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CALATRAVA'S CASTLE: MORPHOGENESIS AS "BEAUTIFUL PROBLEM"

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ABSTRACT

Colleges and universities increasingly offer a combination of formal and informal learning spaces, which perform multiple didactic, individual and group study and socializing functions, as a method of enriching students' educational experiences. This inquiry contributes to the study of these new-model educational buildings through an analysis of Santiago Calatrava's recently completed *Innovation, Science & Technology Building (IST)* on the campus of Florida Polytechnic University. This paper explores the IST's spatial configuration characteristics and their role in contemporary educational processes using space syntax analysis, combined with Bill Hillier's framework of morphogenesis, and through the overarching analogy of a chess game. Much as chess rules are learned and executed by silent players, spatial configurations reflect a predetermined, "pre-linguistic" set of social conventions articulated by the architect and acted out by and upon users, who perform the dual roles of agent and piece. In spatial design, as in chess, rules and randomness interact to produce both known outcomes and new outcomes – or morphogenesis. The author discusses the spatial structure of Calatrava's building as a combination of rules-governed and randomization-supporting spaces, which restrict or liberate movement, behaviours, and interactions in the building. The propositions that first emerge suggest that immeasurable variations (i.e. piece placements and relationships) derive from a small suite of simple, local moves. As the rules become too many or too global, the generative process tends to break down, informality diminishes, and orderliness and uniformity of encounters increase. Second, although rules may govern the movement of pieces, they do not govern the specific decisions that players make. Within the building, users simultaneously strategize and enact their chosen strategy through a complex suite of moves, actions and encounters. The processual nature of users' experiences is key to this exploratory examination of Calatrava's IST and how its design may inhibit or sustain the game of learning.

KEYWORDS

Educational Building, Spaces, Morphogenesis, Chess, Movement

1. INTRODUCTION

In today's shared-experience-based economy, interpersonal communication and collaboration are crucial for the creation and consumption of new knowledge. Contemporary pedagogies of educational environments go well beyond the rote, cognitive mechanics of students' brains (with bodies in chairs facing lecterns), integrating non-discursive, non-cognitive experiences and events, including movements, patterns, visual accessibility, transitions and sensations (Ellsworth, 2005). These are student-centred, experiential approaches to education, where knowledge is not handed down from master to apprentice, but constructed through a combination of traditional, social and media-based methods. It is in part for this reason that new

educational spaces are increasingly complex, multifaceted social and material environments reflecting a motley of pedagogical intentions. It is, however, an open question how effective or qualitatively different these spaces are in implementing these pedagogies.

Space syntax focuses on social aspects of built environments and their interrelationships with spatial configurations. Interest in educational environments among space syntax scholars has risen in recent years (e.g. Sailer, 2015; McLane, 2015; Koch, Bergstrom and Marcus, 2012). This paper seeks to contribute to the discussion via the exposition of one new educational facility through the lens of chess as a metaphor for space syntax-illustrated morphogenesis.

2. DATASETS AND METHODS

This study provides the first syntactic analysis of the Innovation, Science and Technology Building (IST) designed by Santiago Calatrava on the campus of Florida Polytechnic University in Lakeland, Florida (Figure 1). The IST was designed to be a symbol of the university and its commitment to future-oriented 'experiential' learning, innovation and research (Florida Polytechnic, 2016). It incorporates 26 classrooms, 11 science and computer labs, a library, meeting and study spaces and faculty and administrative offices.

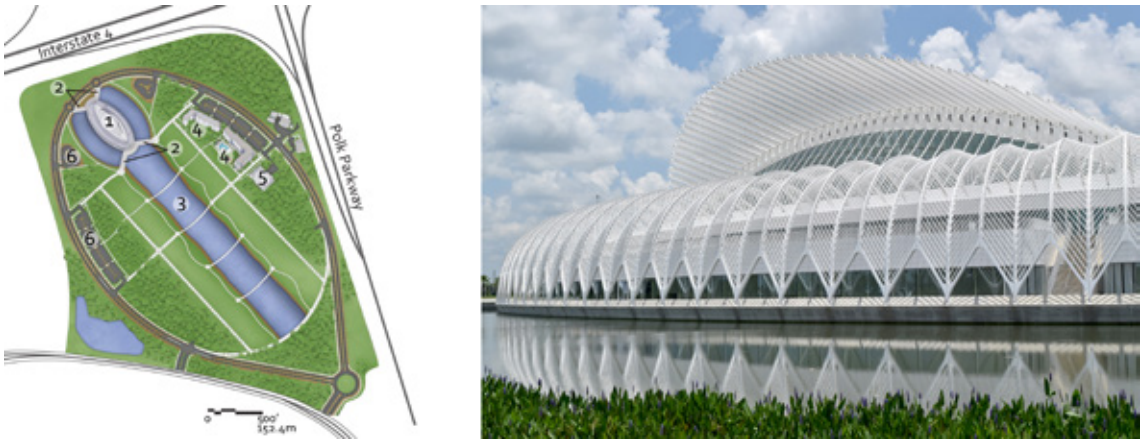

Figure 1 - Florida Polytechnic University campus plan and the Information, Science and Technology (IST) building (2014), Lakeland, Florida. Legend: 1. IST Building, 2. IST Building access paths, 3. Water, 4. Student Residences, 5. Wellness Centre, 6. Parking.

This paper presents results from the exploratory phase of the study. Data were obtained from building plans utilizing space syntax methods (VGA and all line axial map graphs generated by UCL DepthmapX (2014) and from on-site observations. A subsequent phase will include additional field observations, behavioural mapping, interviews with space users (students, faculty, and administrators) and analysis of additional syntactic measures of permeability and visibility.

Hillier's short/long spaces model (2007) served as the conceptual framework for the study and was instrumental in the analysis of syntactic structure of the IST. Short model spaces have fewer rules that frame their configuration and user behaviour patterns, allowing for greater randomization of movement, visibility and socialization, while long model spaces are more strictly regulated by rules and act (inadvertently or by design) to minimize random movement and user interactions.

The metaphor of chess appeared to be particularly fitting for describing the relationships between the configurational properties of Calatrava's building and users' patterns of movement and encounters. As posited by the anthropologist Robert Desjarlais (2011), chess is an "ever-shifting tangle of neural networks, bodies, social relations, perception, memory, time, spectators, history, narratives, computers, databases" (p. 8). This quote echoes much of the multivalence of the social / physical / behavioural inquiries at the root of space syntax

theory. Like chess, in which players learn and adapt to the rules of placement and movement, buildings incorporate social conventions, mutable and immutable physical arrangements, freedoms and prohibitions. Users' movements (and the intended and unintended outcomes of those movements) are determined in significant part by both real visible obstacles and barriers implied through layout. The designer becomes the creator of the configuration, articulating social (and here educational) conventions in spatial form. The rules by which players or users operate narrowly define the relationships between pieces on the board or spatial elements within a configuration while also allowing for the unexpected (unprogrammed, unscripted, unprecedented) to emerge. Or, as Hillier phrased it, "rules and randomness can interact to produce not only known outcomes, but also new outcomes, or morphogenesis" (p. 192).

3. RESULTS

From the outset, university administrators, campus planners and the architectural team conceived the IST as a "campus within a building." This approach is reminiscent of the medieval castle as safehold and multipurpose centre of civic life. The IST is situated within a lake – literally encircled by a moat and accessible via two bridges on opposite sides of its mirrored hemicycle. A screened promenade on the lower level and terrace on the upper level provide outdoor spaces for formal or informal socializing, walking, sitting or studying. Programmatically, the interior is divided into two areas: classrooms and laboratories on the ground floor, and a library and office spaces on the upper floor.

3.1 SPATIAL ANALYSIS: GROUND FLOOR

The ground floor is organized around two curved double-loaded corridors and three secondary corridors running perpendicular to the main corridors (Figure 2). The circulation pattern extends symmetrically from the two entrances and is defined by four rings formed by the intersections of the pathways. These intersections function as navigational decision points, and provide ready access to the main classroom and lab spaces. This is a shallow configuration with a maximum depth of three syntactical steps. The VGA integration map suggests that most spaces have a medium level of integration, with the corridors being the most integrated.

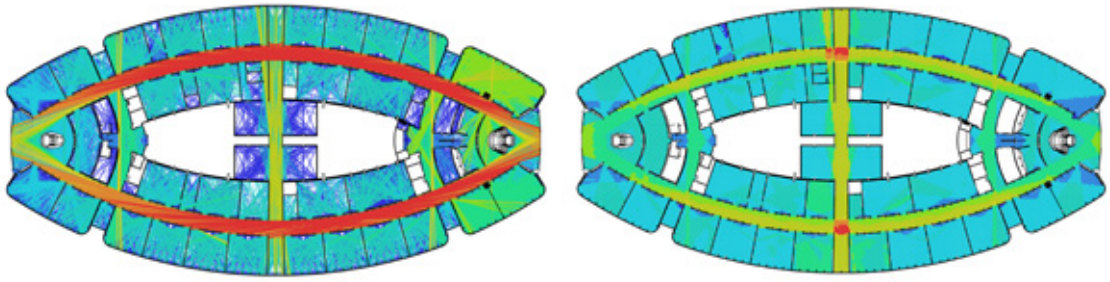

Figure 2 - IST building ground floor: all line axial connectivity map and VGA integration.

The geometry of the space, however, plays a deceptive game on the users: the curvature cuts lines of vision short, thus precluding the formation of a cognitive image of the building as a whole. The building reveals itself only as one progresses along the corridor; there are new routes, openings, angles of approach that cannot be discerned until the user makes his or her next move. The two grand staircases at the entrances provide access to the second floor and reveal what is above only gradually, as one ascends to the next level.

The analysis of these syntactic measures suggests that the IST building's ground floor configuration is a long model with elevated levels of movement and visibility control. This model reflects the traditional educational paradigm of student–instructor interaction in formal classroom settings (the direct interplay of juxtaposed pieces with assigned roles) joined by freer-form entrance and intersection areas (a comparatively open field in which to experiment with tactics and strategies for interacting with faculty and student peers).

3.2 SPATIAL ANALYSIS: UPPER FLOOR

The upper floor configuration combines elements of long and short model spaces, with opportunities for greater randomization of movement and encounters. Its central part is defined by the vast "commons" area reminiscent of the great hall of a castle. This is the main campus library (which provides only electronic resources and does not contain a single printed book in its collection) and individual and group study spaces, but could easily be reconfigured for other functions. Similar to the ground floor, the commons is flanked by two curved double-loaded corridors that provide access to faculty and administrative offices, making this part a long model configuration, which in this instance reflects the social status of faculty members and regulates interactions between faculty members and between faculty and students (Figure 3). The all axial line and VGA analyses show this as the most accessible area in the building, with the greatest potential to become a space of "requirement" in Hogwartian fashion (Rowling, 2004). This is a short model space, in which restrictions are minimized, user co-presence is visual and physical and relationships are defined by local rather than global connections. The space supports random movements and encounters and enables user agency in the form of purposeful being (space holding) and navigating (space claiming). As the tightly gridded chessboard is inhabited by pieces that move differently and serve diverse functions, compressed space in the IST is counteracted by the numerous user types defined by discipline (pieces) and diverse research and educational aims to which common areas may be put (tactics and strategies to the endgame of knowledge creation and communication).

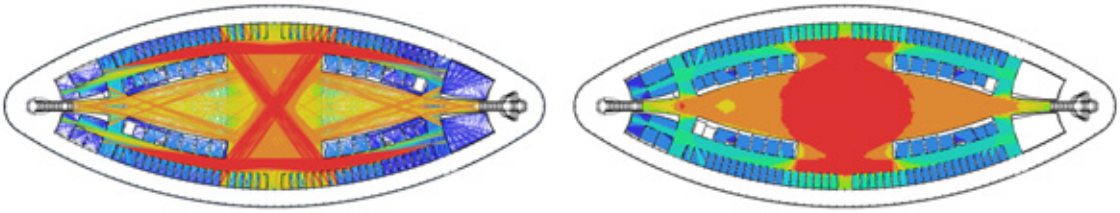

Figure 3 - IST building upper floor: all line axial connectivity map and VGA integration.

On-site observations revealed that open access to the faculty corridor and proximity to the study/library area do add an informal, serendipitous element to encounters and interactions. In a sense, the entire board can be surveyed at a glance. Students in the study area see the professors and professors see the students. Such openness helps to reduce psychological barriers that could inhibit students from approaching and talking with their professors.

4. CONCLUSIONS

4.1MORPHOGENESIS AS "BEAUTIFUL PROBLEM"

The IST embodies a blend of short and long models, respectively restraining and liberating movement and visual accessibility depending on one's location within the building. Returning to Hillier's (2007) view that morphogenesis, or the creation of unprogrammed outcomes, may result from combining local rules and randomness, the researcher is left to wonder if the IST will become a hub for experiential learning in a qualitatively different manner than its counterparts at other universities, both old and new. Its thoroughgoing castleness (complete with crenellations, moat, grand staircases, great hall and chamber-like classrooms and labs), reflects a quite conventional, if grandly aestheticized, monastery, the original architectural template for campus plans. This is in no way to say that the IST will not enable new knowledge formation, just that it may be more conventional than futuristic.

Chess is a game of conventions and most games are won by the player best equipped to employ those conventions through a complex suite of patterns, preordained moves and serendipitous openings to the endgame. To quote Marcel Duchamp: "I always loved complexity. With chess one creates beautiful problems" (as cited in Shenk, 2006, p. 185). Chess is a window for grasping

complex systems. Much as chess rules are learned and executed by silent players, spatial configurations reflect a predetermined, 'pre-linguistic' set of social conventions articulated by the architect and acted out by and upon users, who perform the dual roles of agent and piece. Akin to chess, design may be "solely purposive," yet, as Benjamin Hale has observed, "even strategic arrangements share a formal presupposition with nonstrategic arrangements" (p. 159). Rules govern the movement of pieces, but not the specific decisions that players make, leaving room to strategize and choose between moves. This processuality (rather than outcome) is key to this initial examination of the participatory parallels in Calatrava's IST.

REFERENCES

Desjarlais, R. R. (2011). *Counterplay: An anthropologist at the chessboard*, Berkeley: University of California Press. doi:10.1525/j.ctt1ppmb1

Ellsworth, E. (2005). Places of learning: Media, architecture, pedagogy. New York and London: Routledge Falmer.

Florida Polytechnic (2016). University web page. Available at: https://floridapolytechnic.org/campus/

Hale, B. (2008). 'Quiet, please! There's a game here: Discourse and silence in the formal pragmatics of a chess match'. In: Hale, B. (Ed.), *Philosophy looks at chess*, Peru, IL, USA: Carus Publishing Company, 157-170.

Hillier, B. (2007). *Space is the machine: A configurational theory of architecture*. London, UK: Space Syntax.

Koch, D., Bergstörm, A. and Marcus, L. (2012). 'Configuring academia. Academic entities and spatial identities'. In: Greene, M., Reyes, J. and Castro, A. (eds.), *Proceedings of the Eighth International Space Syntax Symposium*, Santiago de Chile: PUC, p. 8147:1- 8147:23.

McLane (2015). 'Choreographing collaborative academic experiences: The 'quiet building' and the 'airport lounge'. In: Karimi, K., Vaughan, L., Sailer, K., Palaiologou, K. and Bolton, T. (eds.), Proceedings of the Tenth International Space Syntax Symposium, London: University College London, p. 27:1-27.14

Rowling, J. K. (2004). *Harry Potter and the Order of the Phoenix*, New York: Scholastic Paperbacks.

Sailer, K. (2015). 'The spatial and social organisation of teaching and learning: The case of Hogwarts School of Witchcraft and Wizardry'. In: Karimi, K., Vaughan, L., Sailer, K., Palaiologou, K. and Bolton, T. (eds.), Proceedings of the Tenth International Space Syntax Symposium, London: University College London, p. 34:1-34.17.

Shenk, D. (2006). *The immortal game: A history of chess*. Ney York: Anchor Books.

UCL DepthmapX (2014). UCL Depthmap: Visual and Spatial Network Analysis Software. London: University College London, VR Centre of the Built Environment. Retrieved from: https://varoudis.github.io/depthmapX/