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This isn't functioning! Challenging paradigms of functional efficiency in the context of automobile arrangements

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Abstract

Mobility patterns play a crucial role in the context of contemporary eco-crises. Within the context of critical psychologies of the everyday this paper addresses the role that automobile arrangements play in cementing imperial modes of living in the Global north. Departing from conceptual discussions as well as with regard to empirical data from a recent research project, we discuss how appeals to functional efficiency operate in legitimizing the status quo of car-dependent lifestyles. We draw from the work of Gilbert Simondon to develop a conceptual framework that enables re-problematizing self-enclosed patterns of functioning. An understanding of technical objects as relational becoming that require mediation by agents within techno-geographical milieus extending beyond anthropocentric utilities and concerns is developed and exemplified with reference to empirical findings.

Keywords: affective milieu, technology, imperial mode of living, automobile arrangement, car dependence

Introduction: everyday life and the car-dependence of late capitalist societies

As the consequences of anthropogenic transformations of global eco-systems become ever more visible (Richardson et al., 2023), it is clear that past and current social, political and economic efforts to mitigate the destruction of a bio-sphere capable of sustaining human (and many forms

of animal and plant) life fall pitifully short of making the necessary impact (IPCC, 2024). We also know that responsibility for the eco-crises of our planet is distributed unequally with the wealthiest economies – and those striving in these economies – causing a disproportionately large share of the overall devastation (Alestig et al., 2024; Carbon Majors Database, 2024; Chancel et al., 2024). While extractivist, profit-driven economic practices of trans-national corporations as well as short-sighted or outright negligent political leadership need to be placed centre in collective efforts to bring about the change we need, it is also clear that hegemonic modes of living fostered in (but not exclusive to) the global North contribute to ecological crises for several reasons. First, political prioritizing of capitalist capital accumulation through resource depletion is legitimized by the resigned consent and often active support of large parts of the population. Second, extractivist global economy thrives on everyday modes of living founded on unsustainable habits and patterns of consumption that constitute a considerable market for the mass production of goods and services that fuel resource depletion, CO₂ emissions, and more. Third, people spend a significant part of their everyday life at work thus actively contributing to the current economic system through integration in the labour regime (Schaupp, 2024). Efforts to change the hegemonic political-economic regimes of production and consumption need to take into account both, global economic and political structures as well as modes of living that perpetuate and legitimize the status quo. However, the point concerning labour relations also makes it clear that a critique of everyday modes of living, consuming, working, etc. cannot resort to just blaming individuals for making ‘faulty’ decisions (Schmidt et al., 2020). Rather, it has to start by acknowledging different forms of dependence and vulnerability such as the fact that most ‘ordinary’ people simply cannot choose freely to quit on profit-oriented production regimes under conditions of wage dependence (Uzzell & Räthzel, 2012). In that regard, critical psychologies of everyday modes of living (Schraube & Højholt, 2016) contribute to a broader defined critical project by looking specifically at the entanglement between everyday structures of perception, feeling, thought and action with political-economic processes, structural and intersectional positionings and relations of power in society (Adams, 2020; Ergas et al., 2021). In this context, auto-mobility plays a crucial role. Passenger cars are one of the main sources of CO₂ emissions in the EU constituting a major source of environmental pollution. Despite a generally growing eco-awareness passenger car related emissions have actually increased by 5.8% between 2000 and 2019 (EEA, 2022). So far, a substantial “modal shift” (EEA, 2022, p. 5) from carbon-intensive auto-mobility to more eco-friendly alternatives has not taken place which raises the question, what makes auto-mobility such an inescapable aspect of everyday modes of living? Looking for explanations for the continuing dominance of auto-mobility, scholars have focussed on the structural and historical dimensions of auto-mobility and the ways in which the car as epicentre of efficient transportation shapes the planning and development of infrastructures, cultures of mobility, as well as economic, political and judicial frameworks. Globally, auto-mobility accounts for a large chunk of individual mobility. Focussing only on urban commutes, over 50% of the total commutes are car-based (Prieto-Curiel & Ospina, 2024, p. 4). Car dependence (Jeekel, 2016; Mattioli et al., 2020; Zhang et al., 2017) is a particular issue in the global North, with over 90% car share in northern America and up to 75% (although with considerable regional variance) in Europe (Prieto-Curiel & Ospina, 2024, p. 4-5). While these numbers show the extent of car dependence, it has to be emphasized that car use – same as most other forms of ecologically problematic practices – is distributed unequally, both, on a global scale but also among different segments of the population in the global North (Chancel,

Bothe & Voituriez, 2023; Maharjan, Janatabadi & Ermagun, 2024). Again, the wealthiest groups and individuals shoulder disproportionately more responsibility for environmental damage caused by excessive car-use. Because of these massive inequalities research has to acknowledge the connections between car-dependence and practices of socio-economic inclusion/exclusion (Jeekel, 2014; Maynard et al., 2010).

Beyond the infrastructural, economic and political dimensions recent contributions point out that car-dependence has a cultural and psychological dimension (Goessling, 2017; Mattioli et al., 2020) as well and that it is the interconnectedness between material and cultural-symbolic as well as affective features that cements the car's status as paradigmatic mode of mobility even among those who contribute relatively little in terms of actual car use. Previous research on car dependence and its cultural, political and economic underpinnings has focused on the historical emergence of the car as dominant paradigm of mobility and its significance in the context of industrial capitalism and mass culture (Berger, 2001, Urry, 2006). In Northern America, the automobile industry has been considered the epitome of economic progress since the days of Ford's assembly lines. For Germany (and Austria), the car's rise to prominence is inextricably linked not only to the innovative technological advancements associated with industrial capitalism of the late 19th and early 20th century, but also to Hitler's advocacy of the car (Afshar, 2024, Kunze, 2022, Sachs, 1992) as a (propagandistic) symbol of the German Reich's return to prosperity. The Nazi propaganda heavily focused on the promise to provide affordable automobility for all members of the German 'Volksgemeinschaft'. However, while the Nazis did invest in the Autobahn infrastructure (on the back of forced labourers, see Schaupp, 2024, p. 207), it was only in the post-war period of the so called German "Wirtschaftswunder" (economic wonder) from the 1950s onward that the car actually emerged as the dominant means of transportation (Kunze, 2022). The period from the 1950s to the mid-1970s (up to the oil crisis) is the period when the automobile became a cultural lynchpin and structural centre of economy (Urry, 2004). Thus, the car represents economic growth and prosperity and for many still serves as a symbol of personal independence and success. Recent social theoretical and empirical analyses of have also shown that hegemonic car cultures are deeply connected to (gendered) ideas of strength, domination and self-sustained power (Daggett, 2018, Kunze, 2022, Niederhauser, 2023, Urry, 2006) thus pointing out how the car's aesthetic and material properties are associated with cultural images, projections and norms. Through the cultural adoption of the car and flanked by political and economic decision making the auto-mobile permeated societies in a way that makes any attempt to transition into post-automobile, sustainable mobilities almost unthinkable (Mattioli et al., 2020).

It is this lack of an imaginative space of thinking otherwise that we address in this paper. Our points of vantage are conceptual as well as empirical. In conceptual terms, a number of scholars have provided theoretical tools that can help understand how structural affordances of contemporary spatial arrangements are shaped by multi-level processes moulding environments to the effect that car-based mobilities ultimately appear as 'naturally' superior to other forms of moving in and through space. We revisit this body of literature in section one showing how the naturalization of car-based mobility grounds in a specific notion of functional efficiency which is produced and reproduced within a complex, multi-faceted automobile arrangement (Schütze et al., 2022). Empirically, our perspective grounds in insight gained from a recently concluded research project that focused on mobility practices of young adults in the city of Vienna (Hametner et al., 2025). There we found that participants' ways of moving around the city ground in an unquestioned acceptance of the car as kind of a one-size-fits all solution to everyday challenges.

We provide a brief sketch of our research in section two. The main point of convergence between our empirical research and recent conceptual approaches lies in the fact that across both of these contexts, functional efficiency is imbued on the car as a quasi-natural property thereby blackboxing (Latour, 1987) the complex socio-economic process that makes this particular arrangement appear as functioning in the first place. Against the backdrop of this de-thematization of socio-political conditions of functionality, the main purpose of this paper is to explore theoretical perspectives that make it enable a psychosocial and political critique of functional efficiency – or, functioning as such. To this end we draw from Simondon’s writings on technicity in section three showing how a process theoretical and relational conceptualization of technical objects as becoming may inform critical psychosocial investigations of agents’ relation to technical reality.

Imperial modes of living and the automobile arrangement

In order to understand better the socio-cultural centrality of the car and to develop a critical perspective on auto-mobility as a political-economic, cultural and psychosocial phenomenon, a number of scholars have developed conceptual tools to describe the socio-material arrangements that cement the car’s status. One point of vantage – specifically within the German speaking debates – has been Brand & Wissen’s critique of what they refer to as an “imperial mode of living”, that is, a “broadly accepted and institutionally secured mode of living [...] deeply rooted in the everyday practices of people and safeguarded by the state” (Brand & Wissen, 2012, p. 549). According to them, everyday modes of living – including cultural norms and conventions, practical habits but also political-economic relations of power as well as military force – form a multi-level system of relations. Against the backdrop of this broader framework, Schütze et al. (2022) developed a pointed critique of the ‘automobile arrangement that characterizes everyday life in societies in the global North:

The automobile has established itself at the centre of an entire mechanistic network built around it, sustaining and reproducing itself. This network functions as an autopoietic system that only works because of its relationality: Material elements (such as the automobile infrastructure consisting of roads, parking lots, workshops, oil companies, and gas stations) and socio-cultural elements (such as automobile clubs and lobby groups, cultures of consumption and social status, perceptions of property and individuality, and the idea of a good life) are all reciprocally related in virtue of the car [...]. Together, these material, social, and discursive components make up a system of relations, which itself works like a well-oiled machine. The car is indispensable; it is the centre of a material as well as a symbolic universe (Schütze et al., 2022, p. 32)

The key point here is that the automobile arrangement sets in motion a relational dynamic that cuts across different levels of society integrating seemingly heterogeneous processes and structures to the effect that the car emerges as their common material-symbolic centre-piece. Importantly, once in place, the process and work necessary to align diverse forces within the automobile arrangement become all but invisible. Latour referred to this becoming invisible of the social production of technical functionality in terms of a ‘blackboxing’ (Latour, 1987). In Schütze et al.’s analysis multi-level systems of production, distribution and consumption function like a “well-oiled machine” supporting hegemonic modes of living, feeling, desiring and valuing.. In this sense, the

automobile arrangement reaches far beyond the material, institutional and economic properties of infrastructure, urban development and the automobile industry. It turns into an ‘affective milieu’ (Slaby, 2019; Schütze, 2021) which affords specific ways of perceiving, feeling, wanting, and acting. Thus, techno-industrial complexes constitute a ‘world of their own’ imbued with atmospheric, affective and evaluative properties that cannot be captured adequately by traditional notions of technological instrumentality. The term ‘affective milieu’ (Schütze, 2021) describes “a uniquely textured territory in the social universe where specific affect dynamics are at play” (Schütze et al., 2022, p. 35). Inhabitants of the automobile milieu typically experience its immanent structure of affordances as natural properties of a taken-for-granted environment. Schütze et al. exemplify the complex entanglement of environmental structure and modes of practical engagement as follows:

Cars require users to change their behaviour, attitudes, and expectations. The affect relations surrounding the automobile literally hold individuals captive – unknowingly and without force, by integrating them into their web. Owning an SUV will, for instance demand a frequent schedule of maintenance at the workshop, as the expensive and aesthetic character of the car wants to be sustained. This may be accompanied by the constant worry of whether the car will be stolen or damaged, producing a habit of finding just the right parking spot. However, not only are such habits and practices transformed, but the entire bodily awareness of the driver is adapted to the car. The SUV facilitates a certain driving style and affords a unique bodily feeling – quick acceleration and high speed while being comfortably cushioned from the road. In that sense, the driver’s affective repertoire is shaped by the car [...]” (Schütze, et al., 2022, p. 33).

The vivid description of the SUV-owner’s attunement to their vehicle (and to the world through it) shows the extent to which pre-reflexive sensibilities, desires and needs, feelings and bodily attunement are integrated by techno-environmental arrangements. The related concept of affective milieu (Schütze, 2021) emphasizes how automobile arrangements technological functioning, socio-cultural and environmental affordances as well as actor-centred concerns, evaluations, desires and feelings are relationally co-constitutive of a specific mode of living that affords the car as it’s functional centrepiece. At the same time, it is this very notion of functionality which veils the political, cultural and economic systems of production and reproduction that are necessary to hold the automobile arrangement in place.

Vienna’s mobility climate and the paradigm of functionalist efficiency

The conceptual framework laid out in the last section informed a recently concluded empirical research project in which we attempted to shed light on the habitual underpinnings of mobility practices of young adults living in the city of Vienna (Hametner et al., 2025). For the Austrian context, both the overall level of car-dependence as well as the unequal distribution of car-centred mobility are comparable to the international situation (Statistik Austria, 2019, p. 50-56) although Vienna has to be considered an exception in regards to a relatively high acceptance and equally high quality of its public transport systems. Against the backdrop of this bigger picture, our project – which was funded by the city of Vienna – looked into young adults’ everyday experiences and habits of moving in and around the city. We conducted group discussions with Viennese citizens

aged 18 to 30 aiming for a balanced representation of socio-economic status as well as self-identification as generally disposed positively or negatively toward the idea of taking intensified action regarding ecological transition. We contacted potential research participants through different channels, including flyers, personal communication and social media. Overall, the data base consists of ten group discussions with participation varying between three and five discussants. The discussions involved a first part in which we asked participants to engage in an open exchange about their habitual ways of moving in and around the city focussing on anecdotes, examples and reflections of basic needs, desires and concerns relating to mobility. In the second part of the conversations, we confronted participants with a number of potential mobility-related legal measures targeting different forms of non-sustainable mobility and relying on different forms of sanctioning (inflation, bans, and allocation of quota). For a detailed presentation of our findings, see Hametner et al. (2025). Here, we focus solely on how participants employed notions of functional efficiency. When analysing narratives that centred on auto-mobility as default means of moving in and around the city, we gained three key insights:

- (1) While participants' habitualized mobilities were shaped by different practical concerns such as personal safety, time management, convenience and avoiding social exposure, participants relied on auto-mobility as kind of a catchall answer to the heterogeneous challenges of everyday life. This was the case even though participants showed awareness of the ecological costs of car-use and despite feeling considerable normative pressure to act ecologically responsible. Most strikingly, participants stuck to the car even when stated concerns could be met by (more) sustainable alternatives. For instance, the desire to travel safely would imply an argument for public transportation, which is – statistically – by far the safest way of commuting in Vienna. Still, participants linked safety primarily with the interior of their car.
- (2) When asked to explicate mobility choices participants that privilege auto-mobility rarely brought up symbolic or positively affective meanings of the car. While this may in part be due to our focus on the practical dimension of moving in and around the city, it constitutes a noticeable difference from the body of literature stating that the car is defined primarily by its value as a symbolic and cultural icon (e.g. Daggett, 2018; Kunze, 2022; Niederhauser, 2023). In the shared accounts of the groups, the car typically figured as *simply functional*, that is, as unquestionable ultima ratio of efficient transportation. Interestingly, references to the car's functionality often lacked affective markers of enjoyment or satisfaction. Rather, functionality was framed in terms of a resigned acceptance of realities.
- (3) When grappling with normative expectations to adopt more sustainable modes of living, the discussants employed the notion of functional efficiency in a way that allowed them to de-thematise mobility's ecologic costs. Even though they openly engaged in discussions about the necessity to 'do more for the climate', they exempted car-use from such considerations. Importantly, functionality in such accounts was not framed in terms of a specific positive value-property of the car but rather as co-constitutive with the seamless functioning of everyday life as such. In this way, the car seemed inseparably linked to the taken-for-granted mode of living one's life successfully regardless of what notions of success entailed specifically.

We came to refer to this unquestioned acceptance of auto-mobile realities as an everyday paradigm of *functional efficiency*, which normalizes and legitimizes car-based mobilities in a way that makes it possible to sidestep normative pressure to look for alternatives. Such alternatives –morally laudable as they might be –appear as simply dysfunctional. This echoes Schütze and colleagues’ (2022) characterization of automobile arrangements’ working like a well-oiled machine. Since our group discussions did not provide data that would allow us to look deeper into the experiential grounding of this paradigm, we started looking at the notion of the car’s multi-purpose practical functionality from a theoretical point of view. Obviously, it is possible to interpret participants’ insistence on functional efficiency as a defensive line of argumentation allowing them to escape a potential moral dilemma. However, the homogeneity and robustness of the paradigm of functional efficiency to us suggests that – beyond its psycho-affective value – it may have deeper connection to the relational structure of participants’ ways of living with the specific techno-environmental arrangement of automobility. Following this lead, we started to look for a theoretical psychological frameworks and conceptual tools that would help us to construe potential alternative readings of our empirical data. Theory in this context serves as a means to move beyond a self-enclosed experience of the given state of affairs. Ultimately, we turned to Simondon’s work on the mode of existence of technical objects (Simondon, 2017). As we will show in the next section, this broader theoretical perspective did not only enable an alternative reading of our empirical data but may provide a conceptual framework to understand the underlying mode of operation of the human-technical relation. In that regard, we hope that our engagement with Simondon’s work may prove insightful not only to empirical psychologists but theoretical psychologists interested in human-technology relations as well.

Toward a critical theory and ethics of (technical) functioning

Scholarship on technology and its relation to human and more-than human ecologies (Haraway, 1991, 2016; Latour, 2005; Whatmore, 2002) has long pointed out that technical efficiency and functionality cannot be equated with the internal refinement of technical objects, or, with technological innovation. Rather, functionality points to a constitutive entanglement of technics with nature-cultural ecologies (Shaw, 2008) as well as with structures of feeling and wanting, that is, human needs and desires. From a critical psychological point of view this means that notions of technological functioning are grounded in the conduct of everyday life (Chimirri & Schraube, 2019). However, stating that such a grounding relation exists does not yet answer the question, what the role of technical objects (in our case: the car) and notions of technological functioning should be within a critical psychology of everyday life. In this section we draw from Gilbert Simondon’s work on the mode of existence of technical objects (Simondon, 2017) to develop a preliminary conceptual framework that might help to answer this question.

Technical lineage, invention and the techno-geographical milieus of functioning: Simondon on the mode of existence of technical objects

Simondon conceives of technical objects as *becoming* which places him in a tradition of process thought (Stenner, 2024) and marks a stark contrast to understandings of technology and technical objects as defined by pre-determined design, schematics of internal composition (arrangement of parts, energy supply, etc.), or external utility (Simondon, 2017, p. 16-17). Simondon’s theory of technicity is developed against the backdrop of a broader, complementary processes theoretical

framework involving technical, collective and psychic individuation (Simondon, 2020; Wrbuschek & Sluneko, 2021). Still, technical objects are not reducible to either of these parallel movements of becoming – the becoming of collectives, or, the becoming of an individual being relative to its associated milieu. Rather, technical objects have history, or, a lineage of their own: “the individual technical object is not this or that thing, given *hic et nunc*, but that of which there is genesis. [...] The genesis of the technical object partakes in its being” (Simondon, 2017, p. 26). Consequently, for Simondon, the specific mode of existence of technical objects is neither defined by the properties of a given object (e.g. a specific shape or internal composition of parts) nor by a utility that is external to it (e.g. how a human being employs the object for specific purposes). Rather, a technical object is defined as *relational functioning*, where functioning refers to the processual emergence of technical solutions relative to a specific techno-nature-cultural environment (including but not limited to anthropocentric concerns and utilities). In that sense, functioning cannot be understood as a property or quality of the given object but as an emergent, contextually contingent relation between technical objects and what Simondon refers to as *techno-geographical milieus*. In this sense, the meaning of functioning is not contained within the static features of a concrete thing, or, techno-material configuration, but in the potentialities for future functioning relations it opens. It is the defining characteristic of technical lineages that they remain open-ended. Given functional couplings between technical objects and techno-geographical milieus cannot exhaust the full potential for (future) functioning relations. The concrete techno-material configuration may materialize a solution (relative to a previous problem-state of the system), however, this particular functional coupling is overdetermined by the multiplicity of future functioning. Each system configuration can thus be considered a phase within the processual becoming of the technical object. Because of its open ended nature, the genesis of technical objects inevitably encounters moments of *problematization* that call for the invention of novel solutions. Invention here does not refer to the deterministic creation of *this* particular technical object as a solution to predetermined functional necessities but to the pre-figuring of “a possible *response* to a *problem*” (Lindberg, 2019, p. 304; emphasis in the original).

In regards to Schütze et al.’s analysis of the automobile arrangement, we can clarify how technical functioning may be understood as a constitutive dimension of the emergence of a specific techno-affective milieu. Let us start with the example of the car’s functional capacity to accelerate, move at high speed and – consequently – cover great distances in shorter time. Here, the car’s capacity for speedy travel inserts a specific response to a spatial problematic of landscapes (as extensive, remote, etc.) and it is the invention of the car’s specific functioning, which in turn leads to a reconfiguration of the spatial, material and affective features of the landscape itself. The solution to the problematic of spatial extension concretized in the car’s construction however, creates a new techno-geographical milieu. The driver detaches from the very landscapes to which they adapted through the car, while local ecologies are at the same time disrupted by the complementary insertion of roads, noise and the appearance of a previously unknown predatory species. Limiting one’s scope further to how human agents integrate in this relational configuration, the car’s interior milieu also creates a novel problematic, numbing the moving (human) body’s sensitivity to the texture of the land they travel. This problematic (which pertains to the techno-geographical milieu of vast landscapes as well as the driver’s alienation from this exterior milieu) calls forth yet another response, which may be found in the comfortable cushioning, sound system, noise dampening, etc., which shape the interior of the car and shield the driver from feeling numbed. What is

important here is that the evolved car model integrates the accumulated responses to heterogeneous problematics inscribed in previous phases of the process of technical individuation. ‘Nature’ and non-human ecologies are inscribed in such continuous individuation since, for instance, one might refer to the specific affordances of remote, snow-covered or rocky surfaces, extreme interior temperature caused by exposure to the sun, oxidation caused by humidity and other nature-related problematics affording responses in consecutive phases of invention. As can be seen from the example, the terms ‘problematic’ and ‘invention’ here refer to relations between technological efficiency, environmental and ecological adaptability but also socio-cultural concerns involving feelings, normative demands and evaluation. Consequently, a Simondonian framework allows us to look at processual entanglements between technical objects, affordances and structural patterns of environments as well as feelings, desires and vital valuations of (human and non-human) agents. Here, the concept of problematization may be a useful lens for critically examining ways in which consecutive phases of technical invention respond to problematics inherent in the previous phases. Referring to the example of the car’s insertion in remote and extended landscapes, the functional solution of high front ends combined with robust metal spoilers provides a specific response to the car’s potential confrontation with wild animals following their now disrupted migration routes. However, this mode of resolution is not neutral with regard to the previous problematic. Therefore, problematization is not merely a technical problem but constitutively involves an ethical dimension as well.

Mediation and relational being-with-machines

While Simondon rejects the idea that technical lineages are reducible to human-centred intentions and plans, instead emphasizing the relationality of disparate technological, ecological, organismic and human elements in the process of a technical object’s emergence, he still poses the question, what role human agents (should) play in relation to the technical realm. Simondon’s point of vantage is to say that technical becoming requires mediation, e.g. some form of putting in relation the disparate elements that emerge from previous phases of the technical object’s evolution. In order to understand Simondon’s argument, one needs to distinguish between different levels of integration, or, relation here:

- (1) *Internal relations* (immanent to the singular technical object) refer to the continuous perfection of the object’s parts relative to one another (e.g. increasing efficiency of energy transmission from pedal to wheel in a bicycle). With regard to internal relations, one cannot speak of true mediation since relational practice is limited to the linear refinement of an object’s interior properties. However, internal refinement may sometimes serve as a limiting condition, for instance in cases where a technical object’s self-enclosed structure becomes an obstacle for entering novel couplings with other entities. In such cases, Simondon speaks of closed machines. Open machines, on the contrary, contain possibilities for novel innovation (Simondon, 2017, p. 17).
- (2) Relations between technical individuals *in a technical ensemble* refer to the reciprocal integration of technical entities in an open functional series. One of Simondon’s examples is the complex arrangement of a recording studio where the overall functional outcome (the ‘sound’) depends on the synchronous and asynchronous coupling of instruments and recording devices. Here, the overall efficiency is determined not only by the functional perfection of each individual object but also by their arrangement into a

whole. Mediation in this context assumes an intermediate role since it requires that heterogeneous technical entities are put in relation to each other. However, with regard to novel innovation, such serial integration of parts into an ensemble still remains limited. While serial relations in the ensemble already prefigure a third mode of relation (for instance, the probability of feedback loops, distortion, etc. impeding the overall sound texture will crucially depend on the space between instruments as well as the dampening capacity of the walls) it still is bound up by the principles of structural integration and sequential organization.

- (3) Finally, relations of technical objects with regard to *techno-geographical milieus* refer to ways in which the technical object – individually as well as within the structural coupling of an ensemble – interacts with the complex affordances imposed by the associated techno-geographical milieu. With the emergence of more complex technical arrangements, technical functionalities emancipate from internal functional demands of the singular object, or, serial coupling of the ensemble. At the same time, the notion of functioning itself undergoes a fundamental transformation since it now refers to problematics that are no longer contained within the inherent demands of the ensemble (or singular object) but cut across different levels of technological, psychological, socio-cultural, organismic, material-environmental and eco-systemic conditioning.

It is within the techno-geographical milieu, that *mediation* assumes its full meaning. In Simondon's reading, mediation in the sense of a putting into relation of disparate elements across heterogeneous levels of being demands human engagement with the technical (Simondon, 2017, p. 59-62). At one point comparing the role of human agents with the role of a conductor in the orchestra, Simondon emphasizes that technical lineages afford acts of relationing that allow for a specific localization of human practice as being-with-machines. However, Simondon rejects anthropocentric misunderstandings of mediation as determination by rational design or agents' personal needs and desires. Orchestrating the relations between technical objects/ensembles and techno-geographical milieus requires a practice that intervenes at the point of problematization. Mediation means taking part in the principal problematic of techno-natural environments as co-constituted by ambiguous forces operating at different levels of being. Thus, in its full sense it requires that (human) agents make an effort to fully engage the entanglement of techno-nature-cultural processes in the moment of problematization. Against this backdrop, what distinguishes inventive mediation from mere expertise, or, passive technological consumption is the mediator's sensibility for the relation between the over-determining problematic of technical becoming and the specific techno-functional response actualized in a given techno-geographical milieu. It is only from the position of such a holistic understanding of the problem that the mediator can intervene in the process of individuation of novel techno-geographical milieus. At the same time, human agents' role in the emergence of novel technological solutions must not be overemphasized in terms of fully transparent rational design. Due to the overdetermined nature of problem states, mediation cannot oversee or anticipate all potential couplings emerging from the insertion of a novel technical invention. There will always be potential for unforeseen and unintended relations of (dys-) functioning that require responses in terms of subsequent acts of mediation. Construing technical histories in terms of linear development according to human ingenuity and enterprise would – according to Simondon – already constitute a crude misrepresentation of the mode of existence of technical objects as relational becoming.

Closed machines and oppressive affective technologies: toward a critical theory of functional efficiency

There is an inherent ethical dimension to Simondon's conception of human agents's place among the machines, or, within a wider context of techno-nature-culture. Consequently, responding to moments of problematization in the mode of deterministic instrumentalism based on anthropocentric goals would go against the realization of humanity's full potential as mediating force. Simondon refers to this in terms of a fundamental alienation in terms of humanity's losing sight of the initial moment of problematization that gives rise to technical mediation. Such mediation calls for a specific mode of caring that places the mediator within a broader ecology of concerns and functional entanglements across levels of being. Upon this view, notions of functioning cannot be established in a meaningful way without accepting this fundamental responsibility to act as mediator among technical, human, and more-than human beings.

Simondon's philosophy of technological invention thus implies an ethical perspective that resonates with recent feminist and more-than-human ethics of care (Gruen, 2015; Puig de la Bellacasa, 2017). Against the backdrop of such a decentring perspective on technological realities and the need for a milieu-related sensitivity to more-than-human agencies, we would like to return to the distinction between open and closed machines we mentioned briefly in the last section. An open machine is defined by its capacity to engage in novel ways with its associated milieu thereby offering the possibility to partake in the process of resolving problematics – i.e. invention. Thus, on a larger scale, technological arrangements can be considered open to the extent that they offer possibilities for novel relational engagements with emergent properties of the techno-nature-cultural environments they insert in. On the other side, a technical object (or ensemble) can be considered closed, if it reaches a level of self-enclosed perfection that renders it incapable of incorporating novel functional potentials, that is, if it becomes incapable of individuating further. Simondon refers to classic examples, such as a thermodynamic energy-producing unit reaching an energy output that overcharges the subsequent transmitter. In such cases, internal perfection leads to a decoupling of the over-efficient device from its technical environment. Moving beyond the ensemble- and toward the techno-geographical milieu level, functional openness needs to be understood in terms of technology's capacity to engage in functional exchanges with diverse environments and realities. Once again, at this point, one needs to consider technical in its relation to psychosocial concerns but also to material, organismic and biological processes that co-constitute the technical object's techno-geographical milieu. The interesting and thought-provoking consequence from Simondon's conceptualization of open and closed machines is that the very notion of functioning can be seen as connected to the technical object's relational potential within complex environments that expand beyond the limited scope of human aims and concerns. What we can see here is that functionality cannot be described in mere technical terms based on the perfection of the technical object's design specifications, or, the material components utilized in the construction of the object. Rather, functioning becomes a constitutively relational concept that refers to the specific ways in which technical objects interact with other properties of the milieu into which they insert.

Challenging urban (auto-) mobilities: This isn't functioning!

Taking into account that for Simondon the functioning of an open machine depends on its processual interrelatedness with techno-geographical milieus, we may finally return to consider

how participants in our group discussions referred to the car as ultima ratio of efficient mobility. In our presentation of key findings we highlighted that most of our participants were aware of the ecological downside of car-centred mobilities while still relying on the car as the functional solution to their everyday challenges. Against the backdrop of Simondon's process theoretical view we may now raise the question: what specifically is functioning here? By looking at the data through this lens it becomes visible that what is actually functioning is the automobile arrangement itself, in the mode of a self-enclosed techno-material ensemble. For example, discussants pondered the question, whether a switch from car to bicycle would be an option only to find that the car-dominated layout of roads and crossings imposes severe safety risks. Thus, bicycling turns inefficient precisely because of a self-referential functional organization of space that prioritizes car-drivers' mobility over alternatives. The non-feasibility of mobility transitions – which can be understood here as invention of novel technical solutions to the problem of urban mobility – is produced within the same technical paradigm of auto-mobility that legitimizes its persistence on the grounds of its functional superiority. The consequence of this inherently tautological structure is the naturalization of a restrictive and destructive status quo which appears as without reasonable alternative.

Further expanding on a critical analysis of notions of functioning in our data, we could also see that, despite the seemingly inescapable self-referentiality of the paradigm of functional efficiency participants' experiences also featured moments of problematization. One of these moments can be found in the following short transcript sequence:

Bm and I also think to myself in the i- so well [the Viennese Ring road] //mhm// no cars imagine
 Am that would be really cool°
 Bm ↳a- but the streets would be a meadow @(1)@ @something like that@
 Af ↳oh::
 Am ↳that would be ah::
 Bm or sand @(1)@ yes
 [...]
 Af ↳there would be- I'm sure people won't be so grumpy anymore @(1)@ @ja@
 Bm ↳yes there @people don't get so grumpy anymore@
 Am ↳yes @(1)@ yes and there would=be more it would work against the heat in the city or so and and
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In this short sequence, the discussants imagine together, how life might look like in a car-free city. In this context, while participants mention ecological aspects toward the end of the sequence (“heat in the city”) the main focus is on notions of what we can call a ‘good life’ and a collective affective atmosphere. Against this imaginative backdrop, the automobile regime turns from simply functional into an obstructive force. Imagining a city (or a part of the city of Vienna) without cars, a contrast emerges between soiled streets and a meadow or a sandy surface. It becomes apparent that the automobile arrangement makes impossible habits and practices such as sojourning in mid-town meadows, and playing in the sand. The discussants revel in the positive social effects of such possibilities and at the same time point to social downsides of an automobile centered system. The “grumpy Viennese people” signify a collective level of automobile dysfunctionality that links to the car's functionality not by way of its instrumental utility or precision of (internal) construction but by way of its insertion in the wider problematic of the eco-social milieu of the city. It is in

small interjections like this one that potentialities for different techno-environmental solutions become visible in the conversations. Importantly though, participants rarely frame these contradictions in terms of technical functioning. While the parameters by which functionality and efficiency are being evaluated remain self-enclosed in the auto-mobile arrangement, dysfunctionalities relating to other potential concerns and engagements with the urban space are externalized as deficiencies of inferior technologies (the bike as security risk), or, discarded as idealistic thought play. To mark what is lost along the way, Sánchez refers to ecological psychology (Gibson, 1983) developing a concept of ‘unfulfilled habits’ (Sánchez, 2024). According to him, situations “where we do not act on inviting affordances [...] due to an experienced conflict between relevant concerns” (Sánchez, 2024) may lead to feelings of unfulfillment, i.e., “the quality of an experience where we are aware of being at odds with the environment” (Sánchez, 2024). From a different angle, Spurrett (2024) makes a similar argument regarding ways in which technologies can become detrimental to agents’ vital concerns reshaping environments, practices and habits in harmful ways.

At this point, a critical perspective on how notions of functioning figure in the conversations reveals the obstructive effects of a reductionist techno-geographical arrangement by pointing to potential trajectories along which other technical solutions to existing problems may be imagined. In that way, a critical reconstruction of implicit conditions of functional efficiency in a given techno-geographical arrangement may provide a starting point for re-imagining technical potentialities reinstating human agents as mediators of technicity.

Conclusion

In this essay we departed from conceptual and empirical observations regarding the way, in which notions of functional efficiency figure in the context of car-dependent urban landscapes. Based on these observations we engaged with the work of Gilbert Simondon in an attempt to flesh out a preliminary conceptual framework to critically look at such appeals to functioning. We showed that from a Simondonian point of view, functioning needs to be understood as relational becoming of technical objects. However, technical lineages cannot be separated from the emergence of what Simondon calls techno-geographical milieus that is, multi-level systems that extend beyond the scope of human agents’ concerns and involve material, eco-systemic, organismic and biological realities as well. Against the backdrop of an extended understanding of functioning Simondon conceives of human beings’ place among the technical objects in terms of mediation, that is, of putting in relation elements across different levels of becoming. Such mediation requires that agents intervene with the techno-geographical milieu from in moments of problematization, when a given phase of technical evolution encounters dysfunctionalities that require novel acts of invention. However, problematization must not be understood in a reductionist sense as identification of anthropocentric concerns and rational solutions. Rather, problematization requires that agents make an effort to understand the complex entanglement of different trajectories of becoming. In this sense, Simondon’s stance is not limited to a theory of technical innovation but implies an ethical stance in so far as it forces agents to consider the full scope of techno-geographical milieus and thus, connect to more-than-human conceptions of agency and relation.

Applying this framework to our empirical data we found that a broader perspective on notions of functioning may reveal the self-enclosed nature of automobile urban arrangements as well as point toward potential alternatives that are being oppressed within such arrangements. Thus, functioning

may be turned into a site of critical engagement with the current mode of operation of car-dependent societies.

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