Light and Matter

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The images which comprise the majority of these pages have been given the name Light Sculptures. They are not computer generated or hand drawn, they are photographs of the interaction between light and a reflective cylinder. Originally color transparencies, the Sculptures have been interpreted by the computer as inverted, greyscale images. What was once a black background is now white paper, and what were once lines of light are now lines of ink. The sculptures were synthesized through experimentation with the fundamental elements of architecture: Light, Material, and Geometry.

Following the series of Light Sculptures are images of Objects through which materials, tectonics, and proportion were explored. The design and fabrication of each piece was guided by the intent to make something which functioned structurally, visually, and tactily as an integrated whole.

A study of relationships
All music is nothing more than a succession of impulses that converge towards a definite point of repose.

Igor Stravinsky
I have no use for a theoretic freedom. Let me have something finite, definite-matter that can lend itself to my operation only insofar as it is commensurate with my possibilities. And such matter presents itself to me together with its limitations. I must in turn impose mine upon it.

Igor Stravinsky
Contrast is everywhere. One has only to take note of it. Similarity is hidden; it must be sought out, and it is found after the most exhaustive efforts.

Igor Stravinsky
objects
Outer Ring  Baltic Birch, Filler, Primer, Urethane  Inner Seat  MDF, Primer, Urethane  Fasteners 1/4,20 Steel hex, Black oxide  Legs 3/16” Stainless Steel, Sandblasting, Urethane  Seat/Leg Connection Mortise & Tenon  Assembly Tool: Allen wrench
Legs 3/8” Cold rolled steel, 0000 Steel wool polish  
Compression Fittings Aluminum, Mill finish  
Fasteners Steel flat head machine screws, Factory finish  
Seat 3/8” Polycarbonate, 00 Steel Wool  
Feet Acrylic, Polished faces, 600 grit wet-sanded edges  
Assembly Tools Flat blade screwdriver
Legs  Poplar; Hand-rubbed acrylic latex enamel  
Seat  Poplar; Water-born urethane  
Seat/Leg Connection  Tapered dovetail  
Assembly Tools  Hammer
appendix
The synthesis of Light Sculptures can be traced to the fabrication of an acrylic cylindrical wedge. When the wedge interacted with sunlight, beautiful shadows and refractions were created. As the wedge was rotated and placed on either its circular or elliptical face, the refractions changed drastically. Eventually, the sun was replaced by a slide projector and the wedge was placed on a turntable to gain greater control over the variables within the relationship.

After three years of observation, experimentation, and photography of the light show produced by the wedge, an assumption was made that a hollow cylinder would produce a new set of reflective images. The interaction between an acrylic cylinder and sunlight produced only a single geometric construction known as a nephroid. Attempts at shading portions of the cylinder to create a wider variety of constructions met with limited success. Experiments were then carried out using alternative light sources and it was discovered that diffuse light interacted with the acrylic chamber in extremely complex ways, producing a wide range of images. This finding led to the development of an apparatus (described on the following page) which controlled both the light source and the cylinder. This control allowed a deeper analysis of the variables in the relationship which in turn led to further development and refinement of the apparatus and the images.

All of the constructions produced by the wedge and the hollow cylinder are known as caustics or spherical aberrations. They occur simply because an object which is circular in section cannot bring light to a single focal point. Lens manufacturers have attempted to eliminate these aberrations by using multiple elements to correct the angle of refraction or by using components which are aspherical in section. The work which produced Light Sculptures amplified these aberrations and clarified them.
Component/Material
Screen/ Denril
Support/Acrylic
Filter/ Colored acetate

Motion
Stationary

Component/Material
Chamber/ Cast acrylic cylinder
Opaque housing/Black paper
Shade/ Black foamcore

Motion
Y, Z Axes
Pitch
Yaw
Rotation

Component/Material
Bulb/Glass, tungsten, brass
Reflector/Plastic
Wiring harness/Plastic
Primary housing/Sheet metal
Mounting flange/Plastic
Mounting ring/Birch Plywood
Secondary housing/PVC
Primary aperture/Brass
Secondary aperture/Copper
Aperture shutters/Brass
Tertiary aperture/Aluminum

Motion
X, Y, Z axes
pitch
yaw
rotation
All of the work presented in this document has two major aspects in common: analysis of relationships and a way of working which allows development of an initial idea. Regardless of the project undertaken, the questions posed always dealt with the relationships within one element, the relationship between one element and another, and the relationship between a single element and the whole. The system used to create Light Sculptures contains over fifty related variables, and the slightest change in any one of them constructs a totally different image. The discovery of these variables came through exhaustive and often frustrating efforts. At times it seemed as if the laws of physics would change from day to day until the tiny element responsible for the anomaly was found. All assumptions had to be thrown away, and every accident and failure needed to be taken as an opportunity for deeper understanding. Interestingly enough, what was considered to be only an imperfection actually held a promise of something quite wonderous.

The making of each of the Objects relied on letting go of preconceptions to make room for the discovery of relationships within each piece. The actual fabrication of a leg led to the development of a different seat and the making of a seat would then lead to a slight change in curvature of the leg. Painting one element would necessitate a change in texture of another. This process continued in all of the work until the parts or the photons reached, as Stravinsky would put it, “a point of repose”.
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