

SPECIAL ISSUE ARTICLE

Destructive plasticity and the microbial geopolitics of childhood malnutrition

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Abstract

Engaging Catherine Malabou's philosophical work on biological plasticity, this article combines microbiological and geopolitical analysis of the deadliest manifestations of childhood malnutrition. At the scale of microbiology, childhood malnutrition is a devastating condition and a mystery to which it seems microbiomes – the ecosystems of microbes in the gut – hold a key. At the scale of geopolitics, childhood malnutrition is a calamity generated by racial capitalism, poverty, and underdevelopment. What should we do with the plasticity that makes us? Malabou asks. Engaging philosophically with the plastic materiality of microbiomes in childhood malnutrition, the article focuses on destructive plasticity as an ontological alternative to what science on malnutrition pursues as a problem of causality. This leads to an argument that medicine, as well as humanitarian, security, and development interventions, must reckon with the destructive plasticity of what is in essence a political disease of annihilation. The article ends by speculating on resistance via the biological act of nurturing.

Keywords: Childhood Malnutrition; Hunger; Plasticity; Racial Capitalism; Underdevelopment; Critical Nutrition Studies

Introduction

We make ourselves without being aware of it. In describing how we sculpt our own biology based on our histories, Catherine Malabou provides a potent alternative to renderings of human life as a mere playing out of genetic determination. Bringing philosophical analysis to the biological fact of plasticity, or change in form brought on by creation and annihilation, Malabou sees a restricted field of agential intervention: What can we do with the plasticity that makes us? she asks. To her, this question is about freedom.

This article brings Malabou's philosophical concept of plasticity into the realm of the microbiome, the ecosystem of tens of trillions of commensal microbes that live in the human gut, to consider the politics of childhood malnutrition.¹ At the scale of microbiology, childhood malnutrition is a devastating condition and a mystery to which it seems microbes hold a key. At the scale of geopolitics, childhood malnutrition is a calamity brought on by underdevelopment, poverty, and racial capitalism. Probing what a turn to philosophy adds to medical pursuits of treating

¹The term malnutrition is very broad, and in its official definition includes undernutrition (wasting, stunting, underweight), inadequate vitamins/minerals, and overweight, obesity and diet-related noncommunicable diseases (heart disease, diabetes, etc.). Scholars and practitioners within the so-called 'malnutrition community', however, often conflate 'malnutrition' with severe undernutrition in children, which is also the main focus of this article. When using the term 'childhood malnutrition' this article is referring to this focus. However, much of what is described, especially in relation to the microbiome, is also relevant to malnutrition in its broader rendition. The title of the article is a reference to Josué de Castro's classic *The Geopolitics of Hunger*.

malnutrition, the article focuses particularly on what Malabou calls destructive plasticity, which is the inherent biological possibility of ontological annihilation – a change in form that irrevocably splits a being from what it was before, rendering recovery impossible. This shift from causality to ontology, the article argues, allows for new political analysis of a condition with a staggering global imprint.

The numbers are indeed overwhelming: Childhood malnutrition contributes to almost half of all deaths in children under five years of age, corresponding to over three million dead children each year. A lot of this loss is from diarrhoea and pneumonia that become fatal in small, weakened bodies.² Still, the ramifications of undernourishment in childhood are much larger than this. Acute undernutrition, also called wasting, defined by very low weight for height, affects 45 million children worldwide, and chronic undernutrition, also called stunting, defined by low height for age, affects 149 million children.³ Stunted growth is irreversible and associated with impaired cognitive ability, continued vulnerability to infectious and non-communicable disease, higher risks of birth complications, and reduced school and work performance later in life.⁴ Currently, the world is ‘off track’⁵ for meeting the UN Development Goal to ‘end hunger, achieve food security and improved nutrition and promote sustainable agriculture’ despite enough food being produced to feed everyone on the planet, and the COVID-19 pandemic has exacerbated hunger worldwide.⁶⁷ An important caveat to Malabou’s statement that ‘we make ourselves’ is that when it comes to sculpting robust microbiomes, millions are deprived of this possibility. To even talk about freedom in the face of these facts seems far-fetched. In doing so anyway, I seek to resist narratives of superfluous populations that are a lost cause or tragic side effect of global consumption.

Despite what might be assumed, childhood malnutrition is not a linear, reversible problem that is caused by eating too little, and which can simply be corrected by starting to eat enough. To this day, precise causes, and optimal treatment of different types of malnutrition remain shrouded in mystery. Recently, the so-called microbiome revolution shed some light on this conundrum by explicitly linking malnutrition to microbial gut communities. However, establishing a link is not the same as knowing how best to intervene.

This article begins with analysis of childhood malnutrition at the microbiological level, investigating childhood malnutrition as a medical issue and the ways in which the plastic materiality of gut microbiomes is affecting research into and treatments of malnutrition. In the second part, the article takes a geopolitical perspective on childhood malnutrition as a manufactured condition which needs to be reckoned with politically, not just medically. In the conclusion, I take up Malabou’s insistence on a focus on freedom, pondering the political potentials of nurturing.

²Robert E. Black et al., ‘Maternal and child undernutrition and overweight in low-income and middle-income countries’, *The Lancet*, 382:9890 (2013), pp. 427–51.

³Laura V. Blanton et al., ‘Childhood undernutrition, the gut microbiota, and microbiota-directed therapeutics’, *Science*, 352:6293 (2016), p. 153; United Nations Children’s Fund (UNICEF), *Levels and Trends in Child Malnutrition: Key Findings of the 2021 Edition of the Joint Child Malnutrition Estimates* (New York, NY: United Nations Children’s Fund, 2021).

⁴Andrew M. Prentice et al., ‘Microbes and the malnourished child’, *Science Translational Medicine*, 5:180 (2013), pp. 180fs11; Black et al., ‘Maternal and child’; Blanton et al., ‘Childhood undernutrition’; Reynaldo Martorell, ‘Improved nutrition in the first 1000 days and adult human capital and health’, *American Journal of Human Biology*, 29:2 (2017), pp. e22952.

⁵UN, ‘World “Off Track” to Meet Most Sustainable Development Goals on Hunger, Food Security and Nutrition’, available at: {<https://news.un.org/en/story/2019/07/1042781>} accessed 4 February 2022.

⁶UN, ‘Can We Feed the World and Ensure No One Goes Hungry?’, available at: {<https://news.un.org/en/story/2019/10/1048452>} accessed 4 February 2022.

⁷UN, ‘End Hunger, Achieve Food Security and Improved Nutrition and Promote Sustainable Agriculture’, available at: {<https://sdgs.un.org/goals/goal2>} accessed 4 February 2022.

The microbial mysteries of childhood malnutrition

It has long frustrated and puzzled aid workers that severely undernourished children often don't recover even when being fed an adequate diet, or they recover during treatment, but then relapse. In 2007, a joint statement from WHO, UNICEF, the World Food Programme, and the United Nations Standing Committee on Nutrition (SCN) issued a statement promoting community-based care for severe acute malnutrition (SAM), a subset of wasting that affects an estimated 16 million children each year, killing roughly 1 million more.⁸ This recommendation for community treatment became possible because of the advent of RUTF – highly fortified Ready to Use Therapeutic Food, which doesn't need water in order to be administered, and which replaced prior treatment of severe acute malnutrition consisting of hospitalisation with therapeutic, water-based diets and medical care.⁹ While RUTF and community-based care, combined with antibiotics and micronutrients (vitamins and minerals) as part of treatment protocols have significantly reduced mortality due to severe acute malnutrition, it has far from solved the issue.¹⁰

In the early 2010s, new light was shed on childhood malnutrition by linking it to the microbiome; the ecosystem of tens of trillions of commensal microbes that live in the human gut. Because it is impossible to culture these microbes outside the gut, they remained unknown until microbial genome sequencing enabled assessment of microbiome composition and functions. This led to an explosion of research dubbed the 'microbiome revolution', which has linked the human microbiome to autism, anxiety, asthma, cirrhosis, diabetes, dementia, and a wide range of other chronic, mental, and infectious diseases.¹¹ Because microbiomes can be 'contagious' within families and between bodies, this implies that a lot of diseases that were thought to be non-communicable, might in fact be communicable through their link to the microbiome.¹² Popular science titles such as *An Epidemic of Absence*, *Missing Microbes: How Killing Bacteria Creates Modern Plagues* and *Let Them Eat Dirt*¹³ echo a deluge of scientific evidence for the detrimental effects of depleted microbiomes.

Two major findings are of importance to the links between microbiomes and childhood malnutrition. Infants are born with essentially no microbiome and an undeveloped immune system, and the two develop together, each helping to form the other. First, research is pointing to a certain trajectory for the maturation of a healthy microbiome, which develops similarly across geographies and lifestyles in healthy children between birth and two years of age, while malnourished children have immature biomes compared to their age.¹⁴ Secondly, it is suggested that malnutrition is the effect, not the cause, of an immature or stunted microbiome,¹⁵ which means that malnutrition is primarily characterised by how a stunted microbiome hinders the uptake of nutrients, rather than by how lack of food stunts the microbiome.

The microbiome revolution yielded an initial optimism that microbes could provide the missing link such that childhood malnutrition would finally be treatable. However, ten years later,

⁸WHO, *Community-Based Management of Severe Acute Malnutrition* (Geneva: UNICEF, 2007).

⁹Indi Trehan et al., 'Antibiotics as part of the management of severe acute malnutrition', *New England Journal of Medicine*, 368:5 (2013), pp. 425–35.

¹⁰Thi-Phuong-Thao Pham et al., 'Gut microbiota alteration is characterized by a proteobacteria and fusobacteria bloom in kwashiorkor and a bacteroidetes paucity in Marasmus', *Scientific Reports*, 9:9084 (2019).

¹¹Martin J. Blaser, 'The microbiome revolution', *The Journal of Clinical Investigation*, 124:10 (2014), pp. 4162–5; Gianluca Ianiro et al., 'Antibiotics as deep modulators of gut microbiota: Between good and evil', *Gut*, 65:11 (2016), pp. 1906–15; Brett B. Finlay and Marie-Claire Arrieta, *Let Them Eat Dirt: How Microbes Can Make Your Child Healthier* (New York, NY: Algonquin Books, 2016).

¹²Brett B. Finlay, 'Are noncommunicable diseases communicable?', *Science*, 367:6475 (2020), pp. 250–1.

¹³Martin Blaser, *Missing Microbes: How Killing Bacteria Creates Modern Plagues* (New York, NY: Simon and Schuster, 2014); Finlay and Arrieta, *Let Them Eat Dirt*; Moises Velasquez-Manoff, *An Epidemic of Absence: A New Way of Understanding Allergies and Autoimmune Diseases* (New York, NY: Simon and Schuster, 2012).

¹⁴Tanya Yatsunenka et al., 'Human gut microbiome viewed across age and geography', *Nature*, 486:7402 (2012), pp. 222–7.

¹⁵Michelle I. Smith et al., 'Gut microbiomes of Malawian twin pairs discordant for kwashiorkor', *Science*, 339:6119 (2013), pp. 548–54; Blanton et al., 'Childhood undernutrition'.

childhood malnutrition is still an unsolved conundrum. As microbiologist Brett B. Finlay who is at the forefront of this research, said:

I think with malnutrition there is still significant optimism, but I think there is also a realization: This is one complex problem, and it's not one thing fix all. If you clean up sanitation, you have a way of restoring microbiomes, maybe you hit them with an antibiotic, and you have a decreased diarrheal load in the community. But for whatever reason, malnutrition has been really hard to reverse. I think it's the complexity of it all. You need multi-pronged studies that have all these different things going on at the same time, to see what combination actually works. So, I think there is still a lot of optimism and the microbiome is definitely a part of it, I think the data really pushes that way, but how you then use it to fix it, that's the harder question.¹⁶

These unresolved questions also manifest in discussions of whether antibiotics should be a part of the treatment of severe acute malnutrition. When the WHO in 2007 began advocating for treating severely acutely malnourished children with RUTF at home, part of the recommended treatment was to give children broad-spectrum antibiotics as well. At this point, WHO still recommends, and traditional clinical practice advocates, prescribing a course of antibiotic therapy in children with severe acute malnutrition even without confirmation of the presence of bacterial infection. An often-cited study published in 2013 provided RUTF therapy to 2,767 Malawian children with severe acute malnutrition, along with either a placebo or a seven-day course of the commonly prescribed antibiotic amoxicillin, or the more advanced antibiotic cefdinir. Over 80 per cent of the children enrolled showed signs of infection, with a fever, cough and/or diarrhoea in the weeks prior to the study, and 20 per cent of those tested were positive for HIV. In the amoxicillin, cefdinir, and placebo groups, 88.7 per cent, 90.9 per cent, and 85.1 per cent of the children recovered respectively, supporting the use of antibiotics in treatments of severe acute malnourishment.¹⁷ A different study published in 2016 questioned the effects of antibiotics, after it enrolled a total of 2,399 children in Niger with acute severe malnutrition, who received either amoxicillin or placebo with their RUTF. 65.9 per cent of children in the amoxicillin group, and 62.7 per cent in the placebo group recovered, amounting to no significant difference in the likelihood of nutritional recovery. However, the children who received amoxicillin were 14 per cent less likely to end up in the hospital during the treatment.¹⁸ Another recent study in Kenya found no lower mortality after providing prophylactic antibiotics to hospitalised children with severe acute malnutrition.¹⁹ Since, the Niger study has been accused of being full of 'biases [which] led to erroneous conclusions that threaten at least 500,000 children with nutritional failure'.²⁰ The debate is still ongoing but is tilting towards the antibiotic side.

Insofar as a stunted microbiome is the cause of malnutrition rather than the effect, treating acute severe malnutrition with antibiotics should make the malnutrition worse. Eradicating even more bacteria, thereby stunting the biome further, shouldn't be an effective treatment. As microbiologist Brett B. Finlay described, the theory is that pathogens and the unbalanced, stunted biome needs to be taken out before a new, healthy one can start to grow.²¹ However, the practice

¹⁶ Author's interview with Brett B. Finlay, 28 January 2021.

¹⁷ Trehan et al., 'Antibiotics'.

¹⁸ Sheila Isanaka et al., 'Routine amoxicillin for uncomplicated severe acute malnutrition in children', *New England Journal of Medicine*, 374:5 (2016), pp. 444–53.

¹⁹ James A. Berkley et al., 'Daily co-trimoxazole prophylaxis to prevent mortality in children with complicated severe acute malnutrition: A multicentre, double-blind, randomised placebo-controlled trial', *The Lancet Global Health*, 4:7 (2016), pp. e464–73.

²⁰ Matthieu Million et al., 'Meta-analysis on efficacy of amoxicillin in uncomplicated severe acute malnutrition', *Microbial Pathogenesis*, 106 (2017), pp. 76–7.

²¹ Author's interview with Brett B. Finlay.

of prescribing antibiotics is also being labelled as harmful and controversial. Authors who are critical of antibiotic use cite the dangers of long-term effects on child health and mortality, as well as the problem of antibiotic resistance. Some say that antibiotics only have a role in treatment if there is an infection to treat, but it is hard to distinguish which children in a community have bacterial rather than viral infections.

Either way, relapse is common for children who have been fed for 12 weeks or however long a study is, with RUTF and have been given antibiotic treatment. And providing antibiotics is a risky strategy that comes with no guarantees of what the microbiome will be repopulated with, as ‘every course of antibiotics may represent another roll of the dice, potentially allowing displacement of a mutualist with a strain that may or may not provide the same benefit.’²² On the other hand, some studies have shown ‘eubiotic’ effects of antibiotics, when certain antibiotics given for certain ailments promote the growth of commensal strains of bacteria in the gut.²³ Antibiotics or not, the provision of a nutrient-dense diet often corrects both dysfunctional microbiomes and the symptoms of severe acute malnutrition, but this recovery is only partial and temporary.²⁴ There is now a race to come up with pre- or probiotic treatments that can correct a stunted microbiome for the long term, by ‘deliberately shaping human development through manipulating the assembly of microbial communities.’²⁵ It seems that this shaping should be prefaced by an initial destruction, especially in severe acute malnutrition. At present, however, despite the ‘revolutions’ of community-based care and the microbiome, origins, and optimal treatments for malnutrition are still largely unknown. Once severe acute malnutrition manifests, it is incredibly hard to heal.

Writing in 2020 about factors increasing risk of death in in-patient severely malnourished children, doctor and scientist Indi Trehan, in what for a prominent doctor and scientist in the malnutrition community is quite a defeat, remarks on ‘our continued ignorance about the etiology and optimal management of severe malnutrition’ and wonders ‘if real-world deficiencies in patient care, such as overaggressive fluid management or inappropriate use of antibiotics, are actually what is contributing most to mortality’.²⁶ Speaking about the complexity of childhood malnutrition, Finlay echoed these sentiments: ‘We haven’t solved it yet, which pisses me off’ and ‘I don’t have a good answer for you, I’m sorry; there isn’t one that I know.’²⁷

Microbiomes as plastic materiality

There is now consensus that microbes in the gut aid their host in uptaking nutrients and energy from their diet.²⁸ The so-called ‘1000-day critical window for nutrition’ from conception to two years of age is, therefore, it seems, first and foremost a critical window for microbiome development. Establishing a healthy microbiome in the first two years of life is paramount not only for nutrition, but also for cognitive development, bone growth, and development of immune cells. As an example that highlights how vital microbial population is early in life, oligosaccharides in human milk don’t provide nutrition to the baby who swallows them, but act as prebiotics that

²²Les Dethlefsen and David A. Relman, ‘Incomplete recovery and individualized responses of the human distal gut microbiota to repeated antibiotic perturbation’, *Proceedings of the National Academy of Sciences*, 108: supplement 1 (2011), pp. 4554–61.

²³Francesca Romana Ponziani et al., ‘The role of antibiotics in gut microbiota modulation: The eubiotic effects of rifaximin’, *Digestive Diseases*, 34:3 (2016), pp. 269–78.

²⁴Dethlefsen and Relman, ‘Incomplete recovery’; Prentice et al., ‘Microbes and the malnourished child’.

²⁵Paul O Sheridan et al., ‘Can prebiotics and probiotics improve therapeutic outcomes for undernourished individuals?’, *Gut Microbes*, 5:1 (2014), pp. 74–82.

²⁶Indi Trehan, ‘The past informs the future: inpatient mortality in severe childhood malnutrition’, *The American Journal of Clinical Nutrition*, 112:4 (2020), pp. 911–12 (p. 912).

²⁷Author’s interview with Brett B. Finlay.

²⁸Alessio Basolo et al., ‘Effects of underfeeding and oral vancomycin on gut microbiome and nutrient absorption in humans’, *Nature Medicine*, 26:4 (2020), pp. 589–98.

promote establishment of the infant gut with bifidobacterial strains that provide a range of benefits, including stronger immune adjustments from vaccinations, stronger mucosal gut-barrier function and protection from pathogenic infections in the intestine.²⁹ The bacteria that populate the infant gut teach the immature immune cells lining the gut to tolerate certain bacteria and not tolerate others. Infant immune cells are literally taught how to fend off infections by certain bacteria in the gut, making the maturation of a healthy microbiome a kind of school in which a lifelong symbiosis between human host and microbial ecosystem is set up.³⁰ When the microbiome doesn't mature, neither does the immune system, which remains more vulnerable to incoming pathogens.³¹ Undernourished children predominantly die of common infections, and immune defects are consistently observed in under- as well as overnutrition.³² Development of a healthy gut relies on immune receptors sensing nutrients, commensal, and pathogenic microbes. Repeated infections and chronic and intestinal inflammation change gut structure and function, thereby exacerbating malnutrition.³³ This means that immune dysfunction is a consequence of inadequate diet, and also contributes directly to the symptoms and death associated with malnutrition.³⁴

Malnutrition is now a 'double burden', in that underweight and overweight often exist in the same areas, even in the same households or institutions.³⁵ Sedentary lifestyles and low-quality, highly processed foods are the two main factors behind this.³⁶ Not only stunting and wasting, but also obesity has been connected to a stunted or altered microbiome. Both burdens of malnutrition are therefore to some extent microbial burdens. For example, a study from Mexico showed that 'intestinal dysbiosis' and lower diversity characterised the microbiomes of both underweight/stunted and obese Mexican children compared to children with weight considered normal.³⁷

While a healthy biome of an infant harbours few but paramount bacterial strains across geographies and lifestyle, adult microbiomes are characterised by high diversity and are very dependent on environmental factors. There is scientific consensus that already from the age of three and onwards, a healthy microbiome is one characterised by diversity. Highly sanitised forms of life in affluent and industrialised places are now being linked to a large amount of chronic, so-called 'lifestyle diseases', that are associated with lower diversity and altered conditions in the microbiome. As a result of this, there is much interest in the microbiomes of people who have not adopted a so-called Western lifestyle and a diet rich in highly processed foods.

Scientists who ventured into the Yanomami territory in the Amazonian rainforest to sample the microbiomes of previously uncontacted Amerindians sequenced the highest level of microbial diversity ever reported in a human microbiome.³⁸ In the guts and on the skin of Amerindian hunter-gatherers were vastly higher numbers of different kinds of microbes than in the comparison group of people living in the United States. Microbial communities in Amerindian intestines are similar among the Yanomami themselves, likely due to close cohabitation, but highly distinct from those in the comparison group. In the microbial communities on the skin of the Yanomami lived microbes that had been labelled as soil microbes.

²⁹Blanton et al., 'Childhood undernutrition'.

³⁰Finlay and Arietta, *Let Them Eat Dirt*.

³¹Ibid.

³²Claire D. Bourke et al., 'Immune dysfunction as a cause and consequence of malnutrition', *Trends in Immunology*, 37:6 (2016), pp. 386–98.

³³Ibid.

³⁴Ibid.

³⁵Roger Shrimpton and Claudia Rokz, *The Double Burden of Malnutrition: A Review of Global Evidence, Health, Nutrition and Population (HNP)* (Washington, DC: The World Bank, 2012).

³⁶Germine El-Kassas and Fouad Ziade, 'The dual burden of malnutrition and associated dietary and lifestyle habits among Lebanese school age children living in orphanages in north Lebanon', *Journal of Nutrition and Metabolism* (2017).

³⁷Berenice Palacios-González et al., 'Intestinal dysbiosis in obese and undernourished Mexican school-age children', *The FASEB Journal*, 30:1 (2016).

³⁸Jose C. Clemente, et al., 'The microbiome of uncontacted Amerindians', *Science Advances*, 1:3 (2015), e1500183.

The story is similar for Hadza hunter-gatherers of the savannah in Tanzania, whose microbiomes are also very distinct, and harbour much higher diversity than an Italian comparison group.³⁹ The Hadza biome includes microbes that are generally seen to be opportunistic, meaning they can act as pathogens in certain circumstances, such as when the host immune system is suppressed. Most notably, the microbiomes of the Hadza include the *Treponema* group of bacteria, which can cause syphilis and yaws. It is speculated that these bacteria are immunoregulated in Hadza biomes, and aid in the digestion of plant fibres from tubers and the like. And while the adult Hadza have *treponema* bacteria as part of their symbionts, they don't have bifidobacteria, which are prevalent in mammalian milk, and are among the first to heavily populate a human infant. Adults in South Korea, and adults who are vegan also tend to be missing bifido, without this leading to adverse health issues.⁴⁰

The sampling of different microbiomes across the globe has led to a view of the microbiome as a diverse and responsive ecosystem that adapts continuously as a commensal component of the host organism.⁴¹ An Amerindian hunter-gatherer makes for one microbiome; a college professor in a US suburb makes for another. The microbiome can adjust compositionally and functionally in 1–3 days in response to changes in diet. Some bacterial groups are affected by short-term dietary changes, while others are only changed by long-term dietary habits. As such, the biome is reconfigured in response to different environmental factors, which allows the host to adjust metabolic and immunologic performance. These changes in the composition of the biome can happen in response not only to changes in diet, but also to changes in for example location, climate change, antibiotic use, or sanitation.⁴² The finding that microbiomes of people in Japan acquired a gene via lateral gene transfer from a sea bacterium living on seaweed, which now allows these people to extract energy from a red marine algae, suggests that the plasticity of the microbiome improves the metabolic capacity of the human organism to extract energy from its diet.⁴³ According to Finlay, microbiomes are characterised by redundancy:

I tend to think, well, what are the ten thousand genes you need expressed by certain microbes, and as long as those ten thousand genes are expressed, it doesn't matter which microorganisms it is. And then I think there is a lot of redundancy, you can take one out, and then another would just pick it up.⁴⁴

In contrast to these changes, which are all variations of a healthy microbiome, circumstances can disturb the microbiome beyond its limits of adaptability, at which point it can take on a 'disease-associated profile'. This is not only a characteristic of the stunted microbiome in malnourished children, but also Crohn's disease, asthma, diabetes, and allergies, which have all been linked to dysbiosis between host organism and biome. A stunted microbiome is one with an altered state, where diversity is low, and inflammatory and pathogenic bacteria dominate, which affects the gut mucosa layer. The so-called 'vicious circle of malnutrition', where inadequate nutritional status makes the body vulnerable to infections, which makes the malnutrition even worse, for example from diarrhoea or appetite loss, is all about the microbiome: A stunted microbiome is susceptible to infection and doesn't assist its host body in the uptake of nutrients.⁴⁵

³⁹Stephanie L. Schnorr et al., 'Gut microbiome of the Hadza hunter-gatherers', *Nature Communications*, 5 (2014).

⁴⁰Schnorr et al., 'Gut microbiome of the Hadza'.

⁴¹Marco Candela et al., 'Intestinal microbiota is a plastic factor responding to environmental changes', *Trends in Microbiology*, 20:8 (2012), pp. 385–91.

⁴²Ibid.

⁴³Jan-Hendrik Hehemann et al., 'Transfer of carbohydrate-active enzymes from marine bacteria to Japanese gut microbiota', *Nature*, 464:7290 (2010), pp. 908–12.

⁴⁴Author's interview with Brett B. Finlay.

⁴⁵Anne V. Kane et al., 'Childhood malnutrition and the intestinal microbiome', *Pediatric Research*, 77:1–2 (2014), pp. 256–62.

These characteristics of a responsive organ that sculpts itself and is sculpted based on ecological factors make the microbiome a prime example of plastic materiality. Plasticity is, according to Malabou, a concept that helps us grasp the *form* of materiality as neither rigid and fixed, nor in total flux. Plasticity describes the capacity to receive form, as in the plasticity of clay, and the capacity to give form, as in sculpting. Importantly, plasticity differs from elasticity, because the latter denotes a returning to the original form after change occurs; elasticity does not accept form. Plasticity is also distinct from flexibility, which only captures the capacity to be formed, not the aspect of also giving form.⁴⁶ Plasticity lies ‘between determinism and freedom’; between the closed meaning of plasticity (the definitive character of form) and its open meaning (the malleability of form), and this freedom or malleability does not just entail the ability to inhabit one’s form, but to actively make it.⁴⁷ To these capacities of giving and receiving form, Malabou adds destructive plasticity, which I will return to later, in which the nature of being changes, not just the form: Destructive plasticity denotes an ontological annihilation,⁴⁸ but is at the same time ‘formation through destruction’.⁴⁹

Malabou’s main focus on plastic materiality is the brain, as the brain is the creator and receiver of form, and it can also be ontologically annihilated, with Alzheimers, for example, when the change is so radical that a person ceases to remember who they once were.⁵⁰ To Malabou, plasticity is a constitutive historicity, meaning that each person’s brain has the capacity to receive and give form based on that person’s history and experiences. The brain is neither a centralised computer that dictates everything, nor is it merely a programme playing out as a result of genetic determination. We physically change our brains – and our microbiomes – by what we read or eat, thereafter thinking and digesting with this changed form. The material space for political intervention elicited by plasticity is therefore one that is characterised by the possibilities as well as constraints of the material.⁵¹

As an organ, or as a commensal component of the host organism, the microbiome shows remarkable plasticity in much the same way as a brain.⁵² Like the brain it is constituted by its history and its plasticity is both phylogenetic and functional, meaning it is sculpted by its phylogenetic history of microbial encounters and gene swaps as well as its history of environmental influences. Working together as an organ, the microbiome is formed by our ways of life, and at the same time, it gives form to itself by making many forms of life possible. It is therefore the microbiome’s very characteristic of plasticity that makes it important for human health. It is also this plasticity that has made the microbiome a prime focus of microbiology, because as one review says, there are great potentials in research on the microbiome because of ‘precision tools that now allow us to *sculpt* microbiome interventions with diet, prebiotics, probiotics, and targeted antibiotics to prevent and treat disease.’⁵³ What is sought sculpted here are of course plastic microbiomes themselves. As a response to such pursuits, Malabou insists on reckoning with destructive plasticity:

Such a conception of medicine is absolutely incontestable. Nonetheless, it does not sufficiently allow for the incursion of the negative. Once again, pathological metamorphosis

⁴⁶Catherine Malabou, *What Should We Do with Our Brain?* (New York, NY: Fordham University Press, 2009).

⁴⁷*Ibid.*, p. 30.

⁴⁸Catherine Malabou, *Ontology of the Accident: An Essay on Destructive Plasticity* (Oxford, UK: Polity Press, 2012).

⁴⁹Catherine Malabou, *The New Wounded: From Neurosis to Brain Damage* (New York, NY: Fordham University Press, 2012), p. 181.

⁵⁰Brain plasticity is connected microbiome plasticity via the so-called ‘gut-brain axis’.

⁵¹Malabou, *What Should We Do with Our Brain?*; see also Brenna Bhandar and Jonathan Goldberg-Hiller (eds), *Plastic Materialities: Politics, Legality, and Metamorphosis in the Work of Catherine Malabou* (Durham, NC: Duke University Press, 2015).

⁵²Candela et al., ‘Intestinal microbiota’.

⁵³Linda C. Duffy et al., ‘Progress and challenges in developing metabolic footprints from diet in human gut microbial cometabolism’, *The Journal of Nutrition*, 145:5 (2015), pp. 1123S–30S, emphasis added.

is always endowed with a coefficient of positivity, of self-recreation, and of world-reconstruction. The destructive signification of plasticity remains in the shadows. Or, at least, it is always oriented toward its redemption or sublation. How can we think, without contradicting ourselves, a plasticity without remedy?⁵⁴

Destructive plasticity and severe acute malnutrition (SAM)

As mentioned, SAM is a particularly deadly subset of childhood malnutrition; so much so that it urges thinking about destructive plasticity. UNICEF writes the following about the condition causing the death of a million children a year:

Its effects last a lifetime. Children who survive just aren't strong enough to fight off disease, learn in school and live up to their full potential, consigning them to a lifetime of poverty.⁵⁵

SAM can take two forms, namely 'severe wasting', also called marasmus, in which there is virtually no body fat, and protein is lost from muscle, and oedema, also called kwashiorkor, which is characterised by swelling, fat congregating in the liver, as well as skin and hair lesions including depigmentation. Marasmus is considered an appropriate adaptive biological response to a severe lack of nourishment, in which muscle protein is mobilised to protect essential organs and plasma proteins required for survival. Kwashiorkor on the other hand is understood as a maladaptive response, in which the liver shuts down plasma protein synthesis before other less crucial proteins have been mobilised, resulting in swelling and liquid buildup in the body, and a breakdown of the gut mucosal lining.⁵⁶ It is not clear whether the syndromes are two different diseases or are a continuum of the same disease.⁵⁷ Often, children exhibit clinical manifestations of both syndromes at once – a combination that is deadlier than either of the two syndromes alone.⁵⁸ Again, the pathophysiology and etiology of these two forms of severe malnutrition are not fully understood.⁵⁹ As doctor and scientist Indi Trehan writes, 'edematous malnutrition (kwashiorkor) remains a mystery one order of magnitude deeper even than severe wasting and deserves its own specific studies.'⁶⁰ Lately, it has been suggested that marasmus and kwashiorkor can be differentiated based on gut microbial dysbiosis, which varies in specific ways between the two syndromes.⁶¹ Researchers found that both syndromes are characterised by an altered gut microbiome in which there is a decrease in total species diversity, with a predominant loss of anaerobic species (species that do not require oxygen for growth). However, this loss is more pronounced in kwashiorkor. Furthermore, kwashiorkor distinguishes itself from marasmus by an increase in the proportion of certain types of potentially pathogenic bacteria, and bacteria that produce so-called endotoxins. In contrast, none of the bacterial species that increase in a marasmus microbiome are recognised pathogens. It is now speculated that certain strains of pathogenic bacteria produce high levels of ethanol in an oxidised (aerobic) gut, which could be responsible for the liver symptoms of kwashiorkor and be similar in process to non-alcoholic fatty liver diseases.⁶² Kwashiorkor is defined by a proliferation of pathogenic species and oxidative stress, which is an imbalance between free radicals and antioxidants in a body, and which can cause

⁵⁴Malabou, *New Wounded*, p. 188.

⁵⁵UNICEF, 'The Difference Kids Make', available at: {<https://www.unicef.org/kidpower/impact/>} accessed 4 February 2022.

⁵⁶Prentice et al., 'Microbes and the malnourished child'.

⁵⁷Pham et al., 'Gut microbiota alteration'.

⁵⁸Thi-Phuong-Thao Pham et al., 'Difference between kwashiorkor and Marasmus: Comparative meta-analysis of pathogenic characteristics and implications for treatment', *Microbial Pathogenesis*, 150 (2021).

⁵⁹Ibid.

⁶⁰Trehan, 'The past informs the future'.

⁶¹Pham et al., 'Gut microbiota alteration'.

⁶²Pham et al., 'Difference between kwashiorkor and marasmus'.

chronic inflammation. Because of the pathogens that come to inhabit the dysbiotic gut of children with kwashiorkor, treatment with broad-spectrum antibiotics (not just penicillin) is deemed necessary, as only certain antibiotics are effective on all these bacteria. Antibiotics have been shown to decrease mortality in kwashiorkor patients, but not in marasmus patients, where antibiotics may help in nutritional recovery but have not been shown to increase overall survival rates.⁶³ A quarter of deaths in children with kwashiorkor occur due to bloodstream infections, which is not the case for marasmus. Overall, it is suggested that dysbiosis, invasion of pathogenic bacteria, and passage of some bacteria from the gastrointestinal (GI) tract to other sites in the body such as the bloodstream due to a deficient gut mucosal lining, are major characteristics of kwashiorkor but not of marasmus.⁶⁴ It is speculated that perhaps the reduction in anaerobic species and the oxidative stress is part of the explanation for why children with kwashiorkor do not get cholera and have lower rates of HIV.⁶⁵ The particular configuration of dysbiosis, it is thought, leads to certain pathogens having a hard time infecting these bodies.⁶⁶ The reasons for these differences in bacterial populations in the two syndromes are not known.

According to Malabou, destructive plasticity most pungently marks the constraints characterising the material. In the microbiome, we could speculate – because at this point there is no evidence either way – that destructive plasticity occurs at the threshold when the microbiome ceases to be adaptable and is ontologically transformed into the disease-associated profile no longer able to help its human host uptake nutrients from the food it is presented with. Malabou writes that ‘destructive plasticity ... sculpts by annihilating precisely at the point where the repertory of viable forms has reached exhaustion, and has nothing else to propose.’⁶⁷ The microbiome reaches a point where it can no longer adapt to the environmental circumstances it is presented with, and it instead breaks down. One infection or course of antibiotics, and the microbiome reestablishes itself anew, with sculpting plasticity of resurgence. Too many infections or courses of antibiotics, and the microbiome is annihilated, taken over by opportunist pathogens, equilibriums cannot be re-established, and the microbiome is ontologically split from what it was before. As Les Dethlefsen and David A. Relman write in relation to microbiomes and to broader ecological phenomenon:

The existence of sudden regiment shifts in ecosystems, sometimes triggered by perturbations, is a familiar ecological phenomenon, and the return of external conditions to their former state may not reverse such changes in community composition.⁶⁸

One could further speculate that with kwashiorkor, the microbiome has been pushed beyond yet another irrevocable threshold. According to Malabou, the possibility of an ontological change brought on by destruction, an ‘annihilating metamorphosis’,⁶⁹ resides virtually as an ontological fate within the biological, ready to self-actualise at any moment.⁷⁰ An entirely new form takes over where another form once was, with ‘a real and total deviation of being’.⁷¹ The new essence is imposed ‘without mediation or transition or glue or accountability’.⁷² It is ‘a plasticity that does not repair, a plasticity without recompense or scar, one that cuts the thread of life in two or more

⁶³Ibid.

⁶⁴Ibid.

⁶⁵Beatrice Amadi et al., ‘Reduced production of sulfated glycosaminoglycans occurs in Zambian children with kwashiorkor but not marasmus’, *The American Journal of Clinical Nutrition*, 89:2 (2009), pp. 592–600.

⁶⁶Pham et al., ‘Gut microbiota alteration’.

⁶⁷Malabou, *Ontology of the Accident*, p. 54.

⁶⁸Dethlefsen and Relman, ‘Incomplete recovery’.

⁶⁹Malabou, *Ontology of the Accident*, p. 30.

⁷⁰Ibid., p. 6.

⁷¹Ibid., p. 7.

⁷²Ibid., p. 6.

segments that no longer meet.⁷³ Destructive plasticity is the annihilation of equilibrium and the destruction of the capacity to repair.⁷⁴

This description of destructive plasticity corresponds to how a stunted microbiome cannot be resculpted and the overwhelming occurrence of relapse in children receiving treatment. Ontological annihilation cannot be healed or recovered. In acknowledging this ‘ontology of the accident’, Malabou contends that it must be reckoned with philosophically. Plasticity is not a mode of cause and effect, but a mode of being, and to Malabou, the ontology of the accident has a law that is logical and biological but does not allow us to anticipate its instances.⁷⁵ Thinking ontologically about plasticity problematises medicine’s focus on causality, intervention, and treatments and allows us to think politically about the destruction of life-sustaining multi-species organs. As Malabou writes:

To insist on the role of destructive plasticity beyond all horizon of redemption does not amount to denying the possibilities of new therapies. This is not a matter of despair or pessimism. I am simply arguing that ... before asking how to treat or how to heal, it is important, according to the most elementary logic, to inquire what those who suffer are suffering from.⁷⁶

The geopolitics of hunger

The field of critical nutrition studies writes against depoliticisation of disease, reminding us that the ways in which social problems, like malnutrition, are framed are never apolitical, and that the theoretical and epistemological lenses that are used to make visible the problem of malnutrition shape research questions and intervention designs.⁷⁷ As exemplified in the medical malnutrition community described above, ‘mainstream’ public health nutrition operates from a largely positivist epistemology, pinpointing drivers and consequences of malnutrition and looking for solutions relying on experimental evidence from interventions. This field is rooted in commitments to ‘policy relevance’ and utilitarian frameworks that focus on cost-effectiveness and returns on investments rather than rights-based or justice-oriented approaches.⁷⁸ As an alternative to this, critical nutrition studies focus on nutrition inequities, lived experiences of malnutrition, and how power operates in food systems and health nutrition interventions, and argues that interventions might be more successful in more equitable ways if they heed lessons from critical nutrition research.⁷⁹ Here, the microbiome is linked with ‘gendered, classed and racialized physical health’, and it is highlighted how ‘complex biosocial relationships physically affect the body’s ability to nourish itself.’⁸⁰ Furthermore, ‘while colonial histories have structurally shaped economies, agricultural production, and health systems, they also more insidiously introduced a knowledge and identity politics rooted in ideologies of Western supremacy.’⁸¹ These colonial power relations are reproduced today through institutions like the World Bank, transnational corporations, and international research and development agencies.⁸² Critical nutrition approaches therefore ‘create analyses that highlight how white supremacy and colonial logics form the basis of predatory or exploitative capitalist practices in the food system, as well as the often well-intentioned public

⁷³Ibid.

⁷⁴Ibid.

⁷⁵Ibid., p. 30.

⁷⁶Malabou, *New Wounded*, p. 212.

⁷⁷Carly Nichols Carly, Halie Kampman, and Mara van den Bold, ‘Forging just dietary futures: Bringing mainstream and critical nutrition into conversation’, *Agriculture and Human Values* (2021), pp. 1–12.

⁷⁸Ibid..

⁷⁹Ibid.

⁸⁰Ibid., p. 6.

⁸¹Ibid., pp. 6, 7.

⁸²Ibid.

health interventions designed to address them.⁸³ Still, critical nutrition scholars recognise that nutritional scientists produce essential nutrition research and use it to advocate for reducing nutritional suffering; however nutrition interventions could benefit from acknowledging structural context and history, which is to say, politics.⁸⁴ Likewise, this article engages a philosophy of plasticity not because plasticity can render a problematic scientific model of causality for childhood malnutrition more robust, but because plasticity poses an ontological problem by how a form can be completely split from what it was before, such that it is impossible to recover what has been deformed. The point is not to make judgements on good or bad science, the point is that science can be fantastic and still politically unsatisfactory.

In his 1977 [1952] *The Geopolitics of Hunger*, Josué de Castro⁸⁵ debunks the ideas that hunger (defined broadly as both starvation and the ‘hidden’ hungers of protein or vitamin deficiencies that cause malnutrition even in those who eat every day), is a natural phenomenon in human communities or something, as Neo-Malthusianism asserts, which should be averted by population control. Citing multiple examples of how peoples across the continents of Africa, Asia and the Americas were better nourished due to more varied and abundant food-sources before than after being in contact with white colonialists or settlers, de Castro firmly asserts that hunger is man-made by processes of colonialism, underdevelopment, and Western types of resource extraction, one of which is mono-cropping. According to de Castro, it is catastrophic that nutrition with capitalism is relegated to markets that are ultimately oriented towards profit, rather than being viewed and treated as a universal human common. Similarly, Amartya Sen has asserted that poverty and famines should not be explained in terms of supply, but in terms of entitlements.⁸⁶

In *How Europe Underdeveloped Africa*,⁸⁷ Walter Rodney takes up de Castro’s insights by describing the effects of colonialism and capitalism as ‘growth without development’, in which an over-dependence on one or two exports such as rubber, coffee, cocoa, peanuts, or cotton is established, profit goes abroad, and the economy becomes dependent on the metropole. As Rodney writes, ‘the term “monoculture” is used to describe these colonial economies which were centred around a single crop’⁸⁸ and ‘the only things which developed’ in this system ‘were dependency and underdevelopment’.⁸⁹ This colonial invention of monoculture, Rodney writes, had nothing ‘natural’ about it, but was a consequence of imperialist requirements, a characteristic of regions falling under capitalist domination, and was in contrast to African traditions of diversified agriculture.⁹⁰ When cash crops were grown to the exclusion of staple foods, the ground for famines and large-scale imports of food (further exacerbating dependency) was laid.⁹¹ According to Rodney, one of the most important consequences of colonialism on African development is ‘chronic undernourishment, malnutrition and deterioration of the physique of the African people.’⁹² As he writes:

A black child with a transparent rib-case, huge head, bloated stomach, protruding eyes, and twigs as arms and legs was the favorite poster of the large British charitable operation known as *Oxfam*. The poster represented a case of Kwashiorkor – extreme malignant malnutrition. *Oxfam* called upon the people of Europe to save starving African and Asian children from

⁸³Ibid., p. 7.

⁸⁴Ibid., p. 9.

⁸⁵Josué de Castro, *The Geopolitics of Hunger* (New York, NY: Monthly Review Press, 1977 [orig. pub. 1952]). For a thorough introduction to de Castro as a pioneer of anti-colonial geopolitics, see Frederico Ferretti, ‘A coffin for malthusianism: Josué De Castro’s subaltern geopolitics’, *Geopolitics*, 26:2 (2021), pp. 589–614.

⁸⁶Amartya Sen, *Poverty and Famines: An Essay on Entitlement and Deprivation* (Oxford, UK: Oxford University Press, 1982).

⁸⁷Walter Rodney, *How Europe Underdeveloped Africa* (Dar es Salaam: Tanzania Publishing House, 1972).

⁸⁸Ibid., p. 256.

⁸⁹Ibid.

⁹⁰Ibid., p. 257.

⁹¹Ibid., pp. 257–8.

⁹²Ibid., p. 258.

Kwashiorkor and such ills. *Oxfam* never bothered their consciences by telling them that capitalism and colonialism created the starvation, suffering and misery of the child in the first place.⁹³

Acknowledging that the ‘European inventions’ of modern medicine, clinical surgery, and immunisation are positive features, Rodney stresses that they must ‘be weighed against the numerous setbacks received by Africa in all spheres due to colonialism as well as against the contributions Africa made to Europe.’⁹⁴ And because the European bourgeoisie did not suffer from hunger and starvation, ‘bourgeois science therefore did not consider those things as needs which had to be met and overcome.’⁹⁵

In today’s neoliberal geopolitics of hunger, discourses and practices under the rubric of ‘food security’ have been widely criticised for failing to address hunger, for example when the language of food security is used by states to legitimise the securing of rights over agricultural lands (land-grabbing), or is used by transnational agribusiness corporations in the legitimisation of their profit-generating activities.⁹⁶ Here, the hungry can be both subjects of humanitarian interventions and threats to security.⁹⁷ Against this backdrop, it is for example discussed how state and corporate actions of power- and profit seeking influence who gets access to what food; how food security and aid programmes anchored in neoliberal governance practices are ineffective and often neocolonial; and how hunger is depoliticised.⁹⁸ In response to this, the food sovereignty movement, oriented towards ‘the right of peoples to define their own food and agriculture’⁹⁹ rests on an argument, echoing De Castro, that commodification of food invariably leads to food insecurity, and that systems change is necessary.¹⁰⁰ The food justice movement is similarly centred on efforts to grow and access nutritious food, with attention to how race and class influence its production, distribution, and consumption.¹⁰¹ These discussions also reach into research on women’s rights, which is intimately tied to childhood malnutrition,¹⁰² peasant

⁹³Ibid., p. 259.

⁹⁴Ibid., p. 261.

⁹⁵Ibid.

⁹⁶Benjamin Shepherd, ‘Thinking critically about food security’, *Security Dialogue*, 43:3 (2012), pp. 195–212; David Nally, ‘Governing precarious lives: Land grabs, geopolitics, and “food security”’, *The Geographical Journal*, 181 (2014), pp. 340–9; David Nally, ‘Against food security: On forms of care and fields of violence’, *Global Society*, 30:4 (2016), pp. 558–82; Altaaf Mechiche-Alami et al., ‘Agricultural land acquisitions unlikely to address the food security needs of African countries’, *World Development*, 141 (2021), p. 105384.

⁹⁷Jamey Essex, ‘Idle hands are the devil’s tools: The geopolitics and geoeconomics of hunger’, *Annals of the Association of American Geographers*, 102:1 (2012), pp. 191–207.

⁹⁸See, for example, Rajnish Kumar Rai and Patturaja Selvaraj, ‘Exploring realities of food security: Oral accounts of migrant workers in urban India’, *Economic and Industrial Democracy*, 36:1 (2015), pp. 147–71; Roger Merino, ‘The geopolitics of food security and food sovereignty in Latin America: Harmonizing competing visions or reinforcing extractive agriculture?’, *Geopolitics* (2020), pp. 1–23; Susanne Jaspars, ‘Protracted crisis, food security and the fantasy of resilience in Sudan’, *Security Dialogue* (2020), first published online 13 July 2020; Robin Dunford, *The Politics of Transnational Peasant Struggle: Resistance, Rights and Democracy* (London, UK: Rowman & Littlefield, 2016); Robin Dunford, ‘Human rights and collective emancipation: The politics of food sovereignty’, *Review of International Studies* (2015), pp. 239–61; Arnel M. Borrás and Faisal Ali Mohamed, ‘Health inequities and the shifting paradigms of food security, food insecurity, and food sovereignty’, *International Journal of Health Services*, 50:3 (2020), pp. 299–313.

⁹⁹Via Campesina, *Food Sovereignty Now!: A Guide to Food Sovereignty* (Brussels: ECVC, 2018).

¹⁰⁰Michel Pimbert, ‘Towards food sovereignty: Reclaiming autonomous food systems’, *Gatekeeper*, 141: November (2009), pp. i–20. See also Raj Patel, *Stuffed and Starved: The Hidden Battle for the World Food System* (New York, NY: Melville House Publishing, 2007).

¹⁰¹Alison Hope Alkon and Julian Agyeman (eds), *Cultivating Food Justice: Race, Class, and Sustainability* (London, UK: MIT Press, 2011), p. 5. See also Alison Hope Alkon and Kari Marie Norgaard, ‘Breaking the food chains: An investigation of food justice activism’, *Sociological Inquiry*, 79:3 (2009), pp. 289–305.

¹⁰²Anne C. Bellows et al. (eds), *Gender, Nutrition, and the Human Right to Adequate Food: Toward an Inclusive Framework* (London, UK: Routledge, 2015); Marie Jeanne Nzayisenga et al., ‘Food (in)security, human (in)security, women’s (in)security: State policies and local experiences in rural Rwanda’, *African Security*, 9:4 (2016), pp. 278–98.

rights,¹⁰³ and the politics of ‘Big Food’.¹⁰⁴ In short, there is a schism between the idea of food security as the elimination of hunger, and a practice of food security structures and strategies that reproduce hunger.¹⁰⁵ A ‘feed the world’ claim from agrifood science and food corporations, resting on the idea that increased food production through technological change is the solution to hunger, is also used to argue that the need for food is too urgent to afford justice-oriented responses, thereby sweeping aside food sovereignty and food justice, which are arguably better routes towards ‘feeding the world’.¹⁰⁶ At other times, the very broad definition of malnutrition and discussions of malnutrition as a global phenomenon obscure its most deadly effects and how they are limited to specific areas in the Global South: communities where children suffer from SAM rarely have the resources to participate in a movement towards food sovereignty. These different scales require nuance in discussions and analysis of all the different manifestations of malnutrition.

Benjamin Shepherd writes that hunger is easy to dismiss because it is continual rather than extraordinary, and is widely excused as being a natural phenomenon (which was exactly what De Castro argued against).¹⁰⁷ Echoing Johan Galtung, Shepherd therefore redefines food security as a matter of ‘securing vulnerable populations from the structural violence of hunger’.¹⁰⁸ Rather than making utopian claims of ‘ending hunger’, focusing on structural violence highlights the institutional arrangements that perpetuate this ‘human-caused lethal violence’.¹⁰⁹ Similarly, Gálvez et al. write that ‘structural violence is the historically patterned conditions that produce and maintain debilitating inequality’ but qualify this definition by stressing that ‘if structural violence is to be a useful concept – and we think it is – it must bring gendered and racialized histories of conquest, settler colonization, and dispossession into conversations focused on economics or politics’.¹¹⁰

In the discourses of aid agencies and the scientific community dedicated to malnutrition, hunger is overwhelmingly discussed and studied in positivist, utilitarian, and colour blind terms that ignore how the geopolitics of hunger described by de Castro and Rodney continue through neocolonial relations and global structures of white supremacy. Geographically, the highest prevalence of wasting, stunting and SAM occurs on the African continent, particularly in Central Africa, as well as in South Asia and Middle Eastern countries devastated by war. These areas are also where the three million-plus yearly deaths happen.¹¹¹ In other words, it is overwhelmingly brown and black children who die from undernutrition. Ruth Wilson Gilmore’s definition of racism as ‘the state-sanctioned and/ or extralegal production and exploitation of group-differentiated vulnerability to premature death’¹¹² is starkly illuminated in the globally unequal distribution of childhood malnutrition and its accompanying calamity of childhood mortality. As de Castro writes, the geopolitics of hunger result in an enormous waste of human potential, an observation that is mirrored in how Joe R. Feagin et al. describe white racism as ‘a

¹⁰³Dunford, *Transnational Peasant Struggle*.

¹⁰⁴Jennifer Clapp and Gyorgy Scrinis, ‘Big food, nutritionism, and corporate power’, *Globalizations*, 14:4 (2017), pp. 578–95; David Stuckler and Marion Nestle, ‘Big food, food systems, and global health’, *PLoS Med*, 9:6 (2012), p. e1001242.

¹⁰⁵Shepherd, ‘Thinking critically’, p. 203.

¹⁰⁶Valentine K. Cadieux and Rachel Slocum, ‘What does it mean to do food justice?’, *Journal of Political Ecology*, 22:1 (2015), p. 3.

¹⁰⁷Shepherd, ‘Thinking critically’, p. 201.

¹⁰⁸Ibid., p. 206.

¹⁰⁹Ibid., pp. 205, 206.

¹¹⁰Alyshia Gálvez et al., ‘Chronic disaster: Reimagining noncommunicable chronic disease’, *American Anthropologist*, 122:3 (2020), pp. 639–40.

¹¹¹Global Hunger Index, ‘Hunger and Food Systems in Conflict Settings’, available at: {<https://www.globalhungerindex.org>} accessed 4 February 2022; Our World in Data, ‘Death Rate from Malnutrition, 2019’, available at: {<https://ourworldindata.org/grapher/malnutrition-death-rates>} accessed 4 February 2022.

¹¹²Ruth Wilson Gilmore, *Golden Gulag: Prisons, Surplus, Crisis, and Opposition in Globalizing California* (Berkeley, CA: University of California Press, 2006), p. 28.

system of institutionalized human waste’, or a ‘wasteful dissipation of human talent and energy’.¹¹³ The fact that severe malnutrition causes irreversible changes that last a lifetime highlights this waste. Indi Trehan et al. write the following about the causes of SAM:

In some cases, SAM is precipitated by political disruptions like war or natural disasters like drought, which interfere with the food supply. However, more often, SAM is simply a disease of pervasive poverty and poor hygienic conditions, compounded by socioeconomic disparities, seasonal shortages of food, and spikes in illnesses such as malaria or infectious diarrhea.¹¹⁴

To slightly rephrase, SAM is most commonly an outcome of the violence of pervasive poverty. According to literature on racial capitalism, this violence is leveraged upon populations who are rendered surplus or redundant, or as Achille Mbembe writes, ‘abandoned subjects, relegated to the role of a “superfluous humanity”’,¹¹⁵ ousted from even the possibility of having their labour exploited. In his book on capitalism and development, Kalyan Sanyal also focuses on these populations, describing how they ‘constitute a space outside capital’s own realm, the space of poverty’.¹¹⁶ In the words of Arun Kundnani, these populations become ‘displaced signifiers of neoliberalism’s failure to universalize its legitimacy’, and the tension or anxiety that this failure elicits is mitigated by race, which ‘serves as the means by which neoliberalism organizes and codes the complex, dispersed boundaries between these populations and others, between the “exploitable” and “unexploitable”, the “free” and “unfree”, the “deserving” and “undeserving”’.¹¹⁷ This resolving of the neoliberal market ideology through race is likely also what enables a lack of attention to pervasive poverty and severe malnutrition as results of structural violence in post-colonial settings; and what allows a collective looking away, as if this horrific condition is an unfortunate, perhaps inevitable, byproduct for millions who happen to be black or brown. To Gargi Bhattacharyya, racial capitalism relies on ‘the expulsion of populations from the sphere of the productive economy’, and a ‘framing of racialized destiny ... deployed to consign some to living death or death in the name of safeguarding the necessary resources of life for others’.¹¹⁸ Microbes are indifferent to the human construct of race, but often end up highlighting racialised structural violence. Cedric Robinson, to whom the contemporary concept of racial capitalism is attributed, writes that; ‘Racialism, as I have tried to show, ran deep in the bowels of Western culture’.¹¹⁹ More precisely though, it runs deep in the bowels of the youngest of those who are rendered superfluous.

Malabou’s insistence on inquiring ontologically into what those who suffer are suffering from is important here: Severe childhood malnutrition is a politically manufactured disease created by intentional neglect – a necropolitical condition of leaving people with too little to the point where their own systems turn against them. The microbiome, as a living entity, is destroyed such that it can’t be recovered or reconstructed, and in that process, the human host moves towards death. The structural violence of hunger is not just about being temporarily or chronically hungry, it

¹¹³Joe R. Feagin et al., *White Racism: The Basics* (London, UK: Routledge, 2001), pp. 8, 19.

¹¹⁴Indi Trehan and Mark J. Manary, ‘Management of complicated severe acute malnutrition in children in resource-limited countries’, *UpToDate* (November 2021).

¹¹⁵Achille Mbembe, *Critique of Black Reason* (Durham, NC: Duke University Press, 2017), p. 3.

¹¹⁶Kalyan Sanyal, *Rethinking Capitalist Development: Primitive Accumulation, Governmentality and Post-Colonial Capitalism* (London, UK: Routledge, 2007), p. 174.

¹¹⁷Arun Kundnani, ‘What is Racial Capitalism?’, available at: {<https://www.kundnani.org/what-is-racial-capitalism/>} accessed 13 January 2022.

¹¹⁸Gargi Bhattacharyya, *Rethinking Racial Capitalism: Questions of Reproduction and Survival* (London, UK: Rowman & Littlefield, 2018), pp. 179, 178.

¹¹⁹Cedric J. Robinson, *Black Marxism: The Making of the Black Radical Tradition* (Chapel Hill, NC: The University of North Carolina Press, 2000), p. 66.

is about the annihilation of a life-sustaining organ based on co-developed symbiosis. And while we are not able to anticipate singular instances of destructive plasticity in microbiomes of malnourished children, a focus on destructive plasticity urges us to acknowledge how its conditions of possibility are politically manufactured. Medicine perhaps cannot divorce itself from politics if it wants to truly understand and intervene into something which is in essence a political disease of destruction.

RUTF, neoliberalism, and flexibility

Echoing Rodney, Sanyal writes that ‘underdevelopment is the product of development rather than its initial condition’¹²⁰ and stresses that capitalism inevitably produces impoverished excluded populations, as ‘poverty is integral to capital’s own existence, an “other” that it cannot escape.’¹²¹ Hence,

Development can now claim the legitimacy of capital’s existence only by addressing poverty and deprivation in terms of governmental technologies with the aim of ensuring subsistence to the dispossessed, to the inhabitants of the wasteland that surrounds the world of capital. This requires that a part of the capitalist surplus be transferred from the domain of capital for implementing anti-poverty programs.¹²²

One example of this transfer of capitalist surplus in the name of development is the global market for RUTF. For example, UNICEF procures 75–80 per cent of global demand for RUTF, which corresponds to a cost of over 100 million US dollars a year.¹²³ Still, the supply through UNICEF ‘only covers approximately 25 per cent of the global estimated 14.3 million severely wasted children’.¹²⁴ UNICEF writes the following about its own failure to reach all those in need of RUTF:

As wasting is perceived as a humanitarian problem, it receives 80 per cent of its funding from humanitarian budgets. However, in reality the condition is more prevalent in non-emergency contexts, whereby approximately 65–70 per cent of children suffering from severe wasting, globally, do not have access to treatment, and live in non-humanitarian, stable development environments, which often get less attention.¹²⁵

Severe wasting, then, is more often a result of poverty than disaster, but disaster draws more funding, and expelled populations are often excluded even from the anti-poverty programmes Sanyal describes as integral to addressing the surplus of capital, which again precisely highlights neoliberalism’s failure to universalise its legitimacy. When organisations such as UNICEF describe RUTF as ‘A Miracle Food’ and ‘The Solution’¹²⁶ it is perhaps merely a solution for how to incorporate surplus populations back into the reach of capital. UNICEF further writes that meeting the Sustainable Development goal of ending malnutrition by 2030 will require ‘the rapid expansion of targeted feeding programmes, notably CMAM (Community-Based Management of Acute Malnutrition), and the use of RUTF’.¹²⁷

¹²⁰Sanyal, *Rethinking Capitalist Development*, p. 206.

¹²¹*Ibid.*, p. 174.

¹²²*Ibid.*

¹²³UNICEF Supply Division, ‘Ready-to-Use Therapeutic Food: Market Outlook’ (March 2021).

¹²⁴*Ibid.*, p. 4.

¹²⁵UNICEF Supply Division, ‘Ready-to-Use Therapeutic Food’.

¹²⁶UNICEF, ‘The Difference Kids Make’, available at: {<https://www.unicefkidpower.org/impact/>} accessed 4 February 2022.

¹²⁷UNICEF, ‘Ready-to-Use Therapeutic Food’, p. 5.

Insofar as contemporary capitalism, as Sanyal analyses, cannot exist without the production of impoverished surplus populations, and insofar as development policies produce underdevelopment rather than stem from it, the logic that malnutrition can be eradicated by increasing the market for RUTF is dubious. Advocating for RUTF is not merely unconvincing because it seeks to fix the ills of capitalism through more capitalism, but also because RUTF is implicitly wedded to a belief that microbiomes can be repaired, which is to say that as a solution it ignores the ontological, and political, aspect of destructive plasticity.

Malabou connects neoliberalism to a requirement for occupational and personal flexibility, which she describes as ‘the ideological avatar of plasticity – at once its mask, its diversion, and its confiscation.’¹²⁸ She asserts that ‘many descriptions of plasticity are in fact unconscious justifications of a flexibility without limits.’¹²⁹ Ignoring the ontological aspect of destructive plasticity, development interventions such as reliance on RUTF implicitly rest on a view of the human body as precisely this: flexible, repairable, having no limit. Instead, Malabou stresses that there is a limit, even if that limit is death:

A plastic individual, unlike a flexible individual, would ... be one who cannot be pressured to a certain point, said point marking an incompressible threshold, an absolute limit to exploitation. The existence of such a limit, which seems totally absent in flexible or resilient materials ... determines the fragility of the subject as well as its strength. Transgression of this line causes destruction and death, but it is also a resource, a power of negation, by which the individual claims the proper form of his world. Plasticity is both restrictive and energetic. By marking the limit, it also reveals the essential role of non-compliance that allows the subject not only not to bend but also to invent its shape.¹³⁰

In relation to childhood malnutrition, the non-compliance Malabou describes here would be the non-compliance of the gut microbes themselves, which leads to ontological annihilation of not only the microbiome, but also eventually of the subject that hosts it.

The most common formulation of RUTF consists of milk powder, peanut paste, vegetable oil, and sugar, to which are added vitamins and minerals.¹³¹ Positing this commodified concoction as a solution to the structural violence of hunger ignores food’s kernel of nourishment and the difference between mere life and more life. For example:

food fortification, while ostensibly raising micronutrient levels, does little to address the social and political marginalization that women (particularly mothers) face, and thus does little to alleviate their experiences of suffering. ... Addressing nutrient levels alone, as well as viewing nutrition as the absence of nutrients rather than shaped by broader social and economic factors, risks fundamentally misdirecting resources.¹³²

What should we do with the plasticity that makes us? Or, as Malabou asks elsewhere, ‘What should we do with all this potential within us?’¹³³ Seeking to form or even sustain it with fortified peanut butter is not a good answer.

¹²⁸Malabou, *What Should We Do with Our Brain?*, p. 12.

¹²⁹Malabou, *What Should We Do with Our Brain?*.

¹³⁰Catherine Malabou, ‘Préface à la seconde édition’, in *Que faire de notre cerveau? Seconde édition* (Montrouge: Bayard, 2011), pp. 7–34, trans. by Jon Goldberg-Hiller, unpublished, p. 3.

¹³¹WHO, *Guideline on the Dairy Protein Content in Ready-to-Use Therapeutic Foods for Treatment of Uncomplicated Severe Acute Malnutrition* (Geneva: World Health Organization; 2021), p. 2.

¹³²Nichols et al., ‘Forging just doetary futures’, p. 6.

¹³³Malabou, *What Should We Do with Our Brain?*, p. 7.

Conclusion: The politics of nurturing

The horror of childhood malnutrition is that as a global community, we know very well how to nurture a developing microbe-human symbiosis such that it shapes itself into an organ that allows its host to uptake nutrients. This is exemplified by the millions of children who are fed nutritious foods in utero and in their childhoods. Importantly, nourishing a child does not require control over the biological plasticity such nourishment is ultimately aimed at. It is therefore a lot easier than attempting to resculpt an annihilated microbiome. Efforts to intervene into the plastic materiality of dysbiotic or already annihilated microbes, however, amounts to a tactic of biological mastery with eradication as a prominent tool, and in that way, it resonates with dominant, and often futile or unjust, security logics relying on control and eradication of what is deemed dangerous, and which are often aimed at post-facto securing once events or planetary inequities have already manifested.

Rather than casting socially produced suffering in medical terms, critical nutrition studies turn away from ‘nutrition’ to focus on nourishment as subjective, biophysical, and psychosocial.¹³⁴ Likewise, scholarship and activism focused on food justice and food sovereignty precisely highlights the difference between ‘edible foodlike substances’¹³⁵ and food that is ‘fresh, nutritious, affordable, culturally appropriate, and grown locally with care for the well-being of land, workers, and animals.’¹³⁶ This is different from the pursuit of the malnutrition community, which has essentially tasked itself with trying to mitigate the failures of the global order as they manifest in hungry children by seeking to figure out what is, materially, being ruined in these kids, and how to fix it again. While noble and pragmatic, this pursuit overlooks destructive plasticity as an ontological fate resting within the biological, and even if it succeeds, it will have done nothing to change the structural violence that causes the destruction.

What does it mean to claim a resistance from within? A resistance without alternative? A resistance of a biological type?¹³⁷

Returning to Malabou’s insistence on a focus on freedom as emanating from new scientific knowledge of biological plasticity, Malabou seeks ‘to place scientific discovery at the service of an emancipatory political understanding.’¹³⁸ She is not content with new scientific findings of plasticity merely leading to ‘an improvement in the “quality of life” through a better treatment of illness.’ As she writes:

We don’t want these half measures, what Nietzsche would rightly call a logic of sickness, despairing, and suffering. What we are lacking is *life*, which is to say: *resistance*. Resistance is what we want.¹³⁹

In seeing a whole new vision of the human within scientific findings of plasticity, Malabou laments that these findings ‘are incapable of unleashing possibilities, of unleashing new ways of living and – why be afraid of the word? – new ways of being happy.’¹⁴⁰ To paraphrase what Malabou writes about neuronal science, human politics have not been revolutionised by the microbiome revolution, even though it holds such a potential.¹⁴¹ However, in seeing in plastic materiality a potential for resistance and freedom, Malabou is adamant that there is no recourse

¹³⁴Nichols et al., ‘Forging just dietary futures’, pp. 6, 8.

¹³⁵Michael Pollan, ‘Unhappy meals’, *The New York Times* (28 January 2007).

¹³⁶Just Food cited in Alkon and Agyeman (eds), *Cultivating Food Justice*, p. 4.

¹³⁷Malabou, ‘Préface’, p. 5.

¹³⁸Malabou, *What Should We Do with Our Brain?*, p. 53.

¹³⁹*Ibid.*, p. 68.

¹⁴⁰*Ibid.*, p. 67.

¹⁴¹*Ibid.*

to the symbolic. Resistance must come from inside the biological itself, rather than being superimposed onto the material as a symbolic escape from the flesh, blood, guts, and symbioses that make us:

The role of philosophy is not to propose new arrangements or structural paradigms. It is now useless to propose a new symbolic economy superimposed on the material economy and undermine it with it. ... Therefore there is no possibility, except at the price of an idealist and absurd futile attempt, to distinguish between symbolic plasticity and its organic plasticity.¹⁴²

In relation to the calamity of childhood undernutrition, such biological, organic resistance must focus on the, at once simple and highly complex, embodied act of nurturing. As a political project, such nurturing would be aimed at children and caregivers attaining the agency to form their own lives, not symbolically speaking, but biologically, from within, encouraging internal projects of plastic sculpting, repair, and transformation, with all the openness, lack of control, affirmation, and abundance this requires. Nurturing, as an organic, biological act, takes resistance into the body, practicing resistance directly with plastic materiality, espousing an organic realism that ever more symbolic superimpositions do not.¹⁴³ The 2020–1 Indian farmers' protest, which ended with the repeal of three controversial farm laws that would have further deregulated and corporatised India's agricultural sector, and which was supported by agrarian movements for food sovereignty around the globe, can perhaps be seen as one example of this type of resistance; fighting for the ability to nurture. In working with the form and forming of bodies, such biological nurturing is a multispecies strategy of reclaiming the simple, yet to so many unattainable, act of giving life. Despite its seeming simplicity, assuring such nurturing requires distinct political change in how regimes of development, humanitarian intervention, and security are understood and practiced. While I agree that recourse to the symbolic is futile, the tenacity of the violence of hunger leaves me much less optimistic than Malabou about possibilities for emancipation emanating from engagement with plastic materiality. As she writes, 'it is time to understand biological subjectivity as a weapon of some kind. Not simply the mirror of the system, but the means to explode it.'¹⁴⁴

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¹⁴²Malabou, 'Préface', pp. 7, 8.

¹⁴³For a sophisticated call for taking embodiment seriously in international studies, see Lauren Wilcox, *Bodies of Violence: Theorizing Embodied Subjects in International Relations* (Oxford, UK: Oxford University Press, 2015).

¹⁴⁴Malabou, 'Préface', p. 9.