

Filth and the city

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Abstract

Filth is a material and a semiotic category that has long been used to classify and govern the human and the nonhuman world. Undesired social groups and forms of life are elided with disgusting elements of the environment to justify their suppression or eradication. The science and the management of filth have been central to modernity and have profoundly shaped urban life. The rise of microbiology revealed the microbial origins of some diseases, empowering visions of the sanitary city in both the metropole and the colony. This drove substantial investments in sanitation, hygiene, and the removal of animals and agriculture. However, recent research on the human microbiome has demonstrated the salutary role of some microbes for human well-being. It highlights the value of forms of material previously categorized as filth and calls for a recalibration of modern, antibiotic hygiene practices and modes of architecture and urban planning. This new microbiology is driving a nascent, probiotic turn in urban theory that overlaps with a wider appreciation of the beneficial role of nature in the urban environment, and the development of more affirmative models of urban hospitality premised on living with social difference. This review and perspective examines these connected developments, explores their implications for urban political ecology, and outlines a new research agenda. It starts with a chronology of the shifting material and semiotic relationships with filth in science and society, before identifying six key research questions to guide an interrogation of this new chapter in the storied history of filth and the city.

Keywords

Filth, urban political ecology, microbiology, hygiene, planning, sanitation

Why filth, why now?

Filth standardly describes ‘dirty and unclean matter considered disgusting and offensive’. It conjures ‘moral corruption, depravity, or impurity; sinfulness; obscene, offensive, or disgusting behaviour’ (OED, 2025).

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Filth is a material and a semiotic category that has long been used to classify and govern the human and the nonhuman world. Social theorists have traced how undesired groups are elided with disgusting elements of the environment to justify their suppression or eradication. Powerful social norms fold together filthy matter, filthy practices and filthy people. Historians have explored how abject human bodies and practices are associated with unsanitary practices under racialized, colonial, patriarchal and other insidious logics, with harmful social consequences (Downs, 2021; McLintock, 2015; Tilley, 2011).

Mary Douglas (1966) famously described dirt as ‘matter out of place’ prompting a long and rich discussion of the interlocking categories of filth, dirt, shame, abjection, and sewage. This scholarship reveals how the language of filth is inherently rhetorical, denigrating and instrumental. It suggests that in contradistinction to dirt, rubbish, trash and, in particular waste, filth is integrally moralizing. Where waste, with its language of sanitation, has become a term of governmental order, technology, and urban planning, filth remains a term of excess, aggression and exclusion. Filth links politics, biology, religion, sexuality in a network of judgement and contestation. The opposites of filth – purity/*Reinheit*; cleanliness; godliness; inclusiveness – have been repeatedly mobilized as positive values, with huge impacts on the notion of the urban, and violent political action at the levels of the state, the street and the body.

We start from the premise that our contemporary moment requires a major rethinking of the social and biological issue of filth, because of a unique collision of six trajectories. First, recent research on the human microbiome has demonstrated the positive value of microbes for human well-being, including exposure to beneficial organisms (Yong, 2016). It highlights the value of forms of material previously categorized as dirty or filthy and raises concerns that the loss of microbes might cause the dysbiosis that underpins the recent rise in a range of non-communicable diseases. It calls for a recalibration of modern, antibiotic hygiene practices and modes of environmental management (Blaser, 2014).

Second, despite this drive towards appreciating the value of microbes, the COVID-19 pandemic, other zoonoses, and concerns about antimicrobial resistance, make clear the persistent risks of emerging infectious disease. Microbial anxieties continue to have major impacts on public perceptions of sanitation and the relation between health and hygienic practice, amplifying negative attitudes towards microbial exposure. The resulting insistence on cleanliness as microbial absence is in tension with the recognition of the value of the beneficial microbiome (Maller, 2023).

These two insights lead, to a third: the long known, but often neglected fact, that humans are not alone in an urban world, but share it with non-humans in significant ways. These urban multispecies entanglements are closely related to, and are largely constitutive of how humans deal with filth and dirt (Gandy, 2022). Zoonotic disease emerges in the borderlands where human and nonhuman natures overlap (bat caves, wet markets, abattoirs, chicken or pig farms etc.) (Ali et al., 2022; Hinchliffe et al., 2016); yet beneficial microbial exposure has been linked to contact with soil, plants and some animals in the urban environment. This spatial differentiation of microbes and their relation to human wellbeing is hugely important for urban planning.

Our fourth observation concerns how this tension between good and bad urban natures is negotiated in different urban contexts across the global North and South (Kimari, 2023; Maller, 2023). Public health policy has been slow – and confused – in responding to the research on the microbiome and dysbiosis and its implications for society. There are pressing questions about how to balance the need to prevent and cure communicable diseases versus the need for beneficial microbial exposure (Blaser, 2014).

In our fifth shift, urban design and architectural theory has begun to recognize the value of porosity and microbial life in domestic and public buildings over and against the modern trend towards architecture as a sterile, sealed and technologically controlled space. Architecture and urban design are the critical humans and, in particular, urban practices with which humanity has attempted to separate itself from the threats of filthy ‘outside’ nature. After all, the city has often been imagined, especially by urban sociologists, as devoid of any natural characteristics. Against the tradition, based on 19th-century principles of cleanliness

and domestic purity (hygiene) at the basis of the ‘bacteriological city’ (Gandy, 2006), probiotic architectural theory is now heading towards a profound tension with antibiotic architectural practice.

Finally, thinking in urban political ecology has shifted from looking at urban metabolisms in the context of the modern infrastructural ideal (hygienic cities, bacteriological cities, etc.) to the acknowledgment, as Mary Lawhon and colleagues have written, that a more ‘modest imaginary’ may be necessary, an imaginary that accounts for more heterogeneous technologies that deal with waste in ways that are more ‘attuned to and in relation with its immediate surroundings’ (2023: 1). Critical urban theorists have worked to deconstruct the political work done by the social construction of filth and have developed more affirmative models of urban hospitality premised on living with social difference. Urban anthropologists have described how marginalized populations cope with precarious environmental and material living conditions through various everyday practices of cohabitation with the ‘filth’ generated by lack of water, infrastructure, or economic resources (Boudreau, 2017; McFarlane, 2021; Simone and Pieterse, 2018).

In this review and perspective, we explore how these connected developments demand a fundamental reappraisal of the character and the politics of filth. We elaborate on these shifting perceptions of filth in both science and society, to trace the historical coproduction of microbiology and urban theory, and to explore their theoretical and practical implications. On the basis of a joint discussion at a workshop on filth, urban futures and the human microbiome held in London in January 2025, we propose here a new research agenda, which responds to this critical moment in conceptualizing filth. In this context, it is clear that an ambitious research agenda on filth in the city needs to be radically interdisciplinary, and will include not only urbanists, anthropologists, biologists, architects, and political scientists, but also psychologists, artists, philosophers, and humanists. Seeking to engage these diverse fields, we identify six key research questions to guide an interrogation of this new chapter in the storied history of filth and the city.

The urban political ecology of filth

In this section, we provide a chronology of the shifting material and semiotic relationships with filth in science and society, as they have been mapped, theorized and critiqued by different academic fields. We divide this loosely into three parts, before reflecting on the persistent uneven geographies of contemporary sanitation.

Filth before microbiology

Social and natural scientists have long been concerned with the co-evolutionary relationships between people and microbes and how these shape perceptions and practices of hygiene – both individual and collective. Evolutionary psychologists hypothesize about the individual selection advantages associated with an evolved sense of disgust towards the risks of dangerous microbes (Curtis, 2013), as well as the benefits that would accrue to social groups from xenophobic behaviours that provide protection against infection by outsiders (Thornhill and Fincher, 2014). The interlocking issues of scale and contingency are here intensely pertinent: every community teaches its children what to avoid, utilizing the language of dirt, filth, and exclusion; evolutionary psychologists universalize such strategies as a necessary self-defence and argue that disgust is thus an evolutionary beneficial affect; yet it is also clear that at least some forms of disgust are not merely local but learned acts of social prejudice and self-interested aggrandizement. From a contrasting perspective, immunologists trace the microbial character and legacies of humans’ origins as hunter-gatherers, identifying a subset of beneficial ‘old friend’ (Rook, 2009) microbes with whom our species co-evolved, whose presence is expected by elements of the human immune and metabolic systems, and whose social and intergenerational transmission would have been inadvertently encouraged.

Work focusing on later historical periods tracks the microbial shifts associated with widespread changes in human societies during the Neolithic period. Global History has speculated about the microbial consequences of the rise of agriculture, the domestication of animals, and their impacts on human diets. Such consequences follow the emergence of sedentary settlement formations with higher densities of people and their waste. These scholars explore how the ‘evolutionary adapted microbiome’ (Rook et al., 2017) of the hunter-gatherer was radically reconfigured by such transitions, which were accelerated by subsequent rounds of urbanization. They note how towns and cities promoted the growth of ‘crowd infections’ (like typhoid) that flourished in dense urban populations with poor sanitation. They explore (sometimes in a rather deterministic fashion) how accelerated human mobilities associated with the space-time compression of colonialism and globalization help fuel the circulation of infectious diseases with disastrous consequences for immunologically naive populations in colonized worlds (the ‘germs’ of *Guns, Germs and Steel* (Diamond, 1998) to take only the most successful popular account of such history).

Microbiology and the rise of antibiotic urbanism

Historians of modern science and the practice of public health have explored the profound impacts of the rise of microbiology on understanding of disease, perceptions of filth, and on the invention and proliferation of new modes of managing microbial life – especially in cities. The germ theory of disease premised on Koch’s postulates in 1884, indexed a range of pathologies to the presence and abundance of a small number of microbes. This theorization drew on the late 19th-century laboratory-led revelations of microbial causation performed by scientists such as Louis Pasteur and on the earlier innovations in spatial epidemiology produced by scholars such as John Snow. This set of tested and contested theories gradually helped medical practitioners map and identify the urban ecologies of diseases, including, most notably, cholera, anthrax and smallpox. This work traces the co-production of modern microbiological knowledge and modes of urban governance – focusing on the achievements of such influential figures as Pasteur and his allies (Latour, 1988). The political power of microbiology was expressed in visions of the sanitary or ‘bacteriological’ (Gandy, 2006) city – in both the metropole and the colony – whose quality was premised on the absence of microbes (Barnes, 2006).

This conceptualization of microbes as filthy and pathological underpinned dramatic investments and innovations in urban infrastructure – including treated water, public paths, flush toilets and sewerage systems. It also shaped powerful modes of microbiopolitics (Paxson, 2008) – approaches to governing individual subjects and urban populations guided by the logics of microbiology. Historians have traced how the classification of filthy microbes intersected with and amplified classed and racialized categorizations of social difference – in which filth was tied to the abhorrent practices (including housing densities), morals (the idea of ‘promiscuity’) and biologies of marginalized groups. For Warwick Anderson (1995), this racialized model of Pasteurian microbiopolitics was expressed most forcefully in the ‘excremental colonialism’ practiced by colonial health authorities. Here violent modes of governance were directed at defecation and associated regimes for bodily hygiene and waste management.

For the longest time, cities were considered dirty, filthy and unhealthy. Only in the 20th century, the hygienic city appears to turn things on its head and urban life seems to be premised on the assumption that humanity can move away from filth. The city appears to be healthier than the countryside, by virtue of its technology and infrastructure: the *clean* lines of modernism. In 1961, Jane Jacobs predicted in her classic *The Death and Life of Great American Cities* that ‘[c]ities were once the most helpless and devastated victims of disease, but they became great disease conquerors’ (1961: 1). At what cost? The pandemic of COVID-19 demanded a re-vision of the city where the urban population’s density, contact, and mixing became a contributing factor to disease and, as a criterion of recovery, also the source of most intense anxiety (Connolly, 2024).

With the modern city comes a capitalist economy and the administrative state. In both instances, the work and labour attached to dealing with sanitation takes a central place (De Coss Corzo, 2021, 2022; McFarlane, 2023). Indeed, it appears that the entire apparatus of the local state is to facilitate or provide public works, and, eventually, Public Health as *the public work par excellence* is put in place to deal with filth, in one way or another. Dealing with filth biopolitically presupposes the modern state to create measures that are at once specific and universal. This means that specific mechanisms of biopolitics at the local state level are concerned with filth, and often entail the devolution of responsibilities from the central or provincial states (Gümüş-İspir and Dhenin, 2023). As part of these responsibilities, water and wastewater are industrialized and mobilized as the main media for regulating filth. Another prominent example is the control of overcrowded and insalubre housing both through urban planning and social work. At the city level, then, filth becomes the first target of sustained and systematic intervention by the state: sewage pipes in Paris; *Rieselfelder* in Berlin, and the cleaning of the Thames in London, among many other examples.

When the ‘société bureaucratique de consommation dirigée’ (bureaucratic society of organized consumption) (Lefebvre, 1996) took hold in the industrialized global North in the 20th century, when ‘collective consumption’ was considered the organizing principle of the urban (Castells, 1969), much of its work was based upon conquering filth. In the past, as now, this conquest included the control of animals – dogs and birds (Gümüş-İspir and Dhenin, 2023; Thrift, 2021) – and the regulation of sexualities that were considered outside the heterosexual, marital norm. We might argue that turning cities into controlled ‘laboratories’ of social and industrial (re)productivity instead of wild (filthy) natures is one of the purposes of urban politics (that certain forms of ‘rewilding’ saw an upswing during the COVID-19 pandemic is a contingent and minor reversal of such a broad trend (see Ali et al., 2022).

Politically, filth is always articulated with and by other concerns and issues. So, immigration is an iconic site for the rhetoric of filth and the consequent exercise of violent control; working-class neighbourhoods are always an easy and ideologically motivated target of the rhetoric of filth and its (mal)practices of cleansing. This type of action to deal with filth and the humans allegedly attached to its existence is the very core of the rationale that keeps modern cities going: ‘Exemplifying the city as a site of experimentation, scientists often turned to the neighbourhoods of the urban poor and those in colonized territories to conduct experiments as they sought treatments or cures for diseases’ (Gümüş-İspir and Dhenin, 2023). The eradication of filth in some places is connected to the production of political economies of filth elsewhere. Matter out of place has to go somewhere.

As much as the biopolitical agenda of the state includes ‘citylife’ (McFarlane, 2023), it also contains a range of ‘necropolitics’, viewing dead bodies as a threat and matter of scientific advancement (Wilson, 2025). The space and politics of cemeteries are an area of concern, as are the segregationist neo-Haussmannian necropolitics of dispersal and displacement (Ortega, 2020). For example, the contested regulation of burial practices as a politics of Ebola containment in West Africa (Treffers et al., 2022). Necropolitics is intimately connected with circulation within the city: much as Ebola required new practices of transport for bodies as carriers of the filth of disease, part of Sierra Leone’s complex politics of road use (Lipton, 2024), so, at a different scale and longevity, Victorian London city-planning moved cemeteries from the centre of the city to the outskirts in order to build roads and railways that more purposively connected and divided the city into different districts, financially and socially: filth goes hand in hand with demands for progress, technological and social. Modernity’s progress – and with it a despised backwardness of others or our own past – is proclaimed through the stern criterion of decreased filth, and increased cleanliness. To rethink filth requires a rethinking of the temporality of modernity as the teleologically determined and self-aggrandizing narrative of progress or modernization.

For our purposes, in thinking about a politics of scale between the (microbiomes in) the body, the urban built environment (Bosch et al., 2024), and global exchanges of pathogens, the dynamic relation between people and ‘stuff’ is of prime relevance. Since Haussmann’s rebuilding of Paris in the 19th century, most

urban planning had some aspect of ‘cleaning’ or ‘cleansing’ attached to it. This charged language is a constant, despite the changing theories by which such cleaning or cleansing was informed: miasma to germs. Disgust is the main *political* motivator. (And who would argue with that given the enormous success of the hygienic campaigns of the urban 20th century?) Medical success in the control of pathogens – which has been spectacular – cannot be allowed to veil the unintended consequences or failures of such treatments. But also and more importantly, the continuing dirty story of the politics of filth relies on the illusion that science and technology are neutral. An illusion supported by an increasingly complex social dynamic where the affect of disgust and its ideological underpinnings inform and disrupt the equations of planning.

The microbiome and probiotic urbanism

While concerns remain about the control of emerging infectious diseases in an ever more interconnected urban world (Gandy, 2022), more recent work in microbiology has begun to question this pathological conception of microbes as universally filthy, and the forms of microbiopolitics to which it gives rise. Microbiologists have revealed and begun to analyse the human microbiome – the invisible life in, on, and around the human body (Yong, 2016) – that performs a range of salutary functions. They suggest that one of the outcomes of urbanization, along with modern healthcare and sanitation, has been the loss of ‘old friend’ microbes, and propose that this loss is partly behind a commensurate rise in autoimmune, allergic and inflammatory disease (Blaser and Falkow, 2009). They propose that microbial absence can lead to dysbiosis, a pathological effect as dangerous as excessive microbial presence. Archetypal modern innovations like water treatment, and diminished contact with soil and animals, alongside the proliferation of antimicrobial chemicals, have prevented the transmission of beneficial microbes.

In response, these students of the human microbiome have appealed for ‘post-Pasteurian’ (Paxson, 2008) approaches designed to secure the desired microbial exposure, while still minimizing epidemics of pathological crowd infections. They suggest that healthcare needs to be rethought specifically as the lifecourse choreography of microbial exposure on an individual and collective scale. This rethinking will necessitate new forms of microbial surveillance, less tied to the presence and absence of specific microbes and more to the ecological interactions and functions of microbes within and beyond human bodies and in specific types of spaces. Advocates suggest that this should inform a recalibration of modern antibiotic approaches to managing microbial life, and a commensurate reappraisal of the materiality of filth to distinguish salutary old friend microbes and their modes of transmission, from the pathological microbes and the practices and configurations that drive their emergence and proliferation in modern urban disease ecologies.

This new paradigm of microbiology is beginning to shape a probiotic turn in urban governance. Prominent examples include the emerging field of probiotic architecture and urban design (Beckett, 2023; Bosch et al., 2024). This transition includes an interest in new materials that foster beneficial microbes, and alternative means for ensuring the circulation of air to enable exposure to beneficial environmental microbes – especially in institutional settings like schools and hospitals. It extends to large-scale schemes to inoculate cities with beneficial microbes (Gilbert and Hartmann, 2024) or to factor beneficial soil-associated microbes into considerations of urban ecological restoration (Mills et al., 2017), as part of a wider shift in urban governance that seeks to harness the mental health benefits of urban greenspace. Beneficial microbes are also prominent in ecomodernist visions of urban futures sustained by precision fermentation and cellular agriculture and supported by ‘nature-based’ solutions for both bioremediation and waste management.

These tools exercise what Foucault describes as an environmental mode of biopower whose object target is the circulation of materials within the urban milieu (Lemke, 2021). They are enabled by microbiopolitics which is geared towards making probiotic subjects. High-profile public microbiologists exhort citizens – especially parents – that ‘dirt is good’ (Gilbert and Knight, 2017) and encourage a greater tolerance of

filth in recreational, dietary and personal-hygiene practices. They caution against the ubiquity of antimicrobial chemicals and warn of the harm these can do. In seeking to commercialize their science, they advocate for personalized medicine and dietary advice informed by individual microbiome data. They promote proprietary probiotics as dietary supplements, as well as probiotic hygiene and beauty products. Sociological analysis of the consumers of such products in urban Denmark, note a profound reconfiguration of Mary Douglas' conception of dirt as matter out of place, suggesting that in this context it is *sterility* that is pathologized (especially when it is chemically enabled) and dirt that is celebrated (Ditlevsen and Andersen, 2021).

Such probiotic approaches are enabled and guided by new forms of urban microbiome surveillance – especially of wastewater (Arefin and Prouse, 2024). During the COVID-19 pandemic, national governments invested heavily in the surveillance of viruses, bacteria and drug residues – to inform pandemic management strategies. These enabled high-resolution and localized mapping of disease hotspots, transmission pathways and areas of non-compliance. Such biosurveillance infrastructures are now being repurposed to provide aggregate microbiome metrics of population health, in which functional and ecological understandings of microbiome-associated diseases are read out of discarded filth (Anderson, 2024).

The uneven geographies of urban sanitation

If we reflect on cities and sanitation, the following, insistent question will arise: How can cities ever have existed without responding to the need for sanitation? The issue of how to deal with human waste in cities has 'naturally' existed from the beginning of urban life. As Ailton Krenak puts it within his own polemics, 'to sanitize is to urbanize, to urbanize is to sanitize' (2024: 34). So, we might well ask, politically, developmentally, sardonically: Why, if the city has often been cited as the birthplace of higher human accomplishments, such as democracy, has a need as basic as sanitation not been resolved earlier? Or was it resolved in ways we don't recognize given today's (receding and controversial) standards of the modern infrastructural ideal?

Is filth by definition political? '*Anthropos physei ... estin zoon politikon*', Aristotle famously said, which we can translate as 'Humanity, by nature, is a creature of urban political ecology'. Could we sharpen the question: are humans political beings partly because they rise 'socially' above the risk of 'biological' beings exposed to 'natural' filth? Can filth be the ultimate challenge of/to collective action (as supposed by Weldon et al., 2024 in a recent paper regarding AMR)? We might immediately register an important caveat: Beck's (1992) risk-society thesis reminds us that every solution fashioned by modernist interventions and collective action has produced more, and sometimes more pernicious problems.

The question remains, especially as we now know much more than in the past about the relationships of water and sanitation with health, wellbeing, disease and accompanying inequalities in access and provision, whether sanitation does not remain perhaps the most important problem humanity faces in cities? What, then, is the *politics* of sanitation? How do we regulate it *politically*? Govern it. Politicize it. Make it manageable. And in the process, thereby create a just and sustainable city? And what happens if we broaden the view from the 'classical' municipal services around water and waste to a more systemic view of urban political ecologies to include local institutional settings such as hospitals (think of the growing threat of AMR) on one hand and planetary relationalities on the other (Aguiar et al., 2024; Brenner and Ghosh, 2022)?

Urban Political Ecology acknowledges the centrality of the concept of metabolism to this type of thinking (Keil, 2005; Newell and Cousins, 2015). It is a concept with productive significance in and between the social and natural/medical sciences. It may prove a bridging concept as we move forward with this agenda (despite extant conceptual incompatibilities and misunderstandings in the use of it) (Barua, 2024, 2025). Metabolism is, together with another set of controversial and perhaps intractable terms, central to our proposed effort. We have in mind here the related terms of risk, threat, emergency and crisis, that inevitably inform the core of the politics of filth, and stain it.

Nascent critical analysis reveals a distinctly patchy geography to this probiotic turn and its reappraisal of filth (Lorimer, 2020). Comprehensive urban microbial knowledge and control is only available in select parts of select cities, concentrated in the WEIRD world. Personalized microbiome therapeutics are consumed by the worried well. The majority of urban citizens remain at risk from microbial pathogens, while an expanding population suffers from the doubled dysbiosis of *both* absent beneficial microbes *and* exposure to long-standing and novel crowd infections – such as type-two diabetics affected by new forms of drug-resistant tuberculosis. A different strand of critical work traces the persistence of racialized imaginaries of filth into probiotic microbiology, expressed in the celebration of the primitive microbiome as the desired source for projects for microbiome recolonization. Science studies scholars Matthew Wolf-Meyer (2024) and Amber Benezra (2020) have thus critiqued the exoticisation of contemporary hunter gatherers – the Hadza or the Yanomami, for example – who figure as timeless custodians of ‘our’ ancestral microbial heritage, and whose filth will provide the vital elixir to cure the diseases of modern urban affluence.

In summary, shifting paradigms of microbiology have produced radically different conceptions of microbial filth, which have informed diverse approaches to urban design and urban governance. New insights from microbiome science raise a series of far-reaching questions about the Pasteurian microbiopolitics that have shaped urban design and offer rich grounds for (un)making the urban otherwise. However, the reach of these innovations remains patchy and there is a risk that this new paradigm reaffirms 19th-century biopolitics and associated uneven urbanization in a new techno-managerial guise. In the final section, we draw out some of the most salient research questions that emerge from this preliminary review.

An agenda for research on filth in the city

New work in microbiology and social theory shows that we can no longer assume that filth can be contained as waste and dirt, something rational planners could channel somewhere else; something biologists and medical doctors could understand, control and medicate. Instead, filth is to be conceived as *excess*, something uncontainable. And excess is something we can understand sensuously even more than cognitively. Excess is related to both disgust and desire. The excessiveness of filth makes it a force of action, something we react to from the body to the state, from the medical lab to the city as a laboratory. These (re)actions are deeply political, socially learned, and culturally differentiated.

As such, a research agenda on filth needs to attend closely to geographical specificity, spatial relations and historical legacies. In some cities, generally those considered dirty, chaotic, disordered, undeveloped, poor, third-world, southern (and other such terms), there is a certain level of acceptance and accommodation of excess and uncertainty – or, better, a necessary improvisation in negotiating urban disruptions and difficulties (Boudreau, 2022; Simone, 2019). In other cities, it is the excess of sanitation and order that is being contested through various forms of new ecological and microbial practices. These most general of images (stereotypes even) are here to emphasize that there is no secure place from which to contemplate filth: on the one hand, it is not possible to live an urban life without disgust, without a perception of filth, without the self-definitions that dirt indexes; on the other, there is no universal norm of filthiness: different cities ground different sensoriums of cleanliness and filth, different practices of avoidance and engagement with dirt. Filth is seen from somewhere. To reconceptualize filth, that is, demands self-awareness – just as disgust is the least cognitive of affects. This tension, between the sensation of filth and its intellectualization of it, seems endemic to its political contestation and purchase.

Future research on filth requires radical models of interdisciplinarity. Understanding how filth operates to connect the body with the city, we need to recognize the multisensoriality of knowledge, and work with anthropologists who study belief systems, the use of humour, irony, and ‘magical’ religious stories; we need to pursue scientific advances in our understanding of the microbiome and health; encourage artistic ventures in the aesthetic of filth and their capacity to intervene on registers of disgust and desire; invite

architects and planners to rethink toilets, kitchen, and waste disposal; listen to sociologists who can explain political gestures of provocation and transgression, feminists and anti-racist activists who will remind us of the gendering and racialization of filth; we need to ally with sexologists, social psychologists and psychoanalysts who will describe boundaries of belonging and the biopolitical control of sexuality, political scientists who will compare public health policies across time and in various cities, historians and philosophers who can trace the trajectory of filth and the city in order to shed light on the peculiarity of progressive modernism as a historical parenthesis, and so on.

We propose the following research agenda, starting with the language of filth, moving through the development of modern planning and architecture, global metabolic circulation and colonialism, the contours of public health policies, the relationship between ecological movements and the microbiome, and finally, culturally analysing provocations and transgressions that may teach us how to relate differently to filth in cities. Here, then, are the six research questions of this agenda.

1. The study of filth cannot escape the rhetoric of filth. It is easy to recognize that the language of filth is denigrating, inherently moralizing, and instrumental. Yet each distinction of terminology – dirt, trash, rubbish, refuse, waste – brings its own ideology and history of usage. Waste, as we have indicated, as part of the language of sanitation, has become the technical term in the governmental language of planning, but far from being a neutral term, remains deeply implicated in the logics of urban efficiency and excess, as well as biology and cleanliness. Just as urban violence has been motivated by the rhetorical aggression of the language of filth and its opposites, so too the misrecognition – or concealment – of the ideological and physical infrastructures of ‘disposal’ plays a role in maintaining the urban structure in its status quo. **What, then, is the history of the discourse of filth and to what extent is this discourse constant across time and space?**
2. The bacteriological revolution of the 1850s–1880s produced a European and then global commitment to the understanding of the cause of disease with a consequent commitment to cleanliness as a social, moral and political injunction. The scientific discoveries of figures such as Pasteur, Koch and Snow, linked the disease to the presence of specific germs, and indexed health (and wider ideas of progress) to microbial absence. The different pressures of vaccination, exclusion through quarantine, and the technological and political removal of what is defined as dirt/filth from the urban, become institutionalized in the material fabric of the city and in its social order. Architecture aimed at the restriction of dirt; society aimed to remove the filthy from its acceptable order; the urban was judged by its ability to control and regulate the presence of filth. Filth becomes integral to the history of the city as modern, to its own complicit narratives of modernization. Filth becomes a key term in defining space. Filth demands technological and political responses. **How, then, is the rhetoric and recognition of filth integral to the definition of the urban – its materiality, on the one hand, its sociality, on the other?**
3. The relation between cleanliness and filth (and its associated discourses) has repeatedly been mobilized to explain, justify and materially govern the relation between the metropole and imperial expansion. The self-interested assertion of the filthiness of foreigners (and thus their lower level of civilization and exclusion from the fullness of modernity) has led to experiments (e.g. quarantine islands (Bashford, 2016)), practices of violent control, and imposition of urban structures. The global reach of empire is experienced in the circulation of food, other products of consumption, and in the spatial and temporal imaginaries of the dominant and dominated, the comparative dynamics of international recognition. The globalizing city is defined by its construction within systems of circulation – for which the language of metabolism has become an instructive expression. This results in immense spatial variations in the human-microbial relations associated with the reappraisal of the salutary risks and potential of filth. Acknowledging persistent stark disparities in access to the

infrastructure of sanitation, the continued unequal impacts of both infectious and microbiome-associated non-communicable disease, and the rarified character of the locations in which it is possible to 'let them eat dirt', is crucial to assess the (geo)politics of filth. **How does filth help structure the metabolism of the city, its structures of circulation, its function as a global form? How does filth reproduce colonial relations?**

4. The (re)discovery and exploration of the microbiome is starting to change the understanding of the history, materiality and instrumentality of filth. This science revisits earlier chapters in the history of microbiology, which offered a more ecological and nuanced conception of the relationships between microbes and health (e.g. in the writings of the Russian biologist Ilya Ilyich Mechnikov 1845–1916). Microbiome research suggests that most microbes are harmless, and that beneficial microbes help deliver key bodily functions including metabolism, immunity and cognition. What was once considered dirt and, specifically, the cause of disease, and consequently as something to be excluded and regulated, has now been recognized as essential to human well-being. Such scientific advances have consequences at multiple levels. What behaviour is enjoined by the recognition of the necessity and value of the human microbiome? How is the very notion of health (hygiene, sanitation and cleanliness) recalibrated by the recognition of the human microbiome? **How do understandings of the urban, of health and of hospitality change when the human is refigured as a holobiont: a porous ecology vulnerable to microbial presence and absence (DeLanda, 2021)?**
5. In recent years, we have seen a double political movement bringing together urban politics with advances in our knowledge of the microbiome. On the one hand, approaches to urban infrastructure have moved from a universalist ideal (one – networked – solution fits all) to variegated forms of sanitation such as the proliferation of smart toilets, fecal microbiological transplantation, or the monitoring of collective wastewater. On the other hand, ecological urban movements have transformed cities through various greening initiatives ranging from composting to porous architecture. What is the potential of existing probiotic approaches to planning and architecture? How do they interface with current and historic practices of urban greening/the garden city? What political tools and strategies might be required to build new forms of microbial citizenship that reflect new approaches to microbiology? If disgust, the affect of filth, is non-cognitive, what are the possibilities or barriers to any such transformation? **In short, how does the discovery of the human microbiome recalibrate the rhetoric, practices and institutions of filth? Does it demand new conceptions of development, progress and modernity itself?**
6. To constitute something as filth is to act in the world and to establish also a demand for response. Filth makes us act, it makes identity and it makes space – it is inherent to our experience of the urban, our comprehension of the urban, how the urban is inhabited, regulated and felt. Filth is where boundaries are policed and transgressed. Filth is where the urban is contested. Filth, then, is a fundamental vector of self-expression as well as of the denigration of the excluded. Yet – therefore – filth cannot be approached except from a situated position, from a located perspective of the self. To analyse the rhetoric and concept of filth, then, is a paradigm of a self-implicating project. As Derrida might have said, 'il n'y pas d'hors-ordure' (there is no outside of filth). **Can the rethinking of filth avoid rehearsing the complicities of past (re)thinkings of filth?**

Conclusions


These six research questions are individually pressing, but the most compelling problem is to trace the interactions between them. This interconnectivity of argument will require exploring the space between science and society (i.e. the dynamic disruptions of the social process by technology, and the interference from social forces on the development of technology or scientific knowledge); between affect and civic policy (i.e. the mutual implication and misrecognitions between divisive emotional feelings and the calculations

of planning); between infrastructure and its unintended consequences (i.e. the inequalities or foreclosures that the establishment of infrastructure creates, and the emergencies and contingencies for which infrastructure turns out to have been not prepared). Such research also will require a heightened attention to the temporality of urban living, both at the microscale of how sanitation systems, and their lack, articulate daily life for the inhabitants of cities (McFarlane, 2023), and also at the larger scale of the long history of management of waste, and the narratives of progress and modernization in which the self-representation of the city is fabricated. And through all of this, the self-consciousness that the conceptualization of filth produces – how filth reveals who we are – remains a grounding principle, both of the experience or phenomenology of filth, and of its interpretation. For these reasons, we suggest, that rethinking filth in the city has now become an insistent research topic for urban political ecology.

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