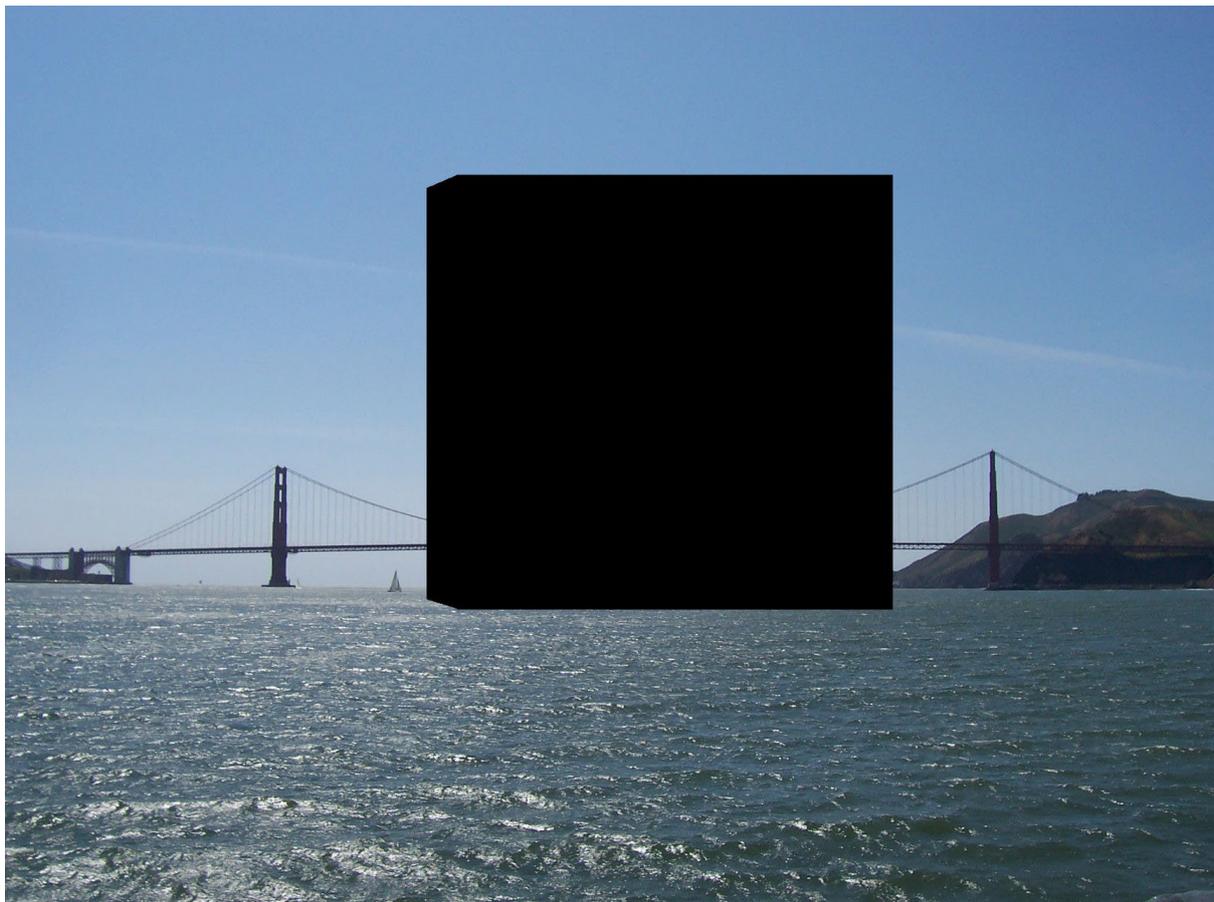


## The Space of the Body: A Working Definition<sup>1</sup>

Christina Varvia

### The space of the body: measured

On my late-night Internet meanderings, I stumble upon a blog post called ‘The Human Cube: The Volume of Humanity’.<sup>2</sup> The premise is simple: how does one measure the space occupied by human bodies? The article offers a back-of-envelope calculation for the approximate volume of space occupied by (all) human bodies on Earth. The author estimates that if one was able to pack every person currently alive (a population of approximately 7.6 billion people with an average weight of 62kg per body) closely next to one other, it would add up to a volume of  $0.47\text{km}^3$  – that is the equivalent of a cube measuring 770m on each side.<sup>3</sup> The accompanying visualisation, which offers a comparison between the cube and San Francisco’s Golden Gate Bridge, demonstrates that the actual space occupied by human bodies on Earth is in fact the scale of an architectural megaproject. And although we are yet to construct a building of that size, it is not outside humanity’s capabilities, as the cube is only 36 times bigger than the largest building currently in existence, the Boeing Everett Factory in the US (measuring  $0.013\text{km}^3$ ).



<sup>1</sup> The beginnings of this text arose from the brief I wrote with Merve Anil for the AA Diploma Unit 3: Body Politic (2019–2020). Students of this unit undertook materialist methodological adventures with brilliant results. The work presented in this article is supported by Novo Nordisk Foundation grant NNF20OC0061342.

<sup>2</sup> Phil Plait, ‘The Human Cube: The Volume of Humanity’, *SYFY WIRE*, 16 October 2018, [www.syfy.com/syfywire/the-human-cube-the-volume-of-humanity](http://www.syfy.com/syfywire/the-human-cube-the-volume-of-humanity), accessed 11 August 2021.

<sup>3</sup> Considering that humans are almost the same density as water (the average density of human bodies is  $0.985\text{g}/\text{cm}^3$  while water is  $1\text{g}/\text{cm}^3$ ), an average human occupies 62 litres of space.

Of course, it goes without saying that human bodies do not enjoy such proximity and have chosen instead to span far and wide occupying every corner of the planet. Yet I find this exercise interesting, because it speaks of the human body not as a sacred thing, but rather as a material entity with physiological properties. Let's say it puts things into a strange material perspective and this perspective is what I wish to pursue in what follows.

The Human Cube exercise also speaks to our species' obsession with measuring. From the moment a child is born we immediately count: ten fingers, ten toes, weight usually between 2.5–4.5kg, average length 45–50cm.<sup>4</sup> An average baby occupies a volume of 0.0034m<sup>3</sup>, or 3.4l, when it first comes to existence. The act of measuring and quantifying human bodies, otherwise referred to as anthropometry, is common within the medical profession but it also informs a range of other disciplines from archaeology and biological anthropology to forensics, phrenology, criminology and of course architecture and design. The quantification of the body informs everything from furniture design and urban masterplans to pharmaceutical prescriptions and surgery.

Measuring the body, however often coincides with the intention of controlling it. Violent anthropometric studies were often made in an effort to profile criminals, while ethnographic studies stratified the human species in order to withhold rights from colonised subjects. These histories, bleak as they are, reveal that the interest in measuring follows political directives: as David Beer observes, 'calculation becomes the basis upon which politics finds its force.'<sup>5</sup> Cognisant and cautious of these problematic practices, let's try to reclaim the measuring of the body as a political tool and evoke what Beer calls 'metric power'.<sup>6</sup> Not to elevate the supposed superiority of some bodies over others, but in order to uncover the intricate ways in which we are all interdependent.

Three disciplines are relevant to this journey: architecture, biology and philosophy. Most significantly, following the work of new materialist theorists, we can propose a new understanding of the space occupied by the human body that extends beyond the individual instance of 62l – or 0.062m<sup>3</sup> – on average that usually informs design practices.

### The space of the body: in architecture

The space of the body is of course primarily an architectural business. In other words, the business of architecture is to design space for the human body. And as a starting point, one needs to define what the body that architects are designing for *is*. 'The canonic Western image of the human at the centre of design is Leonardo's 1490 drawing of *Vitruvius Man* immersed in the geometric order of the circle and square', write Beatriz Colomina and Mark Wigley.<sup>7</sup> If one looks closely at architectural practice, it appears that architects usually rely on the measurements of Vitruvius, Leonardo Da Vinci, Le Corbusier, and Ernst Neufert: four men from different and often problematic historical contexts,<sup>8</sup> all of whom took turns to offer idealistic visions of the (mostly) male (mostly) white (mostly) able body that still sits at the

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<sup>4</sup> 'Physical Growth in Newborns', University of Michigan Health, [www.uofmhealth.org/health-library/te6295](http://www.uofmhealth.org/health-library/te6295), accessed 11 August 2021.

<sup>5</sup> David Beer, *Metric Power* (London and New York, NY: Palgrave Macmillan, 2017), p 56.

<sup>6</sup> Ibid.

<sup>7</sup> Beatriz Colomina and Mark Wigley, *Are We Human? Notes on an Archaeology of Design* (Zurich: Lars Müller Publishers, 2016), p 147.

<sup>8</sup> I am referring here to Ernst Neufert's association with the Third Reich in Germany. Neufert worked on housing construction for the Nazi regime, which utilised prisoners' forced labour. Additionally, his design attitude towards standardisation, captures the spirit of the time which typifies idealised visions of the human body. See more: <https://www.tandfonline.com/doi/abs/10.1080/13602365.2015.1072232?journalCode=rjar20>.

centre of architectural design. They offer what Astrida Neimanis has called the 'phallogocentric Enlightenment vision of discrete, atomised, and self-sufficient, Man'.<sup>9</sup>

Still human bodies vary significantly from that vision. This is hardly a revelation, yet it is surprising how rarely architects seem to care. Perhaps it is because buildings need to be used by more than one occupant and so a safe average needs to be established. And perhaps I find excuses because I have been guilty of the same error. But let us consider this: according to the *Guinness World Records*, the smallest and lightest adult ever recorded was Lucia Zárate (2 January 1864–15 January 1890) a Mexican entertainer who weighed 2.1kg at the age of 17. The largest human ever recorded was Jon Brower Minnoch (29 September 1941–10 September 1983) an American man whose peak weight was 635kg.<sup>10</sup> The spectra of volume, shape, texture, colour and other variations are vast and enough to prompt us to reconsider Le Corbusier's *Modulor*, and contend this 'harmonious measure to the human scale' which relates a figure of a 6 feet tall man to the Golden Section and Fibonacci numbers<sup>11</sup>.

A series of architects, scholars and artists have recently been questioning the standardised dimensions of humans found in most practices. Thomas Carpentier reimagines Neufert's typologies by introducing bodybuilders, cyborgs and conjoined twins in his *Measure(s) of Man: Architects' Data Add-on*, or in *The New Standard*. In a more elaborate manner, Colomina and Wigley curated an exhibition at the Istanbul Design Biennale in 2016 that questioned the very definition of humanity. Through a series of commissioned works and accompanying texts, they investigated the way architecture, design and technology have helped sculpt or even design what we consider to be human.<sup>12</sup> Moreover, these works promoted expanded visions of the human body. Amongst the participants, MOS Architects presented their *Unfinished Encyclopedia of Scale Figures without Architecture*, a catalogue of architectural representations of people within drawings that documents historical styles of scale figures. In this way they reveal the preconceptions of architects designing shelter for these bodies. Additionally, Revital Cohen and Tuur Van Balen reconfigured life-support machines to create a functioning vital circuit, sans the human, teasing out the ways in which the human body is conceived through medical and cultural fields and exposing the mechanistic ways in which we often deal with the body. This overture paves the way for a reconceptualisation of the human body within design.

So let's take a step beyond the problematics of the scale figure or classical Modulor and the very limited conception of the human body within design disciplines. The proposition that I would like to put forward is not only concerned with expanding the types of bodies that ought to be considered in our designs, whether short, tall, fair, dark, linear, curvilinear, etc. Beyond resting on the problematic binary distinctions between male and female bodies, or able versus not-as-able bodies, or the utter neglect for queer bodies; instead let us attempt to offer a working definition of the human body that embraces its corporeality and reimagines it as a subject of research and design.

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<sup>9</sup> Astrida Neimanis, 'Hydrofeminism: Or, On Becoming a Body of Water', in Henriette Gunkel, Chrysanthi Nigianni and Fanny Söderbäck (eds), *Undutiful Daughters: Mobilizing Future Concepts, Bodies and Subjectivities in Feminist Thought and Practice* (New York, NY: Palgrave Macmillan, 2012) p 100.

<sup>10</sup> 'World's Heaviest and Lightest People', Topend Sports, Science, Training and Nutrition, [www.topendsports.com/testing/records/weight.htm](http://www.topendsports.com/testing/records/weight.htm), accessed 11 August 2021.

<sup>11</sup> Le Corbusier, *The Modulor: a harmonious measure to the human scale, universally applicable to architecture and mechanics* (Basel; Boston : Birkhäuser, 2000).

<sup>12</sup> Beatriz Colomina and Mark Wigley, curators of *Are We Human? The Design of the Species: 3rd Istanbul Design Biennial*, held between 22 October 2016 and 20 November 2016 and organised by the Istanbul Foundation for Culture and Arts.

## The space of the body: expanded

Bodies are leaky, dependent and reliant on a system of flows. ‘We are all bodies of water’, begins Neimanis’ essay ‘Hydrofeminism: Or, On Becoming a Body of Water’.<sup>13</sup> In this key text, Neimanis refers to the well-established fact that human bodies are composed of 60–90% water and unravels this thread to describe bodies (whether human or non-human) as vessels of aquatic flows. The essay and the subsequent book *Bodies of Water*, attempt to undo the drawing of the human body as an autonomous, self-serving, sealed and isolated entity, and to reveal the myriad of ways that bodies leak, ingest and release the watery fluids that bind us to other organic and inorganic life. ‘Still, we perspire, urinate, ingest, ejaculate, menstruate, lactate, breathe, cry. We take in the world, selectively, and send it flooding back out again’, Neimanis writes.<sup>14</sup> The world passes through our bodies in endless ebbs and flows, liquid intakes and outpourings that carry nutrients, minerals or toxins. I am intrigued by this open, porous, absorbent and permeable vision of the human body. Unlike a perfectly intact static object, this body alludes to Theseus’ ship: restored plank by plank to sustain its original form and avoid decay, yet it is questionable whether it remains the same object in the end. Philosophers from Plutarch to John Locke<sup>15</sup> have been preoccupied with the riddle of Theseus’ ship and the question of the persistence of identity as the body ages. However, at this moment I am not interested in investigating this paradox in terms of identity and human consciousness. Rather, I wish to offer another thought experiment—a material provocation. The approach I suggest is expansive.

If we refuse the skin as the absolute limit of the human body, where do we draw its new boundaries? What space does a body occupy beyond the +/-62litre sack that we come to recognise in the mirror?

The space of the body could very well be every bite of food we ever consumed, every drop of water that ever quenched our thirst, every molecule of oxygen that we ever breathed, and all the excrement that we ever produced. Jane Bennett in her book *Vibrant Matter: A Political Ecology of Things*, draws up a concept of *edible matter* as an actant that participates in the production and constitution of the self. Following Friedrich Nietzsche and Henry Thoreau, who argued that ‘eating constitutes a series of mutual transformations between human and nonhuman materials’,<sup>16</sup> she highlights how ‘foodstuff’ partakes in the process of creating and becoming human, by revealing the vitality of matter itself. Matter matters, and Bennett demonstrates how it has agency – or what she calls ‘thing-power’– across various scales. Moods change with the intake of sugars or fats. Omega-3 lipoids are reported to influence psychic conditions and repress violent tendencies. Although Bennett recognises that edible matter alone is not enough to shift a person’s character, she posits that an organism’s form is the result of the agency of a plenitude of material bits that act with, against and within the body. In a similar vein, Annemarie Mol in her book *Eating in Theory*, captures how eating teaches us about *being*: ‘as an eater I do not first and foremost apprehend my surroundings, but become mixed up with them. The edible parts of those surroundings, in their turn, wherever they were located beforehand, become assembled inside me.’<sup>17</sup> To consider the human body as a node within a larger assemblage of material compositions is to follow the

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<sup>13</sup> Neimanis, ‘Hydrofeminism’, op cit.

<sup>14</sup> Ibid, p 104.

<sup>15</sup> See Plutarch. *Plutarch’s Lives*. with an English Translation by. Bernadotte Perrin. Cambridge, MA. Harvard University Press. London. William Heinemann Ltd. 1914. And John Locke, *An Essay Concerning Human Understanding*, (The Clarendon Edition of the Works of John Locke ), Peter H. Nidditch (ed.), Oxford: Oxford University Press, 1975. doi:10.1093/actrade/9780198243861.book.

<sup>16</sup> Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham, NC: Duke University Press, 2010), p 40.

<sup>17</sup> Annemarie Mol, *Eating in Theory* (Durham, NC: Duke University Press, 2021), p 30.

footsteps of posthumanist thinking<sup>18</sup> that attempts to make sense of our contemporary, globalised, technoscientific condition. But what would an extension of the body to include every material trace that has contributed to that body's consistency mean in actual terms?

I consult Google's collective knowledge of statistics<sup>19</sup>. An average adult human consumes 686kg of food a year<sup>20</sup> (2884kcal/day<sup>21</sup>), or 35tons of food in their lifetime,<sup>22</sup> as well as 62,400lt of water in their lifetime.<sup>23</sup> In an average life of 73 years<sup>24</sup>, a human body takes in 242.2 million litres of air<sup>25</sup>, 12.1 million<sup>26</sup> of which are oxygen that is consumed and turned into energy. The average body will grow 590 miles of hair in its lifetime.<sup>27</sup> Humans produce around 3,400kg of feces, and 37,300l of urine in a lifetime of 73 years.<sup>28</sup> The +/-62l that a human body occupies at any given moment is only one slither of the space occupied by everything that makes up that body within a lifetime. By stretching the temporality of our vision from a singular snapshot to the long timeframe from birth until death, we render – as if taking a long exposure photograph<sup>29</sup> – a very different image of the human body to what was outlined as the Modolor.

Within this aperture, capturing the metrics of the matter that makes up the human body in its entire lifetime allows us to examine its relationship to its supporting ecosystems. It also helps undo human exceptionalism. Through this lens, we can reverse the anthropocentric consumerist mode of thinking that considers the ingestion of edible substances simply as a necessity to support a higher form of life. Instead, let us consider the human body as a conglomeration of substances forming fleeting moments of consciousness in complex relations with other organic and inorganic bodies. In his book *A Thousand Years of Nonlinear History*, Manuel De Landa cites the biogeographer Ian G Simmons: 'The flows of energy and mineral nutrients through an ecosystem manifest themselves as actual animals and plants of a particular species.' De Landa continues: 'our organic bodies are, in this sense, nothing but temporary coagulations in these flows: we capture in our bodies a certain

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<sup>18</sup> Rosi Braidotti, *The Posthuman* (Oxford: Polity Press, 2013)

<sup>19</sup> In what follows I collect numbers from statistics, calculations, and conversions that overly simplify individual patterns. Differences between various age groups, genders, nationalities, social classes, or even daily routines are radically averaged out to arrive at a number that captures the imagination. The attempt here is not to normalise what an average body should measure, but rather to paint a picture of vastness of matter that flows through bodies. Perhaps the most accurate way of reflecting those differences would have been to determine ranges, however the data available did not offer such opportunity. The metrics mentioned have been converted to reflect an average lifespan of 73 years.

<sup>20</sup> 'What the World Eats', National Geographic, using food consumption data in 2011 from FAOSTAT, <https://www.nationalgeographic.com/what-the-world-eats/>, accessed 8 September 2021.

<sup>21</sup> Max Roser and Hannah Ritchie, 'Food Supply', Our World in Data, <https://ourworldindata.org/food-supply>, accessed 11 August 2021.

<sup>22</sup> 'Food Consumption and Nutrient Intakes', Economic Research Service U.S. Department of Agriculture, <https://www.ers.usda.gov/Data/FoodConsumption/>, accessed 8 September 2021. Note: data reflects an average American consumer, it is noted that food patterns vary significantly across regions.

<sup>23</sup> Henry D. Kahn, Kathleen Stralka, 'Estimated daily average per capita water ingestion by child and adult age categories based on USDA's 1994–1996 and 1998 continuing survey of food intakes by individuals.' *Journal of Exposure Science & Environmental Epidemiology* **19**, 396–404 (2009). <https://doi.org/10.1038/jes.2008.29>

<sup>24</sup> 'Life Expectancy at birth (years)', World Health Organisation – The Global Health Observatory, last updated 4 December 2020, [https://www.who.int/data/gho/data/indicators/indicator-details/GHO/life-expectancy-at-birth-\(years\)](https://www.who.int/data/gho/data/indicators/indicator-details/GHO/life-expectancy-at-birth-(years)), accessed 8 September 2021.

<sup>25</sup> 'How your lungs get the job done', American Lung Association, 20 July 2017, <https://www.lung.org/blog/how-your-lungs-work>, accessed 10 September 2021.

<sup>26</sup> 'Respiratory System', [BBC](https://www.bbc.co.uk/bitesize/guides/z6h4jxs/revision/3), no date, <https://www.bbc.co.uk/bitesize/guides/z6h4jxs/revision/3>, accessed 10 September 2021.

<sup>27</sup> Mitchell Symons, *Numberland: The World in Numbers* (London, Michael O'Mara Books Limited, 2013)

<sup>28</sup> C. Rose, A. Parker, B. Jefferson, and E. Cartmell, 'The Characterization of Feces and Urine: A Review of the Literature to Inform Advanced Treatment Technology', *Critical Reviews in Environmental Science and Technology* (Taylor & Francis, 2 September 2015), doi: [10.1080/10643389.2014.1000761](https://doi.org/10.1080/10643389.2014.1000761)

<sup>29</sup> I am not referring to the fact that the body is mobile and can travel across spaces, as captured by Etienne Jules Marey and Eadweard Muybridge's photography. Instead, I wish to look strictly at the body's materiality through a lens of long exposure.

portion of the flow at birth, then release it again when we die and microorganisms transform us into a new batch of raw materials.<sup>30</sup> The flow of energy and matter sometimes expresses itself as a human body, but that expression is not separate to energy and matter beyond it.

Shifting again to the instantaneous expression of the human body and looking at this concept through an investigative lens, we know that, thanks to homeostasis, the human body retains a balance of 65% oxygen, 18.5% carbon, 9.5% hydrogen, 3.2% nitrogen, 1.5% calcium, 1% phosphorus, 0.4% potassium, 0.3% sulfur, 0.2% sodium, 0.2% chlorine, 0.1% magnesium, and less than 1% of other trace elements (boron, chromium, cobalt, copper, fluorine, iodine, iron, manganese, molybdenum, selenium, silicon, tin, vanadium, zinc)<sup>31</sup>. Each one of these chemical composites has an autobiography that goes back as far as the Big Bang. As planetary scientist Ashley King highlights “nearly all the elements in the human body were made in a star and many have come through several supernovas.”<sup>32</sup> Tracing the life of the oxygen, carbon or iron within the human body sends us on a journey from the depths of the oceans to the far reaches of the atmosphere, from stardust to magma, from quarries and industrial plants, to farms and food markets.

So far, I have been using average measurements to paint a picture of volume and mass. The sum of materials that pass through a human body is tremendous. Naturally, the consistency in the chemical composition varies significantly from body to body, and this variation makes all the difference, determining the human form and the singularity of every body. It makes the difference between Zárata and Minnoch, and everyone else in between. It also makes the difference between homo sapiens, and other primates or even other living creatures.

What would the exercise of measuring the Human Cube reveal if we were to account for this expanded vision of the material body? How much space does humanity occupy then? And what happens if we add all the other mammals, reptiles, birds, fish, amphibians, and invertebrates? How much space is left?

Materially speaking, the human body can only exist within a thin bubble of very specific physiological conditions. What is required to sustain a human body is a complex ecosystem, a spectrum of: 4–35°C in temperature;<sup>33</sup> an electrical field with currents less than 100mA;<sup>34</sup> an atmosphere with pressure no more than 1.4atm<sup>35</sup> and no less than 0.0617atm (Armstrong limit); air composition of 20% oxygen and not too much carbon monoxide or carbon dioxide; a maximum exposure to radiation of 1Sv/h.<sup>36</sup> For a human being to feel comfortable, the sliding scales of all these spectra need to be finetuned to sustain life. Yet, to keep warm and transport materials and bodies across the planet, we burn combustibles to release their energy. In that process we also release toxic particulate matter, or PMs, that in turn infiltrate our lungs and bloodstreams, and toxify the very bodies that we aim to sustain. Aerosols rise into the atmosphere and block sunrays, heating up the crust; our skin burns, our water evaporates. Other species whose tolerances vary from ours, suffocate first.

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<sup>30</sup> Manuel De Landa, *A Thousand Years of Nonlinear History* (New York, NY: Zone Books, 2019), p 104.

<sup>31</sup> Kerry Lotzof, ‘Are We Really Made of Stardust?’, Natural History Museum, no date, [www.nhm.ac.uk/discover/are-we-really-made-of-stardust.html](http://www.nhm.ac.uk/discover/are-we-really-made-of-stardust.html), accessed 22 October 2020.

<sup>32</sup> King cited in *ibid*.

<sup>33</sup> Natalie Wolchover, ‘What are the Limits of Human Survival?’, *Live Science*, 9 August 2012, <https://www.livescience.com/34128-limits-human-survival.html>, accessed 11 August 2021.

<sup>34</sup> ‘Electricity and Human Body’, Wikilectures, no date, [https://www.wikilectures.eu/w/ELECTRICITY\\_AND\\_HUMAN\\_BODY](https://www.wikilectures.eu/w/ELECTRICITY_AND_HUMAN_BODY), accessed 11 August 2021.

<sup>35</sup> Richard E Moon, ‘Gas Toxicity During Diving’, in *MSD Manual Consumer Version*, August 2019, [www.msmanuals.com/en-jp/home/injuries-and-poisoning/diving-and-compressed-air-injuries/gas-toxicity-during-diving](http://www.msmanuals.com/en-jp/home/injuries-and-poisoning/diving-and-compressed-air-injuries/gas-toxicity-during-diving), accessed 11 August 2021.

<sup>36</sup> However, there is not enough data to determine radiation levels safe for humans in the long run, as risks for cancer increases with exposure. See Wolchover, ‘What Are the Limits of Human Survival?’, *op cit*.

The climate crisis discourse teaches us that none of the environmental conditions that are necessary to sustain human life are stable and that our anthropogenic activity has set our fragile ecosystem out of kilter. Many vulnerable populations are already pushed against this new climatic regime, which makes their birthplaces uninhabitable. Considering the vastness of matter that makes up human bodies over the course of their lifetimes, and the fragility of the humanly habitable zones, it is only reasonable to expect that, unless we radically shift the design of the global distribution of matter and energy, we will witness our environment turning increasingly more hostile, smothering liveable areas for the human species.

### The space of the body: an assemblage

In one final stretch, let us zoom out once more and learn from our current times. The act of contact tracing, introduced due to the ongoing Covid-19 pandemic, is an interesting one. If the virus spreads through water droplets and touch, then the connections between the human body and other organic or inorganic bodies become crucial. Contact tracing is essentially a material-network mapping exercise. Here, I am interested in this method, not for its use in identifying malicious cells that could cause illness and decay in human organisms, but rather because it offers another practical and philosophical provocation. Following the pioneering forensic scientist Edmond Locard and his exchange principle, where 'every contact leaves a trace',<sup>37</sup> we can inquire: how many things does a human body touch during its illness? How many things does a body touch within the span of its life?

I wake up in the morning and turn on the tap. Water flows over my hands; it comes streaming through pipes from the Thames' reservoirs and boreholes throughout the country; it is processed in water treatment plants.<sup>38</sup> Before that, it took the form of raindrops carried by clouds and lifted by ocean waves. The same hydrogen and oxygen molecules might have rinsed through millions of other bodies before they were filtered and cleared by both natural and industrial courses. The tap is of a German design, it was installed by a plumber who came from Leeds; the tap travelled by truck and ship; earlier, it was packaged in the factory in Hemer, Germany,<sup>39</sup> the steel, titanium, nickel, and copper that make up the tap came from undisclosed excavation sites – I imagine rural China and Peru. The soap came from Portugal. The bell rings and my Amazon package has arrived. It came by car, train, ship. I touch the cardboard, I touch the book that is inside. I connect with all the hands that touched these before me: the courier, the Amazon 'picker',<sup>40</sup> the printing press handler, the factory worker. I touch door handles, staircase rails, fridge, butter, kettle, coffee, bread; the hands of the baker, the hands of the market vendor, the hands of the coffee bean farmer, the hands of the workers in dairy processing plants. I throw away plastic wrapping, it touches my bin, the recycling skip, the rubbish truck, the landfill site; the plastic stays in the ground forever, stubbornly refusing to mutate to something useful.

I have embarked upon a task that cannot be completed. To trace everything I have ever touched, within a day, let alone a lifetime, is to map out the world itself through the cinematic vehicle of my own flesh. To do so interscalarly<sup>41</sup> is also to compile a list that approximates

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<sup>37</sup> See 'Edmond Locard', The Forensics Library, no date, [aboutforensics.co.uk/edmond-locard](http://aboutforensics.co.uk/edmond-locard), accessed 22 October 2020.

<sup>38</sup> Emma Finamore, 'Where Does London's Tap Water Come From?', in *Londonist*, 2 November 2016, [londonist.com/london/features/where-s-my-tap-water-from](http://londonist.com/london/features/where-s-my-tap-water-from), accessed 11 August 2021.

<sup>39</sup> 'Fact Sheet Grohe', Grohe, [http://www.multivu.com/assets/60654/documents/GROHE\\_Factsheet\\_en\\_Mai\\_2013-original.pdf](http://www.multivu.com/assets/60654/documents/GROHE_Factsheet_en_Mai_2013-original.pdf), accessed 11 August 2021.

<sup>40</sup> Liam Young et al, *Machine Landscapes: Architectures of the Post-Anthropocene* (Hoboken, NJ: Wiley, 2019).

<sup>41</sup> Gabrielle Hecht, "Interscalar Vehicles for an African Anthropocene: On Waste, Temporality, and Violence", *Cultural Anthropology*, 33 (2018), p 109-141, <https://doi.org/10.14506/ca33.1.05>.

infinity yet holds a very finite and singular point of view. A signature of the world through the unique node of my body.

Maurice Merleau-Ponty describes a similar world when formulating his key work *The Phenomenology of Perception*. In it, he introduces the concept of the body schema: an understanding of the position of our bodily parts within the world; not only 'a summary of our bodily experience', but also 'the global awareness of my posture in the inter-sensory world'.<sup>42</sup> Aud Sissel Hoel and Annamaria Carusi expand on the implications of this concept by tracing it back to the biologist's Jakob Johann von Uexküll's notion of the 'interworld'. They posit that 'the body schema is not just a relation to space and to things, but essentially a relation to other body schemas too, making every "world" always already an "interworld" shared with others. Body schemas open onto each other and are interlaced into each other: it is not just that we are aware of others but that the interlaced body schema articulates shared modes of lived being, among which there is neither complete alterity nor complete coincidence.'<sup>43</sup>

The space that is activated through my haptic interactions does not coincide with the space of my house. It includes some of the material surfaces of my house but also transverses sites through fragments of objects across the globe. It is a patchy assemblage of spaces connected through corporeal contact. Although I do not experience or perceive these sites first-hand (as in the body schema-interworld formulation of the phenomenologists), I connect with them through touch. This haptic chain does not formulate my perceptual world, but rather traces a picture of the material world that enables my living.

In this conception, the space of the body is defined by its vitality and interactions with other bodies and objects. By coming into contact with other material bodies, the space of the human body grows until it effectively comes to coincide with the totality of its milieu. The space of the body comprises of 'a constellation' of every molecule of matter the body has interacted with and is not exclusive to the space of other bodies.<sup>44</sup> Rather like Venn diagrams, the spaces of these bodies intersect, interweave and interplay.

'Corporeal space is lived spatiality, oriented to a situation wherein the lived/living/lively body embarks on an architectural dance that actively spatialises (and temporalises) through its movements, activities, and gestures,' writes Diana Coole. 'The body introduces patterns, intervals, duration, and affects into Cartesian or Euclidian space from within it, and it continuously reconfigures its own corporeal schema in responding to and recomposing its milieu.'<sup>45</sup>

To think of all the matter that human beings come into contact with over the course of a lifetime, it is not enough to study the spaces that bodies occupy. Instead, one must look beyond the confines of the house, the neighbourhood, the city to locate the organic and inorganic actants that enable our living. As a methodology, this requires a departure from the Cartesian way of thinking that considers space according to the x, y, and z axes. Here, we can turn to oceanography and the study of fluid dynamics to find a useful heuristic model.

Oceanographers often have to choose between two different methods of investigation: the Eulerian versus the Lagrangian modelling techniques. The Eulerian model assumes a

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<sup>42</sup> Maurice Merleau-Ponty, *Phenomenology of Perception: An Introduction* (London: Routledge, 2011), p 101–102.

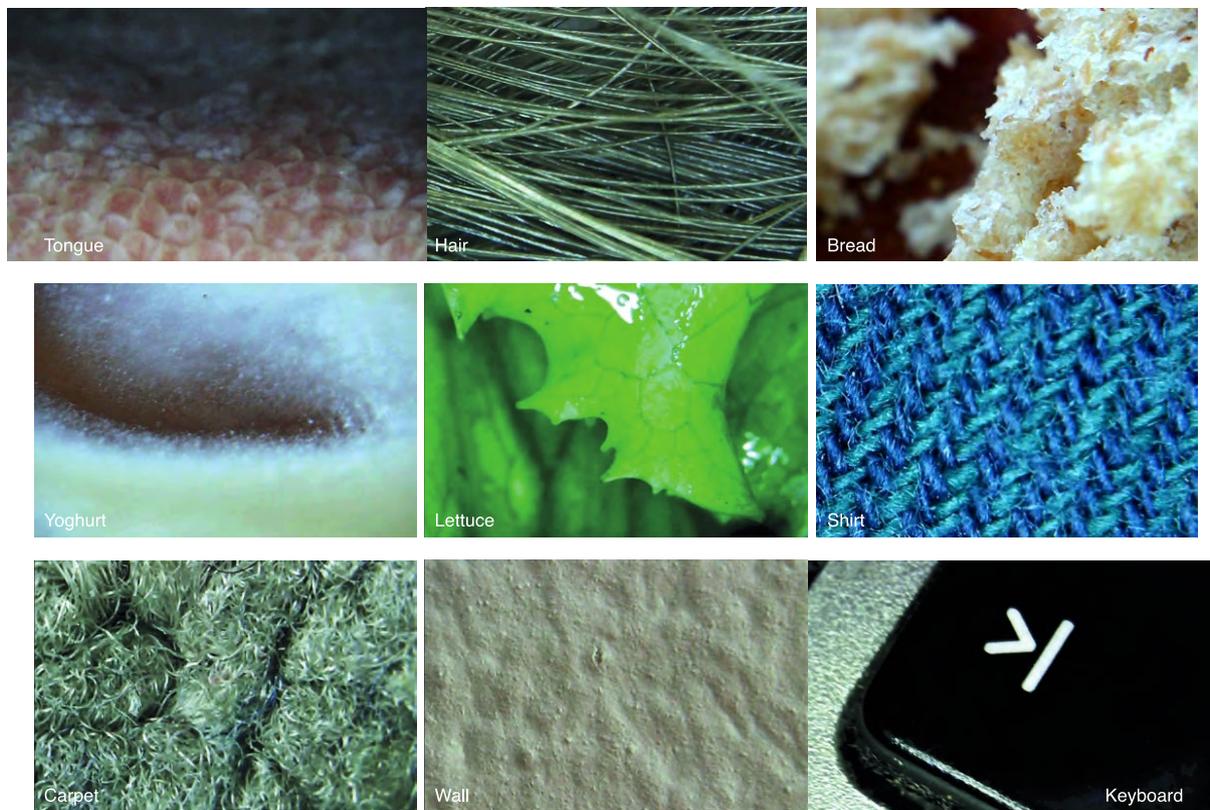
<sup>43</sup> Aud Sissel Hoel and Annamaria Carusi, 'Merleau-Ponty and the Measuring Body', in *Theory, Culture & Society*, 35, 1, p 56.

<sup>44</sup> Gilles Deleuze and Felix Guattari. *A Thousand Plateaus: Capitalism and Schizophrenia* (London: Bloomsbury Academic, 2013).

<sup>45</sup> Diana Coole, 'The Inertia of Matter and the Generativity of Flesh', in Diana Coole and Samantha Frost (eds) *New Materialisms: Ontology, Agency, and Politics* (Durham, NC: Duke University Press, 2010), p 102.

system of buoys fixed in a grid within watery space. The buoys, which are equipped with sensors, record the forces that pass through them at any given moment, measuring wind velocity, temperature and chemical consistency at these fixed points. This is the equivalent of the Cartesian way of understanding space. Alternatively, within the Lagrangian model, scientists trace the movement of particles by deploying floaters that travel with the ocean currents. Instead of *measuring* velocity, in the Lagrangian model the floaters *demonstrate* velocity and temperature by travelling the path that is formed by these field conditions. Space then 'ceases to be a stable background but [becomes] part of the unfolding.'<sup>46</sup>

One wonders what world would unfold if we were to trace a singular Covid-19 virion in its route from patient zero to air, to surface, to skin surface, to host body and out again. Instead of studying human life in lab conditions and gridded canvases, what new lessons could we learn by taking a *dérive* together with material particles, or floaters, that pass through our bodies and continue their journeys beyond?<sup>47</sup>



### Expanded body as political field

New materialism offers a theoretical toolkit that helps reveal the complex material dynamics that entangle humans with their environments. But how are thought experiments such as the ones presented above useful? To consider everything I ever touch is to drive myself mad. But to start investigating how I come into contact with violent industries of material production through my actions is to trace my own complicity. The study of material

<sup>46</sup> Philip E Steinberg, 'Of Other Seas: Metaphors and Materialities in Maritime Regions', in *Atlantic Studies*, 10, 2, 2013, p 160.

<sup>47</sup> See Guy Debord et al, *Theory of the dérive and other Situationist writings on the city* (Barcelona: Museu d'Art Contemporani de Barcelona, 1996).

assemblages can act as a research tool as well as a philosophical concept. It can reveal positionality as well as accountability.

Essentially, what new materialist thinking can offer is a mapping of political complicity at a time when responsibility is widely distributed, at a time when direct causality is hard to establish and contemporary politics are run within *field causalities*, where a multiplicity of forces contribute to the eruption of events.<sup>48</sup> By not shying away, but reversing the political effects of body-measuring, it is possible to investigate the networked body as a political entity.

Follow the Nitrogen, the Sodium and Copper.  
Follow the Silicon, the Chlorine and Zinc.  
What worlds do they connect us with?

To reveal the political dimensions of the human body as a field rather than an object, it is not enough to rely on the Cartesian and Eulerian epistemologies, which would posit the boundaries of the skin as the spatial and temporal confines of the body. Instead we need a Lagrangian investigative technique in which particles of biomatter are tracked beyond their departure from the flesh, to reveal the extents of the body as political assemblage.

As an investigative methodology, the expanded body is not meant to relativise all material relationships. We are not connected to all matter equally, nor is it necessary to see all links in the same focus. Rather we can 'plunge into'<sup>49</sup> the assemblage and surf the web of connections in order to identify junctures where politics manifest in biomatter.

With this in mind, let us consider architecture again. It ought not solely to be viewed as the third skin of the body,<sup>50</sup> nor as the primary shelter of the human species, nor even as the building systemics that feed and discharge the resources crucial to our vitality (water, air, electricity etc). Instead, let us consider architecture as the construction of systems that regulate the flows of matter on a planetary scale and thus facilitate our contemporary globalised existence.

Let us investigate supply chains, excavation sites, and shipping infrastructures. Let us marry architectural thinking with new materialism and take a long hard look in the mirror to discover the world that we as a humanity have designed for ourselves. And then let us debug and rethink that design in a way that acknowledges that the space of the body, *in the expanded sense*, is fragile and that the architecture of the world has come to threaten the very spectrum of properties that sustain our living. A siloed design practice that is satisfied with the recognition of the skin as the absolute hermetic limit of the body will guarantee our complicity. Instead, let us facilitate life by tuning into its complexity. Let us engage with the body anew.

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<sup>48</sup> Eyal Weizman, 'Introduction: Forensis'. in Anselm Franke and Eyal Weizman (eds) *Forensis: The Architecture of Public Truth* (London, Sternberg Press, 2014), pp 26–29.

<sup>49</sup> Coole, 'The Inertia of Matter and the Generativity of Flesh', op cit, pp 101–102.

<sup>50</sup> Ove Jakobsen and Vivi ML Storsletten, 'Friedensreich Hundertwasser – The Five Skins of the Ecological Man', in *Art, Spirituality and Economics*, 2, 2018, pp 39–50.

