

**OPTICAL ENGINEERING NOTE #50:  
THE SECRET OF THE MIRAGE REVEALED**

I don't know if I am endangering myself by providing you with this information, but here it is.

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**CONFIDENTIAL  
OWNER'S MANUAL**

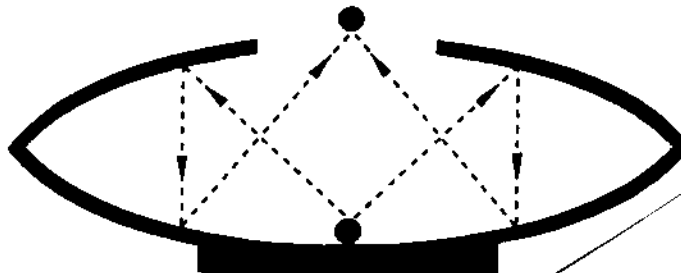
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# MIRAGE

**"The World's Most Perfect  
Three-Dimensional Optical Illusion"**

Manufactured in the USA  
by  
Opti-Gone Associates  
"The Mirage Makers"  
BOX 8118 • Van Nuys • CA • 91409 • USA  
213/656-5780

Observe the path of light rays as they construct a  
three-dimensional image of a marble.



## HOW IT WORKS

(Secret Revealed)

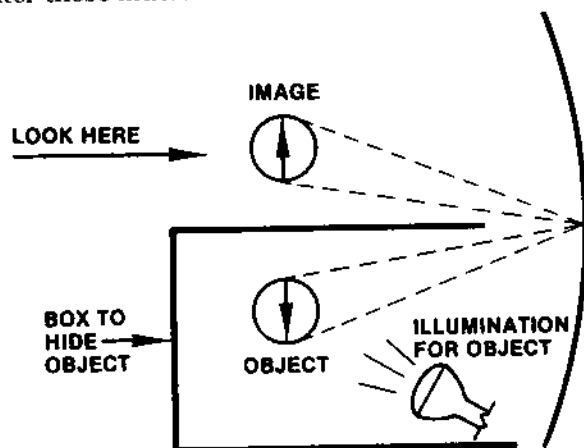
Each mirage you display is a scientific phenomenon called a *three dimensional real image*. For years, students often first heard of them in science labs, but very few actually saw one.

The most popular demonstration (when available) was a single parabolic mirror set-up, looking something like the illustration below.

To reveal only the image and not the object—and to conceal the fact that you were looking into a mirror—a box was necessary to hide the object and its illumination. Primitive, yet impressive, this "mirage" could be viewed from only one direction.

Today, many professors are using MIRAGE to demonstrate real images. It has the advantage of functioning in ambient light, and can be viewed from all 360 degrees. And, it's certainly more attractive than a big, ugly box.

Of course, the mechanics of how MIRAGE works will not be on the minds of your friends when they encounter these illusions for the first time.



Indeed, MIRAGE is capable of fooling anyone. Even with nothing in it, people are amazed when they touch the mirrored circle—their fingers go right through it. And, the moment you place an object inside, there is nothing about the appearance of the device to suggest that the object is not actually resting right where they see it—on top!

You'll also notice that objects which are reversed in a single mirror, are reversed back again in your MIRAGE so that the illusion is "right reading," virtually identical to the original. Achieving this breakthrough in three dimensional real imagery requires critical production tolerances, although the principle itself is simple.

There are two types of images: real and virtual. A real image is one in which the light rays actually come from the image. In a virtual image, they appear to come from the image reflected, but do not. In a flat mirror, for instance, the virtual image of an object is behind or "inside" the mirror, but light rays do not come from there.

Real images form outside the system, where emerging light rays cross and are "caught", . . . inside a camera, . . . on a screen, . . . or in a MIRAGE. All concave mirrors can produce real images under certain circumstances. Conditions must be rigidly maintained, however, or the illusion fails to appear.

As an educational device, MIRAGES are in use in many academic institutions: primary grades up through university level. Applications vary greatly. You can find them in use in departments of physics, psychology, philosophy, mathematics, religion, optics, and general science classes.

Our concept of reality is not hereditary. The illusions you create, . . . on a desk-top, table or in your hands, . . . literally contradict a lifetime of experiences: never has the line between sensory perception and reality been exposed with startling clarity. q



**PLEASE, PLEASE, PLEASE DON'T GOOF MINE UP!**

Study these vital care instructions **BEFORE** handling your **MIRAGE**:

**IMPORTANT!**



## **DO NOT WIPE MIRRORS** **DAMAGE CAN RESULT**

**MIRAGE's precision mirrored coatings are just  $5/1,000,000$ ths of an inch thick ... a critical tolerance that yields remarkable optical resolution. These *unprotected surfaces* will retain their original brilliance if you follow these important tips:**

We advise as little handling as possible. Cover the **MIRAGE** opening with a small cloth or other material when not in use. Should it be necessary from time to time to remove prints or dust, you may take a chance by:

1. Cleaning the mirrors *only* with a facial tissue, *dampened with water*.
2. Apply lightest pressure only! Rubbing will damage the delicate surfaces.
3. Best bet: Use air blast to blow off dust.
4. *Never* use a dry tissue.

Small spots, scratches or slight fog may be observed on these new mirrors. Do not attempt to remove them! They appear occasionally in the manufacturing process, and will have no affect on the illusions you create.

Your **MIRAGE** has been carefully inspected in our labs. With careful use, it will continue to display the most incredible mirages you've (almost) seen!



You can easily lift away or replace the top element without touching the inner surfaces. Simply insert two fingers into the open circle, then widen them to hold the top, as illustrated. Keep your fingers straight; you will leave no prints or marks.

**HAND INSPECTED AND TESTED BY:**

**S. CARPENTER**