Collaborative repair as dealienation:
An exploration of degrowth technology practice

Gregory Prescott

A Thesis

in

The Department

of

Geography, Planning and Environment

Presented in Partial Fulfilment of the Requirements
For the Degree of
Master of Science, Geography, Urban and Environmental Studies
at Concordia University
Montréal, Québec, Canada

March 2023

CONCORDIA UNIVERSITY
School of Graduate Studies

This is to certify that the thesis prepared

By: Gregory Prescott

Entitled: Collaborative repair as dealienation: an exploration of degrowth technology practice

and submitted in partial fulfilment of the requirements for the degree of

Master's of Science, Geography, urban and environmental studies

complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by the final examining committee:

_____ Chair
        Damon Mathews

_____ Examiner
        Éric Pineault

_____ Examiner
        Yves-Marie Abraham

_____ Thesis Supervisor
        Bengi Akbulut

Approved by _____ Department Chair
                Craig Townsend

On_____   _____ Dean of Faculty
                        Pascale Sicotte

Abstract

Collaborative repair as dealienation:
An exploration of degrowth technology practice

Gregory Prescott

The degrowth hypothesis could be summarised by the following: even if limitless growth were biophysically possible—which it is almost certainly not—it would not be desirable. The degrowth project bills itself as more than just critique: it is "a normative concept with analytical and practical applications" (Kallis et al 2018). Yet while scholarship has meaningfully engaged with ecological economics and political ecology to interrogate the metabolic imbalances and distributional asymmetries of growth-centric society, empirical investigation of alternative "living degrowth" are rare (Brossman and Islar 2020). Degrowth research focusing on questions of *technological normativity*, or "technology practice" (Drengson 1995) are few and mostly limited to work adopting largely quantitative, or metabolic, approaches to technology, for instance in the 'low-tech' movement. These predominantly biophysical framings are clearly necessary in apprehending, and acting upon, the *impossibility* of endless growth and commodity innovation/production. They are however, less adequate in accounting for the *undesirability* of endless growth and material accelerations, and in indicating new, more *desirable* pathways for technology practice moving forward.

The present empirical study consists in first-person observation and interviews carried out in a Montreal amateur repair community in 2021-2022. The phenomenon of collaborative repair, or Repair Cafés, is a practice geared to the downscaling of material throughput through the collectivisation of tools, space and repair knowledge. Through observation and analysis, a cluster of questions was asked: how could we begin to think about *degrowth technology practice*? What would it look like? Can the features of collaborative repair offer us hints? Drawing on recent scholarly efforts to revive 'alienation' as a valid theme for social inquiry, and in addressing the noted need for degrowth to think more seriously about "dealienation" (Brownhill et al 2012), the present study looks at collaborative repair as a testing site for the suitability of these concepts, and for their potential application in a proposed degrowth research mandate focused on technology practice. This study is founded on a methodological conviction that when one engages in practice, one not only *does* something, one also *understands* that one is doing something, inevitably investing the action with meaning (Jaeggi 2018). From this point of view, and beyond metabolic and redistributive ends, collaborative repair effects a rehabilitation of meaningful subject-subject, subject-time and subject-object relations—relations typically characterised by alienation in industrial commodity economies. The present study also recommends that degrowth think seriously about "resonance" (Rosa 2019) as a more useful and coherent alternative to 'autonomy' when conceptualising alienation's 'other'. Such a framing appears critical for both elaborating a degrowth critique of technology and enriching discussions of how degrowth normativity bears on practice.

Table of Contents

Introduction

i.   *The Limits to Growth*: technological innovation

and the mitigation of socio-ecological crisis

"The hopes of the technological optimists center on the ability of technology to remove or extend the limits to growth of population and capital. We have shown that in the world model the application of technology to apparent problems of resource depletion or pollution or food shortage has no impact on the *essential* problem, which is exponential growth in a finite and complex system."

(Meadows et al 1972:145, emphasis in original)

Recent decades have made it apparent that the Earth, its inhabitants, and its life-supporting systems are enduring large-scale and irreversible damages directly linked to a variety of anthropogenic activities. Steffen et al.'s (2015) landmark article, published in *Science,* defined the planet's nine biophysical "boundaries" within which human society may flourish. It estimated the relative proximities of these nine systems to critical and existential threshold points,[1] echoing the work of a previous generation of scientific collaborators. In 1972, the Club of Rome published the massively influential report *Limits to Growth* (*LTG*), in which a novel systems theory approach cast emerging environmental challenges as the result of global industrial activities exceeding sustainable levels (Meadows et al. 1972). Their forecast of the state of relations between Earth systems and the global economy was unquestionably grim. Although their conclusions triggered widespread incredulity at the time, certain stark predictions of *LTG*'s "prophecies of doom" (Bardi 2011:101) have proven quite accurate fifty years on (Herrington 2020). As implied in the report's title, *LTG* cast growth—the global, overarching policy project of our time (see Victor 2019)—as the political and economic ideology responsible for squeezing the planet up against the brink of biogeophysical and biogeochemical limits captured by Steffen et al (Schmelzer 2015). If the growth of economic industrialisation was identifiable as responsible for stressing Earth systems, one could only assume the trend to continue indefinitely in the absence of other relevant factors. On account of what supplemental reasoning, then, did the sceptics of *LTG* permit themselves, as many do today, to dismiss the "prophecies" and continue to champion policies of economic growth?

In seeking to understand the epistemic gap between 'realists' and 'optimists', between decades of environmental degradation and strategies proposed to mitigate them, we are confronted with questions of technology. Initial criticism of *LTG*'s findings was based on the knee-jerk assertion that future technological innovation would invariably increase industrial productivity, requiring less and less material input, and thus sustaining indefinite

_____

[1] J. Lokrantz/Azote rendered the work of Steffen et al. (2015) in a widely circulated pie chart viewable here: https://www.stockholmresilience.org/research/planetary-boundaries.html

economic growth (Bardi 2011). Indeed, similar "technological forecasting" is often reflexive amongst advocates of contemporary ecological modernisation ('green growth') proposals. However, "It is not clear to what extent the eco-modernist premise that technological progress promises to make central contributions to a more ecologically friendly world can be supported by sound arguments or whether these are subjective convictions and ideologies" (Grunwald 2018:1861). The situation is symptomatic of a wider operational logic of "technological solutionism" running throughout both policy and mass cultural circles alike (Morozov 2013). The cultural reflex is most often founded on shaky, impulsive reasoning, with expectations of the benefits heralded by technical progress being either "unrealistic" (Winner 1987) or "inflated" (Garcia et al 2018). Yet today, positions challenging technological solutionism have arguably begun to gain traction. There is, perhaps, recent evidence pointing to newfound recognition that strategies designed to mitigate climate and ecological disaster based solely on technological advancements are problematic.

The IPCC Working Group III report on "Mitigation of Climate Change", part of their *Sixth Assessment Report* (IPCC 2022), is subtly reflective of a change of mood in influential corners of the scientific community. Though wrapped in technical, policy-geared language typical of green growth approaches, there is evidence of a tempering, or qualifying, of straight-forward growth-oriented sustainable development goals in the *Sixth Report*. The report acknowledges the limitations of purely technologically-based mitigation strategies, citing "growing concerns" (2022:42) around the increasingly rare mineral resources needed for batteries, as well as the need to avoid "rebound effects" (2022:12) that accompany low-emission technology production. The report also highlights the need for other "demand-side measures" (2022:44) that shift focus onto altering consumption patterns, primarily in the Global North, in order to decrease global rates of material and energy throughput. These acknowledgements demonstrate a veritable rupture with previous IPCC assessments, leading some observers to point out a palpable "degrowth" element underpinning the report's proposals, even if the term itself is omitted (Pineault in Noël 2021). This is not to overstate the case: the *Sixth Assessment Report* continues to insist throughout on the need to develop and expand decarbonised ("low emission", "digital") economic activities (IPCC 2022). However, there remains a tacit recognition of the biophysical limits of such approaches, limits that some scholars and activists have been pointing to for decades. Despite these recent developments, technological advancement, with its promise of infinite increases in efficiency, continues to be proffered as a skeleton key for the pursuit of ecological and climate sustainability—not to mention social emancipation (see Zuboff 2019). This fact forms part of a larger ideological and cultural backdrop against which the present study is cast.

There is inherent irony in the tech solutionist position given the indisputable fact that industrial development, and the ecological destruction it has unleashed, has been historically driven by technological innovation in the first place. These innovations have likewise been closely associated with the emergence of highly exploitative social institutions like colonialism and the trans-Atlantic slave trade (see Lohmann et al 2020). If crises of *social* sustainability—of structural exploitations and inequalities—are traceable to, even consubstantial with the historical

development and proliferation of technological innovations, what possible role could they play in their attenuation? The question is in no way rhetorical. It is however essential in situating the present study and defining its goals.

Technology is an ineluctable part of the human experience, having accompanied and co-evolved with us on our long journey through time. The idea we can simply 'turn away from' or reject technology is both unrealistic and misguided. We must critically re-visit the very nature of our conception of technology, its materialities and meanings, in order to explore new ways of imagining technology practice in an era of mounting of socio-ecological alarm. We are followed on this critical foray by other lurking questions. For example, how can we envisage a theory of technological progress that does not implicate increasing socio-technical complexity, but rather its opposite? Perhaps, what is the distinction between a technology and a technology practice? How and where do we locate the boundary? Is the distinction even worth making? The journey towards beginning to address such questions seems to cross through the empirical and theoretical insights of several fields—economics, sociology and anthropology, philosophy, communications, and science and technology studies (STS)—as well as more speculative works of those who have remained on academic margins. Above all, the journey leads us to look at 'on the ground' technology practice as it exists in relation to the forces of innovation-based, commodity-driven economic growth.

ii.   Degrowth: an empirical and normative critical
          approach to reconcile the material and the social

"Negative growth is, therefore, imperative for our survival. But it presupposes a different economy, a different lifestyle, a different civilisation, and different social relations. In the absence of these, collapse could be avoided only through restrictions, rationing, and the kind of authoritarian resource-allocation typical of a war economy. *The exit from capitalism will happen, then, one way or another,* either in a civilised or barbarous fashion. The question is simply what form it will take and how quickly it will occur."
(Gorz 2010, emphasis in original)

Arising in a context of increasing environmental realism and anti-globalisation sentiment in early-2000s Europe, "degrowth" has emerged as both an activist provocation and a transdisciplinary scholarly niche in its own right (Demaria et al. 2013; D'Alisa et al. 2015;).[2] Seeking to ground research in empirically verifiable environmental and social science, much of the work of degrowth is oriented towards normative claims, taking the form of a "political project" of socio-ecological transformation (Buch-Hansen 2018:157). The degrowth proposal is varied and expansive, an ensemble of wide-ranging policy provisions from capping industrial pollution and establishing maximum/minimum

---

[2] For a concise history of the degrowth movement in Europe, see Kallis et al (2015).

wages, to abolishing commercial advertising and intellectual property regimes (see D'Alisa et al. 2015).[3] As a movement, it marks a departure from individualist, 'middle-class' environmentalism, seeking to identify the relations of power and their institutional manifestations that are responsible for the socio-ecological *problématique*. In this respect, degrowth research therefore shares common ground with the field of political ecology. It has also been interpreted by scholars as broadly convergent with contemporaneous egalitarian struggles for environmental justice (Akbulut et al. 2019), indigenous self-determination (Escobar 2015) and projects of "economic democratization" (Akbulut and Adaman 2020). Degrowth analysis thus appears deeply relevant in an era increasingly defined by concerns over matters of social justice and ecology voiced by those situated "on the margins" of global capitalism (Hanacek et al 2020). Perhaps most of all, degrowth's vision of socio-ecological transition is one premised on both self-reflection and democratic deliberation. As Gorz indicates above, to this there is no acceptable alternative.

Rooted to a large extent in the foundational work of ecological economists Georgescu-Roegen (1972; 1986) and Daly (1993; 1996), the degrowth movement has sought to engage in holistic critique of industrialised society's economistic, growth-centred institutions, taking aim at both their material, ecological impacts, as well as the socio-cultural complexes that underpin these institutions' legitimacy. In reframing all economic activity within empirically testable biophysical boundaries, degrowth advocates for an overall downscaling of *gross* (no 'offsets') economic activity, the equitable redistribution of wealth across local and global scales, as well as a thorough transformation of values, norms and institutions along more participative and democratic lines (Akbulut 2021). Thus an explicitly normative aspect, one setting it apart from many fields of research, is an essential feature of degrowth thought. It can even make sense to distil degrowth normativity to three principles or imperatives: "produce less, share more, decide together" (Abraham 2019). Abraham's formulation is a central one for the present study, serving both as shorthand for what I take to be degrowth normativity, and as measuring-stick to gauge the *degrowth-ness* of a given technology practice.

There is a crucial distinction to highlight here. The degrowth critical project—its descriptive and subsequent normative claims—can be thought of as founded on both *quantitative* and *qualitative* ontologies.[4] 'Producing less' and 'sharing more' (Abraham 2019) appeal most directly to a *quantitative,* biophysical rationale informed by ecological economics, as outlined above. Its reasoning rests on both metabolic and redistributional logics for degrowth. In contrast, the third and evidently more process-oriented imperative ('decide together') indicates a *qualitative* reasoning, founded on markedly "intrinsic content" (Jaeggi 2018:5). It points to a fundamental need for people to be engaged and

---

[3] D'Alisa et al. (2015) have edited a compilation of short entries, *Degrowth: A vocabulary for a New Era*, which outline the foundational premises and varied policy propositions of degrowth. It is accessible and intended as a means of introducing degrowth thought and research, initially continental European, to anglophone and other global audiences, whose familiarity with the term has been relatively recent.

[4] The quantitative-qualitative distinction is formally analogous to other classic dualisms such as nature-culture (structuralism), base-superstructure (historical materialism), and object-subject (psychology). Contrary to these formulations, degrowth thought has sought to avoid both material or ideal determinism. It has thus tended towards a non-hierarchised conception of socio-political evolution, emphasising equally the need for change in its diffuse, grassroots as well as central, institutionalised forms (see D'Alisa and Kallis 2020; Akbulut 2021).

connected in deliberative processes—with others, with themselves, with object-companions. The distinction is a simplification of course. In reality, processes of qualitative and quantitative reasoning can and do overlap and mutually reinforce one another.[5] However, it is productive to uphold the analytical distinction for (at the very least) the purposes of the present study, and keep in mind it is a distinction gestured at, through unelaborated in my opinion, throughout degrowth work generally. This duality—lying at the heart of degrowth's attempt to unite social and physical sciences in dialogue — is perhaps best captured best in a variation of the movement's central hypothesis: *even if endless growth were physically possible, it would not be desirable* (Akbulut 2021).

Degrowth's critical exploration of the *qualitative* nature of human experience in growth society entails looking at the shape and structure of needs, desires and aspirations, as well as their embeddedness in practices and institutions mediated by social power, technological infrastructure and ecological reality. The task here—it is in no way an easy one—is to move towards defining needs and desires as a means of identifying the shortcomings of present forms of social organisation and their failure to respond to such needs and desires. Ultimately, the objective here is to propose more mutually beneficial social arrangements in their place. Degrowth, along with critical theory, and other select corners of social philosophy, has been inclined to adopt 'alienation" as a useful analytical category in its diagnosing of the pathologies of growth society (see Abraham 2019; Deriu 2015). Contrary to critical positions centred on matters of 'justice' (environmental, social, gender-based, urban/rural, etc.), the general tendency here instead is to precede from subjective conceptions of 'the good life', however diverse and contested they may be (Rosa 2014). The distinction impacts the course of research. Evaluating for justice is typically thought of as a quantitative, exogenous, and etic exercise (e.g. determining rates of socio-economic inequality), while accounting for the 'good' is a much more qualitative, endogenous and emic endeavour (e.g. gauging senses of fulfilment, 'authenticity', etc.). Riddled with 'incommensurabilities', this kind of inquiry is the stuff of economists' nightmares. While research in ecological economics can tell us much in terms of justice, it is less equipped to deal with questions regarding the good life. Here the work of more academically liminal figures—of Gorz,[6] Castoriadis and Illich notably—has been essential to the formation of degrowth thought. Their focus on "autonomy" and "conviviality" as qualities essential to social flourishing, has greatly shaped degrowth thought (Deriu 2015). With respect to the conceptual framing of technology, Illich's work has proven uniquely important for degrowthers (Kallis et al. 2018).

iii.   Degrowth and technology practice:

Making room for new research

"The social nature of exchange had to be discovered against tremendous ideological resistance. Today it seems absurd that modern societies renounced control of their own economic life to a second nature they had themselves created. Yet where technology is concerned we remain in wilful submission to a second nature just as contingent on human action as the economy. Liberation from technological fetishism will follow the course of liberation from economic fetishism. The same story will someday be told about machines that we tell today about markets."   (Feenberg 1999:viii)

Empirical research seeking to assess technology within a degrowth framework has tended to follow in the steps of ecological economics in evaluating the biophysical implications of ecological modernisation projects associated with growth-oriented politico-economic institutions. It is on this *metabolic* terrain that degrowth research has engaged with a "critique of technological fixes" (Kallis et al. 2018:303). For instance, proposals such as the Green New Deal (US congress 2019) or the Green Economy (OECD 2011) are premised in large part on sustaining economic growth *and* achieving industrial decarbonisation via energy source substitution, large-scale infrastructure renewal, and by 'incubating' new manufacturing and service sectors. However, such proposals demonstrate by and large an "almost total ignorance of how the economy interacts with ecosystems and impacts their structure and functioning, how dependent economies are on the flow of low entropy materials and energy" (Spash and Smith 2019). Degrowth has been quick to point this out, repudiating "green growth theory" (Hickel and Kallis 2020) and its assumptions that GDP increases can ever be absolutely de-linked, or "decoupled", from negative ecological impacts (Jackson 2009). It offers a metabolic perspective, framing the aggregate economic activities that comprise GDP, and their manifestations in a society's overall "technomass" (Hornborg 2001), as intimately entwined. Indeed, different technological regimes necessitate unique material profiles and embody different amounts and forms of energy in order to exist through time (see Bihouix 2021). Accordingly, research must account for material requirements and impacts (e.g. 'footprints') in evaluating the appropriateness of a given technology and ascertain its potential to be reproducible within the limits imposed by biophysical processes. It is in this direction that degrowth research has moved, in beginning to elaborate on the *quantitative* criteria that defines a posited degrowth-appropriate technology.

It is limiting to conceive of questions of technological appropriateness in uniquely material and biophysical terms. They demand equally, analyses made to encompass social and symbolic aspects, with degrowth scholarship standing only to benefit from the asking of such questions. Higher, more technically elaborate infrastructures presuppose not only broader, more extensive bases of material extraction, but also relations of intensifying "unequal exchange" (Hornborg 2001), technology being inevitably built on human, as well as ecological, exploitation.

Increasingly complex infrastructures rely on systems of hierarchised, complex and geographically displaced social relations in order to mobilise labour on one hand, as well as ever-higher rates of exchange-value accumulation in the hands of an ever-shrinking minority on the other (*Ibid*). Therefore, a more complete critical assessment of technology —like that undertaken for economic growth itself—should be truly socio-ecological in nature. It should be equipped to deal with socio-economic themes like equitable distribution, but also less tangible themes such as reification, fetish, and alienation that resist quantification, perhaps, but never understanding and relevance. The point to emphasise is this: in degrowth's biophysical critique of technological solutionism, the *qualitative* case for de-/post-growth technology has been left underdeveloped. Some recent research has yielded valuable insights, such as that carried out on so-called 'low-tech' normative practices (Sirois-Cournoyer 2018; Bihouix 2020; Coredem 2020), or in more speculative fashion in name of technological "releasement" (Heikkurinen 2018). In their largely convincing formulations, technology embodies both ecological costs and socially undesirable outcomes in proportion to its complexity and elaboration. The path to sustainability thus passes through the reduction and simplification of technological infrastructures. However, a limitation of these works is their allegiance to strictly materialist, artefact-oriented conceptions of technology that leave little space for more subtle understandings of the mutually constitutive relations between technology, labour and embodied practice.[7] To (only somewhat) caricature their conclusions: the only good tech is a limited one.

Within the currents of degrowth thought, it is perhaps Illich's notion of "convivial tools" that has offered the best alternative to strictly materialistic, object-centred approaches, and has held the most promise for a phenomenological, practice-oriented conception of technology. For Illich, "machines" are necessarily integrated and subordinated into larger technocratic structures, which in turn, and by definition, exceed the influence, control and appropriation of local actors (*operators*), thus dominating the latter. In contrast, "tools" retain the capacity to foster "self-realisation" amongst people (*users*) who wield them in order to achieve their own self-defined ends (Illich 1973). Some research has followed up on Illich's line of inquiry (see Caillé 2011), though little on-the-ground, empirical research has been done (again, see Vetter 2018 for an exception). In short, there has yet to be much scholarly engagement with what could be called either a degrowth *ethics* of technology, or a degrowth technology practice. In an attempt to address this gap, the present study seeks to focus on what Drengon calls "technology practice", or the convergence of technological objects (*technikos*), their associated knowledges, skills or arts (*technē*), as well as the

---

7 Vetter's (2018) study is a notable exception. Its methodological investigation of "the matrix of convivial technologies" used by degrowth-related groups employs diverse assessment criteria that ranging from the material (e.g., "durable/nondurable", "fossil energy/renewable energy", "water polluting/improving water quality") to the qualitative (e.g., "heteronomous/self-determined", "alien implemented/respects local traditions") The author proceeds: "It is not a neutral method to solve conflicts around technology but actively promotes normative values derived from the researched degrowth projects" (1784). The present study is similarly aimed at both ascertaining and promoting these "normative values" in relation to technology. Heikkurinen's (2018) work is another exception here. He defines technology as a means of transforming the non-human world into human-appropriate artefacts. Following Heidegger, he defines the technology paradigm as a "framing" of the non-human world as a "standing-reserve for human use". The *logos* (rationale) of technology is thus fundamentally anthropocentric in its essence, as well as intrinsically incapable of enabling a human agency of "letting things be" (1654). Conversely, only through a "releasement", to a certain extent, from technology practices can degrowth society realise itself into existence. While very much insightful, Heikkurinen's contribution is a sort of anti-thesis to the present study. Reading the cited work, one arrives at only one conclusion: the only technology appropriate for degrowth is the one that doesn't exist. Yet, his shortcoming is based on a limited, biased, and ultimately contemporary, definition of technology as a *physical artefact* as opposed to an *embodied technique or practice*.

socio-cultural values and ideals that accompany them and together constitute a practice (Drengson 1995). A practice-centred approach carries with it the intent to avoid conceptual reifications technology, namely the tendency to view the object/apparatus as a separate thing-in-itself, isolated from the ecological, social and sociocultural processes that co-constitute it throughout its lifecycle stages, and of which it is a distillate of sorts. The approach seeks to re-centre human subjectivity in conversations of technology, to restore the human mind and body as the "house of Being" in which technology lives.[8]

iv.   Collaborative repair:

         Degrowth technology practice?

"The question is this: can repair sites and repair actors claim special insight or knowledge, by virtue of their positioning vis-à-vis the worlds of technology they engage? Can breakdown, maintenance, and repair confer special epistemic advantage in our thinking about technology? Can the fixer know and see different things—indeed, different worlds—than the better-known figures of 'designer' or 'user'?"   (Jackson 2014:229)

The notion of collaborative or community repair has come to scholarly and popular attention with the emergence of the Repair Café movement. Centred on a not-for-profit organisation founded in Amsterdam in 2009, it consists of a global network of self-organised, non-centralised collectives carrying out decommodified repair in local, typically urban contexts (Kannengeisser 2018).[9] While celebrated at various moments throughout degrowth-related literature (Carlsson 2015; Paech 2016; Vetter 2018; Schmelzer et al 2022), there has yet to be any serious attempt to focus empirical research on the practice from a specifically degrowth perspective. Perhaps its candidacy as *degrowth practice* is self-evident, with its biophysical, even distributional potentials not requiring closer examination? The ecological and metabolic advantages associated with repair appear plain enough. At first glance, they generally accord with the central degrowth objective of lowering economic throughput—the "produce less" component of Abraham's axiom (2019). When engaged in a collaborative setting, repair resources, knowledge and skills are collectivised and redistributed (Paech 2016), thus responding to Abraham's second principle of "sharing more". Here, the work entails a process of dealienation from others in very real and immediate terms. The latter feature requires highlighting, with a

_____

[8] This is a liberal, maybe counterintuitive, appropriation of Heidegger's (1977a) famous definition of language as the "house of Being" in which humans dwell.

[9] Researchers have used different names to refer to what amount to variations of the same phenomenon: organisations practising collectivised and decommodified repair. Names include 'collaborative repair' (Meissner 2021), repair 'collectives' (Houston et al 2016), 'public sites of repair' (Rosner 2013) or 'repair cafés' in a generic sense. 'Collaborative repair', the most accurate descriptor of these practices' intentions and *modus operandi*, is preferred for the present study. As latter explained, many research subjects themselves most frequently used '*auto-réparation*' or 'Repair Café'.)

crucial distinction drawn between *commercial,* or *commodified* repair, carried out to realise exchange-value in the form of money, and *collaborative or decommodified* repair, which is practiced in order to recuperate or extend an object's usefulness within a subsistence context. In the case of the former, commodities are repaired either under the form of a commissioned service, and for a price, or for resale on used markets towards the end of generating surplus value.[10] While both modes of repair could in many cases be recommended on ecological grounds, commodified repair sits outside the bounds of the present study's empirical exploration.

What then of the specifically *qualitative* merits of collaborative repair as a technology practice appropriate for degrowth sensibilities? Adopting this as its over-arching inquiry, the present study is directed toward Abraham's third and least obvious imperative, "deciding together". It is from this angle that the normative example of collaborative repair appears most promising as a technology practice that enables reflection, deliberation and dealienation.[11] There is also an important methodological question that the study hopes to address here: how can adopting a perspective focusing on technology *practice* inform a degrowth critique of technology moving forwards?

The present study of collaborative repair thus has a double mandate. First, the study seeks to interrogate collaborative repair's capacity to counteract the dynamics of subjectively experienced alienation associated with industrial commodity economies. How might the practice enact degrowth principles as defined in scholarship? This question is about repair itself and is therefore ontological in a sense. It will be examined through analysis and discussion of empirical field-work and interview data collected over the course of a year in Montreal. Second, drawing on the analytical tools of several disciplines, the study is imagined as an exploration in the use of a phenomenological, practice-oriented framework as a means of thinking about what *specifically degrowth technology practices* would look like, practices liberated from the imperatives of modern productivity bias on one hand, and abstract capitalist valuation on the other. The study therefore also strives to yield methodological and theoretical insights in the hope of clearing new paths for degrowth scholarship and thought.

Confirming Jackson' above question, a base assumption of this study is this: collaborative repair does serve as an analytically efficient site for looking at subject- and collective-oriented perspectives on a variety of issues—labour, money, and time—in terms of how they are understood as conditioned by growth-oriented commodity worlds and thus rendered meaningful. In general terms, collaborative repair responds to the degrowth imperative to lower socio-ecological metabolism. It is carried out amidst a conviction that endlessly expanding and accelerating commodity

---

[10] Commercial, or professional, repair is in theory not incompatible with growth-based, and hence ecologically destructive, regimes of capitalist accumulation. Indeed, the assembly lines of modern industrial production rely on repair to a great degree (Jackson 2014). It is also eminently debatable whether repairing ecologically destructive technologies, for example a gas-powered leaf-blower, is necessarily the sustainable option with regard to replacement, for instance with an electric model. Complex calculations involving considerations of relative production, operation and waste costs, product life expectancy, frequency of use, etc. are necessary in settling such particular, technology-specific questions. Integrating these sorts of interrogations into an emergent "repair studies" seems of vital importance moving forward.

[11] Following deployment of the term by Brownhill et al. (2012), Akbulut proposes "dealienation" as a "bridging concept" (2021:105) with which eco-Marxists and degrowthers could collaborate in their efforts to centre labour, not capital, at the heart of economic decision-making processes (economic democratisation). The central theme of dealienation will be treated in detail in Part iii of the Discussion.

cycles are biophysically unimaginable. It is premised on making explicit the linkages between production, consumption, and waste-making practices on several scales. And yet it appears to do more than that: it encourages a reflection amongst practitioners on possible alternative and decommodified modes of valuation. These reflections are themselves rooted in wider re-imaginings of the good life, or what Jaeggi refers to as a "form of life" (2018). It is here that collaborative repair seems perhaps most imbued with degrowth intuitions. The will to this form of repair practice could be encapsulated by the following conviction, to repurpose a slogan: *even if accelerating commodity cycles were possible, they would not be desirable.*

The present study's findings show collaborative repair to be a technology practice characterised by observable processes of dealienation at play on multiple scales and in iterative, self-reinforcing ways. A large-scale, at once political economic and metabolic, process links repairers, commodity chain structures, and global material, or metabolic, flows. This mode of dealienation—from the natural and labour inputs that constitute commodities—is a conceptual, knowledge-based, even *immaterial* component of the practice. Originating in a dialogue between shop experiences and perceived macro-scale political economic forces, it ultimately results in the expansion of critical material consciousness and the *defetishisation* of the commodity form, a first move towards making effective and meaningful *decisions* regarding technology that are in line with social-metabolic realities. Another dealienation process involves the immediate, workshop-based relationship, defined here as one of production, between repair subjects and the objects they are repairing/(re)producing. This 'concrete' dimension of practice is seen as one that fundamentally dealienates subjects from both the products of their labour, investing objects with more enduring meaning, and from themselves (or 'species being') by aligning subjects' practical and technical capacities with their valuations and aspirations concerning the good life, typically framed as 'empowerment'. There is a temporal dynamic, as well, to this repair work, a decelerating disengagement from market-mediated time commodification which is at once a necessary precondition for the practice itself, while at the same time being realised into existence by carrying out the socially reproductive work itself. These observed processes of dealienation at the heart of collaborative repair correspond, following Rosa (2019), to a technology practice that counteracts experiences of alienation by bringing about its very opposite, experiences of *resonance.* That is to say, collaborative repair is a practice that is premised on a cultivation of "relations of relatedness" (2019:178) between subject and other, subject and object, and subject and world.

In the following section, a review of the literature is presented. It is divided into seven parts: part i (pg. xx) is a review of what we have called the 'quantitative' criticism of technology as undertaken in degrowth scholarship, while part ii (pg. xx) reviews more social dimensions of degrowth's technology critique. Part iii (pg. xx) looks at research that adopts what we have called a 'qualitative' critique of growth, giving particular attention to notions of alienation and autonomy as they have arisen in degrowth-related scholarship. In part iv (pg. xx), we turn our attention to the normative principles, practices and economic strategies promoted by the movement that together constitute what we have called degrowth's political economy. Part v (pg. xx) is a survey of research on repair, with particular focus on empirical, field-

based work. In part vi (pg. xx), we take a deeper look at work in criticism which is at once nominally important to degrowth approaches to technology and in need of elaboration and empirical support. Finally, theoretical work that could inspire future directions in degrowth technology criticism (work that figures centrally in the current study) is mapped out in part vii (pg. xx).

Following the literature review, research questions are laid in context (pg. 38). A presentation of the study's theoretical Methodology and key Conceptual Framings are presented (pg. 39). This section is divided into two parts. Part i (pg. 39) is an attempt to qualify 'dealienation' and 'resonance' as effective principles of what we have called degrowth 'normativity', while in part ii (pg. 43) fleshes out the general theory of practice on which the present empirical study is founded, and from which we have derived the idea of 'technology practice'. The particular first-hand research methods put to work in the current study are presented in Methods (pg. 46). Here, four parts describe the methods used: participatory observation (pg. 49); community-based participatory research (pg. 50); one-on-one semi-structured interviews (pg. 51); with a note on data analysis and language translation practices (pg. 54).

Results and Discussion is structured into four parts. With the exception of the first, each part is subsequently divided into sub-parts. Part i (pg. 56) presents data supporting the metabolic or biophysical orientations of collaborative repair work. In part ii, the socio-political and collectivised face of collaborative repair is examined vis-à-vis economic commoning (part ii.i, pg. 62), and conceptualisation of repair as 'care' (part ii.ii, pg. 67). In part iii, the specifically critical and reflective nature of repair work is highlighted. In part iii.i (pg. 74), data pertaining to activities of political economic reflection occasioned through the practice are presented, while reflections on agency through repair work are laid out in part iii.ii (pg. 80). In part iii.iii (pg. 83), discourse revolving around critical assessments of perceived needs is presented. Part iii.iv (pg. 87) illustrates how discourses of 'empowerment' express recurrent attitudes about the 'resonant' nature of collaborative repair. The fourth and final part addresses two additional discursive themes that further elaborate the fundamentally decommodifying character of collaborative repair and relate them to what we are calling a degrowth 'form of life'. Part iv.i (pg. 96) relates the work to particular non-commodified conceptions of labour/time, while in part iv.ii (pg. 103), critical use-oriented framings of the object meaning are presented and discussed, as we ask whether the figure of fetish reappears here. The study's Conclusion is then given (pg. 110).

Literature Review

i.   The quantitative case against growth:

        Metabolism and the material limits of technology

The origins of degrowth criticism can be traced to two primary "lines of thinking" (Akbulut 2021:100), with subsequent strands of scholarship reflecting the mixed conceptual heritage. A "quantitative" (99) epistemological pillar underpinning the degrowth movement rests on work that emerged during the 60s/70s era of environmental activism. The sobering projections laid out in *The Limits to Growth* report (1972)[12] helped to galvanise the burgeoning field of ecological economics. Georgescu-Roegen, with his influential *The Entropy Law and the Economic Process* (1971) and follow-up works (1986), inspired a generation of researchers seeking to ground the discipline of economics within biophysical limits imposed by 'natural', or non-human Earth systems. He referred to his pioneering work as "bioeconomics". Daly was another influential figure in the field, with his idea of "steady state economics" (Daly 1973), essentially zero-growth economics, laying important theoretical and methodological groundwork for subsequent research.[13] Since, the field of ecological economics has innovated the use of analytical concepts like 'stocks', 'sinks', 'throughput', and 'social metabolism' to apprehend flows of energy and materials in and out of the economy and the actors involved in them (see Martinez-Alier 2005; Wiedenhofer et al. 2019). "Social metabolism" refers to the overall

---

[12] The purpose of *LTG*'s work was to engage in economic, not environmental, forecasting. They modelled economic growth rates around five correlating variables (population, resource stocks, industrial production, food and pollution) and ran simulations on computers at MIT. Their conclusions were summarised by several scenarios. The "standard" or business-as-usual scenario projected a rapid decline in industrial output and food production (and population) around 2040. An "optimistic" scenario in which known resource bases are doubled, predicted initial accelerated industrialisation followed by eventual economic collapse. All roads led to Rome - in every case, growth in industrialisation led to economic decline and collapse due to depletion of natural resources in a matter of decades. (Meadows et al 1972; Bardi 2011). The environmental impacts of resource depletion are easy to infer. Just as the planet becomes no longer capable of sustaining the metabolic requirements of human society, the life-sustaining systems on which non-human species depend (water and food sources free from pollution, habitats free from destruction) are likewise compromised.

[13] Georgescu-Roegen, best known for his pioneering work *The Entropy Law and the Economic Process* (1971), sought to found a new economics, "bioeconomics", which account for economic processes as embedded within biological and physical processes as known to science. A student of Georgescu-Roegen's, Daly's landmark *Steady-State Economics* (1977) likewise engages in critique of the abstraction of economic processes on the part of neoclassical economists. He advocated for the foregoing of growth-centric policy ('enough is best') and promoted management principles that would limit economic activities to scales that would not disrupt or counteract the Earth's biophysical regenerative cycles. See Bonaiuti (2015) for a helpful summary contrasting the two economists' approaches.

throughput of energy and materials necessary to realise and reproduce a society's economy. A society's metabolism is equal to the sum total of its rates of extraction, production, distribution and consumption, as well as the scale of its infrastructures, all of which are understood as representing active and embodied ecological costs (Sorman 2015). In normative terms, only through a careful and measured downscaling of overall global metabolism, can deleterious ecological impacts be mitigated (Victor 2008). The conceptual keystone of ecological economists, metabolism has proven an essential point of reference for degrowth thinkers, with Kallis defining the movement itself as "a socially sustainable reduction of society's throughput (or metabolism)" (2011:874).

In order to know the scale of reduction necessary to live within planetary limits, one must gauge the size and shape of current economic activity as well as its trajectory. With social metabolism forming a conceptual bedrock, research in ecological economics has grappled with ways of carrying out nitty-gritty accounting, putting empirically-derived numerical values on flows, stocks and sinks of materials and energies. To this end, various methods and metrics for stock and flow accounting have been proposed by researchers to calculate the ecological costs embodied in industrial production and consumption processes. Examples include "ecological footprint" (Thornbush 2021), "exergy" (Wall 1987), "human appropriation of net primary production" (HANPP) (Erb et al. 2009), and material flow accounting (MFA) (Wiedenhofer et al. 2019). Though varying widely in their approaches, all are designed as a means of tracking and quantifying the flux of life-supporting materials and energy as they move from 'natural' ecosystems to 'human' economies as resources and circulate within society, before ultimately exiting back out of as waste. Analyses of this sort have been carried out extensively, informing research on degrowth in turn.[14]

The work of economist Tim Jackson (2009) has interrogated the link between rates of social metabolism and GDP as a means of evaluating the biophysical feasibility of so-called 'sustainable' or 'green growth' economic projects. These projects, he posits, are premised on strategies of "decoupling" aggregate economic growth (GDP) from its associated negative ecological impacts (e.g., resource depletion, CO_2 emissions, other waste accumulations). Jackson distinguishes "relative decoupling", a reduction in material and energy inputs per unit produced, from "absolute decoupling", an overall increase in productive activity accompanied by a reduction in overall ecological impact. The distinction is analytically crucial, especially given the ambitions of eco-modernisation policy to "dematerialise" economies, often through digital transition (Hickel and Kallis 2020). The analytical difference between Jackson's two "decouplings" is one that is essential in understanding degrowth's position regarding questions of technological innovation. Innovation has, and indeed could continue to be a pathway toward efficiencies in production processes, thereby achieving relative decoupling. However, there is little to no demonstrative evidence supporting assumptions that technology-related efficiency gains will continue indefinitely into the future, astride with future growth, yielding GDP increases amidst the ecosphere repair and restoration. Questions of scale are important here: specific gains in "throughput efficiency", understood as the "ratio of physical inputs to physical outputs" (Alcott 2005:9), in any given

---

[14] See Marín-Beltrán et al (2022) for a meta-study of scientific research on "anthropogenic footprint" and waste.

production process will invariably result in ecological degradation on some scale, somewhere in the world. In other words, while the appearance of dematerialisation in any given economy may occur, the ecological costs entailed by production, transport, consumption and disposal processes are only ever transferred onto other local economies, typically those of the Global South (Jiborn et al. 2018). Striving for absolute decoupling is therefore a fool's errand. Indeed, the authors of *Limits to Growth* were well aware of the fact in the 1970s despite having modelled for the mitigating effects of "technological forecasts", to little avail.[15] The position is highlighted by more recent research into the scarcity of mineral resources on which eco-modernisation proposals inevitably depend (Bihouix 2015; 2021).[16]

The concept of metabolism, applied to multi-scaled analyses, has been put to particular use in degrowth analyses regarding eco-modernisation proposals aimed at socio-ecological transformation through technological innovation (Kallis 2018). This is particularly true of the work carried out by figures associated with the Barcelona School.[17] Proposed transitions from fossil to renewable energies entail massive initial investments of minerals and energies (not to speak of labour) into new technological regimes, as well as the disposal of obsolescent infrastructures in the form of waste. This swapping of technical/metabolic regimes is thus accompanied by many social and ecological costs inherent to every step of extractive, productive, consumptive, and waste-generating processes. After its initial switching out, what are the relative advantages (less CO2 pollution) and disadvantages (more need for lithium mining) of sustaining a new technological systems' metabolic profile?[18] Viewed from any angle, questions like these demand complex and time-consuming accounting. So, while certain technological shifts may well be necessary to avert ecological and climate catastrophe, their merits are by no means self-evident and require careful study.[19] In addition, questions of scale are central. While metabolic gains and efficiencies might be experienced in certain economic or

---

[15] Bardi (2011) argues that the "technological forecasting" of the sort used to refute *LTG*'s predictions — as well as blindly support eco-modernisation proposals generally — is rooted in the speculative science fiction of mid-20th century writers such as Heinlein. Mainstream economists (notably Solow) attempting to factor technological progress into economic models followed their literary counterparts in assuming "progress grows exponentially with time" (76). Although technological progress is not an explicit variable in *LTG*'s modelling, it is indirectly inferable "in terms of its effects on other parameters" (Bardi 43), notably through the relation of input rates of resources to industrial outputs, in other words through the rate of productive efficiency. In any case, and of particular relevance to the study at hand, *LTG* noted, "When we introduce [into the model] technological developments that successfully lift some restraint to growth or avoid some collapse, the system simply grows to another limit, temporarily surpasses it, and falls back" (Meadows et al. 1972:143).

[16] Additionally, the dream of absolute decoupling also seems to be at odds with limits of social acceptability – such a technical transition and the fantastic increases in productivity necessary to realise it necessarily entail levels of automation and exploitation that labour would resist (Frey 2019).

[17] The Barcelona school refers to a collection of university researchers based in the Environmental Science and Technology Institute (ICTA) Universitat Autònoma de Barcelona (UAB) largely responsible for the popularisation of the 'degrowth' moniker within academic circles, and includes the more senior ecological economist Joan Martinez Alier, and a younger generation of inter-disciplinary scholars including Giorgos Kallis and Federico Demaria. Their work has frequently resulted in a network of collaborators, and they maintain a website for their academic association Research and Degrowth (R&D) at https://degrowth.org/

[18] See Bihouix (2015) for a critical discussion of our industrial dependance on a number of increasingly limited mineral resources. His conclusions delineate the inherently unsustainable nature of contemporary hi-tech industrial sectors.

[19] A useful tool for ecological economists and degrowthers in this context is EROI (energy returned on energy invested). Research has established approximate ratios of energy yielded per unit of input energy associated with producing energy from various sources. For instance, while coal and oil have an EROI of 50:1, renewables (solar and wind) tend to average between 10:1 and 20:1 EROI, thus embodying more per unit energy costs in their production, though they undoubtedly reduce CO2 pollution once in operation (Kallis et al 2018).

geographic production sectors, there is a good chance they are simply being offset in other industrial sectors or other parts of the world. What is key from the biophysical perspective of degrowth is that the rate of overall, net metabolism associated with economic activities be lowered in a planned, organised and equitable manner. Certain sectors, such as health care and residential water services, can and indeed must grow (especially in the global South), but "ecological space" must be created, and such costs offset, by curtailing other productive sectors (particularly in the global North) (Kallis et al 2015).

The above corpus of research, in its collective attempt to ground economic activity and its related technical infrastructures in biophysically quantifiable terms, forms an important backdrop for the present study's mandate. To begin speculating on what *technology for degrowth*, or rather *degrowth technology practice* would look like, it must first be acknowledged that a defining feature must be its capacity to enable *net reductions* in metabolic throughput. This constitutes the most basic criterion for degrowth technology (practices). The mistake – one guiding political and economic policy for most of the 20th century and into the present day under the guise of "green growth theory" (Hickel and Kallis 2020:469) – is to orient technical development toward achieving economic growth as an end in itself.[20] This observation lies at the very core of degrowth critique: conceived as a means of achieving overall economic growth, *technology for growth* is always already destined to fail in delivering society from spiralling ecological and environmental disaster. Positions holding to the contrary are rooted in "belief" rather than empiricism (Grunwald 2018). The degrowth position here is clear, while technological innovation — of certain types, on certain contained scales — do appear likely to play a role in socio-ecological transitions (Ibid), their metabolic implications must always be assessed with precaution. Degrowth technological normativity must therefore always operate with a heuristic of *techno-scepticism*, akin to what Garcia et al. have termed "methodological Luddism" (2018).

ii.   Technological innovation and the social:

        Rebound, lock-in and socio-technical regimes

Though the metabolic implications of technology are expressible in biophysical terms, lending it to certain forms of analytical quantification as outlined in the previous section, technology has impacts that exceed the strictly material. Adhering to a strictly quantitative analysis of economies and their associated technological systems without recognising the socio-cultural and behavioural dynamics at play is a mistake. This perspective is widely held amongst degrowthers (Likavčan and Scholz-Wäckerle 2018). Building on scholarly traditions sourced in the works of Marx,

---

[20] The Québec government's *Plan pour one économie verte 2030* (Québec 2020) is exemplary of a green growth approach that envisions a synthesis of the goals of climate change mitigation and those of sustained economic growth. The *Plan* proposes a multi-scale industrial transition away from hydrocarbons, seeking to further, and ambitiously, build up hydroelectric energy generation and storage. It further promotes the cultivation of a gamut of complimentary, electrically-based consumer goods industries in the optimistic spirit of robust economic growth.

Veblen and Schumepeter, there is a recognition throughout degrowth scholarship that technical and socio-economic regimes are interdependent and "exogenously co-evolving" (1666). The work of classical economist Stanley Jevons is often cited in this context. During the industrial revolution, Jevons made the empirical observation that gains in the mechanical efficiency of coal combustion engines were invariably followed by overall increases in industrial coal use. Known today as the Jevons paradox, it describes an empirically observable phenomenon whereby technological innovations that enhance efficient use of input resources in production, and thus render production processes cheaper, have the eventual effect of increasing net demand for the very same resources. The result is a 'rebound' in overall consumption despite gains in production efficiency (Alcott 2005; Polimeni and Polimeni 2006; Sorrell 2009). The concept has been applied and tested in other research scenarios. For instance, Magee and Devezas' (2017) research into the presumed "dematerialisation" of Global North post-war production trends concludes that there is simply none to be observed. Gains in "materials efficiency" (198) have been outstripped by rebounds in production due to "demand elasticity" (199). It is thus demonstrated that demand is neither static, given nor exogenous, and always subject to modulations in the scaling of production and its impacts on commodity price and accessibility.

Some economic research has focused on applying the notion of 'rebound effects' to studies of consumer behaviour. In their study of Norwegian households, Winther and Wilhite observed that households' savings in heating expenditures due to the adoption of more energy-efficient systems, were either reinvested into heating more interior space more often ("direct rebound") or used to finance other consumption activities like travelling or purchasing more commodities ("indirect rebound") (2015). Their conclusions echo a foundational assertion for ecological economists, and one that degrowth has adopted in its own research methodology: namely, that production and consumption phases are always mutually generative. Their impacts can never be examined independently. Distribution and disposal phases are of equal importance in this regard (Martinez-Alier 2005). Social, cultural and psychological factors must therefore always be considered when accounting for the metabolic implications of technical infrastructures and their associated practices.

Of fundamental interest to any emergent degrowth theory of technology is the insight that while people produce technologies, technologies equally produce people. They modulate behaviour, shifting patterns of time and material use, and impacting in turn the terrestrial systems on which our subsistence depends. Technologies are also the co-generative products of socially symbolic valuations: they are equally products of our minds, as well as their mirrors. With keen attention to both the interpenetrating nature of production and consumption processes on the one hand (Røpke 2015), as well as the co-evolution of social and technology practices and institutions, some researchers in the domain of society and technology studies (STS) have proposed talking about "socio-technical regimes" as hybrid "ensembles" (Bijker 1995). The holistic framing and subsequent methodology encompass both the social (institutionalised relations between people) and technological (institutionalised relations between people and artefacts) as non-deterministic and mutually conditioning.

While Bijker's work was conceived primarily to examine socio-technological change in historical terms, other contemporary research has focused on the ways in which socio-technical structures interact with ecology, constituting what Pichler et al. have termed the "societal drivers of society-nature relations" (Pichler et al 2017). The framing contrasts with STS perspectives that emphasise the fluid and evolving nature of socio-technical regimes. It sees such structures as particularly *resistant to change*. Borrowed from the fields of engineering and applied sciences, the idea of "technological lock-in" describes how social practice becomes dependent on technologies, the latter exerting inertia-like "path dependencies" on existing and established institutions of design, production, distribution, consumption and disposal (Liebowitz and Margolis 1995). They are thus tied up with the complicities and vested interests of economic, political and socio-cultural institutions in complex and interpenetrating ways. Lock-ins persist despite continually resulting in "market failures" (Bowles, 1991) and "negative externalities" of many types (Bromley 1986), to borrow neoclassical economic euphemisms for unintended side-effects. The side-effects of modern techno-industrial society are varied and well-documented and include car traffic (Gorz 1973), mining sector pollution (Bihouix 2021), rising inequalities despite commodity abundance (Victor 2019), and skyrocketing levels of waste (Marín-Beltrán 2022), to name only a few. Questions of political ecology are crucial here too: the burdens imposed on the globe by such perverse effects are most frequently distributed in those parts inhabited by the world's poor (Martinez-Alier 2005). From this view, while individual actors must be seen as having differential access to political power, and thus be more or less vulnerable to the negative effects of technical infrastructures, a socio-technical perspective also implies that there can be no full independence from the constraints imposed the hegemony of dominant socio-technical regimes.

In areas of design research, there has been advocacy for a "life-cycle assessment" (LCA) approach in assessing the ecological impacts of commodities and infrastructures, attempting to trace "from cradle to grave" the flow of materials through production, use/performance and waste stages (Marique and Rossi 2018). Still others have mobilised the concepts such as "cradle to cradle", "upcycling" and "circular economies" to describe efforts aimed at minimising the flow of resources into economies through a combination of design principles, and material reuse/recycling strategies (McDonough and Braungart 2002). While yielding insight, such research has tended to adopt strictly metabolic approaches and are often under-theorised in terms of recognising the social embeddedness of technologies and artefacts. In contrast, and working within a degrowth framework, Lizarralde and Tyl (2018) focus specifically on the ecological and social ramifications of decisions made in contemporary product design processes. They delineate five trends in design that violate or threaten the "conviviality" principle (Illich 1973): "biological degradation of the ecosystem, radical monopoly, over-programming, polarization and obsolescence" (Lizarralde and Tyl 2018:1775). They outline a degrowth design practice that would be convivial insofar as it promotes positive ecological *and* social outcomes: "The balance between human activities and integrity of the biosphere, balance between native capacity and institutionalisation, balance between formal education and authentic learning processes, balance in the division of power, and balance between the respect of tradition and its obsolescence" (2018:1775-1776).

The common denominator in the above surveyed research is the insistence that social, cultural and psychological factors must be considered when accounting for the metabolic implications of socio-technical regimes and their associated "technomass" (Hornborg 2001). 'Rebound' and 'lock-in' are epiphenomena inherent to production and consumption processes. They are both rooted in eminently social determinations in unique ways. 'Rebound' relates to the concept of demand elasticity, which in turn impacts consumer behaviour regarding the adoption of technical innovation. These issues have everything to do with socio-cultural and behavioural factors. 'Lock-in' captures the myriad imbrications of institutional, industrial and cultural forms that contribute to the composition of economic activities. Thinking in terms of "socio-technical regimes" and "socio-technical transitions" would seem very useful for a nascent degrowth theory of technology (Grunwald 2018). In critically examining the interaction between people, manufactured artefacts, and larger bioeconomies in which all are embedded, the biophysical *and* social impacts of technologies can be studied as they unfold in both space and time. From there, patterns of rebounds and lock-ins — industrial, institutional, cultural — can be identified and scrutinised for their effects, just as new normative practices to mitigate them can be proposed. A central question remains: what features would define post- or degrowth socio-technological regimes? Looking back to Abraham's triple imperative, it would be a regime built upon technologies whose features would: a) contribute to a metabolic reduction of overall production; b) enable a more equitable redistribution of resources, goods and services; c) cultivate processes for informed and deliberative decision-making regarding technology. Lastly, the literature reviewed in this section underlines the fact that degrowth technology normativity implies something other than just centralised and technocratic-based solutions. It also implies critical reflection on the part of subjects, and a move toward politicisation of technology practice as it bears on economic processes on multiple scales.

iii.   The qualitative case against growth:

Alienation, autonomy and (technological) democracy

The degrowth movement has equally coalesced around a second line of thinking based on a "qualitative" rebuttal of growth-oriented society (Akbulut 2021). Here, growth is rejected not solely on the grounds of its impossibility, but also on its undesirability (Kallis et al. 2015). While economic growth in the form of increased personal income has been conventionally linked with increases in human happiness, with per capita GDP emerging as standard proxy in indexing both individual and community well-being,[21] there exists alternative veins of economic research that have sought to refute such assumptions. Issuing from heterodox economic approaches, certain research projects have highlighted empirically observable phenomena that cast doubt on the desirability of economic growth.

---

[21] This economistic formulation is based on neoclassical assumptions of the "optimising individual" (Fine 2016:4) and packaged as 'rational choice theory' of human behaviour.

For instance, while initial fluctuations in income can be closely linked to reported happiness, there is no medium- or long-term correlation between the two (Sekulova 2013). Much research has likewise demonstrated that beyond a certain threshold of basic material security, per capita GDP increases do not correspond to either reported happiness (Victor 2019) or health outcomes (Fanning and O'Neill 2019).[22] Other critics have gone further still, linking 'excess' economic growth (that is, beyond a modest threshold) with a degradation of "social capital" (Costanza et al 2013). They point to a general erosion of meaningful relationships of solidarity, as well as individuals' mental health, as observable amidst the increasingly competitive economic conditions of neoliberalised industrial society (Ibid).[23] The homogenisation of cultural practice—of language, ritual, skills—can easily be added to the list of 'collateral damages' associated with economic development (Latouche 1996). Degrowth inquiries into these areas, in their interrogations of notions of happiness, satisfaction and the good life, are crucial in demonstrating that the 'side-effects' (not to mention the intended ones) of economic growth are indeed as social as they are biophysical.

This qualitative rationale underpinning the degrowth proposal is accompanied by the assertion that only through a democratically organised contraction of capitalist economic activity, will individuals and societies be able to thrive on more emancipatory and equitable terms (Akbulut 2021). The logic is derived via a heterogeneous intellectual heritage ultimately traceable to Marx's theorisation of the four forms of 'estrangement',[24] or alienation, that working subjects experience under capitalism: 1) from the products of their labour and from nature; 2) from the labour process; 3) from their 'species being' or 'selves'; and 4) from other workers (Marx 1959; Barca 2019).[25] In other words, the 'alienation' concept, from its philosophical sources, is *multiscalar*. It is a condition experienced *at once* as disempowerment on the level of global socio-economic forces, and a loss of meaning on the level of internal, phenomenal lived experience (Jaeggi 2014). It concerns one's relation to the larger world as much as to one's self.

---

[22] This empirical generalisation is known as the 'Easterlin Paradox' and is associated with the work of economist Richard Easterlin (1974).

[23] Related work has instead focused on the rate of economic inequality across a society as most causally connected to its observable/ reported happiness. Here, two concepts are key here: first, dynamics of "social comparison" (with its perceived injustices, contempt, etc) are evoked as a way of understanding how material inequalities play out in communities and undermine social cohesion. The higher the level of socio-economic inequality, the greater the rate of social comparison amongst individuals. Second, "hedonic adaptation" is the tendency for an individual's derived pleasure to be elastic and relative to available means of satisfaction. It also means people quickly habituate to higher income levels, quickly 'reverting' to a level of satisfaction similar to that which they experienced previously (Sekulova 2013). Easterlin observes the tendency to hedonistically adapt to be particularly at play in pecuniary (e.g., making more money, eating better/more food), rather than non-pecuniary (e.g., finding a life partner) domains (Easterlin 2003). The higher incomes promised by economic growth are therefore perhaps not as efficient at delivering satisfaction as rationalising neoclassical economists would have you think. These insights are very much relevant to discussions seeking to build up a theory of human needs.

[24] Marx's uses the terms "*Entfremdung*" and "*Entäusserung*" more or less interchangeably, traditionally translated as 'estrangement' and 'alienation' respectively (Marx 1959). Following 20th-century custom, 'alienation' is preferred in the present study, though 'estrangement' is used intermittently in reference to Marx's original formulation. The difference between the two is understood here as being a stylistic one.

[25] Marx's work focused almost exclusively on examining the processes of capitalist production. Subjects are thus seen as either 'labourers' or 'capitalists' according to their structural positions. His estrangements thus relate to *production processes* under capitalism. The present study rests in part on a base assumption that his four alienations are likewise applicable to *consumption* (perhaps even *waste*?) processes as well. While not elaborated further here, the point is worth keeping in mind.

There is common critical heritage here with other 'autonomist' Marxist thought as exemplified in the works of eco-socialist visionary André Gorz. Credited with coining the word "*décroissance*" in 1972, Gorz is considered a pivotal figure in the formation of degrowth thought (Demaria et al 2013; Akbulut 2021). His interrogations, at once social, ecological and political, entail a critical approach that rests on themes of Marxian alienation, as much as he rejected Marxist orthodoxy. Gorz's critique of actually existing socialism—e.g. centralised, productivist state economism; the dehumanising effects of industrial work for human subjectivities (1994)—undercut a simple faith in utopian visions of a Marxist State. United in their pursuit of economic growth as a means of liberation, socialist and capitalist states are carry out similar projects with comparably dismal ecological and social alienating effects (Vandeventer & Lloveras 2021). Among Gorz's many insights is the recognition that socialist projects organised around the achievement of economic growth are destined to fail in their aim to deliver social emancipation.

Gorz is perhaps best known as an ardent critic of the capitalist wage-labour system and active advocate for a reduction of the work week. The idea has been since adopted by degrowth as an essential strategic component in the effort to achieve several goals: to downscale economic activity for ecological ends (Kallis 2011; Paech 2016; Lange 2018); to free individuals to engage in more sustainable patterns of self-provisioning (Cattaneo and Gavaldá 2010); and free people to participate more meaningfully in democratic processes (Demaria et al. 2013; Castoriadis 1987). Aversion to conventional wage-labour systems resonates throughout the degrowth proposal, inspiring one of the movement's recognised mantras, "*sortir de l'économie*" (Latouche and Jappe 2015; Fournier 2008). On the level of practice, the call here is for a collective 'turning away' from the monetised economy insofar as possible. It also signals the need to redirect the collective imaginary away from prevailing 'economism', modernity's operational logic that reduces the collective social 'good' to economic aspirations and justifications (Latouche 2005).[26] Such a line of critique is neither new nor unique to degrowth research, and is echoed throughout recurrent debates in critical development studies that contest the legitimacy of GDP as a proxy measure for collective welfare.[27]

It is the work of another social philosopher that has proven vital in relating Marxian notions of alienation and autonomy to one another, and in understanding the special consideration they are afforded within degrowth thought. Castoriadis conceived of "autonomy", that is the legislating and enforcing of one's own rules, as a profoundly collective and democratic process. He opposed it to "heteronomy", the naming and imposing of rules upon a people by outside actors (Castoriadis 1987). For Castoriadis it is *institutions*, defined as "the arrangements and procedures that will permit discussion and choice" (113), that are absolutely central. It is collective relations vis-à-vis such institutions

---

[26] The field of development studies has featured similar debates concerning the nature of human welfare, the biased approaches used to evaluate it, as well as culturally-bound conceptions of progress that underpin them. It perhaps comes as no surprise that the life work of economist Serge Latouche, a figure central to the emergence of *décroissance* in 2000s France, involved the critical examination of international development orthodoxy, the neo-colonial face of globalisation, and the cult of economism in general (see Latouche 1996).

[27] See Verma (2017) for a discussion of Bhutan's *post-economistic* and innovative Gross National Happiness (GNH) index and its underlying methodologies from a degrowth perspective.

that determine a society's relative autonomy or heteronomy, effectively two sides of the same coin. Building on more contemporary work in social philosophy, the present study seeks to clear a conceptual path to link Castoriadis' 'heteronomy' with a more expansive notion of alienation. The present study adopts Jaeggi's perspective here: "[A]lienation refers at once to both heteronomy—having one's properties determined by an other—and the complete absence of essential properties or purposes; moreover, it seems to be one of the main points of the phenomenon described as alienation that in it these two problems—power's being turned into impotence and the loss of meaningful involvement in the world—are intertwined" (2014:104-5). 'Heteronomy' alone, considered here as roughly equivalent to 'self-determination', does not entail that second aspect—the dearth of meaning, or meaning-making opportunities—that 'alienation' expresses. So while Castoriadis' notion of heteronomy can, according to Jaeggi, be accounted for as an aspect in an over-arching idea of 'alienation', the later is not true.

If the degrowth vision of autonomy sketched out here involves symbolic disengagement with economistic imaginaries and practical withdrawal from alienating labour institutions, such abnegations must necessarily be accompanied by forms of voluntary simplicity or self-limitation (Alexander 2015). This does not mean reverting to individualistic environmentalism either. The needs and capacities of individuals to invest time and energy into ecologically-minded transformation varies widely, most obviously along socio-economic lines. Rather, degrowth proposes cultivating shared notions of material limitation and sufficiency, what has elsewhere been called "collectively-defined societal boundaries" (Brand et al. 2021), framing economic activity within large-scale biophysical limits and processes.[28] This means experimenting with novel or alternative, democratically-inclined processes as well as building up the institutions to support them. As hypothesised throughout degrowth scholarship, incremental disengagement from economistic pursuits—less time spent in wage-work; more time invested in self-provisioning, subsistence production, or direct barter, for instance—can lead to increased involvement in less material-heavy, and perhaps more meaningful, social and political engagement (Alexander 2015; Lawhon and McCreary 2020). Even more generally, subjective self-limitation vis-à-vis the Other is the basic and necessary precondition for democracy itself, according to Castoriadis (1987). The conclusion is central to degrowth thought: the socio-ecological imperatives of autonomy, democracy and "dealienation" (Brownhill et al 2012; Barca 2019; Akbulut 2021) can only be resolved through an emergence of norms and institutions founded on collectively-defined self-limitation, echoing Gorz's vision of "a self-limitation of needs experienced as a reconquest of autonomy" (1994:12).

iv. Defining degrowth political economy:

Social reproduction, anti-utilitarian ethics, care ethics, and the commons

---

[28] A group of researchers, many of them associated with degrowth, have suggested discussing "societal boundaries" as a means of emphasising the profoundly social and cultural nature of grow-centric institutions (Brand et al 2021). In their formulation, consensus-building political processes can help arrive at generally accepted notions of collective self-limitation.

Marx's contribution of a theory of value to describe the capitalist mode of production laid the groundwork for a generation of autonomist scholars who founded the field of feminist economics in 1970s Europe. His interpenetrating, yet distinct forms of valuation as outlined in *Capital*—use-value, exchange-value, and (socially-necessary labour) value (Marx 1976; Harvey 2018)—lay bare the inherent tensions and contradictions of capitalism generally, and lent the theoretical basis for a feminist critique of gender-based, socio-economic inequality. The work of Fortunati (1995), Federici (2012; 2019) and Mellor (1997) is grounded in the fundamental distinction between economic activity within the sphere of *capitalist production*—the production of commodities destined for market exchange and famously captured in Marx's M-C-M' cycle[29]—and those activities of *social reproduction,* the sustaining of basic needs through either self-provisioning or engagement in non-remunerated, informal exchanges of labour. It is the labours of social reproduction—the raising of children, care-giving, maintenance of hearth and home, gardening, etc.—which are ultimately responsible for sustaining the most fundamental needs of households, and thus constitute the material (and emotional) bedrock supporting all social, economic and political institutions.

Feminist economists' insight is that the origins of gender-based socio-economic domination reside in the very fact that while capitally productive labour is symbolically privileged and materially valorised within capitalist society, and traditionally carried out by men, it is socially reproductive labour that is ultimately responsible for sustaining the very conditions of possibility for capitalist production and accumulation in the first place. Typically done by women in private, domestic settings, social reproduction on the other hand remains largely unrecognised and undervalued in public perception, and virtually invisible to orthodox economists (Fortunati 1995; Federici 2012; Mellor 1997).[30] While capitalist production aims at the creation of *exchange-values*—it seeks returns in the form of money, the universal and exogenous currency of exchange—social reproduction is concerned with procuring, preserving and harnessing endogenous *use-values*, which by definition are as diverse and idiosyncratic as specific 'consumers' themselves.[31] Of particular interest to degrowth research, it has been demonstrated that unpaid, non-market-oriented work activity, corresponding to social reproductive labour, is associated with lower rates of energy consumption, while the

---

[29] In Marx's formulation, the *modus operandi* of capitalist production is best captured in continuous, cyclical processes of money (M) being converted into commodities through production processes (C), which are then in turn sold on the market and thus converted back into profits in the form of money (M') (1976). At this point, the cycle starts anew. Capital accumulation, the essential expansionary feature of capitalism as a mode of production, occurs via the reinvestment of a portion of value surplus gained through the sale of commodities back into production processes themselves (hence ever-growing amounts of M).

[30] In a related vein, the work of ecofeminists has developed the critique that capitalism's systematic devaluation of female lives, and the labours traditionally associated with them, are mirrored in an equal devaluation of nature and its labouring agents (Perkins et al. 2005). For a specifically eco-feminist take on the value of "auto-production", "subsistence", and socially reproductive labour, see Pruvost (2019).

[31] Returning to Marx's M-C-M' schema, there are two insights that are key for the present study: under capitalism, the ultimate goal of exchange-value ($) is to be invested into production in order to see itself increase ('money seeking out money'); this means production is thus aimed at producing goods for sale, rather than use. In this way, capitalism operates under an expansionary (growth) logic of exchange-value creation. Conversely, one could define the degrowth proposal(s) as aimed at favouring the creation of *use-value* within a logic of *sufficiency* and subsistence.

commodification and marketisation of such work is accompanied by intensifications of energy requirements (Cogoy 1995; D'Alisa and Cattaneo 2013).

Anti-utilitarian critiques within economics, as well as the social sciences more generally, have sought to challenge neoclassical economic assumptions about the narrowly-defined 'rational' agent, emphasising instead the indelible social embeddedness and symbolic import of economic activities (Polanyi 2001; Caillé 2020). This critical work turns its attention to the interdependencies between individuals, communities and institutional structures, between human, non-human, symbolic and material worlds. In insisting on the socially-rooted, anti-utilitarian nature of all economic subjectivity (Romano 2015), modern ideals of a self-interested, independent (typically male) economic actor are reversed. In their place, entirely different visions of autonomous and dealienated subjectivities are proposed, defined by "a sense of self that includes a conscious recognition of the relationships that bind us to life" (Deriu 2015:55). No longer atomised or alienated from the Other, but rather engaged in institutions of mutual influence and dependence, the new anti-utilitarian economic subject is also necessarily a political one.

Taken together, these radical departures from both utilitarian economic paradigms and bourgeois-liberal political imaginaries are foundational to degrowth and its proposal of a social, political and economic normativity based on an ethics of 'care' (D'Alisa et al. 2015). Here the cue is taken from feminist political theory scholars who have forwarded the paradigm of care in order to reframe the end goals of social and economic policy around principles of equity, differential needs and mutual aid (Gilligan 1993; Tronto 1993). While the social motivations for the care imperative appear self-evident, the ecological implications of a turn to care-based economics are perhaps less so. Care work is inherently time-intensive, and thus inherently resistant to "the call for rationalization" and other efficiency pressures that accompany marketisation (Bauhardt 2014:61). This makes care work an ideal site for the "decommodification" and "commonization" of economic life on the one hand, along with the positive ecological outcomes associated with market withdrawal on the other. *Care* thus offers an effective normative template for post-growth "socio-ecological provisioning" (Dengler and Lang 2022).[32] This is echoed in degrowth's calls for the establishment of universal basic/care incomes, in addition to work-reduction and/or work-sharing schemes (Victor 2010; Kallis 2011) as means of gradually transitioning away from private-sector wage work and towards less ecologically costly modes of self-provisioning for fundamentals like food, clothing, shelter, etc.[33]

If it is admitted that socially reproductive labour comprises the essential and necessary work of maintaining households on domestic scales, how are we to conceptualise the nature of socio-economic institutions that cut across

---

[32] The projection of care work as the central paradigm governing post- or degrowth economies is not without its challenges however: under market conditions, such a transition carries the risk of multiplying the burdens imposed on the female and/or racialized labourers who traditionally make up this sector (Bauhardt 2014; see also Hanaček et al. 2020).

[33] For a study and detailed discussion of the correlation between remunerated working hours and "environmental pressures", see Knight et al. 2013. Their work links, on the one hand, both the increased economic output and consumption activities associated with remunerated labour, with greater ecological footprints, carbon footprints and carbon dioxide emissions. They conclude that a reduction in paid working hours would significantly reduce such environmental pressures.

and between households? If domestic, socially reproductive labour, sovereign from direct mediation by both market and state, embodies *de facto* anti-capitalist ethos, how could such activities be scaled up to larger community levels? Amidst a desire to articulate more socially equitable and ecological sustainable economies in concrete terms, the notion of "commons" has emerged as another guiding paradigm in speculations about what degrowth economic institutional normativity could look like (Helfrich and Bollier 2015). Generally speaking, a commons is any collectively held and self-managed resource or service wherein stakeholders are *simultaneously producers and consumers* (Akbulut 2017; Abraham 2019). They are, by definition, regimes of *use* rather than regimes of property, and thus stand in contrast to both institutionalised forms of accessibility represented by private property and the market on one hand, and by the centralised state on the other.

Again within a largely Marxian theoretical frame, researchers here point to the long and rich history of 'the commons' as a mode of economic organisation that has sustained autonomous and self-determined communities since time immemorial, but which has been marginalised due to historic processes of "enclosure" that appropriate nature, resources and cultural knowledge within private and state property regimes (see Bellamy Foster 2021; Federici 2014). In much more empirically-oriented body of work, Ostrom's Nobel-winning research has highlighted the nature of contemporary, actually-existing commons ("common-pool resource") regimes, delineating the eight principles on which successful and enduring collectivised resource-use management institutions are founded (Ostrom 2015). While Ostrom's analysis is limited with respect to its critical treatment of political matters of state coercion and socio-economic power distribution, her extensive, site-specific empirical observations have influenced degrowth thought insofar as it offers templates for "the conditions in which self-management can thrive" (Helfrich and Bollier 2015:77). In more recent work, others have extended the commons paradigm to the digital realm (Birkinbine 2018; Papadimitropoulos 2021), seeing in it new possibilities for decentralised patterns of "distributed production" (Kostakis et al. 2018), a useful notion in approaching subsistence repair.

v.   Research on repair:

Phenomenology, methodology, ethnography

Previously subject to academic neglect, scholars have recently demonstrated an increased interest in repair (Graziano and Trogel 2019). Notable work has been undertaken across the social sciences—by sociologists, anthropologists, media and 'sustainability' scholars alike—seeking to ground repair, as well as DIY or "maker" cultures, within political, economic, social and ecological contexts. Their methodological approaches and framings vary as much as the particular empirical settings in which they are set. However, they tend to grapple with several interrelated themes surrounding technical and labour-based materiality on the one hand, and of the meaning of objects/

materials and 'work' on the other. A first strain of research focuses on the phenomenological character of repair. Dant's (2010) comparative study contrasts the industrial work of car manufacture with that of car repair. Following Marx, he considers the latter distinctly "artisanal" insofar as it involves a more "complex repertoire of gestures, a variable emotional tone and the gathering of sensual knowledge" (2010:97) when compared to the more repetitive and often automated work of industrial manufacturing. Bozkurt and Cohen (2019) trace the training and apprenticeship of vintage car repairers and restorers, highlighting the central themes of "object-love" (2019:1108), the valorisation of craft-work, and the longings for 'authenticity' that run throughout their practice. Focusing on DIY and Maker-culture, Snake-Beings (2018) proposes we think of "techno-animism" as a way to understand the "component of agency" (121) inherent in material artefacts themselves as they pass in and out of recuperation, reuse and remaking phases in non-commodified, distributed (re)production. The insights of these studies are relevant when looking at collaborative repair. Marxian leitmotifs of alienation and fetish, while not directly addressed in their projects, lay just under the surface of these research inquiries.

Other scattered, yet important contributions to repair scholarship have emerged across disciplines. They share in a quality of tone insofar as they insist on the need for more research into repair. Media and communications scholar Steven Jackson's seminal essay "Rethinking repair" (Jackson 2014) challenged fellow researchers in his elaboration of the theoretical stakes of a proposed *repair studies*. He proposes a generalised methodological approach of "broken world thinking" (2014:221). Here researchers' focus on design and production processes, their "productivist bias", is challenged by emphasising instead, the ways in which people recuperate, maintain and repurpose their material worlds. For Jackson, repair constitutes "subtle acts of care by which order and meaning in complex sociotechnical systems are maintained and transformed, human value is preserved and extended, and the complicated work of fitting to the varied circumstances of organisations, systems, and lives is accomplished" (222). Though his work is predominantly focused on what I have called 'the symbolic', he acknowledges the potential for repair research to bridge across to more quantitatively-based "sustainability studies" (235). The present study, in similar spirit, originates in a desire to 'bridge' the material and the meaningful.

Subsequent research has picked up where Jackson left off, seeking to frame repair as 'care work' in the feminist tradition. Meissner (2021) calls upon the social reproduction themes of "care economy" and "care work" to her sociological study undertaken at Repair Cafés in Germany, and seeks to interrogate the suitability of these analytical constructs with an eye to building up a transdisciplinary sustainability studies. Her study focuses on how repair shapes relations between people on the one hand, and between people and objects on the other. As an act of caring, repair is seen here as a practice whereby the love one has for the biophysical world is expressed and channelled into material praxis. Her research participants' positioning vis-a-vis the "ecological crisis" is furthermore linked to the "social crisis" of global inequality through their practice of repair. Repair thus becomes "a transformative practice for the restructuring of externalisation societies" (4). Crucially, Meissner also describes the potential limitations of repair work

—specifically, how gendered hierarchies are often reproduced in repair spaces (see also Rosner 2014); and how repair cultures can be in "danger" of resembling instances of "lifestyle movement" depoliticisation (3). In a related vein, Graziano and Trogel (2019) set their sights on the "politics of repair" as a "regime of practice that fosters the imagining of alternative social scenarios, where different relations between human, non-human and more-than-human actors become possible" (205). Their edited volume of *ephemera* unites the efforts of scholars in political economy, architecture, communication and media studies, and attempts to build upon an emergent body of "repair studies" (204). They reach out to traditions of "materialist politics —feminist interrogations of social reproduction; questionings of capitalist valuation structures—that could be relevant to the fledgling field of research (2019). Benedikt Schmid's (2019) contribution in the same volume frames repair as "work" for a "post-capitalist future", contrasting it with the labour practices of capitalist value creation. His ethnographic research within repair communities in Stuttgart provides an important example for the present study.

While recent repair research has been carried out in various contexts, of primary importance to the present study are those done in non-commercial "collective" (Meissner 2021:1) or "collaborative" (Hielscher and Jaeger-Erben 2021:2) settings. In these spaces, tools and knowledge are freely shared amongst organisers and participants. Media studies scholar Kannengeisser (2018) has detailed the rise, from its inception in Amsterdam in 2009, of the Repair Café movement as a manifestation of "consumer-critical practice" that explicitly aims to reduce material-energy throughput by extending the lives of information and communication technology (ICT) devices. In Repair Cafés, collaboration manifests in the commoning of material (tools, parts), non-material (knowledge, skills) and spatial (workshop) means necessary for carrying out repair. The perspectives these studies offer are certainly relevant to currents within degrowth research and politics that seek to interrogate patterns of material consumption in the Global North and propose new forms of "collaborative consumption" (Dewberry et al. 2016). With very few exceptions (see Rosner 2004; Houston et al. 2016), this research has been confined to Western Europe, almost entirely in Germany, and well outside North American contexts. Just recently Coderre Porras (2022) has engaged in a distinctly policy-oriented study of Quebec-based Repair Cafés as a means of formulating recommendations aimed at garnering government support for initiatives. Finally, the Montreal-based environmental non-profit *Équiterre* (2022) has also recently published the findings of a survey-based study into repair practices across Canada, with specific focus on questions of obsolescence and access to commercial repair services.

Die Welt reparieren (The World Repaired) (Baier et al. 2016)*,* an edited volume of field research carried out by German sociologists, adopts a particularly activist tone, calling for a "repair society" on three distinct grounds: to achieve ecologically sustainable production and consumption; to cultivate citizens' technological "maturity"; and to engender "social conviviality" (Bertling and Leggewie 2016:277). The authors further highlight the historic divergence of industrial manufacturing sectors from what now remains of skeletal niche sectors of commercial repair. They see the divergence away from industrial, in-house repair customer-service departments as responsible for an overall decline in

product repairability (Bertling and Leggewie 2016). Decline in reparability has been explained elsewhere along more nefarious lines, with design strategies of "planned" or "programmed" obsolescence functioning to drive up the rates of goods replacement, at the expense of repair, amongst consumers (Dewberry et al. 2016). Similarly, another contribution form the emergent field of German repair studies is Hielscher and Jaeger-Erben's framing of collaborative repair as an instance of "resisting" (2019:1) the programmed obsolescence designed into consumer commodities under capitalist production regimes. These ethnographic studies of collaborative repair offer important examples in terms of their methodological and analytical orientations to non-commodified repair.

vi.   Outlining a degrowth theory of technology:

Technē, tech 'neutralization' and conviviality

The very notion of technology itself—what it encompasses and implies—has been the subject of much debate for centuries. Etymologically, the ancient Hellenic *technē* referred specifically to a skilled gesture, manipulation or 'art' in wielding a tool (Vioulac 2018), thus corresponding much more to the current usage of "technique" than "technology" in the English language. In turn, *technē* is derived from an even earlier Greek *mēchano*, meaning "ruse", "trick" or "ingenious intervention" (Vioulac 2018:222) and emphasises the aspect of mental cunning. When combined with the suffix *logos*, one arrives at *technologos*, the systematic organisation of *technē*, or the ordering of artful thought and skilled manipulation of the material world towards a given end (Drengson 1995). For his part, Heidegger conceived of technology as an "enframing" (*Ge-stell*): a literal window onto the world insofar as we are capable of apprehending it; a means by which reality is revealed to us by way of mediated, material processes (Heidegger 1977; Heikkurinen 2018). The point here is to convey the depth and nuance of technology's conceptual genealogy. It is one that stresses technology's imbrications with the psycho-social and the cultural, and challenges the contemporary, *metonymic* (and fetishised) shading of technology as simply a physical artefact, device or singular machine. Regardless of the various approaches adopted in trying to apprehend it—technology as tool vs. machine; technology as *savoir-faire*; technology as phenomenological experience; technology as social regime—technology remains regardless an interface and point of contact between social, economic, symbolic and ecological worlds.

Marx, in his quest to build up a comprehensive theory of both capitalist production and historical materialism, offered invaluable insight into the nature and function of technology. According to him, innovations in production technology ("fixed capital")—which, along with land, facilities and raw materials comprise the "means of production"—are a structural necessity for sustaining accumulation under the capitalist mode of production (Marx 1976). Indeed, "perpetual revolutions" (Harvey 2018:103) of technological innovation are seen as essential in achieving two of the capitalists' goals: to reduce reliance on costly labour inputs through increased automation, thereby gaining

an upper hand in inter-class conflicts; and to out-compete other industrial manufacturers in the race to minimise per-unit production costs, thereby maximising their own production of surplus value (Harvey 2018). What is surprising in Marx's admittedly underdeveloped theory of technology is the hope he held out for its potential to serve the future socialist revolution. Following Feenberg's typology (1999), Marx's conception of technology is "deterministic" in that he understands it to be at once "autonomous", following an inevitable path onwards and upwards towards self-development, elaboration and complexity, and "neutral" insofar as it represents only a means, without a necessary end, available to be harnessed by either by the forces of capitalist accumulation or worker communism (Feenberg 1999:9). Thus, traditional Marxist thought, as much as modern-day techno-optimist "instrumentalism", is guilty of the "neutralization of technology" (Feenberg 1999:2) as a pure means, independent of the biophysical or social ends toward which it is oriented, and thus devoid of any inherent or substantive value.

Several influential critics of modern, techno-scientific society have taken up different positions with respect to Marx determinism. They have generally questioned the purported neutrality of technology and sought to foreground the unintended impacts that innovation-driven, specialist-led techno-scientific management has had on our socio-cultural, political, even spiritual, lives. The theme of human autonomy re-emerges as central throughout this body of *techno-sceptic* scholarship, with the expansion of ever-more-complex technological systems cast as perpetually undermining human autonomy. Mumford's "technics" is used to describe the totality of civilisation's "megamachine", an expansionary project stretching back millennia and responsible for social stratification and the overall estrangement of humanity from the non-human, biophysical world (Mumford, 1967). Anders' appraisal that technologically-driven society is leading inevitably toward the "obsolescence of humanity" is equally pessimistic (Anders 2011). On the other hand, Ellul's critical theory is somewhat less essentialist and more fine-tuned. For him, "the technological bluff" (Ellul 1990) is the misled belief that technological progress will *solve* humanities' problems: technical solutions only ever *displace* problems to other times, places and peoples. All technological progress thus carries a price, "its harmful effects are inseparable from its beneficial effects", and "it has a great number of unforeseen effects" (Ellul 1990:39). Such a sceptical perspective on the liberatory potential of technological innovation is arguably enjoying a current renaissance in the Global North, despite prevailing "hegemonic" techno-optimism (Kerschner and Ehlers 2016).

Ivan Illich's contribution to the matter is his theory of an intermediate, "convivial" level of technological development that enables the flourishing of sustainable and equitable societies (Illich 1973). In some respects, he work elaborated on contemporaneous post-atomic public debates surrounding "appropriate technology" (Pursell 1993). Illich's important analytic distinction is this: a "tool" requires a certain mastery and skilled "work" on the part of its user in order to serve flexible, autonomously-defined ends. As such, tools are co-substantial with a vision of a more equitable and democratic society: "Tools foster conviviality to the extent to which they can be easily used, by anybody, as often or as seldom as desired, for the accomplishment of a purpose chosen by the user". In contrast, industrial "machines" execute narrow, pre-determined tasks and are "operated" by technicians limited in their understandings of

machine functioning. Operators are therefore both constrained in the manner in which machines are employed and uninvolved in definition of their ends (1973:41). Machines thus undermine autonomy, democracy and equity. On top of this, the veneration of machines, so characteristic of modern society, occurs as a result of them drifting from being conceived of as means to ends, to constituting ends themselves (Samerski 2018). In contrast, Illich's vision of 'convivial tools', with the operational transparency and flexibility of implementation they afford, is seen as a principle that is compatible with degrowth's call for a care-based economy (Likavčan and Scholz-Wäckerle 2018).

Degrowth scholarship, while engaging everywhere with the *notion* that technology plays a vital role in growth-based institutional configurations, therefore raising the inevitable question of its role in post- or degrowth institutional arrangements (Kallis et al. 2018), has only on a few occasions actively imagined, in concrete terms, what degrowth technology would resemble. The handful of research that is an exception to this rule has been greatly influenced by Illich's normative philosophy of technology. For example, Vetter (2017) has elaborated a five-part criteria —"relatedness, adaptability, accessibility, bio-interaction and appropriateness"—in order to empirically assess the conviviality of technologies used by groups who self-define as degrowth-oriented (Vetter 2017). Garcia et al. (2018) have adopted another approach, applying the "methodological Luddism" of STS theorist Langdon Winner to a research effort to develop, like Vetter, a framework for evaluating the appropriateness of given technologies for degrowth-oriented social-ecological projects. In their study, the authors problematise the growth-orientated "technological factor" on two grounds: the first is its purported neutrality; the second, its pairing with unrealistic and "inflated" expectations of its own transformative potential (Garcia et al. 2018:1648). While, again, their work does not include specific case study treatment, Garcia et al (2018)'s theoretical insights immediately resonate with the present study in its lending of a negative example. By this it is meant that, if the exaggerated expectations we invest in technological innovation are rooted in our tendency to fetishise it, then perhaps *the defetishising work of repair*, if it is indeed that, could help to temper and contain such expectations.

vii.   Making space for a research of technology practice

Our hesitations to seriously reflect on technology are rooted in the fact that technological artefacts are so commonly elevated to the position of "fetish" in popular consciousness. That is to say, they become cultural representations of reality which stand in for, and thus conceal, their own underlying conditions of possibility. They are also things over which human agency has lost a good measure of control (Marx 1976; Hornborg 2001; Winner 1978). In other words, the technological artefact is a Latourian "black box": it is treated as a closed system of inner and obscure complexity subject to the scrutiny of only a select few technicians and scientists. For commonly, it is objectified as a *transcendent* 'thing in itself', connected in a wider technical system of neutral inputs and outputs

(Latour 1988). In terms of social ecology research, we find ourselves in a similar bind: thinking about technology seems at once so undeniably relevant to discussions of socio-ecological transition, yet somehow the very concept continues to float above empirical inquiry, an independent variable viewable only indirectly. Even amongst many radical thinkers, the forward march of technological progress is taken both as a given, and one that is not to be resisted. This is because disciplinary research has typically struggled to bridge the gap between the material and cultural-phenomenological dimensions of technology. The analytical vision of nature-society relations laid out here by Fischer-Kowalski, is a elegant exception:

> "In order to reproduce its biophysical stocks, society needs continuous flows of energy and materials. At the same time it expands labour to intervene in nature and modify it according to society's needs (e.g., agriculture, construction activities). Society's biophysical structures are shaped by events that happen in nature. Through culture and communication, society represents these events, interpreting them as rewards for people's efforts (e.g., large harvest), as catastrophes (e.g., floods), or possibly as irrelevant. In the other direction, there is a cultural program that translates into action. An interesting feature distinct to this model is *the overlap between the natural and cultural-symbolic realms: elements are neither exclusively natural nor purely cultural, but are governed by both natural and cultural factors*. In other words, society is a hybrid of the two realms" (Fischer-Kowalski 2015:257, emphasis added).

This co-evolutionary ontology of society/nature sets a useful backdrop for the present study, one which seeks to situate technology as being both infrastructural components embedded in biophysical structures, and as a representation, itself part of 'a cultural program that translates into action'. The analytical project seems urgent at a moment in which the inherited promises and 'emancipations' of technologically driven economic growth appear due for review.

There is both ample scholarship and age-old currents within popular culture casting technological innovation as a primary source of alienation, against which collective struggles for autonomy have often coalesced (Jarrige 2016). Examples range from the 19th-century Luddites who highlighted the social and cultural costs of industrial automation (Ibid), to present-day research into the authoritarian and anti-democratic implications of digital platforms' "surveillance capitalism" (Zuboff 2019). Indeed, there is no shortage of critics who have associated the implementation of technologies to undesirable social outcomes such as the dispossession of skills and worker disempowerment (see Frey 2019), or the undercutting of individuals' and communities' self-determination through coercive, expert-based technocracy (Illich 1976). Their conclusions seem to ring with a measure of truth. The specialised knowledge and division/concentration of labour inherent in growth-dependent, industrial socio-technical regimes inevitably imply, categorically, some quantifiable loss of self-determination.

The tendency toward disempowerment and alienation as a result of technological advancements, what Federici has called "the disaccumulation of our precapitalist knowledges and capacities" (2019:191). In her account,

these constitute "an autonomy that had to be destroyed" (Ibid.) in order to make the way for industrial capitalism. Here again, it would seem wise and necessary to apply the principle of self-limitation, to "release" ourselves, in the words of Heikkurinen (2018), from the endless pursuit and proliferation of technological means. It is only by doing this that we can hope to salvage and retrieve the dispossessed knowledges and capacities that once equipped us to live well and sustainably with others, human and non-human. Schumacher's Small is Beautiful (1973) proposes a similar programme, advocating for the development of "intermediate technologies" capable of balancing the benefits of innovation whist mitigating its social and environmental costs. His sensibilities reflect that of subsequent advocates of low-tech.

Contemporary socio-ecological research concentrating in depth on technology from the conceptual standpoints of 'autonomy' and 'alienation' are few, especially in the anglosphere. There is a stronger tradition of such work in francophone circles. Along with the aforementioned work of Jarrige (2016), a recent example of technology critique following in the qualitative degrowth tradition inspired by Gorz and Illich, can be found in Marion (2015). His analysis, inspired by Anders, Mumford and Ellul, is a fundamentally pessimistic one. For Marion, technology stands for the embodiment of capitalist flows of exchange-value, themselves rooted in the exploitation of social subjects and nature. Technology, like money, is defined by an essence of *abstraction*; and it is this abstraction that serves as the primary ideological and structural mechanism driving social and ecological domination under capitalism. The sociologist and social philosopher Rosa has engaged in related themes surrounding technology. He views technology as the "enabling condition" (2014:26) for a society animated by a logic of social acceleration fundamentally rooted in the capitalist principle of competition and thus driven to accumulate any- and everything—wealth, relationships, 'life experiences', etc. Rosa accentuates a particularly good point in *Alienation and Acceleration* (2014): that technology, commonly cast as a remedy for our chronic 'time starvation", more often has precisely the opposite effect, only widening temporal and rhythmic gaps within ourselves and with society, and deepening experiences of alienation. He makes another critical point: the 'contraction of the present' brought about by technological acceleration—understood as higher paces of renewal of technical artefacts and infrastructures—has engendered an increase in experiences of alienation vis-à-vis our "thing-world" (2014:85). We are afforded less and less time to build enduring, and thus meaningful, relationships with our material environment at the same time that the increasing complexity and intricacy of innovations dispossess us of the understanding and skills necessary to *appropriate* and 'make our own' the object which surround us.

In *Resonance: a sociology of our relationship to the world* (2019), Rosa builds up a more comprehensive theory of alienation as well as the conditions of possibility for its other, "resonance". Though rarely concentrating on issues of technology directly, Rosa does deal with labour, as well as material practice to an extent, searching in them for opportunities for more meaningful subject-subject, subject-time and subject-object relations. As previously noted, it is not difficult to draw a conceptual line between notions of 'heteronomy' and 'alienation', or indeed 'autonomy' and

'dealienation' as their opposing correlatives. But these terms remain hazy. If alienation/heteronomy connotes a lack of both self-determination *and* meaningful connections with others, things, and the world, it is not at all obvious how dealienation/autonomy, its conceptual opposite, implies the rehabilitation of meaningful relationships and the internalisation of decision-making processes. It is here Rosa proposes we talk about 'resonance', a notion that emphasises and foregrounds *relationality* instead of 'autonomy', which seems to obscure it. Insofar that Rosa provides a convincing argument for the discarding of 'autonomy' in favour of 'resonance' as the other of the 'alienation', the present study extends the application of *'resonance' as the most effective way of thinking about 'dealienation' as evoked in degrowth-related scholarship.* This conceptual mobilisation figures heavily in the present study's discussion and conclusions. Lastly, the idea of nurturing resonant relationships to object-worlds—one touched on in what was called the 'phenomenology of repair' literature outlined above—is one that finds a traditional home in craft- and artisan-oriented approaches to labour. Sennett's *The Craftsman* (2008) is a sociological work that explores the practice of craft for clues to how labour can hold intrinsic value and meaning in substantive and anti-utilitarian ways, ways most often at odds with the conventions of market-mediated wage labour. The same holds true for the *products* of craft labour and their richness in semiotic-value when compared to that of industrial commodities. Sennett's examination offers valuable perspective, and a template of sorts, for thinking about how technology practice, and in particular repair, can focus on materiality without fetishising it, and can instantiate practice and skill-acquisition carried out, not for competitive ends, but for their own inherent worth.

Research Question

Contemporary degrowth research has been limited in its critical treatment of questions of technology. Work carried out into degrowth- or post-growth-appropriate technology has focused largely on *quantitative*, or biophysical/ metabolic, criteria. While essential, there is need for more rigorous and systematic engagement with classic social categories like 'labour' and 'value' in order to elaborate a more complex conceptual picture of the technology practice(s) that could serve the ends of socio-ecological transformation as assumed by degrowth. In addition to integrating metabolic (*producing less*) and redistributive (*sharing more*) criteria, this study adopts the position that a more focused critical treatment of *qualitative* criteria is necessary too. The criteria of 'alienation/dealienation'— capturing a generalised social pathology of growth-oriented society as indicated by degrowth and other critical traditions—are an ideal starting point, perhaps even more so than those of 'heteronomy-autonomy'. The present study holds on-the-ground empirical study to be essential in advancing this line of inquiry, with collaborative repair practice offering a privileged site. Here we ask the question, how could collaborative repair be viewed as a technology practice that counteracts, or dealienates, alienated labour and material experiences? How could these processes inform more comprehensive qualitative critiques of technology from a degrowth perspective?

Conceptual framing and methodology

This section is divided into two parts that present the conceptual foundations that give form to the present study's approach to research design and data analysis. Part i defines what the present study understands as 'degrowth normativity'. To this end, it offers first an initial and important distinction between the quantitative and qualitative criteria in which degrowth critique, in its normative aspects, is rooted. Second, it lays out Abraham's triple imperative —"produce less, share more and decide together" (2019)—as a helpful and accurate definition of the movement's normative principles, and relates them to collaborative repair. It here introduces the notions of 'alienation', 'dealienation' and 'resonance' in an attempt to better apprehend Abraham's third term, 'decide together', understood as most closely related to a qualitative normative orientation. In Part ii, a general theory of practice as adopted by the present study, is elaborated with specific reference to the work of Jaeggi. Here, a definition of 'technology practice' is outlined as the most useful way of understanding collaborative repair vis-a-vis the normative principles that define degrowth. Finally, conceptualisation of the repair practice as situated within a larger ethical/moral "form of life" (Jaeggi 2018) is presented.

i.   Principles of degrowth normativity: 'dealienation' and 'resonance'

The degrowth proposal, as outlined, is founded on a two-part rationale. It is as much a positive vision of social emancipation and as it is an insistence on living within terrestrial, biophysical limits (Akbulut 2021). In other words, degrowth thought can be seen as grounded at once in qualitative and quantitative rationales. Degrowth proposals focusing on policy flow outwards from these dual sources, outlining goals that can be traced back to either term. Quantitative ends are generally defined on the one hand by a reduction of material/energy throughput to long-term sustainable levels, and a more equitable distribution of resources across local and global scales on the other. Qualitative ends are typically defined by anti-economistic approaches to questions of well-being and centre on alternative themes such as community-scale autonomy, or self-determination, and conviviality as means of defining socio-ecological transformation. Degrowth's focus on normativity is perhaps the movement's defining feature, setting it apart from traditional scholarly fields with less explicit advocacy approaches to social science research.

In order to more fully grasp the idea, Abraham offers what is perhaps the most concise description of degrowth normativity: "produce less, share more, and decide together" (2019). Abraham's principles serve the present study in two important ways. They are referred to throughout the study as a means of initially sorting and interpreting

data collected pertaining to individuals' evaluations of their experiences in collaborative repair, as reported in interviews. Subsequently, Abraham's three terms serve a second function, lending a formal structure to the presentation and discussion of the study's results. Ecological economics, concerned in large part with the study of social metabolism, offers an empirical basis for defining biophysical limits and hypothesising the *scale and amplitude* of post-growth economies. It forms the epistemological backdrop for the first normative principle, 'producing less'. The present study hypothesised that via object-repair, the purchase of a new commodity is avoided (or minimised to parts), thus reducing overall material and energetic throughput associated with the production, distribution and disposal of an additional commodity. While the repair process itself relies on material and energy costs in the forms of parts, tools and functional shop space, repair is most generally acknowledged to "contribute to a slower rate of consumption" (Dewberry et al 2016:77) insofar as it delays the onset of subsequent disposal and waste phases of object life. Given the mutually constitutive nature of consumption and production processes from a metabolic standpoint—their very distinction being "mainly an artefact of economic accounting" (Røpke 2015:334), the reduction in rate of consumption associated with repair can likewise be justifiably conceptualised as a reduction in rate of production. Such a holistic perspective is furthermore also paradigmatic of degrowth thought, and thus will be adopted throughout the study.

Abraham's second normative principle, "sharing more", relates most directly to the imperative for socio-economic redistribution on both local and global scales. It acknowledges both the injustice and unsustainability inherent in the asymmetric accumulation of resources and technical infrastructures that characterise local-scale economic contexts and structure relations unequal relations between global North and South. When organised in a collectivised, or collaborative manner, the socially reproductive work of decommodified 'self-repair' instantiates the redistributional principle: the material and knowledge-based requisites for repair are "commonized" (Dengler and Lang 2022), that is, access to tools, basic parts and materials, shop space, and skills rooted in experience, is opened up to those who wish to participate in their use, maintenance and ongoing accessibility. In addition to offering a site for the cultivation of a 'commons' where individuals can carry out socially reproductive labour, the very process itself of collectivising the tangible and intangible resources necessary for repair functions to build "resilient localised community" (Aiken 2017:2384), commonly acknowledged as a base necessity for socio-ecological transition.

With 'sharing more', the normative inclination toward practices and institutions designed to achieve a more equitable distribution of resources is plain to see, but there is also here a foreshadowing of a notion of 'togetherness', the collective element of Abraham's third principle, 'deciding together'. We are left here with a question. How are we to unpack the 'decide' component of Abraham's 'deciding together'? What does it entail for degrowth subjectivity, or subjectivities, in contrast to growth-oriented ones, *to insist on being able to decide*?

The present study assumes the most obvious starting point in formulating a response to these questions must involve a serious discussion of the notion of 'alienation' and related concepts. Degrowth's origins can be traced in large part to the work of social philosophers Gorz, Castoriadis and Illich, among others, whose examinations of the *shape*

and *quality* of growth-oriented, industrial society are inflected throughout with themes adjacent to alienation—dispossession, heteronomy, lack of self-determination, loss of meaning, etc—themes traceable in turn to a philosophical tradition extending backwards through Heidegger, Kierkegaard and Marx to Hegel and Rousseau. While 'alienation' has fallen from favour amongst social scientists in the last half-century, who view the concept as contaminated by an essentialising association with the notion of 'authenticity', degrowth scholarship retrieves the classical social concept in order to diagnose a cornucopia of social malaise that shape contemporary, growth-oriented, capitalist society in ways that echo Marx (Abraham 2019; Akbulut 2021). This conceptual rehabilitation has extended to recent works by German social philosophers. Jaeggi has dedicated a book to the topic. In *Alienation* (2014), she proposes an explicitly non-essentialised, *relational* definition:

> "Alienation, then, can be understood as a disturbance of the relations one has, or should have, to
> oneself and to the world (whether the social or natural world). Conversely, unalienated labor, as a
> specific way of appropriating the world through production, is a condition of being able to develop
> an appropriate relation to oneself, to the objective world, and to others" (2014:78-9).

In Marx, the capitalist mode of commodity production and its associated socio-economic institutions are seen as manifestations of alienation, or "estrangement," in four distinct ways—1) alienation from the products of labour/the natural world; 2) from the process of labour; 3) from one's self or 'species-being'; and (3) from other workers (Marx 1959). Subsequent research has adapted Marx's four forms to a degrowth research context and insisted on the need to relate the movement's stated goals back to them: authors here state the need to formulate a degrowth normativity that is focused on "dealienation of labour" (Brownhill et al 2012; Barca 2019). This analytical lens is adopted throughout this study, and is at times stretched to apply to as much to 'technology practice' as 'labour practice'.

If subjective technology/labour experiences typical of growth society are characterisable by the effects of alienation—of a *disconnectedness* from the products of labour, from their origins in 'nature' and the labour of others, from the labour process itself (from the how-to and the means to produce) and therefore from ourselves—then it must be through processes of 'dealienation', or rather the cultivating of dealienating experiences, that the definition of degrowth normativity must pass. In other words, the task of degrowth, then, would appear to lie in defining "the 'other' of alienation" (Rosa 2019:177), in locating and nurturing its conditions of possibility in either existing or newly imagined practices and institutions.

Here we are left in a position: how are we to conceive of alienation's other in substantive and positive terms? At this point, again following Gorz, Castoriadis and Illich, degrowth has typically favoured 'autonomy' as an over-arching conceptual 'north star' in its articulation of socio-economic, political and cultural aims, and in its formulation of policy goals (Deriu 2015). However, as Rosa (2019) points out, it is inaccurate, even problematic, to think about 'autonomy' as alienation's other:

> "In my view, the concept of autonomy focuses solely on the subject end of our resonant wire. For
> this reason, the modern demand for autonomy is not the solution to, but one of the causes of,
> modern experiences of alienation, insofar as it underlies the desire *to bring ever more world within*
> *reach and under control*. Resonance is constitutively dependent on a tangible *limitation of*
> *autonomy*, and autonomy theory is incapable of acknowledging this unless it defines the concept so
> broadly as to transcend the very idea of self-determination, at which point whatever might be called
> autonomy or self-determination effectively means resonance anyway" (2019:183).

Rosa suggests, then, that we talk about 'resonance'—a "relation of relatedness" (178)—as a kind or mode of *inter*subjective experience that stands in opposition to alienation and thus *de*alienates. His concept makes particular sense from a materialist and labour perspective. For instance, while one's engagement with the thing-ness and meaning-fulness of the familiar object s/he is repairing, refashioning or remaking can easily be imagined as one of relatedness or resonance, 'autonomy' seems a partial, impoverished descriptor of the meaning-making and evaluative processes that punctuate such moments. Rosa chimes in on this point in particular:

> "Anyone who has ever learned or, better, *acquired* a certain technical skill or technique for
> 'handling material' knows that special feeling when said material seems to accommodate or respond
> to them, when a relationship is formed between material, implement, and hand…[T]he fundamental
> motion of resonance is that of a dual transformation" (2019:234).

Following these clues, the present study believes that decommodified, collaborative repair, as practiced, is a possible location to can home in on and examine processes of resonance as defined by Rosa. It makes specific use of alienation-associated concepts sketched out here—autonomy, heteronomy, delineation and resonance—in discussing the possibilities and potentials of transformative experiences of technology and labour through critical, collectivised and decommodified material practice. Finally, this study argues that processes of dealienation—from objects, from others and from our own technical capacities—are *a necessary precondition for* individuals and communities to make well-informed and substantive *decisions* regarding their own technological presents and futures, and thus address Abraham's third normative principle.

ii.   Practice, technology practice, and forms of life

Having established degrowth scholarship's preoccupation with socially and ecologically appropriate normativity, (Buch-Hansen and Nesterova 2021), we can now say with some measure of confidence that degrowth conceptions of the 'good life', however cast, most probably involve subjective experiences of 'dealienation'. But where

does this leave a research mandate with empirical pretensions? What is one to look at as an object of study in order to dive into the questions surrounding degrowth technological normativity, as laid out here?

It seems obvious that to make a normative claim—of the kinds that degrowth makes—is to tacitly admit in the first place that amidst structural constraints there remains the potential to exert change in positive, progressive directions. Normative claims are thus *always already* attempts to move beyond familiar paralyses of structure-agency debates. It is here that the notion of 'practice' as a basis unit for social analysis has been adopted by many social science researchers in recent years, especially with regard to themes of sustainability (Shove 2010). Defined as "an organised set of activities that people conceive of as an entity", practice recruits its practitioners to "make connections between a diverse set of heterogeneous elements…material (objects, tools, infrastructures), competence (skills, know-how) and meanings (images, cultural conventions, expectations)" (Røpke 2015:347-8). Practice both precedes the individual/group at the same time as it is *effective* for the individual/group—it is a means of agency that aims to have an impact. It is fundamentally rooted in material and epistemological constraints, as well as in the historical and cultural pre-occupations of its practitioners to which it owes its shape. On the one hand, practice theorists insist on the eminently social rootedness of practice; on the other, they consider subject-object and subject-subject relations to be of equal importance in the constitution of practices (Hielscher and Jaeger-Erben 2019). Lastly and crucially, practice always carries meaning, and therefore is also always shared (Røpke 2015).

As mentioned, the treatment of the theme of technology has remained somewhat limited within contemporary degrowth scholarship, this despite some of the movement's intellectual heritage being traceable to Marxian critical theory. This is probably due to degrowth's relative lack of methodological engagement with the technology issue beyond analysis of the metabolic implications of specific technologies, undoubtedly important in their own right. The present study takes a different approach. In a way, it represents a methodological exploration of possible research encounters between degrowth scholarship and the question of technology. As *the* prototypical fetish par excellence, one must define what is meant by "technology" in the first place. Drengson (1995) has proposed one talk about "technology practice" as a means of capturing all the material, social, behavioural and moral-ethical dimensions that articulate together when people engage in specific artefact-mediated activities. Just as the notion of 'practice' brings materiality into relation with ideals and meaning, its juxtaposition next to 'technology' brings with it the intentionality and moral-ethical valuations that are absent in common, reified understandings of technology as object alone. The issue of intentionality is central to this study's methodological framing. Jaeggi's point is worth underlining here:

> "We not only engage in practices, but understand them simultaneously as something (as a game, as an expression of joie de vivre or intimacy, or as hospitality). This means that the individuals concerned not only do something (crouch behind the bush, cook dinner, eat), but also understand this doing as something (as playing, as a family meal) and invest it with meaning (intimacy, care, refinement)" (2018:63).

Collaborative repair is thus directed both at *effecting* repair (repairing a thing) and at *reflecting* on the practice, technologies and relationships that comprise it. It is this 'understanding' of repair, as expressed by study subjects and researcher, that will need to stand in comparison to degrowth normative principles. Jaeggi's methodological perspective, originating in questions of alienation, is ultimately aimed at interrogating the conditions of possibility for leading a dealienated, or resonant, life. This is to say, it asks how the world, our perceptions of the world, and our place and actions within it, cohere with one another. How do they make both meaningful and realisable our goals, whether expressed in qualitative or quantitative terms, aimed at either metabolic outcomes or at experiences of delineation and appropriation?

Empirically testing collaborative repair as a *technology practice* appropriate for degrowth or post-growth society entails a testing for 'fit' (Jaeggi 2018). An examination of the base principles of degrowth thought, as well as the movement's various proposals items (see D'Alisa et al 2015; Kallis et al 2018), are thus essential to the study and will be referred to throughout. *The question of fit* emerges from the fact that individual practices (e.g. repair, vegetable gardening, walking to work) are never isolated or independent, but rather "stand in specific relations to each other" (Jaeggi 2018:65). Indeed, practices exist at "nexuses", they are interrelated and imbricated with other practices in ways that are not incidental, but rather "intelligible" within a broader "form of life" framework (Ibid). Jaeggi conceives of the process here as a "hermeneutic circle" wherein individual, iterative practices are relatable and interpretable in reference to a "form of life" whole, while at the same time the latter itself is "constituted and progressively concretised by the interrelated practices in question" (2018:66). These iterative meaning-making processes are eminently relevant for the present study given that, again following Jaeggi, alienation is viewed here as a dual "diagnosis":

> "On the one hand, the diagnosis of a loss of power, which we experience, when alienated, in relation both to ourselves and to a world that has become alien to us: alienated relations are those in which we are disempowered as subjects; on the other hand, the diagnosis of a loss of meaning, which characterizes a world that appears alien to us, as well as our relation to that world and to ourselves. An alienated world is a meaningless world, one that is not experienced by us as a meaningful whole. Thus alienation refers at once to both heteronomy—having one's properties determined by an other—and the complete absence of essential properties or purposes; moreover, it seems to be one of the main points of the phenomenon described as alienation that in it these two problems—power's being turned into impotence and the loss of meaningful involvement in the world—are intertwined" (Jaeggi 2014:104-5).

Alienation is thus defined at once by deficits in both self-determination (autonomy) and the ability to make meaning. This brings us back to our point: if alternative dealienating material/labour processes, such as craft, repair, indeed many

activities, actively contribute to meaning-making elaboration, and are in turn rendered meaningful themselves by their 'cohesion' or 'fit' within over-arching an 'form of life', they carry a *de facto* dealienating, or resonant, effect.

The overall theoretical outlook presented here is mobilised in the present study's analysis of interview and field data and will be adopted in the hope of establishing intelligible links between the underlying logics of repair and a wider socio-ecological, or degrowth, worldview. Continuing with Jaeggi's framing, the question arising at this point is: how does the technology practice of collaborative repair, its intentions and significations as reported by practitioners, occupy a nexus of practice serving "what is required" (2018:70) of a post- or degrowth form of life? A approach from the angle of 'form of life' is useful to the present discussion, not despite, but precisely *because* the fact that 'degrowth' itself was not an explicit object of discourse in either shop or interview setting. By laying out several discursive strands apparent in repair testimonies, and the overlapping and interrelating normative sensibilities they represent, the work of collaborative repair—at once concrete and interpretive—can be compared to that of degrowth.

Methods

       In this part, the various aspects of research design employed by the study will be described and set within an overall project. Specifically, five elements, or methods, were brought together in order to collect field data, conduct interviews and analyse data. The first element, as indicated in the previous section, is the study's empirical grounding in a case study, that of a Montreal-based collaborative repair collective. The case study is defined in Part i. In order to flesh out the on-the-ground mechanics of data-collection as undertaken in repair workshops, Part ii discusses the notion of "thick description" (Geertz 1971)—one historically associated with ethnography—and how it influenced the present study. Here, the specific challenges of social research in a live context are reflected upon. In Part iii, the researcher's position vis-à-vis the community of subjects is addressed. The approach here, informed by TallBear's "community-based participatory research" (2014), is outlined with respect to the relationship between researcher and subject group, as well as its evolution, throughout the research process. The study's orientation toward the positivist theme of 'objectivity' is discussed here. Part iv delves into the details of the series of 15 semi-structured interviews which form the major source of the study's data. Its design, and the selection of interview subjects, are topics treated here. Questions of data analysis, and in particular how they bear on objects of discourse, are interrogated in the part as well. An approach that seeks to integrate 'emic' and 'etic' interpretive forms is sketched out and justified. Finally, Part v is a short note on language and touches on the process of French-English translation in particular.

i.   Case study: *ateliers d'auto-réparation* in Montreal

       The normative inclinations of degrowth are increasingly justified by a growing body of scholarship bolstered by analytical tools drawn from domains as diverse as ecological, feminist and otherwise heterodox economics, anthropology, political science and technology studies (Kallis et al 2018). However, it remains unclear how exactly many of the movement's goals could be realised. More precisely, it remains a largely theoretical task to speculate on the normativities required to achieve ecological sustainability, social equity and dealienation in the absence of empirical substance. The stakes are heightened here given the imbricated and interdependent nature of practices—questions of their appropriateness, or fit, within a given "form of life" are therefore complex (Jaeggi 2018), and remain abstract when confined to academic speculation. It is here that a recent call has been made for a research agenda geared to the study of "living degrowth"—that is, of lived practice in its interlocking discursive, material and social forms (Brossman and Islar 2020). It is in a similar spirit that the present study's on-site field research was undertaken. To this end,

approximately 70 hours were spent volunteering at collaborative repair workshops, with about another 10 spent attending organisational meetings.

In February 2020 *Mon Atelier de Quartier* (MAQ), a café with co-working and community workshop spaces, opened in Montreal's Petite-Patrie/Villeray neighbourhood[34]. The fruit of a collaboration of four DIY enthusiasts who recently purchased the commercial space, their vision was to create an accessible space for craft, art and repair workshops. Structured as a not-for-profit organisation, a sidewalk-level café, as well as occasional night-time ateliers for which participants paid a fee (sewing, woodworking, etc), were designed to assist in the financial subsidising of a basement repair shop. The latter was entirely open and free to the public, with shop access roughly 15 hours/week during afternoons and early evenings. Here MAQ offered a space for members of the general public to bring in broken belongings and collaborate in "*auto-réparation*" ("self-repair")[35] with various members of a corps of organisers, volunteers and fellow repair participants. Though met with initial enthusiasm and even some local media coverage,[36] the outbreak of COVID occasioned the enforced closure of MAQ, just weeks after it opened its doors. When MAQ did manage to reopen its doors in August 2021 they began collaborating with Repair Café Montreal—who have organised since 2017 one-off repair events on a monthly basis in universities, gymnasiums, churches. Effectively merging their organisational efforts, MAQ began hosting monthly Repair Café events, on top of maintaining their weekly *auto-réparation* time slots, making the café something of a *de facto* hub for local community repair initiatives in Montreal and an obvious site of interest for the present study.

The relationship between myself and MAQ began with a dialogue amidst their immanent re-opening in August 2021. Looking for volunteers to assist in repair work during workshop sessions, and given my own professional background in craft, I suggested I could help out, explaining my interest to engage in empirical social research via workshop participation. During the September-December 2021 period, I volunteered at collaborative repair workshops every Wednesday afternoon from 1-5pm (55-60hrs total), assisting and guiding people—here on referred to as 'participants'—through the repair processes of a variety of objects that had met various fates of untimely malfunction. In February 2022 MAQ sadly announced they would be closing their doors, citing the recurrent, public health-enforced

---

[34] https://bemtl.ca/2021/07/12/mon-atelier-de-quartier-un-espace-multifonctions/

[35] "*Auto-réparation*" was the term of preference for the collectivised repair workshops that took place at the MAQ, with the name carrying over to repair events that later, and still occur at its current location in on the Plaza St-Hubert. The tag was intended to foreground the fact that what was on offer was not a repair service, but rather accompaniment in one's own repair process. However, from an analytical angle, "self-repair" is insufficient, even misleading, obscuring the collectivised and deeply interactive nature of workshop settings. This study's 'etic' perspective therefore prefers 'collaborative repair', although *auto-réparation* is also used sparingly throughout discussions here to refer to the specific subject group under inquiry.

[36] https://plus.lapresse.ca/screens/aaff50f4-9139-44dc-8290-34a0f46e1951%7C_0.html

closures for the association's ultimate financial unsustainability.[37] The closure was taken as an immense loss for a local community that relied on the café as a site for both repair work and socialising. The closure also occasioned a change in direction for my research. Yet to finish my in-shop observation, and further still from consolidating all my contacts for my interview series, I was determined to persist in my research, and by extension, in helping to ensure that collaborative repair continued to have a home in Montreal. It also happened to be the case that I simply enjoyed the volunteer work and savoured the workshops as opportunities to expand my own repair knowledge, to see new friends, and to make even newer ones.

Fortunately, I was not alone in this determination, and a core group of six organisers and volunteers quickly coalesced with the express goal of finding a new, and nearby, home for *auto-réparation* in Montreal. After a handful of meetings, we had hatch a plan: we would host our next *auto-réparation* workshop at *La Remise*,[38] a tool library and maker-space on the other side of Villeray in April 2022. While all agreed on the event's success (11 objects repaired, and hands dirtied!), there remained reservations amongst us organisers as to the appropriateness of our collaboration with *La Remise*—its model is based on a paying annual membership—which we saw as exclusionary to members of the general public. So our search continued, looking for new spaces and possible affiliations to host and support future repair workshops. I was fully engaged in most steps of this process, along with two others. We eventually agreed to terms proposed by *Solon*, a Petite-Patrie based collective striving to serve as an 'incubator' for citizen-led initiatives geared to "socio-ecological transition".[39] They offered us their office/community/polyvalent space—"*L'Espace des possibles*", a shabbily improvised and entirely functional commercial space on the lively St-Hubert Plaza—to book repair workshops on either weekday evenings and/or weekends. Starting in June 2022, the ongoing *auto-réparation* initiative had finally found a new home, one that both suited its needs and felt right. In June and July, I helped organise and attended three further workshops (15 hours total). In June, our project was awarded a $3000 community grant from Solon in order to purchase tools and build up a small reserve of commonly used parts. At this point, the on-site participatory observation component of my research was completed and all subsequent interview contacts had been established. Although the site location shifted through the research process, a core cast of characters (organisers, volunteers, even some participants) was consistent throughout as the *auto-réparation* intuitive struggled for its own survival. In the end, these workshops can, justifiably I believe, be considered as a unitary case study despite their shape-shifting nature.

---

[37] The MAQ's untimely closure, though tragic in many ways, offers the present study a window onto other important questions and themes that hover about the practice of collaborative repair. What was highlighted in this phase of the case study is the inherent tenuousness and fragility of institutions of non-commodified commons. Their reliance on access to space, tools, knowledge, volunteer labour and time means they will always be vulnerable to market pressures. In MAQ's case, it was the burden of a costly mortgage that ultimately spelled the project's doom. This echoes the observation that private property regimes, or "land commodification", constitute the most salient barriers for degrowth-inspired economic and political transition (Baumann et al. 2020). This analytical perspective is valuable for future research directions oriented towards looking at the limitations of degrowth initiatives.

[38] https://laremise.ca/

[39] https://solon-collectif.org/

ii.　　　Participatory observation and "thick description"

Collaborative repair work is by definition intersubjective. It entails working closely with people—explaining, troubleshooting, manipulating parts in concert (one's always looking for a 'third hand'). In this arena, interactions are oftentimes explicitly *deliberative* in nature, and involve value-informed decision-making processes that guide the steps of repair. For instance, "How important is this computer charger to you?" is asked to gauge risk in making an unreliable electronic component potentially less reliable with a botched repair. Responses to the question "Do you mind if your blender is missing a button?" can be quite telling of an individual's expectational threshold for commodity 'seamlessness' as well as one's underlying attitudes towards idiosyncratic use-value, or conspicuous consumption. In short, such interactive contexts provide the researcher with a terrain rich in data. Geertz (1971) offered the term "thick description" to refer to an innovative methodological approach to ethnographic research that was no longer concerned with positing 'natural laws' as the ultimate object of social analysis, but rather with the apprehending operative cultural 'logics'—that is, the underlying symbolic architectures that structure and animate rituals, practices and institutions. By today's standards, such an approach might seem obvious within the social sciences, but the point highlighted here is this: given "man is an animal suspended in webs of significance he himself has spun", the researcher's role then is "an interpretive one in search of meaning" (1971:5). Geertz's framing recognises the fundamentally interpretive position of the researcher as they engage in field observation, fully immersed in the socially-embedded practice of actors. Through this immersion, the participatory observer becomes better equipped to 'fill in the gaps' and 'make sense' of the inherently chaotic flow of thoughts, ideas and utterances as they emerge in real time and in live settings.

My engagement in *ateliers d'auto-réparation* between September 2021 and June 2022 formed the core of the participant observation component of my data collection. A compilation of field notes detailing repairs undertaken, as well as real-time reflections on the part of either myself or collaborating participants, was kept. Here, observations sought to arrive at perceived patterns of meaning and insight as expressed by participant subjects ("emic" analysis) at the same time as I arrived at and compiled insights of my own ("etic" analysis) (Harris 1976). The intention was to focus on organisers', volunteers' and participants' attitudes towards the significance of their repair work. I was interested in thoughts, words and actions undertaken in and around repair practice as a way of accessing subjects' interpretations of the meaning and value they bestow upon such work—in other words, I was looking in the first place for *emic* matter. Yet the analysis of observation is never straight-forward or self-evident. Take for an example: why is one's repair work done hastily, impatiently, with an eye toward the clock, or rather why was it slow, allowed to meander and unfold as part of a relaxed and sociable moment? Interpretative interventions on the part of the researcher in situations such as these cannot be considered 'hard' empiricism in any conventional sense. The variables at play are

neither easily quantifiable nor isolatable (e.g. maybe the subject simply has a 'rushed personality'?). Nevertheless, when properly dosed, 'off-the-cuff' *etic* observation can have merit insofar as it carries the potential to paint a rich and complex picture of the business of meaning-making that accompanies practice.

Unfortunately, taking detailed 'thick description' notes in real-time proved a data collection strategy ill-suited to meaningful engagement in repair workshops. While seemingly a good idea at the outset of my research design, it struck me as inconvenient and simply unnatural to pause and thus derail moments of repair in order to jot down a quote or two, even if the glue was drying or the solder cooling off. It just never seemed like the right moment. This data collection practice simply seemed to be both at odds with my self-affirmed goal of helping people through their repairs, and evidence of the parasitic nature of my research agenda. The latter was a pervasive, if dull, insecurity that followed me throughout the first months of research. Another obstacle to participant observation was the inherent awkwardness of obtaining explicit consent from research subjects in live workshop contexts. The interjection of ethics form-signing procedure, like extensive note-taking, was truly jarring and disruptive to both repair processes and the intersubjective rapport that nurtured them. It became obvious that I was best to focus on two elements: to concentrate on the work of repair, and through it, cultivate the relationships of affinity and trust from which future opportunities for data collection could potentially spring. To my surprise and pleasure, this is what happened. Throughout the autumn/winter 2021 *ateliers d'auto-réparation* at MAQ, subsequent organisational adventures, and eventual stabilisation of the project in its current form throughout spring/summer 2022, I was lucky to forge many valuable relationships with organising figures, fellow volunteers and participants. In the end, these relationships formed the bedrock of the study's empirical matter.

iii.   Community-Based Participatory Research

My professional background as a shop-based wood-worker has equipped me with considerable experience in the repair of furniture and objects as well as the maintenance and repair of tools associated with the trade. This has afforded me with skills and knowledge that I've repurposed to make myself useful and help others in collaborative repair settings. This has afforded me an invaluable and practical way of 'giving back' to the community that has contributed to my research. (STOPPED HERE!) The approach adopted here with respect to first-hand observation takes its inspiration from what has been called "community-based participatory research" (CBPR) and elaborated in the research and advocacy work of TallBear (2014). At a minimum, work undertaken in this spirit eschews traditional approaches in the social sciences that have championed the virtues of disinterested or 'neutral' observation on the grounds of both their viability *and* desirability (Haraway 1988). Beyond this, CBPR assumes an "ethics of responsibility in research" (TallBear 2014: 2), recognising the inherent power of the researcher and research institutions to impact upon, either positively or negatively, the subjects that constitute the object of their research. The academic's

work here takes the form of advocacy, a "standing with" in TallBear's words (2014:4), where the researcher's motives and goals intertwine with that of the community in which they study, making the knowledge-building process one of "inquiry in concert" (2).

The CBPR method proved particularly crucial as the study proceeded through subsequent, less obvious phases of data collection. The closure of MAQ and forced regrouping of *auto-réparation* initiatives, initially an immense nuisance and obstacle to my work, quickly proved an opportunity to engage in new and different ways with the group of collaborative repairers in question. The institutional, material and social barriers against organising such initiatives—access to space, tools, willing volunteers—were very much highlighted by the organisational meanderings we were forced to undertake in order to make collaborative repair happen beyond February 2022. Amongst a backdrop of such challenges, and in a substantial way, the perspective afforded by a CBPR-stance to research 'granted me permission' to continue my course of research. It justified the fact that my involvement in the repair project seemed to increasingly take on an element of *de facto* advocacy during a moment when the initiative was struggling to find a new workspace.

iv.   One-on-one, semi-structured interviews

A series of 15 one-on-one, semi-structured interviews formed the data pool in which the study's primary analysis originated. This phase of research was carried out between November 2021 and October 2022, overlapping with workshop-based field work as well as extending beyond it. A group of people who had previously taken part in *auto-réparation* workshops (either at MAQ, *La Remise*, or *L'Espace des possibles*) each agreed to partake in an interview. The interviews ranged in length from 17 to 74 minutes and were conducted either in-person or via video conference. The research subject group is comprised of three organisers, four volunteers and eight participants. This "non-probable" method of sampling took the form of a "recruitment of social ties" (Wolf et al 2016). Potential interviewees were selected from people with whom I had become acquainted via repeated encounters in repair settings (organisers, volunteers), or from those with whom I had engaged in actual object repair (mostly participants, but also organisers and fellow volunteers). The initial repair encounters that occasioned the latter were purely coincidental— they were the result of simply not already being involved with another participant when a newcomer entered the workspace. The specific organiser-volunteer-participant subject ratio was devised accordingly to an *ad hoc* quota (Ibid),

and represented the approximate relative proportions of the three distinct categories of people involved in any given *auto-réparation* shop session.[40]

Through these interviews, I sought to learn about subjects' experiences in collaborative repair settings: what and why they were seeking to repair in the first place, as well as their reflections on the repair process—what they enjoyed, what they found challenging, what they would change about it. Here subjects frequently touched on past experiences with non-professional, subsistence-oriented home repair outside of collaborative repair contexts, often drawing both points of comparison and contrast with their recent *auto-réparation* workshops. It must be noted, the inherent limitation of the present research lies in the simple fact that those interviewed had already sought out and engaged in collaborative repair, and thus in a way could be considered already 'converted' to the practice. The presence therefore, of biases favouring certain underlying values and motivations accompanying the practice, cannot be discounted. In short, it must be considered that participants might already ascribe to a socio-ecological 'form of life' within which self-repair is considered a constituent practice. Such criticism inherently calls into question the applicability of any conclusions to wider societal contexts. I can offer here two reactions to such criticism. First, the perspectives sought throughout interview-based data collection were not those of subjects' binary 'verdicts' on repair—whether it was worth it (good) or not (bad)—but rather the qualitative perspectives of why and how collaborative repair was meaningful to them. How did they make sense of it? How did it link up with and fit into other sets of practices and logics? Second, if an express research goal is to locate and examine 'living degrowth', in the form of technology practice as it exists on the ground, the fact that investigation is carried out in communities that appear to partake in similar values and end-goals, does in fact make sense.[41]

Lines of questioning were devised in order to discuss the repair work undertaken by interviewees with specific attention paid to both the biophysical implications of their repair work and their conscious reflections of this. What had they repaired and why? Did their repair work eliminate the need to replace their broken object with a new one? What were their motivations in choosing repair over replacement? Is it one of perceived necessity or choice? If their motivations are economical, what do they intend to do with the money they've saved through the repair process? Why had they chosen to come to a collaborative setting instead of engaging in repair at their home, for instance? A second line of questioning sought to further explore subjects' reflections on what they have learned from the process of

---

[40] The study was initially designed to reflect a diversity of voices along gender, race and age lines. *Auto-réparation* participants varied greatly in term of age (20s to 70s, well distributed) and gender (a tilt towards majority female), less so in terms of racial background. While the ratio of study subjects along lines of gender, race and age illustrate the composition of repair workshops, visible racial minorities were seemingly underrepresented, at a glance, in comparison to the neighbourhood's racial diversity. The apparent deficit in participation of visible minorities in *auto-réparation* workshops was not an object of systematic inquiry, nor did the topic emerge spontaneously from interviews. The disparity is therefore not treated in the present analysis though it undoubtedly merits the attention of future research.

[41] To a large extent, this study is concerned in elaborating and deepening degrowth's theoretical engagement with technology practice. The application of any particular 'living' degrowth practice to wider societal contexts is another question, and one taken up only in places through the course of the present study. That said, the issue of access to collaborative repair—the structural impediments to engaging in the practice, and what it takes to overcome these obstacles—is important one, and is addressed in Results and Discussion, though analysis is not framed in explicitly policy-oriented terms.

collaborative repair. Had they learned anything about the work or materials involved in an object's manufacture? If so, had this knowledge impacted their conception of commodities and their value? If so, how? The essentially qualitative data gained through these interrogations helped illuminate what repair practice represents to subjects, how it might serve as a prism for individuals' reflections on societal patterns of production and consumption. Other questions were designed to probe for insight into the temporal place and prominence of repair work within subjects' lives, seek to compare it with their engagement in remunerated labour. Here it was asked: How long/often have they been doing repair? What limits their repair work? What do they do for paid work, and is the latter a limiting or enabling factor in their repair work? Do you see repair work as an efficient or valuable use of your time, or not? How does the 'pace' of repair work differ from that of other daily activities? With such questions, attention was directed towards individuals' evaluations of time use, specifically the differential estimations of value they invested in the socially reproductive labour of collaborative repair on the one hand, and market-based wage labour on the other.

In the end, structuring interviews around question-and-answer formats seemed both less important and less productive than prioritising open and liberated dialogue. Initial interview experiences left me with the impression that my rigid adherence to a series of questions resulted in two dynamics, and neither were desirable. First, the firing off of questions seemed to stifle conversation flow—it prompted subjects to hold fast to certain topics, and seemed to impart a perceivable pressure to 'answer the question'. Second, while asking a consistent or identical set of questions to all interviewees could be recommendable in pursuit of a certain objectivity in social research—a logic similar to that governing to that used in surveys for instance—it appeared to have the reverse effect in real interview situations. Various pre-fab questions, while appropriate in some interviews, seemed to bend out of sorts the conversational flow of others. At no other point did my inevitable biases and ideological priorities—facts that any social researcher must both acknowledge *and* seek to temper—seemed to unfairly veer the vehicle of research more so than in these moments. If what interested me chiefly was the processes of meaning-making, signification, and valuation attached to collaborative repair, I would need to give subjects more leeway in directing the course of conversation. This entailed striking a subtle balance, one that I thankfully found less and less elusive as I proceeded through the interview phase of research. Increasingly, interviews resembled free-flowing conversations which were sparked by an initial question or two, only to evolve organically into more reflective dialogue directed by the subjects themselves. Without a doubt, the most 'successful', or revealing, interviews were those where I tended to speak very little, with more than 75% or 80% of speech content coming from the interviewee. It is from these discussions that the richest and most pertinent data flowed.

v.   Data analysis and a note on language

All 15 interviews were recorded and represent approximately nine and a half hours of audio in total. The majority were carried out in French, with two done in English. The next step to follow after initial data collection was to transcribe all interviews, a time-consuming, yet valuable process that took me somewhere in the rage of 60-80 hours to accomplish. During transcription, interview passages that struck as particularly useful in answering the study's research questions were highlighted, and their locations noted. During and following the transcription process, a set of discursive categories emerged amidst the mass of data I was both generating and sifting through. It sufficed for several people to use a certain word, to talk about things in similar terms, to employ similar referents, for a discursive category to be born. At this point, categories were re-evaluated, cross-referenced and re-organised. While some were merged together, others split off to form new categories with the arrival of new transcription data and the framings they afforded. Data points were listed by type in table format. It was only at the very last moment, and when direct subject quotes were necessary for insertion in the dissertation's text, that I translated certain excerpts from French to English. In certain select locations, where specific 1:1 translations were tricky, original French terms are included. Taken in its entirety, the work of data analysis was an inherently dynamic one, a constant dialectical process between *emic* objects and *etic* postures (Harris 1976). One cannot deny the inherent creative nature of such interpretive work on the part of the social researcher and translator. That said, the ultimate categorical structuring of data does at least feel substantiated and true, even if it remains my truth.

Results and Discussion

The presentation and discussion of study results is organised around a set of distinct, yet relatable and interconnected, themes. These themes represent salient modes of discourse that emerged in the study's data collection and interpretation phases. The discursive modes coalesced through their observable repetition within and across interviews, and through the consistency they exhibited with the statements, options and actions that were observed in workshop settings. It is to say, the categorised forms of discourse referred to in this section are derived from subjects' own words, evaluations and actions—they are emic interpretations. Yet via the twists and turns of interview, transcription and translation processes, there is an inescapable component of etic interpretation on behalf of the researcher. The very business of parcelling off discursive categories in the first place is always already testament to the privileged position of the observing and scrutinising researcher.

This section is structured in four parts. As noted in Methodology, the presentation of results is structured, in part, according to Abraham's three principles of degrowth normativity—produce less, share more, and decide together (2019). As also indicated, this study adopts the terms as a concise and comprehensive abbreviation of the constituent elements of what we are calling 'degrowth normativity'. Part i address the imperative to 'produce less'. It presents evidence that the work of collaborative repair is a practice in which subjects both reflect on questions of consumption and production while re-affirming the practice as a form of concrete action that can make a meaningful difference. Here, both tacit and explicit recognitions of the *metabolic* nature of economic processes are at play. It is thus suggested here that collaborative repair be considered a "critical metabolic practice". In a second part, the normative principle of 'sharing more', and its expression through collaborative repair, takes centre stage. Discourse focusing on the collectivised nature of collaborative repair, with its economic, social and political implications, is presented. Here, a separate section is included covering discursive representations of what is considered the adjacent theme of *care* as is emerged in repair work. Taken together, Parts i and ii thus cover the biophysical and redistributional dimensions of collaborative repair, aspects that are in no way trivial, but which are perhaps more straightforward and better understood. As a result, they are relatively brief.

In contrast, Part iii seeks to paint a picture of how the observed practice can be interpreted as relatable to Abraham's last and most enigmatic imperative to 'decide together'. A broader and more nuanced conceptual foundation is required to examine what has been defined here as the qualitative normative criteria for a proposed degrowth technology practice. As set out in the the Conceptual Framing and Methodology section, the themes of alienation/

dealienation, fetishisation/defetishisation, and resonance take centre stage at this point in the analysis. Requiring closer and more detailed attention, the part is structured into four sections, each dealing with a different discursive category which in turn shed light on the various ways in which processes of material engagement, informed reflection and skill/knowledge development can better inform technological decisions and practices that accord with degrowth's overall socio-ecological project. Rather than viewing them as processes generative of 'autonomy', the study here suggests we consider these dealienating processes as generative of experiences of 'resonance' (Rosa 2019).

Part iv represents a deeper exploration of the particular processes of alternative meaning-making that emerged in interviews and workshops and which are relatable to central notions of degrowth thought. Two discursive groupings are presented here—one coalescing around discussions linking the themes of labour-value-time (Part iv.i), the other around those linking labour-value-object (Part iv.ii). Together they highlight and enrich the fact that collaborative repair is both premised on, and generative of, profound interrogations of the meaning, value and use of both time and our everyday material environs. This section is conceptually tied together with the aid of Jaeggi's notion of a "form of life" (2018), a way of understanding how diverse, yet imbricated, practices can be rendered meaningful when contextualised within larger moral/ethical projects oriented towards particular visions of the good life. The ways in which labour, time, and material relations are decommodified in collaborative repair, it is argued here, can indeed be rendered intelligible and meaningful with reference to a de- or post-growth form of life. In other words, the practice can fit within a degrowth normative project.

i   *Consuming less, producing less*

In this part, attention is focused on the biophysical, or metabolic, component of degrowth research, and how such quantitative analysis informs degrowth normative claims, encapsulated in the imperative to "produce less" (Abraham 2019). It is highlighted how often the initial motivations of subjects were cast in similar quantitative terms: to reduce consumption and curb waste. Furthermore, the part seeks to illustrate how practitioners' ways of relating to repair work constitute veritable *critical metabolic* perspectives, wherein the boundaries of consumption, production and waste phases are dissolved and a nascent apprehension of stocks and flows is articulated. Interestingly, at certain points discursive focus regarding waste reduction were paired with more general anti-consumerist sensibilities, on the one hand, and with an explicit 'thrift ethic' on the other. They represent subtle and complex understandings of material processes that unfold on, and between individual, local and global scales. Overall, these holistic and metabolic understandings of the ends of repair betray a conceptual sophistication, and perhaps a political one too, eschewing

'middle-class' consumer environmentalism for a fundamental anti-productivist posture, a position akin to that taken up by degrowth. Above all, in dedicating its efforts to downscaling metabolic throughput—to reducing material and energetic demands by extending the life of objects, collaborative repair appears to meet the quantitative criteria for its consideration as degrowth technology practice.

i.i   Collaborative repair as critical metabolic practice

"Toward the end of the nineteenth century, disposal became separate from production, and Americans' relationship to waste was fundamentally changed. Trash and trash making became integral to the economy in a wholly new way: the growth of markets for new products came to depend in part on the continuous disposal of old things. Economic growth during the twentieth century has been fuelled by waste—the trash created by packaging and disposables and the constant technological and stylistic changes that has made 'perfectly good' objects obsolete and created markets for replacements"

(Strasser 2000:15)

A large part of degrowth scholarship, as explained in the Introduction, is rooted in the biophysical analyses of ecological economics. The concept of 'social metabolism' is absolutely central here. It encompasses the dynamic movement of the stocks and flows of energies and materials drawn into economic processes, their embodiment in infrastructures and managed landscapes, as well as their outward flows as waste, pollution and heat back into 'natural' systems (see Sorman 2015). Though conceptually fluid, and a definite departure from the reductive accounting and 'externalisations' that characterise orthodox economic approaches to the environment, metabolic analyses can however be adapted to various scales and framed in rather straightforward ways too. For instance, research has previously noted that global per capita use of minerals and energies continues to accelerate into the 21st-century and shows no signs of slowing down (Kraussmann et al 2016). But where does technology fit into the metabolic picture? And furthermore, how exactly does one make the scalar leap from global metabolism to questions of transition played out on local levels of technology practice?

A strain of degrowth-related work issuing primarily from francophone circles, has sought to shift focus onto the technical/technological dimensions of metabolic acceleration that have been observed throughout the 20th-century (see Bihouix 2021). Here, technological innovation and industrial production processes are framed as primary drivers of current ecological crises. According to Jarrige, "The industrialisation of the world and its technological direction are responsible for an expanding rate of consumption of space, resources and energy; increased artificialisation has reduced biodiversity and organic life; productive forces have multiplied pollution and waste on an unprecedented scale" (Jarrige 2014:232, author's translation). Such perspective in undoubtedly useful for the would-be repairer, whose practical

engagements are first and foremost material and technical. At the same time, other efforts in research have sought to reframe metabolism, attempting to make links between large-scale metabolic processes and small-scale lived, everyday practices: "Reconceptualising social metabolism as the result of routine practices opens up an entirely new perspective on its origins and outcomes as well as possibilities for its deliberate transformation towards sustainability" (Haberl et al 2021:5). To this end, Haberl et al propose the "stock-flow-practice nexus" (Ibid) as the base unit of analysis for their new methodology. In this part, collaborative repair is considered in similar terms.

Every respondent, without exception, insisted on their environmental motivations for getting involved in repair generally, and collaborative repair specifically. The subject of 'consumption' was often foregrounded here, as other studies on community repair have demonstrated (see Hielscher and Jaeger-Erben 2021). In Kannengeisser's work in Repair Cafés, she refers to the practice as "consumer-critical" (2018:104). In the present study, the theme of consumption was often brought up, but in specifically *holistic, or metabolic terms*. While the categories of 'consumption' and 'waste' were most frequently invoked, their use betrayed both tacit and explicit understandings of the inextricable connectedness of commodity life-cycle phases. The operational logic throughout is that one repairs because the basic alternative to repair is repurchase, which only further accelerates demand on industrial production. Over-production, in turn, is clearly identified as a problem throughout testimonies: the sheer over-abundance of commodities, widely devalued and popularly conceived of as disposable, was cited as evidence of this.[42] Several interview participants spoke of their passion for garbage-picking, with their salvage work representing a complimentary practice that minimised waste, rescued use-value, and provided the raw materials for future refurbishment and repair interventions. The point to underscore here is that the metabolic steps of producing, consuming and discarding are intertwined and dynamic in the mind of the subsistence repairer. Such perspective largely matches up with contemporary stances in ecological economics and sustainability studies that view the distinction of 'production' and 'consumption' as "an artefact of economic accounting" (Røpke 2015:334).

When asked why she was attracted to repair work in the first place, Annick cited her interest in "concretely increasing the durability of objects in order to curb over-consumption". Equally for Claudine, it was to "extend the life of things as much as possible to reduce consumption". Nat expressed her own motivations in virtually identical terms. Sometimes discourse emphasised an approach of maximising the "use" of objects already available at hand with a view to minimising over-exploitation of primary resources (Josiane). These positions thus demonstrate that collaborative repair is a practice animated by both a desire to reduce future cycles of production and a concern for current over-

---

[42] Capitalist production inevitably tends towards acceleration. As per-unit values of commodities diminish with increases in industrial output (increases in supply), a product of perennial technological innovation, an increase in units produced is required in order to compensate for the drop in per-unit market value (Abraham 2019:163). The dynamic is one of positive feedback, fuelled by growth's dual and complementary imperatives: to accumulate capital, in order to innovate technologically, in order to accumulate capital, and so on and so forth.

accumulation of stocks in the form of industrial merchandise and technological artefacts.[43] Another metabolic theme that figured prominently in practitioners' motivations to repair was that of 'waste'. The desire to "not throw away" (Evencia, Lucie) was repeated many times in the course of workshops and interviews. Oftentimes, this aversion was expressed in emotional, visceral tones: "There's tons of stuff that's just thrown away. It's unbelievable. It's unbearable!" (Lise); "Throwing out electronic trash like that is pretty much catastrophic" (Léo); one talked of "the image of the piles of junk that are at—and it's not junk!—that are at a landfill, is like terrible" (Joce).

Some discourse related and compared the perceived good work of repair to other practices, like irresponsible disposal, typical of less ecologically inclined individuals: "They don't even go to the Écocentre!"[44] (Lucie). At other times, the inevitably problematic nature of waste management on a structural, institutional level has highlighted. During a down moment at a MAQ *auto-repair* session, I endeavoured to replace my iPhone battery with a newer one that had been salvaged by Mattieu, a specialist in Apple repairs who occasionally volunteered workshops. After the successful replacement, I asked him how best I could dispose of the old one. He told me they would not accept extracted Apple parts at the Écocentre but that it was equally "very dangerous" to throw it out with curb-side garbage, that chemical fire could ensue. What he recommended is that I bury the battery for a few days outside in a bucket of sand before throwing it out, in order to minimise the risk of any small explosion or chemical fire. This last episode underlined the fundamentally problematic nature of much waste disposal as well as how we, as everyday consumers of the Global North, are often removed and dissociated from such processes. In this respect, collaborative repair can serve as a window onto the realities of waste disposal as much as it can be a *praxis* aimed at curtailing its excesses. The point to emphasise is the quantitative reference points that underlie these forms of discourse, rooted in tacit understandings of the metabolic interconnectedness behind patterns of consumption, production and waste.

In certain cases, critical metabolic perspectives, with their expansive readings of macro-scale production/ consumption cycles, existed alongside a more condensed and focused ethic of personal 'thrift'. While spending time discussing her ecological concerns and how they bore on her valuation of repair, Joce doubled back: "I would say the environmental part of it is almost secondary to a kind of thrifty feeling of like…to not waste. I like taking care of objects until they are fully used. Like if a piece of clothing has a stain on it, or a hole in a certain place, and the rest of the fabric is good, I keep it so that I can do something with the rest of the fabric. Or, I'll patch or I'll darn, or whatever." Lucie similarly talked about the reflex to thriftiness ("buying nothing") that she had inherited from her parents and grandparents. Lucie associated the anti-consumerist instinct, the will to material simplicity and thrift, with the values and virtues instilled in previous generations: "You know, my grandparents, for example, they had money when they died, but they lived very simply. They bought nothing, and they used things right up until the last moment. It's just a

---

[43] The startling graphic by Vendetti and Belan (2021) was printed and posted in the MAQ repair shop. It was a frequent point of reference and subject of discussion. It is available here: https://www.visualcapitalist.com/visualizing-the-accumulation-of-human-made-mass-on-earth/?fbclid=IwAR0nA4bwQH1ybB6BYhcGoFHOWtTePdtfdlU0DqPQd7hdYqw1tKwZuZ0tGsk

[44] 'Écocentres' are local dumps in Montreal where materials are sorted before being shipped off to landfills or recycling facilities.

question of upbringing (*éducation*), you know" (Lucie). In these moments, there is a tangible harkening back to perceived attitudes that defined the relationships to waste/trash categories of previous eras, as intimated in Strasser's quote that opens the part. More generally, there was at times a sense that practitioners simply found the logic of personal material sobriety more palatable and relatable than wider-ranging analyses implicating larger structures and diverse groups of actors. The point is worth noting only briefly as the theme of structure/agency is treated in greater depth in Part iii. For now, what is essential in uniting all discourse forms treated in this part, whether tending towards 'critical metabolic' or 'thrift ethic', is its fundamental focus on collaborative repair as a means towards simple material conservation.

Through a degrowth optic, the critical metabolic practice of repair practice matches up with understandings of contemporary socio-ecological crisis as biophysical and quantitative in nature, and therefore requiring calculative assessment and mitigation. The work of repair takes place at the frontiers of material life-cycle phases. Repair retrieves and restores commodities from *waste phases* by cycling them back into *consumption phases.* In its non-commercial, decommodified form, collaborative repair thus qualifies as a reproductive labour of subsistence, a point that will be further explored in Part ii. The links to be made here with degrowth-informed economic normativity are clear. As Graziano and Trogal attest, "Repairing as a way of prolonging the life of possessions intersects with anti-consumerist or anti-growth practices, and takes on further relevance for those diverse political projects grappling with post-growth or degrowth economies" (2019:209). Given collaborative repair relates directly to both production and consumption, seeking to reduce their amplitudes (this section) and transform their essence (subsequent sections), it constitutes an act of "repoliticization" of production/consumption, *always* viewed as a unitary process (Kallis et al. 2015:9). The practice is political insofar as it is *premised* on an acknowledgement of both the inherently contested nature of production/consumption and the countless actors involved in them, as well as clearly *motivated* by ethical/moral understandings of either justice or the good life, findings that will emerge later in this section. A critical sensibility taking aim at growth-centred productivism, perhaps *the* core feature of degrowth, lies at the heart of collaborative repair.

Abraham's first normative principle, "produce less", reflects the heuristic inclination found throughout degrowth thought to locate in production the point of origin of myriad ecological devastations. In short, the question arising here, and touched upon not infrequently in repair circles, is this: what, and how much, should we produce? One is right to pose such a question. Production-focused analysis is also more politically palatable compared to conventional 'middle-class', consumption-focused, environmental activism with its historically exclusionary politics and its equally historical co-optation by 'green washing' marketing campaigns (Rogers 2010). Nevertheless, the materially-grounded practice of collaborative repair engenders a compelling, and ultimately empirically-rooted, interpretation of the fundamental one-ness of production, consumption and waste phases of commodity lifecycles. While a critical focus on production is indispensable, the repair perspective informs its practitioners of other complementary points for critical departure: for instance, the fact that economic growth has been equally founded on

historical shifts toward "trash making" (Strasser 2000:15) and ever-accelerating rates of waste disposal. The point is echoed in recent degrowth scholarship that has also focused on the linkages between per capita rates of waste and consumption across countries, revealing vast if predictable inequalities along North-South lines (Marín-Beltrán et al 2022). In addition to waste, discourses focused on consumption do appear prominent in a first glance at the present study's data. Though this is perhaps understandable, given the consumption-centred nature of mainstream debate on issues of sustainability and practice, a flexible *perspectival acumen* was observed throughout. The practice of collaborative repair itself is credited as affording its practitioners multiple angles from which to regard metabolic (un)sustainability and interrogate one's relation to it. Collaborative repair proves to have a potential to render visible, and thus politicise, social metabolic processes. At the same time, it enables *concrete praxis*, however small-scale, at the interface of material lifecycle phases.

ii   *Sharing more*

The present section shifts attention to the study's findings that, in addition to being tied up with critical and engaged considerations of questions of metabolism, participants cite the collectivised nature of collaborative repair as an equally important and defining feature of the practice. This normative stance echoes Abraham's second principle for degrowth, 'share more' (2019). Communalisation of the tools, parts, work-space and knowledge, resources necessary to accomplish repair, clearly renders the practice of subsistence repair not only more sustainable, but more accessible, equitable and thus just. In this sense, collaborative repair's underlying redistributional logic, akin to that of degrowth normative thought, can be thought of as *quantitative*. Yet this section also presents data framing the practice as one animated by non-economistic, anti-utilitarian and decidedly *qualitative* ethical evaluations that focus on the inherent worth of doing things together—of 'commoning' economic practice—to better accomplish repair, yes, but also to better cultivate a sense of *shared* values, purpose and self-efficacy viewed as necessary for moving forward towards socio-ecological transition. Contrary to the previous section, the dynamics described in the present part do not involve a dialogue between multiple scales, but rather are seen as playing out in the immediate social and intersubjective field of the workshop itself. Here, collaborative repair both creates and maintains an institution of economic 'commoning' the fruits of which are both material (repaired belongings) and immaterial (increased knowledge/skills), while at the same time rendering the idea of community 'concrete'. The production and distribution of knowledge, skills and passion along with a nurturing sense of community, are also fashioned on these workbenches. These are processes that move toward the dealienation of labour and material experiences insofar as they enhance the group's collective *self-determination* and collectively autonomous engagement in life-sustaining practices independent of the forces of

capitalist production. In other words, by *sharing in* the repair process, Marx's second alienation, from the processes of labour, is mitigated. Through the work, we also observe a reversal of the fourth alienation, that from others.

ii.i   Collaborative repair as collectivisation and community-making

"A community economy makes and shares a commons…Without a commons, there is no community, without a community, there is no commons"   (Gudeman in Gibson-Graham 2006:95)

To a large extent, the specifically 'collaborative' aspect of collaborative repair is addressed in this part. This means looking at the difference between what it means to carry out repair in collectivised, rather than market-oriented, contexts. The distinction between *collaborative* and *commercial,* or remunerated, modes of repair is an absolutely crucial one, and deserving of closer treatment. On purely material, biophysical terms, all repair work would appear justified at first glance. In contrast to ecological modernisation and other technological approaches to socio-ecological transition that advocate rapid infrastructure replacement (see Hickel and Kallis 2020), others have voiced concern over the sheer accumulation of manufactured stocks in an ever-increasing and complex "anthropogenic mass" that has now surpassed all terrestrial biotic life (Vendetti and Belan 2021). With this in mind, and excepting the widely recognised need to drastically and quickly phase out hydrocarbon-dependent infrastructures, perhaps maintenance, care and repair of already-existing infrastructures is the wisest rule of thumb in the current state of affairs? This is certainly the bias of the repairer, but it the prejudice justifiable?

Certain researchers in the emergent field of repair studies has underlined the "ambiguity" of repair (Schmid 2019:228). Indeed, the interwoven technical infrastructures on which growing economies depend, even amidst their dynamic expansion, require constant upkeep and self-reproduction through repair (Jackson 2014). Commercial repair of this kind, that geared at maintaining large-scale infrastructures of industrial production, could rightly be considered culpable of sustaining current levels of social and ecological exploitation. Other smaller-scale commercial repair operations can be carried out for immense professional gains, although such niche entrepreneurship is more and more rare today, an issue linked with the un-repairability of new commodities. Insofar as repair can, and does maintain industrial production capacities, providing a base for further capital growth, one must always ask the questions: Repair what? Repair how? Even in informal, community settings, it is important to think in simple metabolic terms and ensure that the materials and energies involved in a given repair do not exceed those inherent in the production of a replacement (Bertling and Leggewie 2016). Without a doubt, getting to the bottom of such matters would involve an exceptional access to data and almost unfathomably complex calculations. Nevertheless, in the vast majority of cases

encountered in workshop settings, the metabolic advantages of proceeding with repair—that is, the relative magnitude of materials and energies involved in their repair over their replacement—seem obvious.

In addressing the uncertainties and ambiguities that accompany repair, collaborative contexts offer an intuitive response to the question 'how to repair?': do it, they say, in a collective and socially distributed way. Central to the practice of collaborative repair, and to the Repair Café movement globally, is the collectivisation of tools and knowledge in an open-access and welcoming space (Meissner 2021), essential elements in carrying out repair as a beginner. These initiatives are governed by a redistributive and egalitarian logic. Above all, a logic of "sharing"—in both a tangible material sense and an intangible sense of sharing knowledge and social experiences—seemed to define what collaborative repair meant to participants. We can begin here to understand the dealienating nature of this work as people become gradually familiarised with the processes and products of production via repair, while at the same time dealienating themselves from their fellow repairers through collaboration and shared goals. This echoes, and in no uncertain terms, represents a counteracting of several of Marx's 'estrangements' that he diagnoses as paradigmatic of the labour experience under capitalism. They counteract them by offering the opportunity for practitioners to better grasp and appropriate the products (first estrangement) and processes (second estrangement) of commodity economies. The collectivising element was repeatedly cited by organisers, volunteers and participants as a defining and essential characteristic to their involvement in *auto-réparation.* Although a couple participants did discuss the economic motivations that brought them to the workshop (repair being cheaper than replacement), the data was fleeting and scarce for this. Annick, an organiser at MAQ, told me that she was ultimately surprised by how few people seemed to show up out of strict economic 'self-interest', having assumed initially that many would be attracted to it because it was "free" (Annick). Instead, it became a place where people would hang around, linger and get involved in others' repairs out of sheer curiosity. Annick referred to it as a type of "town square" (*parvis d'église*) (Annick), a characterisation that rang true.

An important feature of degrowth, and one traceable to its intellectual precursors, is its underlying anti-utilitarian understanding of economic actors and institutions. In contrast to Neoclassical 'rational action theory', degrowth perspectives assume that people's self-interests are always embedded and tangled up in social relations and contexts of mutual interest, more so than competition and conflict (Romano 2015). If capitalistic economic relations and their paradigmatic behavioural/social dispositions—for instance, personal preference maximisation and competition amidst scarcity—have been ideologically justified by orthodox economists' conception of *homo economicus*, entirely different paradigms of reciprocity and deferred exchange, famously captured in Mauss' 'gift model', are viewed at once to having formed the basis of 'traditional', pre-capitalist societies *and* continuing to underpin many economic relationships and institutions into the present day (Caillé 2020). It is only with an anti-utilitarian and substantivist analytical lens, one designed to make room and accommodate socially-inscribed and -

reaffirmed ethical/moral values that eclipse simple self-interest,[45] that the practice of collaborative repair as observed makes any sense in economic terms. As many critics rightly point out, the neo-classical economic project, developed in the wake of the 'marginalist revolution', functions according to a normative agenda more than a fully descriptive one committed to or empirical enquiry (Fine 2016). While counterposing anti-utilitarian approaches seek first to be grounded in observation, with the work of economic anthropology and geography important in this regard, they too arrive at normative insights, advocating for critical engagement with the 'boundlessness and excess' of accumulation (Dzimira 2007) and the democratisation of economic practices and institutions (Romano 2015).

The theme of collectivisation emerged as recurrent in testimonies, with various subjects focusing on the sharing of different resources, both material and intangible, necessary for repair. For Claudine, Lucie, Evencia and Gilles, it was access to volunteers' knowledge that was most important. For Josiane, it was the tools and workspace provided by *auto-réparation* that she were most grateful for. On several occasions, astute reflections were made about the absolute necessity of collectivising repair, noting that the alternative would undercut the practice's metabolic aims: "I realised after the last time at the Repair Café, all the parts, all the materials. I couldn't imagine buying a whole suitcase of things to repair one thing a year. There's no point in it. It would just be consuming for its own sake. That's why a communal thing is ideal, to share knowledge and tools" (Lucie).

Josiane further highlighted the need to "push people to let go of the concept of private property" which she perceived as being addressed through community repair initiatives and tool libraries like *La Remise*. The point echoes one made concerning repair's capacity to engage in a "materialist politics…against private property in favour of the common" (Graziano and Trogal 2019:206). At other points, it was the exchange of "interest" or "passion" for various types of commodity repair that people cited as being particularly valuable in collaborative repair. Here, others' passion provided them with the motivation necessary to embark upon and persevere through repair practice themselves: "It's a passion [for me], clothing repair. But repairing my stereo is not a passion. Me, if I see a stereo, I'm like 'I have no idea what to do with this.' But if it's your passion, I'm gonna enjoy learning how to repair it with you, despite not being passionate about that kind of repair…because all our insecurities, all our worries about a kind of repair are, not erased, but lessened, when you're with someone who knows something about it" (Nat). Taken together, these discourse forms centre on the idea that it is the collectivisation of resources necessary for repair—material, intellectual and emotional— that is central in defining the values and ends of collaborative repair. In the sharing of knowledge and expertise, and through initiation into the work of repair, producers are made of consumers. The hitherto hidden and indiscernible workings of technologies are rendered more accessible, and as a result, subjects are dealienated from processes, products and other actors implicated in commodity worlds.

---

[45] For an example of this kind of analysis, see Graeber (2001) for an in-depth examination of the concept of "value" from a cross-cultural, substantivist perspective.

The process of 'coming together' in collaborative repair was also evoked in another distinct register, not as a necessary feature to ensure biophysical sustainability and encourage equitable access to repair, but as a social end in its own right. Experiences of social cohesion and community-making that collaborative repair engendered were cited many times over as an ultimate benefit of the practice. "I'd return to [a collaborative repair session] just for the community aspect. For the aspect of meeting new people, to create new links. I'd look for things to repair just to have the excuse to be around these great people. It's a great social occasion." (Léo). On one occasion, while helping an older participant fix her broken space-heater, she confided in me that the past two years had been extremely difficult for her. With her depression, and the enforced isolations of COVID-19, she'd suffered badly from social isolation. The social contact of *auto-réparation* workshops, she insisted, was very valuable to her. Similar sentiments from other practitioners cast social encounters ("the creation of links" (Claudine)) in and of themselves, as being the "added value" (*plus-value*) (Claudine) or "wealth" (*richesse*) (JP) that one gained from workshops.[46] Furthermore, the idea of community-building through repair as an inherent and self-justifying good, is paired with a perception of collaborative repair as a project of political consciousness-raising as well: "For me, repair is just a way of getting by, a kind of DIY, when you're by yourself. But when it's on a bigger scale, like in a Repair Café, for me it affects more people. It's a way of life, and it becomes more ecological. I see Repair Cafés as more valuable, socially and environmentally, while when you're alone at home, you repair to get by (*se débrouiller*), you do what you can, but we're less conscious that it's an ecological act in itself" (Tanguy). The view presented here is that communalisation of repair creates an environment in which subjects can apprehend their involvement in something larger, as part of a movement with potential for collective 'empowerment', a notion elaborated further in Part iii.

'Sharing more' is Abraham's second principle of degrowth normativity. Economic practices centring on "communalisation" or "commoning" are central to degrowth proposals (Helfrich and Bollier 2015; Dengler and Lang 2022). In this part, the collective and distributive nature of collaborative repair, as observed throughout interviews and workshops, has been foregrounded. The communalisation of, and free and open access to tools, parts[47] and space are testament to the material and metabolic merits of collaborative repair. These, along with the collectivisation of knowledge and encouragement between practitioners, are indicative of an underlying distributional logic traceable to notions of justice, equity and equal opportunity, all of which figure centrally in degrowth thought (Abraham 2019). Without a doubt, collaborative repair instantiates a practice, even an 'institution' of economic "commoning". While individual practitioners do ultimately leave with their own (hopefully) repaired objects, the other fruit, or 'added value'

---

[46] While the use of pecuniary language does strike somewhat ironic given the *anti-utilitarian* and *substantivist* attitudes that underlie them, they can most probably be viewed as symptomatic of a larger process wherein the idioms and jargon of mainstream economics and finance have entered as metaphor into popular culture and parlance.

[47] Organisers of *auto-réparation* workshops, following the Repair Café template, strove to keep in stock an inventory of basic materials and parts often required in repair: glues, tapes, fabric, solder, a variety of hardware like screws, nuts, bolts, as well as electronic parts (wires, resistors, thermal fuses, crimps, etc.). However, if the repair of someone's object necessitated a specific manufactured replacement part, it would be up to that person to go and purchase the part themselves. Yet even here, initial sourcing of parts, often an impediment to accomplishing repair, was typically undertaken together in-shop with the help of volunteers.

of collectivised repair in the reproduction and transmission of both knowledge skills on the one hand, and a sense of collective involvement and interest with which to move forward. It also represents part of what Gibson-Graham has termed the "community economy" (2006:79) insofar as the practice builds on both cooperation and a pooling of resources while at the same time reinforcing the very idea of "being-in-common" (Nancy in Gibson-Graham 2006:86). In other words, collaborative repair is *effective* not only as a means for redistribution, it is *effective* as a means of encouraging subsequent collaborative, commoning practice. In the words of one volunteer, it is also a way of rendering "community in theory"—flimsy, nominal, and vulnerable to criticism as "post-politics" (Rancière 1999)—"into practice" (Nat). Quite apart from the economic and redistributive ends towards which collaborative repair is oriented, we see there to be a firmly political element at work here as well, encapsulated by the notion that 'being together' in a community context is "the condition of possibility for being political" (Aiken 2017).

As in Gudeman's opening quote, we see here that the creation of a binding sense of community and the commoning of economic practices are mutually reinforcing processes that exist in dialectical relation with one other. Throughout, discursive variations on the theme of "community" were salient in observed data, standing in as moniker for the together-ness and sharing that practitioners deemed to be essential to what matted most about collaborative repair. Conversely the very material, as well as the social nature of repair itself was seen as vital in that it rendered concrete, and grounded what was otherwise perceived as empty "community" rhetoric. Repair practice grounds and gives 'community' meaning. The potential for collaborative repair to suit degrowth's biophysical imperative of slowing social metabolism, and its economic imperative of increasing equitable distribution across scales, seems largely promising. Looking at present case study data, the practice also appears to hold potential for galvanising political consciousness and praxis, contributing to the "political project" to which degrowth aspires (Buch-Hansen 2018). In a very real sense, it instantiates a process of dealienation with regard to Marx's fourth form: it dealienates workers from other workers. As it has been suggested in this part, and much in line with Marx's own position, the uniting of workers in labour processes that shed light on their common causes, is seen as a necessary precondition for any project aimed at social transformation.

ii.ii   Collaborative repair as 'care'

"To care for something (an animal, a child, a sick relative, or a technological system) is to bear and affirm a moral relation to it. For material artifacts, this goes beyond the instrumental or functional relations that usually characterize the attachments between people and things. Care brings the worlds of action and meaning back together, and reconnects the necessary work of

maintenance with the forms of attachment that so often (but invisibly, at least to analysts) sustain it. We care because we

care."   (Jackson 2014:231)

Following up on themes introduces in Part ii.i, the present part re-examines the redistributive, collectivised and decommodified nature of collaborative repair through the prism of labour. Adopting an analytical position sourced in feminist economics, the repair practice is defined as one of social reproduction, as subsistence-oriented work carried out with relative independence, or autonomy, from markets and monetised exchange. Here, the idea of the inherent value of work, a theme elaborated more fully in Part iii, is introduced. On one hand, repair work is framed as meaningful because one does it oneself, it is *one's own work*. On the other, the work is meaningful because it is driven by a will to recognise and sustain things beyond oneself—it is aimed at *caring* for the environment, for objects, and for the embodied labour they represent. Taken together, these facts support the perspective that collaborative repair dealienates in several ways: it foments perceived connections with the products of labour and the natural world; with the labour process; with the labour of others; and with one's own labour and transformative capacities.

In a very real sense, broken commodities cease to be commodities at the moment of breakage, becoming waste[48]. If repair retrieves a thing from a state of waste, then it *categorically* qualifies as an act of production—not of a commodity destined for sale on the market—but of an object defined by a use-value particular to its user. It is a product of social reproduction. And it is via the collectivised and immediate labour-based inputs that characterise collaborative repair (barring purchase of replacement parts) that consumers can gain a measure of "economic sovereignty" and become "prosumers" (Paech 2016:114). Such practice, therefore, has the capacity to lend itself to greater forms of autonomy, a central virtue advocated by degrowth thought (see Akbulut 2021; Deriu 2015; Gorz 1994). This also aligns with Illich's conception of 'conviviality' as liberation from "dependence from commodities" (1973:65): to engage directly in production processes in order "to permit people to shape and satisfy an expanding proportion of their needs directly and personally" (1978:14). Decommodified repair is framed here as an instance of a reversal of Marx's second alienation, from the processes of labour, by "returning control over the processes of production to producers" (Brownhill et al 99).

Feminist scholarship has drawn a crucial distinction between the economic spheres of capitalist production and social reproduction, each defined by distinct operational logics and ends. Under conditions of capitalism, *productive work* is aimed at increasing one's access to exchange-value—to accumulate money. The fact is true whether one is a CEO or a low-level wage worker. *Reproductive work* on the other hand, refers to all other economic activities conventionally relegated to the sphere of the 'household', activities that are not focused on exchange-value returns, but

---

[48] A commodity, by definition, is exchangeable for money on a market. It's defining factor is its exchange-value. While there exist many kinds of markets for broken, salvaged and scrapped objects and materials, the objects entering *auto-réparation* workshops would not have been subject to speculative interests, in the vast majority of cases.

rather on creating and distributing *use-value* in the form of the goods and services, and in fulfilling the labour roles on which physical and mental well-being, and life itself, rely (Fortunati 1995). The profound insight of this analysis lies in its revealing of the fundamentally contradictory nature of socially reproductive labour and its concealment under capitalism (Federici 2019). While conventionally represented as less important and vital, as even supplemental, to its market-oriented, productive counterpart, reproductive labour is in fact precisely the opposite. It forms the socio-economic foundation on which capitalist economic activities rest, carrying out its myriad labours—birthing, cooking, cleaning, mending, caring for young, old and sick—labours that sustain, restore, and that constitute the conditions of possibility for society as we know it. In order to reframe and revalidate such reproductive labour, some scholars and activists have advocated for an "ethics of care" (Tronto 1993). Degrowth scholarship has likewise championed a shift towards care-based economic forms, and a focus on socially reproductive labour as a way of more equitably distributing goods and services, and better achieving ecological sustainability (D'Alisa et al 2015; Abraham 2019; Barca 2019)[49].

The previous part attempted to highlight the redistributive, or sharing ethic seen by both participants and the researcher as underlying collaborative repair. While often expressed in material and practical terms, it has also been noted that repair practice's ethical/moral logic encompasses affective and evaluative understandings rooted in substantive notions of *inherent value*—namely that of engaging in production with others. This is a clear example of a reversal of Marx's fourth alienation through "re-integrating with others, [and] working collectively" (Brownhill et al 99). It is also the very materiality of repair work, carried out in collaborative social and economic settings, that enables actors to engage in work that 'preserves' and 'cares for': they care for their own and others' objects, as well as for others, full stop. Several researchers have insisted on framing repair work as a form of care work (Jackson 2014; Graziano and Trogal 2019; Meissner 2021). Yet such a generalisation seems to require a bit more precision: while 'bad repair', in certain commercial forms, can serve to perpetuate destructive technostructures, as previously, 'good repair', for instance decommodified repair, should be viewed positively as "a way to sustain and restore infrastructures and lives" (Kannengeisser 2018:102). In other words, in its non-commercial and decommodified form, the *productive work* of repair is more accurately one of *social reproduction* insofar as it is a non-marketised, non-remunerated (non-*chrematistic*) labour oriented to the maintenance of household economies (*oikos*).[50]

Meissner proceeds, applying directly the framework of 'care' to Repair Cafés, observing therein four distinct forms that emerge through the practice: "caring for objects", "caring for each other", "caring for community", and "caring for environment" (Meissner 2021). The present study similarly attests to the presence of several care logics in

---

[49] D'Alisa and Cattaneo (2013) have looked at relative rates of energy consumption associated with both wage and social reproductive labour activities. Their time-use study concludes that a shift from wage to unpaid, subsistence work would reduce overall energy demand.

[50] See Vioulac (2018) for a discussion of the Hellenistic distinction between *oikos* (the household, subsistence economic sphere) and *chrematistics* (sphere of market-related exchanges that use money)

collaborative repair practice. It was noted throughout the research process that the express desire to care for an object, and the constituent materials it embodies, was a prime motivator to repair. Lucie described her sense of responsibility by using a language of stewardship: "I say to myself every time I buy something, 'This was produced for me. I am kind of responsible for its life'". Annick likewise spoke of what she saw as our collective need "to be more agile with the materials around us—to take better take care of things" as we moved forward into less certain times. In some cases, the will to object-care was articulated with an observed desire to 'respect' and preserve, in embodied form, the labour invested in an object's manufacture. "To respect the resources used to make this thing, and to also respect the time put into designing and producing the thing" (Gilles). Evencia talked about her will to repair as motivated by a consideration of "all the work that was done to build a thing, a thing that can still be useful. To just throw it out, I have a hard time with that."

A paradigmatic discourse of care, ones echoing the initial reproductive concerns of feminist theory, was invoked by Marie-Claude when comparing the governing logics of wage-work with that of collaborative repair: "Like, you have to choose. Maybe some things aren't worth the time, are not worth it for you. But I mean, in the end, bottom line, let's say if you take care of a child, you're not paid $100/hr to do it. So it's like the same. If you like to knit, maybe you like knitting, and you don't have to be paid $100/hr to do it. It's a choice you make at some point" (Marie-Claude). Here, the subject engages with a "labour of love" discourse (Federici 2012:16). In a similar fashion, Joce drew a line between her repair work and her engagement with other household care activities like infrastructure maintenance projects and gardening, emphasising the inherent worth of such work:

> "Like, I tiled my kitchen, and I would have never thought I'd have done that. Things feel more
> valuable when you do them yourself, when you have your own story to tell about it… Like I
> wouldn't want somebody to landscape my yard when it's like…I dunno, it's just like my way. I
> want to move the dirt around myself" (Joce).

The perspective offered here is that work *makes sense* because one does it themselves, specifically without recourse to paid labour markets. These subjects seek to underline the fundamental incommensurability of subsistence repair or DIY work with an economistic perspective that attributes universal exchange-value ($) to one's use of time. For Marie-Claude and Joce, the socially reproductive work represented by repair, DIY and craft practice—like that of raising a child—is simply incompatible with the logics of either pecuniary compensation or time rationalisation. In a collectivised context, the experience of engagement in meaningful socially reproductive work is shared one in a very real sense. Not once did I see someone repair a thing entirely on their own—assistance, guidance, advice, or simply a steady third hand, was virtually always sought out. The point to underline here is the meaning-making aspect to involving oneself in repair processes. If alienation is characterised on the one hand by a loss of meaning, the rehabilitation and restoration of meaning in the things and work we engage in must, then, be considered dealienating.

In Part ii, data has been presented with the aim of relating the practice of collaborative repair, as perceived and interpreted by its practitioners, to Abraham's second principle of degrowth normativity, "sharing more". The imperative is first interpreted in rather direct, redistributional economic terms. In short, the basic functioning of observed repair workshops—the offering of open access to repair space and tools, the collectivisation of knowledge and expertise in assisting others' repairs—is very much one of 'sharing'. Here, sites of collaborative repair have been characterised as resembling a 'commoning' practice. This is not incidental: commoning is expressive of the core values that both justify the practice in the first place, and that are reaffirmed through it. The values are expressed through an economic normativity of decommodification—that is, production and labour practices that exist in the absence of market exchange and beyond the determining forces of the state. By collectivising repair, the practice is viewable as a reversal of Marx's second and fourth alienations. It "returns control over the processes of production" (second) through "re-integrating with others [and] working collectively" (Brownhill et al 99). As we have sought to emphasise by looking at the idea of 'care' that flows though collaborative repair, undergirded by economic activities aimed oriented to social reproduction, 'reintegration with others' not only means those with whom you do repair work

Parts ii.i and ii.ii have traced an implicit conceptual line between the normative economic paradigms of 'commoning' and 'caring', paradigms frequently espoused in degrowth scholarship. Both are ways of thinking about, and organising, socially reproductive labour (see Dengler and Lang 2022). Both are geared toward an abnegation of the practices and rapports of market exchange, and an embrace of labour and object decommodification. The view that collaborative repair has something to do with caring—as stewardship of objects, as maintenance of previous embodied labours—is one that emerged amongst participants. This renders the work more meaningful. It is also framed as meaningful because *doing* the work itself carries an inherent value, precisely because it is not mediated or instrumentalised by market exchange. It is work that is seen to be more intimately connected with the labouring subject not despite, but because, it is perceived as *inter*subjective and shared.

Jaeggi has defined alienation as consisting of "two different but intertwined diagnoses" (2018:104), namely "a *loss of power*" and "a *loss of meaning*" (105, emphasis in original). Conversely, the present study suggests we think about dealienation as a dual movement toward experiences defined by re-empowerment and autonomy on the one hand, and a restoration of meaning on the other. In the context of collaborative repair, the heteronomy of market-based exchange and labour practices are tempered by the relative autonomy, and collective economic empowerment, of decommodified practice. In this way, a measure of power is reclaimed here. The notion of 'care' has been used in this part to sum up an operative logic of decommodified socio-economic interdependence perceived to be contained in the practice—one extending to, and implicating objects and the environment. Something akin to a care logic is at work in practitioners' formulations regarding how they perceive the work to be meaningful. In this way, care discourse is regarded as an instance and manifestation of a larger process of dealienation that unfolds in collaborative repair, one restoring new meaning to labour.

iii   *Deciding together*

Abraham's third and final principle for degrowth normativity, "decide together", is perhaps the subtlest and thus warrants the greatest attention. It points primarily to what the present study has attempted to distinguish as the *qualitative* case against growth, and the corresponding case for degrowth. Here, questions of biophysical sustainability and redistributive justice shift to the background while themes of alienation, freedom, as well as conceptions of the 'good life', are brought to the fore when considering what the phrase means in terms of technology practice. In approaching such potentially enigmatic Marxian concepts, 'deciding together' must first be considered from an equally Marxian political economic standpoint. At first glance, the phrase seems to indicate forms of more direct and horizontal, rather than distant and delegatory, democratic organisation in shaping society's economic, political, and technological practices and institutions. Lurking behind this third principle is an underlying question: under what conditions could we have more say in, and more connection to the social, economic, political processes that determine social life? Toward the end of testing collaborative repair *for fit* against the imperative encapsulated by 'deciding together', an identical question is directed at the *technological*: under what conditions could we have more say in, and more connection to, the technological processes that define society? The present study's intention is to clear a conceptual space where we might better and more fully explore the question implied by Abraham's third principle.

In order to progress further in the present analysis, a more concerted deconstruction of the phrase is required. 'Deciding together' implies a particular process of decision-making, one predicated on a certain 'together-ness' not dissimilar to that observed as institutionalised in collaborative repair practice and discussed in the previous part. So, while at this point we have a clearer picture of in mind of how the collectivised nature of repair might enable a together-ness, what does it mean to 'decide'? If to 'decide' is to undertake conscious deliberation toward the end of exerting an impact or influencing an outcome, what are the necessary conditions which precede it? I wish to speculate here that the making of *real, deliberative decisions* depends on two fundamental and necessary processes, in the absence of which it cannot be claimed one is making a truly deliberative decision. The first is an access to, and reflection on, available information pertinent to guide sound decision-making. This does not imply a neutral or distanced scientific project, but one inflected with frequent ethical-moral and value-laden judgements. The second is a subjective sense of belief in one's own efficacy in achieving or affecting change—a basic pre-condition for living a 'successful life' (Rosa 2019) and affirming either individual or collective agency. Finally, these two speculated

prerequisites are generative processes insofar as they are carried out, challenged and reinforced under given social conditions and in particular institutional settings. In its entirety, 'deciding together' is understood as a normative mode only capable of emerging along with dealienated subjectivities.

In Part iii, Abrahams's third normative principle 'decide together' (2019) is first unpacked as a dual and recursive process, the dynamics of which are interpreted as being observed throughout, and set in motion by, the practice of collaborative repair itself. A first and initial step in 'deciding' is framed as involving heuristic activity on the part of repairers to collect and deliberate information garnered through repair—on the political economic drivers of global flows of labour and materials, and a sustained reflection on our place in it all (Part iii.i). Here, a theoretical discussion involving the question of commodity fetishism—the limits imposed by it, and the possibility of transcending them—is embarked upon. Here, questions of *structure* are front and centre. Part iii.ii follows up with a counterpoint, and takes a look at the framing of repair as concrete material *action*. It follows with an introduction to the notion of 'craft' as a paradigm for thinking about how practice can be an iterative interrelation between processes of asking questions and seeking out solutions. Part iii.iii takes a look at how repair practice occasions reflections on perceived needs, and how such critical reflections bear on technology practice.

A second necessary precondition for 'deciding', in any consequential way at least, is defined by a sense of self-efficacy or 'empowerment', motifs near-ubiquitous in observed repair testimonies (Part iii.iv). These two processes: interpretation and deliberation of information; and reinforcement of a sense of individual and collective efficacy, are iterative and self-reinforcing. They are observable throughout both repair sessions themselves, and participants' representations of them. Together, they capture the how's and why's of collaborative repair practice. And such is the essence of practice according to Jaeggi: "the attitudes toward and interpretations of practices go hand in hand with the practices and lend them their specific character" (2018:63). Part iii further explores in greater depths the theme of 'alienation', beginning with a further examination of Marx's four "estrangements"—1) from the products of our labour/natural world; 2) from the labour process; 3) from ourselves; and 4) from others (Marx 1959). It then proceeds to define what is meant more precisely when we talk about the degrowth imperative to "dealienate" (Barca 2019; Brownhill et al 2012; Akbulut 2021) and how this might relate to technology practice. Further theories aimed at exploring the ontological 'other' of alienation are discussed at this point. Degrowth's prioritised terms of 'autonomy' and 'conviviality' are compared against Rosa's notion of "resonance" (2019) as the conceptual antipode, and antidote, to alienation. From this angle, collaborative repair is considered as a practice conducive to experiences of resonant relationships to the world.

iii.i   Reflections on political economy

"The fetish character of the machine resides in the ability to present itself to our consciousness as a local achievement rather than as a product of the confluence of global flows. It is high time to demystify the special forces that seem to literally animate our machines, beginning, perhaps, by asking why they continue to be so unevenly distributed over the face of the Earth."

(Hornborg 2001:147)

The present part focuses on what we have called the 'reflective' processes that are both instigated by repair and necessary in carrying it out. Considered as the initial or diagnostic steps of collaborative repair, here practical questions begin are asked about the nature of machines/technologies and their possibilities for repair. At the same time, larger speculative interrogations and conclusions—political-economic 'lessons'—are arrived at which also ultimately serve to help practitioners draw conclusions regarding macro commodity production/consumption/waste realities and therefore inform meaningful technology practice moving forward. In this part, the concept of "fetish" is mobilised to assist in describing commonplace, pre-repair relationships to the commodity form, along with the "defetishing" potential of collaborative repair. These exploratory/reflective processes are dynamic and multi-scalar: their point of departure is the concreteness of a singular object/commodity. From there, critical perspectives zoom outwards to global scales of industrial commodity production with their social and ecological implications. This represents a dealienation from the products of labour and the natural world, as well as from others, Marx's first and fourth forms of alienation. The critical observations gained through collaborative repair can also de desired as iterative: political-economic lessons fold back on themselves, informing future repair work and consumption practice more generally. Technical familiarisation through *opening up*, along with critical interrogation through *asking questions*, key aspects of the first moments of repair, are framed as integral to understanding how the practice can be considered as one of 'deciding together'. In other words, we arrive here at one of the present study's core arguments: the dealienation of technology practice is the necessary and sufficient precondition for 'deciding together' in the face of questions of technology.

In our contemporary, globally-integrated world of industrial production, asking questions about objects/ commodities—the first and most basic step in any repair—means asking questions about political economy. If then, an essential precondition for truly 'deciding together' is the gathering and deliberation of information, as outlined, the material and technical insights arrived at through collaborative repair make the practice a privileged point of entry for deliberation. The vast majority of research participants cited the practice as being valuable precisely for the perspective that collaborative repair afforded them: "It makes you ask questions" (Tanguy); "One can learn really concrete lessons" (Gilles). Following the initial disappointment of breakage, one embarks upon looking "inside the beast" (Gilles). Such moments are often fraught, and one can get the impression of being a trespasser here: "There's like a kind of taboo. You

know, we're not supposed to [open the object]. We're not used to doing it, so it's like we're breaking the rules" (Léah).

Here, the first hurdle is oftentimes the most challenging: outer casings of mass-produced commodities are notoriously tricky to open, representing a 'make or break' moment in the success or failure of a given repair. Various kinds of reflection circulate amongst collaborative repairers, largely a curious and chatty bunch by nature. There is general talk concerning the relative repairability of older commodities, comparing their designs with that of newer products, their cheapness and 'programmed obsolescence'. There are mutterings about the inevitable profit motives behind new design trends and the inevitable consequences of accelerating waste generation. Not infrequently, after initial attempts at repair, someone arrives at a (realist, cynical) conclusion: "They aren't even built to be repaired!" (Marie-Claude). Amidst such reflection, several perspectival angles come into question, and sometimes positively complex analyses emerge involving diverse actors, underlying structural economic forces, and one's own place in the whole mess:

> "You're excited to get started [with your repair], and then you get frustrated that someone hadn't
> thought at all that one day it would be opened [for repair]. Or else they've done it on purpose to
> stop you from opening it…very often you sit there cursing: 'Damned people who designed this
> toaster, whenever, wherever they are!' Some guy at a design table, on a computer. That guy, I don't
> like. I hope he gets what's coming to him…It's all for profit. It's out of clear contempt for people
> who one day want to repair it. Because, obviously, when you [design] in a context where you're
> sure that your product won't last, that it'll be thrown away, you just don't care. It's frustrating. And
> these people, if we want to personify them, for instance the person that made the toaster, we'd think
> they'd have zero social consciousness or sense of the common good, that they pretty much don't
> care that the landfill at Ste-Sophie is overloading…This guy, he couldn't give a damn. And if we
> chatted with this person that we've personified, the toaster designer, he'd probably say to us 'Look,
> I made it that way because all my competitors do too. And if I did it another way, I'm gonna sell ten
> times less toasters, and the company will go bankrupt, and I'll have to work for other people"
> (Gilles).

In this passage, one gets a picture of the kind of dense reflection that can accompany collaborative repair. The repairer's experience is easily one of frustration. Yet despite the (admittedly ironic) personification of the imagined sociopathic designer, it is clearly understood that it the absurdities and excesses of commodity production and life-cycles are the result of macro-scale, deeply integrated political economic, and market-based *lock-ins*. What is important, and indeed central in making the collaborative repairer inclined to such reflection, is the very reflexive question of an object's 'repairability', typically the very first question posed in repair. It is the presence or absence of 'reparability' that becomes the point of entry for the mental wanderings of the curious frustrated and excited repairer. 'Repairability' is thus a proxy of sorts. It is a straightforward index for the extent to which one can appropriate a technological thing, a point revisited in Part iii.ii.

Once open, a commodity's constituent parts, their inner workings and inter-dependencies are visible in ways seldom afforded us in our everyday interactions with technological artefacts. Very often, one is stuck by an object's complexity: "I tried opening my cell phone, and everything changed for me. I thought 'Wow, look how many parts there are! My God, all the work that went into this thing.' So your whole outlook changes. It's no longer just a trivial thing that you can toss or cast aside." (Annick). In these moments, thoughtful consideration of the labour and materials inherent in a commodity's conception, fabrication and assembly, seem easily come by. What's more, such information is subjectively useful, not only in terms of motivating repair, but in informing our relationships with materiality more generally. With what she had learned through her repair experiences, Evencia found it increasingly difficult to simply throw a thing away, knowing "all that had been put into making it—extracting materials, and all the work that had been done to construct it." Léah, likewise, found collaborative repair made her "think also about the people who assembled [an object]. It's baffling to think about the whole life of a commodity, where it comes from and where it ends up." If such statements represent a perspective that inquisitively extends outwards and backwards, speculating on the material and social circuities of a object's life, there remains also something of a marvelling, an astonishment at the baffling complexity of productive processes.

At other times, practitioners spoke of the moment of 'opening up' in somewhat different terms. For Julien, he found an immediate "satisfaction" in laying things bare, in "understanding the mechanics and the elements that are used in a product". This kind of discourse describes the perceived *demystification* occurring in repair workshops. Nat narrates the process with a marked elegance:

> "When you disassemble something, it's like you're seeing the steps in reverse, how it was put
> together. It makes us familiar with—if for example it's a mechanical object—it makes us more
> familiar with the mechanical process. But it also shows you that it's not made by magic, you
> know…when you buy things, you're under the impression that the products built themselves. But
> when you take something apart, we realise the steps involved in making it. But I'd also say the
> human value due to the fact that someone built it. Especially myself, when I think of clothes, when
> I work on a piece of clothing, I realise that the person who makes things has a value too. So I think
> the process of taking apart and putting back together, it's like it opens you up to the value of things.
> It lends more value, I feel, to the object or clothing" (Nat).

What emerges here is a technical and technological consciousness in which consumer-based assumptions and superstitions rooted in myths of autonomous machines and commodities are challenged, if not debunked entirely. At the same time, information regarding a machine's functioning and complexity, as well as speculative thoughts on the relative labour time embodied in it, can be gleaned in moments of repair. Such information is seen as valuable, contributing to more sound judgements of quality and better consumer normativity in the future. On another occasion, Nat was guiding another participant and myself through the basics of mending—how to thread a needle, sew a patch,

and how to hem pants. We started chatting about the effort and skill involved in making something as simple and everyday as a t-shirt, when Nat said:

> "A five-dollar t-shirt just shouldn't exist. It takes you to make one t-shirt, that you yourself sew, to realise that you can't sell these things for five dollars. Basically, we're abusing materials, we're abusing people, without even realising it or wanting to. We don't think about the costs of the materials and humans that are hidden behind what we buy and consume" (Nat).

Nat's discourse strikes a distinct note relatable to critical theory. Marx identified precisely this type of 'hiding' or 'concealment' with his famous passage on "the fetishism of the commodity" (Marx 1976:163). Here, he drew attention to what he saw as a key feature defining the relation between people and their manufactured environment under capitalism. The 'fetishistic' nature of commodities can be traced to its: while the commodity instantiates the physical embodiment of diverse human labours (social relations) and raw materials (biophysical relations) required in its production, these constituent relations are concealed in its singular, unitary form. The fetishised commodity therefore, is the quintessential material embodiment of Marx's four alienations (see Brownhill et al 2012). In a context of market exchange, the mystique and "magic" (Nat) that envelops commodities obscures our common apprehension of the conditions necessary for their creation (Marx 1976). Commodities therefore take on an aspect of autonomy—as if they "built themselves" as Nat puts it—in much the same way that technology in general can. Resuscitating Marx's concept, Hornborg speaks of "machine fetishism" as emerging amidst processes wherein global flows of extracted resources and labour are encapsulated and 'black-boxed' into seemingly magical and immanent technologies. His updating of the fetishism concept provides a way of analytically 'unveiling' such flows and opens up a conceptual space for critically examining technology practices.

The truth, of course, is that commodities are anything but autonomous. But we are daily deprived of the perspective required to see the fact, caught up as we are in the daily grind of lives filled with ever more manufactured stuff, coming from ever further afield, sourced from ever more twisted and complex supply chains, available for purchase in deterritorialised, digital marketplaces run by an infinite string of third parties. If the picture painted here is superlative, the impression it conveys of the obstacles, both perceived and real, that conspire to obstruct what we can, and do, know about commodity origins, does at least feel accurate. They are obstacles that preclude our engagement in transformative normativities vis-à-vis technology. The banal fetishisation and everyday *black-boxing* of commodities and technologies has an alienating effect in the full, double sense outlined by Jaeggi (2014). In one sense, our obliviousness of inner workings of a thing, and our resultant incapacity to fully technically appropriate that thing, constitute a *loss of power*. In another sense, this obliviousness, paired with an ignorance of the thing's material and social origins, constitute a *loss or deficit of meaning* over commodity forms. Indeed, the odds are stacked against the would-be critical and conscientious consumer. Yet it is precisely here where collaborative repair, as a defetishising technology practice, seems to offer a countervailing force to the alienations associated with commodity-worlds. The

practice opens a heuristic window onto the embodied labours and materials, the inner workings and manufacturing processes, onto the 'magic' contained in technological artefacts. Through the reflections on materiality that it instigates, the practice is even revealing of the commodity's final and greatest magic act, that of 'disappearance':

> "You get to know about [an object's] end of life, where these things go. The amount of stuff that's produced in the world, which end up in dumps in developing countries. It's unbearable. There are people who will deal with it with bare hands. There are toxic chemicals that can pollute…It's night and day, my relationship to objects [after starting repair]. It's just what happens when you start getting into it, start looking at the details of an object, when you lift the veil to see everything that goes into it in terms of resources, time, human beings at every step…transported it, wrapped it… There are also precious metals that are rare, with all the political struggles around them. It's infinite" (Annick).

The image presented here mirrors with eloquence what Schmid has noted in his own ethnographic research, "[R]epair penetrates commodities and makes visible what is below their material (and social) surfaces. By inviting interest on how things are made, repair often triggers reflections on obsolescence, and the complex and often unjust global value chains commodities pass through" (Schmid 2019:244). The process Schmid describes is precisely that of defetishisation as I've ventured to define it. The work of collaborative repair can be said to *defetishise*: it offers perspective on the material and labour inputs embodied in commodities through opening up, looking and asking questions. These questions lead to other, larger interrogations, even "lessons" (Gilles) about the nature and workings of macro-scale commodity production industries. This process is dealienating insofar as it renders our relationships to commodities more meaningful. Beyond mere reflection, actually engaging in a thing's repair involves both a technical understanding of the object and the deployment of a modicum of skills. This process, one of *appropriation*, is dealienating in that it entails an empowering of our relationship to commodities.

There are obvious limits to knowing the social reality of those labouring behind a product's manufacture. One cannot pretend or hope for true transparency to the question of commodity origins. The same must be said with respect to any object of social inquiry. The crucial point here is this: while the prevailing cultural logic of consumerism, and its metabolic accelerations under capitalism, actively conspires to undermine the capacity to subjectively grasp the social and material implications of commodities, the collaborative repair workshop offers an interrogative space where critical, interrelated questions (How can I repair? Is this worth repairing? How can consume more responsibly?) can be asked, and possible future courses for material and technological practice can be charted. Insofar as practitioners gain insight into such questions, they partake in a process of dealienating themselves from "products of labour and the natural world" and "from others", Marx's first and fourth estrangements. We could call it *dealienation via reflection.* To be sure, an inquisitive disposition toward the political economic structuring of commodity lifecycles does not require one engage in repair. However, what emerged from site-work and subject repair testimonies was a palpable sense that

the work of repair itself can offer unique insights to such questions. The preliminary steps of opening up, of familiarising oneself with inner workings and constituent parts, of diagnosing a failure, does just these things: it is a local, metonymic interrogation that can *open up* onto the problems and failures of larger socio-ecologic processes if one is prepared to ask the right questions.

As underlined in Part ii, the collaborative format of this work is central to the process of reflection, as information and knowledge is frequently exchanged about the nature of material origins and their waste forms, the intentions of commodity designs, and their repairability/obsolescence, amongst other topics. Here, a picture begins to come into focus as to how collaborative repair can be viewed as a practical arena in which informed and meaningful technological decisions can be made together, to return to Abraham's third normative third principle.

This section has sought to portray one face of collaborative practice, namely, its critical engagement with political economic realities in ways that are unique, even more immediate. The critical reflections that emerge from the process are a necessary precondition for the making of deliberate decisions with respect to technology practice, decisions specifically informed by the social and ecological orientations of degrowth thought. And yet such critical political economic reflections could also, and indeed do, occur in classrooms for instance, influencing normativity by other means. So what makes the practice of repair so special? Precisely this: because the practice is first and foremost a material and technical one, it dealienates in various and diverse ways, it offers knowledge *both* in the from of critical insight *and* embodied, technical/manual skill. It is this study's position, outlined above in the deconstruction of 'deciding together' as a two-part process, that while necessary, reflection alone is not sufficient to establish transformative technology practice: one must actually engage in *new constructive practices*. It is on the level of practice, alone, that future "projects" of transformation are built and future agents of change are "recruited" (Røpke 2015:348). Understanding structure is not enough; one must attempt overcome it. In other words, in the wake of diagnosing an object/commodity's failure or malfunction, one must now try to fix it!

iii.ii   Agency, practice, and the repairer's virtues

"Practice and practical *share a root in language. It might seem that the more people train and practice in developing a skill, the more practical minded they will become, focusing on the possible and the particular."*

(Sennett 2008:46, emphasis in original)

Having discussed the process of diagnosis and its accompanying reflections, this section outlines how repair is framed by practitioners as a constructive practice, one that in its orientation toward finite project-specific ends, is viewed as cultivating positive character traits. In a way, it is conceived as both a counter-posture, and complement, to

what we called the political-economic analytical view presented in the Part iii.i. Instead of *dealienating through reflection*, collaborative repair is here presented as a practice that *dealienates through action.* By engaging in repair, in the acquisition and application of technical knowledge and the building up of embodied skill, the repairer is dealienated from the labour process, reversing Marx's second 'estrangement' (Marx 1959; Brownhill et al 2012). As indicated here by Sennett, engaging in material practice is also seen as a route to approaching something fundamental about peoples' relations to work, specifically their need to impact and exert meaningful change. Marx saw our alienation from this fundamental need, from our "species-being", as a major failure of capitalism, and one that constituted its third form of alienation (Ibid).

Grappling with, and speculating about, the structures of commodity production, and how they relate to both subsistence repair and one's capacity to carry it out, were salient features in *auto-réparation* workshops as we have attempted to demonstrate. But ultimately, repair is a practice oriented toward a result, however small and modest repairing an individual object might be. In a way, it's a practice that insists on the importance of practice itself. There is thus a circular, self-asserting logic at play, as well as an instance on "non-hierarchical notions of scale" (Schmid 2019; Aiken et al 2022). There is a resistance to trivialise individual or small-scale practice as inconsequential, and a will instead to contextualise and embed it in medium- and larger-scale flows of goods, labour and knowledge/skills. Community repair, Schmid notes, demonstrates a scepticism of local/global dualisms, and adopts a view that "Power does not reside within actors or structures but emerges through the ways human activities interlock with each other and the more-than-human world, materialise in bodies and artefacts, and become relevant in situated performances" (Schmid 240). There seems to be something about the very practice of repair itself, in the doing of it, that is instructive of how to meaningfully act in the face of large-scale social and economic institutional structures.

Repair, like many things, is easier said than done. In addressing the obstacles to repair work, Julien talked about the issue of simply finding the time to do it, an issue that arose amongst many people, especially repair novices:

> "For sure, for working people, they have very little time…you work during the day, your wife
> works, you have your kids in the evening…You don't have any time to repair, so it's easier to go
> out and buy [a replacement]. But if you like [repair] and you're motivated, that's what you're gonna
> do" (Julien).

According to this testimony, despite underlying economic forces, despite the experience of 'time starvation' that defines contemporary life (see Rosa 2014), obstacles to subsistence repair can be overcome if one is 'motivated' or 'passionate' about it, as for instance with a hobby. So there is something about, *making time for* repair, the routinisation of practice, that is central to engaging in the practice itself. It requires surpassing temporal obstacles structurally imposed by both labour-market engagements and other activities of social reproduction. 'Motivation', driven by one's self-directed interest, is here invoked as necessary to overcome such obstacles. It is perhaps here that echoes of Marx's third estrangement—from oneself or species-being—ring through most clearly. We saw in Part i that such 'motivation' is

largely an ethical one, informed mostly by ecological as well as social, considerations—it is what makes collaborative repair meaningful in the first place. Motivation can also be driven by a sense of enjoyment arrived at through repair, a topic later addressed in Part iii.iv. Temporal themes are revisited in Part iv.i where it is suggested that the practice of repair itself can hold a key of sorts in the unlocking of temporal time constraints. For the moment, suffice it to make the point that Julien emphasises the *possibility* of transcending structural forces and engaging in practice.

In his analysis of craft, Sennett notes, "Every good craftsman conducts a dialogue between concrete practices and thinking; this dialogue evolves into sustaining habits, and these habits establish a rhythm between problem solving and problem finding" (2008:9). Ruminating on the structural determinants that underlie socio-ecological crisis on the one hand, and impede everyday repair on the other, one can easily find oneself in a state of despair. In the depths of frustration, the repairer thinks of "throwing in the towel" (Julien) and abandoning repair altogether. Even prior moments of breakage can leave one feeling helpless, a victim of larger 'conspiratorial' political economic forces (JP).

However, what emerged in the study's data was an observable tacit resistance to 'structure-heavy' analysis. In other words, there was an *agency bias* that appeared to drive the practice of *auto-réparation*. For instance, Josiane considered the issue of programmed obsolescence something of a red herring, a one-sided diagnosis that shifted too much responsibility onto corporate actors and absolved consumers who both "always want new things" (Josiane), and are delighted to throw things away in order to replace them. The perspective echoes what Marion has characterised as the "diluting of responsibility" typical of advanced technological regimes and their complex divisions of labour (2015:102; author's translation). Josiane's discourse foregrounded what she saw as a collective need to assume responsibilities to others and the planet through technology practice. For her, this meant avoiding replacement and "being autonomous in using what we already have on hand" (Josiane). JP took a hard line perspective on the matter, viewing the issue of programmed obsolescence as an overblown one that can engender passivity and complicity in a system of accelerated commodity production-consumption-disposal cycles. He sees collaborative repair as a way of :

"We have to stop thinking that the system isn't us…We make choices in all this. But the system is

not against us. It is made for us, to serve us. So yeah, [promoting] overconsumption increases

company profits for your retirement fund. There are many ways to look at the issue, but we always

look at in a way that avoids [our own] responsibility in it all (*en se déresponsabilisant*). We are the

system. It's just that you can decide to function in a certain way in it" (JP).

The accuracy of such a position is clearly open for debate, specifically with reference to two facts: one, that a just distribution of historic responsibility for socio-ecological crisis must place this primarily in both the global North and amongst the global wealthy. Two, that one's agency to act *against* or *outside* 'the system' could very well be relative to one's material prosperity, or at least correlate with a certain minimum threshold of security. Nevertheless, JP's statement is not offered not for its objectivity and balance, but as illustrative of how decommodified repair practice is imagined by participants as a way of taking on material responsibilities, and how this was in turn implied a change in

mindset. The demonstrative preference for solution-oriented action relates to what we have described as one's belief to have meaningful impact, to have 'self-efficacy' in Rosa's words (2019), themes further elaborated in Part iii.iv.

The observed *agency bias* amongst collaborative repairers was also expressed in terms of an essentialised 'character' or 'disposition' that was seen to define the repairer. Gilles explained that Robert, an accomplished repairer and volunteer at workshops, seemed to typify certain character virtues he associated with repair: "The repairer has a good attitude. Richard is very optimistic. He is also reserved, modest (*discret*). You feel his attention is focused on finding a solution" (Gilles). In this picture, collaborative repair practice both requires and engenders positive character traits to navigate through and counteract the inevitable frustrations encountered in repair itself. The repairer's "optimism", well-tested amidst frustrating conditions, is here relatable to the kind of "hope", and ultimate praxis, that Jackson sees as underlying repair sensibilities: "If hope can be thin and cruel, it can also be thick, grounding, and productive, a source of individual and collective agency rather than resignation" (2019:345). Repair requires hope in the first place; the same is true for all forms of praxis. It is a hope that clings to belief in our own efficacy (Rosa 2019), what we are framing here as a second pre-requisite for decision-making. But where does one come by such hopes and beliefs? If they form the underlying conditions that precede and delimit the possibilities of, and for collaborative repair, at least as much as political economic structures do, in what origins are they themselves sourced? Is it possible that passion, hope and belief of this sort originate in moments of engagement in the practice itself? Marx's third form of alienation, from one's self or "species-being" (Marx 1959; Brownhill et al 2012), bears directly on such questions. It hints at a conviction, that one's meaningful engagement in labour, one's belief that such labour can have an impact, that it can be *transformational*, reside in and define some inner human essence. Such a position might strike us as out-of-date and romantic, and this skepticism is taken up in subsequent parts. Suffice it to say for the moment: if capitalist production can be seen to preclude, or impede, such meaning and belief, then just maybe collaborative repair can restore their virtues. Maybe it can dealienate in this sense as well.

The repairer's agency was an issue that emerged in the present research context in a particular way. This agency was cast as undergirded by certain virtues seen as crucial to accomplishing repair. Evencia, Julien and Marie-Claude cited the "patience" and persistence required to achieve success in repair. Again, the associative linking of engaging in material/technological practice with the cultivation of what are viewed as positive character traits, is one articulated with regard to the practice of craft.

> "[T]he craftsman's way of working can give people an anchor in material reality. History has drawn
> fault lines dividing practice and theory, technique and expression, craftsman and artist, maker and
> user; modern society suffers from this historical inheritance. But the past life of craft and craftsmen
> also suggests ways of using tools, organising bodily movements, thinking about materials that
> remain alternative, viable proposals about how to conduct life and skill" (Sennett 2008:11).

Perhaps the paradigm of craft, as sketched out in this part by Sennett, gives us a template for thinking about collaborative repair as technology practice capable of reconciling structural impediments with concrete, transformative practice; of nurturing a positive and solution-oriented disposition amidst the pitfalls of frustration; of assuming socio-ecological responsibility despite limitations of scale.

iii.iii   Reflections on perceived needs

"...a self-limitation of needs experienced as a reconquest of autonomy"   (Gorz 1994:12)

In this part, another 'agent-focused' component of the agency-structure dialectic as it transpires in repair work, is defined and examined. The inherent uncertainties and frailties surrounding both technology and our attempts to retrieve use-value from it via repair, are framed here as prompting deeper reflections regarding what we ask of technology. As our expectations and needs vis-a-vis technological artefacts are interrogated, we learn something about ourselves too: here may perhaps reverse the alienations imposed by the forces of 'exogenous preference' issuing from advertising and high-tech-oriented consumer culture. In other words, we may dealienate ourselves from ourselves, seen here as an essential, if not entirely sufficient, precondition for deliberate decision-making, whether individual or collective, about the technologies we cultivate and the places they occupy in our lives.

The idea proposed in Marx's third estrangement is perhaps the most perplexing of them all. What could it mean to be alienated from one's 'self' or 'species being'? If we are to avoid analytical appeals based on notions of inner essence or authenticity, how are we to interpret this? Brownhill et al (2012) have interpreted 'species-being' to stand for a fundamental connection, interrelation and interdependency on others, both human and non-human, in a proto-ecological, even cosmological sense. This is a good starting point, but Marx's third estrangement could use more conceptual definition: Brownhill et al's definition seems very similarly to that indicated by 'alienation to others', Marx's fourth estrangement, thus leading to analytical confusion. The present part takes a different approach, insisting on what it sees as the *internal* aspects implied in 'alienation from one's self', and imagines this form of alienation as having to do with 'estrangement' removed from one's desires and interests in any meaningful way (Rosa 2014). This formulation makes sense if one considers that alienation is a dual "diagnosis" signifying both a *loss of power* and a *loss of meaning* (Jaeggi 2014). Dispossession of the power to decide, to exercise self-determination, or to be 'autonomous' in Castoriadis' sense (1987) is seen as inextricably linked to a deficit of meaning-making on the subject's behalf. Experiences of dealienation, then, along the lines sketch out here, is expected to combine the enhancement of subjects' power, in the sense of self-determination or autonomy ('the naming of one's own law'), on one hand with a restoration of subjects' capacity for to render things meaningful on the other.

As discussed in Part i, an interest in having a reductive impact on production-consumption-waste cycle acceleration was a basic motivation for many repairers. In collaborative repair, they see a practice they feel could make a difference toward this metabolic end. Here, then is empirical expression of the observation that practice is always intentional, that it's "inextricably interwoven with attitudes and orientations" (Jaeggi 2018:63), and thus invested with meaning. Practice is always oriented toward doing something: in the case of collaborative repair, the 'something' is *both* the specific object/repair itself *and* the multiple overlapping motivational logics, many convergent with those of degrowth, that motivate repair and make it meaningful.

Degrowth critique has been influenced, in part, by the notion of "voluntary simplicity" as a means of achieving biophysical sustainability and social equity, as well as a way of "reimagining 'the good life'" (Alexander 2015). In other places, researchers have talked similarly of the need to be "sufficiency-oriented" and to focus on "behavioural changes in relation to collective limitation, reduction of consumption, deceleration, and the desire to have *enough*" (Schmelzer et al 2022:332, emphasis in original). Measured liberation from technological and commercial dependencies, "self-limitation" as Gorz puts it above, is in turn cast by degrowth critics and their precursors, as the most expedient route to autonomy, understood here as self-determination. Whatever term is applied, the normative concepts presented here are closely related, and most importantly they are all premised on a process of self-reflection, whether done individually or in a collective context. One type of reflective deliberation that emerged in observation was that concerning perceived needs. In various stages of breakage, diagnosis, and (successful/failed) repair, subjects' questioning of technological devices' capacity to be use-*full*—that is a technology's ability to variously respond to needs—was often compared against their tendency to accomplish use-*less* tasks, and thus simply contribute to superfluous material dependencies. Gilles considered these moments as offering important "lessons" about "the necessity of really having having the object in question" (Gilles). Lise articulated an example of such a critical perspective on technology that she'd gained through a particular repair experience. Once, after failing to repair a coffee grinder, and in discovering the cheapness and fragility of its parts and manufacture in the process, she decided against replacement, opting to change her consumption habits and decrease her reliance on the device in the future: "I didn't replace it. I said to myself, 'This is junk! I don'd even need one. I can grind my coffee at the store! One less gadget!'" (Lise).

The superfluous and unnecessary technical complexity of commodities is frequently observed and discussed in collaborative repair settings. For instance, Annick talked about the manufacture of modern appliances:

> "They're adding all kinds of functions to tools that are otherwise pretty simple…Most appliances, there're are all these additional settings, with an electronic screen which adds a whole level of complexity to the appliance…It's not true that people use all these things. They're just gizmos (*gadgets*). It's for sure connected to planned obsolescence, and the kind of appliance, and the knowledge required to repair it. It distances most people from our ability to repair" (Annick).

On another occasion, a man showed up with a high-end toaster dissembled into various constituent parts. He had already attempted its repair, to no avail, over the course of five hours at home. He cut a figure that was equal parts exasperation and sheepish self-mockery: he was not backing down from the challenge despite himself. Sylvain, a volunteer specialising in electronics repair, spent the next three hours helping the man. The former's palpable frustration boiled over at some point, signalling his abandonment of the repair. He cursed the machine's complexity, which featured 'sneak-previews' to demonstrate to users a toast's depth of toasted-ness in order to gauge satisfaction, thus necessitating a technical system of sensors, relays and a motherboard. His exclamation that "This shouldn't be allowed to be made!" (Sylvain) makes sense when someone is familiar with the inner simplicity of conventional toasters. They were typical objects of repair at workshops. The accelerating technical complexities of objects and infrastructures means an impoverishment of our ability to comprehend and appropriate our material lives *generally*, as well as reduction to repair them *specifically*. not only a reduction in our capacity to repair The question of (in)capacity for repair is simultaneously and cause symptom of experienced alienation vis-à-vis the contemporary "technomass" (Hornborg 2001).

Recalibration of technical expectations was a common one throughout repair sessions and represent another mode of deliberative reflection that bears on matters of consumption. People who do repair can offer unique perspective on such matters. Because they repair, they know what it takes. They also know something about the precarity, costliness, limitations and disappointments of pursuing technical solutions for technical problems. JP recounted a story about the failure of his dishwasher at home and his lack of recourse to repair. After looking into the costs of several options—professional repair ($1000); *auto-repair* (hundreds of dollars in parts and many headaches); replacement (over $1000) — he and his wife found they rather enjoyed doing dishes by hand:

> "It's my lazy side. And at some point, it works, it's fine, and you get used to it. I like doing the dishes, and so we decided to wait [on replacing it]. 'OK, we'll wait a month before we buy a new one, just to see…So we start doing dishes by hand, and realise, both of us, that's it's like a kind of meditation for us. It's a moment to chat…There's an upside to not having a dishwasher" (JP).

The above story of object-failure instigated a reflective process that rendered JP and his partner more sensitive to the intrinsic value of washing dishes by hand, occasioned by the transition from a technology practice of greater technical mediation and higher metabolic throughput, to another technology practice of less technical mediation and lower metabolic throughput.

These stories and testimonies illustrate a perspective of the plasticity of human needs. It recognises that pleasure derived from consumption activities are elastic and relative to available means, an empirically tested phenomenon referred to as "hedonic adaptation" (Sekulova 2013). With this in view, the occasion of object failure leads to opportunities for reviewing one's previously assumed needs and expectations of convenience. Here there are sceptical reappraisals of the need to do repair in particular, and to rely on certain technological 'fixes', more generally.

Sometimes the repairer's perspective leads to repair, other times it leads to adapting oneself to the changed nature of an object or technology. The repairer understands this because of their familiarity with the precarious and ephemeral nature of technological functionality due to the fact that no object comes through the repair process 'unscathed'. Even when carried out with advanced expertise, it is seldom that repair leaves no trace of itself—a solder, patch or piece of tape to hold things together; a whirring noise that wasn't there before; an out-of-place screw that doesn't quite match. Such things are problematised in the mainstream imaginary, but not in repair: "[O]ur consumer culture wants us to think that the only way to solve a problem is by buying something new. And repair culture is like, 'No, you can figure out how to repair something.' Sometimes it's about just using it differently. Like, our oven is in like a kind of weird state and we have to use it in a weird way in order to get it to function" (Joce). From this view, altering one's habits to accommodate commodity breakdown is seen as part and parcel of the repairer's spirit. Motivated by a resistance to replace and a will to material conservation, repair is oftentimes accompanied by tacit acceptance of mechanical 'inconveniences', aesthetic 'blemishes' as well as the need to modify one's technological habits and requirements.

Collaborative practice affords lessons and informs attitudes regarding the nature of technologies and their capacity to alternately fulfil needs on the one hand, and create new dependencies on the other. In this, it is a practice that renders more *meaningful* our relationships to technology. The act of critically considering one's technical/ technological expectations necessarily involves a reflexive accounting of one's perceived needs. This two is a process of meaning-making, one that can involve a real measure of introspection. It is precisely this kind of introspection that can dealienate us from 'ourselves'. In the context of repair, this mean that sometimes, paradoxically, the best approach to repair is to *not* repair. The introspection described here is viewed as a necessary pre-condition for engagement in larger scale, societal deliberations aimed at socio-ecological transformation irrespective of whether they are articulated with reference to 'justice' or 'the good life'. To arrive at a more substantial notion of "collectively defined self-limitation" (Brand et al 2021), the apprehension of, and reflection on, perceived commodity-based needs and technological expectations more generally, seem like worthwhile point of departure. Collective repair provides a site for such reflection to occur, a site for critical interrogation of one's own—as well as society's—perceived technological needs. In this way it offers a means of dealienating subjects, equipping them with the possibility of making meaningful decisions regarding technology practice.

iii.iv   Empowerment, autonomy and resonance

"[T]he fundamental motion of resonance us that of a dual transformation. Just as a subject's hand *and* head—*or habitus and thus* relationship to the world—*are changed by acquiring and practicing a skill, the material hereby handled or processed is*

transformed as well, and this twofold change is mutual and reciprocal, emerging from and in a single *process in which cause and effect cannot be distinguished and which thus cannot be reduced in causal or instrumental terms."*

<div align="right">(Rosa 2019:234, emphasis in original)</div>

In this part, we examine the notion of 'empowerment', how it is a central feature of collaborative repair, and how it is potentially relatable as a defining indicator of dealienating technology practice. In addition to field site and interview data, an in-depth theoretical discussion is sustained here. Marx's four estrangement's (1959) are reviewed as we search for more helpful definitions for both alienation and its conceptual 'other'. Alienating labour is described as a two-part phenomenon, one in which a subject's power and meaning are perceived to have been lost (Jaeggi 2014). With this in mind, the empowering effects of collaborative repair are analysed as reversing these dispossessions, reinvesting labour as both more autonomous and self-determined, relatively liberated from market and commercial forces, and more meaningful as a process of self-transformation and self-realisation. Finally, this part introduces Rosa's notion of 'resonance' as a viable conceptualisation of alienation's 'other' (2019), seeing in it a more appropriate formulation of the dealienating processes put into motion by collaborative repair, and one from which degrowth research could benefit.

One of the most salient discourse types amongst a majority of research subjects was that associated with the language of 'empowerment'. Specifically, there was much discussion of participants being motivated to repair as a way of gaining knowledge and skills for future applications. They imagined their acquisition of these skills and knowledge as leading them to more effective normative practices defined aimed at the end of 'sustainability', but also as a way to open on to more direct interactions with material infrastructures and technologies in a self-reinforcing sense (see Rosner and Ames 2014). So skills and knowledge learned through collaborative repair, naturally centred on repair itself, were seen as valid beyond the repair shop as well. 'Empowerment' was viewed as extending in many directions, bearing even on one's consumption and discarding practices generally. The ways in which collaborative repair was articulated as 'empowering' paralleled the themes of autonomy as frequently evoked in degrowth scholarship. They aim to maximise the internalisation of production into one's own sphere of socially reproductive subsistence practice, apart and outside of market mediation.

A discourse directly involving the words "empowerment" or "autonomy", and other closely related terms, was observed amongst the vast majority of those interviewed. Repair testimonies collected from participants often began with discussion of their insecurities and hesitations: of "not knowing where to start" (Evencia). Recourse to collaborative repair, then, is a place to ask questions and gain strategies for action. For many, the will to empower oneself through material engagement was evoked as a primary motivator for attending collaborative repair sessions in the first place. Many spoke of embarking on a personal project that centred on better grasping the technologies that surround them: "I don't like not understanding the things I use, you know?" (Joce). This was related to a general desire to feel more confident working with one's hands: "For several years now I've been thinking that I'd like to gain more

<div align="right">81</div>

manual skills, to be able to repair more…They are skills I want to acquire" (Léah). For Marie-Claude, a CEGEP-level math teacher, repair work held the promise of physically engaging in 'material' labour in ways her career couldn't offer. For this the practice seemed to posses an inherent value for her: "I would like to be more manual and do really concrete things instead of just being in my head, thinking about things but never realising them. First, I want to gain knowledge of how to repair things…I think it's important for me to gain some know-how" (Marie-Claude). These are testimonies that highlight the will to learn new, specifically embodied skills, to experience the feeling of 'being useful', and to feel a sense of "self efficacy" (Rosa 2021).

In some cases, practitioners talked about collaborative repair as an opportunity to gain a measure of independence from, even a relative power over, what appears a vastly complex and opaque technosphere.

"I've never looked inside a lamp before. And it's astonishingly simple, so you feel this kind of - and it's problematic language - you feel this kind of mastery. They're all problematic terms in a way, but self-sustaining…You feel like, yeah, I think 'mastery' is one of the words. You feel like a kind of demystification of the world in a way, and a self-reliance. You open up the lamp and you see "Oh, it's just like a few different things" (Joce).

The movement towards "self-sustaining" is cast here as being undertaken one object and one repair at a time. But the ultimate is goal something larger, part of a greater personal and social project that hopes to bend towards more autonomous material practices. The theme of "mastery" is an interesting one here. Within a context of manually embodied labour, it recalls again parallels with craft work—it implies an apprehension of materials and their interrelations, as well as their *appropriation and control* by and for users themselves. Here notions of appropriation, autonomisation and empowerment occupy a similar conceptual space. The stand for the enhancement of one's power vis-à-vis the materials and technological environment:

"For me, I think [collaborative repair]'s a way towards empowerment. What interests me is autonomisation, to you know, demystify the object. To know that, OK, we have objects, but we have a power over these objects. We have a power also over the companies that want us to swallow up anything and everything. It sounds really big picture, but when I say 'empowerment', it's about learning to do things, about knowledge (*connaissances*). Repair involves many skills" (Annick).

Annick's description of repair work, and what one gains from it, re-iterates the perspective explored in Part iii.i that the practice "demystifies", or defetishises the commodity form, rendering intelligible its constituent parts and inputs. This is a process of de-objectification. But what is remarkable here is Annick's equation of object demystification, the exploding of an object's *thingness* or object-hood, with the restitution of power or agency in the consuming subject— the shattering of peoples' *thingness*, as if they were 'objects' devoid of volition, ready to "swallow up anything" in the interest of capital. Marx (1959) implies similar sentiments, seeing in non-alienated, decommodified labour the expression of humanity's non-determined-ness and the origins of our capacity for self-determined and creativity:

"The capacity for labor, conceived as a process of metabolic exchange with nature, simultaneously

transforms both the world and the human being. The human being produces herself and her world in

a single act. In producing her world, the human being produces herself and vice versa. And, insofar

as this process is successful, she makes both the objective world and herself her own. That is, she

recognizes herself (her will and capacities) in her own activities and products and finds herself

through this relation to her own products; she realizes herself, therefore, in her appropriative

relation to the world as the product of her activities. In this sense, labor—unalienated labor—counts

for Marx as the human being's essential characteristic" (Jaeggi 2014:85-6).

This excerpt highlights Marx's position on the liberational potential of labour under non-alienated, non-capitalistic conditions: it is a process of self-realisation as much as world-realisation. In a collectivised context, empowerment can also denote the experience of feeling useful to others, as well as to oneself. For Tanguy, a trained mechanical engineer and volunteer, *auto-réparation* events were an opportunity to put into practice what he learned in classrooms: "At school, you learn things, but you don't feel useful, you know? You only have the knowledge. To be able to apply the simple concepts is gratifying" (Tanguy). The expressed sentiment of 'feeling useful', I would suggest, is an abiding one for many involved in collaborative repair workshops—it is simply the nature of the practice, with people checking in on others' repairs, lending a hand or a tool when needed, expressing a doubt or allaying a fear over a certain repair strategy being considered. JP dwelled on the *shared* pleasure that emerged when a successful repair occurred, of the "dopamine" and "high fives" (JP) exchanged between various participants irrespective of whether the object repaired was theirs or not.

There are, however, also at times hard barriers to the process of empowerment through repair, especially for those without engineering experience, that is, the vast majority. As much as Joce found a way to "demystify" her lamp through collaborative repair, she also stumbled on other concepts that further entrenched her sense of technical complexity: "It's electricity. It's so complicated. I feel like repairs involving electricity are different from repairs involving anything else. It's like 'How does this exactly work?' And you have to triple check that you've unplugged it" (Joce). Similar reflections on the relative trickiness of electrical fixes and their intimidating nature were commonplace in repair sessions. Electricity is a thing not easily demystified or defetishised. It seems to retain an air of magic for everyone save a select few minds. Oftentimes electrical queries would be directed at Sylvain, a retired volunteer with a career's worth of repair experience, regarding the functioning of specific electrical parts (thermal fuse, capacitor…). On more than a few occasions, Sylvain would command the attention of the room with his off-the-cuff take on Electronics 101, holding court with theoretical explanations of amperage, voltage, and resistance. Whether one came away from such moments feeling less or more confused is a separate issue requiring study in itself. The point here is, dealings with more complex electronic object-repairs, often small-scale and intricate, perhaps carried out on brittle motherboards resembling microscopic urban landscapes, represent real and hard barriers to experiences of

appropriation and empowerment in the sense outlined above, but even these too can be overcome, little by little, with the help of others.

Degrowth's self-defined normative tilt is towards practices and politics aimed at increasing individual and collective autonomy (Akbulut 2021; Muraca 2013). Equally, and to similar socio-ecological ends, degrowth scholars have emphasised the need to dealienate labour experiences (Barca 2019). But how exactly do we reconcile these terms? As far back as Rousseau and Hegel, 'alienation' was intended to describe a state of *subjective experience,* itself the result of the subject's disconnection from society (Jaeggi 2014). Marx applied it specifically to the experience of labour under capitalism. This study, following the example of Brownhill et al (2012), have deconstructed the notion of alienated labour along the lines of Marx's four estrangements (Marx 1959). They prove a useful starting point, indeed for the present study too, but their limitations become evident with regard to the idea of 'species-being', an opaque and essentialising concept that relies too much on discredited humanism and too little on the lessons of ecology (see Marx 1959:31-2). Brownhill et al (2012) do persist with Marx's analytical frame, concluding that in order to dealienate us from our 'species-being', we must move toward social collectivisation based on an "expansion of the notion of self" (Brownhill et al 100) in a cosmological sense. While compelling, their proposal remains abstract largely because Brownhill et al's approach is an institutional one: there is little detail about how such 'expansion' could play out on the level of experience or how it could intersect with practice. The present study has sought to more fully examine the latter, and in order to do so, further theoretical elaboration is necessary.

A more robust conceptual link between 'alienation' and 'autonomy', one that degrowth scholarship would benefit from, can be established with reference to Jaeggi's (2014) definition of the former concept. Indeed, it is her framing that proves most useful in rear to our analysis of collaborative repair. Jaeggi sees alienation as *manifesting* in:

> "the inability to establish a relation to other human beings, to things, to social institutions and thereby also—so the fundamental intuition of the theory of alienation—to oneself…. The alienated subject becomes a stranger to itself; it no longer experiences itself as an 'actively effective subject' but a 'passive object' at the mercy of unknown forces" (2014:58-9).

As for its *causes,* alienation is seen here as a dual diagnosis, one resulting from both a "loss of power" with a "loss of meaning" (103-4). The distinction is a crucial one for the present study. If one constituent half of alienation is occasioned by a "loss of power", understood as disempowerment or "heteronomy" (104), then the dealienation of labour must necessarily spring from their reversal: its must from the autonomisation of labour practices that enhance self-determination and empowerment. Dealienated labour practices must contribute to the restoration of meaning in, and through, work, and thus counter alienation's second underlying cause. (The latter point is more fully elaborated in Part iv.) It is in these respects, and with reference to repair testimonies, that collaborative repair can be considered as dealienating technology practice.

If we are to consider 'autonomy' as an institutional manifestation (Castoriadis 1987) of individual and collective subjective experiences that are marked by an absence of alienation, how do we name and talk about desirable subjective experience itself in positive terms? Equating 'dealienating experiences' with states of 'autonomy' is a confusing one, and one rooted in an incomplete conception of alienation. The notion of autonomy, as conventionally conceived, sits uncomfortably alongside other *inter*subjective principles of social organisation like collectivisation and collaboration which are central to degrowth critique. Weaving theoretical linkages between ideas of individual autonomy (e.g. liberalism) and collective autonomy (e.g. communitarianism) are famously difficult and require much subtlety (Lasch 1991). Illich's concept of "conviviality" is often invoked in degrowth circles as an implied candidate for alienation's "other" (Rosa 2019:182). In scholarship, it is employed as normative critique with implications on both institutional levels (regarding bureaucracy, health care, see Illich 1976) and on the level of material practice (for tools vs machines see Illich 1973). Degrowth's critical approaches to technology have frequently been framed in terms of Illich's notion of "convivial tools", the notion being extended more recently to include "convivial technology" (Schmelzer et al 2022:407). While firmly set in the degrowth conceptual canon (D'Alisa et al 2015), and I do believe inspiring, the conviviality critique is under-developed. Despite, or possibly for this latter reason, the present study takes another tack at this point, forwarding alternative conceptual tools. Tools better fitted to thinking about alienation's 'other' with regard to collaborative repair and discourses of empowerment. Tools that could enrich a degrowth theory of technology practice.

Rosa (2019) has proposed thinking about "resonance" as the subjectively experienced counterpart of alienation, offering a conceptual key in our present analysis of collaborative repair. Rosa's work forms part of a current, alongside that os other contemporary German-speaking social philosophers (Honneth, Jaeggi), that has sought to retrieve Marxian 'alienation' from the neglect and scepticism of a generation, reviving contemporary critical theory in the process. 'Alienation' here is conceived as experiential numbness rooted in a perceived 'disconnectedness'—in a "relation of relationlessness"—from the world and its actors, both human and non-human (Rosa 2019:178). "Alienation thus denotes a situation in which the subject experiences his or her own body or feelings, material and natural environment, or interactions as external, unconnected, non-responsive, in a word: *mute*" (Rosa 2019:178). 'Muteness' is counterposed with 'resonance': "a kind of relationship to the world formed through affect, emotion, intrinsic interest, and perceived self-efficacy, in which subject and world are mutually affected and transformed" (174). As a theoretical concept, and on par with notions of autonomy popular in degrowth, resonance is both descriptive and normative in nature. It is framed equally as a way to describe human experience, "as a measure of the successful life" in a diagnostic sense, and as a normative principle around which practice can be organised (171). Rosa is quick to clarify his intention of avoiding that implication that 'human nature', 'authenticity' and 'identity' are universal, essential or transhistorical things. Resonance, he states, is "a relational need that is open in terms of content" (182). Rosa proceeds to relate the

concept to many practical and institutional corners of society. Here he qualifies the practice of manual trades and crafts as examples of "resonant relationships":

> "Anyone who has ever learned, or better, *acquired* a special technical skill or technique for
> 'handling material' knows that special feeling when said material seems to accommodate or respond
> to them, when such a relationship is formed between material, implement, and hand" (Rosa
> 2019:234).

This last framing is evidently germane to our present analysis of collaborative repair. Familiar themes have been encountered in testimonies above—the desire to engage with material processes, to feel competent and useful in such moments, and to experience a 'mastery' of sorts over one's technological environment. Whether describing the sensation of hand-planing an ill-fitting drawer-side, or the satisfaction of executing a particularly neat solder joint, "resonance" goes some distance in thinking about how dealienation transpires in collaborative repair settings. A central feature of resonant relationships to labour is captured in attitudes of "intrinsic interest" (161), that is, attitudes that exhibit a non-instrumental disinterest in the ends "rewards" of doing a work task (Ibid). Despite object-repair being aimed at exactly that, it is clear that the work represents something larger and more global—it is a job worth doing for it's own sake, because it is seen as 'good' work. One can equally describe the empowerment discourse sketched out this and other parts in terms of subjects' expressions of "perceived self-efficacy" (159), of "making a difference", or "leaving a mark" (Bandura in Rosa 2019:162), other key effects of resonant relationships to labour. The experience of resonant relationships to labour, as well as other practices generally, are in turn associated with emotional states of happiness, joy and satisfaction (Rosa 2019). There are many examples collected in the present study to illustrate resonance theory. Several practitioners reported their feelings of "great joy and satisfaction…in acquiring skills that you didn't previously have" (Nat). Others described repair work as one of "pleasure and joy" (JP). It instills one with "a feeling of power, a feeling of pride" (JP). Josiane explained things like this: "I feel empowered repairing things. You know, there's also the adrenaline of repair. It's fun! You feel like you know something that others don't. You can say, 'I repaired that.' It's a pretty powerful feeling" (Josiane).

In line with the custom of much degrowth research, it is tempting to point to 'autonomisation' in analysing these reported labour experiences. However, 'resonance', Rosa's proposed counterpart and antidote to alienation, feels more appropriate in examining the dealienating nature of collaborative repair experiences. In considering the repair testimony laid out in this and previous parts, the theme of perceived connected-ness or *relationality*—to other repairers and labourers, to biophysical realities—was often front and centre. Other types of relations are further explored in following parts. Rosa justifies his preference for resonance:

> "[T]o define autonomy as the 'other' of alienation ultimately ignores the relational character of
> alienation (and of its opposite)" (2019:176); "In my view, then, defining autonomy—at least in the
> sense of self-determination—as the 'other' of alienation overemphasises the 'intentionalist',

domination-oriented aspect of self-efficacy at the expense of its responsive, appealing, process-

oriented dimension and loses sight of the 'pathic' side of successful relationships to the

world" (177).

This perspective makes a lot of sense when looking at collaborative repair, a practice involving a good deal of

acknowledgement of, and reflection on, material and social relatedness, and one that's carried out amidst a logic of

collectivisation focused not only on rational, redistributive ends, but also substantive evaluations that favour doing

work for its own sake, investing such work with meaning, and ultimately investing one's self with a sense of purpose

and meaning. These are suggested here as being crucial to making enlightened and socio-ecologically appropriate

decisions regarding technology. Technology practices that favour subjective appropriation both technically and

semantically, technology practices that resonate, might then be identified as most compatible with degrowth

imaginaries.

iv   *Practices of decommodification in a degrowth 'form of life'*

The previous parts in Results and Discussion have hopefully painted an adequate picture as to how the

critical, collectivised and action-oriented aspects of collaborative repair conspire to reclaim a space for practicing

technology in ways that are both deliberative and relatively autonomous of, and resistant to, the structures of

commodity production. This has been described as dealienating in that it restores power to subjects. Power of this sort,

or rather *appropriation*, has been in turn framed as a necessary pre-condition for 'deciding together', Abraham's

proposed third degrowth normative principle (2019). However, while the dealienation of technology, like that of labour,

requires moving toward more autonomous and self-determining technology practices, achieving 'autonomy' is not

enough in conceiving how to reverse the effects of alienation. Alienation's other underlying feature, a loss of meaning

(Jaeggi 2019), requires attention as well. These remaining parts of Results and Discussion are dedicated to further

examining how collaborative repair can be seen as a technology practice that *renders meaning* in two specific respects.

One is with respect to the connections it highlights between subject, labour and time (Part iv.i). The other has to do with

the practice's foregrounding of the relationships linking subjects and objects (Part iv.ii). In both parts, questions of

(de)commodification are again central, in turn evolving into sustained discussions of exchange- and use-value as the

topics came up on-site and in testimonies.

After some deviation, the following sections seek to relate collaborative repair back to central notions of

degrowth thought with the assistance of one final conceptual apparatus. This study was premised on a definition of

practice as a thing that both *does something* and *understands that it does something* (Jaeggi 2018). In other words, it

sees collaborative repair, our object of analysis, as being both about the repair of objects themselves, and about the

meanings associated with carrying out such work. On the other hand, collaborative repair has emerged in this study as a

complex set of critical and action-oriented sub-practices, themselves linked and related to other beliefs, convictions and

practices. Leah described what her repair work represented to her:

> "It's a mix between a hobby and an overall objective. For several years now, I've been telling
>
> myself that I want to become more manually skilled, more capable of repairing things. So, yeah, it's
>
> like a long work in progress…a learning challenge. Ultimately, it's skills I want to acquire. It makes
>
> sense (*ça cadre*) with my lifestyle in that I'm someone who doesn't spend much money. I've always
>
> been self-employed. I've always been careful with my spending. So yeah, it makes sense. It's not
>
> like I'm some kind of super-consumer (*hyper-dépensière*) for other things. So it fits. But it's not
>
> only that. Its also because I like to be autonomous and to make environmental choices. I dunno, I
>
> just really love using an object as long as possible" (Léah).

When doing and talking about repair, participants' attentions drift back and forth, in and out, in many directions, and on

many levels. Considerations of international waste markets, of personal shopping habits, of the scarcity of metals in

Bolivia, of what their partner would say if they destroyed a family heirloom, may all be taking place on a single shop

bench. They are considerations that can all bear *inwards* on a singular repair. But they are also considerations that can

apply *outwards* to other adjacent practices that touch on and influence the work of repair. How, in this case, can we

isolate what collaborative repair practice is understood to be about? Again, Jaeggi offers a methodological cue to

conceptualise the relationship between such seemingly diverse and heterogeneous elements:

> "Forms of life are nexuses of practices, orientations, and orders of social behavior. They include
>
> attitudes and habitualized modes of conduct with a *normative character* that concern the *collective*
>
> *conduct of life*, although at the same time they are *not strictly codified* or institutionally binding…
>
> Forms of life do not concern just any arbitrary practices, but *normatively imbued* practices; they are
>
> part of the social-norm structure, of a normative social order with a claim to validity. Finally, if
>
> forms of life must in certain respects be 'appropriate to the subject matter' [*des Sache angemessen*]
>
> (in the way that weatherproof clothing must be appropriate to the weather), then it follows for the
>
> question of the self-sufficiency of what can or should count as a form that they must be social
>
> formations capable of satisfying such real (factual or substantive) requirements" (Jaeggi 2018:50,
>
> emphasis in original).

The following and final two parts, then, are an attempt to situate collaborative repair as a singular practice that exists in

relation to other practices, attitudes and evaluations within what can be called a 'degrowth form of life'. With this last

framing in place, two lines of interrogation are undertaken. One is to better grasp what the practice *means*, therefore

arriving at a better understanding of its nature. The other is to ask whether the technology practice is appropriate, 'like weatherproof clothing' for rain, to the project of degrowth, to its 'social-norm structure' and its underlying 'claims to validity' aimed at socio-ecological transformation.

iv.i   Repair, labour and time

"Time is experienced as a brute, natural given, and people tend to blame themselves for bad time-management when they feel that they are running out of it. Time, so far, is essentially beyond the realm of politics"   (Rosa 2014:62)

A certain type of data, collected primarily in interviews, forms the empirical core of this part. By asking questions about barriers and impediments, both perceived and real, that stand in the way of one's engagement in collaborative repair, a leitmotif of time emerged as salient. While in some isolated cases, economic rationality is used to justify the practice, the temporal fundamental incompatibility, or 'friction', between subsistence repair on the one hand, and regimes of growth and wage labour on the other, is highlighted here. However, contained in the poison is the seed of a cure: some participants explicitly viewed decommodified repair as a practice that can assist in relative liberation from labour market engagement and a shift to socially reproductive activities. Indeed, in collaborative repair one finds a practical paradigm for other modes of economic normativity, modes that very much align with degrowth's call to '*sortir de l'économie*'. Lastly, in this section, we analyse the repair works apparent *imbrication with and dependency on* other attitudes and practices that tend toward the decommodification of labour and the internalised decommodification of time itself. Jaeggi's conceptualisation of "practical nexuses" that fit together and articulate in a "form of life" (2018) is mobilised in order to understand this imbrication, and thus judge the appropriateness of the repair work for a degrowth form of life. Amidst such interpretation, collaborative repair is practice that is rendered meaningful, it is *about something* in the sense that it is aimed at a larger socio-ecological project, and therefore by definition dealienating.

       One line of inquiry that structured interviews with practitioners, volunteers and organisers had to do with perceived barriers to collaborative repair. Many brought up the fact that regular engagement with the practice is a considerable time commitment. It would appear that many people consider they simply can't spare the time to repair broken things. It runs counter to, after all, a major ideological component of consumerism—that it is easier, indeed more pleasurable, to discard and buy again than to repair. Indeed, the modern "task of consumption" (Strasser 17) implies a moral responsibility to adhere to such behaviour, even a new conception of citizenship associated with our wilful participation in accelerated consumption normativities:

"There's a social pressure [to replace]. People say, 'Oh, you're being cheap! You can afford it. Go

buy another one and get it over with. You'll see, it's a lot easier that way. On top of that, you'll be

helping people. The poor shopkeepers!' There's a whole logic in our society opposing [repair].

Society is even organised that way. 'The economy, it's got to keep moving forward! It's got to keep

growing!'" (Julien).

Julien expressed how repair, as he saw it, was at odds with mainstream social mores and what he saw as the dominant underlying logic of economic "growthism" (Schmelzer et al 2022). Indeed, it has been noted elsewhere that repair often "intersects with anti-consumerist and anti-growth practices" (Granziano and Trogal 2019:208). Yet, the empirical fact contained in Julien's observation—that economic growth is fuelled in part by accelerating consumption—is accurate irrespective of the explicit 'political' intent, or lack thereof, that a practitioner brings to subsistence repair. The line he draws here between growth ideology and the acceleration of commodity cycles was outlined at length in Part i. If, as Julien's statement implies, non-commercial repair work constitutes a metabolic *slowing down*, then we might surmise that it also carries with it an effect of *deceleration*. We therefore can it as temporally non-conforming, as effecting "frictions and tensions" (Rosa 2014:69) between its own temporal rhythm and that demanded by the commodity cycles of hegemonic, growth-centred forms of life.

Study subjects considered the issue of time to pose a serious challenge to the scaling up of collaborative repair in general. On the other hand, collaborative repair was equally cast as an arena in which alternative equations of time and value were possible, where the coupling of time and exchange-value (income) could be loosened, however minimally, and where a relative disengagement from labour market could provide a template for possible socio-ecological emancipation. Relative decommodification of one's time and labour emerge here as associated with a process of 'deceleration'. In order to make time for repair it is therefore, and paradoxically, necessary to 'slow down', portrayed as a structural disengagement from capitalist time-value equations that creates more room for socially reproductive tasks. Collaborative repairers are guided by an operative logic that favours the latter not only because it is ecologically-minded, but because it means doing work imbued with more inherent value, work that is more 'appropriable', work that 'resonates'. Nat touched on the matter :

"To take the time to do [repair], it feels good. It's like, sometimes I get into sewing and the hours

just fly by. I saw to myself 'Man, it took me two hours to do that?!' But I'm super happy with what

I've done. So that's it, it costs you in time" (Nat).

While the passage underlines what is seen as the pleasure inherent in slowing down and making time for repair, the temporal 'frictions and tensions' also comes through. As much as Nat enjoys the decelerated work, there is also an ingrained conscientiousness of the clock whose demands are articulated in the form of 'costs', a true capitalist trope if there ever was one. It is contested moments such as these that Rosa had in mind when he hinted at the 'politicisation' of time in this part's opening.

The commitment to engage in collaborative repair often involves the concerted questioning of inherited, growth-based notions regarding productivity, time-use and time-value, and offering alternate readings and valuations in the their place. In Part i, the argument was made that collaborative repair represents a practice based in a reflexive understanding of the metabolic interconnectedness of industrial life-cycle phases. On top of the nitty-gritty of in-shop repairs themselves, collaborative repair discourses very often shift freely between critical reflections on diverse domains of activity—(un)sustainable consumption choices, discarding habits, perceived needs. The issue of time, specifically the tension between demanding remunerated work schedules and the time-investment required to do repair, was observed as a perennial one throughout the process of data collection. The fact is also evident in the very profiles (age, employment status) of organisers, volunteers and participating regulars: they tend towards a general over-representation of retirement-age 60-80 year olds and 25-35 year olds, and markedly less 35-60 year olds in the 'sweet spot' of their careers. Younger individuals were often students, part-time salaried workers, self-employed, or some mixture thereof. They represented people who, either by choice or not, did not (yet perhaps) engage in full-time salaried work. The timing of collaborative repair sessions—mostly weekday afternoons and early evenings, occasionally Saturdays—though not prohibitive to those working 40+/hours a week or those charged with caring for dependents, do represent a serious impediment for some.

For instance, one participant-turned-volunteer, Léah, was torn over whether to pursue a new professional opportunity after years of more precarious self-employment. The full-time job would represent considerably more, and more consistent, pay than she'd ever received. However, she was saddened by the lack of time she'd have left to dedicate to repair workshops compared with before. An avid repairer and mender, part-time, self-directed work schedules had always afforded her with flexible availability to engage in the socially reproductive work that converged with her sustainable values (see D'Alisa and Cattaneo 2013 on the matter). Conversely, she associated full employment, on which she was about to embark, with less sustainable habits generally:

> "I'm convinced that if you work less than 35 hours, if you work part time, you have more time to do
>
> things like [repair], which are ecological and gratifying. You have time to cook, to eat. You have the
>
> time to live better. But the problem is that people who work a lot, who don't have time, they think 'I
>
> have money to buy a new thing. I'm exhausted, therefore I deserve to indulge', and then the cycle…
>
> You really feel like you're compensating for the work you do, for all the stress…" (Léah).

The above narrative draws a stark, if not exaggerated, tension between the those who have time to repair, and thus adopt (at least some) sustainable and dealienated labour normativities, and those who not only *cannot* repair, but who are compelled to accelerate their consumption in order to assuage the existential exhaustions of overwork. The research of Knight et al (2013) corroborates Léah's intuitions, concluding that wage-economy working hours "are significantly associated with greater environmental pressures" (621), and recommending the "resource-reducing impacts of shorter hours of work" (692).

There were some participants who came to *auto-réparation* events motivated by the need to save money. In such cases, the objects in question were most often high-end, specialty products, the repairs of which would be costly and entail sendings away to pricey professional outfits. In these cases, the objects represented vital utilities to their respective owners, utilities that required immediate restoring. One man, a massage therapist, had brought in a hand-held massage device which he required for his professional practice. Fortunately, a quick lubrication of the machine's central piston-like mechanism sufficed, and he was able to keep his afternoon appointments. Another man showed up with his CPAP machine, a medical device that forces air through a face-mask and down one's throat, designed to help sleep apnea sufferers at night. He explained to me that it had recently been made public that the machine's sponge-like filter was carcinogenic, and that a class-action lawsuit for reimbursement by the manufacturer Philipps was in the works but tangled up in court. A new machine would cost him $1000-2000. His sleep absolutely depended on the machine, and he'd have to take the filter out on his own, which we did together in a highly improvised way. In both cases, participants were motivated by considerable savings of money, and collaborative repair made sense to this end. Such cases, though not exactly rare, comprised a small minority of repair interventions. At the same time, one of MAQ's co-founders, JP, upheld a pecuniary logic for *auto-réparation.* He would sometimes talk about the research and transport time involved in choosing and purchasing commodities ('the labours of consumption') as representing more than what the majority of people earn in per/hour gainful employment. Though not entirely convincing as an argument, it is worth noting as one way among many to justify the practice as 'making sense'.

The rationalisation of collaborative repair in pecuniary terms was an observed exception in repair workshops and discussions. Most subjects aligned themselves with a logic that decommodifies both *time* and *material.* More precisely, they saw in collaborative repair a practice that resisted subsuming time and material to the rule of exchange-value or "economic reason" (Gorz 1989). "You don't make any money [doing repair], but what's the point of having more money it your object doesn't work. That's kind of my vision. I see [repair] as an investment of time for a return that's not…that *is* material, but that's not money, and that doesn't have to be money" (Léo). Claudine felt that the aspect of decommodified exchange she saw in collaborative repair, and other DIY community projects in which she engaged, was an essential feature. She explained with a sense of pride:

> "The projects I'm involved in, it's all volunteer. There's no budget, but we get things done because
> we exchange [labour]…There's no money in it. It's only exchanges! Just in using my hands, and
> what I have in my hands. Not necessarily with money" (Claudine).

Collaborative repairers tended to demonstrate evaluative frames of reference that diverge from typical temporal calculations under capitalism: "Maybe you need to have a different mindset to appreciate it…because some people are focused on quick results, and it can annoy them to spend all that time, to *waste* all that time repairing" (Julien). The time investment required for collaborative repair cannot be realistically rationalised according to a labour-market mindset focused on exchange-value compensations. It involves other motivations that diverge from conventional

quantifying rationale: "I feel like repairing things, and knowing how things work, and feeling less beholden to…yeah, like having more freedom with how I spend my money, which is what I feel I gain by repairing things myself. Yeah, I guess it's a different kind of calculus. My calculus is maybe more about…it's not in dollars. It's in time sometimes" (Joce). Non-rational, non-economistic motivations form a good deal of the 'logic' of collaborative repair, whether these have to do with one's 'passion' for the intrinsic value of such work and its empowering effects (see Part iii.iii), or the practice's perceived alignment with a larger project of socio-ecological transition. Nat explicitly casts her anti-utilitarian valuations and 'projects' as being in a state of friction with labour market engagement:

> "I've often worked part-time in my life, because I always thought that two adults working full-time, with life, with the kids…I find it's just insane. So we made some decisions, my husband and me. I'd work less so that my days off, I could de household things. But we had to reduce our material desires to live this way. Because if your goal is to have a nicer couch, to have a bigger TV, to have a new car, new phone, you just can't. You can't say to yourself 'I'm taking some time here to do what I love, and to do repair work', because what you need is to bring home money to pay for all those things. So there's a side of things where you have to choose repair. You have to choose your time over the things you want to have, or need to have, or think you need to have. Because if you don't have more time, you can't think about doing repair. It's bigger than just repair. There are a lot of related things that enable you to do it or not. There are a lot of decisions surrounding it" (Nat).

The organisation of one's life, the "decisions", which Nat identifies as key to accommodating repair practice, are indeed several. Taking control of one's time involves a scaling-back of labour market engagement, if and where possible. Liberating one's time for more social reproduction, whatever its perceived benefits (more time for family, hobbies, sustainable choices) inevitably involves financial sacrifice, and one that not all are equally positioned to bear. However, the sacrifice can be mitigated by reducing one's consumption expectations generally. It is worth reiterating here that maintenance and repair—along with salvage and buying used, practices complementary to repair—are themselves successful strategies to avoid buying new. In this formulation, decommodifying one's time, i.e. a relative withdraw from labour markets, likewise implies a relative disengagement from commodity markets, i.e. less purchasing power. In terms of mainstream economic sensibilities, this could only seen as a step backwards, or worse, a sign personal moral failure. However, some interviewed repair practitioners had the opposite view, framing their own 'less work/lower income' situations in a positive light, as both enabling repair and being enabled by repair. Léo reflected on such matters in an fairly explicit paradigm of economic autonomy, at least in the degrowth sense of market disengagement:

> "The value of my money is a lot more now that I can repair things. That's to say, before I would have received $100 in pay but not been able to buy much with it. Now, my $100 lets me live comfortably considering that I'm resourceful (*débrouillard*) in other aspects of my life. My need for

money is less, so the value of the money I do have is greater. That's the way I see things. It's about

being less dependent on money…It's not necessarily about having more, because that's not my

long-term goal. But it's more about being less dependent on that for my everyday needs" (Léo).

What also emerges in his testimony is the idea that a living situation of relative material sobriety being specifically

conducive to repair. When you don't have much purchasing power, making sustainable choices like doing repair,

cooking at home, or taking public transportation, can potentially become the easiest option. Conversely, what you do

have, as in the case of Léo's $100, suddenly takes on an elevated value. Such a reflexively parsimonious approach to

value—a kind of thrift disguised as self-imposed austerity—is very much paradigmatic of the repairer, to conjure a

stereotype. The very practice of (non-commercial) repair in the first place, and the basic material conservatism that

underlies it, relies on such a disposition. It depends on an "old ethic" (Strasser 2000:199) that strives to *conserve*

usefulness; it is a thrift that precedes and predates contemporary notions of 'economy' and 'cheapness' that now confine

and equate thrift with the act of saving money.

The general approach converges with degrowth's call to "*sortie de l'économie*" (Latouche and Jappe 2015;

Fournier 2008) as a normative guiding principle toward social and ecological transformation. In this critical space,

conventional employment under capitalism is not cast as a liberating process, but very much its antithesis: it is seen as a

prime driver of alienation (Barca 2019). Feeling, indeed being, locked-in to salaried work is a lived experience for

many, and constitutes a real barrier to finding the time to engage in decommodified practices. This is especially true for

those in poorly-payed and precarious employment situations, and for those with dependents. Despite this, and

somewhat paradoxically, the hope is that collaborative repair, in its own small way, can offer a key to help loosen the

shackles of our collective dependence on paid labour, an important normative element in emergent "postcapitalist

politics" (Lawhon and McCreary 2020). Along with other practices (e.g. work sharing, time banking, gardening) and

policy proposals (e.g. universal basic income) forwarded by the degrowth movement (D'Alisa et al 2015), collaborative

repair is framed by practitioners as a practice that can help to disengage from both commodity, and thus labour,

markets, however marginally. The time reclaimed is repurposed to carry out more subsistence-oriented, socially

reproductive labours, and ultimately increase one's temporal autonomy or self-determination, that is, the measure of

control one has over deciding the use of one's time. Collaborative repair, as outlined, is interwoven with a critical view

of contemporary industrial economies' accelerating social metabolism. This trend towards acceleration plays out not

only terms of material, commodities cycles, but also in terms of social experience (Rosa 2014). Repair, as presented in

here, is aimed at resisting both forms of acceleration. The oft-repeated theme of 'making time for repair' constitutes a

move to *appropriate time*, even to engage in an embryonic *politics of time*, as in Rosa's initial quote. It is an attempt to

reclaim labour time from market forces in the name of dealienation.

While the word "degrowth" was never uttered in workshops or interviews, there are many observable

instances of logics of decommodification that are compatible with degrowth intuitions and policy positions. It is

perhaps best to describe collaborative repair as embedded within a larger interpretive/normative schema, or "form of life" (Jaeggi 2018) one could name 'degrowth'. That is to say, collaborative repair exists in a "nexus of practice":

"If many practices first derive their meaning and their conditions of possibility from being

embedded in a further nexus of practices and interpretations—hence, if the good and the purpose

that a practice is supposed to realize cannot be realized in it alone—then forms of life turn out to be

structured ensembles in which complex goods or purposes are pursued" (Jaeggi 2018:70).

When practitioners talked about, carry out and interpret repair work, they often talked of any number of practices—garbage-picking, maintaining tools, shopping less, disposing/recycling wisely. While not about repair themselves, these adjacent practices were seen as intertwined with, and mutually dependent, on repair. They are all driven by a similar underlying logic of *metabolic deceleration*, perhaps *the* central element to most definitions of degrowth. This is why they are meaningful. But that is not all. These practices also find their "conditions of possibility" in one another at their practical nexus. This section explored how the practical disposition to decommodify one's time, in the form of a shift from wage work to social reproduction work, both aligns with the goals of collaborative repair and cultivates its conditions of possibility.

iv.ii   Use-value, objects of meaning, and new fetishes

"If previously the substantial form of a thing, that is it say a thing's essence, was rooted in its usefulness, with its exchangeability purely accidental and contingent, capitalism and the industrial revolution have reversed this ontology…from now on, a thing's substance is constituted by its exchange-value, that universal ether of commodities."

(Marion 2015:32, author's translation)

This part opens with an abbreviated take on value theory and focuses on the distinction between use- and exchange-value which emerges as crucial in understanding collaborative practice in both an economic and symbolic sense. Discussion then turns to labour-value equations where the notion of work carrying *inherent value* is re-examined, adapted and extended to encompass the objects of repair. Repaired objects are thus framed as embodying both an enhanced or recuperated use-value, as well as an added or supplemental value or meaning, the result of a semantic *rubbing off* of the work's inherent value onto the artefact. Finally, a somewhat speculative discussion of new and different fetishes that originate in repair is embarked upon to further debate. These fetishes seem to emerge in two places: in the form of the repaired artefact, as noted, as well as in the form of the skills and knowledge of the experienced repairer. While apparently transcendent and focused in a singular individual, the skills and knowledge

necessary to excel in repair are ultimately understood in collaborative repair as things that are attainable and *appropriable*, thus tempering its fetishisation.

The commodity's concealing effect is the result of a particular valuation process that reigns under capitalism according to Marx. As Hornborg puts it, "Alienated from their producers, commodities appear as autonomous sources of value rather than embodiments of the labour of human persons" (2001:133). The explanation for this is fairly simple: destined for exchange above all else, the inherently contingent, variable and idiosyncratic use-value(s) ascribed to a given commodity by an individual is/are subordinated to its exchange-value, its ultimate measure of worth in a marketplace. Here, an object's value is indexed against the universal equivalency of money (Harvey 2018). This is how prices are arrived at. Viewed from here, it is not difficult to recognise how the situation makes for fertile terrain in which the deep roots of alienation can spread. Marx's four estrangements—from the products of labour and the natural world, from the labour process, from ourselves, and from others—can be directly sourced back as the phenomenological effects of the instrumentalisation of labour and nature to the ends of commodity production and capitalist accumulation (M-C-M')[51]. Establishing this regime has involved an important ideological and symbolic struggle. The abstraction of various and diverse phenomena—object-usefulness (Hornborg 2001:92), work (Martin et Ouellet 2014), the notion of 'value' itself (Graeber 2001)—into reified, fetishised forms is the enabling precondition for the universal convertibility required by capitalist marketplaces, and achieved through the medium of money and prices.

A brief analysis of collaborative repair makes clear that in its case, something entirely different is occurring with regard to object valuation. A broken thing is without *both* use *and* exchange-value[52]. Repairing a thing for personal use precludes any market involvement in either the process itself (apart from possible parts purchase) or its end (repair for use, not sale). While repair restores use-value, exchange-value does not necessarily enter the picture. Collaborative repair is focused almost entirely on the rehabilitation of *use-value,* the slippery, idiosyncratic and 'accidental' substance of which Marion speaks above. Systematically ignored in the analysis of orthodox economics, use-value evades easy quantification or convertibility—what is a useful thing to someone, may be burdensome waste to someone else, the operative logic of garbage picking representing a case in point. Usefulness thus acts differently to capital's law of universal equivalency: it is thus disobedient to the purportedly 'physical' laws governing mainstream economics.

Industrial production-consumptions cycles are driven by the devaluing, cheapening and destroying of material things and biophysical endowments: they consume use values, and increases entropy, in the quest for exchange-value creation. Yet while exchange-value typically diminishes amidst the process of consumption (a used car

---

[51] Marx famously summarised the *modus operandi* of capitalist production as M-C-M'. Money (M) is invested in the production and sale of commodities (C) for a return of investment + profits (M'). Money, the *medium* for facilitating exchanges of 'utility', becomes the primary *object* of production, and thus labour process under capitalism.

[52] Jackson makes a point of noting repair's complicity in sustaining global technical infrastructures which are very much less than emancipatory. Scrap and recycled materials markets prove that broken things can be recuperated for capitalist exchange-value (Jackson 2014). This however, is not the case in collaborative repair, where repair is focused for the most part on objects of personal use.

is cheaper than an identical new one), use-value does not necessarily decrease in the same way, or at the same rate whatsoever. The collectivisation of a tool, for example, increases its usefulness as it becomes used by several people at once. Thus collectivisation has the effect of *both* reducing the demand for said tool, and *also* thereby reducing its exchange-value as a secondary effect (Marion 1015:153). The process of using something, and related practices of maintenance, repair and sharing, each have the effect of enhancing an object's use-value. The non-commercial, subsistence repairer thus occupies a role of producer here, restoring function in order to fulfil their assumed immanent and self-defined needs. The condition described here is, without a doubt, one of relative dealienation according to all theoretical accounts: here the subject exerts a greater *power* over the use, value and thus *meaning*, of the artefacts of technology and labour that surround them.

This study's empirical investigation into collaborative repair backs much of this up. There was a marked tendency amongst practitioners to insist on *use-inflected valuations*, not just implicitly but overtly, and sometimes in eloquent terms. Léo described the contrast of evaluative modes:

"All my childhood, it's like I lived in a world where the constant question was: 'How much does it cost?' Nobody at the Repair Café asks that. The question's more like, 'Is it valuable to you? OK, Let's repair it' I find that nice." (Léo).

For Léo, collaborative repair offered a place of exposure to a different way of relating to material objects, a place where more room is afforded for individual and self-directed object valuations free from recourse to the purportedly 'objective' notions of price. Claudine came to an *auto-réparation* session at *l'Espace des possibles* with a Bialetti coffee maker the handle of which had broken off. Together we fashioned and installed a replacement handle out of wood. While it worked, it was certainly less visually elegant or seamless compared to the original 60s Italian design. One suspected that not everyone would have been satisfied by the result, but Claudine was: "No, what drives me is functionality. My coffee maker works now. On top of that, I've got a unique design!" In workshops, there was a pervasive idea that investing one's own labour into an object's repair or restoration rendered it more valuable.

The work of repair—and in general doing things oneself without recourse to the market—has been framed as being intrinsically valuable (Rosa 2019). The point first emerged in Part iii.iv, having been discussed in relation to discourses of 'empowerment' and the meaning of work/labour. Joce addresses the matter explicitly. She relates the value she instills in repair work to manual work more generally:

"Things feel more valuable when you do them yourself, when you have your own story to tell about it…It's like, always respecting the materials, of belonging, of situating yourself in a place. Like I wouldn't want somebody to landscape my yard…I dunno, it's just like my way. I want to move the dirt around myself…It's totally all of a piece" (Joce).

Here we see many ideas superposed in relation to one another. While it might beg further elaboration and clarification, one feature is obvious: Joce's is a narrative of wilful dealienation. The labour experience depicted here simply has must

be considered as exemplifying alienation's 'other'. It is a narrative of resonance, the very fact Joce feels she has 'her own story' to take away from it, is telling.

In collaborative repair, there is a generalised and observable tendency toward object decommodification that manifests in several symbolic-interpretative logics: more direct labour investment = greater object value; greater object repairability = more meaningful subject-object relations = greater object 'life'. While not practices in their own right, these subject-object orientations and attitudes contribute to making collaborative repair, as well as other adjacent object-care practices discussed in the study, a nexus of practices that 'fit', cohere with, and hold together, a potential post- or degrowth form of life. The last point is one emphasised by Jaeggi: "One can no longer argue only that certain practices do not fit or are inappropriate (which was indeed the initial tentative starting point), but also (positively) that certain practices must be components of the nexus of a form of life if it is not to remain deficient" (Jaeggi 2018:70). In order to achieve degrowth, one must alter the practice of technology. This means reconsidering the time and meaning we invest in *technology we produce* (production), as well as reconsidering the value and meaning of *technology we use* (consumption).

This evaluative process internal to the labour of collaborative repair—labour that *resonates* with practitioners—has the added effect of transforming subject-object, or technological, relations. Here we encounter a different, but derivative, idea to that of labour's 'intrinsic value': that the *intrinsic value of a specific labour* imparts a similar value *onto the technological objects and products of that labou*r, that this value 'rubs' off and takes objective form, is perhaps even re-fetishised, in the embodied form of the artefact of collaborative repair. This phenomenon occurs only as the result of a productive engagement with materials, a commitment to their conservation, and the deployment of cultivated skill. Strasser puts it wonderfully with reference to the gendered work of mending:

> "In cultures based on handwork, handmade things are valuable without being sanctified as art; they
> embody many hours of labor. People who have not sewed, or at least watched others sewing, value
> that labor less than those who have, and lack the skills and the scraps that enabled so many women
> to see old clothing as worthy of remaking" (Strasser 2000:12).

Strasser points to the possibility that artefacts produced under the immediate and non-market-mediated circumstances of social reproduction can take on enhanced symbolic status without being 'sanctified' as fetish. This is, she indicates, precisely because the production is done according to a *familiar and appropriable process*. Knowledge of, and therefore relative delineation from, what it requires technically to make or fix a thing (a reversal of Marx's second estrangement), engenders an immanent and idiosyncratic, but also symbolic, expressible and sharable enhancement of an objet's value. This wholly different *surplus value* was variously expressed as "charm" (Léah), "uniqueness" (Claudine), or as representing simply "a thing that's built", a thing bearing the mark of its own creation (Joce). Tanguy, a founder/volunteer, described his home as filled with bizarre and eye-catching repairs, modified objects, and improvised replacement parts: "When friends come over and say 'Why is that like that? Why is that different?' I say

'Oh, I repaired it' and they find that very cool" (Tanguy). Léah remarked on her "appreciation of charm in what's old, remade, and what lasts" (Léah). Another subject recounted how their involvement in repair work both informed, and was informed by, a generalised disposition toward the object-world:

> "At home, every object has a meaning. The little couch was from the old lady down the street there, who gave it to us because she was moving…The other piece of furniture there, I made it…Each thing has a meaning. It comes from somewhere. It has a story. It's like, every object is important. It's not just some gizmo that you use, and then throw out. It doesn't just leave your life" (JP).

JP's account describes an attitude that extends considerably beyond repair and encompasses an over-arching consumption normativity centred on the nurturing of subject-object relations. The theme of object care, touched on above, is conceptually adjacent to this. The common denominator is that repairing things, like doing handcrafts, doesn't simply produce *more use-value*, but also produces *more meaning* when compared to processes of industrial manufacture.

Collaborative repair is largely premised on a sensibility that our relationships to, and through fully market-mediated commodities, defined by the effects of multiple alienations, cannot possibly be as meaningful or resonant. Federici, I believe, has similar things in mind when she calls for "re-enchanting the world" in all its relational dimensions, linking humans and non-humans alike (Federici 2019). Interestingly, amidst the weakening of "commodity fictions" (Jackson 2014:230) that collaborative repair accomplishes, the possibility of new fetishes emerges, ones centred on both the repaired artefact and the accomplished repairer themselves as a wielder of a different sort of 'magic'. In part iii.i, we examined our relationship to commodities as being fetishistic in nature. The production of industrial commodities draws on, conceals and contains incomprehensibly diverse labours and materials, investing them with the *effect* of magic and transcendence. If collaborative repair is recommended here as a practice that can help dispel and defetishise commodity mystique by interrogating its inner workings and reflecting on labour processes by engagement in (re)production, it must also be asked whether other and new fetishes and reifications arise amidst the work and products of repair. A well-repaired object, fitted for instance with a patch, the emblematic symbol of repair, becomes itself invested with a heightened value that can border on fetishistic, at least among those 'converted' to repair. During shop sessions, there was oftentimes talk about the common aesthetic love and appreciation for the patch, that visible trace, however weird and wonky, of a successful repair. There was even a name for such love, with practitioners referring to "the patch effect".

Rosa's notion of "resonance" (2019) is again applicable here. Evident in testimony, we live with and transform objects which are then integrated as personae in our biographies—*they resonate* in us. Repair-mindedness seems to engender an intuitive consideration for the living possibilities of materials themselves. This is precisely what Rosa meant with 'resonance'. An experienced mender and sewer, Joce compared the vitality of her heirloom wool sweater to that of today's industrial clothing:

"My mother knitted something for her[self] when she was 15, that I still wear. And it fits me

perfectly. And it's a sweater. It's like in perfect condition, like you wouldn't even believe it. And it's

like 65 years old. So in terms of fabric I guess I have like a better sense of the types of fabrics. You

can't reuse stuff from Zara, for example. Or you can't sew it. It's really hard to work with some of

that fabric. It's like not even intended to be ironed. That's why everything is dry-clean only, because

it's not meant to live really" (Joce, emphasis added).

The material familiarity she's gained from repair work has given Joce two things. First, it's granted her an interpretive

eye for object-repairability in the case of fabrics. Secondly, it's afforded her a view onto the variable nature of the

relationships we can have with materials depending on whether they issue from industrial or more artisanal production

contexts. She equates the promise and potential of meaningful subject-object relationships with a consideration of

objects themselves being symbolically 'alive'. Conversely, there is only a much-diminished prospect for experiencing

meaningful relationships with industrial commodities, dismissed as already 'dead' at birth—they on the other hand are

mute. In Sennett's words, "People invest thought in things they can change" (2008:120). One could here replace

'thought' with 'meaning', or even 'life' to adopt Joce's metaphor. The last position is even substantiated in other

research that has examined the "extended agency" linking DIY creators to the materials they salvage and repurpose.

Here, it is proposed we think of "techno-animism" as an intangible aspect of material reality that is however perceptible

to those engaged in material transformation, wherein intentions and possibilities flow openly, back and forth, between

subject and object (Snake-Beings 2018). As we can induce and impart meaning onto objects, so too can the process and

products of repair transform us. As Rosa explains, citing specifically the example of repair, "resonance" is two-way

street:

"When we have repaired, altered, cleaned, or manipulated an object (e.g. a moped, a computer, a

sweater) many times over, we and/or our idiosyncrasies have literally *become part of it*—just as,

conversely, it has *become part of us* and changed *us*" (Rosa 2019:232, emphasis in original).

Similar processes were hinted at and described further in previous discussion of 'empowerment'. That is, simply the

subject's perceived transformation via their engagement in repair.

In opening up and penetrating commodity surfaces, the 'magic' with which an object is invested seems to

diminish to some extent, leaving us with many questions and spaces for reflection. Yet amidst the *deconstructing* work

of collaborative repair, both literal and symbolic, we cautiously note the new reifications and fetishes that can emerge

along with the evaluative processes particular to the practice, as in the case of the patch. As commodity forms are re-

appropriated in collaborative settings, object mystique can be transformed into the mystique of repair prowess. The

manufacturer's 'magic' is displaced by the magic of the skilled repairer. More precisely, it is the embodied knowledge

and skills themselves—skills and knowledge positively appraised as attuned to mechanical workings, and sensitive to

use-value and its salvage—which are the object of renewed fetish. Gilles spoke with veneration when comparing his abilities to that of Stéphane, a retired professional repairman, volunteer, and general repair whiz:

> "I've improved in my capacity to repair things…We learn a lot with Stéphane too, his massive ability to…you know, what Stéphane does is magical. He opens anything and knows right away how it works! He says, 'Yeah, yeah, there's a pump here, a spring over there, a wire here. That should get it going again.' He knows all about that stuff. But just to see him at it, it gives you confidence, and that is very powerful. I've been interested in repair a really long time, but it's become concretised in the last couple of years with the Repair Cafés…There, things are concrete, and there're developing, and me, I'm developing (*progresser*) along with them. Like I said, when Stéphane's there…as much as we can clearly see that he's good and we're less good [at repair], we feel like with his help, we're learning and developing too. It's encouraging to see. We see how he manages to find a solution" (Gilles).

In his account, the mystique of the skilled repairer, however transcendent it may appear in the eye of the beginner, can be demystified too and assimilated into the subject through engagement with materials, and collaboration with those from whom they can learn. In the end, there is nothing magical about it. The novice's sense of alienation at their first repair workshop can be transformed through the practice itself, leading to ultimately resonating experiences. This is what I believe was intended when people spoke in the first place of "empowerment". The only seemingly independent, if not exactly reified, key to doing repair was what subjects variably referred to as 'interest', 'passion', or 'drive'. Sennett draws a similar conclusion in naming "motivation" as more important than "talent" in successfully engaging with craft (2008:285). In thinking about the socio-ecological transformation of labour and technology, the project and proposals of degrowth could stand to learn something crucial from an orientation to craft, and material practice generally, with their promise to dealienate.

Conclusion

The present study has sought to examine the question of whether collaborative repair is a technology practice appropriate for the socio-ecological projects of degrowth. This orientation is in response to calls for more research on two fronts: on the intersections of practice with metabolic and material realities on the one hand (Haberl et al 2021), and on the possibilities for delineating socio-ecological labour on the other (Brownhill et al 2012; Barca 2019). These formulations are linked in a respective manner, to what has been called the 'quantitative' and 'qualitative' approaches adopted in degrowth research (Akbulut 2021). The study was equally driven by theoretical and methodological concerns as much as empirical and theoretical ones. (Can one take interest in one without the other?) These concerns stem from a desire to further develop degrowth research and thought. Despite intellectual associations with thinkers eminently concerned with questions of technology, it is only in recent years that degrowth scholarship has seriously began addressing on the topic. While valuable, this research has tended to adopt strictly biophysical or metabolic approaches in its analyses.

Discussion has been structured in part according to Abraham's three normative principles for degrowth—produce less, share more and decide together (2019)—with regard to data collected from on-site field work and interviews with repair practitioners. Methodologically, the present study was founded on a conviction that to engage in practice is to already, and necessarily, to engage in a process of reflection, where "individuals concerned not only do something…but also understand this doing *as* something…and invest it with meaning" (Jaeggi 2018:63, emphasis in original). We have thus examined what collaborative repair *does*—contribute to decelerating industrial commodity cycles (produce less) under conditions of material and knowledge-resource collectivisation (share more). Even more so, we have focused attention on what it *understands to be doing*. It is on these terms of investigation that we have sought to explore the possibility of technology practices that fulfil Abraham's third normative principle, to 'decide together'. Taking a cue from Abraham himself, as well as that of a number of degrowth-related figues (Gorz, Illich, Castoriadis), this study reframes the last interrogation as one having to do with the notion of alienation, and more specifically, with the priority of reversing or mitigating it.

Marx theorised alienation as a subjective state that resulted from individual and collective 'estrangement' from core aspects of labour. He identified four forms of alienation—(1) from the products of labour and the natural world; (2) from the process of labour; (3) from others; and (4) from oneself—as symptomatic of the experience of labour under capitalist production (Marx 1959). Following and elaborating on Marx's four alienations, some authors have posited the need for degrowth to strive to "actively reverse" these alienations and "dealienate" by way of "new commoning practices and social relations" (Barca 2019:209; see also Brownhill et al 2012; Akbulut 2021). The present

study adopts these criteria, expanding their application from an examination of *labour practices* to an examination of *technology practices*. In so doing so, and in line with degrowth's socio-ecological orientations, the analysis seeks to encompass material matters as much as social ones. With this in mind, the data collected here suggests that collaborative repair responds to the call to dealienate technology practice in the ways circumscribed by Marx. The 'critical metabolic' work of repair, discussed in Part i, functions as a site in which repairers are compelled to confront questions concerning the origins and ultimate endpoints of materials used in commodity manufacture, thus counteracting the first form of alienation. The work implies a subject-based shift from that solely of 'consumer', to that of producer engaged in use-value (re)production through repair. This spells out a reversal of Marx's second alienation, that from the process of labour. The eminently collectivised and cooperative nature of collaborative repair, detailed in Part ii, seems to recommend it as dealienating the labouring and technical subject 'from others', thus mitigating Marx's fourth alienation.

It has been suggested, we hope convincingly, that making deliberate decisions with respect to technology practice involves several of processes of dealienation at various steps of the repair process. It requires gathering information and reflecting critically on workings and structures across metabolic scales (Part iii.i). It also requires a belief in one's own capacity to exert change by adopting a solution-oriented disposition rooted in a commitment to material engagement (Part iii.ii). Initial diagnostic work can also cycle back into further timely and germane reflection concerning perceived needs and expectations with regard to technology (Part iii.iii). In Part iii.iv, we approached Marx's third and most mysterious alienation, from oneself or one's 'species being', seeing in 'empowerment' an effective paradigm that stands for the inherent value of materially-based work and the building up of skills to meaningful ethically-informed ends.

The intersection of meaning-making processes and technology practice has played a recurrent theme in the present study. The theme of autonomy, a leitmotif in both technology and degrowth studies, has been central in this regard. Again following Marx, we have sought to examine the tendency in industrial societies to elevate technological innovations to fetishes. In common perception, technology is conceived as exercising transcendent "autonomous agency" (Hornborg 2001:145-6). This is due to the "disembedding" (Ibid) effects of modern commodity production networks. It has been demonstrated that collaborative repair is premised on an assertion that fetishistic concealments, along with the distances both conceptual and material, between commodity origins, users and eventual waste destinations, are not inevitable. Here we can mitigate the experiences of alienation. However, this requires two things: that we familiarise ourselves with technological objects, and that we engage in the work ourselves. These imperatives inform, in turn, an over-arching normative principle toward decommodification that is central to collaborative repair practice. Driven by *decommodifying logic*, the practice proposes and reaffirms alternative kinds of relationships to labour-time-value on the one hand (Part iv.i) and object-companions on the other (Part iv.ii).

Collaborative repair is understood to be doing many things at once. First and foremost, it is understood as a site "to localize, to question, and to open up" (Sennett 277). It is a practice where particular questions are asked of particular technologies in order to get concrete results. In doing this, interrogations are expanded to wider reflections on large-scale socio-technical realities: about social and material origins and destinations; about how to produce and consume better; how to think about time; and how to better and more meaningfully live with technological objects. The practice's collective nature is understood as important above and beyond strictly materially distributive ends. It is seen as a means to share knowledge, perspective and 'passion', and imagined as a catalyst for further collective practice.

The work and significance of repair plays out on multiple scales: from the object, to the subject, to the repair shop, to the global commodity-metabolic chain, and backwards and inwards again. Such is the perspective of the collaborative repairer. Through engagement in repair, practitioners better familiarise themselves with 'upstream' technical labour processes and material inputs as they carry the baton forward in preserving, restoring and maintaining usefulness, acts of (re)production in and of themselves. In the work, meaningful reflection and action are simultaneous, existing at once alongside each other. The reflection is aimed at once at doing repair (or, how we can better do it), and at how our technologies are intertwined with materials and labours (or, how the former can demand less of the latter two). In this way, collaborative repair again resembles what Sennett saw as particular to the practice of craft: "Prehension presides over each technical step, and each step is full of ethical implication" (178).[53] It is precisely with respect to the varied processes described here that collaborative repair is imagined as fulfilling Abraham's third imperative, enabling subjects to make better technological decisions together under collectivised conditions.

I have tried to demonstrate that various dealienations that have emerged from our study—dealienation from the products of production, from its process, from others, and from themselves—mean that collaborative repairers are better placed to engage in making meaningful technological decisions. In other words, engaging in collaborative repair offers better access to both the "information" and the "critical spirit" vis-à-vis technology necessary to decide upon our relations vis-à-vis technologies (Ellul 1990:159). To make a decision is to assume a *responsibility*. The latter relates, in turn, to the notion of autonomy, a virtue often championed in degrowth criticism (see Muraca 2013). In Castoriadis' view, autonomy is understood in its simplest of terms, as living according to one's own rules. Autonomy is thus seen as a necessary antidote to alienation insofar as it implies the internalisation of decision-making processes (Castoriadis 1987). However, looking to 'autonomy' for a conceptual guiding principle on which to theorise *dealienated technology practice* seems limiting. If there's one lesson learned by the collaborative repairer, it's their their interconnection with, and interdependency on, diverse materials, objects, labours and knowledges. 'Autonomy' seems to capture only part of this picture.

---

[53] It is important to note that Sennett's conception of 'craft' is very much an inclusive one, encompassing activities as diverse as repair, artisanal trade-work, and parenting (2008).

In order to more fully examine the idea of 'alienation', we have supplemented Marx's definition of alienation with that of Jaeggi, seeing in the notion a *dual diagnosis* caused by both a loss of power and a loss of meaning (2014). Where appeals to 'autonomy' as the 'other' of alienation seem to theoretically address and reverse the first loss, they fail to address the second. 'Autonomy' also fails to highlight and elaborate the very real material constraints, witnessed first hand in repair, that structure practice, whether alienated or dealienated. While Illich's notion of "conviviality" (1973; 1973) is oft-cited to describe a normative technological vision that favours institutional decentralisation and inter-subjective connections, there is a lack of work, both theoretical and empirical, that deals with the concept in depth. Establishing deeper and more developed links with critical theory would be helpful in this respect. Recent work in German social philosophy offers conceptual structures for examining with greater subtlety questions of alienation as well as questions regarding the possibilities of transformative and dealienating technology practice. We suggest that Rosa's notion of "resonance" (2019) in particular is very promising in this regard. Resonance theory appreciates and integrates the "tangible *limitations of autonomy*" (Rosa 2019:183, emphasis in original) that emerge as ever-present and defining of technical, manual or craft-based practices. It also recognises the mutually constitutive and *interrelational* character of subject-object, as well as subject-subject relations. Degrowth research on technology would benefit greatly from integrating such an analytical perspective. It could open doors to new ways of thinking and exploring the boundaries of material and semiotic processes as they play out in everyday technological normativities, while helping to imagine new practices. Acknowledging the imbrication and embeddedness of individual practices like collaborative repair, within larger, ethically infused "forms of life" (Jaeggi 2019) would also help toward this goal.

Bibliography

- Abraham, Y.-M. (2007) "Le mythe fondateur de la rareté" in *Objecteurs de croissance. Pour sortir de l'impasse : la décroissance.* Ed. S. Mongeau. Écosociété, 58-70

- Abraham, Y.-M. (2019) *Guérir du mal de l'infini : produire moins, partager plus, décider ensemble.* Écosociété

- Aiken, G. T. (2017). "The politics of community: togetherness, transition and post-politics". *Environment and Planning A*, 49(10), 2383–2401

- Aiken, G. T., W. Eadson, K. Hobson, & L. Dinnie. (2022). Vicarious scale and instrumental imaginaries in community sustainable transitions. *Global Environmental Change*, *75*.

- Akbulut, B. (2017) "Commons", in *Handbook of Ecological Economics: Nature and Society.* Ed. C. L. Spash, 398-402

- Akbulbut, B. and F. Adaman (2020) "The Ecolocigal Economics of Economic Democracy" in *Ecological Economics*, Elsevier, 176, 1-9

- Akbulut, B. (2021) "Degrowth". *Rethinking Marxism*, *33*(1), 98–110

- Akbulut, B., F. Demaria, J.-F. Gerber, & J. Martínez-Alier. (2019). "Who promotes sustainability? five theses on the relationships between the degrowth and the environmental justice movements". *Ecological Economics*, *165*.

- Alcott, B. (2005) "Jevons' paradox", *Ecological Economics*, Elsevier, 54(1), 9–21

- Alexander, S. (2015) "Simplicity" in *Degrowth: A Vocabulary for a New Era.* Eds. D'Alisa, G. Demaria, F., Kallis, Routledge

- Anders, G. (2011) *L'Obsolescence de l'homme*, Dario

- Baier, A., T. Hansing, C. Müller, & K. Werner (2016) *Die Welt reparieren*, transcript Verlag

- Barca, S. (2019) "The Labor(s) of Degrowth", *Capitalism Nature Socialism.* 30(2), 207-216

- Bardi, U. (2011) *The Limits to Growth Revisited*, Springer

- Bauhardt, C. (2014). "Solutions to the crisis? the green new deal, degrowth, and the solidarity economy: alternatives to the capitalist growth economy from an ecofeminist economics perspective". *Ecological Economics*, *102*, 60–68

- Baumann, A., S. Alexander and P. Burdon (2020) "Land Commodification as a Barrier to Political and Economic Agency: A Degrowth Perspective" *Journal of Australian Political Economy* No. 86, pp. 379-405

- Bertling, J. and C. Leggewie (2016) "Die Reparaturgesellschaft. Ein Beitrag zur Großen Transformation?" in *Die Welt reparieren.* transcript Verlag. Eds. Baier, A., T. Hansing, C. Müller, K. Werner, 275-286.

- Bihouix, P. (2015) "Les *low tech*, la seule alternative crédible" in *Creuser jusqu'où? Extractivisme et limites à la croissance.* Eds. Y.-M. Abraham and D. Murray, Écosociété

- Bihouix, P. (2021). *The age of low-tech : towards a technologically sustainable civilization*. (C. McMahon, Trans.) Bristol University Press

- Bijker, W. E. (1995). *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change*. MIT Press

- Birkinbine, B. (2018) "Common praxis: towards a critical political economy of the digital commons", *Communication, Capitalism and Critique*, 16(1), 290-305

- Bonaiuti, M. (2015) "Bioeconomics" in *Degrowth: A Vocabulary for a New Era*, eds. G. D'Alisa, F. Demaria and G. Kallis, Routledge, 23-26

- Bowles, S. (1991). "What Markets Can –and Cannot—Do", *Challenge*, 34(4), 11-16

- Boykoff, J. (2011) "The Leaf blower, capitalism, and the atomization of everyday life, *Capitalism Nature Socialism*, 22(3), 95-113

- Bozkurt, O., & C. R. Lara (2019). "Repair work as good work: craft and love in classic car restoration training". *Human Relations*, *72*(6), 1105–1128

- Brand, U., B. Muraca, É. Pineault, M. Sahakian, A. Schaffartzik, A. Novy, C. Streissler, H. Haberl, V. Asara, K. Dietz, M. Lang, A. Kothari, T. Smith, C. Spash, A. Brad, M. Pichler, C. Plank, G. Velegrakis, T. Jahn, A. Carter, Q. Huan, G. Kallis, J. Martínez Alier, G. Riva, V. Satgar, E. Teran Mantovani, M. Williams, M. Wissen & C. Görg (2021) "From planetary to societal boundaries: an argument for collectively defined self-limitation", *Sustainability: Science, Practice and Policy*, 17(1), 265-292

- Bromley, D. W. (1986). "Markets and externalities", in *Natural resource economics : policy problems and contemporary analysis,* D.W. Bromley (ed.). Kluwer Nijhoff

- Brossmann, J., Islar, M. (2020) "Living degrowth? Investigating degrowth practices through performative methods". *Sustainability Science* 15, 917–930.

- Brownhill, L., T. E. Turner & W. Kaara (2012) "Degrowth? How About Some 'De-alienation'?" *Capitalism Nature Socialism*, 23:1, 93-104

- Buch-Hansen, H. (2018) "The Prerequisities for a degrowth paradigm shift: Insights from Critical Political Economy", *Ecological Economics*, 146, 157-163

- Buch-Hansen, H. & I. Nesterova, (2021) "Towards a science of deep transformations: Initiating a dialogue between degrowth and critical realism". *Ecological Economics*, 190 107188, 1-9

- Büchs, M., & Koch, M. (2019). Challenges for the degrowth transition: the debate about wellbeing. *Futures*, *105*, 155–165. https://doi.org/10.1016/j.futures.2018.09.002

- Caillé, A. (2011). "Au-delà du libéralisme, le convivialisme", *Revue Projet*, 324-325, 94-97.

- Caillé, A. (2020). *The Gift Paradigm - A Short Introduction to the Anti-Utilitarian Movement in the Social Sciences*, Prickly Paradigm Press.

- Carlsson, C. (2015) "Nowtopias", in *Degrowth: A Vocabulary for a New Era.* Eds. G. D'Alisa, F. Demaria & G. Kallis, Routledge, 214-216

- Castoriadis, C. (1987). *The Imaginary Institution of Society*.Polity

- Charter, M. and S. Keiller. (2016). "The Second Global Survey of Repair Cafés: A Summary of Findings." *Report by Centre for Sustainable Design, Surrey*. http://www.research.ucreative.ac.uk/3140/1/The%20Second%20Global%20Survey%20of%20Repair%20Cafes%20-%20A%20Summary%20of%20Findings.pdf

- Coderre Porras, C. & Université de Sherbrooke. (2022) "Pour une operationnaliation facilitée des cafés de réparation au Québec comme levier favorisant une économie circulaire" (dissertation)

- Cogoy, M. (1995). "Market and non-market determinants of private consumption and their impacts on the environment". *Ecological Economics*, *13*(3), 169–180

- Coredem (Communauté des sites de ressources documentaires pour une démocratie mondiale) (2020). *Low tech : face au tout-numérique, se réapproprier les technologies. Passerelles N.21, avril 2020.* Available at: https://www.coredem.info/IMG/pdf/passerelle21-online-final.pdf

- Costanza, R., G. Alperovitz, H. Daly, J. Farley, C. Franco, T Jackson, I Kubiszewski, J. Schor & P. Victor. (2013). *Building a Sustainable and Desirable Economy-in-Society-in-Nature*. ANU Press

- Daly, H. E. (1974). "Steady-state economics versus growthmania: a critique of the orthodox conceptions of growth, wants, scarcity, and efficiency". *Policy Sciences*, *5*(2), 149–167

- Daly, H. E. (1977) *Steady-State Economics: the economics of biophysical and moral growth*, W.F. Freeman

- Daly, H. E. (1993). "Steady-state economics: a new paradigm". *New Literary History*, *24*(4), 811–816.

- Daly, H. E. (1996). *Beyond growth : the economics of sustainable development*. Beacon Press.

- Dant, T. (2010). "The work of repair: gesture, emotion and sensual knowledge". *Sociological Research Online*, *15*(3), 97–118

- D'Alisa, G. and C. Cattaneo (2013) "Household work and energy consumption: a degrowth perspective. Catalonia's case study", *Journal of Cleaner Production*, 38, 71-79

- D'Alisa, G. Demaria, F., Kallis, G. (eds.) (2015) *Degrowth: A Vocabulary for a New Era*, Routledge

- D'Alisa, G., M. Deriu and F. Demaria (2015) "Care" in *Degrowth: A Vocabulary for a New Era*, eds. G. D'Alisa, F. Demaria and G. Kallis, Routledge, 63-66

- D'Alisa, G., & Kallis, G. (2020). Degrowth and the state. *Ecological Economics*, *169*

- Demaria, F., F. Schneider, F. Sekulova and J. Martinez-Alier (2013) "What is degrowth? From an activist slogan to a social movement", *Environmental Values*, White Horse Press, 22(2), 191-215

- Dengler, C., & Lang, M. (2022). "Commoning care: feminist degrowth visions for a socio-ecological transformation". *Feminist Economics*, *28*(1), 1–28

- Deriu, M. (2015) "Autonomy" in *Degrowth: A Vocabulary for a New Era*, eds. G. D'Alisa, F. Demaria and G. Kallis, Routledge, 55-58

- Dewberry, E. L., L. Saca, M. Moreno, L. Sheldrick, M. Sinclair, C. Makatsoris, C. & M. Charter. (2016). "A landscape of repair", in *Proceedings of the Sustainable Innovation 2016. Circular Economy Innovation and Design.*, Towards Sustainable Product Design, The Centre for Sustainable Design, University of the Creative Arts, Epsom, Surrey, UK, 76–85.

- Drengson, A. R. (1995). *The practice of technology : exploring technology, ecophilosophy, and spiritual disciplines for vital links*. State University of New York Press.

- Dzimira, S. (2007). "Décroissance et anti-utilitarisme", *Revue du Mauss permanente*, 26 mai.

- Easterlin, R. (1974) "Does economic growth improve the human lot? Some empirical evidence" in David, P.A., Reder, M. (eds.). *Nations and Households in Economic Growth: Essays in Honor of Moses Abramovitz*. Academic Press

- Easterlin, R. (2003) "Explaining happiness". *Proceedings of the National Academy of Sciences* 100: 11176-11183.

- Ellul, J. (1990) *The Technological Bluff*, trans. G. Bromiley, Eerdmans.

- Équiterre (2022) "Dévoilement de la première étude pancanadienne sur l'accès à la réparation". available at: https://www.equiterre.org/fr/articles/devoilement-de-la-premiere-etude-pancanadienne-sur-lacces-a-la-reparation

- Erb, K.-H., F. Krausmann, W. Lucht & H. Haberl. (2009). "Embodied HANPP: mapping the spatial disconnect between global biomass production and consumption". *Ecological Economics*, *69*(2), 328–334

- Escobar, A. (2015). "Degrowth, postdevelopment, and transitions: a preliminary conversation" *Sustainability Science*, *10*(3), 451–462

- Fanning, A.L., & O'Neill, D.W. (2019). "The wellbeing-consumption paradox: happiness, health, income, and carbon emissions in growing versus non-growing economies". *Journal of Cleaner Production*, *212*, 810–821

- Federici, S. (2012) *Revolution at Point Zero: Housework, Reproduction and Feminist Struggle.* PM Press

- Federici, S. (2014). *Caliban and the Witch*. Autonomedia.

- Federici, S. (2019). *Re-enchanting the World : Feminism and the Politics of the Commons*. PM Press.

- Feenberg, A. (1999) *Questioning Technology*, Routledge

- Fine, B. (2016) *Microeconomics: A Critical Companion.* Pluto Press

- Fortunati, L. (1995). *The Arcane of Reproduction: Housework, Prostitution, Labour and Capital*. Autonomedia.

- Foster, J. B. et al. (2021) "Marx and the Commons", *Social Research,* 88(1), 1-30

- Fournier, V. (2008). "Escaping from the economy: the politics of degrowth", *International Journal of Sociology and Social Policy*, *28*(11-12), 528–545

- Frey, C. B. (2019). *The technology trap : capital, labor, and power in the age of automation*. Princeton University Press.

- Garcia, J.L., H.M. Jerónimo & T.M. Carvalho. (2018). "Methodological Luddism: a concept for tying degrowth to the assessment and regulation of technologies", *Journal of Cleaner Production*, *197*, 1647–1653

- Geertz, C. (1973). "Thick Description: toward an interpretive theory of culture" in *The Interpretation of Cultures: selected essays*, Basic Books

- Georgescu-Roegen, N. (1971). *The Entropy Law and the Economic Process*. Harvard University Press

- Georgescu-Roegen, N. (1986). "The entropy law and the economic process in retrospect". *Eastern Economic Journal*, *12*(1), 3–25

- Gibson-Graham, J. K. (2006). *A Postcapitalist Politics*. University of Minnesota Press.

- Gilligan, C. (1993). *In a different voice : Psychological Theory and Women's Development*. Harvard University Press

- Gorz, A. (1973) "The Social Ideology of the Motorcar". *Le Sauvage*, Sept-Oct. Available at: http://notanothercyclingforum.net/bikereader/contributors/misc/gorz.html

- Gorz, A. (1989) *Critique of economic reason*, Verso

- Gorz, A. (1994) *Capitalism, Socialism, Ecology*, Verso

- Gorz André. (2010). "The exit from capitalism has already begun". *Cultural Politics*, *6*(1), 5–14.

- Graeber, D. (2001). *Toward an Anthropological Theory of Value : the false coin of our own dreams*. Palgrave.

- Graziano, V. & K. Trogal (2019) "Repair matters", *ephemera*, 19(2), 203-227

- Grunwald, A. (2018). Diverging pathways to overcoming the environmental crisis: a critique of eco-modernism from a technology assessment perspective. *Journal of Cleaner Production*, *197*, 1854–1862

- Haberl, H. et al (2021). "Stocks, flows, services and practices: Nexus approaches to sustainable social metabolism", *Ecological Economics,* 182, Elsevier

- Hanaček, K., B. Roy, S. Avila, & G. Kallis, (2020). "Ecological economics and degrowth: proposing a future research agenda from the margins", *Ecological Economics*, 169, Elsevier

- Harris, M. (1976). "History and Significance of the Emic/Etic Distinction". *Annual Review of Anthropology*, *5*, 329–350.

- Harvey, D. (2018) *The Limits to Capital*, Verso.

- Heidegger, M. (1977). *The Question Concerning Technology and Other Essays*. Translation by W. Lovitt, Garland Publishing

- Heidegger, M. (1977a). "Letter on humanism".

- Heikkurinen, P. (2018). "Degrowth by means of technology? a treatise for an ethos of releasement". *Journal of Cleaner Production*, *197*, 1654–1665

- Helfrich, S. & D. Bollier (2015) "Commons" in *Degrowth: A Vocabulary for a New Era.* Eds. G. D'Alisa, F. Demaria and G. Kallis, Routledge, 75-78

- Herrington, G. (2020). "Update to limits to growth: Comparing the World3 model with empirical data". *Journal of Industrial Ecology*. Wiley. 25(3), 614–626

- Hielscher, S. and M. Jaeger-Erben (2019) "Resisting obsolescence? The role of a 'culture of repair' for product longevity", *3rd PLATE (Product Lifetimes and the Environment) 2019 Conference*

- Hielscher, S. and M. Jaeger-Erben (2021) "From quick fixes to repair projects: Insights from a citizen science project", *Journal of Cleaner Production*, 278, 1-11

- Hickel, J. & G. Kallis. (2020). "Is green growth possible?" *New Political Economy*, *25*(4), 469–486

- Hornborg, A. (2001). *The power of the machine : global inequalities of economy, technology, and environment.* AltaMira Press.

- Houston, L., S. J. Jackson, D. K. Rosner, S. I. Ahmed, M. Young & L. Kang. (2016). "Values in Repair", in *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (CHI '16). Association for Computing Machinery, New York, NY, USA, 1403–1414

- Illich, I. (1973) *Tools for Conviviality*, Harper and Row

- Illich, I. (1976). *Medical nemesis : the expropriation of health*. Pantheon Books

- IPCC (Working Group III), (2022) "Chapter 1" (leaked) from *Sixth Assessment Report, Part III: Mitigation*; available at: https://mronline.org/wp-content/uploads/2021/08/chapter01.pdf

- Jackson, S. (2014) "Rethinking repair", in *Media Technologies: Essays on Communication, Materiality, and Society.* Eds. T. Gillespie, P. Boczkowski & K. Foot, MIT Press, 221-239

- Jackson, S. (2019) "Repair as Transition: Time, Materiality and Hope" in *Repair Work Ethnographies*, Eds. Strebel, I., A. Bovet, P. Sormani, Palgrave Macmillan, 337-347

- Jackson, T. (2009) *Prosperity Without Growth.* Earthscan

- Jaeggi, R. (2014). *Alienation*. (F. Neuhouser & A. E. Smith, Trans.). Columbia University Press

- Jaeggi, R. (2018). *Critique of forms of life*. (C. Cronin, Trans.). Belknap Press of Harvard University Press

- Jarrige, F. (2016) *Technocritiques*, La Découverte

- Jiborn, M., Kander, A., Kulionis, V., Nielsen, H., & Moran, D. D. (2018). "Decoupling or delusion? Measuring emissions displacement in foreign trade". *Global Environmental Change*, *49*, 27–34

- Kallis, G. (2011). "In defence of degrowth". *Ecological Economics*, *70*(5), 873–880

- Kallis' G., F. Demaria & G. D'Alisa. (2015) "Introduction: degrowth" in *Degrowth: A Vocabulary for a New Era.* Eds. D'Alisa, G. Demaria, F., Kallis, Routledge

- Kallis, G., V. Kostakis, S. Lange, B. Muraca, S. Paulson, & M. Schmelzer. (2018). "Research on degrowth." *Annual Review of Environment and Resources*, *43*(1), 291–316

- Kannengeisser, S. (2018) "Repair Cafés as communication configurations: consumer-critical media practices for cultural transformation" in *Communication Configurations: Transforming Communications in Times of Deep Mediatization* Eds. A. Hepp, A. Breiter, & U. Hasebrink, Palgrave Macmillan

- Kerschner, C. and M.-H. Ehlers. (2016) "A framework of attitudes towards technology in theory and practice", *Ecological Economics*, Elsevier, 126: 139-151

- Kerschner, C., P. Wächter, L. Nierling, & M.-H. Ehlers. (2018). "Degrowth and technology: towards feasible, viable, appropriate and convivial imaginaries", *Journal of Cleaner Production*, *197*, 1619–1636

- Knight, K. W., E. A. Rosa & J. B. Schor. (2013). "Could working less reduce pressures on the environment? a cross-national panel analysis of OECD countries, 1970-2007". *Global Environmental Change*, *23*(4), 691–700

- Kostakis, V., K. Latoufis, M. Liarokapis & M. Bauwens (2018). "The convergence of digital commons with local manufacturing from a degrowth perspective: two illustrative cases" *Journal of Cleaner Production: Part 2*, *197*, 1684–1693

- Krausmann, F., A. Schaffartzik, A. Mayer, N. Eisenmenger, S. Gingrich, H. Haberl, Helmut, M. Fischer-Kowalski (2016). "Long-Term Trends in Global Material and Energy Use", in *Social Ecology: Society-nature relations across time and space*, chapter 8, Springer, 199-216

- Lange, S. (2018). *Macroeconomics Without Growth. Sustainable Economies in Neoclassical, Keynesian and Marxian Theories*, Metropolis

- Lasch, C. (1991). *The True and Only Heaven : Progress and its critics*. Norton.

- Latouche, S. (1996). *The Westernization of the World: Significance, Scope and Limits of the Drive Towards Global Conformity*, Polity Press.

- Latouche, S. (2005) *L'Invention de l'économie*, Michel Albin

- Latouche, S. & A. Jappe (2015) *Pour en finir avec l'économie: Décroissance et critique de la valeur*, Libre et Solidaire

- Latour, B. (1988) *Science in Action: How to Follow Scientists and Engineers through Society*, Harvard University Press

- Lawhon, M., & T. McCreary. (2020). "Beyond jobs vs environment: on the potential of universal basic income to reconfigure environmental politics" *Antipode*, *52*(2), 452–474

- Likavčan L., & M. Scholz-Wäckerle. (2018). "Technology appropriation in a de-growing economy". *Journal of Cleaner Production*, *197*, 1666–1675

- Lizarralde, I. & B. Tyl. (2018). "A framework for the integration of the conviviality concept in the design process". *Journal of Cleaner Production*, *197*, 1766–1777

- Lokrantz, J. and Azote (n.d.) "Planetary boundaries", *Stockholm Resiliency Centre*, Stockholm University, available at https://www.stockholmresilience.org/research/planetary-boundaries.html, accessed 09.11.2021

- Lohmann (2021). "Heat, time and colonialism", *The Corner House*, accessed at: http://www.thecornerhouse.org.uk/sites/thecornerhouse.org.uk/files/ENGLISH%20VERSION%20OF%20HEAT%2C%20TIME%20AND%20COLONIALISM.pd

- Magee, C. L., & T. C. Devezas. (2017). "A simple extension of dematerialization theory: incorporation of technical progress and the rebound effect", *Technological Forecasting & Social Change*, *117*, 196–205

- Marín-Beltrán, I., F. Demaria, C. Ofelio, L. M. Serra, A. Turiel, W. J. Ripple, S. A. Mukul & M. C. Costa. (2022). "Scientists' warning against the society of waste". *Science of the Total Environment*, *811I*, 1-14

- Marion, L. (2015). *Comment exister encore? : capital, techno-science et domination*. Écosociété.

- Marique, A. F., & B. Rossi. (2018)." Cradle-to-grave life-cycle assessment within the built environment: comparison between the refurbishment and the complete reconstruction of an office building in Belgium". *Journal of Environmental Management*, *224*, 396–405

- Martin, E. & M. Ouellet, M. (2014). "La Crise du capitalisme et aussi la crise de l'anticapitalisme", in *La tyrannie de la valeur : débats pour le renouvellement de la théorie critique* (Ser. Collection théorie, th 07). E. Martin, & M. Ouellet (eds.) Les Éditions Ecosociété.

- Martínez-Alier, J. (2005). *The environmentalism of the poor : a study of ecological conflicts and valuation*. Oxford University Press

- Marx, K. (1976) [1867]. *Capital, Volume 1*. Penguin Books.

- Marx, K. (1959). *Economic and philosophic manuscripts of 1844* (M. Milligan, Trans.). Progress Publishers.

- McDonough, W., & M. Braungart. (2002). *Cradle to cradle : remaking the way we make things*. North Point Press

- Meadows, D. H., D. L. Meadows, J. Randers, W. Behrens, & Club of Rome. (1972). *The Limits to Growth: a report for the Club of Rome's project on the predicament of mankind* (Ser. Potomac associates books). Universe Books

- Meissner, M. (2021) "Repair is care? - Dimensions of care within collaborative practices in repair cafes", *Journal of Cleaner Production*, 299, 1-10

- Mellor, M. (1997). *Feminism and Ecology*. New York University Press.

- Morozov, E. (2013) *To Save Everything, Click Here: The Folly of Technological Solutions*, PublicAffairs

- Mumford, L. (1967) *The Myth of the Machine: Vol. 1, Technics and Human Development*, Harvest/HBJ

- Muraca, B. (2013) "Décroissance: A Project for a Radical Transformation of Society", *Environmental Values*, 22(2):147-169

- Noël, A. (2021) "Un Rapport inédit du GIEC prône la décroissance pour prévenir la catastrophe climatique". *Ricochet*. 16.09.2021. Available at: https://ricochet.media/fr/3780/un-rapport-inedit-du-giec-propose-la-decroissance, accessed on 23.11. 2022

- OECD (2011) *Towards Green Growth*, OECD Publishing

- Ostrom, E. (2015). *Governing the Commons*. Cambridge University Press

- Paech, N. (2016) *Liberation from Excess: the road to a post-growth economy,* Oekom verlag

- Papadimitropoulos (2020) *The Commons: Economic Alternatives in the Digital Age*, U. of Westminster Press

- Perkins, E., E. Kuiper, R. Quiroga-Martínez, T.E. Turner, L.S. Brownhill, M. Mellor, Z. Todorova, M.A. Jochimsen & M. McMahon. (2005). "Explorations feminist ecological economics", *Feminist Economics,* 11, 107–150

- Pichler, M., A. Schaffartzik, H. Haberl, & C. Görg. (2017). "Drivers of society-nature relations in the anthropocene and their implications for sustainability transformations", *Current Opinion in Environmental Sustainability*, *26-27*, 32–36.

- Polanyi, K. (2001). *The Great Transformation : The Political and Economic Origins of our Time* (2nd Beacon paperback). Beacon Press.

- Polimeni, J. & R.I. Polimeni. (2006) "Jevons' paradox and the myth of technological liberation", *Ecological Complexity*, 3, 344-353

- Pruvost, G. (2019) "Penser l'écofeminisme: féminisme de la subsistance et écoféminisme vernaculaire, *La Découverte*, 2(42), 29-47

- Pursell, C. (1993). "The rise and fall of the appropriate technology movement in the united states, 1965-1985". *Technology and Culture*, *34*(3), 629–637

- Quebec. (2020). "Plan pour une économie verte 2030 : Politique-cadre d'électrification et de lutte contre les changements climatiques", gouvernement du Québec, available at: https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/environnement/publications-adm/plan-economie-verte/plan-economie-verte-2030.pdf?1605540555, accessed on 09.11.2021

- Rancière, J. (1999). *Disagreement: Politics and philosophy*. U of Minnesota Press.

- Rogers, H. (2010). *Green Gone Wrong : how our economy is undermining the environmental revolution*. Scribner

- Romano, O. (2015) "Anti-utilitarianism" in *Degrowth: A Vocabulary for a New Era.* Eds. G. D'Alisa, F. Demaria & G. Kallis. Routledge. 21-24

- Røpke, I. (2015). "Sustainable consumption: transitions, systems and practices", in *Handbook of Ecological Economics*, Martınez-Alier, J. & Muradian, R. (eds.), Edward Elgar Publishing

- Rosa, H. (2014) *Alienation and Acceleration: Towards a Critical Theory of Late-Modern Temporality*, NSU Press

- Rosa, H. (2019). *Resonance : a sociology of our relationship to the world*. Polity.

- Rosner, D. (2014) "Making citizens, reassembling devices: On gender and the development of contemporary public sites of repair in Northern California", *Public Culture* 26(1), 51-77

- Rosner, D. & M. Ames. (2014) "Designing for repair? Infrastructures and materialities of breakdown", *Proceedings of the Computer Supported Cooperative Work & Social Computing, ACM* 2014: 319–331.

- Samerski, S. (2018). "Tools for degrowth? Ivan Illich's critique of technology revisited", *Journal of Cleaner Production*, *197*, 1637–1646

- Schmelzer, M. (2015). "The growth paradigm: history, hegemony, and the contested making of economic growthmanship", *Ecological Economics*, 118, 262–271

- Schmelzer, M., A. Vetter & A. Vansintjan. (2022). *The Future is Degrowth : a guide to a world beyond capitalism*. Verso

- Schumacher, E. F. (1973). *Small Is Beautiful: Economics as If People Mattered*. Harper & Row

- Schmid, B. (2019) "Repair's diverse transformative geographies: Lessons from a repair community in Stuttgart", *ephemera*, 19(2), 229-251

- Sekulova, F. (2013) "On the economics of happiness and climate change" [doctoral thesis, ICTA-UAB, Barcelona], accessed at : https://www.tdx.cat/bitstream/handle/10803/120213/fs1de1.pdf?sequence=1&isAllowed=y

- Sennett, R. (2008). *The Craftsman*. Yale University Press.

- Shove, E. (2010) "Beyond the ABC: climate change policy and theories of social change", *Environment and Planning A*, vol. 42, no. 6, pp. 1273–85

- Sirois-Cournoyer, A., & HEC Montréal. (2018). "La nature du low-tech : un travail conceptuel et exploratoire" (dissertation)

- Snake-Beings, E. (2018) "Maker Culture and DiY technologies: re-functioning as a Techno-Animist practice", *Continuum*, 32:2, 121-136

- Sorman, A. (2015) "Metabolism, societal" in *Degrowth: A Vocabulary for a New Era.* Eds. D'Alisa, G. Demaria, F., Kallis, Routledge

- Sorrell, S. (2009). "Jevons' Paradox revisited: The evidence for backfire from improved energy efficiency", *Energy Policy*, 37, 1456-1469

- Spash, C. & T. Smith (2019). "Of eco-systems and economies: re-connecting economics with reality", *real-world economics review*, 87, 212-229

- Steffen, W., K. Richardson, J. Rockström, S. E. Cornell, I. Fetzer, E. Bennett, R. Biggs, & W. de Vries. (2015). "Planetary boundaries: guiding human development on a changing planet", *Science*, *347*(6223).

- Stewart, M. J., and J. Stewart. (1999). "What can we learn from time-use data?" *Monthly Labor Review*, *122*(8), 3

- Strasser, S. (2000). *Waste and Want: a Social History of Trash*, Holt

- TallBear, K. (2014). "Standing with and speaking as faith: a Feminist-Indigenous approach to inquiry", *Journal of Research Practice*, 10(2), 1-7

- Thornbush, M. J. (2021). *The ecological footprint as a sustainability metric : implications for sustainability* (Ser. Springerbriefs in environmental science). Springer.

- Tronto, J. C. (1993). *Moral Boundaries: A political Argument for an Ethic of Care*. Routledge

- United States Congress (2019) *Recognizing the duty of the Federal Government to create a Green New Deal,* H.R. 109, 116th Congress

- Vandeventer, J.S. & Lloveras, J. (2021). "Organizing degrowth: The ontological politics of enacting degrowth in OMS"*Organization*, 28(3), 358–379

- Vendetti, B & M. Belan (2021). "Visualizing the accumulation of human-made mass on Earth", available at: https://www.visualcapitalist.com/visualizing-the-accumulation-of-human-made-mass-on-earth/?fbclid=IwAR0nA4bwQH1ybB6BYhcGoFHOWtTePdtfdlU0DqPQd7hdYqw1tKwZuZ0tGsk

- Verma, R. (2017). "Gross national happiness: meaning, measure and degrowth in a living development alternative". *Journal of Political Ecology*, *24*(1)

- Vetter, A. (2018). "The matrix of convivial technology - assessing technologies for degrowth". *Journal of Cleaner Production: Part 2*, *197*, 1778–1786

- Victor, P., (2010). "Questioning economic growth". *Nature,* 468, 370–371

- Victor, P. (2019) [2008]. *Managing Without Growth: Slower by Design, Not Disaster.* Second Edition. Elgar.

- Vioulac, J. (2018) *Approche de la criticité*. Presses Universitaires de France

- Virilio, P. (2003). *Unknown quantity*. Thames & Hudson

- Wall, G. (1987). "Exergy conversion in the Swedish society", *Resources and Energy*, *9*(1), 55–73

- Wiedenhofer, D., T. Fishman, C. Lauk, W. Haas & F. Krausmann. (2019). "Integrating material stock dynamics into economy-wide material flow accounting: concepts, modelling, and global application for 1900-2050". *Ecological Economics*, *156*, 121–133

- Winner, L. (1978). *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought*, MIT Press

- Wolf, C., Joye, D., Smith, T. W., & Fu, Y.-chih (Eds.). (2016). *The Sage handbook of survey methodology*. Sage Publications

- Zuboff, S. (2019). *The Age of Surveillance Capitalism : The fight for a human future at the new frontier of power*. PublicAffairs