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# The Ames rotating trapezoidal window: A teaching aid for human perception

## Abstract

This thesis deals with human perception and how we process information seen today, based on information and experiences learned yesterday. Using monocular and binocular cues to perception, our mind tells us what we are seeing, whether this is in actuality true or false.

## Degree Type

Thesis

## Degree Name

Master of Science in Vision Science

## Committee Chair

Steven Cool

## Subject Categories

Optometry

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THE AMES ROTATING  
TRAPEZOIDAL WINDOW  
A TEACHING AID FOR  
HUMAN PERCEPTION

BY

JAMES P. DE VLEMING

A thesis submitted to the faculty of the  
College of Optometry  
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Adviser:  
Dr. Steven Cool

SIGNATURE PAGE

THE AMES ROTATING  
TRAPEZIODAL WINDOW

BY: JAMES P. DE VLEMING 

ADVISOR: DR. STEVEN COOL 

## ABSTRACT

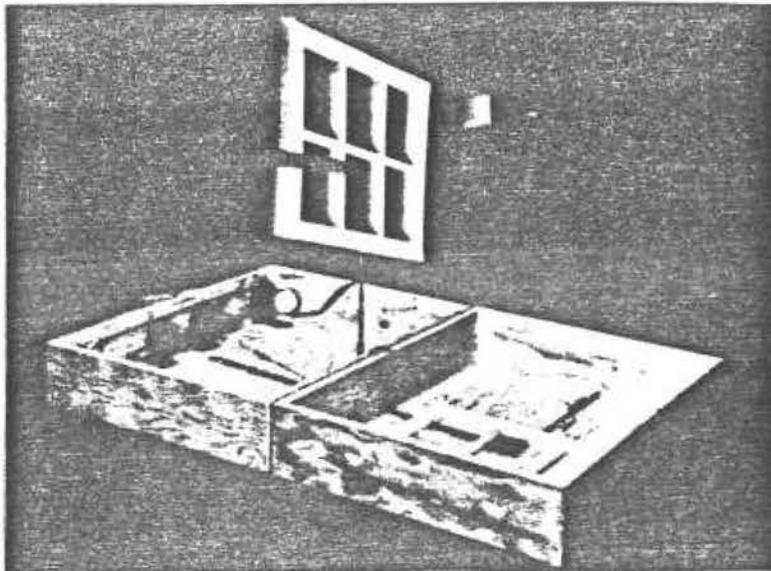
This thesis deals with human perception and how we process information seen today, based on information and experiences learned yesterday.

Using monocular and binocular cues to perception, our mind tells us what we are seeing, whether this is in actuality true or false.

Ames studied many types of perception that add together to help the brain decipher what we see. There are monocular clues based on brightness, shading, shape, and size. There are also binocular cues based on disparity of images between the two eyes. All these cues, along with past experiences, are used by the brain to help the mind perceive what the eyes take in. This teaching aid shows how some of these cues work and how they can be used to confuse the mind as to what it is perceiving.

When the object being looked at and the mind's perception of that object are the same, there is correspondence, and perception comes easily. However, when the two "objects" don't correspond, the mind has to try and determine, based on both monocular and binocular perceptual cues and past experience, what the object is. Here is where the mind can be tricked into seeing one thing and perceiving another.

This aid will show the contributions a person makes about the perception of an object just by looking at the object.



The rotating trapezoid demonstration

To view the "window", the observer needs to close one eye for near viewing or use both eyes from a distance of 25 feet or more. The first "illusion" is that the window is oscillating back and forth and not rotating around in a circle.

When a cube is connected to a corner of the window, it will seem to detach itself and float on it's own through space.

When a tube is placed through a pane in the window, as the window oscillates, the tube will appear to bend, then lengthen, and finally wrap itself around the end of the window. If an observer is conditioned that the tube is metal (as opposed to rubber for the above description), the tube will bend, lengthen, and break though the end of the window.

These illusions of the window doing strange things as well as the cube and tube acting strangely, are due to the fact that the shape and shading of the window cause the mind to assume the window is rectangular. The assumption that the window is rectangular causes a confusion in the mind as to what is happening and where it is happening. How can a cube float and a tube bend and lengthen? The mind "knows" the window is rectangular and bases all it sees on this. The only way for the eyes to be seeing what they are seeing is by the cube floating and the tube bending and lengthening. The motion of the window, cube, and tube vary based on the observer's viewing of the objects and therefore can vary infinitely.

If someone could overlook the "constancy" of the rectangular appearing window, they would have no perception of the floating cube or of the bending tube.

As can be seen from this illusion, the mind can be tricked into not trusting what it sees by using some of the cues it needs to perceive in ways it isn't accustomed to. From past experiences, the mind has learned what things are from how they appear. No matter what the eyes see happening, once perception has occurred, the mind will make other parameters of the object change to fit the perception of what is happening.

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