved two bodies with wombs, no contraceptives were needed. This situatedness amplified my attention to the current need and choice of contraception. This intimate detail fades to the background and no explicit references are made to current or previous relationships. At the same time, it provides material for a queer engagement with the ideas of leaks and vulnerabilities that are at the core of this research. In the work, intimacy and vulnerability emerge through the hormonal modulation for

contraception; cell extraction and cultivation; intimacy with slugs both in the performance *W.03* and in the non/living piece *W.02*.

The progestin-based contraceptive I take, taken with no interruption according to its prescription, does not trigger bleeding like other combined or estrogen-based pills do. This results in the fact that I am a body with a womb that does not menstruate, thus contesting more traditional readings that univocally associate *Wombs* with menstruations or leakiness (and, as a consequence, female bodies with uncontainability). As I explained in Chapters 1 and 3, the idea of leak which I adopt develops from queerfeminist and environmental scholarship that contest the association with the feminine. It is not female bodies that are leaky, nor bodies with wombs.

The works' poetics develop into broader topics. In *Semina Aeternitatis*, it dances around ideas of transience and permanence, erosion and preservation, and memory becomes a vector for these. *Wombs* offers a queer reading of possible ecological implications of sexual choices. Memory and sexuality are both very vulnerable matters, as they present a space of exposure and a resistance to be fixated. The artworks acknowledge the breadth of the topics. Instead, such matters open an inquisitive space across personal and broader more-than-human dimensions. Both works depart from experiences that may belong to many and place them within a more-than-human context. They address neither personal nor social implications of these topics (although I address them in the preliminary research described in Chapter 4). Rather, they look at what more-than-human relationships may be stirred from these topics. The core of the works' poetics lies not in the human experience, as the attention is pushed towards implications, complications perhaps, and less investigated aspects.

The aim of such artistic choice is political and ethical because it is a way to show implications. As the works' poetics touch upon matters which may belong to the experience of many, they call for responsibility. Rather than placing these implications somewhere far away and pointing at something detached, which leaves both myself as an artist as well as the audience not implied, the works bring back such implications within everyday matters. By doing so, the works reclaim a space of complexity. They also contest the understanding that implications with more-than-human matter and ecologies happen somewhere else thus remaining faraway phenomena. They point at how these implications may pierce the personal sphere. It is

not much about choosing either or, but rather looking at the complexities that arise, and thinking what to do with them. It is precisely at this point where the works become political — and have something to reclaim.

Chapter 4 accounts for the realization of the artworks regarding the biolab practice, and the realization of the installations and performances. It outlines how the artworks were realized in different contexts and with different techniques. I provide insights into the details of materials and bioprotocols employed for their development, and describes exhibits and exhibition settings. The artworks' initial ideas developed contextually through the biolab work and aesthetic choices. Uncontainability and vulnerability mattered throughout the research as a pervasive presence.

A closer look onto processes and exhibition in *Wombs* allows magnification of how emerging vulnerability underpins the formulation of ideas. The three instances *W.01*, *W.02*, *W.03* address slightly different aspects of the core topic through different methods; they can be exhibited independently, or together. The first exhibition at *Extravagant Bodies* featured *W.02* and *W.03* along with pieces of wood with slug trails. The exhibition at UR Institute displayed the whole series along with a microscope and an initial sketch. The exhibits play with recurrent elements in their narrative, technical aspects, and aesthetics. One of these recurring elements the cohabitation of materials deriving from the body with a womb which set in motion the piece and other organisms or parts of them. Scientific glassware is repurposed in *W.01* and distorted in *W.02*. All the pieces hang in the space rather than being placed onto a pedestal — a choice that poses some practical challenges, but evokes the idea of organisms nesting and stretching over the viewer.

The processes in the biolab as well as the aesthetics of the works hint at relationalities. They present bodies, or parts of them, placed in relationships to each other. To do so, they feature materials of more-than-human origin such as bacterial cultures, urine extract, slugs and cells extracted from their eggs. They recount possible (though perhaps improbable) encounters. Slugs — both as a whole organism as well as a cell culture — create a counterpoint to all too human readings that surround contraception or hormonal therapy. To include the slugs into the process, my research took a detour to learn about their anatomy, physiology, and behaviour.

Slugs, which are usually a defenceless animal (except for its slime), made me vulnerable to the necessity of understanding more about them. By creating this necessity, the presence of slugs enacted a response-able change and asked for new knowledge which I pursued with methods of art and science. Interestingly enough, the necessity to know more about slugs in relation to the research question of the artwork exposed my work to an area of indeterminacy in science. Current research is debating whether mammalian sex steroids may affect gastropod physiology (see ‘Wombs’ in Chapter 4). While this debate precludes the possibility of definitive answers, it also offers the opportunity to expand on knowledge as an open and vulnerable process. It allows observation of how the relationship between art and science in bioart is never simplistic in the sense that scientific tools are simply used to realize artworks. Rather, by embracing areas of indeterminacy it may become possible to understand the artwork as a catalyst of various — sometimes even contrasting — positions.

It is worth observing how the concept of Schrader’s response-ability emerges from the experimental indeterminacy about a certain microorganism. In Schrader’s discussion, the microorganism resists complying with the (human) necessity of data evidence, for it is not possible to establish how and when toxicity arises, explain possible links to certain pollutants, and motivate regulation of industrial activity. However, the microorganism sets in motion relationalities that are not confined to making an important piece of information available, but exceeds into questions of knowledge production. In my work, the scope and funding of the artwork did not allow experiments on the matter, so I referred to existing literature. Nevertheless, it was possible to formulate questions about environmental implications and to queer human-only readings of personal choices.

A further area of indeterminacy regards the text encoded in the plasmid in *Semina Aeternitatis*. The experimental process was concluded after the successful cloning of genetically engineered *K rhaeticus* and the cultivation of the bacterial strain to obtain biofilm. The context of the project did not allow, for instance, to retrieve the DNA after some time and see whether and what mutations (the spontaneous genome modification that happens after cell division) may intervene, or determine the permanence of the plasmid over time. However, this would not alter the meaning of the project, which is about using bioinformatics and synthetic biology to poetically manipulate ephemeral memories. Similarly to *Wombs*, the project

shapes a landscape that includes both successful experimental procedures as well as areas of resistance. This matters to the research for it avoids simplistic assumptions and rather incites further unravelling of the vulnerabilities in the process.

Whereas areas of indeterminacy remain in the artworks, the majority of the experimental endeavours were ‘successful’. As the gel electrophoresis demonstrates, it was possible to conduct complex bioinformatic procedures with a less explored organism; Prof Alistar and I experimented with a custom plasmid that was tested on *K rhaeticus* for the first time. The different rate of cell division between *E coli* (about 20 minutes) and *K rhaeticus* (about 24 hours) set the pace of lab work. Whereas the bioprotocols of DNA extraction, amplification and cloning with *E coli* could happen overnight, replicating the same procedures to obtain cultures of *K rhaeticus* with the desired genome required adapting to a completely different pace. This gave the opportunity to reflect on the response-abilities and agentialities at play in the process, and trace vulnerabilities of both experimental organisms and artists/researchers.

In *Wombs*, cell extraction from my vaginal epithelium and slug eggs successfully led to a number of cell batches that are ready to be exhibited in the future. Tests about hybrid cell culture indicate that a lower temperature than the standard 36°C of human tissue culture enables both cells to coexist for several days. As I noted in ‘Wombs’ in Chapter 4, cells from slug eggs seemed to remain suspended. The limited time of the residency and the pandemic constraints did not allow further investigation. What would happen over time? A proportion of human and slug cells in a culture different than what I used would induce changes in their behaviour — would they establish some kind of communication or exchange? These are hypotheses that I did not have the opportunity to explore or even discard. However, that such questions arise indicates how the cells as materials and entities have agency over the research. In parallel, the apparent suspension does not mean that the two cell types were indifferent to each other. Quite the contrary: there may be mutual adaptation at play, or chemical exchange (mutually beneficial? aggressive?) that I did not have the capacity to verify. My research is vulnerable to this apparent suspension.

For the non/living installation in *W.02* I made a basic cell incubator that replicates the fundamental principles of scientific equipment, and adjusts

the culture parameters to compensate the aspects that my design did not include. The hybrid cell culture adjusted to their existence in the incubator, and both slug and human cells remained alive until the end of the show.

Each of the experimental endeavours just mentioned was successful and provided new knowledge about the organisms and the procedures, which led to publications (Alistar & Pevere 2020). Importantly, the experimental endeavours were key to the successful realization of the artworks, which have been exhibited internationally and will be further exhibited after the pandemic hiatus. However, the aim of the research is not only to provide fragments of viable scientific knowledge, nor only to contribute to an artistic field. Importantly, it shapes occasions to think with and through more-than-human bodies encountered in this research.

The successful experimental procedures, together with the areas of resistance, illuminated how the more-than-human bodies are in relation. As I mention elsewhere, the relation includes the matters at play in the artwork (cells, bioreactors, bacterial culture, plasmids) but extends beyond it and includes myself as artist and researcher, the scientific collaborators and participants, and the narrative of the works. Throughout the process, each of these matters manifested certain areas of resistance or uncontainability. The biomatter in the artworks reacted to the different contexts of the lab vs exhibition space. The latter required extra care to ensure adequate conditions to host the non/living matter, for instance in terms of culture parameters or compliance to norms around genetically engineered bacteria. The required adjustments revealed different kinds of vulnerabilities and responses.

The space of a bioart work is an unstable space for its inherent uncontainability and vulnerability. It fundamentally transgresses binaries of life/death, nature/culture, art/science, and therefore is a queer space. As the artist-researcher, I became part of this queer space. From within this queer space, I could observe how my interaction with the matters in the artwork steered my transformation together with theirs, and revealed vulnerabilities on both sides.

The non/living points at how the processes within the artwork are defined by the organic and biotechnological components, and how the expe-

rience of uncontainability includes possible contamination, waste, and multi-species encounters. This fabric remains present in both *Wombs* and *Semina Aeternitatis*, as the interactions between bioprotocols, non/living matter, and experimental settings constitute the space of the artworks. As in Radomska, such a fabric extends the non/living beyond the space of the biolab. And conversely, a body under medical treatment becomes a portal for complexities that exceed the border of human skin. In other words, the non/living operates through life and death processes: it erodes boundaries and divides and brings entanglements to the fore.

Regarding the more-than-human bodies encountered in the artworks, I argue that they become non/living because of their vulnerability. Their inherent instability becomes magnified by focusing at close distance on the interplay of life and death processes. Such instability, though, is a mark of processuality rather than a negative attribute, with potential for transformation and liveliness. Engaging with life and death processes may magnify how ‘failures’ are, instead, sites of potential that reclaim attention and care. Vulnerabilities can be embraced as a different way of being, rather than a lack of self-protection; a positive force and a maker of change.

Embracing vulnerability unlocks a space — and a method — for queering. Responding to the exhortation to do things differently entailed in the verb ‘to queer’, it unlatches liveliness from a flat “exposure to threat and violation” described by Drichel (2013: 5). Exposure may suggest what is needed to avoid harm, and thus become a vector for showing how to do things differently. Queering vulnerabilities implies acceptance and reclaiming of the potential for transformation that they reveal, and harnesses the multitude of possibilities that they evoke.

Regarding the artworks analysed in Chapter 3, it must be noted how both performances *Succour* and *Incorruptible Flesh* appeal to the medicalization of the body: the first by employing archaic medical devices, the latter by operating from within the HIV+ condition of the artist. The bioart works *Surface Dynamics of Adhesion* and *Anti-Marta* are realized within the space and with the support of biotechnological and medical infrastructure and collaborators. The works required negotiating with control, sterile setting, and collaboration across art and science (Graça and Bates are trained scientists). Differences should not be overlooked, though. The artwork

Surface Dynamics of Adhesion is prepared in an S2 biological laboratory. Biomaterials are prepared, then encased in a custom-made petri dish, and eventually displayed in the exhibition space in a composition with other objects. In the case of *Anti-Marta*, the artwork is materially prepared in a surgical room. The skin graft leaves a permanent mark on the arm of both participants, while a participative video installation with no biomaterial is set for the exhibition space.

A surgical room and a biolaboratory are different biomedical spaces regarding the agency of the artists and other subjects involved. In *Anti-Marta*, we see de Menezes and Graça covered by a green blanket while surgeons perform the skin transplant. For *Surface Dynamics of Adhesion*, Bates is the artist/scientist/researcher who (in collaboration with other researchers) performs experiments, prepares materials, inoculates cultures and kills them. Beyond those distinctions, an S2 biological laboratory and a surgical room do share biosafety issues and ethical complexities specific to biotechnological artworks.

Of the two bioart pieces, *Surface Dynamics of Adhesion* presents non/living matter in the exhibition space. In the display design of *Anti-Marta*, the video mediates the surgery procedure. Of all four works, only *Anti-Marta* does not physically expose biomaterials. Yet the piece shares a relevant feature with the others: it is framed within an art exhibition, but simultaneously extends beyond the space and temporality of the gallery. *Anti-Marta* ‘happens’ in the surgical room, then on the artists’ skin and immune systems. *Candida albicans* cultures are prepared in a biolaboratory and then exhibited in *Surface Dynamics of Adhesion*. *Succour* begins in the performance and remains active through cicatrization between iterations of the piece. *Incorruptible Flesh* is reconfigured across each episode, years apart, and the offering spurs a procession towards Athey’s living mortal remains. It is as if what is displayed shows only a fragment of the artwork’s life, which leaks beyond the frame of the exhibition and soaks into the fabric of life.

The artworks in this research operate through discernible artistic means, narratives, and aesthetics. These different modalities present us with an uncontainability that manifests from more or less intentional openings. I speak here of material openings and their consequences, as in the electroporation procedure (with consequent introduction of synthetic plasmids into bacterial bodies), the controlled slash on the skin (with consequent

rivulet of blood and then scar), or the skin graft (with consequent reconfiguration of immune system). Less literal openings like the symbiotic commensality and its uncontainability within the patterns on agar suggest an inherent exuberance. The works all involve human bodies, and in particular the artists’ bodies specifically. But not only. They hint at, let emerge, host, and offer openings in the presented bodies.

It should also be noted how the works manifest different degrees of eroticism and refer to a varied gender spectrum. De Menezes and Graça’s celebrate a heterosexual partnership. Athey employs queer sexuality throughout his oeuvre and the *Incorruptible Flesh* cycle is inscribed within the grief of HIV-related mortality in the gay community. Bates’ frames *CandidaHomo* ecologies as an ‘unsettling eros’ that queers the symbiotic relationship between human and commensal yeast (Bates 2018). In *Wombs*, the spectrum intersects human sexual behaviour and hormonal modulation of bodies with the queer ecologies of hermaphroditic gastropods.

Poetics of uncontainability

By ‘poetics of uncontainability’ (PoU) I intend a celebration of unsettled integrity. It is ‘poetics’ since it is a style of art-making, a way of using elements and materials, a fashion of weaving narratives and aesthetics together. PoU has emerged in this research through reflecting upon my artistic practice through feminist and queer ideas — the leak, the non/living, vulnerability and ‘to queer/queering’ as a process. It is directly linked to adopting leak as a method and emerges from it. I analysed the four artworks in the literature review regarding the context of their respective artistic movements, but also with a focus on the leakiness and vulnerabilities of the bodies involved. Simultaneously, I engaged with the concepts by making artworks with non/living matter and art and science practice. PoU interprets this process and the lyrical world of the artworks.

Drawing on the biophilosophical formulation of uncontainable life, PoU hints at the omnipresent potential excess in the non/living and its fundamental troublesome character. The idea of uncontainable life is intimately bound to art, as it was forged through the engagement of bioart works. Next to the uncontainable life (of bioart works), Radomska’s analysis brings the examples of waste and contamination as possible excess, with specific ethical and naturalcultural implications. Her examples cite the

famous artwork by TC&AProject exhibited at Mori Art Museum, when a mushroom grew on the artwork. The mushroom is out of place, in excess, in a museum exhibit. Elsewhere, such as a composting heap in a garden, a similar mushroom would indicate a healthy, thriving commensality of decomposer species. The naturalcultural fabric matters.

PoU looks at uncontrollability from within the artistic process. It thus places the aesthetic and poetic choices of the artist within the movable fabric shaped by agentialities and even unpredictabilities of materials, organisms, equipment rather than somewhere above them. A normative approach to this movable fabric would rather strive to control them. PoU weaves uncontainable elements into artistic creation to expand the relationalities at play in an artwork. For its feminist and queer lineage, it draws from the naturalcultural fabric of each artwork and acknowledges how the context marks the narrative. For instance, *Wombs* frames the hormonal modulation of organs beyond the boundaries of human bodies. In *Anti-Marta* the surgery is an act of love, whereas *Incorruptible Flesh* exposes a 'living corpse'. The bodies encountered in this research are vulnerable bodies: they present leaks, wounds, orifices, molecular transfer, symbiotic commensality. In some cases the wound is an act of love; in others it conveys grief and healing. A univocal reading of their uncontainability is not possible. Yet, what can be done is harness the inherent uncontainability as an artistic means or style.

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Semina Aeternitatis and *Wombs* bring attention to how implications across entities and borders are inevitable. By saying inevitable, I do not mean that implications happen in the way they do in the artworks: these present but one among many possible ways implications may manifest themselves. Preserving memories, for instance, does not happen usually with genetically modified organisms: other materials are used, such as paper, film, or digital devices. The technology for DNA data storage is still under development. The artwork combines these two ideas to bring up how choices that are private, or poetic, inevitably interfere with other entities. *Semina Aeternitatis* amplifies this 'messing up', this interference, through the choice of living bacteria and memory preservation.

Semina Aeternitatis evocatively engages with memory, an 'evanescent' entity, and reworks it into a plasmid, a 'tangible' entity. Quotation marks are a must here, as my reasoning does not comply to the spirit vs matter

binary which feminist and queer studies have disrupted so clearly. I am talking here of provisional states of being and their nuances. This distinction between evanescent and tangible takes into account how a memory has a material substrate in neuronal activity called an engram. In the same manner, oral narration consists of sound whose air pressure makes eardrums vibrate and excites neuronal activity. Also, whereas DNA is sturdy and stable molecules, plasmids are bound to transform during bacterial replication.

My point is that, despite its nanoscale, the tangible entity modifies the body of bacteria by becoming part of its genome. The scale is infinitesimal, there is no way a human naked eye can perceive it without biotechnological mediation. The plasmid can be visualised under UV light or through gel electrophoresis. The first case is a standard procedure in bacterial transformation. A fluorescence gene was added to the plasmid to mark transformed bacteria: under UV light, bacterial colonies would glow. In the second case, after enzymatic breakdown of DNA molecules extracted from transformed bacteria, the procedure allows identification of whether genome excerpts of the 'desired' scale are present.

The uncontainability in *Semina Aeternitatis* is inscribed in a narrative of transience and permanence. The usually transient character of personal memories is combined with the intervention into bacterial bodies. The artist, through bioscientific means, is the one who takes responsibility and interferes both with the transience of memories as well as with bacterial bodies. There is an artistic intentionality that steers the process: an electrical shock is intentionally applied to bacteria in order to let the plasmid into their body. Similarly, in *Surface Dynamics of Adhesion* the yeast colonies on agar plates are fashioned by the artist, who harnessed *Candida's* commensality for artistic purposes. During the exhibition, living yeast disrupts the pattern on the blood agar plates. The chimeric sculpture of *Semina Aeternitatis*, made of microbial cellulose and bones, is sterilized, but immersed in an ongoing process of transpiration triggered by the moisture trapped in the cellulose.

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In *Wombs*, the underlying eroticism of the piece is explored through the flow of pharmaceutical molecules through my body and possible environmental implications once those molecules are released into the environment. The initial idea looked at the uncontainability of these molecules:

taken for health reasons, what happens to them? A great part is digested and metabolized, but what about the residues? Of the specific hormones I take, there is insufficient data to make a statement. Thus the artwork continued along possible encounters triggered by this kind of molecule. As outlined in Chapter 1, my research contests the coupling feminine-leakiness, and rather looks at leaky bodies that exceed gender binaries. Among them, dumps, and a non-menstruating body with a womb. The uncontainability at play is linked to the endocrine and metabolic systems. It also scratches beyond the borders assigned between environments and bodies. By so doing, it fashions a landscape of interconnectedness, of uncontainable tensions that permeate, leak, and transgress boundaries.

PoU unsettles assigned integrity and borders. It points, as in Radomska, to a potential of excess and to the provisional character of borders. Such poetics show how art may amplify the intrinsic tension and implications. As I unpacked in the previous pages, it is political, because it challenges a status quo. However, the artworks encountered in this research do not celebrate orgiastic states of unruliness. That was the case, for instance, for certain works of feminist performance, which challenged social norms and reclaimed through openly transgressive actions and staging (see Chapter 1). The art encountered in this research offers what may be described as a subtle, yet radical in its own terms, way of challenging binaries or assigned borders. What is revealed is an intrinsic state of tension, of uncontainability — and, by so doing, potential openings and vulnerability.

The artworks in Chapter 3 invited me as audience to a contemplative transgression of bodily borders, eroticism, and non/living embodiment. The yeast patterns on agar lose their design at a pace that is not perceivable by the naked eye, yet one would notice the changes by visiting the work on different days. A video presents a surgery, the skin graft is then rejected, and one can see the scar on the artists' bodies: these events have more-than-human temporalities and can be appreciated with intervals, not in their processuality. A rivulet of blood surfaces where a blade touches the skin. Those are not dramatic events, but focused and meditative interventions across containment and letting go.

Despite the works evoking uncontainability and touch, artists are carefully responsible regarding potential biohazards that arise from manipu-

lating human biomatter, as in Bates' display of informative plates in the exhibition space. The containment of biohazard is common 'good practice' in biological arts, but also in performance art, as the unmotivated paranoia that followed some performances by Athey reminds us (Doyle 2013a: 17). The non/living installation of *Semina Aeternitatis* is exhibited after sterilization in compliance to European regulations of genetically modified organisms, which aims at preventing the introduction of those organisms into the environment. Poetics of uncontainability (and arts of vulnerability) does not celebrate potential risks; the matter is more subtle. It rather manifests non/living and more-than-human entanglements and harnesses them for a more aware and ethical being in the world.

The artworks I have engaged with present vulnerable bodies that resist normativities regarding gender and sexuality and also, importantly, in the relationship with matter. In this sense, they resonate with the intention of the fields of queer ecology and queer death studies to extend queer unsettling of normativities and binaries beyond the focus on gender and sexuality. The art pieces deal with openings, orifices, and excess that unsettle integrity of the bodies they present. On such basis, my discussion adopts the leak and the uncontainable as marks of poetics aimed at magnifying more-than-human entanglements, which I indicate as PoU.

I have discussed above how the selected artworks 'start from the human' to point beyond human-only realms. They do so by inviting into the time-space of the artwork microbial hosts, bodily secretions (of humans and gastropods), molecular reconfigurations. The works queer (as a verb) and exceed what is otherwise understood as human. By doing so, they reclaim leaky areas of relationalities. They show, chant, celebrate that which is not contained, and place the leak at the heart of their poetics.

Arts of vulnerability

I propose 'arts of vulnerability' (AoV) as a "queer way to engage with the leak and the uncontainable" (Pevere 2022). The expression emerges from my artistic research, and bioart practice is the catalyst for the present discussion. With arts of vulnerability, I intend the art that guided the research here — art that I or others made. AoV refers to art in its diversity: art practice, artistic research, artworks, shows, reviews. At the same time, I also mean art as the "skill in doing something, especially as the

result of knowledge or practice” (OED 2021). AoV is plural — arts — and cannot be singular, for there is no univocal mode of doing it and rather it appreciates multiplicity.

While intimately linked to the PoU, AoV regards more art practice than the lyrical world of the artworks. It is something that can be learnt: an artistic and epistemic tool; a skill. It draws on the understanding of art as a way of knowledge production outlined in the introduction. Anna Tsing, Heather Swanson, Elaine Gan and Nils Bubandt use the expression ‘arts of living on a damaged planet’ to invoke modes of rethinking and inhabiting the world that are attuned with ecological disruption (Tsing et al 2017). While mending is urgent but not always possible, it becomes even more urgent to transgress the normative narration of Man’s conquest of Nature (idem: 9) and learn new modes of observation and listening. Arts of living on a damaged planet is an invitation to deal with matters that are often not simple, such as symbiotic relationships, toxicity and contamination, or ecological codependencies. That is exactly the reason why arts are needed. Similarly, AoV is an invitation to deal with leaks, the uncontainable, and unruliness — in art and beyond.

190 AoV comes with a practical suggestion on how to do art with vulnerable, uncontainable, leaky bodies. This is a matter of nuances and not of resolute answers, and what it suggests is but one among many possible ways of art-making. What distinguishes AoV is that it reclaims the leak, the uncontainable, the vulnerable, for they enable encounters and knowledge in a more-than-human spectrum. I understand arts of vulnerability very practically at three levels. It is a way to make art, it becomes a philosophical position, and it may be useful to navigate more-than-human matters, in arts and beyond. I will now explain the three.

The realization and exhibition of *Semina Aeternitatis* and *Wombs* involved various degrees of uncontainability, leakiness, and vulnerability. At the beginning of the research I assumed those as features of the materials involved, which I knew for their resistance to be controlled and their inherent leakiness. After all, they are wet materials; organisms or their parts; non/living entities; sometimes liquid bioreagents to be administered and contained in sterile laminar flow hoods. Despite the efforts, controlled settings and procedures, uncontainability remains. One may give the optimal conditions to a culture to grow and thrive, yet there is always

the possibility that it does not react as wished. I treated them as precious materials for they were non/living, hence uncontainable and vulnerable. They inspired a sort of reverence. On a more practical note, the price of bioreagents and equipment amplified a considerate and careful use of them.

With the time that I had, I developed a way of treating the materials that was based on attunement with and listening to them. Rather than putting my efforts into a normative control of their processes, I learnt to listen to non/living and more-than-human matter. When I say listen, I do not mean aural listening, but a heightened attention towards catching nuances, a change in behaviour, or catching tiny indications of what the materials, organisms, or processes needed. One learns to discern the smell of a cell culture, for instance, as an immediate indicator that the time has come to change the culture medium. Similarly, from the initial cautious observation of Branko the slug in the terrarium, where my attention was directed at keeping it comfortable, I learnt how to touch it when cleaning was needed or to put it back in the terrarium when it escaped.

‘Listening’ to the slug culminated in the performance for camera. For the occasion, I took it from the terrarium and placed it on my skin. I waited and allowed both myself and the slug the time to understand what to do. I stayed still, on the floor of the studio. I perceived the slug stretching out to its full length and start exploring the surface of my back. I felt the silvery trails get colder and dry. Contrary to my expectations, the slug was not shy at all. I left behind the position of the artist and researcher observing the animal and offered my skin to its exploration. After the performance, I placed Branko back in the terrarium and fed it. At the end of the residency, I released it in the garden. The performance for camera had no audience, there was only the slug, the photographer, and myself: it was an intimate moment. I cannot say, therefore, what might happen if there were an audience, and I limit my observation to this context. A change happened in the position I had towards the slug. During the performance, I was ‘listening’ to its behaviour, I was no longer in the position of the observer. I knew the slug was vulnerable and I made myself vulnerable to it.

A similar change happened in the way I was working with non/living entities like cells or genetically modified bacteria. The kind of attunement required to, for instance, use smell as an indicator of a (cell or bacteria)

culture, pervaded the whole process inside the lab as well as during the exhibition. I realized I was not only running protocols to achieve a certain result, or certain artistic aim. I slowly entered a state of contemplation and listening driven by the process I was engaging with. I did have plans and schedules to fulfil my work and run the experiments needed during the residencies (which were in great part accomplished), yet I realized the process was not steered by myself only. As described in Chapter 4, the realization of the works took place in different contexts and with different time settings. At the IEGT I had less than four weeks in the lab and a precise experimental target (the transformation of *Acetobacter*). At UR Institute, I had four weeks in the lab plus the residency in Zagreb in 2019 and four weeks in the lab in 2021, with a more open-ended research intention. Despite the different time scales, contexts, and intentions, in both cases I realized how the attention moved from the initial aim to a way of listening to the process.

I had to find a way to negotiate with the inherent uncontainability and leakiness of the entities I encountered. While I could gain a deep understanding and knowledge about their processes, the discrepancy of my position — the artist and researcher who administers nutrients and settings but also life and death of cultures — made it challenging for me to take the other's point of view. I do not deny I wish I could. What I could do, though, was embrace both their vulnerabilities as well as mine: I made myself open to the encounter. I made art with vulnerable materials, but foremost I learnt how to make art by making myself vulnerable. By making myself vulnerable I could understand what I had to do. It is a learning process that comes with unsuccessful experiments, installations needing improvements, cultures requiring adjusted parameters. Importantly, engaging with vulnerable and unstable materials invites understanding of them, of where they are vulnerable, what their vulnerabilities may reveal, and how to take care of them. “Listening’ to these signals and understanding their implications can be trained, like as a skill. With time, one can grow skills — arts — of dealing with these vulnerabilities” (Pevere 2022). By making myself vulnerable, I reclaim the fact of being open, uncontainable, in the same way I reclaim the fact of working with leaky matter: this becomes a core element of artistic creation.

While my discussion so far has focused on the non/living entities in the lab, performance, or exhibition, I would like to outline how AoV addresses

the lyrical world of the artworks too. In the previous section I explained how the narrative of *Wombs* and *Semina Aeternitatis* stem from the entanglements across individual vulnerabilities and organisms or ecosystems. In *Wombs*, dealing with vulnerable matters in the realization of the work corresponded to the way the narrative developed. The body I am, a body with a womb, is vulnerable to the molecules I intake for contraception. Inner organs and glands react to these molecules. By choosing this kind of contraceptive, I make myself vulnerable to it. Yet, because bodies “do not end at the skin” (Shildrick 2015) vulnerabilities are extended to the environment and other organisms by the flow of mucus, urine, secretions.

One may argue that the leak, the excess, the uncontainable is skilfully administered in the artworks presented here and that their excess is eventually contained. The hybrid culture of gastropod and human cells is prepared so that these different cell types can coexist inside *W.o2*. In *Semina Aeternitatis* the leaks — the moment when Edith shares her memory, and the electroporation procedure — are intentional. Similarly, the skin cutting in *Succour* is rhythmically controlled, and *Candida* colonies in *Surface Dynamics of Adhesion* escape the boundaries of the patterns but not the acrylic frames that enclose them. Similarly, one may insist on how wounds create scars, orifices have sphincters, allogeneic skin grafts are rejected by the receiver. Such leaks reclaim the necessity to attune with it. Negotiation with leaks implies negotiation with the complexities that arise from engaging with flesh, symbionts, and desires without romanticized simplifications.

By saying it is a way to make art, I mean both art practice and art research. The relationship between the two is addressed in Chapter 1, and it suffices here to remind that AR takes art practice as field work to address a research question. Hence, AoV can be applied in art practice as well as in the research methods, as it happened with this project. Self-reflective, situated research opens to the privilege and responsibility of engaging with questions such as ‘When to intervene? What to control, what not? What to kill? Why? And how?’. Artists have variously addressed those questions before (Catts & Zurr 2002; de Menezes 2015; Mackenzie 2017 among others). However, those questions are meant to remain open, for art to amplify and make accessible, and sometimes, hopefully, to unpack them (Pevere 2022).

The idea of AoV originates thus in the manipulation of non/living matter as an artistic means. It becomes also a way of making art and artistic research. Through a queerfeminist reading, it further becomes a philosophical and ethical position. It takes the situated experience of artistic creation as an amplifier of the ethics and complexities of such engagement (Radomska et al 2021). Art allows magnification of otherwise unperceivable aspects as the interplay of processes and matters. Art operates in a response-able fabric where the matters require attunement and may resist functionality. In this context, an artist may seek to accommodate processes while steering them towards an artistic vision. The engagement with the non/living in bioart makes even more evident this need for negotiation without any presumptions of control.

AoV contemplates the complexities arising from the non/living, because it turns processuality and enmeshments into materials for artistic creation and philosophical inquiry. In so doing, it also reclaims states of indeterminacy and their possible uncontainable outcomes. An artwork in the exhibition may get contaminated, as in the example from the Mori Art Museum in Radomska's theorization. The work of an artist in the lab needs to take into account unpredictability, failure, and temporalities of the other as part of the process: the process itself is vulnerable, and the artist ought to embrace this to fulfil the artistic vision.

To this extent, the legacy of feminist and queer studies helps challenge understandings of vulnerability as something to protect against, and rather invites making something out of it. Daigle stresses the part referring to 'ability' rather than to the wound (Daigle 2018). In my discussion of the artworks in the literature review and in the fieldwork, I make clear how it is this potential wound that enables encounters and artistic creation. In *Wombs*, I expose my body to pharmaceutical compounds and seek for correspondences in other organisms. In *Semina Aeternitatis*, it is the moment of electroporation and the consequent holes in the bacterial membrane that allows Edith's memory to become part of the bacterial genome. In *Anti-Marta*, the wound is a mark of love and reconfiguration of the immune system. Potential wounds are not something to skew away from. Rather, one may reclaim these potential wounds and look at their ethical and biopolitical nuances. It is possible to understand the leak and the uncontainable as marks of vulnerability as, after Shildrick, they manifest "the permeability of the boundaries that guarantee [normatively

embodied self]". Shildrick further argues how vulnerability is not fully containable within the binary structure of the Western logos, and signals a transformation (Shildrick 2002: 1).

Queer theorizing further helps unpack these complexities beyond normative thinking. AoV takes leaks and vulnerabilities as existential modes of being. What is not fully containable inherently challenges — queers — normativities and binaries: "Queer is all about excess, pushing the boundary of what is possible" (Giffney & O'Rourke 2009: 8). Queer leaks and defies control; as in bioart practice, it calls for negotiation and its ethical potentials. It becomes a political move in the moment vulnerabilities are reclaimed. There is not a 'lack of' something, or some failure to comply with normative requirements. There is not the need to shy away from that which is uncontainable and leaky. AoV reclaim them as sites of encounter and knowledge, and a call for negotiation.

A remark is required regarding the way this refers to trans-corporeality by Alaimo (2016) and the environmental ethics of vulnerability by Hird (2013). By taking the leak and the uncontainable as the entry points of AoV, my idea acknowledges how different complexity arises in other contexts. From the perspective of environmental studies and movements for environmental justice, Alaimo invokes the way bodies are intermeshed with the material world in flesh and in biochemical pathways. Trans-corporeality analyses and imagines ways of talking about bodies 'of all species' in times of environmental crisis. The leak is not a feminist concern only, but leaks in landfills (and pipelines, and stockage places, ...) are urgent matters that pose ecological risks that are distributed asymmetrically. AoV does not overlook such complexities, but rather reclaims them.

From different angles, the contributions by Alaimo and Hird engage with scale and context that are different than those in bioart and their example helps magnify the complexities of the ideas presented here with regard to more-than-human matters. *Wombs* is inscribed in the mesh of flesh and biochemical pathways described by Alaimo, and *Semina Aeternitatis* points at how reworking of private materials may interfere with other organisms and environments. The scale is different, as an artwork, despite all the materialities at play, and rarely reaches the intricacies of a landfill. Yet, Alaimo and Hird's thinking sheds further light on how art may be taken as example in addressing more-than-human entanglements.

I should remark how the artistic process analysed in this research retains an uneven distribution of power. Throughout the development of *Semina Aeternitatis* and *Wombs*, it was me in the role of the artist making decisions about the biomaterials and organisms: when it was a good moment to inoculate a culture, and when to comply to the law by sterilizing the exhibit. I dissected one slug. I took great care of the slugs kept in the terraria, which I set free afterwards. I controlled humidity, temperature, rinsed cell cultures, and administered antibiotics and antifungal to eradicate vaginal microbiome in the epithelial cell culture. I froze cells and bacteria to store for future exhibitions. Those procedures in the lab open a biopolitical spectrum which is further amplified by the lyrical world of the artworks.

However, those choices were never determined only by myself as an artist. A certain cell culture needs certain parameters to thrive, an installation needs certain technical features to hang from the ceiling in a stable manner. A slug needs certain humidity and temperature: I once booked a taxi to move Branko's terrarium from the studio to the apartment in Zagreb, and had to deal with the taxi driver's reaction. The distribution of power was differential, but relationships are never univocal. Branko contributed to the creation of *W.03*, although I cannot say it was intentional.

¹⁹⁶ The choice of contraception is biopolitical not only towards society, as a more traditional reading of contraception would intend, but is biopolitical towards environments too because it enacts transcorporeal ethics. AoV becomes a queer biopolitical option because it amplifies and reclaims those implications and takes them as point of departure. Importantly, it unlatches them from univocal or normative directions. It encourages becoming vulnerable and stepping into this complexity in order to understand what is to be done.

Regarding the different treatment of the slugs in the work: the realization of the project allowed to know more about them and learn, possibly, how to respect them. It also exposed contrasting perceptions in the audience: some were disgusted, others were not bothered by killing slugs in the garden, and others again were fascinated and wanted to know more. Traditionally, animals in art have variedly unsettled ethical parameters and have exposed friction related to animal rights (Aloi 2012). Bioart works like *Victimless Utopia* or *mEat me* address straightforwardly the hypocrisy in the different perceptions of how animals are treated in industrialized

societies: whereas animal-based diets are increasingly under scrutiny, the use of animal derivatives in industry (pharmaceutical, medical, cosmetic) is less challenged. In art, the presence of an animal or animal derivatives may still be perceived as problematic. Simultaneously — with some exceptions — less attention is given to the ethics of using polluting materials or resources in art. The ethics of plants in art is still marginally addressed. Whereas a full discussion of these aspects exceeds the focus of the dissertation, AoV intersects them by acknowledging that the artist is within the same fabric — but with differentials of power.

Temporalities matter too: for AoV one ought to account for the different temporalities of the non/living entities in planning and steering the work. For instance, the reaction of a bacterial culture to a changed nutrient may not be immediate. It takes time. Different bacteria need different times for cell replication, as was the case with *E coli* and *K rhaeticus* in *Semina Aeternitatis*. Sometimes it can take more time than expected, or experiments must be made more than once. At a different scale, landfill leachate described by Hird shows how a project of containment may reveal its leakage over time, and with it unprecedented compounds of chemicals and bacteria.

AoV engages with the ethics and complexities of engaging with non/living matter by reclaiming the precondition that bodies are leaky. Human; more-than-human; non/living; bodies of knowledge are. It is because of such leakiness that bodies are vulnerable, although not all in the same manner as the distribution of power during the artistic creation is never flat. As an artist, I tried to make myself vulnerable to the artistic process in the same manner I made myself vulnerable to hormones I take as contraceptive, and reclaim this choice, and queer it. (Pevere 2022)

¹⁹⁷

Leaks across arts and science

Following the discussion of PoU and AoV, I return to the questionnaire I submitted to some of the scientists involved in the project. I refer to my co-authored article (Groth et al 2020) for a more comprehensive discussion about art and science collaborations; here I simply intend to trace whether AoV and PoU may say anything on the matter. The questionnaire featured four open questions and a space for extra remarks. The purpose

was to know more about the scientists' experience and intercept what, if any, openings may have emerged in the collaboration.

Analysed qualitatively, the questionnaires offer a description of the experience in sensorial terms and curiosity: words like 'weird', 'fascinating', 'interesting', 'creepy', 'alive', 'huge complexity', 'not obvious', and 'proud' return throughout the responses, including notes regarding the perceptual experience ('nothing smells like this'). These words suggest a rich engagement with the process and the topics raised in the questionnaire. However, the scientists with no previous experience in transdisciplinary collaborations did not visit the exhibition (but saw pictures of them).

When asked about any reflections on their own work, one scientist gave a generous answer and reflected on the way biology is presented as "very simplistic". Their reflection on the complexity of biological life is accompanied by the realization that papers and literature address "single aspects in sometimes specific conditions when these things were analysed and examined", thus pointing at how taking existing protocols to work on further ideas sometimes clashes with the specificity of research. They continue, however, saying they learnt to see "the whole picture" and look at things from different angles, making them understand more of the complexity of life. They concluded with "your work also taught me a new different angle".

One scientist with no previous experience in art and science collaboration commented, in the space for extra remarks, that many in the group had initial reservations, for the presence of an artist was perceived as a "total contradiction" to what they do, thus suggesting an understanding of art and science as distinct disciplines. They also admitted to having reservations around whether the presence of an artist in the lab may interfere with their work. However, they continued by saying that the experience was a breakthrough they "did not know they needed" and that the group was "happy" to see artists working. Another scientist in the same lab commented on the cumbersome bureaucracy linked to the genetic editing procedure and that they appreciated how art employing scientific methods may have to deal with the "exhausting" problems of both. Another scientist appreciated the effort required for finding the partners and financial support. All respondents were open to future collaborations,

and one commented "definitely yes" because the collaboration expanded their knowledge of what you can do with a specific technique.

One scientist reflected on how some visitors (to the show) were frustrated by not understanding exactly the science behind the process, and commented: "is our society so science-driven that, even in an artistic context, a drop of science is enough to enable the intellect to take over the engagement with the artwork?". Another scientist used the occasion to reflect on the killing of bacteria in the lab, which they linked to sacrificial rituals.

One scientist concluded with "you are working with science outside the borders of science. There is a lot of creativity possible that could have quite an impact on future research and development". The remark does not specify what kind of research and development, whether technical and scientific or research in general. However, the word choice "outside the borders" hints at possible unrest within disciplinary borders and suggests their transgression may open up novel knowledge.

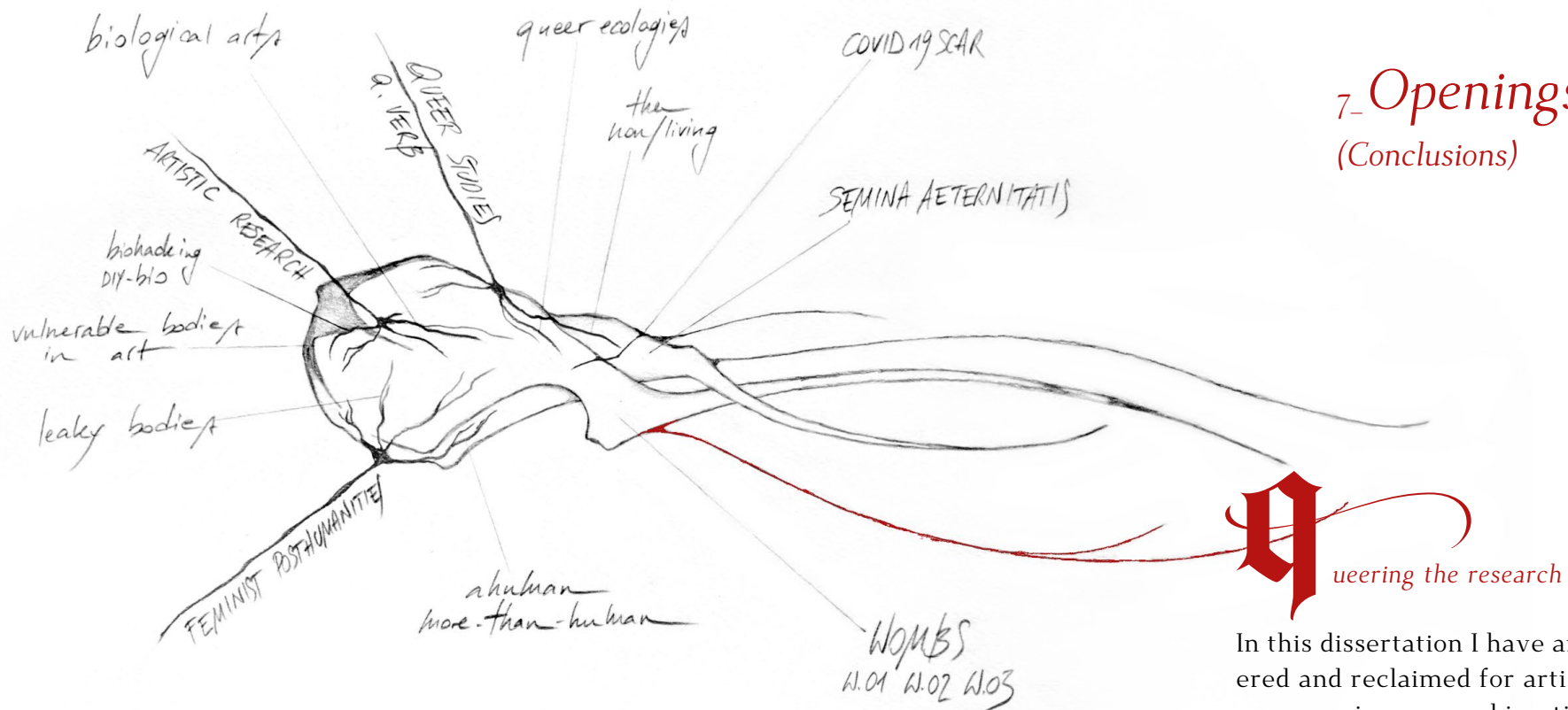
The answers to the questionnaire revealed how initial reluctance dissipated towards a more open attitude and a gratifying experience, especially for the respondents with no prior experience in art and science collaborations. The respondents with prior experience did visit the show, and presented the collaboration, including pictures, techniques and ideas, to their students in their university lectures.

The questionnaire did not include PoU and AoV explicitly for it was formulated before the full development of the concepts. Moreover, it intentionally avoided philosophical concepts and terms to be more accessible to respondents with a different background. Having said that, it is worth noting how the landscape of uncontainability described in PoU finds some resonance with the answers provided. The transgression of borders is evoked for its potential for future knowledge and the layers of further interpretation that artistic intervention may add to scientific procedures. Although the scientists with no previous experience did not visit the exhibition, the process they took part in stayed with them and spurred reflections both on the process itself as well as their own practice. Drawing from this understanding, PoU may be extended to refer to more-than-human relationalities in knowledge and research, as in the case of this dissertation. The uncontainable character of the disciplines I have

employed has converged into a dissertation that has its own character, research problem, methods, and findings.

AoV, instead, intervenes in the trajectories of encounters that were initially unsettling (“a total contradiction”) but bore a transformative potential. Wording like “it was the first time”, or the choice to expand how basic biological knowledge now seems simplistic in one’s practice, hints at what those (initially unsettling) encounters mobilize. Even if none of the respondents commented on the consideration of *E coli* either as a living being or a tool for science, the questionnaires point at how art may formulate different understandings of existing things.

To conclude, learning about the experience of the scientists allowed me — as an artist and a practitioner — to review my ideas on the collaboration and the process itself. Engaging with others’ vulnerabilities, points of resistance, or the uncontrollable potential of collaboration offered the possibility to test, at least provisionally, how the research conducted is not confined within the the exhibited artworks. Rather, it brings the discussion back to issues of knowledge production across disciplines and enacted by art, magnifying the fabric that surrounds bioart practice and outlining the artwork as a response-able element and catalyst for ramified interplays and vulnerable becomings.



7. Openings (Conclusions)

Queering the research

In this dissertation I have argued how leaks and vulnerability may be queered and reclaimed for artistic purposes. I have investigated both through my experience as a bioartist in the realization of *Semina Aeternitatis* and *Wombs*. Art has been both a material as well as a situated method of inquiry. Furthermore, I have tested art as a way of knowledge production that exceeds a single artwork or the technical tools used to realize it, and that may speak to artists and scholars across a range of intersecting disciplines. I have reflected on my artistic practice in queerfeminist terms and used it as site for my queerfeminist theorizing. What has emerged alongside the artworks are the concepts arts of vulnerability (AoV) and poetics of uncontainability (PoU): they both speak from art to something that exceeds it.

My initial motivation was to investigate biological art practice with a queerfeminist theoretical framework. Thus, the biophilosophical concepts of uncontainable life and the non/living have guided my reading of bioart. While acknowledging the artworks' bioscientific fabric, Radomska's biophilosophy points at bioart's potential of excess to show that life is a multiplicitous, dynamic and not-reducible process. The non/living erodes classical divides of life/death, growth/decay, organic/inorganic and harnesses the potential of excess to surpass prescribed boundaries. In this

theorizing, biotechnological facts become part of this multiplicitous transgression of divides.

Central to my research, and alongside Radomska's biophilosophy of bio-art, has been a constellation of ideas that speak of an irreducible openness. I have intersected Shildrick's idea of leaky bodies (material bodies and bodies of knowledge) with environmental and queer readings through Hird's work on landfills and how leachate forces communities, environments and policymakers to engage with ecological complexity. By reading the works by Shildrick and Hird in queer terms, I have explored leaks as an ontological mark of bodies that forces thinking in terms of inherent uncontainability.

To describe the landscape of materials and ideas that come with this dissertation, I have employed the term more-than-human, which I borrow from environmental studies and critical geography. The more-than-human hints at a complexity that, while including the human, exceeds it. I chose the term for it is a good reminder that, even though there are human matters at play, there is always more to it. It points at an irreducible exceedance and thus responds to the ideas of leaky bodies and uncontainable life. With it, I refer to the materials and processes of the artworks and to the comprehensive fabric of the research.

The way I have combined ideas and artworks relies on philosophical lines that see matters and knowledge as interdependent, intra-active à la Barad, and able to affect each other mutually. Among these lines, I have turned to Alaimo's trans-corporeality to elucidate how bodies and environments are interpenetrated. Trans-corporeality accounts of permeability of bodies and environments that are traversed by different substances that can never be fully accounted for. Emerging from environmental movements, the idea helps thinking across bodies. It also links explicitly to the narrative of *Wombs*. The artwork, in fact, stems from an interrogation of molecules taken for contraception and their possible environmental, trans-corporeal entanglements.

While nurturing these lines of thoughts, this dissertation remains about art. Questions arising through the process were to be answered through art. In *Wombs* and *Semina Aeternitatis*, this was valid both for their technical aspects — which I approached by weaving into the artworks' poetics

— as well as for the ideas they mobilize. The many hours spent in the lab — compiling bioprotocols or manipulating and observing biomatter — shaped the need to unpack 'what to do' with leaks and vulnerability. In fact, the leaks manifested as a reluctance to comply. Even when leaks were controlled, they presented the haunting possibility that something may yet resist my intentions. Leaks revealed vulnerabilities as sites of potential harm. Within the experimental space, harm would mean for instance a contaminated culture or a failed experiment. Outside a strictly functional setting, a leak may reveal something else. In the narrative of the artworks, leaks would lead to unsettling encounters or overlaps across bodies and environment.

In other words, making the artworks shaped a complex relationality between my artistic intentions, the interplay of organic and technoscientific matters, and research questions. In this relationality, the artworks were themselves response-able, to say it with Schrader, for they spurred me, the researcher, to ask more questions. Whereas I (as artist and researcher) was steering the process, the non/living in the artworks resisted to be fully controlled or manipulated. It called me to respond to it. So, the artworks are not only the result of an artistic drive, but rather they emerge from tensions across the various narratives and materialities at play. I (as artist and researcher) was part of this response-able relationship.

Embracing queer as a verb has unlocked possible ways to engage with the response-able fabric surrounding the artworks. Thinking in queer terms has become an action. The legacy of trespassing heteronormative paradigms or human/nature divides has resulted in attention for diversity and nuance. In this research, the overcoming of binaries (organic/technological, art/science, matter/ideas) acknowledges the difference between, for instance, my role as an artist and the role of Branko the slug. Contextually, it magnifies the trans-corporeal effects of being together in the artwork. The result of the queer research approach is the refusal of univocal readings, and rather an opening up to nuances, implications, and modes of being.

Queering the research has led to embracing differentials and the haunting presence of leaks and vulnerability. I have done this with the intention to seek where they would lead me. They became epistemic tools to reflect on art-making, from the situated perspective of an artist and researcher in a

response-able relationship with artworks, ideas, organisms. Furthermore, the call to action entailed in understanding ‘queer’ as a verb has helped highlight possible answers to the question of ‘what to do’ with non/living artworks and uncontrollable matters: arts and poetics. Arts as a skill, and poetics as a fashion of weaving things together. In the next section, I revisit how the artworks *Wombs* and *Semina Aeternitatis* contributed to the formulation of AoV and PoU.

Leaky matters

I offer PoU as a style of art-making: a fashion of weaving matters and narratives that honours leakiness and vulnerability. With this, I mean that it shapes a landscape where the uncontrollable is offered as a site of encounter and possibilities, rather than as something negative. PoU therefore transgresses normative readings and divides. I use ‘honour’ in queer terms: it exhorts us to acknowledge, unpack, and celebrate its potential and refusal to comply with univocal definitions.

I formulated PoU based on my engagement with four artworks reviewed in Chapter 3 and the two artistic components of this PhD research presented in Chapter 4. The artworks encountered in Chapter 3 (*Surface Dynamics of Adhesion*; *Anti-Marta*; *Incorruptible Flesh*; *Succour*) offer what may be described as a subtle, yet radical, way of challenging binaries or assigned borders. They present more-than-human bodies cut open, perforated, exposed in their vulnerability, altered through mutual skin grafts or queered by symbiotic commensalities. Those works evoke eroticism and intimacy within a queer spectrum. By doing so, they invite the audience to focus on a trans-corporeal fabric of proximity, desire, touch. Whereas the artworks feature different degrees of bioscientific machineries in the exhibit, they refer (in various degrees) to medical and scientific knowledge and tools to formulate questions about relationalities in a more-than-human spectrum. By shaping a heightened state of attention in the viewer, they trigger a meditative state which invites a contemplation of the leaks offered.

Uncontrollability in *Semina Aeternitatis* and *Wombs* is entailed in their non/living character. Both interweave bioscientific knowledge and matters that challenge normative understandings in the exhibit and realization. I made them by employing scientific tools and protocols to manipulate cells

and bacterial cultures. The artworks employ certain techniques that have a history in biological arts, such as cell culture and genetic engineering. However, they interpret those techniques with innovations regarding less common bacterial strains and custom algorithmic code conversion in *Semina Aeternitatis* and a hybrid human–slug cell culture in *Wombs*. Throughout the process, I managed inoculations and autoclaving. I worked in a sterile setting, isolated non/living processes, determined when killing was needed.

However, the uncontrollability of *Semina Aeternitatis* and *Wombs* unfolds further in their narratives. *Wombs* speaks of possible becomings of contraceptive hormones beyond the human body that takes them. These possible becomings became encounters through skin-to-skin touch in *W.03*, hybrid cell culture in *W.02*, and bacterial metabolism in *W.01*. The work also encounters areas of indeterminacy in current science regarding the role of mammalian sex steroids in gastropods. The work dialogues with this indeterminacy and comments on the complexity of trans-corporeal relations. *Semina Aeternitatis* reworks fleeting, uncontrollable memories by imagining how these memories may become part of an organism’s genome by means of DNA data encoding. To achieve this, a multitude of bacterial bodies were nurtured, autoclaved, disassembled to extract and manipulate the desired molecule in multiple stages.

Engaging with the artworks in Chapters 3 and 4 shapes PoU as an artistic idea. In fact, PoU emerges from art to describe art. However, it is not controllable within art and takes off from the lyrical world of the artworks to become something else. PoU builds upon the understanding of art as a way of knowledge production, presenting an aesthetic instance and then becoming a queer epistemic approach. As an artistic idea, PoU describes how uncontrollable matters may be artistically employed to speak of unsettling relationalities.

Drawing from this understanding, PoU may be extended to refer to more-than-human relationalities in knowledge and research, as in the case of this dissertation. Taking a step further, it may be framed within rising environmental complexities to highlight how trans-corporeal connections, flows and influences are inscribed in a landscape that is fundamentally uncontrollable. It suggests looking at the leakiness and uncontrollability at play to appreciate how ramified and pervasive more-than-human bonds

are. In the movement from art to possible other contexts, PoU maintains its original focus.

With a similar trajectory, AoV has emerged from art to transgress it. In Chapters 1 and 3, I reviewed a series of ideas that shift from understanding vulnerability as the site of potential harm to an enabler. From different angles, those ideas divert from a passive role attributed to that which is vulnerable. I called on queerfeminist theorizing to reclaim this vulnerability and make something out of it, to tentatively respond to the question of ‘what to do?’ that emerged from the artistic process. My argument acknowledges that vulnerabilities are never distributed evenly and how power dynamics influence them. Nonetheless, my argument aims to unlatch from normative understanding and seek for ways of engaging with vulnerabilities that magnify their complexity and potential.

In the four works reviewed in Chapter 3, vulnerabilities are harnessed to manifest desire, longing. My analysis has outlined how vulnerabilities are used to invite the audience to react by sitting close to the *Candida* plates, for instance, or place the arm under the video projection of a surgery, or to caress and anoint a mortal body. Not only were vulnerabilities employed to communicate with the audience, but they were key in the material eventfulness of the artworks, as in the moment that *Candida* cultures overgrew the decorative patterns, or when the artist’s immune system was altered by an allogeneic skin graft.

In *Wombs* and *Semina Aeternitatis*, I was exposed to the process in my role as artist and researcher. I conducted the research beginning from the artistic intuition to the practical work in the lab and the long hours and thrills of setting up an exhibit for the first time. In other words, I was part of this response-able fabric arising from these artworks coming to the world. Chapter 6 has described how, within such a fabric, vulnerabilities of organisms or their parts, of machineries, of collaborators in the transdisciplinary work, and mine became apparent.

In *Semina Aeternitatis*, I engaged with the paradoxical desire to store memory on a bacterial genome. This implied manipulating Edith’s childhood memories and transferring them via a technoscientific procedure which was tested in this setting for the first time. Trans-corporeality manifested incrementally throughout the process, from the initial interview to

the electroporation procedure and beyond. The artwork was presented to the audience to convey both the research process (the research desk) as well as a sense of longing (the sculpture with the skull and cellulose). The three instances of *Wombs* speak of exposures (of bodies to hormones, of different cells in a common culture media, of myself and a slug). Trans-corporeal entanglements reflect on desire (not to become pregnant) and ecological complexity (what may certain hormones mean to slugs?). The artwork manifests in multiple exhibits that shape a landscape of interpenetrations.

The vulnerability of non/living matters, processes and organisms remained pervasive throughout the process. Every step of the manipulation of the materialities required an advanced attunement to their needs, which I have described as a non-auditory listening. Rather than controlling them, I remain open and take response-ability for others’ vulnerability. To do this, I had to make myself vulnerable to them. Simultaneously, such an acknowledgement shaped the necessity to unpack their potentials, in a similar fashion as with leaks. It spurred the formulation of possible different imaginaries that may undo simplistic answers such as removal or control. Thus, vulnerabilities have become a matrix to access the relationship. Crucially, taking into account the response-able context of the realized artworks, making art made me vulnerable to the process and entities: vulnerabilities became a catalyst of change.

To summarize, AoV is characterized by four elements examined in Chapters 3, 4 and 6. Firstly, it draws on PoU to honour that which is not containable. Secondly, it builds on uncontainability and vulnerability to shape sites of more-than-human encounter. Thirdly, and perhaps most importantly, it queers and reclaims vulnerability to make art with it. On these premises, the fourth feature is that AoV exceeds art and becomes arts, or a skill of doing things. Because it is a skill, it can be acquired through practice.

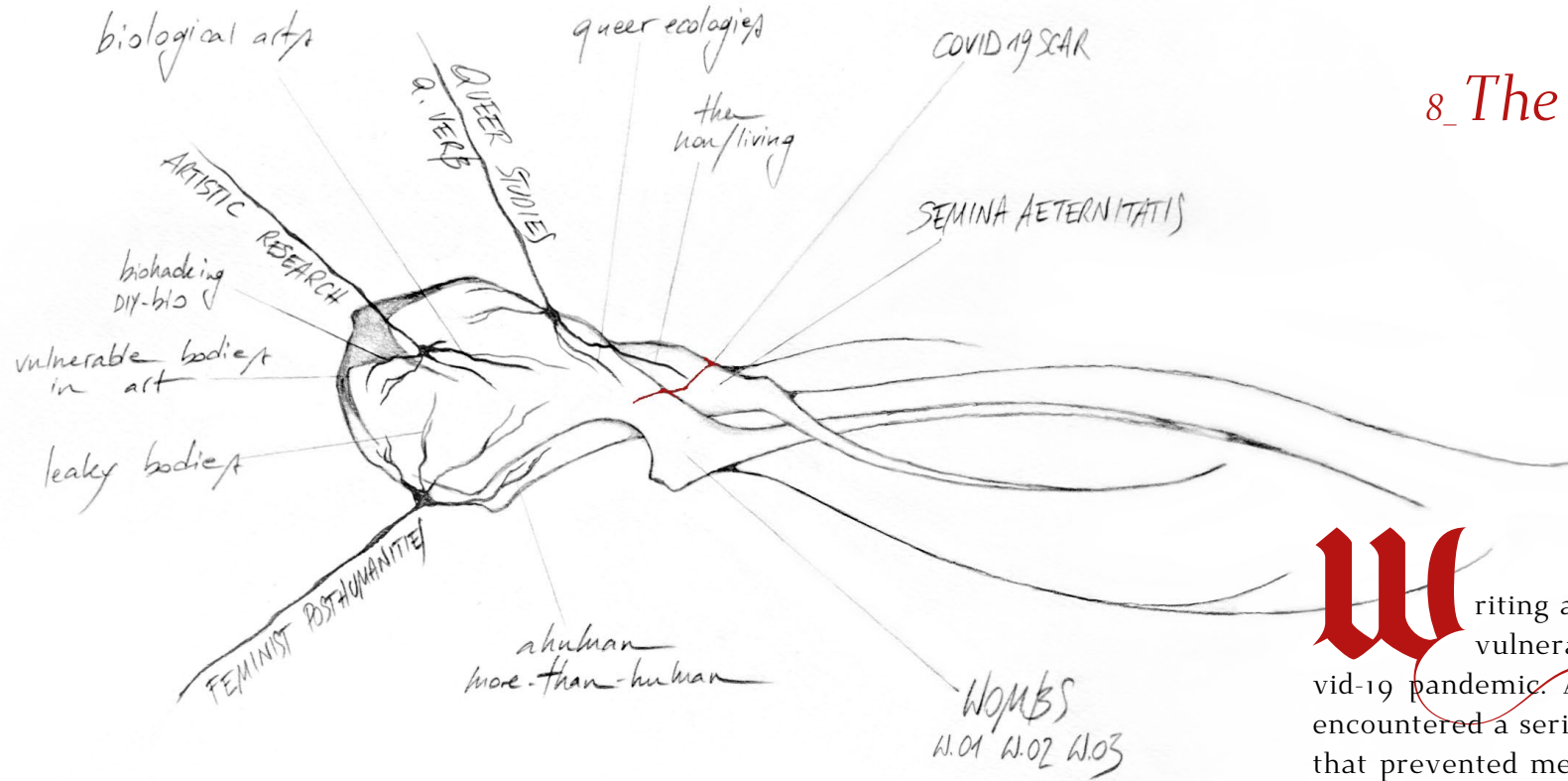
By assuming the leak as a methodological stance, I have worked on the overlaps between the artistic work with non/living matter and the understanding of bodies and relationships as never enclosed. I have worked with the wet materialities of organisms and their parts. I have engaged with more-than-human entities, which refuse to be contained within human-only experiences and poetics. There was an inherent exuberance,

exceedance, uncontainability, in material and processes. It was wet work, which implied a lot of washing, rinsing, pipetting, autoclaving, sealing. Non/living matters required skills not confined to the scientific protocols adopted in the process. Rather, they required a sort of learning from their specific liveliness and context.

The knowledge tendered in this dissertation is situated in the multiple experiences of practical work in the wet lab, linked with the manipulations of liquids, and a research framework based on practices that are, each in their own terms, leaky: bioart practice, queerfeminist thinking, and transdisciplinary artistic research. They unsettle clear cuts and univocal paradigms. With this in mind, I have imagined this dissertation as immersed in the fluids that permeate my work. The enigma in the drawing — perhaps an extra-bodily organ, perhaps a symbiont — is not meant to be resolved here. What matters is the set of relations that it manifests.

Interpenetration — the myriad of complications that derive from being mixed, transcorporeal, in dynamic material and semantic exchange — must happen somewhere. There must be leaks. Or, rather, leaks are the way interpenetration happens. In my understanding, vulnerability is the trait that enables interpenetration. It is not only a feature that makes bodies open — and conversely openness is not only a feature that makes bodies vulnerable. A queer reading of these relationalities turns them into a catalyst of change. AoV may be learnt, as a skill, to make art and to catalyse change with the hope for nuanced and response-able engagements.

8 The Covid-19 scar



Writing about biological art practice and its intimate bond with vulnerability is an unsettling endeavour in times of the Covid-19 pandemic. As a practitioner in the field and a PhD candidate, I encountered a series of converging impairments caused by the pandemic that prevented me from hands-on practice in biological laboratories as I would otherwise do both for doctoral research as well as for exhibitions. During the months of travel restrictions and lockdown, I was invited to join multiple public discursive occasions³³ that more or less intentionally addressed the implications between the pandemic, society, and biological art practice. I conducted artistic research more through discourse (rather than practice) than I usually did before the pandemic — and practised research discursively.

Although most fieldwork was completed and the dissertation was in its planning phase when the Covid-19 pandemic erupted, a comment becomes necessary as I have written the dissertation during months of travel restrictions or lockdown. This section is a postscript, or perhaps a note written in the margin, which I cannot eschew. While this writing is not about the pandemic, the consequences of the pandemic widely cut through my work.

There is an irreducible ambivalence in this situation, which is both a bitter halt to my research and the ‘problem’ of a privileged person. The pandemic affects hu-

33 Among others: Interview with Makery (La Frenais 2020); the Non/Living Queerings working group for the Braiding Friction series (Biofriction 2021); interview for State Studio Curious Minds series (Ninane & Takirdiki 2020); *Outré: Encounters with Non/Living Things*, curated by Bilge Hasdemir, V1 & V2 Galleries at Aalto University, Espoo (FI) and related interview; Zoom-based Viral Cloud conversations between Art Laboratory Berlin and Bioclub Tokyo.

man cohorts with severe consequences on the lives of many (Radomska et al 2021). The impossibility of exhibiting an artwork that involves human and slug cells may remain marginal to many. Yet, this impossibility of working reveals the naturalcultural fabric the piece operates in: an interweaving of ecological, sanitary, political, and jurisdictional realities (Pevere 2021). This impossibility is linked with the specific vulnerability expressed in biological arts. embodiment and ecologies sustains the inquiry. The research manifests through the artworks shown in exhibitions; presentations at conferences; published essays; and this dissertation.

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Appendix

Questionnaire for the scientific collaborators

The following pages reproduce the questionnaire as submitted to the collaborating scientists, including layout and page breaks.

Hello,

and thank you for your time!

I am addressing some scientists I have collaborated with during my PhD about the work we did together. I will treat replies anonymously as substrate to reflect on transdisciplinary collaboration in art and science in my dissertation. Art and science can be both considered different forms of knowledge production. More often than we think, they touch each other — think of the creativity of a bioscientist in the lab, or the technical skills required by an artist.

Please feel free to be concise or expand your answers as you prefer. All your comments are valuable also when they are critical. However, please keep in mind that this is not an evaluation questionnaire. Rather, I would like that the exceptional researchers I worked with have a say in my research. The questionnaire aims to understand their experience with regard to the knowledge production in transdisciplinary research.

Before we continue to the real questions, I kindly ask you to reply to data treatment policy:

- Do you give me the permission to work on your replies for my dissertation and possibly future publications? (Yes/No)
- Do you give me the permission to use your replies anonymized? (Yes/No)
- Do you give me the permission to quote your replies? (Yes/No)

If you have any questions, please do not hesitate to contact me. at margherita.pevere@aalto.fi

Also, in case you are interested to read some of the literature I refer to about art and science collaboration, please let me know. I'll be happy to share some texts.

Thank you!

Question Nr. 1

Some time has passed since our collaboration. Did anything stay with you of this experience? If so, what stayed?

Question Nr. 2

One scientist (it may be you, but I am asking the same question to everyone) one day spontaneously commented that before the collaboration they used to consider E coli as a tool, but during the collaboration they started seeing it as “a living being”. This spontaneous comment stayed with me.³⁴

Did anything similar happen to you? Did you reflect on any particular aspect of your work that you had not considered before, and if so, what kind of aspects?

Question Nr. 3

Did you visit the exhibited artwork? What was your perception of the exhibited artwork after being involved in the “making of”?

Question Nr. 4

In the future, would you be open to be involved again in transdisciplinary work with artists?

Question Nr. 5

Do you have extra remarks?

³⁴
This comment opens to rich lines of discussion. You can read some possible lines of reflection on the last page. Up to you whether to read it before or after replying to the question :)

*“One scientist (it may be you, but I am asking the same question to everyone) one day spontaneously commented that before the collaboration they used to consider *E coli* as a tool, but during the collaboration they started seeing it as “a living being”.*

The comment opens to rich lines of discussion — it is not my intention to address them exhaustively here, but rather to quickly sketch some of them.

On the one hand, for instance, we can discuss how the term ‘living’ has different meanings according to different scientific, philosophical, or even religious beliefs. On the other hand, the comment tackles the use of organisms in research, an aspect that is regulated according to different kinds of organisms (bacteria, viruses, insects, mammals, plants, etc.). Yet, how do scientists find their individual ethical stance? How does scientific training encourage future scientists to interrogate their own work?

Another line of reflection may address the scientific method. *E coli* is a worldwide model organism: this aspect is important for replicability of experiments and validation of scientific knowledge. Isn’t scientific method also the expression of a certain Weltanschauung? Whose Weltanschauung is it? All this responsibility on the shoulders of a bacterial strain...

Last but not least, the scientist’s comment suggests a potentially transformative power of transdisciplinary collaboration, for all parts involved. How can we include this transformative power in research?



What does it mean to be vulnerable and what may vulnerability tell us about bodies and environments in posthuman terms?

This monograph responds to these questions by presenting artistic research conducted through the manipulation of organic matter and biotechnology (bioart). Slugs, cellulose-producing bacteria, bioreagents, drawing, writing: diverse materials constellate throughout the research and come together in celebration of leaky matters and relations.

The reader is guided through the realization of two artworks (*Semina Aeternitatis* and the series *Wombs*) with insights into biotechnological and artistic methods, and the contexts of realization and exhibition. The monograph then offers a nuanced discussion in feminist and queer terms about materiality, vulnerability, and the entanglements of life and death. An image section accompanies the writing.

What emerges are two concepts — ‘arts of vulnerability’ and ‘poetics of uncontainability’ — which, while coming from the arts, may have something to say about these very unstable times.



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