

# Metabolism and Art

HANNAH STAR ROGERS AND ADAM BENCARD

ABSTRACT

Metabolism holds potential as both a crucial topic and an analytical tool for our current biopolitical moment, for understanding the agency and significance of material forces as they move into and through bodies. From this vantage point, this article suggests practicing a metabolic gaze by reading together metabolism and contemporary art. It discusses ways of defining metabolism that might be productive in helping to produce tools and touchstones for metabolic readings, before presenting examples of artworks that might be interestingly illuminated by light of this sign.

Thinking with and through metabolisms will yield fruitful new ways of thinking about the deep material imbrication of organisms, including humans, with their environments, as they inhabit and consume them. As John Bellamy Foster explains, Marx conceived of a metabolic cycle dysfunction in the mid-nineteenth century, labeling it a “metabolic rift” understood as a separation “between humanity and the soil, reflected in the antagonism of town and country” [1]. Metabolic humanities appear to be a rising sign under which medical humanities, environmental humanities, and agricultural corners might be united, and metabolic arts may be a productive stage for the three-legged stool of art, science, and technology studies (ASTS) to balance in tension around the subject [2]. As a fundamental biochemical process of life, metabolisms are ubiquitous and multilayered. Metabolisms extend from distinct multispecies bodily processes to a range of chemical transformations across many organisms on a planetary scale, atmospheric and respiration relations between human and plant metabolisms, and the body as an environment, to notions of metabolism in a more purely metaphorical sense, in aesthetics. This is not to suggest that metaphor is absent in what is generally understood to be the

scientific notion of metabolism; indeed, sociologist Hannah Landecker has shown how very entangled social conditions and metabolic science are and have been [3]. Landecker suggests that metabolism was foreclosed by understanding the body as a machine, with a ledger, but this could also point to understanding the body as a business, with immediate implications about capital and a relationship to Foster’s Marx. For Landecker, metabolisms are “everywhere and nowhere,” as they involve “interconnected sequences of mostly enzyme-catalyzed chemical reactions by which a cell, tissue, organ, etc., sustains energy production, and synthesizes and breaks down complex molecules” [4].

Metabolisms are ubiquitous but may be most noticeable in states of dysfunction. These dysfunctions are the basis of medical sciences, the source of new ways of conceiving of ecological relations in a climate-changed world, and a longstanding way of diagnosing philosophical indigestions. Metabolism can be the constant that brings methodological tendencies to the fore as a shared subject, and yet the variable historical understanding of metabolism suggests that our studies need not be bounded by the current state of metabolic science and indeed, as ASTS scholars would argue, should be studied in the complexity of its social, political, philosophical, and historical contexts. Metabolism serves so many possible needs for scientists, scholars, and artists by providing metaphors, models, puzzles, solutions, and balances. We recognize that what metabolic science is today is built on a stack of ever-modified metaphors [5], including the metabolism as an engine or motor (fast/slow, and often with an emphasis on the notion of fuel/energy sources), furnace (hot/cold), “chain reactions,” “chemical cascades,” the “chemical carnival,” and many others [6]. Science is always implicated in metaphorical thinking, as even the classic experiment asks us to make correspondence between the specific findings on the bench and the broader world, and this extends out to our public understandings of science, often with further analogies that both simplify these concepts and make them more culturally complex. We suggest a focus on Landecker’s etymology for

Hannah Star Rogers (researcher), Medical Museion and CBMR, University of Copenhagen, Copenhagen, Denmark. Email: hannah.rogers@sund.ku.dk.

Adam Bencard (researcher), Medical Museion and CBMR, University of Copenhagen, Copenhagen, Denmark. Email: adam@sund.ku.dk.

See <https://direct.mit.edu/leon/issue/56/4> for supplemental files associated with this issue.

the term *Stoffwechsel*, translated literally as “total metabolism,” with a further emphasis around the *stoff* or, in English, “stuff” of the process, to emphasize the insistence bioartists have shown in exhibiting the stuff of living things and parts [7]. This emphasis on stuff has been important in bioart. It has avoided distance and representation—even resisting the idea that part of the actual living tissue, bacteria, organism represents a whole organism or a type—and at the same time it has insisted on pulling against conceptual art to attempt to produce those ideas in material. Being in the presence of stuff has been a hallmark of bioart, and an emphasis on process may well be the hallmark of the metabolic arts.

The dual use Marx and Landecker make of, on one hand, critiquing soil chemistry and medical genetics, respectively, and on the other hand, using those subjects as the basis for their thought is an approach shared by bioartists, who often use the very biological and biotechnical materials they are critiquing. Enter metabolic arts: Drawing on metabolism from the sciences, embodied experience of metabolism, and the potential of laboratory and home metabolism practices to create encounters with life and life processes, many artists and art-aligned practitioners have created art and art-science works that relate to metabolism. The works we seek to connect span the gamut of mediums, subjects, and celebration and critique and engage metabolism on a variety of levels that could make such works a material and theoretical contribution to humanistic thought about metabolism. We observe and anticipate that many artists may return to Marx’s original thinking about metabolism, particularly his interest in the way that capitalist systems had been disentangling plants from animals, including people. One natural and functional system was thus separated into two sets of problems with planetary implications: urban/rural waste and food insecurity/soil depletion.

## METABOLIC ARTS

The metabolic gaze can enrich understandings or experiences of a range of contemporary life-science-engaged artworks. Tissue Culture & Art (TC&A), made up of Oron Catts and Ionat Zurr, along with collaborators specific to individual works, have offered a trajectory of artworks spanning from 2016 to the present, including iterations of COMPOSTCUBATOR and Sunlight Soil and Shit (De-)Cycle (3SDC) [8]. While each work is distinct, they represent the formation of the artists’ thinking on these subjects over several instantiations. In the COMPOSTCUBATOR series, a compost heap powers an incubator for sustaining a group of cells, generally through microbes heating water in conduit that flows past the incubator chamber, and regulates the temperature. 3SDC was designed as a series of engagements around a set of agricultural tools, with an emphasis on considering their implications and the philosophies behind these and other proposed system changes. This installation-event was launched with the installation of a COMPOSTCUBATOR in Freemantle, Australia, positioned by the artists on their project website in relation to agricultural systems: “The heated incubator sustains the growth of cells in a tissue culture flask

to create what is today known as ‘lab-grown meat’ (AKA in-vitro meat, clean meat, cultivated meat, and cultured meat). This type of ‘meat’ is the cornerstone of what is called Cellular Agriculture—growing animal products without the animal” [9]. A second portion of the project is the use of “Alkaline Hydrolysis” (also “Aquamation” or “Biochemiation”), based on an 1888 process for turning farm animals into crop fertilizer. The artists created their own version by hacking brewing equipment to break down much smaller animal bodies (meat and fishing waste) to fertilize the project’s hydroponic garden. The “Hydroponic Garden” itself is ironically supported by artificial lights driven by solar panels when possible. All these elements are connected by the “Control Room,” which gathers data from sensors across the project (thermometers, CO<sub>2</sub> levels, pH monitors, cameras, etc.). The project aims to highlight the problem of increasing metabolic rifts to solve agricultural issues, something that seems implicit in many of the lab-based food systems proposed in the public sphere today. The artists write: “SymbioticA’s 3SDC builds resources to enable the community to accelerate metabolic rifts in agricultural innovation. This project considers whether the precursor to sustainable food systems will be the creation of a metabolic rift—where the means of production will grow ever distant from nature.” The artists directly invoke Marx’s metabolic rift as the target of their investigations by explaining that the exhibition is durational and will be changed over the course of the exhibition. They state that “maintaining the utmost clarity and transparency of our process is the key to promote understanding of the impact of metabolic rifts” [10]. TC&A are engaging with metabolism, not only in its nuanced form at the microbial level but at the larger systems level of our food system.

Baum & Leahy’s *Cometabolise: a holobiont dinner* (2021) was a living sculpture and an exploration of making the idea of the holobiont more familiar for viewers (Color Plate C) [11]. A holobiont is an assemblage of a host and other species living in or around it that together form a discrete ecological unit. It expands and blurs the notion of the host, suggesting that as a unit it could never be extracted from these entangled relations. The artwork insists on the overlapping metabolic processes of the multispecies beings that help to metabolize our food. From a holobiont perspective, our bodies are permeable living environments for our cells and the cells (and whole bodies) of other living things. The artwork emphasizes the idea that bodies are porous, multispecies entities by highlighting that humans and microbes eat and drink together. The assemblage was a bespoke dining set with a glass vessel that contained a sourdough culture held in a spherical glass carafe reminiscent of a bioreactor. A closed container for a starter culture is, of course, one of our most familiar bioreactors. The piece reminds us of the domestic nature of metabolism and invites thoughts of kitchens and laboratories. The artists emphasize the performative nature of the work, as the microbes are constantly metabolizing and are fed while visitors are offered bread baked from the starter at a communal dining table. The piece encourages viewers to consider their bodies as bioreactors.

George Gessert and Violet Ray's video piece *BREATHE* (2022) investigates plant metabolism and its circular processing of our human breathing. Given his history with plants as a primary subject and medium for his artwork, Gessert's work with plant metabolism is an obvious extension of those concerns. The yet-unexhibited filmic work that was created with Gessert's longtime interlocutor and new collaborator, media artist Violet Ray, poetically explores the metabolism of plants through photosynthesis by exhibiting the process at a cellular level and using text to invite audiences to connect their own breath to the cycle of the plant's photosynthesis and respiration. The artists ask us to pace ourselves with plants. As Gessert puts it, as we think of metabolism, "Why stick to humans and animals? Photosynthesis creates the air we breathe and is a key part of the planetary metabolism that supports most life on earth" [12]. This focus on the larger cycles in which metabolism is implicated overlaps with the concerns of scale that appear across Metabolic Arts.

Tagny Duff's *Wastelands* (2015–2018) explores shit as an energy source in a speculative future without fossil fuels. Duff explores a deep future 500 years away when humans, through collaboration with bacteria and viruses, use their own feces as an energy source in small, portable bioreactors [13]. *Wastelands* relies on Duff's many years of experience working with biotechnologies in its artistic practice, with a particular focus on viruses and on WhiteFeather Hunter's co-invention of a new bioplastic with art conservator Courtney Books. The latter provided the basis for the biomaterial development used to construct the bioreactor bags for the project. Metabolic ubiquity can create complications, since living things always involve metabolisms, but all art with living things may not query those processes or engage them directly. Yet the search for metabolisms may provide new insights and new places of tension for contemporary arts about life and the Anthropocene.

---

## References and Notes

- 1 J. Foster, "Marx's Theory of Metabolic Rift: Classical Foundations for Environmental Sociology," *American Journal of Sociology* **105**, No. 2, 366–405 (1999).
- 2 H. Rogers et al., eds., *The Routledge Handbook of Art, Science, and Technology Studies* (London: Routledge, 2021).
- 3 H. Landecker, "Food as exposure: Nutritional epigenetics and the new metabolism," *BioSocieties* **6**, No. 2, 167–194 (2016).
- 4 H. Landecker, "The Metabolism of Philosophy, in Three Parts," in *Dialectic and Paradox: Configurations of the Third in Modernity*, I. Cooper and B. Malkmus, eds. (New York: Peter Lang, 2013).
- 5 M. Black, *Models and Metaphors* (Ithaca: Cornell Univ. Press, 1962.)
- 6 See C. Taylor and B.M. Dewsbury, "On the Problem and Promise of Metaphor Use in Science and Science Communication," *Journal of Microbiology & Biology Education* **19**, No. 1 (2018); A. Rabinbach, *The Human Motor: Energy, Fatigue, and the Origins of Modernity* (Basic Books, 1990).
- 7 *Stofsk(r)ifter: Metabolic Machines*, A. Bencard et al., eds., exh. cat. (Copenhagen: Medicinsk Museion, 2020).
- 8 See Tissue Culture & Art's pages at COMPOSTCUBATOR 0.1 & 0.2—The Tissue Culture & Art Project: tcaproject.net and 3SDC Sunlight Soil and Shit: sunlightsoilshit.systems.
- 9 Tissue Culture & Art [8].
- 10 Tissue Culture & Art [8].
- 11 For more, see art pages at Baum & Leahy: baumleahy.com.
- 12 Personal correspondence with the artists, February–April 2022.
- 13 For more, see Tagny Duff's project page at *Wastelands—Thoughts, images and experiments considering human-microbial relations on Earth in 2517*: tagnyduffcom.wordpress.com; and WhiteFeather Hunter's documentation page: www.whitefeatherhunter.ca/bio-tech.

---

Manuscript received 18 July 2022.

**HANNAH STAR ROGERS** holds the postdoctoral fellowship of art and science, funded by Novo Nordisk, at Medical Museion, University of Copenhagen. She is the author of *Art, Science, and the Politics of Knowledge* (MIT Press, 2022).

**ADAM BENCARD** is Associate Professor in Medical Humanities at the Medical Museion in Copenhagen and affiliated with the Novo Nordisk Foundation Center for Basic Metabolic Research's section for Metabolic Science in Culture.

COLOR PLATE C: **METABOLISM AND ART**

Baum & Leahy, *Cometabolise: a holobiont dinner*, photograph from *The World Is in You* (Medicinsk Museion and Kunsthall Charlottenborg, 2021). (© Baum & Leahy. Photo © David Stjernholm.) (See the article in this issue by Hannah Star Rogers and Adam Bencard.)