Petrophonics

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Abstract: Drawing from sound studies, energy humanities, and anthropology, this essay identifies a critical gap in the academic recognition of "petrophonics"—sonic and vibrational byproducts of fossil fuel dependency that pervade contemporary soundscapes—within sound and soundscape studies as well as the environmental and energy humanities, where such phenomena are often dismissed as "white noise" or background ambience. Through theoretical analysis and empirical observation, we attempt to define petrophonics as both an object of study and a framework for critical engagement. Focusing on traffic noise—the most accessible example of petrophonics—as a cultural and material phenomenon rather than a mere auditory background allows us to explain and propose a speculative definition of petrophonics, characterized by its materialist grounding in fossil fuel infrastructures and its capacity to exist independently of audibility. This essay concludes by emphasizing the political, temporal, and decolonial dimensions of petrophonics, advocating for an ethico-affective approach that foregrounds the relational and infrastructural realities of petromodernity. This framework invites scholars and practitioners to re-attune to the pervasive yet overlooked sounds of fossil fuel dependency and imagine alternative, post-petrocultural phonic worlds.

Keywords: petrophonics; energy humanities; sound studies; anthropology of sound; petrosonic; autoethnography; climate crisis

Résumé : S'inspirant des études sonores, des sciences humaines de l'énergie et de l'anthropologie, cet essai identifie une lacune critique dans la reconnaissance académique de la « pétrophonique » – les sous-produits sonores et vibratoires de la dépendance aux combustibles fossiles qui envahissent les paysages sonores contemporains – dans les études et les paysages sonores, ainsi que dans les sciences humaines de l'environnement et de l'énergie, où de tels phénomènes sont souvent rejetés comme du « bruit blanc » ou de l'ambiance de fond. Par l'intermédiaire d'une analyse théorique et une observation empirique, nous tentons de définir la pétrophonie à la fois comme un objet d'étude et comme un cadre d'engagement critique. En nous concentrant sur le bruit de la circulation – l'exemple le plus accessible de la pétrophonie – en tant

que phénomènes culturel et matériel plutôt que comme simple fond sonore, nous proposons une définition spéculative de la pétrophonie, caractérisée par son ancrage matérialiste dans les infrastructures de combustibles fossiles et sa capacité à exister indépendamment de l'audibilité. Cet essai conclut en soulignant les dimensions politiques, temporelles et décoloniales de la pétrophonie, en plaidant pour une approche éthico-affective qui met en avant les réalités relationnelles et infrastructurelles de la pétro-modernité. Ce cadre invite les chercheurs et les praticiens à s'intéresser de nouveau aux sons omniprésents mais négligés de la dépendance aux combustibles fossiles et à imaginer des mondes phoniques alternatifs, post-pétroculturels.

Mots clés : pétrophonie ; sciences humaines de l'énergie ; études sonores ; anthropologie sonore ; pétrosonique ; auto-ethnographie ; crise climatique

Introduction: Roads, Elisions, and "White Noise"[1]

A) On a crisp afternoon in deep winter, the snow glistening in the sun, I wander suburban streets of West Lethbridge. It is quiet, mostly. I wear noise-cancelling headphones, my brother's discarded AirPods Pro (first generation), to be precise. I am not as interested in the audio I am listening to as I am in distracting myself from the high-pitched rings of tinnitus. I turn onto the Coal Banks Trail, trudging through deep snow. To my left, prairie suburb gives way to coulees, snow-covered hills that line the wide Old Man River. In the distance, I can see Whoop-Up Drive—a major roadway that stretches across the valley, connecting West Lethbridge to the rest of the city—and, even further on, the High-Level Bridge, a train crossing built of black steel trestles a century ago to transport coal out of the region. I follow the trail as it bends south toward the University of Lethbridge.

As I am listening to a somewhat old recording of a comedy show on Apple Music, I become more and more aware that something is wrong with my AirPods, or rather, that the sound that they are emitting is suffering from vibrational interference. I stop and listen more carefully to determine what the problem may be. The vibrational interference is now so loud that it is almost impossible for me to hear the show or even my own thoughts. It is not a sonic interference but a physical vibration that disrupts the sound in my headphones. The interference lasts all the way to the university, finally disappearing when I sit down in the library. An anomaly, I assume. I walk around the quiet study zone, looking for a warm place to sit down and work.

Some hours later, again wearing AirPods to mask the always-present tinnitus, I walk back the same way I came, and the vibrations reappear. Perhaps it is not the headphones, but something external. Maybe electromagnetic interference from the nearby university buildings (who knows what the physicists, engineers, or astronomers are up to), but it feels more grounded. I notice that the vibrational interference fluctuates in intensity as I wait for the pedestrian lights to go green at a big intersection on University Drive West. It almost seems as if the vibrations come from the passing traffic, sharpening whenever big trucks or buses thunder past. Meandering back over Coal Banks Trail, I hold still at 49.679228, -112.875684 because the vibrations are now so bad that I need to take out my headphones as I can bear it no longer. The outside is now quieter than the noise-free environment that should be provided by my headphones. The suburb's white noise takes over and frees me from the guttural vibrations.[2]

As I stand there on the trail, still confused, I kneel, take off a glove, and place a hand on the ground. It hums and vibrates, moving almost imperceptibly in sync with the traffic. I have the sense that the vibration caused by the cars, trucks, and buses moves through my body into the headphones, making traffic noise visceral. The vibrational interference and my psychological unease, the physical vibrations of the ground, and the noise produced by the traffic interweave and overlap. The hush of my "orphic media" has been broken: the headphones no longer fulfil their promise of distraction (cf. Hagood 2019, 3). My sonic microcosm of peace is in the hands of combustion engines and has been ruptured.

B) According to the Oxford English Dictionary, "elision" has two meanings: first, "the omission of a sound or syllable when speaking" or "an omission of a passage in a book, speech, or film"; and second, "the process of joining together or merging things, especially abstract ideas." This duality captures our approach in this paper. First, we reflect on the omission of what we name petrophonics. We begin from a seemingly banal point: most of the sounds we hear (particularly in urban centres of North America) are produced or conditioned by the combustion of fossil fuel, either directly (for example, traffic, trains, heating systems) or indirectly (for example, most energy is still derived from fossil fuels). And yet, most research elides the petrophonic; this is even true in the emerging disciplines of sound and soundscape studies, which are oriented by the study of sound and its social and cultural dimensions. This omission is not accidental; rather, it is a symptomatic and instructive expression

of what might be called, following Patricia Yaeger (2011, 310), the "energy unconscious."

Second, we use elision-as-omission as a point of departure for elision-as-connection. Specifically, we aim to connect an emerging constellation of insights. From the emerging field of energy humanities, we draw insight into the foundational ways in which fossil fuel dependency structures contemporary culture. From sound studies, we draw concepts and methods for attuning, taking sound as an object of cultural inquiry, paying particular attention to the adoption of sound-based approaches to anthropology. The article, "Soundscapes: Toward a Sounded Anthropology," by David W. Samuels et al., is notable for introducing key questions from sound studies into the field of anthropology. The authors ask: "What would a sounded anthropology be? How might the discipline of anthropology develop if its practitioners stopped thinking of the field recording only as a source of data for the written work that then ensues and rather thought of the recording itself as a meaningful form?" (2010, 330).

Framing petrophonics as elision, as both omission and connection, we work toward a speculative definition of petrophonics—not as a definitive concept or prescriptive practice, but as a set of maxims that, we hope, serve as a point of departure for scholarly and creative work related to sonic dimensions of petrocultures. More broadly, we believe the convergence of petrocultural critique, attunement to sound, and ethnographic analysis may be combined and used for sounding the alarm on our petro-dependency—and imagining (sonic) worlds beyond fossil fuels.

C) To make the petrophonic a bit more concrete, we pivot towards one of its most obvious examples, namely traffic noise. We chose this example as it also foregrounds the problem of elision we hinted at above, that is, research in sound and soundscape studies has tended to dismiss traffic as background or white noise. Marie Thompson (2017, 24) explains that white noise "is a summation of all frequencies with equal intensities distributed uniformly across the spectrum" and "pure white noise, with an entirely flat frequency spectrum and time independence, can only exist as a mathematical abstraction." Most sounds commonly referred to as white noise, such as traffic, wind, ocean waves, fans, static, and waterfalls, are factually more adjacent to pink or Brown noise.

White noise is perceived as pleasant, often invoked to help people, relax, or even enhance focus, as in the case of Brown noise, or to mask or drown out

other sounds. In their ethnography of urban sound environments, Venäläinen, Pöllänen, and Muršič (2021, 237) ask questions regarding the future of the urban soundscape in the wake of EVs: electric motors produce significantly less noise than combustion engines, and they posit that "a noisy engine has been an aural manifestation of the dominant role of cars in the urban hierarchy." Noting that European legislation requires EVs produced after July 2019 to be equipped with an "acoustic vehicle alert system" (AVAS) for when they drive less than 19 km/h, Venäläinen, Pöllänen, and Muršič (2021, 237) describe what that warning should sound be: "a mix of tonal sound and white noise." The sounds emitted by these vehicles are said to be an improvement over the tonal sound of a regular combustion engine, which makes it difficult to locate, whereas the EV's sound is directional and thus easier to make out. Quoting a manufacturer of AVAS, Venäläinen, Pöllänen, and Muršič (2021, 237) note that "White noise is very pleasant. It's the sound of falling water."

White noise is commonly used to mask other, more obtrusive sounds; people will turn on a fan to go to sleep, to drown out other noises in their house, apartment, or hotel room. In professional audio and music production, noise is often used to enhance scenes or moods, specifically in soundscapes and other audio production situations. For example, the website for audio technology company iZotope includes multiple articles describing how to use white (and other coloured) noise in professional settings and gives examples where noise is added to give more depth to a seascape sound, used to de-ess—a technique used for reducing or eliminating the excessive prominence of sibilant consonants in audio—or how white noise can be used to establish tension, rhythm, and mood in music production (cf. iZotope 2018; Luthar 2023). We may not realize it, but "white noise" (used as an umbrella category for most coloured noises, it seems) is everywhere.

It is then not so surprising that in her study on atmospheric noise in Los Angeles, Peterson (2021 paraphrasing Manaugh 2017, 6), writes that Los Angeles "is also a relatively quiet city, the sound of freeway traffic blurring into a background white noise punctuated, perhaps, by sirens or a circling helicopter." For both Peterson and Venäläinen et al., traffic noise is "background white noise," seen as part of the urban city soundscape, and classified as something omnipresent but never truly disruptive unless we count something like sirens or honking. Traffic is white noise, something that is there, but relatively easily dismissed. This idea is confirmed by the index of Peterson's book about Los Angeles—quite possibly one of the busiest cities on the planet in terms of

traffic—which only features two entries for traffic noise. Yet, there are videos on YouTube featuring "urban white noise" soundscapes that focus particularly on the city and intend to be calming for the listeners.

However, what might seem a rather banal observation about something most of us who live in large cities know—yes, there is a lot of traffic noise, but you just do not pay attention to it—is actually quite revealing of a deep symptomatic issue that lies at the core of modern (Western) societies: it points towards an unconsciousness of how deeply our day-to-day soundscapes are imbued with petrocultural sounds, that which we will dub *petrophonics,* and perhaps more worrisome, how we have to a large extent been conditioned to ignore them—or, at the very least, such sounds seem to have been academically dismissed to the category of "(white) noise." Our attempt here, in sounding the alarm, is to be taken quite literally: we aim to contribute to a re-definition of (anthropological) sound and soundscape studies against the background of the petrophonic, and to re-attune people to the deep material connections of the sounds of petromodernity in their daily soundscapes to foster a new affective relationship towards not just one's sonic environment, but the environment writ large.

The inaudibility of petro-sound within sound and soundscape studies is a limitation—, but it is an instructive one, as it helps frame the question: Where may we find the practices, tools, and concepts to develop a framework for petrophonics? What modes of listening allow us to hear—and thus put to use—the petrosounds that are so pervasive, yet apparently so difficult to hear? More importantly, however, the practice of listening without judgment is an opening for a process of making audible. Here, we are reminded of Foucault, who writes that "to make visible the unseen can also mean a change of level, addressing oneself to a layer of material which had hitherto had no pertinence for history and which had not been recognized as having any moral, aesthetic, political or historical value" (1980, 50-51). Petrophonics, then, is the attempt to make audible the inaudible.

Tuning Traffic: On the Intersections of Anthropology of Sound, Sound Studies, and the Energy Humanities

A) Traffic noise seems inconspicuous. As noted in the introduction, it seems that besides being an indicator of urbanization and, to some extent, wealth, traffic noise is not particularly desirable and is often dismissed. It is nevertheless potentially the most clear "cultural" or auditory indicator of

societies determined by petrocapitalism; never-ending traffic jams, precarious Uber and Lyft drivers, trucks in all shapes and sizes, parking issues, honking, revving motorcyclists, school busses, ambulances, police car sirens, fire trucks—most of us can hear those noises instantly in our heads. There is a discrepancy between the aural/sonic meaning of petrosounds, of which we here posit traffic as being the most easily recognizable one, and its cultural meanings, however. We acknowledge that there is aural diversity in the perception of traffic sounds, which may, for instance, culturally signify a sense of progress towards urbanization in parts of the world that are still developing (for example, Boyer 2019). Yet, its sonic-material meaning is the same everywhere: these are sounds that emanate from a material relationship with oil.

It is, therefore, not so surprising that American composer John Cage (1961, 3) opens the very short chapter "The Future of Music: Credo" in his book *Silence* with the following reflection: "Wherever we are, what we hear is mostly noise. When we ignore it, it disturbs us. When we listen to it, we find it fascinating. The sound of a truck at fifty miles per hour." We will delve deeper into Cage and a definition of noise in the next section of this article but for now, it seems poignant to note that Cage's very first example of noise is that of a truck speeding at 50 mph. Cage's text is drawn up in an equally "experimental" fashion as his compositions—although he would resent that we refer to it as experimental—but the interspersed lines of that same chapter read that "I [John Cage] believe that the use of noise to make music will continue and increase until we reach music produced through the aid of electrical instruments" (1961, 3). In the same breath, he considers music no longer to be the right word for this musical future he envisions (which did come to be), and substitutes it for "organisation of sound" (1961, 3).

B) What John Cage, and also the example from the introduction, makes clear, is that there is a strong relationship between petrophonics—for now, noise grounded in oil infrastructure—and petroculture; one that has yet to be explored in detail by the respective fields that are implicated by this relationship: sound studies and anthropology of sound on the one hand, and the energy humanities on the other. The energy humanities have posited the notion that, at the very least, all Western modes of life and their associated affects are facilitated by our reliance on fossil fuels (and their apparent "unlimitedness"), which in turn has an impact on all cultural production in one way or another. What comes to the foreground in the energy humanities is the infrastructural relations—both material, social and psychological—between

society, individuals, and fossil fuels; not merely a critical inquiry of the material infrastructure itself, but more so of the social, political, historical, and cultural infrastructures that are created and sustained by abundant access to fossil fuels (cf. Boyer and Szeman 2017; Devine 2019; Devine and Boudreault-Fournier 2021; Petrocultures Research Group 2016; Vemuri and Barney 2022).

What is notably absent in the energy humanities, however, is an attention to noise or sound, or specifically, what we consider as the petrophonic. Sound has been discussed in certain energy humanities scholarship, mainly those that lean towards anthropology, as exemplified by, for instance, the anthropological duo-monographs *Energopolitics* and *Ecologics,* written by Dominic Boyer (2019) and Cymene Howe (2019) respectively. Both these excellent accounts stem from extensive fieldwork in Mexico and delve into the social, political, and cultural implications of wind power development in rural communities. They examine how wind power projects are not just about generating renewable energy but also about shaping landscapes, communities, and political relationships.

One of the recurring elements in these studies is an observed worry from the local populations about noise pollution or contamination from the proposed wind turbines on their lands, and how this will impact local ecological systems, particularly the fish population, cattle, and the people themselves. While technically renewable energy, the wind turbines are produced using, amongst many other materials, steel, which requires the combustion of metallurgical coal in blast furnaces, a highly fossil-fuel-intensive process. The wind turbine becomes an audible infrastructure not just of renewable energy but also of its fossil fuel past, yet perhaps most importantly, its audibility only materializes once the sound waves it emits are classified as noise because there is a worry about their ecological and cultural impact.

C) Such an attention to the sounds of petroculture is necessary but insufficient. While both Boyer and Howe observe the sonic concerns, they do not further inquire into the subject. A compelling attempt at a conversation between the energy humanities and sound studies occurred at a 2023 study day of the Royal Musical Association and British Forum for Ethnomusicology entitled "Critical Perspectives on Petrosonics" (Davison, Nooshin, and Williams 2023; Nooshin 2021; Weaver 2023). Laura Weaver's article, which is a summary of the study day's proceedings, does not explicitly define the term "petrosonics," but it can be inferred from the context that it refers to the study of sounds associated with petrocapitalism, including the extraction and use of fossil fuels. According to Weaver's summary, presentations covered topics such as the nostalgia for

steam engine sounds in Britain, the use of hymns in mining towns to justify fossil fuel exploitation, and the impact of oil heritages on local communities in Iran. Key themes from the event included the temporal awareness that listening can provide, the local versus global dynamics of petrosonic experiences, and the role of sound in reflecting and challenging energy infrastructures.

Such research is, we believe, necessary, but may be too limited in scope. Specifically, it seems limited to specific audible histories, not phonic histories. Why do we opt for the term "petrophonic" as opposed to the term "petrosonic" (see infra, 3. VII-VIII)? The main difference would be that petrosonic, in the way it has been used, seems to exclusively apply to sounds or noises that are explicitly originating from or related to petro-infrastructures and/or are audible. What we are trying to argue by introducing the concept of *petrophonics* is that the petrophonic does not necessarily need to be actively perceived (or be made audible) in order to be an object of cultural analysis and that the affective effect of the petrophonic, whatever that may be, can exist in the absence of the physical dimension of petrophonics. The petrosonic seems *a priori* defined by negative connotations and affection and, therefore, lacks the critical and methodological potential for research-creation that petrophonics have—even if many of the noises that fall under the term petrosonic would also be part of the petrophonic. In logical terms, we would argue that A (the petrosonic) always equals B (the petrophonic), but B does not always equal A. We believe that the petrophonic is noise, and noise in the words of Thompson (2017, 7) "is implicated in and necessary for, but also exceeds the sonic."

The potential of defining the petrophonic as not requiring an audible component means that it remains open to a multitude of purposes that extend beyond a renewed attention to sound studies, soundscapes, anthropology of sound, and the energy humanities tout court. Take, for instance, the landmark 1974 album *Autobahn* by the German electronic outfit Kraftwerk. A petro*sonic* approach might usefully analyze the sonic qualities of the eponymous track, including the ways in which synth sound, recorded sound, and lyrics simultaneously represent and celebrate traffic sounds on a particular stretch of highway. A petro*phonic* approach does much more: its point of departure is not the sonic or figurative content of the music itself, but the material conditions of its existence. It would include the obvious, yet meaningful insight that all aspects of the album's development—writing, recording, circulating, and listening—depend directly on materials and energy derived from petroleum. Another example would be Eliot Bates' 2020 study of rare metals in an early

2000s Focusrite Red 8 microphone preamplifier—"an amplifier designed to amplify a very weak signal (as from a microphone, pickup, et cetera) and deliver it to another amplifier for further amplification" (OED)—and the extractive processes behind this as an attempt to develop a suitable technological ethics and locate the Anthropocene in audio technology. Such an investigation could function as an example of a (non-audible) petrophonic inquiry, one that incorporates but is not limited to petrosonics, the audible cultures of petromodernity.

D) What this conversation between sound studies (broadly conceived, as the study day also included musicology and anthropological presentations) and the energy humanities also highlights is the absence of attention in sound studies to that which we call the petrophonic. Arguably, it is everywhere all at once and yet actively absent—a point we will return to in the next section. Anthropological studies of sound, and especially those of urban environments, seem to recognize the abundance of petro-infrastructural noise yet seldom treat it as meaningful. As noted in the introduction, such noise is often treated as "white noise," and the following citation from Venäläinen, Pöllänen, and Muršič (2021, 234) is indicative of sound anthropologists' dismissal of petrophonics: "There are silent parts of the walking path for pedestrians in Turku: especially silent paths in parks, or sideways. Walkers-by greet you with a loud goodbye. But human voices still sink in an ocean of background traffic noise." In short, this quote exemplifies a clear—but, in our view, unwarranted—distinction between, on the one hand, meaningful sound and silence and, on the other, the meaningless "background traffic noise" into which sound and silence "sink".

E) Based on the limitations noted above, we want to ask: what happens if, instead of dismissing petro-sounds as "background noise," we attend to them? What if we are deliberate about not starting from a distinction between (meaningful) sound and (background) noise? These questions are challenging, in part because they address distinctions and limitations that are central to the field, and one of its foundational thinkers, R. Murray Schafer (1977), whose book *The Tuning of the World* is likely the most widely cited foundational text in sound studies and introduces a key concept: the soundscape.

"Soundscape" is difficult to define. This is perhaps because it has been proven fecund for a wide range of applications and fields, but also because Schafer's own definition seems amorphous. At some points, Schafer's use of the term refers broadly to "any acoustic field of study." At other points, Schafer has something more specific in mind: his interest is not only in describing

soundscapes, but also in creating and teaching practices of thinking, acting, and listening—that is, forms of attunement—that enhance the shared soundscapes. In short, there is an aspect that is normative, even prescriptive. In Kelman's assessment: "[Schafer's] soundscape is not a neutral field of aural investigation at all; rather, it is deeply informed by Schafer's own preferences for certain sounds over others" (2010, 214). Others use stronger language. Thompson, for example, critiques what she refers to as "Schaferian aesthetic moralism" (2017, 5). We would define it as aesthetic judgment or taste, as opposed to "moralism." In any case, the prescriptive aspect is crucial for understanding Schafer's conception of soundscape, such as Schafer's distinction between the "hi-fi soundscape"—"in which discrete sounds can be heard clearly because of the low ambient noise level"—and the "lo-fi soundscape"—in which "noise" muddles discrete sounds. Moreover, Schafer clearly states which is preferred: "Today," he writes, "the world suffers from an overpopulation of sounds." The point, for Schafer, is to enhance our soundscapes by enhancing desirable sound while reducing the "noise" that muddies listening.

We claimed above that recent scholarship in sound-based anthropology tends to dismiss the petrosonic as background noise, rather than hearing it as meaningful. But this distinction already exists in the founding texts of sound studies. In striving to attend to the petrophonic, then, part of the task involves developing new frameworks for listening, frameworks that are less prescriptive and more descriptive. More concretely, this involves attending to something like traffic noise—to the sensible sounds of petroculture and the petrocultural conditions of the sonic—rather than dismissing it as mere background noise as the limit to meaningful listening.

A Speculative Definition of the Petrophonic

What, finally, constitutes the petrophonic or petrophonics exactly? We posit the following speculative maxims that could form the basis for defining the petrophonic. As we embark on a research-creation practice that aims to compose with the petrophonic soundscapes that challenge the dominant definitions of "the soundscape" (as noted in the previous section), it is important to stress that these maxims may change over time and new insights may be gained in our creative process. For now, however, we believe that the following twelve speculative maxims, derived from our initial fieldwork and theoretical research (philosophy of sound, sound studies, critical theory, et cetera), can constitute an initial working definition of the petrophonic:

I. Petrophonics are highly specific forms of noise that are grounded in fossil fuels. They are materialist sonic force-relations and do not carry specific aesthetic traits, unlike other defined forms of noise or sound;

II. Petrophonics are an addition or correlative to the categories of biophonics, geophonics, and anthrophonics as used in current definitions of sounds present in soundscapes;

III. While petrophonics are material(ist), they cannot be reduced to the material infrastructures that produce them. Petrophonics do not need to be observed or actively heard in order to exist or to have an impact on humans, non-humans, and the environment in which they occur;

IV. Petrophonics have transformative and creative power because they are not a priori imbued with any affective connotation, they are in their phenomenological essence neutral signs;

V. While petrophonics are affectively neutral, they can become affectively powerful when observed, whether good or bad. Any affective interpretation of the petrophonic is specifically determined by the observer's social, cultural, political, historical and economic predispositions as well as the material and auditory conditions in which they occur;

VI. Because of their nature, petrophonics can be observed in nearly all (Western) soundscapes to varying degrees of intensity. We categorize the levels of petrophonic intensity according to their degree of separation from their material grounding, fossil fuels. The basic four petrophonic intensity levels are, to an extent, open for interpretation—more could be added, current ones could be changed—but the following can function as an initial framework for categorization:[3]

   a. Level 1: noise[4] emanating directly or "naturally" from fossil fuels (coal, tar sands, oil, natural gas, mines);

   b. Level 2: noise resulting directly from petro-infrastructures (pipelines, derricks, pylons, refineries, coal plants, mining operations, et cetera);

   c. Level 3: noise resulting from the direct use or input of refined or processed fossil fuels (cars, planes, lawnmowers, steam locomotives, boats, leaf blowers, pressure washers, et cetera);

   d. Level 4: noise resulting from second-degree use of refined or processed fossil fuels in some form (bicycle tires, asphalt, computer keyboards, crayons, deodorant, golf balls, skateboards, make-up, clothes, medicine,

wind turbine blades, solar panels, furniture, carpets, paints, plastics, umbrellas, guitar strings, et cetera);

i. Subsequent levels could be further identified depending on how much of the object's chemical makeup is defined by the hydrocarbons;

VII. Petrophonics should be approached in an ethico-affective manner (compare Thompson 2017). An ethico-affective approach decentres the human as it argues that noise does not need to be heard at all to be talked about, does not require an observing or listening subject, and thus is non-anthropocentric, and defies a negative definition of noise. At the same time, because noise does not have to be heard, it is not solely audible and it can affect the non-human and the environment;

VIII. From *VII* follows that the petrophonic is a necessary condition for the petrosonic but exceeds it as it is not limited to the audible world, nor does it carry the affective connotations of the sonic;

IX. A study of petrophonics is, by definition, decolonial, as it requires an analysis of the relations between the sonic expression and its material grounding, which are embedded in the levels of intensity. Recognizing where, how, why, and for whom petrophonics exist, forces a deconstruction of capitalist power relations including issues of deterritorialization, extractivist violence, and labour exploitation;

X. Petrophonics have an unusual relationship to time and space due to their material basis. The petrophonic exists at the same time in the past, present, and future, and while being audibly observed, petrophonics can be considered to have a fixed position in space, yet their phonic origin does not have to correlate to the same spatial position as its audible phenomena, nor does it have to carry the same time signature. Petrophonics are therefore hauntological signs (cf. Derrida 2006);

XI. Petrophonics are political in a Deleuzian sense (cf. Deleuze 1990; Buchanan and Swiboda 2004; Deleuze and Guattari 2005) and they function as proleptic infrastructure that provides the basic rhythms to human life—in the words of Lefebvre (2004, 15): "Everywhere where there is interaction between a place, a time and an expenditure of energy, there is rhythm"—the petrophonic is that rhythm;

XII. The petrophonic is multi-sensorial and does not partition between different senses: as the petrophonic sound denies its boundaries of form—it is not just mere sound, noise, or music, it is all of them at once or everything in between.

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Notes

1 This is a co-authored piece of writing; however, this first section, A, is meant to reflect the experience of Martens upon visiting Janzen in Lethbridge to collaborate on the Petrophonics project to specifically research sounds of abandoned energy infrastructure in Southern Alberta, such as coal mines, oil wells, mining towns, et cetera—hence the first-person singular voice. The rest of the piece uses a we-perspective as it reflects an ongoing conversation between the authors.

2 Martens acknowledges that their experience of dealing with tinnitus is particular to themselves, and this statement is not meant to reflect any kind of universality about the condition; the authors are aware that there is aural diversity in dealing with hearing impairments.

3 This hypothetical categorization is based on the logic of media geology (cf. Parikka 2015) and Michel Chion's three modes of listening (2012) to establish a non-hierarchical ranking of levels of sonic proximity and mediation in relation to fossil fuels. It also follows similar media archaeology logics of plastic waste as posited by Boetzkes (2019), De Loughry (2019), and Taffel (2016).

4 We realize that using the term "noise" here might give the impression that these are not neutral signs, but our use of the word noise aligns with Thompson (2017) as it does not carry any negative or positive connotations, for that matter. We see noise as a fundamental and distinctive structure of sound, not as a quality of sound.

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