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Edited by Michael E. Leary-Owhin  
and John P. McCarthy

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and Lukács, demonstrating that air conditioning both flows from and enhances capital's more general processes of abstraction and fragmentation. Locating contemporary air conditioning within the factory and city, I draw out the struggles over the production of air, with examples from factories and urban air-rights projects. This takes us through to contradictory air, which is where, in Lefebvrian fashion, I leave the analysis.

## An architectronics of space

Lefebvre's theorisations of space have been profoundly influential across—and controversial in—a range of disciplines. What has not yet been considered, however, is that which must fill space for it to be habitable by life: air. Indeed, in his writings on space Lefebvre makes only a few specific mentions of air, and he never addresses air as a unique element of space. He generally only writes of it in a series of other natural elements and components like land and water. Indeed, this is how air is traditionally conceived of in both political economy and critiques of political economy (see the chapter by Lopes de Souza in Part 5). Thus, Marx (1967b: 745) considered air to be primarily a 'free gift of Nature'. Lefebvre (1991: 329), with a century on Marx, can recognise that air is no unproblematic gift:

Those commodities which were formerly abundant because they occurred 'naturally', which had no value because they were not products, have now become rare, and so acquired value. They have now to be produced, and consequently that come to have not only a use value but also an exchange value. Such commodities are 'elemental' – not least in the sense that they are indeed 'elements'. In the most modern urban planning, using the most highly perfected technological applications, *everything* is produced: air, light, water – even the land itself.

Lefebvre's architectronics provide us with a methodology for uncovering just how it is that air is produced and the process by which it has come to be produced. Architectronics is a methodology intended 'to describe, analyse, and explain' the manner in and by which 'the preconditions of social space have their own particular way of enduring and remaining actual within that space' (229). Things have a way of remaining in space; 'In space', that is, 'nothing ever disappears – no point, no place' (212). The idea is that social relations remain etched in space throughout time, although to different extents. But this lasting presence means that we can uncover the history – and the present – of the production of space, with an eye toward the future. Lefebvre often uses the word 'deciphering' to describe the analysis of space that is architectronics. This is a transdisciplinary endeavour that 'embraces and seeks to reassemble elements dispersed by the specialized and partial disciplines of ethnology, ethnography, human geography, anthropology, prehistory and history, sociology, and so on' (299).

The four key analytical headings for Lefebvre's architectronics of space in *The Production of Space* are absolute space, abstract space, contradictory space, and differential space. Importantly, absolute space is not equal natural space. While absolute space can *appear* as natural space, it is precisely that space which has first been reconceptualised and transformed by human labour, in particular its origins are 'fragment[s] of agro-pastoral space, a set of places named and exploited by peasants, or by nomadic and semi-nomadic pastoralists' (Lefebvre 1991: 234). Absolute space is a lived space wherein the concept of representational space reigns. It is, as such a space of the inhabitant, the dweller who makes the space through their own use; spaces as they are directly lived in everyday life. As such, absolute space is not so much about epistemology or the realm of the Symbolic and is more ontological.

The move toward abstract space is concomitant with the rise of private property, which allows space to be striated and owned. Absolute space was abstracted through the process of entering into the realm of signification, as spaces were governed just as much by bodies and labour as by legal codes and tax regimens. The town's overthrow of the country as the motor of social and economic growth is crucial in this transition, what Lefebvre labels as the first spiral of abstraction, in which the logic of exchange value through mercantilism comes to dominate. A second spiral of abstractions comes later by way of the consolidation of towns into an overarching state formation. With the second spiral of abstraction the logic of capital, and not merely the merchant, is stabilised. Space becomes an exchange value, not a use value.

The capitalist logics of abstraction seek to make space a blank slate upon which the agents of capital – merchants, industrialists, financiers, real estate agents, corporate executives – can inscribe their plans and desires. It seeks to order space, thereby subjecting it to the 'rationality' of the market. It is, however, 'not homogenous; it simply *has* homogeneity as its goal, its orientation, its "lens"' (287). Here we reach what I take to be a key principle of Lefebvre's pedagogy: use and use value endlessly persists and resists. Capital is never able to completely subject space to its demands because its internal antagonist, labour, cannot help but meddle in its plans, making space for itself and its social relations. Thus, the abstract space of capital sits beside and in fact depends on the contradictory space of labour in the same way that abstract labour sits beside and depends on concrete labour. They sit together in a contradictory unity.

A productive way to think about this contradictory unity concerns the use value and the exchange value of space. The use value of a commodity is its socially determined utility, the fact that it fulfils some need or want, some singularity, whereas the exchange value of a commodity is a quantitative relation of the commodity to other commodities. That which makes commodities exchangeable is the human labour that produces them, and this is also what makes commodities possess a use value and not merely a value or a use. In order for something to have a use value it must be exchangeable, must be the product of human labour, and in order for it to have an exchange value it has to have some utility. No one exchanges useless things. There is a unity, but each are opposed to the other, for neither can be realised at the same time; one cannot use and sell a commodity at the same time. Capital cares only for exchange value – and thus for abstraction – whereas labour cares only for use value – and thus for singularity, for difference. Once space is understood as a product of labour, then it too becomes the subject of this antagonism. Thus, capital's abstract space is not a mere *perspective* on space, it is actually a *mode of producing and realising* space, a mode inclined to commodify space. Lefebvre gives a clear example of this tendency and the ways in which space can be abstract and contradictory:

When an urban square serving as a meeting-place isolated from traffic... is transformed into an intersection... or abandoned as a place to meet... city life is subtly but profoundly changed, sacrificed to that abstract space where cars circulate like so many atomic particles. (Lefebvre 1991: 312)

And yet even when cars circulate in an atomised and individualistic fashion, we find ways to engage with each other, to communicate and engage in a type of social intercourse.

Lefebvre is clear that whether a space is abstract or contradictory hinges upon its relationship with the mode of production and its position relative to the class struggle. As he puts it quite bluntly early on in the book, 'the class struggle is inscribed in space. Indeed, it is that struggle alone which prevents abstract space from taking over the whole planet and papering over all differences' (55). Here, we arrive at the final index of architectonics: differential space. This is the project toward which Lefebvre's book, and one might say, his life, was oriented: 'the



project of a different society, a different mode of production, where social practice would be governed by different conceptual determinations' (419). Whereas abstract and contradictory space are locked in a relation of the unity of opposites, differential space is freed from this particular unity; it is not just use value against exchange value, but *use without any value whatsoever*. The logics of differential space are governed neither by production nor by consumption, but rather by enjoyment. Differential space is that which breaks us out of the triple dialectic of absolute, abstract, and contradictory space. As Lefebvre (2013) insists in *Rhythmanalysis*, in one of his typically counterintuitive moves, the dialectic is always triadic. The dialectic contains not only the thesis and antithesis, but also the synthesis, and the last term is not the passive product of the first two. Instead, it reacts back on both the thesis and antithesis. The struggle on this reading, then, is to harness contradictory space in order to break through into a new mode of production, a new set of social relations and conceptual determinations, that are proper to differential space: pure use, pure enjoyment. We might also put it like this in a more classic Marxist formulation: Contradictory space arises when the working class becomes as a class *in itself*, and the class struggle produces differential space when it, organised as a class *for itself*, accomplishes its self-abolition.

### An architectronics of air

If we want to take up residence in contradictory space, mobilise the spatialised class struggle to inaugurate something radically new, an event that is congealed into a new set of relations, then we have to engage in an architectronics of air, as that which fills space and makes it inhabitable. This is not only strategically useful, as this chapter's introduction intimates, it is also an increasingly dire task. In December 2016, what is popularly referred to as an *airpocalypse* began in northern China, forcing those residents with the means to flee, and everyone else to remain indoors or, if they dare venture outside, to don a mask. Flights were grounded and classes were cancelled. Less dramatic (and sensationalised) realities of air pollution abound throughout the world, with many urban centres having smog indexes that are featured on regular weather reports and dictate movements across and through space.

Architectronics begins in the present, so I will start here, where I sit in my office in an academic building dedicated in 1938. At the highest level of abstraction, I am enclosed in an interior. This is the basic state of being. Thus, Heidegger, on whom Lefebvre relies quite heavily, missed the mark when he focused in solely on the question of *being*, for, as Sloterdijk (2011) shows, being is always a *being-in*. Sloterdijk's spheres project is an investigation into the fact that we are always contained in various types of enclosures:

for humans, being-in-spheres constitutes the basic relationship—admittedly, one that is infringed upon from the start by the non-interior world, and must perpetually assert itself against the provocation of the outside, restore itself and increase. In this sense, spheres are by definition also morpho-immunological constructs. Only in immune structures that form interiors can humans continue their generational processes and advance their individuations.

(46)

We are always contained within something, and we are constantly constructing interiors in which to contain ourselves and others. This is the primal situation, one that begins in the most intimate of spheres: the womb. In the uterine sphere one resides with one's mother and one's double, or placenta. When one is born and 'the cord is cut', one leaves this bubble and enters into a larger sphere, or series of spheres: hospitals, nurseries, houses, schools, and so on.

Interiors raise not only architectural questions but also questions of the atmosphere, for air is that which fills and determines the viability and enjoyability of enclosures. Being only takes place, after all, within a quite slim range of temperatures. Not only do we seek out the best microclimates, but we also construct these microclimates. The hut is a simple interior that transforms a landscape in order to produce more viable and enjoyable microclimates. As architect Lisa Heschong (1979: 8) notes: 'As soon as a simple square hut is built, at least six new microclimates are created'. There is (in the Northern Hemisphere) 'the south side warmed by a sunny wall, the north side in shade... an east side with its morning sun and perhaps protected from the prevailing breeze, and a west side warmed in the afternoon but buffeted by the wind' (8). Finally, we have 'the inside with its shelter from the rain and wind and sun, and the roof, raised above ground level, more exposed to wind and sun'. Heschong's insights are important for my purposes here because they demonstrate that the conditioning and production of the air is not a recent phenomenon, something that Sloterdijk's analysis gets wrong (he locates the beginning of air conditioning in 1915).

The hut is a part of the absolute space, a natural landscape transformed through human labour for the purposes of lived life. A manufactured and controlled fire provides another example, as humans transform wood into smoke, heating the air in the process (and polluting it, too). The lit fire helps us fulfil basic needs, allows us to cook food and escape the cold. But it also has social and affective functions. As a microclimate, it produces a totalising atmosphere that touches all of our senses: 'a flickering and glowing light, ever moving, ever changing. It crackles and hisses and fills the room with the smells of smoke and wood and perhaps even food. It penetrates us with its warmth' (Heschong 1979: 29). Our consciousness, too, comes alive, and 'memory and an awareness of time, are also bought into play, focused on the one experience of the fire'.

That which births the space of the abstract from the absolute is private property. As Lefebvre (1991: 252) notes, 'Once unshackled, the principle of private property did not remain sterile: rather, it gave birth to a space'. The abstraction of air likewise hinges on its production for the purposes of exchange rather than use. This is, in fact, the origins of our modern air conditioning technologies and apparatuses. Rather than in human comfort (use), they began for the purposes of production (exchange). In 1902 there were two air conditioning installations in New York City, one for the New York Stock Exchange and another for the Sackett-Wilhelms Lithographic Company in nearby Brooklyn. While the former was meant to increase economic productivity by cooling stockbrokers, the latter was designed with only materials in mind. The printing company contracted Buffalo Forge (which would later be the Carrier Corporation) to develop humidity controls to help level out fluctuations that occurred during the printing process. At the time, colour publications were produced by running the same paper through different printers successively (once through for black, another for red, etc.). As the humidity would fluctuate, the paper would expand or contract, misaligning the ink. This would then result in 'poor quality, scrap waste and lost production days' (Schultz 2012: 4). Similar systems were soon installed in factories producing all sorts of hygroscopic commodities such as cotton, candy, pharmaceuticals, film, macaroni, tobacco, bread, and munitions. Government contracts for engineering air conditioning systems in the production of weapons, ammunition, and gunpowder were critical for helping the still-nascent industry survive through World War I and the Great Depression. The abstraction of the air amounts to its reification, its domination by the law of value, and capital's drive to decrease socially-necessary labour time. Only through such an analysis can we truly see how air becomes not just an ancillary material, but an actual commodity, which will help us prepare for the investigation of the production of contradictory air.

As mentioned, use value and exchange value exist in a dialectical tension. What we have not yet covered, however, concerns that which makes different singular commodities exchangeable, which is the labour power embedded within them. The value of the commodity is thus determined by 'The labour-time socially necessary... to produce an article under the normal conditions of production, and with the average degree of skill and intensity prevalent at the time' (Marx 1967a: 47). In other words, even if two factories produce commodity  $x$  in different quantities of time, each of the total number of  $x$  commodity would contain the same value. The value of commodity  $x$ , however, will not be constant over time, for socially-necessary labour time;

is determined by various circumstances, amongst others, by the average amount of skill of the workmen, the state of science, and the degree of its practical application, the social organisation of production, the extent and capabilities of the means of production, and by physical conditions.

(47)

We could certainly add in air conditions and air conditioning technologies as determining factors, particularly for hygroscopic industries. Yet socially-necessary labour time is also determined through the operation of the coercive laws of capitalist competition:

The rule, that the labour-time expended on a commodity should not exceed that which is socially necessary for its production, appears... to be established by the mere effect of competition; since, to express ourselves superficially, each single producer is obliged to sell his commodity at its market price.

(327)

If factory  $a$  produces commodity  $x$  at a rate above the given socially-necessary labour time, then that factory will sell commodity  $x$  below its value, and the factory will either conform to the socially necessary labour time or will be shuttered. In this manner, if one film producer, say, Kodak, installed a process air conditioning system, it would, through the coercive laws of capitalist competition, compel other film producers to follow suit. This tendency was more than amenable to the burgeoning air conditioning industry for two reasons. First, it obviously increased their sales. Second, and relatedly, it would standardise the installations. As Gail Cooper (1997: 48, 44) observes, 'If, for instance, all rayon plants adopted the same process, they would present the same engineering problems', and this 'standardization within the industry [served] to make the heavy initial investment in engineering work pay off in subsequent installations'. The logic of standardisation was at work at the level of the air conditioning industries and their clients in amalgamated and individual factories. It was also, however, at work at the level of the individual worker's body. This is what brings us to the contradictory air of the modern industrial factory.

For Lukács, the commodity form and its accompanying fetishism structure the way that people under capitalism understand and experience themselves, others, and the world. For Lukács (1971, p. 83), this is why Marx begins volume one of *Capital* with the chapter on commodities, for the commodity is 'the central, structural problem of capitalist society in all its aspects'. In essence, Lukács' concept of reification is commodity fetishism—the notion that through the commodity social relations are present as relations between objects—extended throughout the totality of capitalism. This generalisation has two implications that negatively impact society and workers, and both have to do with abstraction. First, the object of production is fragmented in time and space; production processes are divided up and extended across the entirety of the



globe. Second, the subject of the production process is abstracted by the developmental logic of capital, wherein 'human qualities and idiosyncrasies in the worker appear increasingly as mere sources of error when contrasted with these abstract special laws functioning according to rational predictions' (89). The working body has to conform to the individual machine and the totality of capitalist relations, including the coercive laws of competition and the law of value. The worker's entire being and sense is abstracted: the principle of rational mechanisation and calculability must embrace every aspect of life.

Air conditioning both flowed from and accelerated the abstraction inherent in reification. It standardised factories and industries and, most significantly, it introduced the atmosphere as an ontological category that could be subjected to the principles of mechanisation, standardisation, and calculability. Most notable in this regard was the formulation and, in 1911, publication of Willis Carrier's paper, 'Rational psychometric formulae'. The paper provided a theoretical discussion of the mechanical control of atmospheric temperature and moisture and, most importantly, proposed a chart that correlated temperature and humidity, a version of which is still in use today. Each industrial process had unique atmospheric requirements, as did the different stages of each process. Thus, Carrier's 'Mechanical Weather Man' – the company's animated persona – promised manufacturers that the corporation could make 'every day a good day' (Schultz, 2012: 34).

The abstract air conditions of modern industrial capitalism also worked on the worker, who in turn entered into the struggle over *who* would control the air and for what purposes. Cooper (1997: 45) presents us with compelling examples of this struggle as it unfolded in everyday practices of cotton workers and managers via the battlefield of the window:

While closing windows could increase humidity within certain limits, that increase was almost always achieved at the expense of ventilation and personal comfort. Because of the conflict between the needs of production and the conditions of comfort, the manner in which workers chose to regulate the windows under their immediate control was not easy to predict. Those who were paid by piecework rates might decide to keep the windows closed in warm weather to preserve high humidity levels and increase their productivity despite the personal discomfort, or they might sacrifice wages for better working conditions.

While air conditioning engineers and advertisers promised their clients the ability to not only increase but better predict and calculate their production, workers pushed back, exerting their agency to undermine and disrupt the abstraction of their workplace air.

The battle between abstract and contradictory air plays out in the urban through air-rights projects. David Gissen, for example, analyses the Washington Bridge Extension Complex, five buildings hovering over the Trans-Manhattan Expressway in New York City. Air-rights refers to the ability to build over roadways, something that became more attractive as the density of urban development increased in the mid-20th century. Literature studying air-rights development 'suggests emerging links between risk analysis, cost-benefit analysis, and other forms of technocratic engagements' (Gissen 2014: 39). The Bridge Apartments capitalised on the polluted air and carbon dioxide emissions generated from the thousands of cars passing underneath it in its (purported) ability to seal and completely condition the interior using aluminium as a skin, which was thought of as both resistant to the invasion of pollutants and easily cleaned of them.

Many of the initial technologies proposed to help create an interior condition divorced from the exterior were scrapped due to budget costs, including 'a cap over the highway, an integrated

ventilation system for the buildings' interiors and park spaces, and an air-conditioning system for the buildings' (49). Ultimately, the Bridge Apartments were unable to produce this kind of interior space, leading to rent strikes, a USA Environmental Protection Agency study, numerous lawsuits and litigations. Ultimately, the urban planners here transformed the air into 'a form that might be captured and isolated within a city' (65). This air was 'both an objectified thing that could be traded... and a substance that could be transfigured into something more inhabitable' (65). The former represents the abstraction of air and the latter the contradictions of commodified air.

## Conclusions

Lefebvre never does tell us what a true differential space looks like. This, I proffer, is for the simple reason that he could not. It's not that he didn't have the intellectual proclivities to do so, but rather that he could not answer a question theoretically that could only be worked out through the practice of class struggle. What Lefebvre does give us, however, is a spatial methodology and a historical and social excavation of our present spatial configurations so that we can know that space is never just as it appears. Indeed, this is the trick of representations of space of which we must always be cautious: they 'confuse matters precisely because they offer an already clarified picture' (Lefebvre, 1991: 188–9). In a similar vein, I cannot offer up what differential air feels like, how it circulates through blood or carries affective dispositions between subjects and bodies. What I have done in this chapter, however, is to introduce air and the production of atmospheres into our understandings of planetary urbanisation and the production of 'nature'.

Air is not only produced through capitalist industrialisation. Indeed, the most basic and primal conditions of the human *being* require the creation of microclimates and aerial containers, and the innovation of thermal strategies. This is crucial to understand so that we do not construct a false history of a moment of natural, unadulterated air to which we can return or which we can reconstruct. At the same time, however, it is just as crucial that we grasp exactly how thoroughly capitalist industrial modernisation has conditioned our air in particular ways, and just how air has properly become a commodity, with all of the fragmentation and reification that commodification implies. This commodification has always been met with resistance. The perpetual expression of resistance is, I suggest, one of the main threads that runs throughout Lefebvre's entire body of thought. And resistance is not an abstract concept or a romanticised idea, but springs forth from our desire for use value as against exchange value. As Lefebvre (1996: 170) put it, 'use and use value resist irreducibly'. The task at hand is to utilise this atmospheric resistance as a weapon in the struggle against the domination of space and for a real appropriative movement.

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