

The Asclepius Machine: Spontaneous Genetic Mutation

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A NOTE TO THE READER ON THE USE OF THE TERM, *DISABILITY*

The use of the term *disability* throughout this paper is to enroll the reader within the mechanics of diversity, without flattening the contours of a highly differentiated social body. In contrast to the terms *multi-abled*, *handicapped*, or *physically challenged* that convey social acceptability, or in some circles morally correctness, are all qualifiers that flatten the debate. Scholars and experts active in contemporary debates within disability theory use the term *disability* to punctuate an otherwise undifferentiated conception of the social body. Within disability studies, there exist well-rehearsed critiques of semantic structures around the terms necessary for developing this discourse. This paper is not concerned with semantic structures in isolation, but rather seeks to co-produce the necessary attributes relationally. Semantics play a minor role in terms of the scope of interests outlined below. For purposes of communicating, the reader may elect to supplant disability with a term deemed more appropriate to the amplitude of the work.

The following suggest a range of interpretations and approaches on the subject of disability: (1) Aristotle's definition of what constitutes a complete human, whereby to be complete means to be fully charged with acute cognitive and physical faculties, therefore rendering children and disabled figures in antiquity as incomplete; (2) early 19th century clinical definitions for hysteria, manias, phobias and other cognitive diversions; (3) P. T. Barnum's freak shows featuring *subhumans* bought and sold in the entertainment marketplace; (4) Jerry Lewis' annual MDA telethons recounting the hardships

and challenges of muscular dystrophy, and the oppression of compassion; (5) the blue wheelchair iconography of parking tags designating space for the handicapped; and (6) the inevitability that disability will either temporarily or terminally affect one's life, all suggest a range of interpretations and approaches to the subject of disability. To claim the term *disability* is to identify nuanced differences, such neurological or genetic diversities, within the heterogeneous compositional dynamics of culture.

On the occasion of the 20th Anniversary of the Americans with Disabilities Act, and the terms of this conference, the Asclepius Machine, so named for Asclepius, ancient Greek god of the medical arts and healing; born of cesarean section, son of Coronis and Apollo; and serving as the seminal work within this paper, seeks to move in on the conference theme of taking stands, while addressing issues of bio-mechanical diversity in architecture's responsive extensions.

RELATIONAL STRUCTURE

The Asclepius Machine, spontaneous genetic mutation situates three acts through design, responsive civic infrastructure and research through making that explore the relational mechanics between genomics, responsive systems and urbanism by dramatically altering the perception of disabled bodies within the public sphere. The objective of this work is to reconfigure cultural codes through the production of spatial devices that cultivate an actionable, resilient and responsive design, thereby extending the operative range of architectural and human bodies in space.

Disability culture is among the more resilient and tolerant forms of social organization, yet remains under-subscribed by current design practices. Even as design acknowledges the responsibility to accommodate people with disabilities, it fails to invest the full spectrum of its project subjectively, responsively, aesthetically nor in terms of the city. The well intended ambitions of design to directly engage the subject of disability culture are shrouded in the mantras of universal design, design for all or access for all. In contrast, this proposal seeks to exaggerate the advantages of disability and open channels for design to generate unlikely spatial itineraries.

Organized in three acts, this paper examines the potential of architecture's capacity to inventively engage disability culture. Act I locates the work within the deep structure of architecture with an emphasis on mythological and archaeological formations of space. Act II establishes parallels between genetic mutations and biomechanics, exploring the spatial relationships between human and non-human actors. Act III situates public spheres and opportunities for a polyvalent culture to coproduce the performance of architecture, inducing a state of extreme urban euphoria.

INTRODUCTION

"When a disabled body moves into any space, it discloses the social body implied by that space" (Siebers 2008, 85).

The Asclepius Machine is an ongoing design research project situating architecture between civic and institutional structures that implicate a more inclusive conception of the social body. The research explores the relational mechanics between genetic diversity and urban infrastructure by developing architectural products that incorporate interaction design, sensor technologies and kinetic structures. This research emphasizes the social perception of disabled bodies in the passive spaces between civic and institutional thresholds. The objective of this work is to reconfigure cultural codes that diversify conceptions of beauty and pleasure in some of the more unlikely spaces of the city. By producing spatial devices that cultivate actionable, resilient and responsive structures, this project extends the operative range of architecture by enrolling a more inclusive spectrum of public constituency. This includes constructing relationships between urban

environments that integrate disability practices, and the quality of public health as a measure of cultural production. The Asclepius Machine seeks to mark the 20th Anniversary of the Americans with Disabilities Act by radically re-conceiving the architectural project within disability theory, culture, technique and aesthetic in terms of enlivening civic life.

The Asclepius Machine is an exuberantly designed accessible ramp and interactive biomechanical architecture for all people, especially for those who require assistive devices to ameliorate particular disabilities, especially neuromuscular disorders. In contrast to passive infrastructures designed only to meet minimum standards of building code compliance with little consideration for disability culture, the Asclepius Machine is a performative architecture, motivating a broad understanding of how cultural diversity contributes to and produces the vitality of everyday life.

The Asclepius Machine is to the 21st century what the arcade was to the 19th century—an animated passage, a civic infrastructure and a space capable of cultivating diverse urban experience and euphoria. In contrast to the passive labor of 20th century infrastructure, designed with singular understandings of fitness and beauty avoiding the extreme capacities of the human experience, the Asclepius Machine is a complex and interactive environment thriving among human, technological and mechanical diversity. Located between the scale of furniture and a pedestrian bridge, the Asclepius Machine animates and extends the operative range of human bodies and responsive structures. If assistive devices, such as electric wheelchairs or GPS enabled navigational systems for the sight impaired, are mechanical extensions of a sensing body, the Asclepius Machine is a biomechanical hybrid working between mechanized bodies and locative urban environments. Unlike most forms of accessible infrastructure, such as ramps and parking allotments, which only fulfill legal requirements, the Asclepius Machine is a performance vehicle, motivating a robust understanding of the contribution of genetic diversity to the vitality of everyday life.

The motivation for this paper is to coproduce urban machines and architecture that rethink civic infrastructure, genetic diversity and disability constraints, reworking the history of architecture as an

ancient form of locative media into a computationally pervasive device in the ephemera of urbanity. The project seeks to extend the range of architecture's capacity to enroll an intricate engagement of the public sphere to the extents of perception regardless of bodily ability. The objective of this work is to reconfigure cultural codes through producing devices, formal structures and pervasive environments to advocate for more actionable and responsive architecture, producing a wider range of civic paradigm.

The fear of pain, loss of civic identity and the dissociation of disabled bodies from social conceptions of beauty have incapacitated the agency of architecture to produce spatial models beyond what is typically expected from the instrumentality of design as a function of spatializing civil forms of governance. Given the prevalence of disability, any compliance based design-as-usual approach does more to isolate disabled bodies from the social body than it does to cross-connect and represent a more diverse array of a complex civic body. The disabled body is commonly perceived as challenged, is rendered incomplete and thusly incapable of achieving full spatial paradigm and participation in the public sphere. As suggested by Siebers, if a disabled body reveals the spatial limits defined by the social body, then to radically reposition disability as an art practice opens up the range of approaches for design excel beyond the legal and psychological restraints of compliance.

In *Madness and Civilization*, Michel Foucault chronicled the plight of disability in subsequent epochs as an actor gradually marginalized, institutionalized and incarcerated. The more technologically mechanized civilization became, the more clinically detached our relationships and capacities to tolerate extreme forms of social transformation. As such, more able bodies preconditioned the environment and legislated cultural codes to prohibit contact with the ground, moving in sync within a world of auto-mobile bodies, avoiding the crawler at all costs. This rendered the crawler literally and figuratively in the dust. Civilization has evolved into a series of constructed detours designed to avoid contact with the plight of the crawler. The invention of asphalt and its systemic deployment pervasive in urbanizing frictionless landscapes is part of the architecture of speed, hygiene and increased social distancing. Upon meeting on the street,

non-crawlers are often surprised and somewhat taken aback in the presence of the crawler (Fig. 1). This often generates feelings of unease and candid awkwardness. Though the crawler moves slower, crawling itself affords the opportunity to quickly cultivate other perceptual modalities with an uncanny ability to detect energies of the extreme unseen. With the slightest shift of the eyes, a single finger twitch or puff of air, the crawler adapts to the environment, though the so-called civilized world remains mostly oblivious to the effort.



FIGURE 1. ACTOR:CRAWLER, ACTANT: CRAWLING STICKS: These are simple hand stilts used to protect the hand as the body crawls over the surface of the city. Crawling sticks are a low-tech form of assistive technology extending the ground to the body. Detail from the painting, *The Fight Between Carnival and Lent* (Pieter Bruegel the Elder, 1559).

The Asclepius Machine seeks out terrain within the discipline where architecture has averted its attention, and overlooked some of the more complicated conditions of the epoch. In the area of responsive design and responsive surfaces, the interest in de-

veloping technologies has trumped clear and articulate applications for these interestingly complex apparatuses. By contrast, the Asclepius Machine seeks out various technologies within interaction design and applies them to enable and work within disability culture. Architecture is able to promote dialogue at every level of cultural production, yet struggles to attend, with enthusiasm, to the more pervasive or apparently perverse forms of social trauma between fitness regimes and disability culture. While sentiments of social justice and technological development compete for the attention of design, it is hardly worth it to dismiss one over the other, or acquiesce to any one singular position. To take a stand could attract attention around any practice that seeks to de-simplify the terms of its engagement, yet persist in the task of designing and daring to situate and construct space in the world without knowing the full effect of what the consequences might be, and the simultaneous after-effects yet to be invented.

The Asclepius Machine rethinks architecture with an emphasis on construction systems of affordance, sensation, configuration and formula. It is important to recall the crawler with regard to threshold, for it is no longer as reductive as a door to enter a room, but rather it is a sophisticated series of sequences, micro-narratives and physical encounters that are continuously negotiated in a world of standardized products designed exclusively for non-crawlers.

The work produces spatial itineraries, sequences, micro-narratives and physical constructs that resist standardized design for genetically atypical scenarios. The research pursues work that completely reconceptualizes the agency of architecture as a vehicle to deliver a wider representation of the instability of the social body punctuated by bodies with diverse abilities.

To locate issues of responsivity it is necessary to recognize the resiliency of culture and architecture to mutually adapt to difference and transformation. Resilience is often an after-effect in the face of situational or enduring adversities. Responsivity could be understood as an after-image of a strained body gradually recovering its amplitude and scope having been disfigured, or unmantled by some expressive force. Architecture is responsive in this capacity. As a material formation, architecture is the first objective targeted in war and the lasting

impression of collapse etched in the civic memory after an earthquake. That is, the fixity and corrective formation of architecture, indeed the degree of architecture to take a stand, is so hard-wired into the urban psyche that to see would otherwise be considered a type of urban disability, or what I am calling spatial or urban pathography.

Urban pathographies draw out difficult conversations, complex figures and clinically minded assumptions residing under socially held concepts of beauty and appropriate performance. Pathography is necessary in exploring the structures and mechanics of cultural evolution and should not be confused with the pathetic or pathogens rendering contaminated spaces or plagued bodies. The accounting of spatial pathography coproduces the terms for architectural mutation through mythological, technological and cultural structuring to propagate more resilient infrastructural and architectural vehicles capable of receiving and responding to a wider conception of the social body. This may suggest ways of developing the work that directs attention away from the primacy of the object into what is volunteered or affected within an urban network. These are the meta-structures of architectural extensions, the actants or actor-objects and the agencies of human and non-humans alike. The degree of affinity when one detects the transformation or threshold from one actor network cascading into another.

ACT I: MYTHOLOGIES AND ANCIENT EVENINGS: COMPRESSION OF DEVELOPMENTAL TIME

Crawling through the city has evolved from an acceptable social practice to a pathological and uncivilized practice. Genetically fit species continuously precondition the contemporary environment to prohibit contact with the ground. The genetically fit move in synch within auto-mobile bodies, avoiding the crawler at all costs, and leaving the crawler literally and figuratively in the dust. Pathographic space is a series of detours that render non-typical genetic structures and bodies out of civic space. This has resulted in geographies of extreme genetic distance, spatially and culturally. This research aims to inject a more radicalized design agenda into the discourse to vivify and test architecture's capacity to enroll a more intricate understanding of the public sphere by incorporating a highly differentiated social body into the primary region of program.

Forced by circumstances beyond individual control, the urban crawler invented crudely crafted appendages using simple tools and materials to increase mobility, enhance mechanical sensation and improve the quality of daily life. As an agent close to the architecture of the ground, the crawler gained a unique temporal perspective through negotiating a network of clipped actions, and quick glances of things passing by; seeing every step of the walker as an act of catching just before falling, and assimilating seemingly random scenes unfolding as they accelerate and decelerate in space.

Depicted in the urban landscape of Bruegel's painting, *The Fight Between Carnival and Lent* (1559), architecture plays a passive role in situating an un-sentimental attitude toward the extreme range of animated characters, actors and objects. Cultural perversions such as drunkards commingling with children, or revelry in the midst of abstinence, are qualities that arrest a presumably more civilized and cultured audience. It is the simultaneity of difference without the collapse of civic enterprise that represents a culture that makes no glaring distinctions between disabled or able bodies, permitting a broad schema of genetic diversity and social interest to thrive. In the current epoch, where the cultural code is tightly legislated, self-regulated and homogenized, the world of Bruegel appears excessively and euphorically differentiated.

Act I establishes a historical and mythological genealogy on behalf of the Asclepius Machine and anticipates future architectural speculations in kind. This invites a conversation beyond the mechanics of design research, and takes it to task within other realms such as the health and applied sciences. Architecture responds and sends signals, but has not generated enough audience to consider this activity beyond effects.

INTERMISSION

This section of the paper has been left intentionally unresolved due to its ethical bearing around debates residing outside the constitution of appropriate architectural discourse. Back stage, murmurs can be heard as the chorus deliberates the fate of Dr. Peter Singer, Ira W. DeCamp Professor of Bioethics at Princeton University. Should an individual have the right to infanticide given the clinical evidence of a profoundly disabled biological or human entity (fig. 2)? The objective of occupying the in-



Figure 2. Harriet McBryde Johnson and Dr. Peter Singer debating bio-ethics of deleting or propagating genetic diversity.

termission with the chorus debating the fate of the applied ethicist, Dr. Peter Singer, is meant to challenge (the author) with the difficulty of coproducing the terms and questions circulating in disability theory and develop spatial material strategies through architecture. The worth of the Asclepius Machine is measured in its capacity to enroll the mechanics of its production within a lively debate in bioethics, while simultaneously volunteering platforms for spatial engagement and formal performance that work themselves into unknown cultural terrain beyond analogy.

ACT II: SPONTANEOUS MUTATIONS AND GENETIC DELETIONS: SIMULTANEOUS INVENTION [WORKING AT A DISTANCE]

The Asclepius Machine works both locally and at a distance. Structurally, 24 frames support the ramp that forms a loop at its midpoint (fig. 3). Half of the frames have levers that are controlled by pairs of pneumatic air muscles. Similar to our own body mechanics, one muscle contracts while the other extends, operating a lever. This action modulates a composite roof cladding system of translucent polymer panels and elastic membranes. Mechanically, a series of shape memory alloy sensors are embedded in the ramp floor. As each sensor deflects under the load of an individual, a signal is sent to a microprocessor that controls a solenoid regulating air pressure. Pressurized air is delivered to and simultaneously evacuated from the pair of air muscles. Grooves are milled in the handrail

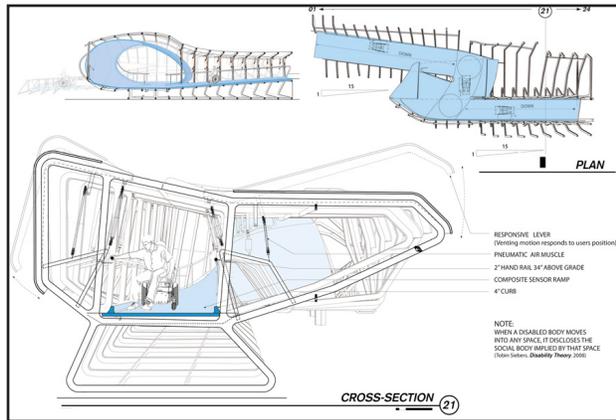


Figure 3. Longitudinal section, plan and cross-section of the Asclepius Machine.

to indicate location along the ramp for the seeing impaired. Local telemetry measuring precipitation and wind speed allows the structure to be tuned to the nuances of the atmosphere, and secured in the case of extreme weather. Sonic pings attract attention via global positioning and urban way-finding. Working at a distance, via web interface or handheld device, a remote operator can perform the machine like a large musical instrument. The Asclepius Machine is a locative apparatus saturated in the cultural codes and formulas of genetics, computation and new means of civic communication.

The project situates disciplinary agendas and acts of making that explore the relational mechanics between genomics, architecture and urbanism with the goal of extending the operative range of the body regardless of ability. The agency of the genomics project exists in the computational exactitude necessary for measuring complex regulatory sequences of DNA structures. Measurements of genetic uncertainty trigger special attention to anomalies such as spontaneous mutations or genetic deletions that augment structural ordering often transforming the performative capacities of the organism. This project elaborates on, and in a sense scales up, regulatory sequencing beyond the analogy of genetics to the scale of architecture, especially as a component-based assembly of interactive conjugate objects, or objects that are capable of two or more modes of work. How do acts of making architecture, building components, bodily devices, responsive skins and surfaces begin to extend or compensate for genetic anomaly? Do spontaneous mutations necessarily

implicate the degradation of the body, or can they become vehicles to expand what might be possible in establishing a correspondence with new forms of extreme urban euphoria?

ACT III: EXTREME URBAN EUPHORIA: THE ASCLEPIUS MACHINE

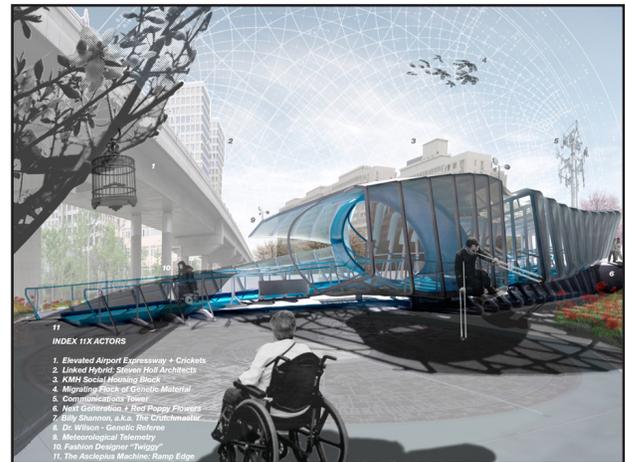


Figure 4. The Asclepius Machine located in Beijing under the Airport Expressway, and between Steven Holl's *Linked Hybrid* and the social housing block Qing Shui Yuan.

The relational structuring of the project is complex and requires attention to aesthetic and operational responsibilities. The Asclepius Machine is a highly charged structure that is situated in the background context of the city. For example, it replaces complacent structures that link civic realms with the institutional protocols involved in the management of everyday work. What was a primitive surface, a simple bridge or sidewalk, is now charged with a deeper responsibility in producing civic enterprise. Extreme bodies demand extreme architecture; the art of movement. A parkour actor trips through the frame intersecting the path of a person immobilized by a spinal cord injury. A vertigo of events is distributed across mechanically inclined bodies that do not know what they might become or the spaces they may inhabit. The lighting is electric blue like an airport runway at dusk. A hissing sound of an air muscle inflates changing the rate of our own respiration. The ramp surface of the passage twists up looping over our heads. Though anchored to the ground, a brief moment of weightlessness is induced.

Mimicking the movement of the body, the structure opens and closes in synchronization with the mov-

ing actor (fig. 5). For those with neuromuscular disorders, such as muscular dystrophy, a disease that decreases muscle mass and function, the Asclepius Machine is conceived as a surrogate mechanized body that generates energy through the fragility of the physical body. The Asclepius Machine renders new urban space that reconceptualizes the agency of the social body, implying a more tolerant, diversified and euphorically inclined civic body from the vantage of disabled bodies that have taken stands and staked out positions long ago.

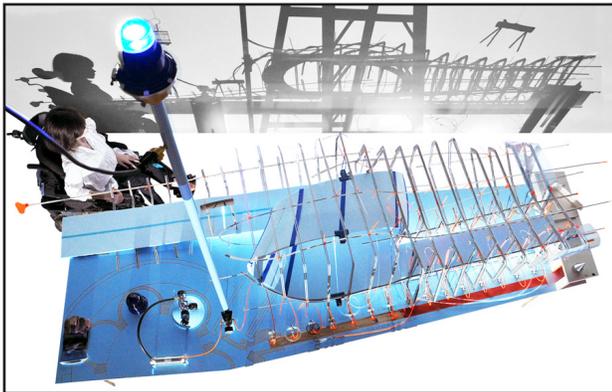


Figure 5. A 1:10 working prototype of The Asclepius Machine with Celeste, daughter of Asclepius. For 5665.

CREDITS

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ENDNOTES

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