The Embryological House, Greg Lynn

Form Development
Body Development
Technique Development
Space Development

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Diagrams And Theories
Architect Greg Lynn's Embryological House was at once made and born, a hybrid of computer simulation and genetic mutation.

Greg Lynn's Embryological House was an early work of digital architecture: a work in which the computer was a fundamental part of the design process. Research identified characteristics of digital architectural artifacts that are keys to their long-term preservation. The results imply a shift in the focus of preservation from the artifact to its transformation in a digital context and a re-evaluation of preservation strategies and principles.

"DESIGN IN THE AGE OF GENETICS"

The Embryological House was inspired by the evolutionary biology and the science of turbulence and made possible by the computer's ability to generate warped or fluid forms. The result of three-dimensional curves defined by mathematical formulae rather than of straight lines specified by fixed, two-dimensional coordinates. The Embryological House represents a new approach to fabrication and growth. Historically, a modern house would be thought of as a kit-of-parts. Each part is distinct and discreet, and you customize the house through the addition or subtraction of parts from the kit.

FORM EVOLUTION

THE EMBRYOLOGICAL HOUSE IS A SERIES OF ONE-OF-A-KIND HOUSES THAT ARE CUSTOMIZED BY GREG LYNN FORM FOR INDIVIDUAL CLIENTS. THE HOUSES ARE ADAPTABLE TO A FULL RANGE OF SITES AND CLIMATES. THE MINIMUM REQUIREMENT FOR ANY SITE IS A 30.5-METRE (100-FOOT) DIAMETER CLEAR AREA OF LESS THAN 30-DEGREE SLOPE FOR THE HOUSE AND ITS SURROUNDING GARDENS, DESIGNED BY JEFF KIPNIS.

Figure 1: Shows how the particles that are control points of the surface of the form when toggled may generate multiple iterations.
Form Development
Form development of iteration 1 in detail:

Figure 2: Shows how the particles alone in free space.

Figure 3: Shows how the toggle of particles that are control points of the surface – TYPOLOGY I

Figure 4: Shows how the second stage of the toggle of particles that begin to generate a more clearer push and pull for the same surface morphology – TYPOLOGY II
Form Development

DEVELOPMENT AND EVOLUTION

At the prototyping stage of the Embryological House, Lynn developed six instances exhibiting a unique range of domestic, spatial, functional, aesthetic and lifestyle constraints. In the project description he emphasized that:

'There is no ideal or original Embryological House, as every instance is perfect in its mutations. The formal perfection does not lie in the unspecified, ordinary and generic primitive, but in a combination of the unique, intricate variations of each instance and the continuous similarity of its relatives. The variations in specific house designs are sponsored by the subsistence of a generic envelope of potential shape, alignment, adjacency and size between a fixed collection of elements. This marks a shift from a Modernist mechanical kit-of-parts design and construction technique to a more vital, evolving, biological model of embryological design and construction.'

Figure 5: Shows the particle pull in iteration 2.

Figure 6: Shows the particle pull in iteration 3.

Figure 5: Shows the particle pull in iteration 4.
Body Development

Interpreting the possible relationships between “a body and a building” is difficult as even thought the interaction is intended and planed in it’s the perception and the factor of diversity of people that causes an imbalance in this equation. Architect Greg Lynn’s Embryological House is at once made and born, a hybrid of computer simulation and genetic mutation.

Greg Lynn’s work the – “The Embryological House” is a postmodern, organicist style inspired by evolutionary biology and the science of turbulence and made possible by the computer’s ability to generate warped or fluid forms. The relationship between architecture and the body is apparent at many levels in this example of his work. The Embryological House is suppose to trace the evolution pattern of the human embryo.

One of Lynn’s biggest fears was: How do you keep a biological house from eating its occupants?

Figure 6: Here are a sequence of diagrams that address Lynn’s fear of the form consuming the occupants.
Body Development

The Embryological House represents a new approach to fabrication and growth. Historically, a modern house would be thought of as a kit-of-parts. Each part is distinct and discreet, and you customize the house through the addition or subtraction of parts from the kit.

At the prototyping stage Lynn defined this project in stages and each mutation was considered a stage in evaluation, none of the mutations were considered perfect.

The Embryological House was an attempt to participate in that economic reality, but with a completely different implicit lifestyle and relationship to the environment. Lynn wanted to take a more biological approach, where there would be no discreet components.

“Blurring of boundaries”

The concept was that system had the same morphospace—the same form-space—so that a change in any component would inflect every other component within the system.
“POSSIBLE MUTATION PATTERNS AS NON WAS CONSIDERED IDEAL”

Figure 9: Diagrams the mutation system and the possible iterations that could be generated in varied sequences.
“The Embryologic Houses can be described as a strategy for the invention of domestic space that engages contemporary issues of brand identity and variation, customisation and continuity, flexible manufacturing and assembly and, most importantly, an unapologetic investment in the contemporary beauty and voluptuous aesthetics of undulating surfaces rendered vividly in iridescent and opalescent colours.”

- Lynn

“The Embryologic Houses employ a rigorous system of geometrical limits that liberate models of endless variations.”

Figure 10: the endless iterations that could be generated using the basic program code.

Each iteration is generated by surface morphology.
Program Response to Particle Population

Embryological House (1997-2002), a major work by American architect Greg Lynn, is a born-digital project. The artist set a number of goals for this conceptual work:

- rethink the idea of house typology beyond the modernist "kit of parts" model to an organic, flexible, genetic/generic prototype from which an infinite number of iterations can be generated;

- extend the interplay of "generic" and "variation" implied in this rethinking to notions of product "branding" and the satisfaction of individual desire through consumer-specific, unique versions of the product;

- push the capabilities of existing automated manufacturing technologies for the production of non-standard architectural forms

Figure 11: Diagrams how particle populating may be a organic and flexible way prototyping. Infinity number of integrations that may be responsive to the various parameters set out by the programmer.
Technique Development

Site Occupation

Architecture is always situated in a context – a site.

Architectural sites are described by topographic, environmental and material characteristics as well as less tangible political, economic and cultural forces. An architectural site may be highly specific or completely generic. Architectural sites are not pre-conditioned for the arrival of program; thus the needs of program may be supported or challenged by site conditions. In either case, an intelligent management of the contact between site and program will yield precise architectural solutions.

Figure 13: Diagrams demonstrating the particles properties of smoke in processing and how altered values of particle deception generates different diagrams.

Figure 12: Diagrams particles populating one given external form that may be defined as a single iteration; each iteration may be generated by defining the particle properties differently thus detailing the outlined form differently each time.

Figure 14: Shows how once the particles are emitted form can been generated around them to form different iterations.
Technique Development

Computer Simulated Design for Program

"POSSIBLE MUTATION PATTERNS IN TERMS OF TECHNIQUE GENERATION AS NONE WAS CONSIDERED IDEAL"

Figure 15: Diagrams the mutation system and the possible iterations that could be generated in varied sequences.

Figure 16: Diagrams the sequence of outputs of form from a computer simulated design program. Each iteration shows a little difference.
Figure 17: the endless iterations that could be generated using the basic program code
The Embryological House, Greg Lynn

Technique Development

Particle Population to Define Form

Figure 18: The particle settling process to form a definite form

Figure 19: Structural technique adopted for fabrication

The houses are built of monologue aluminum shell and secondary frame with additional steel members. The aluminum panels are painted in a palette of opalescent colors that highlight the voluptuous shapes of the exterior.
Technique Development

Computer Renderings of the Project

Figure 20: Greg Lynn Embryologic House [computer rendering]
Understanding space in terms of frames of function and logic thus creating an experience for the observer. This system of perceiving space as a sequence of static frames gives each observer the liberty to conceive space privately.

Figure 21: Defining the main nodes of function in the space.

Figure 22: Defining the main nodes that respond to the external conditions.

Figure 23: Overlapping the two definitions.

Figure 24: Over laying the to definitions in the space.

Figure 25: In section the main nodes that respond to the external conditions and inhabitation of the space generated.

Figure 26: Rendering of the inhabitation of the space generated.
Space Development

Spatial Logic: Formal and Cultural

*Iteration II*

**Figure 27**: Defining the main nodes of function in the space.

**Figure 28**: Defining the main nodes that respond to the external conditions.

**Figure 29**: Overlapping the two definitions.

**Figure 30**: Over laying the to definitions in the space.

**Figure 31**: In section the main nodes that respond to the external conditions and inhabitation of the space generated.

**Figure 32**: Rendering of the inhabitation of the space generated.

**Viewing the built form in multiple perspectives and multiple layers of function**
Space Development
Spatial Logic: Formal and Cultural
*Iteration III*

Figure 33: Defining the main nodes of function in the space.

Figure 34: Defining the main nodes that respond to the external conditions.

Figure 35: Overlapping the two definitions.

Figure 36: Over laying the to definitions in the space.

Figure 37: In section the main nodes that respond to the external conditions and inhabitation of the space generated.

Figure 38: Rendering of the inhabitation of the space generated.
Space Development

*Formation evolution and emergence of space* → Over time

The population ratios change over the evolution of space and so does the definition of space get more refined thus effecting the inhabitation levels.

### Smooth spaces

Smooth spaces are like that of the ocean or the desert; they appear as one continuous entity.

### Striated spaces

Striated spaces on the other hand feel much more controlled and rigid, have limits, and focuses on points.

The Embryological House iterations seem to be an ideal example to study in terms of the evolution of smooth space to striated space. The rendered images show the transformation of this digitally developed project and the translation of the early iterations to the later more controlled and higher developed iterations.
The Embryological House has a double skin. The first skin, which is the building enclosure, is built of aluminum and glass. I wanted to avoid punching windows, so the skin has very fine shreds in it; the wall can go from something like punched windows to something like a glass wall, depending on far apart you have these shreds. The wall is translucent and filigreed, like a screen.

Because of that fenestration system, there’s a second skin over the first, a shading skin. We take the solar data for any region in the world, put it in the computer, and calculate where the daylight and shadows will fall on the form. Then, we use that information to map a double skin onto all those undulations and indentations. This second skin is a system of strips, almost like a Venetian blind, but in 3-D, wrapping around the contours of the house. Looking at it from the north of the house, you can see between those strips; from the south, they overlap to generate opacity.

The door to the house is a sphincter-like aperture that irises open and shut. It uses counterweights; all you have to overcome is the inertia of the weight of the door and then it basically opens itself. Inside, it’s like being in a jungle. The way the light enters the house—through fronds, and through the arbor of the shading system—make it very aqueous.

The inside of the Embryological House is like a car interior. You have a surface that is upholstered, carpeted, veneered and has instrumentation and technology built into it. The floor of the upper level can inflect, bulge and gastrulate to form furniture, storage, cabinets, tables, chairs, tubs, and so forth, and is embedded with appliances, furniture and equipment. The floor finishes include cork, artificial leather, wood, MDF, Maderon, stainless steel, rubber, carpet, fabric, ceramics, gel padding and plastic.

The lower level, by contrast, is completely planar. It’s really two kinds of living space: the lower one is very uncustimized, open to all kinds of quick modifications. You move from one level to the other via ramps or stairs that you can plug in. The lower level of the house is half in and half out of the ground. The house can generate its own “nest,” in a sense; when you set the form on the ground, whether the site is flat or sloped, the shape of the house pulls the ground up to meet it. In the computer, you can set the geometry of any one of the house formations on any kind of ground, and the interaction of the two will make a unique kind of a nest that surrounds the house.

Embryological House concludes with "A New Style of Life," a science-fiction story describing the domestic life of an occupant who has been consumed by his Embryological House, as in swallowed. The interference between its digital and biological systems gives rise to a house that is animal-like in structure—and behaviour. Chaos ensured.
Works Cited


Benjamin H. Bratton, “The Premise of Recombinant Architecture One”, In Session, 2006, 94-111


Lars Spuybroek, “The Structure of Vagueness”, NOX Machining Architecture, 2004, 352-259

External References


