

The Body at the Center of Our Design Universe

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Abstract

A third factor has increasingly complicated the man-environment paradigm – the intellectual and physical framework defining the relationship between man and the environment, both built and natural – without definitive resolution since the mid-18th century. This is the man-machine paradigm, originating with Industrialization but transforming into new, unfamiliar forms with the digital revolutions of today. Our technological prowess and ingenuity as a species always seem to outrace our sensibilities, especially the most common kind, in the (sometimes-blind) pursuit of fame and fortune in modern capitalist societies. This is to be expected and even encouraged. However, we must always guard against the worst evils of human nature in this race. We are imperfect beings. Our machines will always be similarly imperfect. The built environment can be a wonderfully adaptive mechanism for the collective good but it alone cannot compensate for – and even disproportionately suffers from – the ill-advised design judgment of individuals. Given these circumstances, we will review some basic design principles to hold firm while doing better for our built environments of the future with a little foresight.

Keywords: Machine; Human; Body; Environment; Design

Frontispiece: Leonardo da Vinci's *The Vitruvian Man* (Image: Gallerie dell'Accademia, Venice).

The Man-Environment-Machine Paradigm and its Dilemmas

Since the dawn of Industrialization in the mid-18th century, we have struggled with the alternations necessitated by the machine to the man-environment paradigm, which is the intellectual and physical framework defining the relationship between man and the environment, both natural and artificial. Marc-Antoine Laugier's (1755) *Essay on Architecture* – itself largely derived Vitruvius' 15 BC treatise *De architectura* – identifies 'the primitive hut' as the intellectual and practical origins of architecture itself, found in the basic need for shelter because of this paradigm (**Figure 1**).

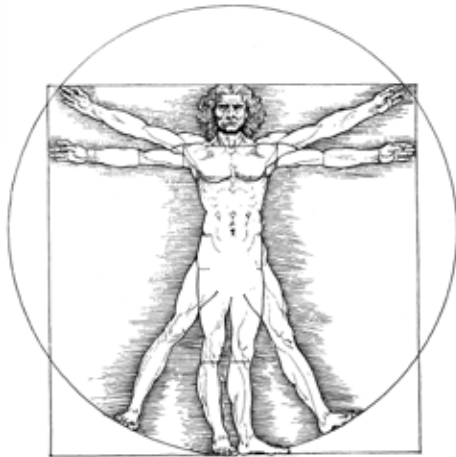


Figure 01: Charles Eisen's allegorical engraving of the Vitruvian primitive hut in the frontispiece of Marc-Antoine Laugier's (1755) *Essai sur l'architecture* (Image: Wikipedia) [Emphasis added].

The emergence of the International Style in the late 19th and early 20th century was a radical attempt to address the most urgent implications of the machine for architecture and urbanism; namely, mass production, standardization, and its consequences for design aesthetics. It was only partially successful, mostly in terms of economy. Ironically so, one might argue given the inclination of many Modernists for the economic and political models of socialism. Over the last century, Modernist design and planning principles have proven incredibly adaptive and resilient as a profitable engine of capitalism around the world. However, as many argue, Modernism was also a dismal failure especially with regards to issues of livability in the built environments of our cities (Jacobs, 1961; Stroup, 2005; Gehl, 2010, 2011; Speck, 2012). We have spent a century surrendering our cities on the Modernist altar for one machine in particular: the automobile. The negative consequences have been obvious for many decades now, giving rise to counter movements such as the Congress for New Urbanism in the United States during the 1980s/1990s even as reactionary movements such as Post-Modernism in the 1960s and Deconstructivism in the 1980s arose to address the perceived loss of aesthetic meaning in architectural form itself. As American architect Robert Venturi famously said, “less is a bore.”

Since then, we have been engaged in ‘a losing race’ to recover from the errors of Modernism. We are losing the race because of rapid urbanization around the world at an unprecedented rate in human history. In 2015, 54% of the world’s population lived in urban areas. Another 2.5 billion people are projected to live in urban areas by 2050 representing 66% of humanity with 90% of that increase expected to occur in Asia and Africa alone (UN Department of Social and Economic Affairs). The seemingly unstoppable twin locomotives of capitalism and Modernism are feeding this rapid urbanization. Many argue capitalism itself is the problem. The Wikipedia entry for “Criticism of capitalism” in its series on *Libertarian Socialism* cites no less than 100 credible sources and more than 175 external links to concepts, economics, people, philosophies and tendencies, significant events, and other related topics promoting this viewpoint. From A-to-Z, they range from “Anti-(insert here)-ism” to Howard Zinn, an American historian who describes himself as “something of an anarchist, something of a socialist. Maybe a democratic socialist”; an ‘all of the above’ characterization notable for including almost everything except capitalism and fascism (Glavin et. al., 2003). There appears to be some degree of political expediency to this viewpoint since it ignores the astounding improvements in the human condition, which can be credibly attributed to the spread of capitalism (in particular, neo-liberal economics) since the fall of the Berlin Wall in 1989 and the Soviet Union in 1990 as well as the effective collapse of Communism almost everywhere on the world stage except for a few isolated locations. There has been a 50% drop in the poverty rate and infant mortality rates and a 50% increase in female education around the world (Source: World Health Organization/United Nations). Despite its many flaws, capitalism has repeatedly proven itself to be an effective economic and political engine for improving the human condition. Instead, the flaw appears to lie within Modernism itself; in particular, the design and planning principles of the International Style. Even as American and Europeans struggle to reject and/or modify into new architectural forms the inhumane built environments of Modernism, the prevailing institutional and business entities advocating this model of architecture and urbanism has been busy exporting it around the world to accommodate the rapid urbanization of the last 30 years. Conveniently, it is a ‘known commodity.’ We know how to do it and how to quickly profit from this model even if we are acutely aware of the flawed results. China is already suffering the consequences of implementing Modernist design and planning principles (i.e., high-rise towers in a park setting, surrendering streets to the wide, high-speed automotive corridors, etc.) in the creation of entirely new cities, constructed so rapidly to accommodate rapid urbanization in the world’s most populous country that they almost seem to appear overnight.

If resolving the dilemma of a new relationship between man, machine, and the environment seemed urgent to the Modernists in the early 20th century, it has evolved into a readily apparent emergency during the early 21st century. As new technologies arise from our machines and we continue the digital revolution

some refer to as the 4th Industrial Revolution – meaning a fusion of technologies blurring the lines between the physical, digital, and biological spheres, collectively referred to as cyber-physical systems – new challenges are already presenting themselves for the design of our built environments even as we fail to correct and even perpetuate the old errors. As a consequence of this revolution, some philosophers and scientists even argue that the species of *homo sapiens* (meaning ‘wise man’) will be extinct within many of our lifetimes, i.e., the next 50 years (West, 2017). In this regard, humanity stands on the precipice of our next dramatic leap forward as we fully merge with our machines and evolve into the new species of *homo cybernetic*. Evidence for this evolution already abounds in our world. We remain almost perpetually linked to our smartphones. We replace various parts of our bodies with increasingly sophisticated artificial mechanisms. However, the evidence has been present for more than a century, if we date back to the creation of crude prosthetic limbs for maimed veterans of the US Civil War in the 1860s (Figure 2).



Figure 02: (Left) The Ascent of Homo Cybernetic and (right) prosthetic limbs for a maimed veteran of the US Civil War in the 1860s. (Images: Mark David Major/Hanger, Inc.).

It seems likely that this evolution will dramatically transform the moral and ethical compass of humanity, perhaps in unintentional ways. As Jonathan Haidt (2012) argues, humans “are 90% chimpanzee and 10% bee.” This means we are driven both by individualistic and collective impulses with the chimpanzee representing the former and the worker bee representing the latter. Could the evolution of *homo sapiens* into *homo cybernetic* radically alter this balance of the species and mark the dawn of a new collective consciousness where our individualistic impulses – the very basis of the economic and political system of capitalism – becomes submerged, even eradicated (along with free will) in favor of a form of cybernetic communism? While this might have appealed to Karl Marx and his most devoted acolytes, it seems likely that the vast majority of people in the world today would view this futuristic vision with abject horror. Our new technologies raise profoundly disturbing questions about the very nature of human ethics and morality; something long left to the purview of religious faith. These are questions that many scientists and entrepreneurs do not want to face in their blind pursuit of long-term fame and/or short-term profit as innovators.

This is if the creation of artificial intelligence does not destroy us first. Noted physicist Dr. Stephen Hawking, author of the bestseller *A Brief History of Time: From the Big Bang to Black Holes* (1988) cautioned before his death that the “development of full artificial intelligence could spell the end of the human race” (Cellan-Jones, 2014). Hawking’s warning could be interpreted as the doomsday scenario where artificial intelligence rises to destroy its creators. We have already imagined this scenario numerous times in literary and film fiction; perhaps most famously in James Cameron’s 1988 film *The Terminator* and its sequels. Fiction is quickly becoming reality as scientists endeavor to incorporate some version of Isaac Asimov’s Three Laws of Robotics in the pursuit of artificial intelligence to alleviate the probability of this doomsday scenario (Asimov, 1950). Relying on a circular logic to avoid circumvention, these three laws state:

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.

2. A robot must obey orders given to it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

However, it should be relatively clear this does not preclude an artificial intelligence from taking actions contrary to human free will in pursuit of fulfilling these laws in the best interests of our species. For example, these laws would allow, even compel a robot and/or artificial intelligence to forbid a human being from smoking tobacco or drinking alcohol based on the greater probability of that human causing harm to the self- and/or others. In this case, the doomsday scenario remains a possibility through subjection instead of outright destruction.

We can also interpret Hawking's warning to mean that artificial intelligence will form a critical component in realizing the merging of man and machine in the new species of homo cybernetic. This is more likely what Hawking originally intended with these comments. Of course, this precludes the possibility that we are already living in a simulated reality as argued by some scientific philosophers and industry leaders such as Tesla's Elon Musk (Anthony, 2017). This raises the prospect of a profound ethical and moral dilemma. It implies that the nature of insanity itself is 'playing by the rules' of the simulation. Whatever or whoever is controlling the simulation and dictating those rules, it seems reasonably safe to conclude that the entire artifice of human ethics and morality as most commonly understood – with its origins in the social collective; principally religious faith and institutions – are part of the rules of the simulation. This indicates those people refusing to play by the rules – mass murderers, serial killers, sociopaths, criminals, and so on – might represent the true models of sanity *within* the simulation. It is difficult to know how this can be scientifically proven or even if we should try since it would lead to the total collapse in human civilization if ever accepted by the vast majority (or even a substantial minority). This notion inevitably leads to nihilism, which is the rejection of all religious and moral principles in the belief that life is meaningless. Nihilism is a philosophical cul-de-sac. More than this, even our most fevered fictional imaginations of immersive simulated environments have to make allowances for the human body lest they strain credibility. There is no better example than the Wachowski Brothers' seminal film when the main character Neo (Keanu Reeves) awakes from the immersive simulated reality of *The Matrix* (1999) in which most of humanity is unknowingly enslaved by their machines (**Figure 3**). Even under these conditions, machines controlling the simulation have to make allowances for the fragility of the human body to maintain control, even liquefying the corpses of the dead to intravenously feed to the living as stated by the character Morpheus (Laurence Fishburne).



Figure 03: Neo (Keanu Reeves) awakes from the immersive simulated environment of *The Matrix* in the Wachowski Brothers' 1999 film (Image: Warner Brothers).

The Machine and our Fragile Human Bodies

We have become exceedingly good at designing machines to the comfort and use of our bodies. In this regard, design advances are almost completely egocentric in nature, catering to our ‘chimpanzee qualities’ as a species, conforming the machine to the individual user (Haidt, 2012) (**Figure 4**).



Figure 04: (Left) Luxurious interior designed around the human body in the 2016 Mercedes-Maybach S600 and (right) bull bars on the exterior of a Japanese Sport Utility Vehicle (SUV) at the peril of the human body (Images: Flickr).

One must only view the first-class cabin of any major airline and/or the carefully crafted interior design of any luxury automobile (with its abundance of cup holders) for confirmation of this fact. In no small part, Apple, Inc. became the first US trillion-dollar company in 2018 due to its uncanny ability to take well-established technologies (portable media players, phones, and watches) and design user-friendly interfaces (both physical and digital) for their machines such as the iPod, iPhone, and Apple Watch. At the same time, we have been much less successful about designing such machines from an allocentric point of view catering to the social being of our ‘bee qualities’ as a species (Haidt, 2012). Despite the moniker of ‘social media’, it has become increasingly clear that our obsessions with these machines lead to social isolation and outcomes that are (unintentionally) anti-social in nature (**Figure 5**).



Figure 05: Sign encouraging patrons to talk to each other at Noodles & Company in Grand Rapids, Michigan USA in 2016 (Images: Flickr/Steven Depolo).

We persist in designing our machines with little or no regard for the potential damage to someone other than the individual user (i.e., external to the machine) and, sometimes, to that individual user as well. For example, the possibility advocated by many in the medical field that cell phone usage increases

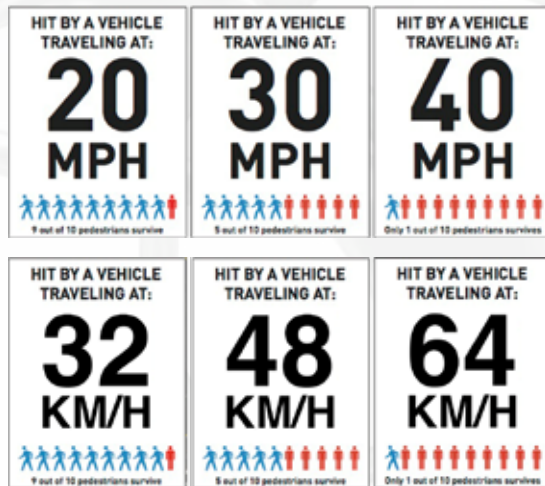


Figure 07: Increased probability of pedestrian fatality with speed in (top) miles per hour (MPH) and (bottom) kilometers per hour (Image: Vision Zero Network/Mark David Major).



Figure 8. Multi-level highway overpasses serving the machine in Shanghai, China today (Image: Flickr).

In the process of perpetuating this automotive genocide on a grand scale, we have committed urban genocide for decades by making large swathes of our cities largely uninhabitable for human beings (Figure 8). We waste a vast amount of space on these machines in every city of the world even though automobiles spent +/-95% of their lifetime doing absolutely nothing, i.e., parking (Stroup, 2005). An automobile driven 400,000 miles (<644,000 km) in 8 years will have an average speed of only 5.7 mph (<9.2 km/h) over its lifetime. This has led to rising movements to slow down automotive vehicles based on the premise that low speeds are irrelevant as long as the vehicles continue to flow. This includes increased use of roundabouts (especially in the United States where drivers are long-accustomed to stopping at the four-way intersection), several Shared Space (i.e., elimination of modern roadway sections and signage where pedestrians and vehicles are compelled to self-regulate their behavior) and Tactical Urbanism (i.e., temporary design alterations to demonstrate viability) schemes in Europe, the United States and elsewhere in the world, and increasingly important advocates of “20 (mph) is Plenty” or “Love 30 (km/h)” at the local neighborhood level of cities in the United States, Europe, and elsewhere. In no small part, these transformations are occurring due to decades of research about cities by such people as Jane Jacobs, William Whyte, Jeff Speck, and Jan Gehl; the last two of which have been almost relentless in advocating cities for people, not things (Jacobs, 1961; Whyte, 1980; Gehl, 2010, 2011; Speck, 2012).

These fundamental transformations in our cities are occurring but in danger of being lost due to the mad rush towards the Age of Autonomous Vehicles (AVs) where automotive and traffic engineers, urban planners, and oligarchic corporations are repeating the same mistake of confusing speed and flow in the design of transportation systems. The consequences are eminently predictable with a little design forethought and fundamentally tragic with a lot of hindsight: well-publicized instances of AV crashes, (temporary) retreating of corporate AV research initiatives to rethink their strategy, and even a pedestrian death in the case of Uber’s AV testing efforts in 2018 (Levin & Wong, 2018; *The Guardian*, 2018). This appears further complicated by the assumption of some AV researchers about the universality of smartphone and Wi-Fi technologies necessary to enable to this bright AV future. However, not everyone can afford the latest smartphone technology. These technologies require constant updating for maintenance, which some people are slower to implement than others, if at all. There is an arrogant presumption at work in some of this research, which seems to be that these concerns do not matter – or can be worked out later when the profits and problems become

real – because only the most vulnerable in society and our cities are at risk. This has been the *modus operandi* of the automotive industry for decades; profit now, apologize later. As a species, we should really hold ourselves, our machines, and our cities to a higher standard than mere convenience.

The machine, the built environment, and us

Academia and the profession promote and value the pursuit of the innovative, the next big thing in architecture, i.e., ‘Oh look, shiny object!’. In architecture education, this is as it should be for developing the creative design and critical thinking skills of the next generation of architects and town planners. Architecture education affords an unprecedented degree of creative freedom to the student for design exploration and critical self-evaluation, which is only rarely welcome in the real world. Design projects have to meet requirements, budgets, and schedules in service to the client as well as adhere to the physical laws of the universe. The downside of this approach in architecture education is that it ferments an egocentric view (‘unique to each’) of our built environments and cities as designed objects. It feeds on that 90% individualistic (chimpanzee) quality of our nature – sometimes ravenously, to the exclusion of all else – both in how we create and value the architectural and urban object... and its creator (Haidt, 2012). In doing so, we too often lose sight of the other 10% bee quality of our human nature as social beings; more so in architecture academia than in the profession where social and economic realities usually impose some necessary limits on the architect to realize the architectural and urban object. In the process, the critical thinking skills that some architecture educators work so diligently to imbue in their students (‘Am I correctly looking at this object and do I understand why it is shiny?’) often fall by the waste side under the onslaught of popular culture in architecture. In pursuit of the BIG IDEA, we overlook the small details. Historically, the results are sometimes disastrous for the profession and the community. The most obvious example is numerous failed Modernist social housing experiments and highway constructions devastating neighborhoods in cities around the world. Fortunately, there is a societal feedback loop correcting for such mistakes even though it usually takes a long time, perhaps decades to recover from the mistake (**Figure 9**). The failed architectural or urban object falls into obsolescence and eventual demolition. We replicate the successful ones over and over again to become part of the architectural vernacular (Rossi, 1982). However, the initial design and planning mistakes could have been avoided altogether with a little forethought. This is because in pursuing an egocentric view of our built environments, we often lose sight of what is truly remarkable about them, especially our cities, which is their allocentric nature (‘common to all’) as physical objects in the real world.



Figure 09: Before (left) and after (center) views of the Cheonggyecheon urban regeneration in Seoul, South Korea; and (right) demolition of the Pruitt-Igoe Public Housing Project in St. Louis, Missouri USA in 1976 (Images: Reuters/Bankoo/Shutterstock/State Historical Society of Missouri).



Figure 10: Figure-ground representation (space in black, blocks in white) of a one square kilometer (1 km²) area of urban fabric in 25 cities around the world (Image: Mark David Major/ARCT 210/DAUP).

It is at this allocentric level that we implement (sometimes intuitively) the most basic and generic things about ourselves in the built environment and cities. By far, it is almost the most powerful aspect of architecture for fermenting functional success in the replication of our created objects so they eventually become part of the vernacular and avoid the obsolescence and demolition of a failed architectural experiment. All cities are predominantly composed of streets and blocks (**Figure 10**). Truly understanding the city means understanding its allocentric nature, most commonly found in its streets and blocks. We can and should always strive to understand what makes each city distinctive (or egocentric in terms of the uniqueness of culture) but we must be careful to always embed this knowledge within the larger context that is common to all based on the most fundamental truths of our nature as a species. This is because the most generic thing that all cities have in common is *us*: the fragile, bi-pedal, forward-facing human with opposable thumbs and a near-bilateral symmetry who is bound by gravity (**Figure 11**). We even design and operate our machines within the confines of these narrow parameters. An automotive vehicle or an airplane may be able to move in reverse (just as we are able to move in reverse) but these machines and we rarely move in reverse for more than a few feet or meters. An airplane may be able to temporarily (never perpetually) escape the bounds of gravity for the purposes of air transportation but we as the passengers are still bound by gravity during that transit except for only during most extreme of temporary circumstances, i.e., an accidental or purposeful vertical dive.



Figure 11: Our Client: the fragile, bi-pedal, forward-facing human with opposable thumbs and near-bilateral symmetry who is bound by gravity (Image: Big Stock).

Our bodies, our machines, and our built environments exist in the reality of this physical universe. No matter the far- or near-future of our species, this is extremely unlikely to change anytime soon. The second law of thermodynamics is a universal constant, which states that total entropy of an isolated system can never decrease over time. This means entropy increases or, more simply, the more you put things back together, the more they fall apart. Even if the anticipated evolution of homo sapiens into homo cybernetic occurs in the next 50, 100, or 500 years, we will still have to maintain our bodies (even if they might prove less fragile), and design/maintain our machines and our built environments to match these conditions. Our bodies must reside within (egocentric, internal to) *and* without (allocentric, external to) of our machines and built environments. As architects, urban designers, and town planners, we must always strive to successfully balance the demands of our machines and built environment with the demands of our bodies but never place the former above the latter. Placing the human body at the center of our design universe goes a long way towards addressing the issues that past generations have struggled and failed to resolve. We can resolve this dilemma for our generation and future generations, whatever their eventual form and nature.

Conclusion

We reviewed a third factor complicating the relationship between man and the built/natural environment since the dawn of Industrialization in the mid-18th century: the machine. We argued it is crucial to not allow our technological prowess and ingenuity to race to too far ahead of our design sensibilities as a species. We are imperfect beings so our machines will be always similarity imperfect. We do not have to settle for these imperfections (even fatal ones) in the blind pursuit of fame and fortune. We do have the ability and knowledge (some based on ancient wisdom) to mediate for these imperfections in developing more adept machines and more livable communities in our cities. This is the strength of the built environment as a physical, economic, and cultural mechanism in human society. To accomplish this, we have to avoid ill-advised design and planning decisions, which places something other than the human being – and the human scale – at the center of the design process. In doing so, we can and should do better for our built environments of the future, no matter the evolutionary course of our species.

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