**Frustrated Icosahedron/Dual Spaces**

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*A+D Museum*

**Proposal for Exhibition and Opening Performance**

The power of a designed space lies in part in the interactions and exchanges that typify how that place is used, and how people relate to the designed objects in it.  Our world is very crowded, and we don’t often experience public museum spaces with an awareness of their participatory design pattern that unfolds in real time. Using the Frustrated Icoshedron as a catalyst we can observe how visitors engage with the space and the objects in it through improvision .The visitors can create their own unique objects, or write a description of personal narratives associated with a design object or experience brought to mind by the show. Using images from an opening performance and building into the experience designs made by visitors as the exhibit grows over time with material contributed by the public, and the visitors see how it transforms over time.

Inspired by PDK’s Frustrated Icosahedron, we propose to construct a series of performances and an exhibit exploring pattern and symmetry through motion and music. The piece will examine the physical consequences of patterns that cannot fulfill themselves, playing with ideas of Geometrical frustration symmetry/asymmetry, completeness/incompleteness. , Dual spaces including positive and negative spaces, packing, unfolding, sharp angles, and hard edges versus figurative action and curves, cuts, spinning, and flattening.

The performance and exhibit opening will consist of two physicists, a mathematician, an architect and designers as they pack both the Frustrated Icosahedron. and a more ephemeral negative space version .(Dual spaces).This process will take approximately one hour . The performance will include a live music performance by the Geoff Nutgall, lead violinist with the Saint Lawrence quartet. He will play a new, site-specific composition by Dohi Moon, guest composer at KCMRA at Stanford. The music and packing performances will be integrated. PDK will do real time digital action gesture drawing during the performance.

Mini equilateral triangles will be provided along with drawing paper and pencils so that the public can try to figure out the packing problem represented by the frustrated icosahedrons unfolding in real time during the performance. We have done this performance before (see video) and viewers particularly liked the interactive portion of the exhibit. Different possible assembly patterns will be displayed in real-time as the audience invents them. This will be accomplished by taking live photos and/or video of models and drawings provided by viewers.

Performance and Improvisation

A fog screen will be used as a means of displaying visual media. (A fog screen is a laminar flow of water particles, which are substantial enough to reflect light but small enough to remain in the atmosphere, hence not creating a mist or moist environment.) This media will include not only archival images, but also real time digital drawings and paintings being done by PDK in reaction to captured images. Custom edge detection software will be used to pull key lines from the performance allowing for visualizations for the sake of the audience, recognizable expressions of forms, patterns and objects.

Performance and Improvisation

Some of the movement and paintings in the performance will be scored in advance so that the musicians (packers) can use as landmarks, gestures, changes and cues specific to the work. The painter will start a new score/painting given how the work unfolds in time. This process, the kind of location in which it takes place, and the people who populate it serve as a foundation for the event specific improvisation.

The invitation to the public to participate, though brainstorming, in writing ,drawing, and pattern formation was inspired by thoughts of, grand central station in New York filled with bustling patterns of bodies in motion. There people in transition leave a vanishing gesture drawing trailing after them like ghosts in space. It is one thing to see a time-lapse photograph of the space showing such trails, but entirely another to experience the realization in the very space. Imagine watching the construction of a designed object and then being invited to walk around the piece immediately thereafter. What new questions arise? Inspirations? Discoveries?

The designed world is coextensive with human relationships and social interactions. A cultural aesthetic means social aesthetics that work to create connections between the endless possibilities of the human performers and the conditions embedded in the specific environment. Our efforts hopefully will serve to slow time down and create a contemplative, but inspiring experience in the face of the busy, anxiety-producing circumstances of everyday life.

*Pre-Exhibit Creative Process/Spot Composition*

We will take mini icosahedral forms to a range of sites that use this shape; for example, in a physics seminar space, or a biology lab, we can investigate how this subject is interpreted and how it comes to life when it is used as part of given vocabulary of scientific form. Our research process includes informal “improv” with mathematicians, physicists, biologists and designers as they play with a frustrated icosahedron. Dohi Moon will use these opportunities to help generate original music for the performances.

Using the object as a point of discussion and interaction will yield interesting and informative insights to the impact of such a palatable representation of scientific concept. These situations will all be filmed and/or shot for later use in the exhibit. The juxtaposition of the smaller form in a scientific setting with the larger form in front f the viewer will enable meaningful connections to the world outside of the exhibit.

Design Intent

We are excited by the preconscious character of perception in understanding and responding to a designed environment .The principal phenomena that interest us, include responses to the light, locomotion, sound and psychosocial (greeting, and farewell rituals) dynamics in a public space. Processes that are tacit, taken for granted, or subliminal, interest us. Recent work in the psychology of perception has disaggregated aspects of experience that we ordinarily take as inseparable and shown how much in our perception is not actually perceived, but inferred or imagined; and brought to light the physical constraints that shape our sense of the world.

The term “dual space” is used as an analogy for the transformations and transitions between an object and the surrounding negative space such that the distinction between the two is blurred. In a sense, the background and the foreground are inverted. We propose to take the frustrated Icosahedron and create a dual space experience for the viewer. Here the cracks, and spaces generated by the Icosahedron, and the shadow of a person viewing it, are presented in such a way that it is difficult or impossible to tell if the person is the real thing or a shadow. The purpose of this installation is to give observers the opportunity to become aware of their own perceptual processes.

Projecting the archival material and media from the object’s interactive travels will allow us to show this material in an original and impactful way without actually needing the objects themselves, and the mist screen serves as a projection plane that is not a barrier. That is to say, because people can walk through such a screen even as media is projected on it, the images can become a much more integrated part of the exhibit than is normally possible. During the assembly performances, the mist screen can also be used to further amplify this effect and to blur the states of past, present and future by projecting images of different stages of build than the participants are actually in over the stage.

Subsequent Exhibit

Since the performances of the packing of the frustrated icosahedron will only occur at the opening, the exhibit thereafter will consist of the piece and its “negative” counterpart in the main room. The negative form is an additional piece, which will be mounted and suspended so as to blur distinction between form and shadow.

In the smaller room an exploration of the concept of frustration will be presented through paintings and drawings. This will not only dramatize the piece but also allow viewers to spend as much as desired with the piece rather than feeling they should hurry to the next part of the exhibit.

It should be noted that two smaller pieces would also be placed in this entry space- a light drawing of the form, and a metal floor drawing. These forms will start to prepare the viewer for the more solid, three-dimensional piece to come.

Background

The Frustrated Icosahedron sits on a minimal, seven foot wide white square that appears to float above the floor and consists of twenty guided redwood plywood equilateral triangles. They will be placed equidistant from each other on a non-marked grid for the opening of the performance. Different lattice patterns, like those I you might envision in Chinese checkers will be used for the rests during the packing process, for example a Kagome lattice. The Frustrated Icosedron consists of twenty tetrahedra packed into a form representing a platonic solid cracked from the stresses and pressures caused by forcing material from four dimensions (where it would not be frustrated) into three.

A photograph titled “Orange Peel negative curvature will be displayed near the icoshedron .You cannot flatten an orange peel, you can only cut it and stretch it forcing it to lie flat, still curving like a carpet in two dimensions. Frustration is a key concept in science, with relations to well-known physical phenomena, such as the glass transition in supercooled liquids and pattern formation in microemulsions.

The icosahedron itself is a well-used timeless form, and a platonic solid. It can be found in architecture, design, physics, mathematics, and biology. Buckminster Fuller’s quest for low income, futuristic housing led him to base his design for the geodesic dome on the icosahedron. We hope to borrow some digital duplicates of archival images for the design of the geodesic dome from Stanford University, which houses his collection. (As such, no insurance will be required for these materials.)

Exhibit Components:

- The frustrated Icosahedron and base (to be transported from San Francisco)

- The negative frustrated icosahedron and transported from San Francisco)

- Teapot size Icosahedrons to be played with and handled by the audience

- Images and the “Frustration Curvature” video displayed on interactive fog screen

- Spot composition score painting

\_ Public’s drawings and paper sculptures.

- Gaze tracker/interactive experience…. see the brainbox.org for video

Then for back room

- 4 expressive portrait paintings with objects

- Floor drawing

- Related wall drawing (leds)

Condensed Biographies

*Pamela Davis Kivelson* has been working on performance and installation projects mostly in California and in New York. She has exhibited extensively paintings, drawings and sculptures. She has 43 works up around the Stanford campus currently. She is a lecturer in the design department at Stanford University, and is a founder and member of the Brainbox group. Some of her painting work can be viewed at: pdkstudio.com

*Edwin Wood and Andrew Murphy* is graduates of the Stanford Joint Program in design, founders of Monkey Wrench Design, and members of Brainbox. In conjunction with artists Banerjee + Gorbet, they designed and fabricated two installations, *Chronos and Kairos* and *Courtesy of Nature,* at the San Jose Airport.

Geoff Nuttall co-founded and is the first violinist of the St. Lawrence String Quartet, which an ensemble-in-residence at Stanford University.

*Dohi Moon* is a guest composer at the CCRMA at Stanford University.

Polly Krauss is a ceramist and teacher. She is making small icoshedral forms

For more information, visit: thebrainbox.org