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- 1 The *underground* is strongly linked to imaginaries woven by humans' actions towards the unexplored world below their feet. It has nourished myths and fictions about the afterlife, escapism and exile. In Plato's *Republic*, the allegory of the soldier *Er*, descending to the *Inferno* (Richardson, 1926) revives humanity's fears and beliefs about communication with the unknown and the challenge of limits. In Homer's *Iliad*, the dead also descend to a subterranean realm ruled by gods. In the Homeric *Odyssey*, the *katábasis* is described as a heroic journey to a supernatural world (Burgess, 2016). Although underground ways of life have been envisaged in literature, fiction, religion and folk tales, human settlements throughout history have reaffirmed practical ways of living on the Earth's surface through adaptation to each region's climate. Visions and imaginaries about the underworld have profoundly changed with the advent of industrial society, by mechanising, measuring and wishing to conquer every inch of the *terra*. The underground world was rationalised while it was accessed, tamed and forged by new aspirations about the expandable limits of humankind's territory. The *troglydite* (from the Greek, meaning living in holes) houses and settlements dispersed around the globe remind us of human beings' ongoing efforts to protect their bodies from hostile weather, but also of the effort to deal with the scarcity of building materials and comfort of housing conditions. But what link could one make between Friedrich Engels's criticism of the unhealthy, wretched conditions of the working classes in industrial Manchester and Liverpool, the semi-underground apartments for migrant populations in Athens (Maloutas & Botton, 2021) or the abandoned bunkers providing refuge for the unwanted of society's global metropolises? The stratification of classes in human settlements is the result of finite, valuable (for its use) space and the constant quest for better living conditions "on an upper level" with sufficient air and light. This social stratification of the urban environment was celebrated by architects and planners of the 20th century¹ who wished to structure the city vertically – such as

renewals in the manner of Haussmann. For the “unwanted” of modern economies, the “space below” was linked with criminality, danger, and escape.

- 2 The 20th century’s western world was finally able to integrate the scenario of living underground only after WWII, with the menace of apocalyptic destruction of the planet. Tunnels, bunkers, secret passageways and air raid shelters’ infrastructure were laid underneath European cities (Poland, 2019) and woven into a network of an alternative world, ensuring short-term survival if needed (Rose, 2001). The invisibility and distance from the surface allowed these underground worlds, throughout the 20th century, to shelter and incubate forms of political resistance and emancipation from authoritarian oppression (Williamson, 2012). The fiction of the underground used as metaphor and pretext has led philosophers and writers to criticise dominant ideologies and cultural phenomena (see Dostoyevsky’s *Notes from the Underground*). In a post-industrial world of diplomatic democracy, and neoliberal mechanisms of social appeasement, the need to go underground has atrophied and the substrate has become no longer an acceptable shelter for the masses but only a precarious solution for the oppressed or hunted. At the same time, new underground networks are proliferating to host expanding economic activities of cities (Bélanger, 2007), complex infrastructure and defence systems (Saveur, 2003), and even collective pedestrian spaces deployed below dense metropolises in Canada or Asia, for climate or mobility flow regulation purposes (Zacharias, 2001).
- 3 The underground has been analysed both as a geological substrate and a constitutive element of the Earth. Technological progress also made it visible to humankind after the second half of the 20th century (Goel *et al.*, 2012). A thick heterogeneous mass of soil substances, micro-organisms, roots, fossils and rocks lies underneath the smooth, concrete streets and cemented pedestals of human settlements. What is the current interest for social sciences and urban studies in looking at the underground in a time when the James Webb telescope reveals to humanity the tremendous unlimited nature of the universe and the vastness of the sky above our heads? Before visiting new galaxies, humankind is more than ever tied to Earth’s underground resources, whose use questions the limits of humans’ dominance and the attitude of overconsumption through energy production, material use and food harvest. From an ontological point of view, the *subterranean* intrigues us by virtue of its contrast to what constitutes the world of habitus for human beings, the Earth’s ground. From a planning point of view, the subterranean space fascinates us on account of its vastness, theoretical imperishability and proximity to the existing dense settlements. It is therefore considered a prominent space for urban growth (Harris, 2015) and ripe for experimentation in planning principles (McNeill, 2019; Reynolds, 2020). On the other hand, late capitalism has satisfied its thirst for new space by extending the city’s functions below ground (Ovenden, 2020). Although the concept of the anthropocene (Malhi, 2017) has been rapidly adopted among the scientific community, human activity continues to disturb natural cycles and multiply over-infrastuctured spaces (Allenby & Chester, 2018). If we count just the “two million kilometres of pipelines covering the globe” (Watts, 2011, p. 66), it is more than clear that human impact has also upset the substrate. After decades of technological innovation and a Cartesian view of the underground as a measurable space, and a space apart, today’s emergencies require an orchestrated and multidisciplinary approach (Besner, 2016) to deal with the anthropophised space as an ecological entity.

- 4 Despite the continuous conquering of the underground² and its vital role for life to flourish on the surface, it has always carried the “burden” of being an infamous space. It is interesting perhaps to draw a parallel with how societies in the early 18th century started to create distance by spatializing and isolating illness, insanity, but also behaviours, people and opinions judged as outside the norm. Architecture of health³ and detention around the world has often created places apart, dissociated from ordinary urban life.⁴ Putting something at a distance, away from the city’s gaze or under the ground, reflects the rationalism of the modern world trying to forget or render invisible what cannot be understood or controlled. Since the 1990s, cultural centres, data centres, organic urban farms and logistics centres have been proliferating in the bowels of international metropolises, as facilities created and imagined to foster the development/reappropriation of underground spaces (Reynolds, 2020). Along with a profusion of ideas and sophistication of projects, international meetings of professionals⁵ and thematic publications in scientific journals⁶ also demonstrate the effervescence that animates the debate among the operational world and scientists on the subject. The underground space has emerged stage front over the past twenty years (Admiraal & Cornaro, 2018) as an issue of mutual interest for professions dealing with the urban. Long regarded as a “residue” of the city, neglected by stakeholders, devoid of natural light and air, the underground space has notably responded to the storage and burial needs of the vital functions of the city (networks of any kind) or, in some cases, climate protection (e.g. Montreal). Thus, for a long time, the underground has been attractive for its capacity to host engineering and defence works, energy production facilities, housing security structures, parking lots, technical galleries (utilidors) and various types of urban infrastructure (Goel et al., 2012). Contemporary urban planners and architects (Von Meijenfeldt & Geluk, 2003) have long imagined exploiting of this *common*, more often mobilising imaginaries of a futuristic city than knowledge and techniques inherited from the vernacular architecture (e.g. water reservoirs, troglodyte habitats).
- 5 Metropolisation, urban sprawl and climate change are today confronting urban settlements with the challenges of densification and adaptation. The underground space is called upon to prove itself as a structuring space for metropolitan life. It emerges as a promising response to the impasse of land shortage in dense areas but also to the challenges of reducing buildings’ energy consumption, resource management and mobility (Malone, 1996). From a perception of the depths as a constraining space, we are witnessing a revival of vocabulary and policies affirming a desire to connect (Labbé, 2016) the underground cavities to the network of vital urban functions. Despite this excitement, regulatory and operational tools have not yet been developed. The high cost of underground works, the complexity of operational arrangements,⁷ the risks involved in the recognition of common land to be shared and the absence of an exhaustive inventory call for a reading that takes into account the plural dimensions (environmental, social) of the underground as well as for an overhaul of analytical toolkits and design principles.
- 6 The debate is still open and has been invigorated by recent developments regarding the global health crisis that have profoundly changed social interactions in closed and open places. Cities have always been built in direct connection with their subterranean space. The remains of the cavities of historic cities (Lavagno & Schranz, 2007), the reuse of natural caverns, numerous vernacular architectures and engineering works prove

that humans have always inhabited the underground, either out of necessity (Ming, 2017) or out of ambition. If this “universe” is still little apprehended today, this reflects much deep-seated reluctance; hesitation in relation to technique, but also cultures and lifestyles. Under what conditions can we imagine life at depth as we know it on the surface? Vertical stratification and the promotion of architecture in an underground environment (Meiss & Radu, 2014) ensure a gain in the ground, but also allow effective shortcuts to connect activities in the metropolis. How can we then rethink new forms of habitat, sustainable use of resources, mutualisation of functions in the ground below the verticality of urban space (Harris, 2015)? In addition to questions of constructability and programmes, the underground city requires profound changes linked to the very structuring of social life traditionally organised around *areas, zones, districts* on the surface. In recent years, in the private sector, many operations have emerged that offer a framework for “new generation” programmes and new uses (O’Sullivan, 2015) for investment in underground space. Besides large-scale urban operations such as La Défense or Les Halles in Paris, certain architectural achievements confirm the renewed interest in projects questioning the ground-basement relationship (Endicott et al., 2020). These examples show that fundamental questions in architecture and town planning⁸ find fertile ground in the underground and invite professionals to explore subtractive approaches, breaking with certain traditional referents such as landscape urbanism. The initiatives of certain metropolises seek to question mono-functionality and to widen the field of intervention over a larger territory in order to anticipate urbanisation and safeguard unbuilt areas.⁹ These steps reveal a desire for proactive policies about the subsoil. An *underground urbanism* (Barles & Guillerme, 1995) would then find in post-industrial metropolises a role to play in restoring the effects of 20th century urbanism (sprawl, spatial fragmentation). From dominant approaches of anthropophisation and outlandish colonisation of the subterranean in the past, we are moving today towards a new paradigm in the management of resources (Parriaux et al., 2010). Current projects increasingly understand the subsoil in its biological and historic memory richness and in its fragile and evolving dimension. Proposing methods of viewing subsoil as a potential urban amenity and a potentially revisited *lost space* (Tranick, 1986) leads us to approach the underground as a valuable resource for human life on the surface.

Senses and the underground. What to look for?

- 7 Questioning the underground through the concept of atmospheres invites us to reflect on the power relations and the renewal of methodological approaches, and to understand these spaces as new frontiers of political action and laboratories of urban life. This special issue welcomed contributions that interrogate the underground as an atmospheric universe of human labour and a quest for survival, and a new terrain of power negotiation. What theoretical, operational and disciplinary approaches can be engaged today in order to recontextualise the debate on the potential *spatialities* of underground space? Exploring the underground space in its capacity to welcome, please and comfort also means recognising the existence of a growing and diversified underground life, requiring the renewal of a long-standing debate (e.g. structure, land, security, etc.) on current issues such as the hybridisation of public spaces, the tourist attractiveness of cities and the role of the senses in the urban experience. It is the objective of this special issue to open the debate on an updated reading of underground

space and its role in the fabric of urban life (Lévy, 1994), mobilising the concept of atmosphere and experience (Malpas, 1999) that has been present for more than forty years in works of human and social sciences in France¹⁰ (Amphoux, 2003) and in the Anglo-Saxon research environment (Buser, 2014). How can the multisensory dimension of underground spaces shape new imaginaries but also question practices and power relations in the production of space?

- 8 Starting from the hypothesis that the use of the underground will be intensified and diversified in the years to come, this issue invites a discussion on the possible bridges between the creation of atmospheres and the embodied practices of the underground. From the mundane act of searching for objects stored in the cellar to the daily journeys in the corridors of the subway, cinematography has paid homage to the activities of humanity underground in a trivial or temporary way (Hunt, 2019). Investigating the underground through basic human practices (work and living) and through the prism of atmospheres invites us to rethink individual behaviours, powers or control, accessibility and habitability. How is the experience of underground places influenced by age, gender or culture? How can subterranean atmospheres correlate with the rhythms of use, their intensification or lighting? How should we respond to the disorientation caused by the lack of sensory references (Cui et al., 2012) or compensate for the loss of richness of natural atmospheres resulting from seasonal, climatic changes? Practising the underground was traditionally thought through a successive stacking of “nested” functions and networks. Turning our attention to the way in which interiorised spaces are experienced in bodily terms (Davidson & Milligan, 2004) calls for a break with this mode of reading, and for introducing not only the olfactory dimension (Alarcón, 2013), but also the affective (Buser, 2014) and temporal dimensions. Beyond short-term activities,¹¹ the subsoil is also practised more continuously by the populations who work and live there.
- 9 This issue invites us to summon atmospheres to cut across traditional questions about the use of space (path, orientation, signage), its quality (comfort, aesthetics, design) across sensory dimensions (partitioning, oppression, immensity, enclosure) of the underground, to political ones (ownership, right and spatial justice, etc.). Investigating the practices of the underground requires an understanding of the conditions of underground experience in the light of social hierarchy theory and spatial justice (Elden, 2013). How can the concepts of atmosphere and experience offer methodological tools for accessing life stories, revealing conflicts of access, controversies over the occupation of underground space? The representation of depth has intrigued artists, engineers and explorers since the 17th century. The underground has motivated fictions and imaginations (Harle, 2015), being a space that has been little inventoried and studied, but which has provoked overwhelming feelings for those who access it. At the dawn of the 20th century, the underground of the industrial city was linked to work, darkness, isolation, fear. A binary vision of society divided between spaces giving access to fresh air and others deprived of the sun was to be reversed after the second world war, with problems of reconstruction of cities and numerous technological advances in structures. Over the years, the image of the subsoil has oscillated between the quest for a rational representation and projections that different societies make there according to their economic and political contexts. If the imagination of the underground has long been linked to gloomy, humid, labyrinthine atmospheres, it is equally linked to feelings of refuge and protection. The debates on

the reinvention of underground spaces and their integration into the framework of urban spaces (Bourdin, 2007) thus call for a reinvention of tools of representation (Bélanger, 2007) and a renewal of urban imaginations. From the axonometric engineer's views¹² to the master plans identifying land availability¹³ and the experiments in mapping the continuous paths of transport users (Montoya et al., 2015; Asgari et al., 2016), the representation of the underground oscillates between functional issues and affective social ones. A desirability of the underground conveyed by new imaginaries conditions the wishes of underground practice and its success in programmatic and economic terms.

- 10 The search for staggering, spectacular urban atmospheres overthrows traditional perceptions of underground figures¹⁴ and seeks to reveal new strata of the city's memory. What role could image, sound, discourse have to play in renewing perceptions of underground space? If the usual focus of professions dealing with the underground starts from outside the represented space through elevations and plans, this issue invites readings of the underground which place the human body at the centre of interactions with the environment. It aims to highlight possible bridges between affective atmospheres, political ecology and analytic frameworks of a *social* underground, introducing the latter as a living and evolving *interface*.
- 11 All three articles presented here assume a malleability of the limits between underground and above ground, drawing on the hypothesis that this malleability is politically constructed. By mobilising the concept of atmospheres, the authors look to shift and shake dominant views of the underground, and to uproot meanings relating to its high potential for collective action and environmental awareness. Atmospheres and moods, as described in interviews or through representations in art, weave a language for communicating feelings of dispossession, marginalisation and despair, and for this reason they become springboards for new critical approaches to underground space. The atmosphere concept is used both by opponents and supporters of dominant systemic powers (state, institutions, media) in order to dehumanise or humanise the invisible reality of a lived underground. Following the concept of atmospheres, Tobias Etienne-Greenwood argues about the continuity of the underground world to the surface, underlining that this continuity is perceived through the presence of the industries exploiting the underground, but is mostly sensed¹⁵. The argument tends to shift the perception of a retired "faraway" desert territory and causes us to hear, close at hand, the whispers of continuous ground through discourses and feelings of autochthonous populations. In the second article, by Marie Trossat, the use of the notion of atmosphere highlights the notion of division between the underworld and the surface, but alerts us to the importance of a political reading of this division. Taking refuge in the underworld, trying to make habitable what is essentially uninhabitable, reveals more general struggles about access in the city for those who are stigmatised as unwanted or marginal. Living underground, the article argues, seals class and social belonging and reinforces the division between a homogeneous group of the repressed and the rest of society. Marijn Nieuwenhuis uses atmospheres to draw attention to the complex realities of the 21st century proletariat who, deprived of its means of collective struggle, incorporates the pains of Gaia and incorporates into its body the results of the ravaging activity of humans. Unearthing the conditions of living and working with the underground space opens up new fields in relation to an enlarged terrain for political action in the future.

Atmospheric undergrounds and becoming places

- 12 Almost immediately after its appearance as a research topic, the concept of *atmospheres* has united disciplines around the common incentive of renewing the question of humans' experience and practice of the world.¹⁶ As Böhme (2017) has argued, the atmosphere “*is a hazy and vague in-between phenomenon*”. Sumartojo and Pink (2018) underlined the intertwining relation between practices and creation of atmospheres in the lived world. The concept has been used to enrich methodological approaches aiming at understanding human behaviour and affect of environments (Anderson, 2009). Following the hypothesis of Schmitz (2019) that “*an atmosphere [...] is the unbounded occupation of a surfaceless space,*” we then come to ask what kind of atmosphere an underground space could elicit. And through which means could this atmosphere be “captured” to provide readings of the underground? The relation between atmospheric environments and phenomenology has largely been explored (De Matteis et al., 2019). For Pike (2007), the underground has undoubtedly forged modern culture and influenced ways in which cities are seen, governed and lived in. Architecture and planning also contributed to a shift in understanding and producing underground spaces, by privileging approaches that go beyond metrics and technical objectivation (Tidwell, 2014) or aesthetic instrumentalisation for commercial reasons (Babin & Attaway, 2000). In their work *Staging atmospheres*, Bille, Bjerregaard and Sørensen (2015) show the way in which production of atmospheres can influence sociality, affect, politics and aesthetics. At the same time, atmospheres, argues Trigg (2021), play a prominent role in shared emotions such as anxiety and phobia, and forge perceptions of common experiences in political events or social menaces such as pandemics. For Dovey (2010), experience of places plays a prominent role in identity formation. His hypothesis that *who we are depends on where we are* calls for an exploration of underground space's power to blur imaginaries, create emotions, and trigger social and political action in the context of the unfinished nature of produced spaces. There is a large corpus in the literature that explores the methodological interdisciplinary approaches to sensing atmospheres (Engelmann & McCormack, 2018). How could the underground world as a natural and experienced environment (Buser, 2014) feed the production of urban atmospheres (Catania Kulper & Periton, 2015)? But also, how can the concept of atmospheres provide a legitimate and fresh entry to the *underground* as a subject of action and research? First of all, approaching the underground through an ambient perspective prompts further discussions on the sensitive sensitive relation that humans have with humanised environments. Which is the affective dimension of *uses* and *interactions* in the underground? Exploring human sensoriality in situations of despair, obscurity, disorientation, fear, in places disconnected from everyday social life and attachments, intrigues us because it reminds us that other forms of practising space merit an enlargement of our traditional visions and areas of application of the concept of *place*. But atmospheres also serve as a point of entry to discussion here, as they carry rich representations – both individual and collective – of comfort, joy, boredom, excitement... in every practised environment. This close attention to *senses* and *emotions* triggers and challenges dominant logics of stakeholders and the power exerted over underground space (Chadoin, 2010). Approaching the underground through the entry afforded by *atmosphere* causes us to set aside for a while the dominance of our visual approach to designed spaces and to

reconsider the underground through the *sense of place* (Howes, 2013). Linking subject (human body) and space through affect (Anderson, 2009, Bissel, 2010) draws new lines of exploration and an approach to the *ground* as a double-sided element of our world. What can the atmosphere, this omnipresent feeling and perception that is rarely noticeable (Bégout, 2020), bring to the debate about becoming underground places? For the underground's characteristic of being eminently local, the concept of atmospheres highlights a fresh look at the underground space, dealing with it not as an indifferent mass underneath, subjected to globalisation techniques and visions, but as strongly linked to societies, ecosystem and place. Following Goffman's postulate that encounters define affective experience of a place (Goffman, 1961), there is finally fertile ground that this issue aims to survey: that of negotiations, encounters and passages between the two worlds. In which ways can atmospheres enlighten the dialogue around human action, imposed, spontaneous, framed, controlled, claimed, dreamed, taking place in the underground as a new kind of *lived space*?

Descending underground, three journeys to the unseen

- 13 In his article on Vaca Muerta, a shale oil and gas formation located in Argentina, Etienne-Greenwood questions how political activism can use atmospheres as a tool for unearthing the exploitative aspects of the hydrocarbon industry. By interrogating the impacts of the act of excavation, the author tends to bring to light the margins for political and collective action. Excavation, as a force of human-driven exploitation, is here interrogated through its disastrous effects on the landscape of Vaca but mainly through its traces, marks on everyday life and the sensory world of the inhabitants of the territory. The author asks what kind of atmosphere is ultimately achieved through the exploitation of hydrocarbon resources? As Gandy points out in *Concrete and Clay* (2002), the power of steam coming from below the streets is a reminder of the robust invisible machine turning urban life. The author stretches the dominant imaginary of a fixed *frontier* hermetically separating the *above* from the *below*, and highlights how this thick separating membrane is in itself a medium of communication of atmospheres from the underground. Where does the atmosphere occur? Is it the characteristic of the underground world or ultimately the essence that emanates from it towards the above, Etienne-Greenwood asks. Drawing on the example of Vaca Muerta, the paper showcases how by using the concept of atmospheres, populations can actually stretch the limits of the underground atmosphere world towards practices and narratives of life above ground. Up to what point can an underground atmosphere be sensed? Following the thread of atmospheric strata of life allows us to re-explore and question the inherent conflict between a dense world in terms of sensory stimuli and a smoother, "linear" and sometimes monotone atmospheric world beyond the ground. Conflict is also spotted in the activities taking place in the two worlds. The landscapes of breeding, pasture and natural seasons are menaced by a violent rhythmic force of uprooting, removing and digging. By examining ways of experiencing the petrol-scape of the hydrocarbon industry, the contribution reflects on modalities of construction of a collective conscience towards a neglected common good, the soil. The first section discusses the concept of atmospheres from an eco-phenomenological perspective. The second section discusses in more detail aspects of this reified atmosphere. In the conclusion, Etienne-Greenwood seizes the question of an ambient underground as a trigger and a *sine-qua-non* condition for potential collective action. As the author

reminds us, underground atmospheres are diffuse and have the capacity of marking everyday life and emotional engagement to a place. The communication of the two worlds (underground and overground) occurs not only through *movement* (steam, drilling, etc.) and *physical space* (holes, shafts, tunnels) but also via *discourses* and *collective memories*. How could we indeed reintegrate what is sensed into the common knowledge of a place? The author mobilises Deleuze's concept of *mode minor* in order to share with us a glimpse of a forgotten world. As Watts (2011) underlines, the *petro-landscape* becomes an instrument of control, surveillance and domination. In the second section, the author shows that the activity of wrapping and penetrating creates a new landscape of effusion that contaminates the "hosting" territory morally and environmentally. The contamination of the place is first *felt* by a world of invasive actions (creation of routes, new workers arriving in villages, etc.). Then, the contamination is felt by a second act, that of abandonment. "After taking what it is to take or installing what it is to install", the territory is left deracinated, with its skin (the ground surface) deformed. This voracious course of growth for profit leaves "a no-man's land." The article highlights the mere action of consumerism against Gaia in the context of a capitalist quest for profitability and criticises the dark dimension of heavy industry using ground as an exploitable product, eradicating all its aspects of cultural and affective definition. The very act of perforating and rapidly extracting reflects the neglect of petro-capitalism for the concept of place as a locality defined by the attachments that individuals develop there (Relph, 1976). The gigantism of the extractive industries is highlighted in the actual context of a dramatic environmental crisis¹⁷ by drawing attention to the formation of territories which are dismantled from their human structure. In the course of this, inhabitants struggle to name causes and reveal causal chains. The dispossession of "their" ground is followed by an orchestrated tendency to neutralise the territory's cultural emotional threads. By naming the Vaca Muerta territory as *desert* or *empty*, the media create an image of a place without any past and identity to conserve. Interviews and fieldwork succeed in opposing the feeling of fullness that villagers have with the vision of emptiness promoted by the industry, and in underlining the importance of resistance of an existing world fighting for its identity beyond the objectification and homogenisation of the environment.

- 14 Wide trails and truck routes are superimposed on a rich ecosystem that has grown through time via various social rhythms. The concept of time is here used to accentuate the perceptions of "invasion" and "expansion" (of the industry). The instantaneous time of digging is opposed to the *deep time* of formation of underground resources. The article questions the tools and the consequences of the petroleum industry in the era of energy transition. As the author underlines, the underground's deep time is a palimpsest of experiences and not a homogeneous and empty time. The author also draws on the concept of corporeality in order to construct the argument about the travelling of underground atmospheres. The body as a sensory receptor discovers new sonic, visual, odoriferous environments and testifies to the faintness provoked in human existence by a violently transformed soil, water and air, triggering several indicators of the presence of the hydrocarbon industry (such as light pollution during the night for instance). Etienne-Greenwood seeks to understand the conflict-laden relation between a regular – from above – vision infusing the integral territory and the stories of communities dealing with noise, vibration, pollution, uprooting. The paleness of the exposed, tired bodies of the militants unveils the invasive force of a new world penetrating sacred "barriers" of territories and human skin.

- 15 Trossat's article draws on the concept of uninhabitability of underground space, aiming to explore the limits of acceptance of what is *habitable* and what is *uninhabitable*. The concept of atmosphere is a pretext to question how uninhabitability is felt and negotiated by occupants of civil protection shelters in Geneva, space zero in the Gare du Nord and heating tunnels in Bucharest. By examining those three underground spaces, all occupied for a certain period of time, and today shuttered down or abandoned, the author searches to reveal how dialogue embodies atmospheres and conditions of uninhabitability. Scientific work in social sciences, architecture and natural sciences has long been preoccupied with the conditions of living places. Exploring uninhabitability is not only linked, for the author, to insalubrity, but also to less directly visible forces of uprootedness and isolation. How are we to measure uninhabitability? asks the author. Can we make every space habitable? By exploring the conditions of appropriation of the underground, the paper seeks to unveil the link between class and dispossession, and how the underground as a world of refuge is embodied. The article highlights the reasons for this withdrawal from the world above ground and examines how this detachment is sensed in the everyday life of people living in underground conditions as an inevitable reminder of institutional power. By mobilising Heidegger's work on the correlation between familiarity and the act of inhabiting, the author insists on the capacity of these unwelcoming spaces to weave threads of attachment through the sharing of emotions and a feeling of common destiny. The underground spaces in Bucharest, Brussels, Geneva offer the necessary space, albeit temporarily, for protection from the constraints of the world above (police) but underline the necessity of a minimum space for living. The author mobilises *atmospheres* to underline the new *heterotopias* and *no-right zones* that are created in these spaces and examines the forces of degradation through invisibility and detachment from the life above. The sense of closeness, extreme proximity, non-breathability, anxiety, interweaves with feelings of insecurity and instability in a hectic environment (fights, thefts, etc.). The body "imprisoned" in a highly codified and enclosed environment (such as being in a camp) with tacit and official rules struggles to go through life. The atmosphere conveys signs both for institutional powers and the population of the dispossessed. For the former, the underground continues within its historical symbolic charge as synonymous with decline, confinement, sickness and insurrection. For the latter, the underground reflects feelings of deterrence, repression and expulsion from the right to access the "real" city. The act of *going down* reminds the bodies of the violent reality of the capitalist world separating those *above* and those *below*. The modalities of establishment and governance of these spaces play a prominent role in the production of their atmospheres. The spaces described as uninhabitable invite us to wonder about the relationship between exclusionary powers and potential margins (in the city) for solidarity, liberty and foundational elements of a sense of community. If living underground for migrants of the space zero is a constant and violent reminder of their place in the group of the "unwanted," this same force of survival and adaptation in the uninhabitable sows the seeds of searching for escape, makes them liveable, and in this way they gain access to the whole city. *What does it mean to live in the world?* asks the author, concluding that living is an elusive condition, constantly menaced but also asserted.
- 16 In the third article, on China's coal mining plants, Nieuwenhuis examines the power of contemporary art to unveil the politics of subterranean atmospheres. How should we examine subsurface atmospheres from the position of an above-ground world? In order

to bypass this pitfall, the author proposes to look through the lens of political contemporary art to unearth the lived experience of mining underground spaces. The article draws a certain attention to the line separating the two worlds and the antitheses that this separation accentuates (dark/light, breathable/unbreathable, etc.). In a China of six million mining workers, living in the underworld is not an exception but the rule for numerous populations sustaining the capitalistic edifice of rapid growth and modernisation. The argument is constructed through three sections, each aiming to reverse the status quo's view of the underground and offer different readings of the geography of resistance. The aim is not to analyse and so objectify what is happening in these modern proletarian spaces of bodily labour. On the contrary, the author is interested in the nature and the modalities of the production of channels of communication of a *sensed* underground world. Miners' environments carry popular imaginations and social prejudices oscillating between the will to hide them and the will to explore and uncover them. This world apart is charged not only to supply the world above with coal, but also to satisfy the latter's desire to uncover what is considered lost in the geological time of evolution. Going "deep down" is also going "back then", while huge gateways of communication of the two worlds bring the past, present and future closer. The article makes a statement about subversive forces of coal mining exploitation and the power of the contestation of art. While discussing class race capitalism of the deep, art shakes and shocks feelings and perceptions about underground atmospheres. This discovery, that an underground world indeed exists, is momentarily unveiled by protests about working conditions or invasive infrastructure (such as pipelines), but also through an embodied materiality and specific atmosphere towards which art holds out its hand. However, the social representations of the miner's body are also constructed through history. Art itself, in certain eras, has raised the atmospheric moods of the underground,¹⁸ celebrating its political significance as a symbol of the struggle against colonial capitalism. However, the author quickly reminds us of the shift towards today's condition: "*miners, once celebrated workers, are now disposable commodities.*" The underground world's atmospheres are mediums of respect and admiration of a struggling heroic body. However, the regime's censorship leaves rare cracks for the underworld to be resurrected. Images of struggle and hope of the past give way to images of surrender and despair at the same time as the shiny, bulimic world above (the author refers to the ghost town Kangbashi in China) struggles to celebrate its success. The article seeks to give voice to a soundless world and alerts us poetically to the environmental and human cost of industrial colonialism: "*The miners are gone, what remains is the proletariat lung,*" the author observes. The eternal journeys of miners' bodies migrating horizontally and vertically fleshes out the barren reality of geographic and class social boundaries between development and degradation, inside world and outside world. The miner's body becomes itself the well of communication between the contemporaneous *Hades* for exploited workers and the political interests of the above-ground world. The skin of the miner's body, like the skin of the Earth, is compromised. The grades of porosity are negotiated through powerful representations of engaged cinema and painting.

Five themes for discussion

- 17 The three articles are woven around certain positions for a renewed approach to the subterranean realm, from the point of view of both the social sciences and political

ecology. Their value resides in the power to reinterpret contemporary ways of seeing the different and the unknown. Finally, we point to five themes that transcend all three papers and offer a common ground for further discussion beyond this special issue.

- 18 The first theme concerns the concept of **limit**. In geography, the concept of limit is often used with that of frontier to mark a separation and split the space into specific entities, parts that could be zones, territories or areas (Gadal & Jeansoulin, 2000). The delimitation of areas and zones through the use of lines was always a means of mastering space (Ingold, 2007). All three papers unfold the thickness and curvature of the line separating the surface from the underground. Authors question the porosity of the ground as an artefact but also highlight its value as an ecosystem in today's transition. The maxim "*Cuius est solum, eius est usque ad coelum et ad inferos*"¹⁹ cited by Morgan (2013) reveals that the question of who owns the subsurface has been a subject concerning land purchase and management for centuries. As Elden (2013) underlines, starting with the act of excavating and "going down," humans perceive the underground as another territory bounded and controlled by a certain kind of power. However, Elden argues that territory is a volume, not an area; such territory consequently involves all kind of expressions of processes and is not merely the outcomes of a spatial expression. Graham (2016,) in a long historiography of the city, recalls how identity politics are determined in terms of above and below (Graham, 2016). Boundaries are expanding but also under negotiation, and dominant forces continue to search for adequate tools of governance of a lawless and unmapped space (Admiraal & Cornaro, 2018). The numerous entanglements of functions in contemporary metropolises raise questions about property and appropriation of potential underground spaces open to the public. As Garrett et al. (2020) point out, the underground space, considered "boring" and left to the state's responsibility for necessary works, is becoming the next chapter of neoliberalism and stretches the implications of privatisation of the underground. The redefinition of physical boundaries below ground will raise new problems and renegotiate the gendered geographies of subterranean infrastructure (Joris, 2011). Through the years, knowledge, power and politics have been strongly linked to representations and visions of the surface via map-making, fencing (Cosgrove, 1998).
- 19 Atmospheres are also a **medium** for denouncing inequalities and highlighting oppressions, struggles and plural non-visible worlds. In Paul Virilio's work *Bunker Archaeology* (2008 [1975]), on dystopian structures, remnants of military spaces convey the culture of modernity. In the project *Paris ville invisible* (Latour & Hermant, 1998),²⁰ atmospheres of places are a strong medium of communication on unseen dynamics forging the metropolis. Most representations of the underground are technical, military, transport and industrial documents, and maps and models are necessary tools in creating and controlling underground spaces (Nystrom, 2016). Arts have flirted less with the subterranean but a solid corpus of bibliography has pointed out the relationship between representation and embodied experiences of human activity under the surface (Garrett, 2016). Underground atmospheres are presented as unexplored and mystical, triggering affect and convoking experiences that defy basic human functions (Melo Zurita, 2019).
- 20 On the other hand, the **act of descending**, going deep and invading the underground carries several symbolic and cultural significations that characterise underground atmospheres. Classified as a space of storage, as the leader of the Chinese revolution

once said: “dig tunnels deeply, store grain everywhere” cited by Meyers (1978), the underground is also considered a space where politically and economically driven power is exercised. In his book “The Rat People,” Saint-Paul (2016) addresses the obscure portrait of a Chinese workforce, urban migrants searching for a better future within China’s economic miracle but condemned to living underground in an extended network of deep tunnels and bomb shelters.

- 21 The underground emerges as a new **territory** and space of potential becoming. This subterranean territory can be represented, it symbolises an answer to the needs of dominant society’s cause, as in the case of the US Federal Civil Defense Administration’s documents, which tend to normalise life in nuclear bunkers (Masco, 2020). In our contemporary societies, these territories unfold new geographies of spatial injustice and urban poverty.²¹ Elden argues that “*Territories are bordered, divided and demarcated, but not understood in terms of height and depth*” (Elden, 2013).
- 22 In this special issue, all the articles invite exploration of underground atmospheres through the prism of powers exercised to bodies. Examining the inhabitability of the underground offers a terrain for discussion on modes of negotiation of hybrid urban spaces and reinforcement of housing inequalities. How can underground atmospheres contribute to the discussion of the right to housing and propose an emerging development of function and concept of public space? (Masco, 2020; Meiss & Radu, 2004). Unveiling the scars and the cracks of light of a distinct world below the earth’s surface, the articles show the tangibility and expandability of the underground in our everyday reality. By unravelling the knots of experience, the authors aim to bring to the fore the political thread of atmospheres, exploring the latter’s potential means of resistance. Lucy Osler and Thomas Szanto spot the political dimension of atmospheres in the fact that the latter can be created and can influence who experiences them (Osler & Szanto, 2021). They explain that “*political atmospheres occur at the ‘micro’ level, at events such as political rallies, meetings, or speeches.*” Albertsen (2016) asks “how does atmosphere relate to different conceptions of power?” and continues: “*critiquing atmospheric powers can generate political conflict.*” It is around this capacity of “disturbance” that Albertsen evokes that the following papers structure a problem in the ways with which atmospheres empower resistance.
- 23 Griffero (2021) has argued that beyond coming into being through natural perception, “*atmosphere is also sometimes filtered through the ideas and evaluations of the perceiver.*” Griffero explains the existence of an atmospheric “we-space” which extends beyond someone’s physical body and evolves around transactions between the self and others. Göbel (2020) shows, through the example of *resonanzraum* in Hamburg, that underground space can create stages of atmospheres with powerful cultural emissions linked to history, anti-conventional art movements and collective experience. As Schroer & Schmitt (2020) underline, the englobing characteristic of atmospheres arises out of a constellation of things and empowers the perceived quality of a specific situation. In the underground manufactured world of first mines and then transport infrastructure, a world working continuously to produce separates and distinguishes itself from the rhythms of the city (White, 2016). The segregation below ground continued the living patterns and social relations above ground. As Clark (2017) suggests, the subterranean can erase itself as the ultimate power source for all socio-political life in the context of the Anthropocene. The underground adds a layer in human collective action, offering an additional space of existence that escapes the

panoptic vision (the *omnivoyance* sketched by Virilio in 2002) of the dominant political matrix. The contradictory character of the underground as a space of refuge and space of repression ultimately brings it close to the binary characteristics of the above world, whose settlements, cities and housing repulse or embrace. Anderson (2009) draws on a series of opposites colouring the concept of atmospheres and is interested in the relations of tension. Switching between visibility and invisibility, underground space continues to wear its symbolic cloak of a space for potential questioning of dominant interpretations of geographical realities. A dialectic relationship with the world above, the juxtaposition of a necessary opacity of the underground against the myth of “transparent” hegemonic forces, offers new frames of reading the possible scenarios of socio-cultural evolution.

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NOTES

1. Such as Harvey Wiley Corbet, Paul Maymont, Colin Buchanan.
2. For instance subway constructions, coal mining.
3. See the exhibition “Providing Support: City, Architecture and Care” curated by SCAU and Cynthia Fleury, Pavillon de l’Arsenal, Paris, 2022.
4. See for example the typologies of sanatoriums, psychiatric clinics, hospitals.
5. See for example the AFTES (Association Française des Tunnels et de l’Espace Souterrain) Congress or the annual ITA-AITES World Tunnel Congress.
6. See for example the journal *Tunnelling and Underground Space Technology* but also the French journal *Tunnels et espace souterrain* (TES).

7. See for example the *macrolot* model in France.
 8. For example centrality, conversion, economy of means, mix of uses.
 9. See the case of cities such as Helsinki or Amsterdam.
 10. See for example the special issue “Les dessous de l’espace” of the journal *Géographie et cultures* <https://journals.openedition.org/gc/8847> in 2018, the research report “Ambiances sous la ville : une approche écologique des espaces publics souterrains” of the AAU-Cresson laboratory in 1997 or the research report “Espace et urbanisme souterrains : État des lieux et perspectives” by Sabine Barles and André Guillerme.
 11. For example passages, crossings, leisure.
 12. See for example illustrations of The Sphere Magazine (1900–1965) at The British Newspaper Archive, Underground junction of the Hudson and Manhattan Railroad (now PATH), 1909. [715×1073], the Picadilly Underground Station diagram by Macpherson, pre-1940, the diagrams of Paul Maymont for his project ‘Paris Sous Seine’.
 13. See the case of the city of Helsinki.
 14. For instance refuge, invisibility, enclosure, suffocation, darkness, isolation.
 15. For example lights in the night, smell, noise.
 16. See Schroer & Schmitt, 2017; Edensor & Sumartojo, 2015; Galland-Szymkowiak & Labbe, 2019.
 17. See the Intergovernmental Panel for Climate Change (IPPC) Report 2022.
 18. See for example the song “Which Side Are You On?” (1931), by activist Florence Reece, wife of Sam Reece, a union organizer for the United Mine Workers, or the 1984 documentary with the same title by Ken Loach.
 19. Meaning *he who owns the soil owns also up to the heavens and down to the centre of the earth*.
 20. Bruno Latour (sociologist and philosopher) and Emilie Hermant (clinical psychologist, writer and photographer).
 21. See for example the underground residents of Tokyo in “A Million People Live in These Underground Nuclear Bunkers.” *Photography*, 16 Feb. 2017
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