



THE "LIGHT PRESSURE EFFECT" ON A SURFACE  
"A RESEARCH ON THE VARIATIONS OF CELLULAR SURFACES CAUSED BY MECHANICAL INPUT"

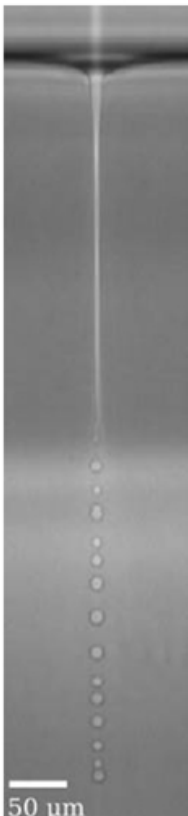
ADP043P  
Advanced Digital Design Techniques

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COURSE MA Architectural and digital design systems

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YEAR 2008 - 2009



[1] It can be shown using Maxwell's equations that the radiation pressure exerted on a body by an incoming electromagnetic wave is equal to the energy density (radiant energy per unit volume) of the wave.

$$P = \epsilon/2 E^2 + 1/(2\mu) B^2$$

## ABSTRACT

"Energy is the capacity of a physical system to perform work."

Light and heat take both part of several forms of energy. Light pushes an object in its path, just as the wind would do, modifying its status ("LIGHT PRESSURE").

Applications of light pressure, also called radiation pressure, range from optical levitation to optical trapping and manipulation of biological particles.

Light can be modeled as either rays consisting of energy carrying photons or electromagnetic waves. In physical optics, we model light as an electromagnetic wave which carries both energy and momentum [1]. When electromagnetic waves strike a surface, pressure is exerted on the surface due to the momentum carried in the waves. This idea of light pressure can be traced back to Johannes Kepler. In 1619, Kepler correctly theorized that it was the pressure of light which makes a comet's tail point away from the sun.

Whereas buildings can be considered as living beings, they can be effected by these forms of energy and modified in some of their parts and characteristics.

This thesis intends to explore the possibilities to create a reactive architecture as a thermo-sensitive skin in which it is possible to reconfigure its structure through input caused by natural forms of energy.

The structure of the skin is thought as an experimental parametric surface; a light-filtering structure system made of thousands of cells that can change their shape, plus small openings that can modify their diameters.

These openings, under effect of heating caused by light, will have the same behaviour of pore of human skin.

The aim is to investigate this parametric structure and its behaviours through generative and parametric tools: making different simulations, analyzing it and studying different design.

The proposal is to utilize the generative possibilities of algorithmic scripting within physical and mechanical computing.

Light as one of the most important components in architecture and I would like to investigate the best way of "how to catch" and to "express" it.

It would be very interesting to have a double reaction to the light in the skin of an architectural body:

- to catch the EXTERNAL LIGHT and let it go through its skin ;
- to express the INTERNAL LIGHT in the opposite direction towards the exterior.

This will create a level of interconnection between the life of a building and the life of surrounding environment and could give it autonomy.

Considering the physical theory of the pressure generated by photons and one of the latest experiments done by Wendy Zhang, (assistant professor in physics at the University of Chicago) in which is shined a laser beam through a soapy liquid, producing a long jet that eventually broke up into droplets, the concept of RADIATION PRESSURE will be studied.