

## EYE-TRACKING BOSTON CITY HALL TO BETTER UNDERSTAND HUMAN PERCEPTION AND THE ARCHITECTURAL EXPERIENCE

**Ann Sussman, Janice M. Ward**

Geneticsofdesign.com, Concord, MA, USA

**Abstract.** Learning how architecture impacts human perception can help us understand how civic monuments bring us together or drive us apart, create community cohesion and identity or the reverse: anomie, placelessness and the fragmentation of the public realm. Boston City Hall and Plaza, an urban renewal project from the 1960s, intended to revitalize a historic American city, makes for an excellent case study to see how buildings impact us and in this instance, promote ‘avoidant’ behavior. This pilot-study shows the power of one biometric tool, an eye tracker, to quickly reveal how the City Hall architecture does not fit human evolutionary predispositions, implicitly turning people away — and always will.

**Keywords:** *architecture, urbanism, design, eye tracking, fixations, evolution, conscious and pre-attentive processing.*

**Corresponding Author:** *Ann Sussman, Janice M Ward, GeneticsofDesign.com; ArtScape/Bradford Mill, 43 Bradford St., Concord MA 01742, USA, Tel.: 978 790 7776, e-mail: [annsmail4@gmail.com](mailto:annsmail4@gmail.com); [Jward@acanthi.com](mailto:Jward@acanthi.com)*

**Received:** 2 April 2019;

**Accepted:** 29 April 2019;

**Published:** 28 June 2019.

### 1. Introduction

Piazza del Campo in Siena, Italy and Boston’s City Hall Plaza are often cited as the best and worst of what architecture can be, (see Figure 1). The Italian piazza with its crenelated city hall and tightly-aligned buildings has invited public gathering and acclaim for centuries, frequently making *best in design lists* (D’Alessio, 2016). Boston’s 50-year old plaza, on the other hand, an urban renewal project from the 1960s, has never lived up to its promise. Instead, one can find it listed as one of “the most disappointing places in America,” (Project for Public Spaces, 2002) and even calls for its demolition (Renzas, 2012).

Why is this? The question has been studied extensively. Researchers have carefully analyzed Boston City Hall Plaza for years, including in graduate school theses (Helfand, 2009) and recent Tufts University planning classes (Wu, 2016). In 2015, Boston’s then-new Mayor, Marty Walsh, launched yet another initiative (Quinn, 2015) to find ways to improve the look, feel and function of his workplace.

So, why does Boston’s Government Center fail from a public perspective? Frequently mentioned strengths of the Italian versus the American counterpart, which remarkably enough, was inspired by its historic counterpart, (Helfand, 2009) are listed in Table 1.

## Piazza del Campo



## Boston City Plaza



Photos: Courtesy of Wikimedia

Figure 1. Piazza del Campo and Boston City Plaza

Table 1. Strengths of Piazza del Campo versus Boston City Plaza

| Piazza del Campo, Siena, c. 1349   | Boston City Hall Plaza, MA, c. 1968   |
|--|---|
| <ul style="list-style-type: none"> <li>• Pedestrian friendly access to and within the plaza;</li> <li>• Buildings and plaza scaled for people with safe, obvious places for gathering;</li> <li>• Destinations for all, such as shops, eateries;</li> <li>• Protected from vehicular traffic; cars banned from central city;</li> <li>• Open, yet has awnings for shelter; distinct edges, clear exits.</li> </ul> | <ul style="list-style-type: none"> <li>• Not-very-pedestrian-friendly access to site and uncertain circulation path within;</li> <li>• Buildings and plaza not human scaled; no place really feels safe; no gathering spots beckon;</li> <li>• Few destinations such as shops, eateries;</li> <li>• Unprotected from vehicles to east, west and south;</li> <li>• Open design offering little shelter or well-defined edge-conditions.</li> </ul> |

Our research suggests there is something more. Indeed, to make sense of Boston City Hall Plaza today, we think you first need to ask *really basic questions* — like these:

- How do people actually take in the place?
- Where do they look when they are there?
- What draws their eye initially, then second and third?

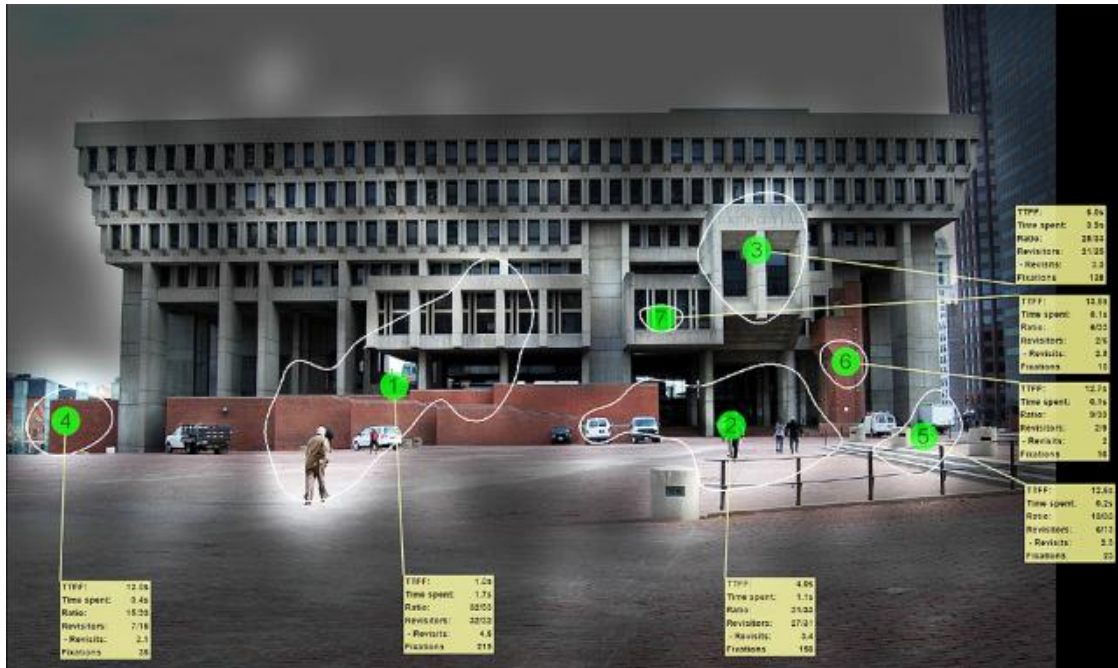
Using biometric tools, such as *eye tracking*, which measures our conscious and ‘unconscious’ eye movements as we take in visual stimuli, and is frequently used in advertising and web design, we can now do so, efficiently and inexpensively (Sussman, Ward & Hollander, 2018). So, what happens when you eye track Boston City Hall?

Much more than we expected. In fact, it took us a while to understand our findings; but after running four pilot-studies, (Sussman & Ward, 2017) eye tracking more than 150 buildings both within and outside Boston over two years, we can now report with some authority:

*Boston City Hall and Plaza fail to attract the public because the building and surrounding spaces don’t provide the **fixation points**, or places to maintain visual gaze (Krauzlis, 2017) in the first 3-5 seconds the brain needs to see (that’s during **pre-attentive processing**, before the conscious brain can get into the act), to most easily regulate, feel at its best, and effortlessly move us forward.*

It was astonishing for us to ‘see’ how difficult it was for people to actually look at, or ‘fixate’ on *any part of the building*, even with its picture on a monitor placed

directly in front of them. Check out two of the images from our study below. Note where people look: at City Hall's edge conditions, at other people, at vehicles in the vicinity. Only at six (6) seconds in did viewers, not all, but 75% of them, look directly at the building — apparently, the high contrast large black windows with the engraved letters above catching their eye. After that, almost half the participants (15 of 33) quickly looked away to focus on outermost edge conditions again. See Figure 2.



**Figure 2.** Eye Tracking Boston City Hall and its Plaza

The *shadow study* above shows eye-tracking results from our first pilot-study (Sussman & Ward, 2016) of Boston City Hall using *iMotions* biometric software (imotions.com). It aggregates data from 33 viewers and glows brightest where people looked most, fading to dark grey in areas ignored. *Note how much of the building and plaza are in the dark, the unconscious (pre-attentive) brain directing people away from City Hall.* This is hugely significant, revealing right away how difficult it is for people to take in the building. The brain simply does not want them to go there. The green-circled numbers above show seven areas of interest (AOIs) that drew the attention of study participants sequentially. Yellow boxes highlight more eye-tracking metrics.

### ***The Metrics***

*Fixations* is where eyes stop to focus. The length of time it takes people to focus is *Time to First Fixation (TTF)*. *Time Spent* is what it sounds like — length of time spent focused. *Ratio* compares the number of people who gazed at an area over total number of participants. *Revisitors* refers to the number of people who looked away and looked back at an area; *Revisits* are the number of times they went back to a same spot.

Figure 3 shows the Fixation Sequence (1 - 7) Boston City Hall (front elevation).

- 1- By 1.3 seconds, 32 of 33 participants look at the area with a person and through an opening in City Hall to light beyond, (humans are hardwired to look for people and areas of high contrast without conscious effort).
- 2- Next, 31 of 33, focus on a second group of people and high-contrast area; gaze again appears directed *through* the building rather than *at it*.
- 3- 25 of 33 then apparently move to study the text and contrast provided by the elevation's tallest punched windows; significantly, this happens at 6 seconds, when more of 'conscious' brain may come online.
- 4- 15 of 33 then notice a side wall against the skyline; (as mammals, we innately seek out well-defined edges, it's a survival strategy).
- 5- At 12.6, 13 of 33 shift focus to a person and trucks in the courtyard.
- 6- 9 of 33 focus on high contrasting section of brick wall, slightly above trucks.
- 7- At 13.6 seconds, 6 out of 33 finally looked at an almost centrally-placed location on the City Hall building, high-contrast windows above 2nd fixation point; our bifocal vision favors looking at things centered in front of us, so this move seems to take a while.

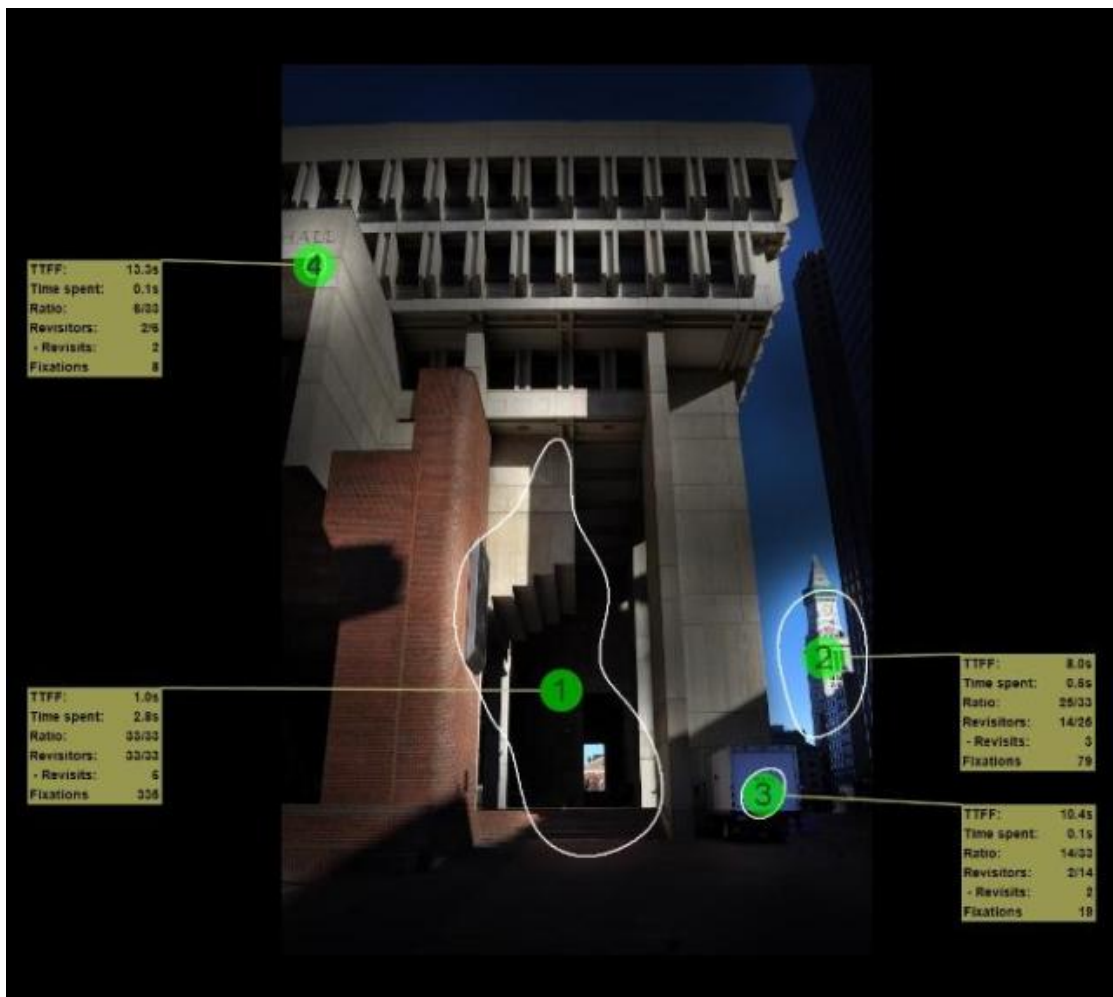
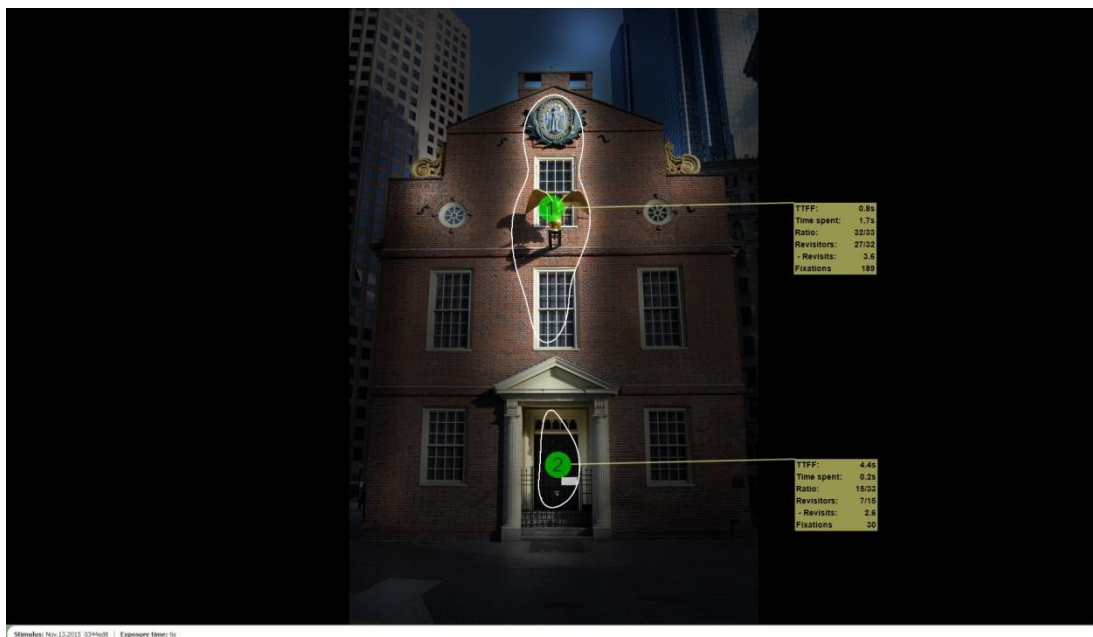


Figure 3. Fixation Sequence (1 - 7) Boston City Hall (front elevation)

### *Closer Details of the Fixation Sequence (1 - 4) Boston City Hall (front elevation).*

- 1- By 1 second, 33 participants fixated (335 times) on the high-contrast central area of image; again, gaze appears drawn to the light, blue sky and brick building *beyond* the plaza.
- 2- By 8 seconds in, 25 of 33 viewers, or 75%, are looking away from City Hall to iconic Custom House Tower.
- 3- 14 of 33 went for the truck, and its contrasting print letters;
- 4- At 13.3 seconds, 6 of 33, or 18% of viewers, go back to look at the building, likely drawn to contrasting color, sharp edges and letters above entry, again we see the building promoting ‘avoidant’ behavior in the critical *pre-attentive* phase.

Of course, a next question would be, what kind of architecture draws the eye in *pre-attentive* processing? That is key to understand if we want to design people-friendly places! And a quick answer would be architecture responding to our *pre-attentive habits* which evolved in nature over millennia; this evolutionary process made human perception relational, pre-set to seek out faces, fractals, and delight in taking in diverse bilateral-symmetrical arrangements. (For more on the forms we innately seek and easily process, see NDI articles by N.A. Salingaros, including *Socio-Cultural Identity in the Age of Globalization* (2018)).



**Figure 4.** Fixation Sequence (1 - 2) Old State House, Boston (rear elevation).  
Eye-tracked images©geneticsofdesign.com

No surprise, then, that when you eye track a traditional façade, such as the view of Boston’s Old State House, (c. 1713), below, a Georgian creation, listed as one of the oldest public buildings in the U.S. (Wikipedia, 2019), and *less than 1/10 of a mile from Boston City Hall*, you will watch people within 5 seconds — in *pre-attentive processing*

— find the door. The Old State House anticipates *how we see* and *what we need to see* to ground ourselves in space, which significantly is requisite for making us feel like we belong in a place. It is bilaterally symmetrical, with clear hierarchy and a façade suggesting a face. Architecture that fails in *pre-attentive processing*, such as Boston City Hall, fails because it neglects human requirements including *one particularly salient fact*: we see ‘reality’ through an ‘evolutionary scrim’ and this ancient brain architecture (Pleistocene) drives our lives, setting the parameter for built environments and city design not only in pre-industrial and Colonial times, but today and into the future. Successful places in our external world must mirror needs of the hidden, internal one. *Natura non facit saltus*. (Nature doesn’t make leaps!)

### Acknowledgments

Many thanks to Boston’s Institute for Human Centered Design ([humancentereddesign.org](http://humancentereddesign.org)) for providing lab set-up and staff for this study, to iMotions ([iMotions.com](http://iMotions.com)) for creating game-changing biometrics, and to Prof. Justin B. Hollander of Tufts University for his initiative, collaboration and support for studies outside Boston.

### References

- D’Alessio, E. (2016). Project for Public Spaces, Best in Design Lists. Available at: <https://www.pps.org/places/piazza-del-campo>.
- Helfand, A.M. (2009). Siena’s Piazza Del Campo as a Precedent for Boston. Graduate Program in Architecture. Notre Dame, Indiana. Available at: [https://www.invertedumbrella.com/aaronhelfand/design/city\\_hall/helfand\\_thesis\\_may\\_2009.pdf](https://www.invertedumbrella.com/aaronhelfand/design/city_hall/helfand_thesis_may_2009.pdf)
- Hollander, J.B., Purdy, A., Wiley, A., Foster, V., Jacob, R.J., Taylor, H.A., & Brunyé, T.T. (2019). Seeing the city: using eye-tracking technology to explore cognitive responses to the built environment. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, 12(2), 156-171.
- Krauzlis, R.J., Goffart, L., & Hafed, Z.M. (2017). Neuronal control of fixation and fixational eye movements. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 372(1718), 20160205.
- Project for Public Spaces. (2002). Case Study. Hall of Shame Archive. Available at: <https://www.pps.org/places/city-hall-plaza>.
- Quinn, G. (2015). Boston Magazine. *Mayor Walsh Wants to Fix Boston City Hall Plaza*. Available at: <https://www.bostonmagazine.com/news/2015/09/15/mayor-walsh-fix-city-hall-plaza/>
- Renzas, E. (2012). Do These Buildings Deserve the Wrecking Ball? Available at: <https://www.californiahomedesign.com/trending/2012/06/22/do-these-buildings-deserve-wrecking-ball/>
- Salingaros, N.A. (2018). Socio-Cultural Identity in the Age of Globalization, *New Design Ideas*, 2(1), 2018, 5-19.
- Sussman, A., Chen, K. (2017). The Mental Disorders that Gave Us Modern Architecture, *Common Edge*, 22 August 2017. Available at: <https://commonedge.org/the-mental-disorders-that-gave-us-modern-architecture/>
- Sussman, A., Hollander, J.B. (2015). *Cognitive Architecture*, Routledge, New York.
- Sussman, A., Ward, J.M. (2016). Planning for the Subconscious. *Planning Magazine*. June 2016. Available at: <https://www.planning.org/planning/2016/jun/subconscious/>
- Sussman, A., Ward, J.M. (2017). Game-Changing Eye-Tracking Studies Reveal How We Actually See Architecture, *Common Edge*, 27 November 2017. Available at:

<http://commonedge.org/game-changing-eye-tracking-studies-reveal-how-we-actually-see-architecture/>

Sussman, A., Ward, J.M., Hollander, J. (2018). How Biometrics Can Help Designers Build Better Places for People, *Common Edge*, 5 April 2018, Available at:

<https://commonedge.org/how-biometrics-can-help-designers-build-better-places-for-people/>

Wikipedia. (2019). Old State House, Boston.

[https://en.wikipedia.org/wiki/Old\\_State\\_House\\_\(Boston\)](https://en.wikipedia.org/wiki/Old_State_House_(Boston))

Wu, H. (2016). Tuft's University. Planning Models, Boston City Hall Plaza.

<https://sites.tufts.edu/govcenter/5-planning-models/>