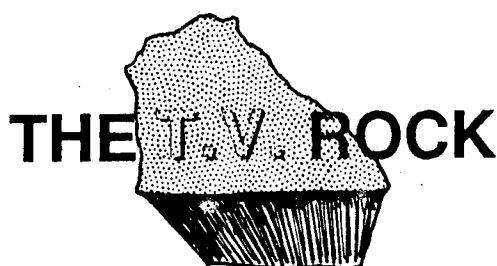


## OPTICAL ENGINEERING NOTE #1: COHERENT FIBER OPTIC BUNDLES

**COHERENT FIBER OPTIC BUNDLES** are sets of ordered waveguides. They are coherent because order is preserved between the input and output ends.

The **TV ROCK** readily illustrates the principal. Where it comes from is best described by its instruction sheet:



COMPARE THE IMAGES OF A REAL T.V. AND THE T.V. ROCK.  
THEY PROJECT ALMOST THE SAME!

### THE TV ROCK

#### What Is The TV Rock?

The TV Rock has fiber optic properties. It will transmit and receive an image in almost the same way your television does. But it does not use electricity, have sound or more than one channel! It will display whatever you put it on top of—you can even read this booklet through it!

The TV Rock is a mineral made of sodium, calcium, boron, oxygen and water. Geologists who study it have also named it Ulexite (YOU-LEX-ITE). As you will see, Ulexite comes in many forms and it is used to make many things. But most exciting of all is its rare TV like property that no other mineral exhibits as dramatically.

#### What Is Fiber Optics?

Fiber optics are thin transparent fibers that carry light over a distance. The fibers are made of materials such as glass, plastic, or in the case of The TV Rock, Ulexite. Each fiber carries a signal or a bit of information and bundles of these fibers help to carry many signals or bits of information. The combined effect of what the bundles carry forms the image you might see in your television or in The TV Rock.

Fiber optics is a fairly new field. It started mainly in the 1970's and was used mostly in communication systems. Fiber optics are used in telecommunication systems, computers, consumer electronics, medical and laboratory instrumentation and military electronics.

One example of how fiber optics are used is in automobiles. Many cars have microcomputers in them that help to make them more safe and use less fuel. Instead of using heavy metal cables and harnesses to monitor oil pressure, engine temperature and fuel to the engine, fiber optics are used. The result means over 50 pounds less weight per car and that means fuel is saved because there is less weight to carry.

#### What Are the Uses of The TV Rock?

The world depends very much on the element boron. The TV Rock contains so much boron that it is mined as a boron ore. Most boron comes from just twelve ores like Kernite, Colemanite and Ulexite (The TV Rock). It is mined, refined and shipped to locations throughout the world where it is used in many industries.

#### How Does The TV Rock Work?

The TV Rock is made of many optical fibers. Look at the side of The TV Rock. You should see many silky fibers that are parallel. Each tiny fiber transmits light from one end of The TV Rock to the other. The bundles of fibers project whatever they are put on top of because they can transmit light.

#### How Do The TV Rocks Form?

The TV Rock probably formed many thousands of years ago by filling in underground cracks in an old dried up lake bed. The material that makes up The TV Rock was first dissolved by water and then came through the ground into the cracks. You can experiment to see how this might happen by putting table salt into warm water. The salt represents the dissolved Ulexite (The TV Rock) and when the water evaporates you will be left with crystals of "pretend" Ulexite. If the water and salt you had were put in cracks underground and the water evaporated, you would see nearly the same thing as geologists see when they find Ulexite that has filled in cracks. Geologists call these filled in cracks veins.

About 5% of all fiber optical materials actually contain boron in the form of boric acid. Fiber glass, automobile bodies, boat hulls, aircraft sections, heat resistant laboratory glassware, ceramics, and many lenses contain boron from ore mined in the form of The TV Rock.

The porcelain enamel on your refrigerator, stove and bathroom sink contain boron. Even Teflon cooking ware contains boron as a bond between the Teflon and the metal.

Boron (extracted from The TV Rock) is used in soaps and detergents, cosmetics, medicines, fire retardants, building materials, to kill weeds and in fertilizers. The heat resistant tiles covering the space shuttles use special boro-silicate glass to protect them from the high heat of re-entry into the Earth's atmosphere. There is even a boron compound that is woven into bullet proof vests. These vests are so tough they can stop a .44 cal magnum bullet at six feet!

Who would have ever thought that Boron could be so exciting?

**Always Let the TV Pryors Come First and then to Their History!**

The TV Record comes from across the globe. The sets of 1990, which include Taiwan, The TV Record, are called *Insights*. Markets are covered in the countries of Italy, Turkey, Peru, Argentina, Chile, China, India, Russia and the United States of America. The United States is the leading producer of records in the world. The TV Record Company alone produces over 90% of the live records in the world. Over 1,000 live records are produced.

Incense occurs in the first item of the TV track but instead conformity in the form of what sounded marvelous from time: blue columbines. "The lastest mining business sector" in the United States with the discovery of "bluene" ("blue" and "blue") in 1870. The former U.S. Senate, then there pulled two senators reacted with 20% of interest. "The good twenty blue" (across) would only take 100-150 million, one-way from Utah Valley to Mexico. California is just 10 days. The dozen impurities across "various" (and) over 30 degrees Fahrenheit, but during the period from 1870 to 1980 hundreds of ships were made through the lake, richly, and many "scent" designs of the journey. One 2000-2500 pounds of ore were mined during that period—and a lot of carbon of the metal (or) was left.

Before the time borders were used as walking sticks by *gypsies*, and the only sources were in Italy and Tibet. Marco Polo supposedly brought some with him when he returned from the court of Genghis Khan, reporting that the money came from "near as far as I know of the time."



FORGETS ARE MENTIONED IN THE CONSTITUTIONAL LAW OF THE ARABIC REPUBLIC  
CHIEF, THE COURT HAS ALSO THE RIGHT TO REVIEW THE CONSTITUTION

Case 6: The "A" Factor

The Ta' Rock rarely catches and very dangerous in some water. It also causes people who happen. But if you are careful with it, it will lead thousands of years.

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## THE T.V. ROCK

## NATURAL FIBER OPTICS

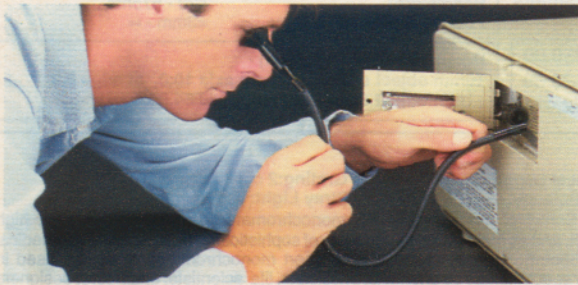
**DISCOVERY BOOKLET**  
ORIGIN-HISTORY-USE\$-REFERENCES

Distributed by C. V. Mosby Co. 977, 15th Ave. East St. Louis, Mo. 64103

Another hip thing to do is to shine a laser beam into the TV  
ROCK.



The **ENDOSCOPE** is Edmund Scientific #61,600\*. It has an input objective and an eyepiece to magnify the image, plus the waveguides are flexible, as opposed to the **TV Rock**. Notice that the clipping on the left is from the 1994 Catalog, and the one on the right is from the 1995 Catalog, and it's been improved with its own illuminating source.



#### FLEXIBLE FIBERSCOPE

This incredible tool allows you to inspect the most difficult-to-reach places. The semi-rigid gooseneck sheathing can be bent through multiple angles to clear almost any obstruction. Fiber optics, while made of glass, are a flexible material designed to withstand repeated bending and flexing. Inside the sheathing are thousands of thin fiber optic glass strands which transmit an image from one end to the other. The fiber optics are coherent, meaning that each fiber is at the precise position at both ends of the sheathing. At the remote end there is an objective lens to focus the light and at the viewing end there is a 7X eyepiece to magnify the image. For best viewing adequate illumination is required at the objective end upon the subject matter. Inexpensive plastic fiber optic light guide can be used for illumination.

#### Specifications:

Field of View: 70 degrees      Length of Sheathing: 17"  
Diameter of Sheathing: 3/8"      Fiberscope Magnification: 7X  
Sheathing Material: Polyolefin-jacketed flexible stainless

Edmund Flexible Fiberscope      G61,160      \$429.00

#### ILLUMINATED FLEXIBLE FIBERSCOPE

This incredible tool allows you to inspect the most difficult-to-reach places. The semi-rigid gooseneck sheathing can be bent through multiple angles to clear almost any obstruction. Fiber optics are a flexible material designed to withstand repeated bending and flexing. Inside the sheathing are thousands of thin fiber optic plastic strands which transmit an image from one end to the other. The fiber optics are coherent, meaning that each fiber is at the precise position at both ends of the sheathing. At the remote end there is an objective lens to focus the light and at the viewing end there is a 16X eyepiece to magnify the image. Within the same sheathing as the image bundle is a small fiber optic light guide which transmits light from a battery-operated, pen-type flashlight to the objective end to illuminate the subject. Fiberscope is also submersible.



#### SPECIFICATIONS:

Field of View: 54°  
Diameter of Sheathing: 8.6mm/0.33 inch  
Diameter of Obj.: Tip 14.11mm/0.55inch  
Usable Length (to insert): 500mm/19.70 inch (submersible)  
Overall Length: 800mm/31.50 inch  
Minimum Radius of Bend: 100mm/4.00 inch  
Sheathing Material: Polyolefin-jacketed flexible stainless  
Fiberscope Magnification: 3.6X @ 9.4mm F.O.V.  
Power Requirement: 2 "AAA" (not included)  
Weight: 120g/4.25 oz.

Edmund Illuminated Fiberscope      M61,160      \$399.00

\*. How I came into possession of this item is an interesting story. I had ordered #61,160, a **Beamsplitter**, but someone at the warehouse was one digit off that day, to my advantage. For the application of the Beamsplitter see **OPTICAL ENGINEERING NOTE #34, RETROREFLECTIVE MATTE SHOTS.**

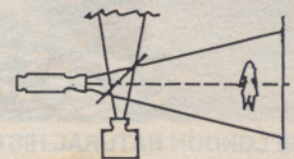
#### DRAMATIC EFFECTS WITH BEAM SPLITTERS

By combining a beam splitter with a front projection system—the same Oscar-winning technique used in "2001: A Space Odyssey"—you can place photo subjects in any setting you desire. Used by TV stations, this technique is great for movie cameras and 35mm SLR's. For an almost totally neutral beam splitter, we recommend the 40R/60T type. Instructions included. High uniformity-glass. R/T indicates Reflectance/Transmittance.

Size	R/T	Stock #	Price
5" x 7"	30R/70T	G61,097	\$31.80
10" x 14"	30R/70T	G72,500	\$85.00

**Anti-Reflective Coated.** Eliminates ghost images since coating reduces the rear surface reflection to less than 1/2 of 1 percent. Coatings are neutral over visible spectrum.

5" x 7"	40R/60T	G61,260	\$31.80
5" x 7"	30R/70T	G43,362	\$31.80
10" x 14"	40R/60T	G72,502	\$85.00
10" x 14"	30R/70T	G43,363	\$85.00





The funnel-like piece of glass was made at Northwestern University by a gentleman named Casey Kot\*. He heated a bundle of glass fiber optics so they fused together and then stretched them like taffy while still red hot. After it cooled the ends were cut and polished flat with ever smaller grits so that it smooth to the eye.

Since the two ends preserve the order of neighboring fibers, it is a **coherent fiber bundle** and is capable of transmitting images. However this thing can magnify or minify, depending on which is the object input or the output end. Small inputs can be magnified to large outputs, and large inputs minified to small outputs. It is hard to see magnification with our sample, since quite a small area is expanded to a much larger one, but minification is no problem.

Edmund catalogs a similar item, their #52,362. It has a smaller ratio between the input and output ends, so it works better on the magnification side, albeit at a lower ratio.

Ratios are simple proportions:  
 $\text{magnification} = \frac{\text{output}}{\text{input}}$ , if  $\text{output} > \text{input}$ .  
Minification occurs if  $\text{output} < \text{input}$ .

#### FIBER OPTIC FUSED TAPER MAGNIFIER

- The Perfect Wide Flat Field
- Lifts The Image Off The Page
- No Focusing Necessary

A tapered bundle of fiber optic image conduits magnifies or reduces the subject image when placed directly in contact with the subject. Tapered from 1 3/16" out to 2" diameter, the magnifier stands 1 1/2" tall. Since the image is virtually lifted off the page, it can be viewed from any angle or distance and still remain perfectly flat and in focus. Normal magnifiers work best only at one specific focal point from the lens. With the large end up, the taper is a magnifier; with the small end up, it acts as a reducing lens.

#### SPECIFICATIONS:

Magnification: 2X  
 Field of View: 1 3/16" (small end of taper) 29mm  
 Apparent Field: 2" (large end of taper) 51mm  
 Working Distance: 0 (direct contact)  
 Height: 1 1/2" (48mm)  
 Weight: 13 oz.  
 Fiber Optic Magnifier N52,362 \$79.00



#### PROBLEMS

- What is the magnification (or its reciprocal, minification) for
- The Edmund sample? 1 3/16" input, 2" output. (Note that they rounded their figure.)
  - The Northwestern sample? 40mm input, 5mm output. (No need to convert units, magnification is dimensionless.)

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\*. Unsung hero of pioneering plastic fiber optic technology, nicking them to make Xmas-tree-like lights.