Messages sans codes: colossi, laser scans and the form-makers’ angst

Steven Fleming

The University of Newcastle, Newcastle, Australia.

ABSTRACT: 3D form capturing, using laser scanners, has the potential to impact architectural form-making the way photography once impacted the making of 2D images. To illustrate, it would be possible to take a scan of a particular person’s body and face, reformat the scan as a CAD file, then add floors, stairs and lifts to produce a computer model from which CAM technology could then extract information necessary for manufacturing a human-shaped building. In this paper, some cultural factors behind architects’ wariness of technology capable of usurping their role as form-makers, are brought into focus through a discussion of the colossus, that type from their own tradition most capable of igniting architects’ ire. Factors behind their reticence include: (1) prejudices deeply rooted in Modernism, traceable ultimately to Plato’s views on mimesis; (2) pejorative associations with amusement park fixtures and tourist traps; and (3) fears colossi built for profit might diminish those serving more civic functions.

The technological capacity to replicate our bodies as buildings, has come just when colossi are deemed to be tasteless. In antiquity, The Colossus of Rhodes emblemised the technological brilliance of its sculptor, Chares of Lindos, while a key Renaissance treatise describing architectural elements that even today would be considered high-tech, lists among them an inhabitable colossus. The liberalism of past eras, in which we can imagine form-capturing technology being readily embraced, invites us to rethink the revolutionary potential laser-scanning could have on the creation of architectural form.

INTRODUCTION

Architects often draw on shapes in the physical world for inspiration. Cliff faces, tree branches, microscopic organisms, soap bubbles, and countless other shapes have been translated into architecture. As our technological capacity to replicate forms has progressed, the imitation of natural forms, by architects willing to embrace technology, has in recent years become increasingly literal; but why do architects seem unwilling to make their work absolutely mimetic? What compels them to abstract shapes from nature, when they could simply copy them outright? At what point do questions of taste and civic decorum intervene and stymie technology?

The present paper approaches these questions through the consideration a hypothetical building, an office tower in the literal shape of a particular person. The aim is to hold up a conspicuous, perhaps absurd straw man, to tease out issues of taste surrounding the use of CAD, CAM and in particular 3-D laser scanning, as they could be used in the creation of biomorphic architecture.

1. WHY NOT BUILD TOWERS IN THE SHAPE OF OUR BODIES?

In its three dimensional shape The Statue of Liberty in New York Harbour is a literal representation of a contra-postural human, raising one arm. As he describes it, Daniel Libeskind’s competition winning version of Freedom Tower is a contra-postural, reaching, and very large version of The Statue of Liberty, though greatly abstracted. Libeskind’s building still looks like a building, which is to say it follows the conventions of building, insofar as building is regarded as an enterprise wed to straight lines: straight lines of force to the ground; the straight alignment of brick upon brick; the use of straight lengths of steel or of timber; straight shafts for the passage of lift carriages; straight, or planar façade systems; and straight walls and rooms for furniture to align to. However, many of the age-old reasons for straightness in buildings have been abrogated by such technologies as Computer Aided Design (CAD), its industrial corollary Computer Aided Manufacturing (CAM), and engineering tools capable of calculating forces in every kink, curve and camber of a non-linear structure. The landmark event in this architectural paradigm shift, was the unveiling of Frank Gehry’s Guggenheim Museum in Bilbao. Since then, works by Peter Cook, Future Systems, Lars Spuybroek and others have shown that habitable, fully functioning buildings can have any shape at all. If buildings can be any shape, why—for argument’s sake—can they not be in the literal shape of humans? Why should a Freedom Tower in the literal shape of a human, be completely unthinkable, when the realisation of such a building would be prohibited by a lack of money, not know-how? These questions acquire added poignancy in the light of 3D laser scanning technology, that could—as an example of its power—capture individual’s forms, even their facial features, and use these as patterns for buildings.

Examples of human shaped cities and buildings, though sporadic, are sufficient in number to suggest that among designers and patrons, an impulse is likely always to exist—at least in a few—to build in the literal shape of the body, not only sculptures, but inhabitable buildings as well. The oldest and most famous colossus, the one which marked the entrance to Rhodes Harbour from 280-226 B.C., is believed to have been fabricated in brass and iron. Though it would have been hollow, no records exist to suggest it was also inhabitable. The first account of an inhabitable work in the
literal shape of a human, is found in Vitruvius, who describes a fourth-century B.C. proposal by the architect Dinocrates (coincidentally, also of Rhodes) for a man-shaped city on Mount Athos. As it was to have been represented lying on its back, the human form conceived by Dinocrates could not have been readily discerned from vantage points anywhere on the ground. The idea that colossi, of the inhabitable variety, could ever be erected vertically, seems always to have remained too far fetched even to be theorised.

In recent years too, architects who have indicated how their colossi might actually be realised, have generally only done so with "Gulivers"—colossi strewn on the ground. For example, the designer Gaetano Pesce has built detailed models of proposals for horizontal colossi in Les Halles, Paris, which indicate parallel wall planes intersecting regular floor plates, in such a way that each buildings’ exterior attains the plastic form of a human figure (Vanlaethem 1989). Models of R. Porro’s proposal for a resort on the Dalmatian Coast, while not offering so much interior detail, suggest low-rise archucated forms were envisioned, forming the shape of human in a lying position.

Nigel Coates has come closest to building an upright, and inhabitable colossus. His ongoing interest in literal anthropomorphism is evident in his 2007 work Mixtacity, a sprawling scale model of The Thames Gateway East of London, festooned with pieces of bric-a-brac (cotton reels, vases, chess pieces) plus an assortment of figurines, all representing high rise buildings in the literal shape of these objects. Previously, with his full scale installation built for millennium celebrations housed within London’s Millennium Dome, Coates scanned two sitting models, fused them, then made a plaster model that he sliced into segments, from which he then patterned equally spaced structural ribs. While he worked from captured forms, his insistence on manipulating them—first by morphing two bodies, then by translating them into plaster—betrays Coates’s attachment to traditional expectations that architects must always create architectural form, and that merely capturing and reproducing forms from reality does not involve the kind of creative input, or cultural encoding, that is expected of architects engaged in the generation of form.

It is tempting to ask if the above examples point to an office tower or apartment block, in the shape of an upright human, some time in the not-too-distant future; but postmodern reticence regarding meta-narratives cautions us not to speculate about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered some time in the not-too-distant future; but postmodern reticence regarding meta-narratives cautions us not to speculate about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals. Isn’t it through paper works—works not about future events in this way. What we nonetheless should do, is ask why more architects have not already considered such an application of recent building technology, in their unbuilt proposals.

Arguably, we are not seeing paper colossi (to which the aforementioned examples all seem to point) due to cultural reasons. The technology is able, but the culture does not appear to be willing.

One cultural factor impeding the theorising of inhabitable colossi, can be seen in architects’ use of the words “literal” and “abstract”. Architects speak of literal representations (big Merinos, big Oysters—two Australian examples) as though they are feebile, while representations that are abstracted—beyond recognition, preferably—retain an air of sophistication. Abstraction, it is assumed, behooves the profession. Abstraction behooves labels like “architecture”. Literality, on the other hand, belongs at the fair ground. Nigel Coates’s colossi were tolerable only because they were housed within a circus big-top of sorts.

But abstraction has not always been preached like a dogma. Consider Louis Sullivan, who enthusiastically adorned the masonry facing of his buildings with literal representations of foliage, and this despite his place among the pantheon of Modernist heroes credited with inventing an architectural style that celebrated each building’s internal logic. This aspect of Sullivan’s work is consistent with an attitude toward literal imitation before Modernism, when mimesis wasn’t feeble, but orthodox. Acanthus leaves became column capitols. Rather than deriding faithful copies of ancient relics, architects and critics spoke of “archaeological correctness”, especially as the concept applied to Greek and Roman revivalist works.

Given the enthusiasm for literality in all prior centuries, it is worth considering the origins of twentieth-century prejudices, that would cause us to hold abstraction in higher regard than literal forms of mimesis. A succinct, if dismissive explanation, can be found in the writings of the French political philosopher of art, Jacques Rancière, according to whom mid-twentieth-century artists in all fields, if they were self-consciously Modernist, exchanged concerns about meaning and representation for an aimless search for the unique essence of the medium within which they were working (Rancière 2004). Rancière is principally referring to minimalists: minimalist poets who liberated words from the need to communicate; playwrights like Samuel Beckett, whose epidemic Break runs for just 37 seconds, and; minimalist painters, for example Mark Rothko, who conceived paintings reduced to pigments on two-dimensional surfaces. Essentialism in architecture meant buildings reduced to volumes and planes; Richard Neutra’s Kaufman House and before it Mies van der Rohe’s Barcelona Pavilion, were conceived with this mindset. The Modernist tendency to go on abstracting until only that which is essential to the medium remains, has been so influential that the sensibilities of even the most radical postmodernists, or anti-Modernist architects, might still be affected.

While the twentieth-century marked a sudden reaction against literal forms of imitation, the philosophical seed of that paradigm shift, in one sense, had been lying dormant since Plato, whose famous Parable of the Bed Maker in Book X of The Republic tells painters not to represent things they see in the visible world. For Plato, the world we experience with our senses is an imperfect adumbration of a world that can only be apprehended using our intellects. Their attachment to the sensible world causes people to act without reason—as they did when killing Socrates, Plato’s mentor and the force behind much of his thinking. If the particular things we see around us are merely confused copies of transcendent entities, that we rarely stop to think about, then representations of visible things must only be copies of copies. Seeing a painting of a bed trains the viewer’s mind upon the sensory realm, that Plato would urge him or her to see past.

ANZAScA 2008 Conference Proceedings
An architect taking inspiration from Plato’s parable of the bed maker would most likely identify with Plato’s figure of a craftsman who, according to Plato, would never make recourse to previously existing beds, but rather look to a purely intelligible Idea, *The Bed Itself*, when conceiving the details and form of his beds. Such is the thinking behind Quatramère de Quincy’s theory of building types (Lavin 1992). It is a kind of thinking that reaches its twentieth-century apotheosis in Louis I. Kahn’s theory of form and design (KAHN 1961), a theory that advocates first-principle reasoning over imitation at every stage of the design process, beginning with programming. While architects like Kahn continue to inspire those after them with quasi-platonic appeals to inventiveness as the *sine qua non* of architectural form making, the colossus—a building type whose shape can be captured from nature, with no invention, no abstraction, and no cultural encoding—has little chance of being taken seriously by architects. Instead the genre seems doomed by associations with signs marking tourist traps.

In countries where crass commercial development is outpaced only by the making of highways, colossi are more likely to notify drivers of exit ramps, than they are to house lettable floor space. *The Golden Driller* in Tulsa, USA, is a paradigmatic and especially large example. Built for the International Petroleum Exposition of 1953, then repositioned in 1966 to the Tulsa Expo Center where it now stands as an icon and sign, *The Golden Driller* has a piñata-like air, as though it was constructed only to be demolished shortly thereafter. It has the anatomical finesse of something a child might make from play-dough and, like most big anthropomorphic signs, promises souvenirs not worth keeping and food not quite fit to swallow. For those with memories of trips to Luna Park, the idea of a colossus is likely to evoke memories of having their own selves swallowed, by gaudy heads built as gateways over turnstiles. Such examples of human shaped buildings, diminish the enterprise of erecting colossi. We have Western consumer culture to thank for these and the other pejorative associations we attach to buildings in the literal shape of people.

But in countries where capitalism is yet to attain the same level of brazenness as it has in the West, and where colossi serve votive or nationalistic purposes, the thought of a building in the shape of a person may not automatically cause people to cringe. The world’s largest and most noble colossi are to be found in Asia and Eastern Europe, and many of these have been built within recent decades. The giant Buddha figures *Ushiku Daibutsu* (1995) and *Awaji Kannon* (1989) in Japan reach respective heights of 110m and 88m. These structures attract pilgrims, not drivers just looking for toilets. China has since answered Japan’s efforts with the *Spring Temple Buddha* (2002), *Nanshan Haishang Guanyin* (2005), and the *Grand Buddha* at Ling Shan (1996), at 128m, 108m and 88m. All have achieved instant status as sites of significance to Buddhism. Meanwhile, in Eastern Europe, the colossus as a type is synonymous with nationalistic monuments, celebrating victories in war. In Russia *The Mamayev Monument* or “mother motherland” commemorates The Battle of Stalingrad. At 85m, it was the world’s tallest statue when completed in 1967. Not to be left out entirely, Ukraine has since built her own *Mother Motherland* (Figures 1 and 2). Completed in 1981, it is 62m tall, and might have been taller were her sword not artificially shortened in deference to the height of ancient churches nearby, that were deemed more important. Like New York’s *Statue of Liberty*, Ukraine’s version provides interior access to an observation level, though neither are inhabitable in a real-estate sense.
Also noteworthy is The Statue of Liberty’s size relative to that of the statues mentioned above. Being just 46m tall, it is dwarfed by them, as well as by 23 other statues worldwide, in such unlikely countries as Taiwan and Myanmar. The colossus, today, is a non-western phenomena. In countries like China and Ukraine, where larger and more recent examples come to mind than they do in the West, colossus-building would be held in higher regard than it is now in America, where a national bronze moment to the idea of liberty, has been forced to compete, in the size stakes, with that country’s “quirkiest destination”, as The Golden Driller was named in ’06 (Tulsa’s Golden Driller Honored 2008).

Despite her puny size by world standards, The Statue of Liberty continues to loom so large in the consciousness of Americans, and those in countries most influenced by America, that many people would automatically presume her to be the world’s tallest statue. For someone holding that assumption, about such a revered statue, a privately owned and much larger building in the shape of a person, might be unthinkably audacious and thus a ready target for associations with The Golden Driller or other big things. In Asia and Eastern Europe too, for-profit colossi might well be resisted if it was thought they might dwarf religious and national monuments, and thereby devalue them.

At many intervals throughout history, societal values have dictated what applications may, or may not, be imagined for technology. Technology can lead people to think the unthinkable, that the Earth might orbit the sun for example, and we can see, by the way Galileo was punished for having used a telescope to make the deductions he made, the power societal values wield over science, technology and individuals’ imaginations.

In her commentary on the Renaissance period architectural treatise, The Hypnerotomachia Poliphili, Liane Lefaivre refers to the “cold thinking” of every period prior to The Renaissance, when “hot thinking” prevailed, and she infers that no subsequent era has produced such hot thinkers as Alberti (The Hypnerotomachia Poliphili’s author, Lefaivre argues), thinkers who were so much more interested in what could be, than what should be (Lefaivre 1997). Whoever authored The Hypnerotomachia Poliphili, hot thinking allowed them to imagine buildings in which Egyptian and Classical motifs collide in ways that prefigure, and go beyond, the radical eclecticism of contemporary architects like Robert Venturi. Hot thinking allowed them to imagine high-tech wizardry—for example, doors hinged by magnets—that is just now being pursued in realised buildings. Hot thinking allowed Alberti, or who whoever wrote The Hypnerotomachia Poliphili, to imagine buildings capable of copulation, an idea only recently revisited in the theoretical works of architect John Hejduk (Hejduk 1995). However, the passage from The Hypnerotomachia Poliphili that in some ways seems most off-the-wall, is the following word portrait describing an inhabitable colossus:

More than a latent distaste for literality, or pejorative associations with tourist traps, or fears colossi might mock cherished monuments, it could simply be that the colossus (an obvious application for technology just waiting at the ready) has been rendered unthinkable by our present cold thinking. The remainder of this paper reflects on what might be called hot thinking on the part of the present author, who used a 3D laser scanner at The School of Architecture and Built Environment at The University of Newcastle, to map his own body, as the first step toward modeling a hypothetical office tower in his own precise image.

2. HOW TO BUILD TOWERS IN THE SHAPE OF OUR BODIES.

The argument thus far, has concerned the will to build inhabitable towers in the shape of real people. Colossi have been built and/or theorised with sufficient consistency to suggest a client might exist somewhere, either now or else soon, with the means and desire to patronise such an enterprise, if only they could find an amenable and capable architect. The aim of the remainder of this paper is to show that amenability might count for more than expertise, because the expertise to scan human forms and enlarge them as buildings, is already within the reach of most architects.

The scanner that was used by the present author to survey his own body, was the RIEGL LMS-Z420i 3D terrestrial laser scanner. This tool is marketed in Australia as a surveying tool, principally to the mining industry. Trained upon a quarry, it will ascribe an X,Y and Z coordinate to thousands of points on the quarry wall surface; tens of thousands if the scanning resolution is increased. The raw data can be displayed on a computer monitor as a mist comprised of fine points, referred to as a point-cloud.

Other applications for this technology include the scanning of historic streetscapes (Murphy et.al., 2008), and the creation of an ultra fine 3D model of Michelangelo’s David by researchers from Stanford University (Levoy et.al. 2000). Laser scanning was used in the making of the film clip to the song “House of Cards” by the British band Radiohead; in that case, low resolution scans were made using multiple lasers capable of scanning the singer’s face many times per second, to produce images that could be played back in real time.

As 3-D laser scanners cost more than most luxury cars, few architectural firms are likely ever to purchase such items. However, the rapid uptake of 3-D laser scanning by an allied profession, surveying, will soon place architects in a position where they could have bodies scanned and modelled, as readily as they can obtain surveys of sites. It is
conceivable that, within a few years, any architect could ask a local surveyor to carry out the procedure outlined in the following paragraphs.

To understand the exercise that was undertaken at The University of Newcastle, one should imagine two point-clouds: a scan of the front, and a scan of the rear of this author (Figure 3 and 4). These point-clouds were brought together to form a whole 3D model, rather like the halves of one hollow Easter egg. The amalgamated point-cloud model was then imported into Auto-Cad—a program that is able to receive files comprising multiple XYZ coordinates—where it was sliced horizontally into 150 cutlets of equal thickness, that would each form the pattern for an office floor, in a tower 150 floors high.

While the exercise stopped short of a complete Auto-cad model of a building, complete with lift-core and structure, it nonetheless highlighted issues effecting the capturing of live human forms for the purpose of replicating those forms in architecture. For example, it highlighted the need to scan live subjects quickly, at a low resolution, due to the fact that live subjects cannot remain utterly motionless; even when scanned in the most cursory manner, the cutlets on which plans were then patterned remained cloudy and nebulous. This did not pose a problem in low sections, through the ankles or lower legs, for example. It was in the higher regions of the figure, the head and the chest, that factors such as respiration and unavoidable body sway effected the accuracy of the scans.
There are of course ways of eradicating inaccuracies caused by swaying and breathing. Scanning can be undertaken using plaster figurines, cast using moulds patterned from subjects’ actual bodies. However, the logistics of making moulds from live humans does not allow for the adoption of natural poses. A cast would have resulted in what historians of Greek art might call a server pose, after the Server Period that prefigured Classical Greek art. Casting would capture more detail, which might be beneficial, were such details as wrinkles on a subject’s elbow or neck not superfluous to the end result. The advantage of scanning is that it captures a figure’s overall expressiveness, or state of repose.

Likewise, consideration might have been given to employing a sculptor, to produce a plaster or wax figure that would have remained static while being scanned. The problem with that option, is the sculptor’s figure would have been his or her interpretation of the subject’s body, not a pure replica. What is so appealing, and potentially revolutionary, about combining 3D laser scanning, CAD, and ultimately CAM to pattern buildings on things found in nature, is that the process...
can make architecture that is akin to photography. A term Roland Barthes devised to explain photographs, "messages sans codes", would perfectly describe buildings requiring no cultural coding in the making of their shapes. In the case of towers modeled on people, what Barthes calls a photograph’s quasi-tautological relationship between signified and signifier (Barthes 1964:42) would subsist between the colossus and the body it was patterned on.

Architects could be forgiven for feeling wary of laser scanners. Previously, only architects were able to translate the beauty of nature into wall planes and roofs, as once only painters could translate scenes onto canvas. Now laser scanning, coupled with CAD and CAM, can capture and replicate. It is too early to predict what will or will not be done with the technology, now that the pieces exist to ostensibly "print" forms captured elsewhere. All we can do is check ourselves before saying technology should not be used in the ways that have been considered above. Bemoaning the architectural form-making potential of laser-scanning, would be akin to saying 2D images should never be made using cameras.

REFERENCES
Hejduk, J., Architectures in Love: Sketchbook Notes, New York: Rizzoli, 1995