

Initiated in 2015 as a conceptual platform for ideas, tactics, and collaborations, Open Source Estrogen began with a simple question: What if it were possible to synthesize estrogen in the kitchen? From this seed came more questions as to how gendered bodies are controlled and managed through corporate and institutional science and how endocrine-disrupting molecules exist already around us as a state of environmental toxicity. Is there hope for disobedient bodies amongst capitalist and ecological ruins? To answer this question, the project and its following mutations position hormones and their molecular colonization as a constant entanglement with the self—human, nonhuman, and planetary—with their biopolitical omnipresence as the very source from which we collectively hack, demystify, and emancipate its molecular mystique.

All Washed Over by Hormones of Loving Grace

Mary Maggic

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How is gender codified by hormones? How did we arrive at the black-boxed fact that a molecule like estrogen produces characteristics of femininity and testosterone of masculinity? It is widely accepted that gender is chemical, that »sex hormones« such as estrogen, progesterone and testosterone are responsible for the production of primary sex characteristics in the developing fetus, then of secondary sex characteristics at the onset of puberty.¹ However, the way that scientific institutions have defined female-ness and male-ness since the 1800s comes already entangled with preexisting gender biases. Canadian philosopher Ian Hacking writes in *Representing and Intervening*, »We did not just find sex hormones somewhere in a lost corner, like a desert island lost in the mist. We ourselves called sex hormones into existence.«² Despite the facts that hormones like estrogen and testosterone are responsible for the basic homeostasis of the body, as opposed to solely the reproductive system, and that they are produced in all bodies regardless of gender, scientists continued to source hormones from their codified gender assignments. For example, French-Mauritian scientist Charles-Édouard Brown-Séquard (1817–1894) who popularized the concept of organotherapy in the late 1800s, would inject himself with extracts of animal testicles in order to rejuvenate his own masculinity.³ The hormones were literally »sexed« – given sexes of their own.

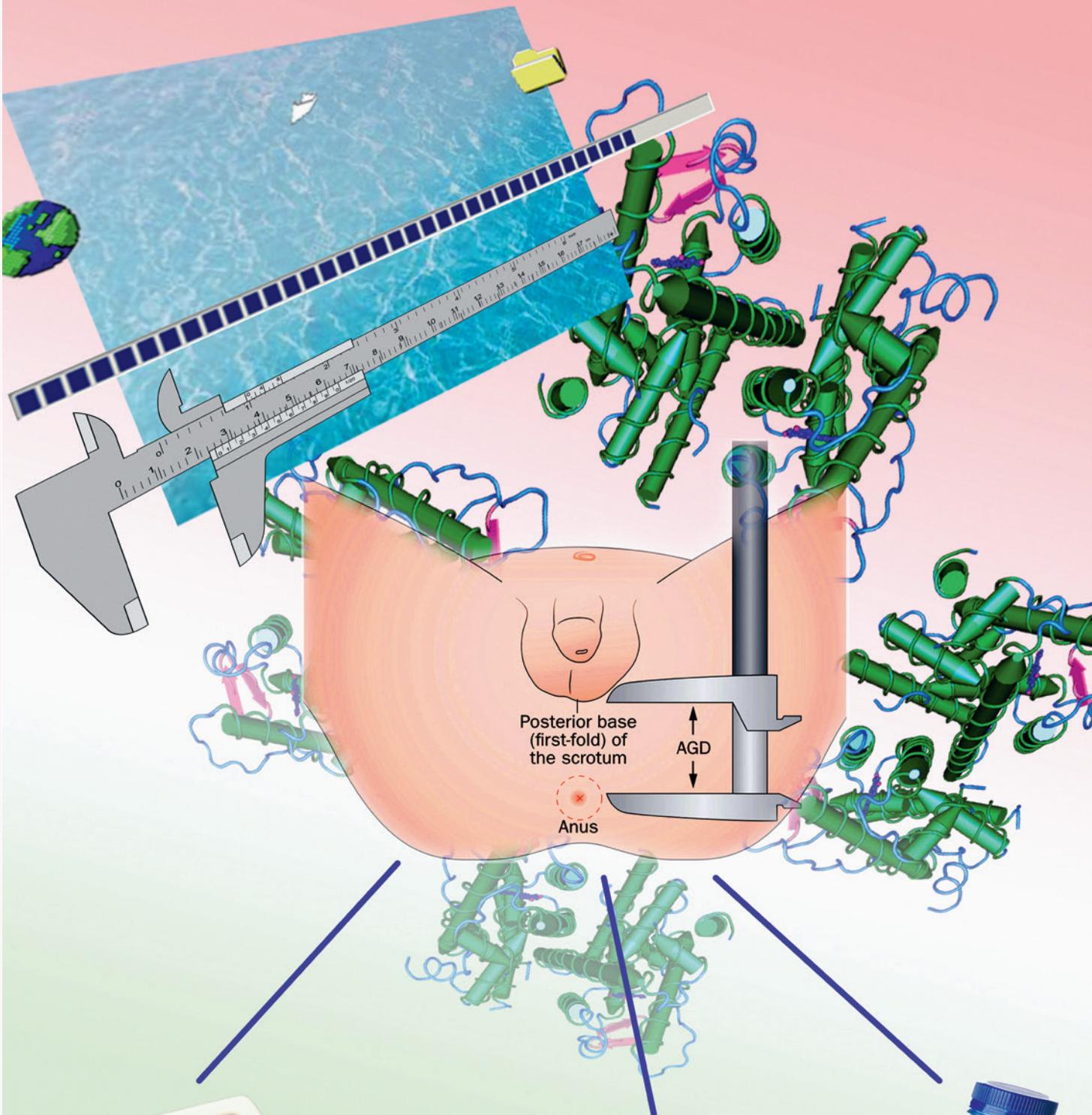
When the medical basis for organotherapy was later verified by the presence of hormones like estrogen and testosterone, these molecules would increasingly act as a kind of biosurveillance that controls and manages whole populations and their gender subjectivities. This state-scientific production of heterosexual bodies would eventually prove to be highly profitable for those institutions in charge of their gatekeeping. Operating under what Spanish philosopher Paul B. Preciado calls a »pharmacopornographic regime,« these molecules would reproduce notions of femininity and masculinity, where biotechnologies like Viagra, birth control pills and anti-AIDS medicine use sex, sexuality and sexual identity as the »somato-political centers for producing and governing subjectivity.«⁴ The 1930s mark a period in the hormone historical timeline where several major European pharma-industrial companies set out to race and territorialize both human and nonhuman sources for hormones. From pregnant

women and horses to prisoners and psychiatric patients, there was no end to the amount of consensual and nonconsensual bodies that could be turned into biocommodities for a budding hormonal industry. What emerged was a mutually beneficial triad: the clinic that diagnosed and created more patients, the laboratory that researched and developed hormonal therapies and finally, the pharmaceutical companies that marketed these therapies to the masses.⁵ Today, synthetic estrogen and progesterone continue to be the most highly manufactured molecules in the world.

While today's major petrochemical, agricultural and pharmaceutical corporations have compartmentalized into their distinct categories of industry, their roles in the origins of chemical research are far more intertwined. In the 1930s, British scientist Edward Charles Dodd pursued an estrogenic molecule that would be referred to as the »mother substance,« one that would produce enough visibly feminizing effects to be marketed as a hormone therapy to the masses. First synthesized in 1891 by Russian chemist Alexander Pavlovich Dianin (1851–1918), Bisphenol A (BPA) was one of the molecules tested by Dodd and was determined to be 1/37,000 as effective as estradiol, a naturally occurring estrogen. Finally, Dodd came upon the far more estrogenic compound diethylstilbestrol (DES), which eventually became a widely used hormone therapy for »female problems« associated with menstruation and pregnancy, while BPA's commercial potential would not be fully realized until after World War II when it was industrially developed in the U.S. and Switzerland as an epoxy resin and later as a polycarbonate plastic.⁶ DES, which continued to be prescribed to women and factory animals for the next 30 years, was finally banned in the 1970s for its carcinogenic effects and harmful chemical legacy that spanned multiple generations of women. In the same decade, as petrochemical companies like General Electric, Shell and Dow Chemicals ramped up production on plastics, BPA had already reached half a billion pounds in the U.S.⁷

We're All Living in an Estroworld ___ Since the continued rise of industrial capitalism, every corner of the planet is left with some residue of synthetic molecules, many of which are hormonal. These synthetic molecules are synonymously known as persistent organic pollutants (POPs), endocrine disrupting compounds (EDCs) and xenoestrogens because of their estrogen-mimicking and estrogen-displacing properties. From the discovery of polycarbonates in the Marianas Trench, to whole populations of birds, frogs and fish failing to produce viable offspring due to pesticide contamination, to the transgenerational cancers inherited from grandmothers who were prescribed DES, this microscopic moment on the scale of geologic time is already (and continues to be) marked by unprecedented levels of environmental toxicity, irreversible planetary changes and collective

FIG. 1
**PHALLOMETRICS. Digital illustration
for the project GENITAL(*)PANIC, 2019.**
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Posterior base
(first-fold)
of the scrotum

Anus

AGD



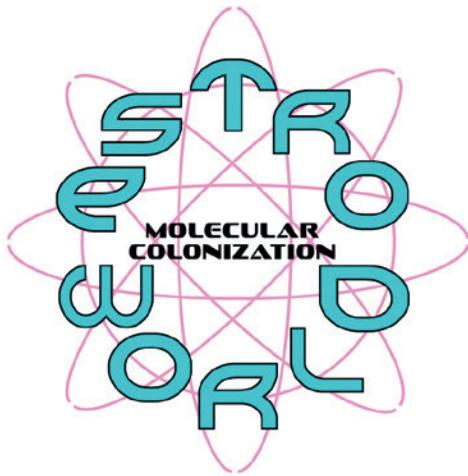


FIG. 2
ESTROWORLD INC.
Digital illustration, 2020.
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species mutations. Canadian researcher and writer Heather Davies describes the accumulation of plastics as a kind of »geologic indigestion,« a marker of the Anthropocene where the natural can no longer be disentangled from the synthetic.⁸ The effects of these synthetic molecules on the human body have been linked to neurological (autism, lower IQ, mood disorders) and physiological effects (diabetes, obesity, early-onset puberty, worldwide sperm count drop) as well as various reproductive cancers. These molecules drift, seep, wander, flow, invade wherever they please, carried by both air and water in invisible and unimaginable ways (FIGURE 1). This type of »slow violence« is in direct contrast to blatant catastrophic events such as the Chernobyl nuclear disaster; more akin to climate change, the effects of environmental toxicity are gradual and therefore difficult to perceive and mirror the preexisting lines of inequality where toxicities are more likely to be distributed among nonwhite, indigenous and marginalized communities.⁹

None of us consent to live in a permanently polluted world, where harmful molecules continue to leave their chemical traces despite their classifications as endocrine disruptors as well as the many environmental lobbying and activist efforts to pass legislation that would further regulate the unrelenting capitalist production of toxic molecules. While bodies are being unknowingly polluted, non-normative bodies continue to be policed and pathologized on the basis of our oppressive and exclusionary gender binarism, from violent surgeries of intersex infants and the disqualification of intersex Olympic athletes from their gendered categories to the denial of hormonal therapies to transindividuals. Dominant political discourses continue to feed our collective panic with apocalyptic visions of the future while framing reproductive futurism as the ultimate privilege of cis-, abled heteronormative bodies, suggesting that queer, trans and intersex bodies have no place in the survival of the human species.¹⁰ Marked by an all-pervasive environmental toxicity deeply tied to patriarchy, neoliberal capitalism and colonial hegemony, and a resulting epistemic crisis to our preexisting taxonomies of ecological heteronormativity and gender binarism, this is the ESTROWORLD (FIGURE 2) that we all live in, and this is the molecular colonization that we never signed up for.

There Is Hope for All Disobedient Bodies ___ So what does it mean if our bodies are industrially modulated, that our sex, gender and reproduction are not as fixed and recalcitrant as we always believed? How do we situate our bodies, identities and fears in the midst of toxic and alienating environments? Are we able to reformulate old notions of the normative body in order to build more inclusive futures? A collaborative research project initiated in 2015, *Open Source Estrogen* began with a simple speculative question: What if it were possible to synthesize estrogen in the kitchen? From this seed came many more questions as to whose bodies are affected,

who is producing and distributing these hormones, who gets to have access, and what are the ethics of self-administering self-synthesized hormones? The project's scope eventually expanded to the multitude of hormonal molecules that now pervade the planet as a state of environmental toxicity, revealing a strange tension between active queering (through gaining access to hormonal therapies) and the passive queering that happens unbeknownst to almost every organism on the planet. Emerging from this tension is the urgency to refigure new feminist care strategies for living and coping in a permanently polluted world, where body sovereignty is utmost at stake, and where notions of purity are not and should not be a viable option (FIGURES 3–4).

The term »open source« in the project's name takes on a double meaning. »Open source« signifies one of the project's main methodologies, the collaborative prototyping and sharing of DIY/DIWO (do-it-yourself/do-it-with-others) protocols for hacking hormones. If we frame these molecules as black-boxes wherein knowledge has been institutionalized from the realm of amateur exploration, then the social rupture of these black-boxes usurps the institutional process of knowledge production. The ethos of hacker culture has always questioned power and power relations when asked who gets to produce knowledge because whoever gets to produce knowledge also gets to define and enforce subjectivities.

FIG. 3
Video still from the speculative
fiction film *HOUSEWIVES MAKING
DRUGS*, 2017 (10:12 min.).

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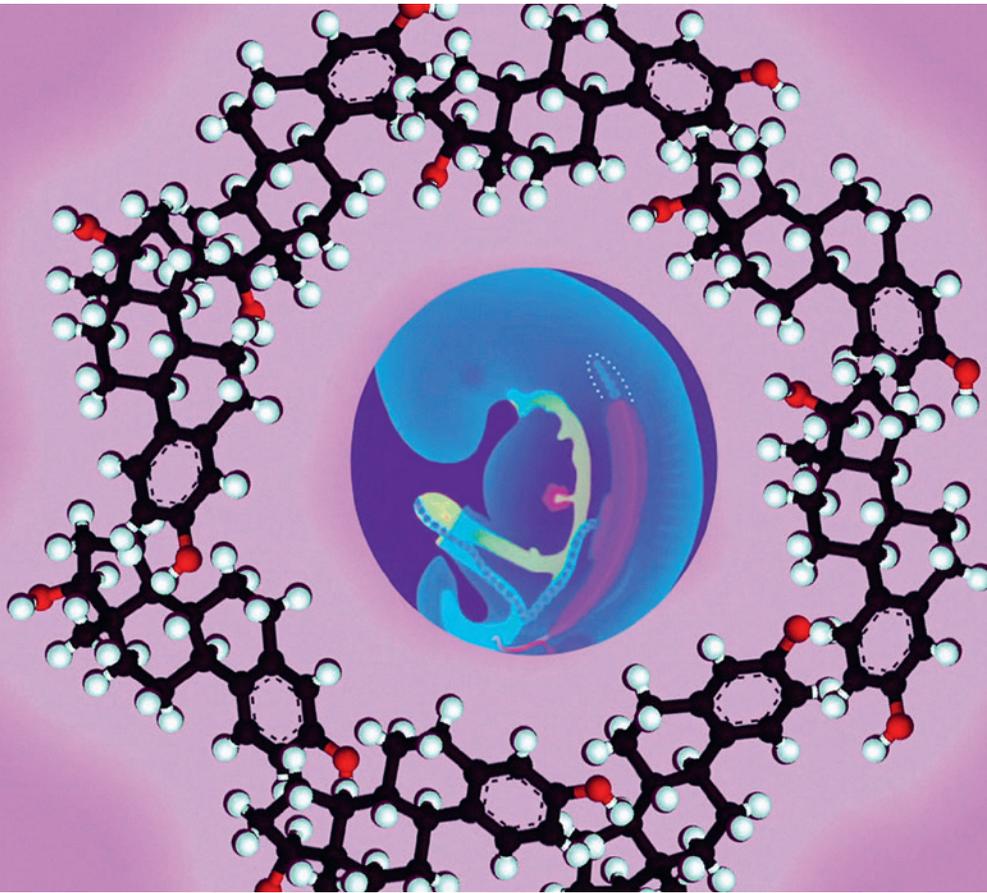


FIG. 4

**Projection still from the parti-
cipatory performance**

MOLECULAR QUEERING AGENCY, 2017.

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Hacking and demystifying hormones undoubtedly creates critical spaces for redefining those power relations and fostering new collaborative queerings of the status quo. If hormones are the tools of biotechnological surveillance, then hacking them readily dismantles their institutional biopower. Due to the biopolitical omnipresence of these molecules, the project's name takes on its second meaning. »Open source« is also the potential state of these molecules—readily available to hack, mutate, collaborate with, become with, and build new possibilities for our collective future. In the famous words of *The Xenofeminist Manifesto*, »Alienation is the labor of freedom's construction.«¹¹ While the biopolitical ubiquity of these molecules renders our planet more alienated than ever before, it is with this very alienation that we can explore the limits of the possible. There are visions of a just and inclusive future outside the ones prescribed to us by dominant patriarchal discourses that allow us to move beyond apocalyptic panic. There is hope for all disobedient bodies.

Hormone Queering Resistance ___ The intersection of art and biotechnology has always ruptured the institutional boundaries that have defined power and knowledge, opening the doors for greater public accessibility. One such intersection is the practice of »biotechnical civil disobedience,« which originates from Critical Art Ensemble, a renowned U.S. art and tactical media collective that pioneered works around bioterrorism, germ warfare, transgenic foods, and the unconsenting commodification of marginalized bodies. Their projects often employed processes of public demystification in order to address critical concerns around corporate biotechnology where the lay public becomes increasingly divested of its political and socioeconomic implications.

Hacking therefore bridges these gaps in power and understanding through a process that U.S. writer and artist Claire Pentecost regards as »public amateurism,« where people consent to learn and fail together in public, removing the hierarchy of the expert.¹² In a similar spirit, *Open Source Estrogen* also devises its own cultural strategy for civil disobedience, taking influence from the chapter »Transgenic Production and Cultural Resistance: A Seven-Point Plan« in *Molecular Invasion* by Critical Art Ensemble, 2002¹³:

Six Point Plan for Hormone Queering Resistance

1. Unearth the dominant patriarchal agents of hormonal production and pollution; build public understanding of the xeno forces at play.
2. Demystify the institutionalized »black-boxed« knowledge of biochemistry, endocrinology and ecotoxicology; pave the way for hormone hacking, freak science and amateur exploration.
3. Resist neoliberal pharmaco-capitalist profiteering of (un)consenting bodies.
4. Reject glorifications of »the natural,« condemnations of »the unnatural« and above all, rhetorics of technosolutionism that promise to elucidate both.
5. Undermine deeply entrenched notions of (eco)heteronormalcy and purity; use »queering« as a reclaimed potential for resistance.
6. Consider the microperformativity of hormones as an agential power of not only molecular colonization but also of molecular collaboration.

FIG. 5
YES-HER Yeast Biosensors
Mobile Lab, Linz, 2016.
© Mary Maggic



While *Open Source Estrogen* makes up the conceptual foundation for why we demystify hormones, *ESTROFEM! LAB* provides the how. Through a nomadic workshopology and collaborative prototyping practice often referred to as »estrogen geeking« or »freak science,« *ESTROFEM! LAB* focuses on the tools and protocols that make visible our shared molecular colonization (FIGURE 5). A term that emerged through the online and in-person gatherings of the global Hackteria network for open source



FIG. 6
ESTROFEM! LAB workshop hosted
by Hhintersection, Hamburg, 2020.
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biological art, workshopology is the constant feedback loop of workshopping in and of itself—it represents the concept of *homo ludens* or communal tinkering, play and geeking as an iterative process that continuously develops new accessible ways for amateur knowledge-production. Because of the Hackteria network and collaborative spirit of workshopology, the hormone-hacking protocols of ESTROFEM! LAB owe themselves to collaborations with Paula Pin from Spain and Gaia Leandra from Italy of Transhackfeminism and Gynepunk Lab, Slovenian new media artist and collaborator with Aliens in Green Špela Petrič, as well as many others in the larger art-science scene, such as U.S. interdisciplinary artist Rian Hammond of Open Source Gendercodes and Canadian artist and professor Byron Rich, who first conceptualized the idea of an open source birth control pill for *Open Source Estrogen*. A series of mobile labs outfitted into suitcases, these protocols have included (1) YES-HER yeast biosensors, a low-cost detection method using transgenic yeast containing a human estrogen receptor; (2) Urine-Hormone Extraction-Action, a DIY column chromatography method for the isolation of urinary hormones; (3) DIY Solid Phase Extraction, a method of concentrating hormones and EDCs from dilute environmental water samples; and lastly, (4) fungal bioremediation with various species of white-rot mushrooms. The protocols have been largely disseminated through public workshopology (FIGURE 6), acting as discursive and reflexive exercises in building technical knowledge as well as greater body sovereignty. Only from this social excavation of harmful toxicities can we begin devising strategies of collective care for a more equitable future.

The Fluid Commons — One such strategy was explored during a 10-month research residency called »River Gynecology« which took place in Yogyakarta, Indonesia, in 2019. Collaborating with Lifepatch, a citizen initiative in art, science, and technology on the Jogja River Project, the goal was to engage communities living along the river to monitor its health as though it were their own bodies, exploring strategies founded in decolonial feminism and care. Kali Code is the most heavily polluted river in Yogyakarta and at first glance it is a surreal landscape that is colonized by plastic waste dumped from residences, hotels, hospitals, and general shops and eateries in the area (FIGURES 7–8).

FIG. 7
View from a bridge across the
Kali Code river in the city center
of Yogyakarta, Indonesia, 2019.
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FIG. 8
Children playing at the Kali Code
river during the summer dry season,
Yogyakarta, Indonesia, 2019.
© Mary Maggic





FIG. 9
Projection still of a rotating
mandala composed of trash found
in the Kali Code river, Indonesia,
from the installation MILIK BERSAMA
REKOMBINAN, 2019.
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Despite the polluted conditions of this river, the citizens still believe the water is safe for daily use, such as cooking, cleaning, washing, drinking, playing, and fishing. While the root of the problem is complex and multifaceted (income level, education and awareness, lack of government infrastructure), it can also be seen as a sociocultural issue. Because Javanese mysticism, *Kejawèn*, is especially embodied in the Indonesian river communities living along the river, the project tried to incorporate these elements into the presentations, workshops, and artworks stemming from this research residency. Through interviews with local citizens it was discovered that while several spirits have been sighted to travel along the river, the river itself is not a spiritual entity but rather a highway that connects two spiritual kingdoms: the volcano Merapi in the north, and the South Sea.

Because the river was observed as »other« from the bodies of the people, the project took inspiration from the theoretical framework of Hydrofeminism as a way of creating solidarity with and across watery bodies.¹⁴ Although water is the stuff of life, it is also the primary carrier of all these harmful toxicities that connects us all in a collective multispecies struggle. While the citizens of Kali Code are undoubtedly those who never consent to live in an intoxicated landscape, they themselves are perhaps incognizant of their own porosity with the environment and the plastic waste that is the source for their becoming-with. In the trilogy of works titled *MILIK BERSAMA REKOMBINAN* (2019), this very plastic waste is heavily represented in all three works of the installation. First, long latex sculptures, embedded with trash, flank the left and right side of the installation and represent aerial views of the river on the east and west side only as if the water was replaced with skin. Next, a sinuous bamboo sculpture resembling the shape of Kali Code is marked with petri dishes of bio-remediating fungi (inspired from one of *ESTROFEM! LAB* protocols) as they sit along blue-stained agar that invites microbial contamination throughout the duration of the exhibition. And lastly, a rotating mandala projec-

tion composed of the same trash in the latex sculpture rotates constantly while producing new kaleidoscope-like combinations, and includes audio of a child's voice reciting a story about a river who is in pain because it cannot digest all the plastic so it must return it all to humanity (FIGURE 9).

The original impetus of *Open Source Estrogen* asked: What does it mean to truly take back control over our bodies from patriarchal hegemonic forces, and refigure strategies for living, acting, and caring in a permanently polluted world that is the Estroworld? From the hands-on and collaborative experimentations of *ESTROFEM! LAB* that generated protocols from detection to extraction to remediation, we are able to seize the means of hormonal knowledge production and reveal molecules that were previously invisible or heavily obscured. This then allows a reflexive way to confront the policing of our bodies and at the same time the existence of our bodies in a toxic Anthropocene. The practice of hacking functions not only at the level of scientific technicality, but as sites of mutations and queering that are necessary for social resistance, consciousness-raising, and deconstructions of the very definitions of »normal« and »natural« that have produced inequalities for so many thus far. And like the hormonal molecules it investigates and emancipates, the project is akin to a responsive body that never stops queering, a gender with no final destination. *Open Source Estrogen* urges us all to undo the trap of eco-heteronormativity and ultimately rewrite a future that undoubtedly embodies queerness. It's all about what kind of world we really want to build here. We are all living in an Estroworld, but it can also be our Estroworld.

- 1 Anne Fausto-Sterling, *Sexing the Body: Gender Politics and the Construction of Sexuality*, New York: Basic Books (2000).
- 2 Ian Hacking, *Representing and Intervening: Introductory Topics in the Philosophy of Natural Science*, Cambridge: Cambridge University Press (2010).
- 3 Charles-Édouard Brown-Séquard, »The Effects Produced on Man by Subcutaneous Injection of a Liquid Obtained from the Testicles of Animals,« *The Lancet* 137, 3438 (1889): 105-107.
- 4 Paul B. Preciado, *Testo Junkie: Sex, Drugs, and Biopolitics in the Pharmacopornographic Era*, New York: The Feminist Press at the City University of New York (2013).
- 5 Nelly Oudshoorn, *Beyond the Natural Body: An Archaeology of Sex Hormones*, London: Routledge (1994).
- 6 Sarah A. Vogel, »The Politics of Plastics: The Making and Unmaking of Bisphenol A ›Safety,« *American Journal of Public Health*, November, 99 (Suppl. 3) (2009): S559-S566.
- 7 Elvira Greiner, Thomas Kaelin and Goro Toki, »Bisphenol A,« in *Chemical Economics Handbook*, Menlo Park, CA: SRI Consulting (2004).
- 8 Heather Davis, »Toxic Progeny: The Plastisphere and Other Queer Futures,« *PhiloSOPHIA: A Journal of Continental Feminism* 5, no. 2 (2015): 231-250.
- 9 Rob Nixon, *Slow Violence and the Environmentalism of the Poor*, Cambridge, MA: Harvard University Press (2013).
- 10 Lee Edelman, *No Future: Queer Theory and the Death Drive*, Durham, NC: Duke University Press (2004).
- 11 Laboria Cuboniks, *The Xenofeminist Manifesto*, London: Verso (2015).
- 12 Claire Pentecost, »Outfitting the Laboratory of the Symbolic: Toward a Critical Inventory of Bioart, ibid., 107-123.
- 13 Critical Art Ensemble, *The Molecular Invasion*, New York: Autonomedia (2002).
- 14 Astrida Neimanis, »Hydrofeminism: Or, on Becoming a Body of Water,« in *Undutiful Daughters: Mobilizing Future Concepts, Bodies and Subjectivities in Feminist Thought and Practice*, eds. Henriette Gunkel, Chrysanthi Nigianni, and Fanny Söderbäck, New York: Palgrave Macmillan (2012).

