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Super-tall and ultra-deep:
The cultural politics of the elevator

An essay to be published in Theory, Culture and Society

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Abstract

Entire libraries can be filled with volumes exploring the cultures, politics and geographies of the largely (+ITALLIC) *horizontal* (-ITALLIC) mobilities and transportation infrastructures that are intrinsic to urban modernity (highways, railways, subways, public transit and so on). And yet the recent 'mobilities turn' has almost completely neglected the cultural geographies and politics of +ITALLIC vertical - ITALLIC transportation within and between the buildings of vertically-structured cityscapes. Attempting to rectify this neglect, this paper seeks, first, to bring elevator travel centrally into discussions about the cultural politics of urban space, and, second, to connect elevator urbanism to the even more neglected worlds of elevator-based descent in ultra-deep mining. The paper addresses, in turn: the historical emergence of elevator urbanism; the cultural significance of the elevator as spectacle; the global 'race' in elevator speed; shifts towards the 'splintering' of elevator experiences; experiments with new mobility systems which blend elevators and automobiles; problems of vertical abandonment; and, finally, the neglected vertical politics of elevator-based 'ultra-deep' mining.

Keywords

Elevator

Verticality

Mining

Urbanism

politics

Introduction: 'Reworking The Innards of 'Up'

Looming high above the Japanese city of Fuchu, a dense suburb twenty kilometers to the west of central Tokyo, a 213meter building dominates the low suburban skyline. Seemingly too thin to be of any commercial use, the 'GI Tower' sits, surrounded by a glade of trees, rather incongruously, at the heart of a huge research campus of the giant Hitachi corporation.

Opened in 2010, the purpose of the tower is not to whisk affluent urbanites above the smog, noise and traffic. Nor is it some material embodiment of hubris and ego in the material 'race' upward that is so evident in the global spread of super-tall skyscrapers. It is, rather, a vertical test-track: the world's highest elevator research tower, a living testament to the central role of Japanese engineers in, as Ryan Sayre (n.d) so pithily puts it, "technologically reworking the innards of 'up'."

Tasked with developing ultra high-capacity and ultra high-speed elevators now demanded by the world's vertically-sprawling megacities, the tower -- the world's tallest lift research structure -- is basically a series of lift shafts unadorned with surrounding residential or commercial space. It is a perfect monument to the skyward reach of the world's cities and, more particularly, to the crucial but often ignored roles of new vertical transportation technologies in facilitating this reach. Hitachi are using the \$61million tower to design and develop a new generation of elevators that will be like the Shinkansen of the urban skies: super-fast, high-capacity elevators that will exceed one kilometer a minute in speed. "If you worked at the Hitachi GI Tower," gushes Meghan Young of the TrendHunter blog in 2010, "I'm sure

one day will be enough to satisfy your need for speed. Roller coasters? Easy as pie. A formula 1 race car ride? You could do it sleeping. The world's fastest elevator? Now that's a ride!"

Hitachi, like other big elevator manufacturers, are also using the tower to design a whole new array of high-tech elevators technologies. There are new design, power and materials technologies to design lighter, smaller lift shafts and elevator cars; double decker lift cars (in effect, elevators stacked one on top of the other); 'destination dispatch' elevators which assess the preferred destinations of potential riders in advance of their entering the elevator and use algorithms to assign them to specific cars to reduce overall movement; and even pressurisation systems that automatically compensate riders' ears for the reducing pressure of ascent.

The first of these is especially important as 'super-tall' skyscrapers of over 100 storeys proliferate across the world because elevator shafts consume a higher proportion of overall space as the floor-plate of buildings reduce in size as they reach greater heights (from 7% to 20% as towers shift from 70 to 100 storeys, for example; see Simmen, 2009; 17).

The weight of steel ropes and lifting systems, meanwhile, has limited vertical ascents to around 500 meters in one go. Elevators have thus "become the bottleneck of the super high-rise building," Johannes de Jong, of the Kone elevator company, points out to *Business Week* in 2013 (quoted in Catts, 2013). Echoing the long co-evolution of skyscraper and mine elevators, Kone's 350 meter research elevators, built to research the same challenges as Hitachi's tower, are placed in a disused mine in the Helsinki suburb of Lohja. Capturing this coevolution perfectly, the shaft is called the 'High Rise Laboratory.'

Kone executives are especially hopeful that their new carbon-fibre rope technology, which they claim is the 'holy grail' in skyscraper engineering, will allow elevators to safely ascend 1000 meters in one go (double the current limit). This would allow the widespread construction of skyscrapers way beyond 1 km tall. "Today most engineers will tell you that the limit of vertical

height in buildings has more to do with the steel cable in elevator shafts than any other factor” (Rosen, 2013).

Startlingly, beyond a few technical articles in the trade presses of the ‘vertical transportation’ industry (see Strakoshe and Corporale, 2010), structures like the GI tower, and the elevators that they shape, remain almost invisible within social scientific debates on cities and urbanism. Similarly, beyond its appearance within certain genres of cinematic film, and periods when elevators were carefully designed as ornamental spaces in their own right, elevator urbanism has received little of the wider poetic celebration of, say, airplane urbanism, auto-urbanism, or railroad urbanism. “While anthems have been written to jet travel, locomotives, and the lure of the open road, the poetry of vertical transportation is scant” (Paumgarten, 2008).

Entire libraries can be filled with volumes exploring the cultures, politics and geographies of the largely *horizontal* mobilities and transportation infrastructures that are intrinsic to urban modernity (highways, railways, subways, public transit and so on). Indeed, a highly important ‘mobilities turn,’ linked closely to the cultural analysis of speed (Virilio, 2006), has been underway in the last two decades within the social sciences aimed at excavating the cultural politics of such embodied flows within contemporary societies (see Urry, 2007). By contrast, the cultural geographies and politics of *vertical* transportation within and between the buildings of vertically-structured cityscapes have been largely ignored by social scientists and humanities scholars (although see Cwerner (2006) on elite helicopter verticalities). The social scientific literature on lifts, elevators and vertical people movers thus remains both minuscule and esoteric (see Goetz, 2003; Simmen, 2009).

Beyond some work indirectly discussing the crucial roles of elevators in the emergence of skyscrapers (Gottman, 1966), or in modernist housing programmes (Jacobs, and Cairns, 2013), I am aware of not a single academic paper explicitly addressing the detailed geographies of elevators within my own particular sub-discipline of urban geography – an academic discourse that, one would have thought, might have a great deal to say on the subject.

(It is paradoxical, indeed, that the world's geographers gather in their thousands every year in a major corporate hotel in a US city for the American Association of Geographers conference. During this they perform complex vertical choreographies using elevators to move between multiple sessions on 'mobilities', 'time-space compression', 'logistical urbanism', 'transport geographies' and so on, where the ubiquitous and crucial power of this taken-for-granted device remains utterly absent).

This particular neglect, no doubt, is one legacy of the largely flat constructions of geographic space in geography that has come with a widespread reliance on the 'Bird's Eye' views of the cartographic gaze that Eyal Weizman diagnosed in his critique of conventionally 'flat' geopolitical discourses (see Weizman, 2002).

Reflecting its own origins in the traditions of top-down cartography, the sub discipline of transport geography, too, has tended to treat cities and regions merely as flat surfaces rather than volumes. As part of a broader 'vertical turn' in urban studies (see Graham and Hewitt, 2013), however, transport geographers and planners are finally starting to realise that the politics of accessibility in vertically-stacked and vertically-sprawling cities, laced together by assemblages combining multiple vertical and horizontal transportation systems, requires urgent attention. "The comprehension of the very nature and complexity of spatial and functional relationships between these spaces," write Jean Claude Thill (2011; 405) and colleagues, "framed by the indoor and outdoor infrastructures supporting human movement (hallways, elevator shafts, walkways, and others) is enhanced once it is recognized that the city is not flat." Some residents in that most verticalised of contemporary cities – Hong Kong – now apparently travel almost as far vertically using elevators as they do horizontally by foot, bus or subway.

All of this means that the elevator, I would argue, needs to be brought centrally into social scientific discussions of the cultural politics of urban space. With this in mind, what follows is an attempt to offer a preliminary cultural politics of elevator urbanism. As an attempt to encourage a critical social science of elevator urbanism, my discussions are deliberately very

broad in scope. (For example, they connects elevator urbanism to the even more neglected worlds of ultra-deep subterranean mining using new elevator systems). The paper discusses, in turn: the historical emergence of elevator urbanism; the cultural significance of the elevator as spectacle; the global 'race' in elevator speed; shifts towards the 'splintering' of elevator experiences; experiments with new mobility systems which blend elevators and automobiles; problems of vertical abandonment; and, finally, the neglected politics of elevators which, rather than ascending upwards within buildings, descend deep into the earth to sustain 'ultra-deep' mining.

The 'Colonisation of the Up'

"The elevator is a special prop for the imagination... [But] of all the imaginings associated with the elevator [in film, futurism and science fiction], one extreme vision has already become reality. Elevators, as the 'germs' or technological imperatives that can determine a skyscraper's height and footprint, have travelled through urban fields with the speed of an epidemic, making, in less than half a century, cities grow in block after block of towers" (Simmen, 2009; 18).

The elevator has a history of at least 2,000 years: Rome's Colosseum even had a system of 12 winch-powered elevators operated by slaves to lift wild animals and gladiators straight into the bloody action of the arena. Without a means of drawing power from more than human muscle, however, such systems were inevitably highly limited.

It was Elisha Otis' invention of a safe, automatically-braking elevator in Yonkers, New York, in the 1850s that created a technology for the vertical movement of people as well as goods that has been central to the rapid colonization of vertical space through urban growth. (However,, as Andreas Bernard (2014) demonstrates, the origins of the elevator are complex and multifaceted; Otis merely added the crucial innovation safe breaking to well-established hoisting systems.

¹ This phrase is drawn from Sayre (n.d).

“This small innovation,” writes Ryan Sayre (n.d.), “opened an entirely new kind of space; a space we might call the ‘up’.” ‘Up’ had of course always existed,” he writes, “but not until the late 19th century had it become a place to work and live. Up as a habitable territory had to be made, sometimes forcefully but always without precedent.”

When combined with electric or hydraulic power and cable drum innovations adopted from the mining industry -- of which more, later -- safely-braked or ‘safety’ elevators released cities from the millennia-old constraints created by the human ascent of stairs; the overcoming of gravity for the movement upward of human inhabitants was able to match the overcoming of gravity through innovations in skyscraper construction. By 1916, the Woolworth Building in Manhattan – the world’s highest ‘skyscraper’ at the time – boasted 29 elevators that ascended at 3.5 meters per second to an altitude of 207 meters (Simmen, 2009, 20).

Faster, bigger and more reliable elevators have been fundamental to the skyward shift in architecture and engineering ever since. Hitachi’s research elevators are now running at speeds that are three hundred times as fast as those in New York a hundred years ago. Whilst geographers talk widely of a ‘time-space compression’ (Harvey, 1989) effect caused by the widespread diffusion of new transport and communications technologies over the past century and a half – telegraphs, telephones, the internet, air travel, global shipping, automobiles and railways -- a similar, albeit neglected, effect of vertical time-space compression has occurred through the dramatic speeding up of elevator cars.

Elevators also played less obvious roles in the iconic growth upwards of the skyscrapers of corporate America – especially Chicago and New York -- during the late nineteenth and early twentieth centuries. Social historian of technology lthiel de Sola Pool (1977) stressed that the history of the skyscraper has, in fact, been inseparable from the history of both the elevator – which allowed ingress and egress of required office workers – and of the horizontally-stretched networks of electronic communication (telegraphs and then telephones) – that allowed those people both to

commute to work and to attempt to exercise control at a distance over dispersed sites once there. Without telephones to allow the central power of the modern metropolis to concentrate and pile high into the sky, so many lift shafts would have been necessary to carry the multitudes of messenger-boy to the destination of the message (factories, warehouses, shipping centres and the like), that there would have been far too little office space left for the buildings to be viable.

Elevator travel has long been a central component of cultural notions of urban modernity. This relationship is complex, however. In one sense, the experience of being crammed in a box with strangers moving rapidly upward, pulled by a suite of hidden motors and cables, can induce powerful, almost primeval anxieties. Indeed, psychologists recognise fear of elevators as a serious and widespread phobias. Such anxieties are rapidly compounded with unexpected delay and malfunctions -- hence the introduction of 'elevator music' in 1928. The shift away from staffed elevators to automated ones added to the sense of desocialised vulnerability and was paralleled by a shift from ornate to utilitarian styles of design of elevator interiors (Hall, 2003).

Elevators are by far the safest form of powered transport: only 61 people dying within them in the US whilst at work between 1992-2001 (Wilk, 2006). However, the becalmed normality and hushed voices of habitual vertical ascent merges into the purest horror with the prospect of being trapped completely, the (extraordinarily rare) breakage of a cable or, rarer still, the collapse of the overall building. (In the World Trade Centre disaster in September, 2001, when an estimated 200 people died in elevators in free-falls, smoke, fire or eventual structural collapse, "the elevator shafts [] center became chimneys of accelerating the fire" (Simmen, 2009; 24).

More prosaically -- as we shall see later -- unreliable, vandalised and poorly-maintained elevators have long been the Achilles heel of modernist dreams of mass social housing housed in vertical towers, especially in North American and European cities. Without functioning elevators, these Corbusian blocks, rather than emancipating 'machines for living' or modern

spaces projected into the light and air of vertical space, quickly reduce to dystopian nightmares of extreme isolation and enforced withdrawal, especially for those with children or the less mobile. J.G. Ballard's (1975) novel 'High Rise' is a superb evocation of such a breakdown.

"The elevator is an utterly essential technology for high-rise housing." (Jacobs and Cairns, 2013; 84). Recognising this, the better managers of mass vertical housing systems – such as the Singaporean Housing Development Board – maintain an emergency 24 hour response team to allay residents' concerns about vertical isolation caused by elevator failure.

Vertical (Post)Modernities

"This small room, so commonplace and so compressed... this elevator contains them all: space, time, cause, motion, magnitude, class" (Coover, 1969; 4; cited in Garfinkel, 2003; 173).

Elevator ascent, surrounded as it is by primeval anxieties, is also profoundly modern. It has been likened to a rather banal form of vertical teleportation. "Unlike ship, air or rail travel", Jeannot Simmen argues, it "does not entail journeying from place to place and offers nothing to see. Instead of passage over time, the relevant parameter is the time wasted while ascending" (Simmen, 2009; 28).

And yet the elevator remains extraordinary: Human enclosure within them is a fascinating exercise in urban anthropology. As density increases, so imperceptible adjustments are made by inhabitants as to their location, demeanor, and eye position. This maximizes personal space and minimizes the risk on unwanted intimacy. "Passengers seem to know instinctively how to arrange themselves in an elevator," writes Nick Paumgarten (2008):

"Two strangers will gravitate to the back corners, a third will stand by the door, at an isosceles remove, until a fourth comes in, at which point passengers three and four will spread toward the front corners, making room, in the center, for a fifth, and so on, like the dots on a die."

The experience of elevator travel is also overcoded with a rich history of fictional, filmic, poetic and science-fictional imagination. From the mysterious and secret seven-and-a-half floor in the 1999 film *Being John Malkovich*, to a whole chapter of urban folk-lore, or a myriad of unfortunate and filmic deaths and catastrophes, the elevator stalks the interface being the banal and the fearful or unknown within the vertical and technological cultures of the contemporary metropolis.

“Public yet private, enclosing yet permeable, separate from but integral to the architectural spaces that surround them,” elevators, Susan Garfinkel (2006; 176) writes, “invite us to expect the unexpected in certain predictable ways.” In film, she shows how elevators have variously been used to symbolize the ‘corporate ladder’; aspirations of social or economic advancement or sexual liaison (or sexual predation); the democratization of ‘public space’; anxieties of technological collapse; the monotony of corporate life; and anxieties of urban anomie. In Depression era American cinema “physical proximity and the elevator’s rapid upward thrust are meant to augur the heterosexual liaisons that follow” (Schleier, 2009; 68). Sometimes, as in Woody Allen’s 1997 film *Deconstructing Harry*, elevators are used to symbolises anxieties about the how vertical connections might operate as thresholds to Heaven or Hell.

Importantly, the relatively, standardised and enclosed experience of the modern elevator is increasingly shifting -- at least amongst high-end office buildings or the celebrated and spectacular vertical structures visited by tourists. Since transparent ‘rocket-ship’ style elevators were installed along the interior atrium of John Portman’s influential Hyatt Regency hotel in Atlanta in 1967, exterior, glass or ‘panorama’ elevators on the inside or outside of buildings are increasingly common.

Connected with long-standing tropes of science fiction and space-age futurism, from HG Wells 1936 film *Things to Come* or Charlie’s journey skyward in Roald Dahl’s *Charlie and the Great Glass Elevator*, here the vertical journey itself is increasingly exposed, commodified, and celebrated. Within some systems – most obviously at Seattle’s Space Needle, built in

1972 -- the vertical journey also became packaged to directly ape the Apollo Astronauts' vertical elevator ride up an Apollo gantry to be strapped into a Saturn V rocket for a moon launch.

As with other celebrated postmodern architectural icons such as Los Angeles' Bonaventure hotel or Detroit's Renaissance Center, Portman's transparent elevators in Atlanta were crucial in creating the sense of a mini, self-contained city -- a pure space of consumption and spectacle, powerfully removed from the world beyond the curtilage. "The elevator really established the dynamics of the whole space," Portman recalled. "To pull the elevators out of the wall made them like moving seats in a theatre" (cited in Patton, 2003, 110-111). In turn, they quickly became icons of Atlanta's rapid growth in the 1970s and symbols of a much broader geographic rebalancing of US urban growth towards the South. After the opening of Portman's hotel, Phil Patton recalls that:

"visitors from the rural hinterlands around Atlanta made special trips to the city to see the elevators. The multiple cars, rising as others fell, were tapered at the ends like candies in twist wrappers and lit like miniature riverboats.... The elevator ride was worth the whole trip: a rocket launch take off, then the passage through the building's roof to the Polaris rotating restaurant." (2003, 106).

Figure 1: The atrium elevator's in Atlanta's Hyatt Regency Hotel.

(Photographed by Rick. Attribution License.

Source:<http://www.everystockphoto.com/photo.php?imgeld=2118096&searchId=df5c185d11d7b7c09b6f8085f14d18e8&npos=3>)

Notably high or fast vertical journeys within iconic towers, meanwhile, are increasingly fetishised as part of wider fantasy landscapes of urban tourism and consumption,. The elevator ride increasingly becomes a commodified destination and spectacle in and of itself. Elevators in glitzy new towers on Australia's Gold Coast, for example, now have video screens on the ceilings depicting the image of the receding lift shaft above -- along with indicators of speed and location -- so that occupants can be more exposed to the nature of the journey (Figure 2). (Predictably, they don't show the view *below* when descending; presumably this might be a source of occupants' fear).

Figure 2: “One of Australia’s fastest elevators”: The real-time video screen on the cab roof of the tower to the sky lobby on the Skypoint Tower on Australia’s Gold Coast (Photographer: Stephen Graham)

Whether or not such reminders of the vertical mobility underway beyond the (usually) opaque box are always appreciated, though, is a moot point. The Otis company recently conducted research to assess whether elevator passengers would appreciate screens emphasising the fact that they were hurtling vertically up and down deep vertical shafts. They found “that people would rather be distracted from that fact” (cited in Paumgarten, 2008).

“Where are the Fastest Elevators?”

The spread of vertical cities, not surprisingly, is linked to a global boom in the industries of vertical transportation. In 2012 there were roughly 11 million elevators and escalators in service across the world. 700,000 were being sold a year and the global market was expected to grow at 6% per year to be worth \$90 billion a year by 2016, up from \$56 billion in 2008 (Bodimeade, 2012). Not surprisingly, Asia, and especially China, totally dominate this growing market: half of all investment was in China in 2010 (Koncept Analytics, 2010).

Rapid advances in lift/elevator technology is as fundamental to the global proliferation of super-tall skyscrapers as are innovations in materials science and civil engineering. In Japan, new elevator technology has been central to relatively recent moves beyond long-standing earthquake-limited height controls --- 30 meter limits were in place until 1968 -- that have spawned a series of multi-use “city within city” vertical complexes. In some ways, these resemble scaled-up and vertically-stretched versions of John Portman’s 1970s and 1980s North American designs. (Examples include the Sunshine 60 building – which had the world’s fastest elevators between 1978 and 1993 – and Roppongi Hills).

These “vascular shafts” (Sayre, 2011, 11), encompassing super-thin malls, elite condominiums, multi-storey parking garages, corporate HQs and expensive hotels and restaurants, are serviced by some of the world’s fastest elevators. These are marketed publicly as icons of national modernity every bit as symbolic of radical time-space compression or kinetic elitism as the more familiar Shinkansen bullet train networks that lace the country’s cities horizontally. “With four of the world’s five fastest elevators today produced by Japanese companies,” writes Ryan Sayre, “Japan has actively promoted velocity as a worthy rival to altitude in the colonization of ‘up’” (Sayre, n.d).

Figure 3: Vertical Shinkansen: The video screen and accompanying for the world's fastest elevator – made by Toshiba --which serves the 508 meter Taipei 101 tower in Taiwan. When the building opened in 2004 it was the world's tallest skyscraper. Floor, height, speed and position in the building are all displayed as part of the spectacle of ascent.

Source: Erik Charlton, Attribution License, at <http://www.everystockphoto.com/photo.php?imageId=2487517&searchId=4c2d42fe0e4e397a8fcddc39815bb06&npos=20>

Indeed, super-fast elevators are now being lauded by the world's business press as proxy indicators of what's really going on in the fast-changing economic geographies of globalization, urban growth, and real estate speculation. "If you want to know where the world's hottest economies are," *Forbes* magazine gushes, "skip the GDP reports, employment statistics and consumer spending trends. All you need to do is answer one question: Where are the fastest elevators?" (Van Riper and Malone, 2007, quoted in Sayre, 2011, 10). The world's fastest elevators currently – installed by

Toshiba in the Taipei Financial Center, Taiwan – currently peak at a vertical speed of 60 km/hour and are pressurized to avoid ear damage amongst riders (see Figure 3).

In April 2013, Hitachi excitedly announced that they were taking over the vertical speed record with the construction of even faster elevators – developed in the Gi tower already discussed – in a new 530 metre tower in Guangzhou, China. These will climb 95 floors in a mere 43 seconds, a maximum speed of 72 km/hour.

Much higher super-tall towers served by unprecedented vertical transportation systems have long featured in modernist architectural imaginaries. In 1956, for example, Frank Lloyd Wright designed a mile-high tower – a 528 storey city-tower for Chicago. This was replete with 66 atomic-powered quintuple-decker elevators traveling at sixty miles an hour. Ever since, architectural fantasy have centred on constructing ever-higher and more grandiose vertical visions. (Currently, Dubai's Burj Kalifa is being trumped by the Ilm Kingdom Tower raising to the sky in Jeddah.)

Elsewhere, automated elevators have been incorporated into radically vertical structures for stacking everything from containers to cars within broader systems of logistics, warehousing and transportation. The 'Car Tower' operated by Volkswagen in Wolfsburg, Germany, is perhaps the most iconic example here.

Figure 4: VW's car tower in Wolfsburg Germany, a system of vertically moving and storing customers' new cars via an elevator which is part of a large car-themes theme park.

Source: Source: I Love butter, Attribution License,
<http://www.everystockphoto.com/photo.php?imageId=6243169&searchId=81e1664fbd4d22263b41462d67220fd4&npos=2>

Way beyond even the gigantic scale of projected architecture, the dream of a functioning elevator linking the Earth's surface to a geostationary satellite – or even the moon – has long gripped science fiction writers. The International Academy of Astronautics even argued in 2014 that a 100,000 km 'space elevator' will be feasible by 2035 by applying emerging research into super-strength carbon nanotube materials. A means of radically reducing the costs of launching satellites, such a project, built as a 'tether' to winch loads vertically into space, would also, they argue, be a crucial step to much more intensive extra-planetary exploration and colonization (Swan, 2013).

Street People, Air People

"There were the Street People and there were the Air People. Air people levitated like fakirs [...]. access to the elevator was proof that your life had the buoyancy that was needed to stay afloat in a city where the ground was seen as the realm of failure and menace" (Raban, 1991)

As such vertical megaprojects are imagined, marketed and constructed, whether as putative responses to sustainability challenges, demographic and urban growth, the changing possibilities of speculation and construction technology, or sheer megalomania, so the uneven social geographies surrounding vertical mobility are likely to become more and more stark. Social inequalities in access to vertical transportation are already starting to mimic the increasingly 'splintered' geographies which have long surrounded horizontal systems (with 'premium' services like airport trains and TGVs 'bypassing' poorer geographical areas)(see Graham and Marvin, 2001).

Ascension of the super-tall towers of the 1930s, limited by elevator technology of the time, involved several time-consuming changes between elevators that were vertically staggered in sequence, up the structure. These elevators were able to stop at every floor. Experience of these repeated journeys in the Empire State building, Mark Kingwall (2006; 192) writes, served to remind the upward traveller of his [sic.] constant and continued suspension." There is nothing," he continues, "like having to change elevators three times that cable does not stretch indefinitely far".

The design of stronger cables, though, allowed single-leap elevators to reach the tops of super-tall towers. Such a shift both allowed the super-fast and super-tall elevator experience to be sedimented into urban culture as the ultimate socio-technical 'black box' – a miraculous teletransporter involving merely the act of walking into and walking out of a room as startlingly different heights. "I enter a small room," Kingwall observes, "the doors close; when they open again, I am somewhere else. The taken-for-granted elevator is perhaps the closest thing we have to the *Star Trek* transporter device, and it is so ordinary we hardly even think to think about it" (2006; 192).

Such new technologies also facilitated the engineering of 'unbundled' and 'spolintered' elevator experiences: radically diversified elevator speeds and leaps, organised to allow elite or premium users to experience intensified processes of vertical time-space compression whilst 'bypassing' less valued users who were removed into more prosaic and slower elevators (Graham and Marvin, 2001). Since the architects of New York's World Trade Center introduced the idea of the 'sky lobby' in 1973 – a lobby half-way up super-tall towers where 'express' and 'local' elevators can exchange traffic -- super-high towers, mimicking the pattern of subway trains on the New York subway, have increasingly been built with fast, long-distance or 'shuttle' elevators and 'local', slower ones which stop on every floor. Such approaches are starting to allow designers and architects to carefully customise different elevator speeds and experiences to different classes of residents or visitors.

In effect, such transformations work to diversify experiences of vertical mobilities, replacing single, public passage-points up and down with a spectrum of vertical mobility systems organised using the latest card and radio-chip-based access-control technologies familiar in many hotels. Compounding widening fears about the vertical secession of elites in the world's cities (see Cwerner, 2006) express and VIP elevators can bring elite users occupying the prestigious penthouse spaces of towers radically 'closer'

to the ground whilst conveniently bypassing the mass crowds confined to the shuttles that stop at every floor below.

Already, a variety of lifts provide highly segmented vertical topologies through which to ascend the world's tallest building, the Burj Khalifa in Dubai. Those lucky enough to access the 'VIP' lift to the luxury restaurants and viewing platforms on the 123rd floor (Figure 5) ride upwards in a luxurious lift car in around a minute beneath a sign that reads "the stars come our to play" (and hence extolls the both the status of the selected passengers and their velocity upwards).

Figure 5: View from the viewing platform on top of the Burj Khalifa in Dubai

Source: Le Grand portage, Attribution License,
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Super-luxury hotel towers like the Waldorf Astoria in Ras Al Khaimah, also in the UAE, meanwhile, are keen to extend the capsular geographies that their clients demand: they now advertise that their penthouse suites are now equipped with entirely private VIP lifts (see De Caeter, 2005). Many corporate office towers are now also now being equipped with VIP lifts that

whisk CEOs and top executives straight to their offices at the apex of buildings without having to stop at intervening floors or rub shoulders with the company's workforce from the 'lower' tiers of corporate hierarchies.

The extreme vertical urbanism embodied in possible future projects like the 2.4km, 400 storey 'vertical city' projected for Dubai, is an example of the projected use of a range of elevator systems to deliver different levels of time-space compression to different users on the vertical plane. It has been deliberately being designed with "internal elevator layout[s] splitting the working populations from the residents and providing high speed VIP express services to designated areas." (Khaleej Times , 2008).

Horizontal Verticalities? Elevator-Automobiles and Logistical Urbanism

As elevators become more sophisticated, computerised and automated, so do the more advanced automobiles and 'intelligent' highway systems. Indeed, echoing many fantasies of frictionless modernity and modernist urbanism, much corporate research and development now centres of dissolving the boundaries separating the worlds of horizontal automobility and vertical elevator culture altogether. Building on the kinds of automated 3D logistics systems already operating in ports, airports and warehouses, Otis, the original elevator company, are, amongst others, working on systems of automated 'cars' that can travel both vertically and horizontally. 'Cars' within such emerging systems "move horizontally through a building and then, when linked with a sister mechanism, acquire the traction necessary for moving vertically" (Easterling, 2003, 137).

Otis have argued that such systems could transport larger flows of people upwards, removing constraints on building ever-higher skyscrapers. Interestingly, though, they stopped marketing their system – known as 'Odyssey' -- to skyscraper builders after the 9/11 collapses.

Trapped: Vertical Transport Crises

"Good high-rises rely on good elevators" (Cizek, 2013a)

Figure 6: A broken elevator in Chicago

Source: The Dark Thing. Attribution License, at <http://www.everystockphoto.com/photo.php?imageId=10805698&searchId=63ccd1baa824e17f8456520cc2befac4&npos=13>

Beyond the glitz of the VIP elevators serving super-tall residential towers, with their modernist imagery of serene and frictionless ascent in incredibly fast capsules, the vertical mobilities sustained by elevators remain starkly contested. On the one hand, the complete dependence of occupants in tall towers on vertical transport means that elevator access to the world beyond can become the ultimate 'ransom strip' – a means to extort higher and higher service charges from dependent tenants.

Many residential tenants renting out some of the 1000 apartments in the Burj Khalifa, for example, have recently found themselves to be electronically locked-out of some of the luxurious spas, gyms and other facilities that they assumed their £40,000 annual rent allowed them to access. Such communal services have been withdrawn because the tenants' landlords have been failing to pay the building's owners the high maintenance and service charges stipulated in their contracts. In 2013, typically, these amount to around £155,000 for owners of a £1 million apartment. Increases have gone way beyond rates of inflation: In 2012 they rose 27% . When property owners can't or won't pay, building owners resort to locking tenants out of key communal facilities or posting 'name-and-shame' lists of on-paying tenants next to elevator doors (Armitage, 2014).

In social or low-income housing towers, meanwhile, the costs and problems of maintaining elevators is a perennial problem. Often, vertical transport crises caused by decrepit and unreliable elevators lead to social isolation in cities just as powerfully as the more visible and reported horizontal crises of failed rail, auto or air travel systems.

Whilst attention in Canadian cities has centred on the rise of private condo towers, many of low incomes are often marooned in the sky by the failure to maintain continuous elevator services in the cities' stock of increasingly decrepit high-rise rented towers that are populated by low income communities. The United Way (2010) lobby group warns that Toronto, for one, is becoming a city of 'vertical poverty' where the physical renewal of these towers' elevators – as well as the rest of the buildings -- is necessary to prevent a major infrastructural crisis which systematically isolates the population's most vulnerable members high in the sky. Growing up in a decrepit tower in an inner city in Toronto, Jamal, a participant in the study, recalls that:

“the elevator would skip floors, jumping and jolting, moving up and down. I used to wonder if we would survive if the elevator dropped from the 13th floor to B2. I was so terrified when my family went in there. I had disturbing thoughts that they wouldn't come out. To this day, I'm scared of the elevator” (quoted in Cizek, 2011b).

In France, meanwhile, the plight of immigrant communities in high-rise banlieues where elevator services have become ever-more perilous has become a widespread symbol of the troubled politics of assimilation in the post-colonial Republic since the 2005 riots. Clichy-sous-bois, a largely African neighbourhood on Paris's Eastern periphery where the 2005 riots started, has become a symbol of processes of vertical as well as social and horizontal abandonment. Since the riots, as the physical spaces of high-rises have deteriorated, anyone who could afford it moved out, and crime levels have escalated. Elevators maintenance has collapsed (especially in private rented blocks). Many families have found themselves to be isolated in the sky for long periods.

In 2013, Margareth, a Congolese immigrant living near the top of a high tower, was interviewed by Paris's *LesinRocks* magazine. The elevators in Margaret's block are now 'mere ornaments', the magazine reported (Doucet and Sudry-le-Dû, 2013). Repairs, at best, take several months. When interviewed, it had been over a week since Margareth had been to ground level to shop. "With the kids, just the trip, it would take me almost an hour," she says (quoted in Doucet and Sudry-le-Dû, 2013). When she does shop, she minimises weight to make the ascent of the stairs easier. "I have techniques I take the syrup to avoid packs of juice."). "A woman ascends slowly and silently up the stairs, bent double under the weight of a full cart, she pulls with a strap from the front," the local Mayor, Claude Dilain, writes scathingly in *Le Monde*. "She lives on the 8th floor. We are 15 km from Paris, is this possible?" (quoted in Doucet and Sudry-le-Dû, 2013).

A complex support and barter system amongst neighbours, along with an improvised pulley system to raise shopping bags to higher floors, is the only thing keeping the less mobile tenants from real hunger. In 2013, as tenants waited for elevator repairs, Dilain intervened and organised a system of 'live elevators': volunteers to help residents ascend the stairs. (The name of one of the towers so served -- tour Victor Hugo -- inadvertently reminds us of another scene in the complex history of Paris's vertical politics).

The reliance of modern elevators on electricity adds a further twist to the vulnerability of high-rise occupants. Whilst power outages never featured in the imaginings of the modernist architects who postulated life in vertical towers, thrust up into the 'light and air' and away from the urban ground, the fragilities of contemporary power grids can quickly turn vertical living into vertical isolation. This was powerfully demonstrated in October 2012 as Hurricane Sandy tore into New York City. "With Hurricane Sandy knocking out power to much of Lower Manhattan, the downside of living near the top of a glittering new skyscraper was made clear" (Cameron, 2012), Residents were forced to discover the stairwells of buildings that they had not seen in years (if at all).

The 400,000 residents in public housing 'projects' were particularly badly hit with over 430 elevators shut down due to power outages. These also stopped water and sewage pumping, forcing often vulnerable, disabled and frail residents and children to try to improvise the carrying of water – as well as food -- up long stairways. Ill residents had to be manhandled down stairways; nearby fire hydrants were opened to obtain water; dark stairwells became fearful and exhausting structures that had to be rediscovered and negotiated (often painfully). Widespread calls ensured for emergency back-up power to be installed into towers in the event of future outages, calls that were rejected because of inadequate funds.

Going Down: Elevators and "Ultra-Deep" Mining

"As gold prices reach near-record highs, [South Africa's](#) mining companies are keeping up by drilling to record depths" (Wadhams, 2007).

Discussion of the cultural politics of the elevator, where they happen at all, suggest that these stop entirely at ground level. And yet, as suggested above, the subterranean worlds of elevator travel – subsumed within the crucial but usually invisible worlds of mining – are even more startling than those above ground. As with the world's largest bunkers, the most enormous subterranean mining complexes are like cities underground that exist far

from – and yet operate to sustain -- the world's rapidly expanding surface-level metropolises.

Indeed, whilst the language changes – with an 'elevator' relabeled a 'cage' – the technologies of building massive vertical mining structures deeper and deeper into the ground have fundamentally co-evolved with those for building the growing forests of taller and taller skyscrapers into the sky. Whilst the latter, located at the cores of the North's global cities, house the corporate executives, stock markets and super-rich financiers that draw vast wealth from deep, neocolonial excavation of scarce and valuable metals and ores in the global south, the former provide the sources of some of the key materials used to construct vertical urban towers. And yet the popular graphs showing the rising heights of skyscrapers over the last century are never accompanied by graphics showing the parallel, but much more extraordinary and dangerous, excavations down.

"When one tries to clarify the role played by mining in the early history of the elevator," Andreas Bernard (2014, 28) writes, "one finds an interesting simultaneity under and above ground". Gray Brechin (2003), in his pioneering work on the imperial ecological politics that surrounded the growth of San Francisco, also stresses deep connections between mining and skyscrapers that the complex coevolution of their elevator systems. He shows how many other elements that were key to the corporate skyscrapers in North American downtowns from the late nineteenth century onwards actually emerged first in deep mines. California gold mines provided the sites where the ventilators, multilevel telephones, early electric lighting and high-speed safety elevators that would be crucial to skyscraper construction were first used systematically. "All were demanded and paid for by the prodigious output and prospects of the gold mines of California." In addition, the use of square supports to build large, multistory structures within mines to provide support as material was removed provided the basis for the famous steel girder structures of corporate towers.

The parallel processes of using these suites of technology to dig down, to provide the raw materials to construct raised-up skyscrapers, were not lost

on contemporary commentators. “Imagine [the mine] hoisted out of the ground and left standing on the surface, wrote reporter, Dan De Quille. The viewer:

“would then see before him [sic.] an immense structure, four or five times as large as the biggest hotel in America, about twice or three times as wide and over two thousand feet high. In a grand hotel communication between these floors would be by means of an elevator; in the mine would be in use the same contrivances, but instead of an elevator it would be called a “cage.””(quoted in Brechin, 2003, 67).

Influenced by Lewis Mumford's (1934) ideas of the capitalist 'mega machine' – where financial industries constitute an economic apex based ultimately on the exploitative and dangerous processes of mining -- Brechin stresses that Dan De Quille's vision is even more evident in the contemporary context of super-tall 1 km towers and 4 to 5 kilometer ultra-deep mines. Indeed, he even suggests that the clusters of finance towers that commonly signify the centres of 'global' cities should be seen as 'inverted minescapes' “reaching up from the staked claims of downtown real estate” (Brechin 1999, 70) and reliant ultimately on the speculative and commodified wealth sustained by the dangerous labour of mining at greater and greater depths (along with other primary or extractive industries).

Following the pioneering visions of De Quille, Mumford and Brechin, much more attention needs to be paid to the neo-colonial geographies of *vertical* resource grabs – and the wider 'resource curse' that often accompanies these processes for marginalised groups -- as well as their more familiar horizontal counterparts.

One place to start doing this is with contemporary gold mining. Whilst deep mining is reaching further and further into Earth's crust to reach remaining bodies of a wide range of scarce ores and metals in the context of burgeoning demand and high prices, it is the frenzy for gold is driving the most extraordinary elevator descents deep into the earth's crust.

The Mponeng mine, 60 km from Johannesburg -- currently the world's deepest -- is the poster child for so-called "ultra-deep" gold mining where super-long elevator descent over 3.5 km (2.2 miles) the earth's crust. "New shallow deposits [of gold], aren't easily being discovered around the world," Ray Durrheim, a South African seismologist reported in 2007. "The resources are at greater depths" (quoted in Wadhams, 2007).

Mponeng's huge vertical, three-deck elevators which descend down vast shafts into the earth -- perhaps they should more properly be called 'depressivators' or 'lowervators'? -- take 120 miners at a time. They defend downwards through the mine's 123 levels ten times further than the elevators to the viewing deck of the Empire State building ascend. At such depths, the temperature of the rock, slightly closer to the radiation-based heat of the earth's core, reaches 60 C (140 F); the entire mine has to be refrigerated using 6000 tone of ice a day to stop the miners from baking alive.

Matthew Hart (2013), journeying to the depths of the Mponeng mine in 2013, reflects on the comparison of the mine's elevators with those of the world's tallest building. "In the ... the Burj Khalifa in Dubai," he writes:

"57 elevators shuttle people up and down the tower, often in stages through upper-floor 'sky lobbies.' We had traveled five times the distance covered by the Burj Khalifa's system, and had done it in a single drop. We made our way to the cage that would take us deeper, to the active mining levels that lay far below. We stepped into the second cage and in two minutes dropped another mile into the furnace of the rock" (Hart, 2013).

The mining galleries that reach away from the elevators would cover the areas of Manhattan between 59th and 110th Streets. And the tunnel systems built to allow miners to extract the ore are 30 miles longer than the New York City subway (Hart, 2013).

But mines like Mponeng are more than interesting subjects for over-excited documentaries filled with endless lists of impressive statistics on the *Discovery*

Channel. As the rescue of 33 miners from Copiapó copper mines in Chile in 2010 demonstrated very publicly, they are a perilous places for extremely dangerous labour driven by the wild speculation of commodity process that are a key feature of globalised neoliberalism. Matthew Hart (2013) calculates that the extraordinary price of gold in 2012 -- \$1581 an ounce, a figure driven higher by declining confidence in other investments – meant that Mponeng alone produced \$950 million worth of the metal that year.

Just as they are central to higher skyscrapers, faster and bigger elevator systems are crucial in opening up deeper and deeper layers of gold and other metals and minerals to systematic exploitation. “With improved winder and rope technologies,” *Mining Weekly* reports, “cages can now be hoisted below 3000m in a single drop. This offers “great economic benefit in deep-level mines as it enables personnel to reach the rockface far sooner and thus have more productive time at the face” (Rebelo, 2003).

Fuelled by extraordinary levels of profitability caused by unprecedented gold process, gold mining corporations are already planning even deeper shafts to reach untapped, ultra-deep resources. The AngloGold corporation is planning to dig to 4.5 km by 2018, tempted by the estimated “100-million ounces of gold that cannot be mine conventionally” deep within South Africa’s goldfields (Creamer, 2013). As in skyscraper elevators, the weight of ropes is a key constraint. Back in 1997 mining engineer D.H. Diering admitted that “if someone asked the question ‘what would stop us going to 5 000m today, assuming there was an ore body worth going to and enough money to pay for it?’, the simplified answer would be ‘ropes’.” Innovations like the carbon fibre rope being launched for skyscraper elevators are thus likely to fuel the latest in a long line of technological crossovers over the next twenty years in the parallel push upwards for skyscrapers and downward for mines.

Whilst nowhere near as deadly as the thousands of illegal, informal or artisanal mines that dot the mining regions of Latin America, Africa, and parts of Asia, the elevators in relatively high-tech deep mines remain extremely dangerous.

Like all major mines, Mponeng also reports regular deaths and injuries during normal operations. In South Africa, an average of 5 miners die each week (Bell, 2000). At least six fatalities were reported in the mine by *Mining Weekly* during 2012/3 ; the killers involved seismic collapses, heavy machinery malfunctions and electrocution. Scientists have also raised concerns that ultra-deep mines can trigger surface-level earthquakes.

In May, 1995, in the most notorious deep shaft disaster so far, the engine of an underground railcar in the Anglo-American Corporation's Vaal Reefs Mine near Orkney, South Africa, broke loose and fell down a 2 kilometer (7000 ft) elevator shaft, Crushing a two-deck cage completely flat, it instantly killed the 105 men within it.

"We would not generally oppose the idea of ultra-deep mining if our people were safe," Lesiba Sheshoka, of South Africa's National Union of Mineworkers (NUM), told the National Geographic in 2007. "But we are opposing it on the basis that ... we have already seen a significant rise of fatalities." (Wadhams, 2007).

Such resistance to ultra-deep mining fails to even address the gold industry's catastrophic record of fatalities and debilitating illness through diseases like silicosis, nor its appalling track record in legal denials for liability. South Africa's NUM – currently taking UK-owned gold firms to court in London along with 3,500 ex-miners to force recognition of the problem – calculates that there are at least 50,000 ex goldminers in South Africa with the disease (which is often fatal through reduced resistance to TB).

What is especially striking is that, whilst huge investments go in to deeper and deeper mines to keep miners alive whilst mining (and of course, to secure and protect the all-important gold), very little is done about the air and ventilation problems that cause silicosis. "It was always possible through ventilation and proper clothing to protect people from silica dust in [gold] mines," NUM president, Senzeni Zokwana said when interviewed about the case. "But in the past men were down [the mines] just to break rocks and make money" (Cited in McVeigh, 2014).

Notes:

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