Stone Enhancements and Fakes
Chapter 14 of P.G. Read

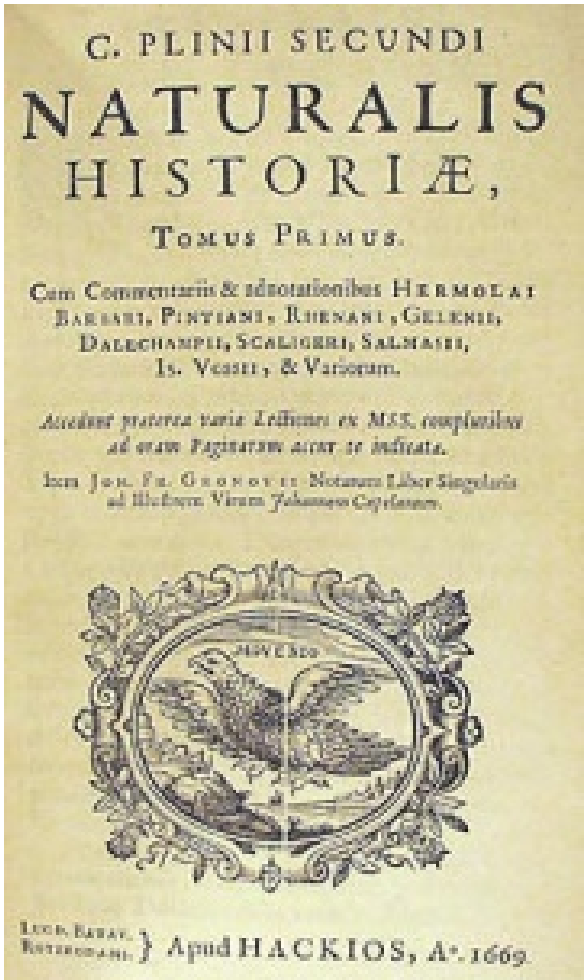
Since Ancient Times

- Even the Romans talked about enhancement of gems.

- Pliny's Natural History

Written in the First century

A.D. discusses enhancements


C. PLINII SECUNDI
NATURALIS
HISTORIÆ,
TOMUS PRIMUS.
Cum Commentariis & annotationibus HERMOLAI
BARBARI, PINTIANI, RHENANI, GELENII,
DALECHAMPII, SCALIGERI, SALMASII,
Is. VOSSII, & Variorum.
Accedunt præterea variæ Lectiones ex MSS. emendatiores
ad oram Paginarum autem ut indicata.
Item JOH. FR. GRONOVII Notarum Liber Singularis
ad illustrem Virum Johannem Cyprianum.
Apud HACKIOS, A°. 1669.

Possible enhancements

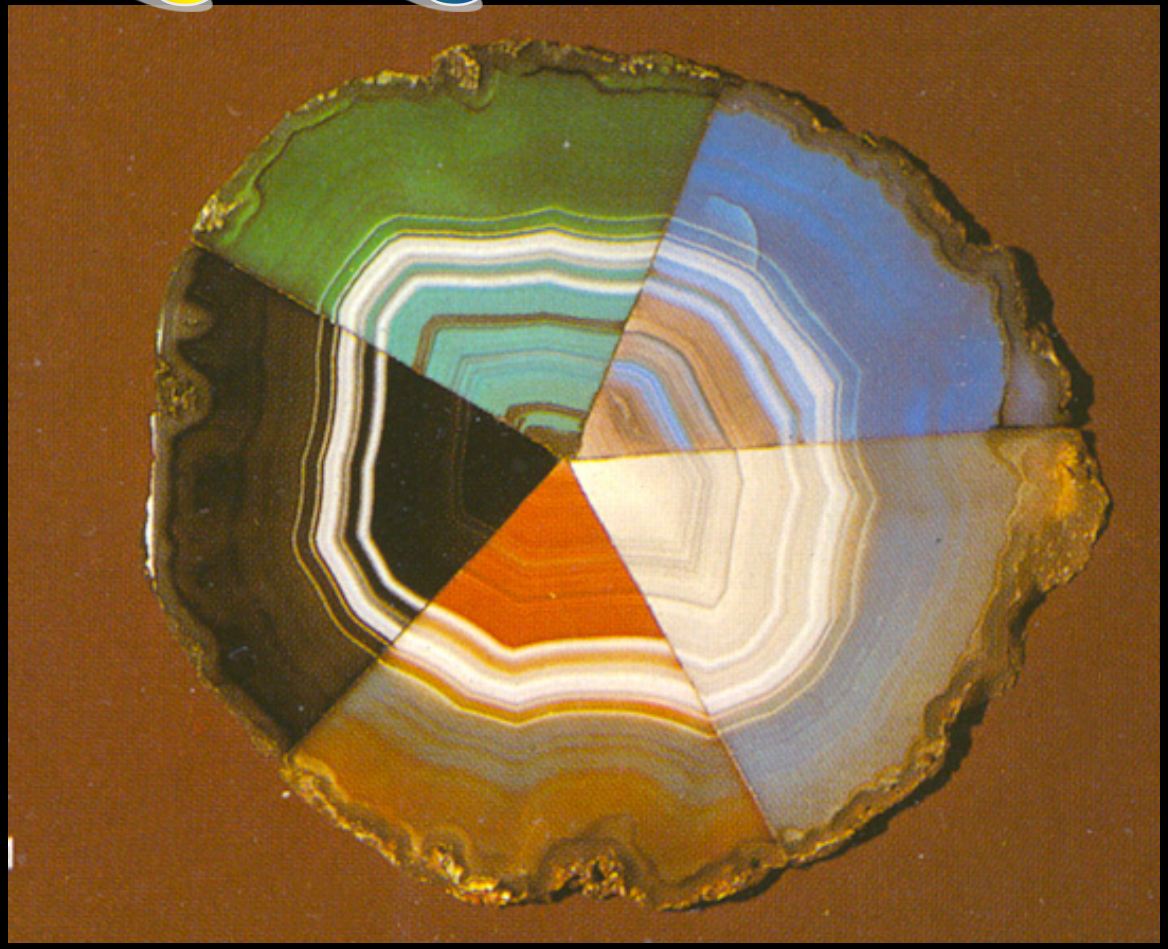
- Dying
- Foiled backing
- Oiling
- Heating
- Bleaching
- Doublets and triplets (composite stones)
- Irradiation
- Synthetic overgrowth
- Diffusion (covered)
- Laser Drilling
- Impregnation/filling
- Imitation/simulant

Dyeing

- Stone must be permeable
- This may mean that fractures are created by heating and filled.
- Stones are given a dye. This can usually be dissolved by solvents and recognized. For example, acetone on a tissue paper.
- Stones can be coated with vapor deposits or dyes (these will wear off).

Dyeing Agate

- Acid treated
- Permeable layers
- Dyed



Stones that are dyed

- Agate & chalcedony, carnelian, coral, ivory, jade, onyx, opal, pearl, turquoise

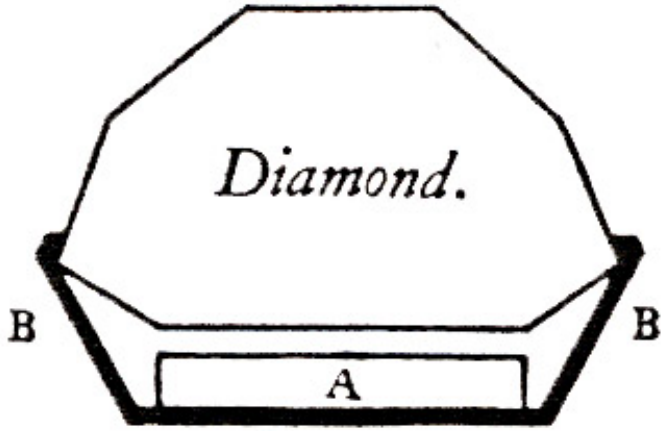
- Most of these stones will be mentioned later

Metal Coating

Titanium Coated Quartz

Foil Backings

† *This diagram may be taken to illustrate Cellini's description:*



A *Reflector.*
B *Bezel tinted inside.*

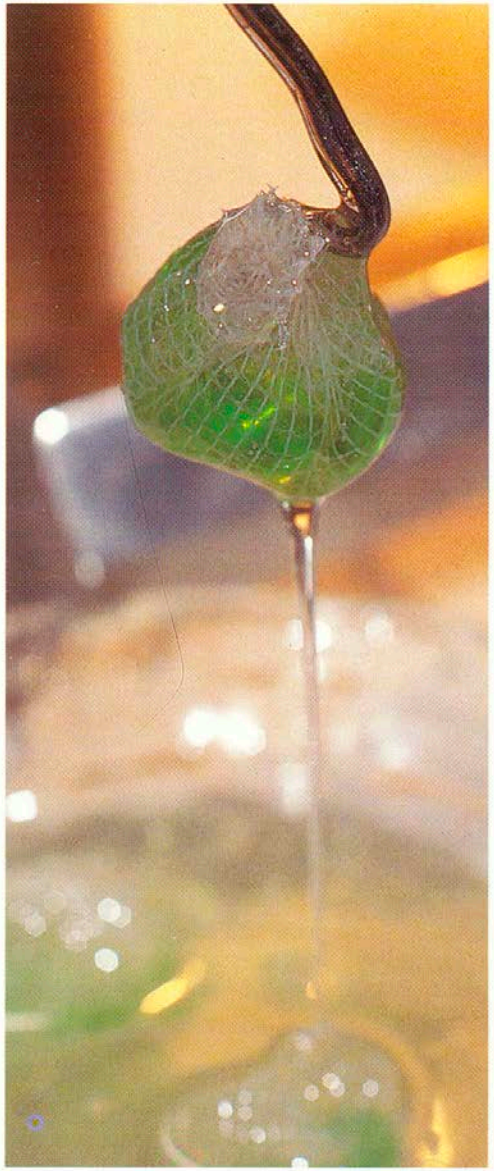
Foil Backings (cont…)

Use included:

- Increasing brilliance
- Giving color
- Also may enhance a poorly cut stone
- Only effective in Bezel settings

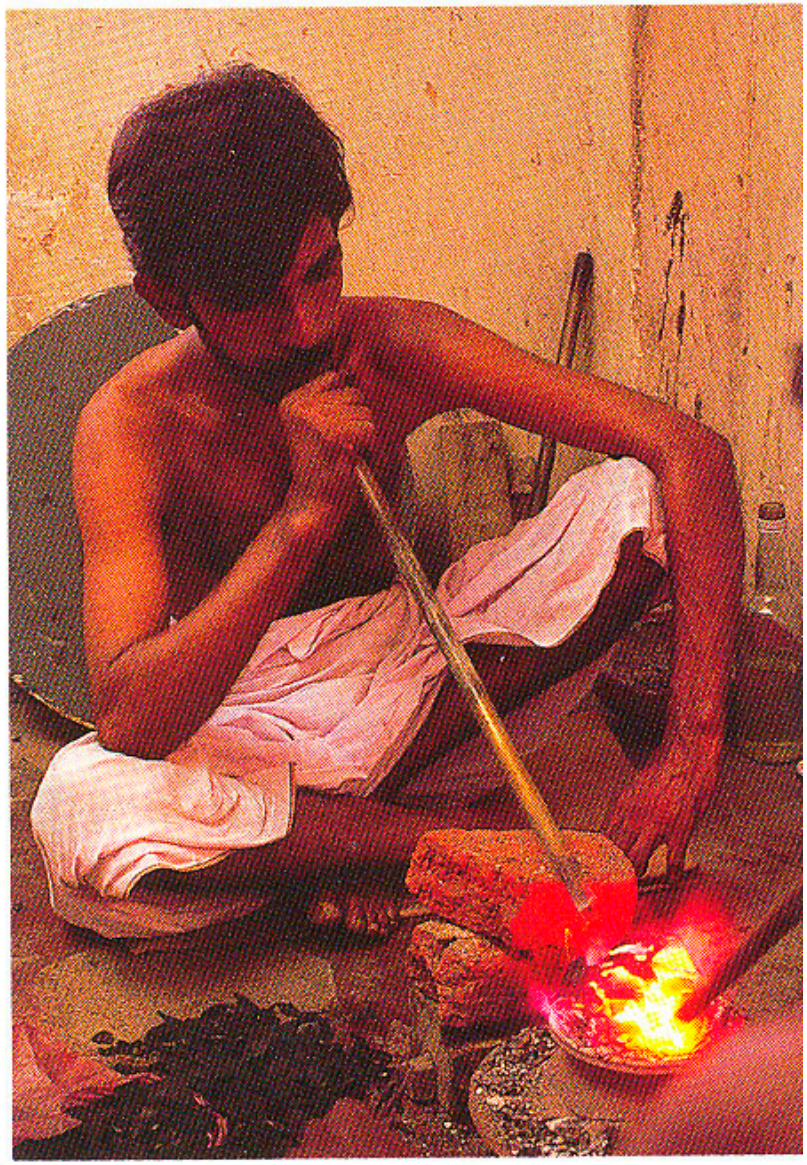
Oiling

Oiling is an almost universal emerald enhancement, but virtually unknown to the public. Of all the major gems, emeralds are most likely to have inclusions, distinctive relics of the crystals' birth process. Some serve as fingerprints, by which gemologists identify naturals. Too many inclusions diminish a stone's beauty and value. Oiling is not permanent and should be repeated every few years. Only if cracks reach the surface can an emerald benefit from oiling.



A Bogotá laboratory technician washes and dries emeralds (top). Then he soaks them overnight in heated oil, sometimes under pressure, to force oil into inclusions (left). After draining and another cleaning, some emeralds display substantial improvement. Shown above is a 28 ct. gem before and after oiling. Usually, whoever owns a gem at the time it is faceted decides whether to oil.

Heat treatments



Bleaching Pearls

Bleaching Coral
Black to Gold

Bleaching

- Though mainly done on organic substances such as pearl, coral, & ivory it is also done to minerals
- Bleachable minerals include: Chalcedony (a type of quartz), tiger’s-eye, and petrified wood.

Doublets

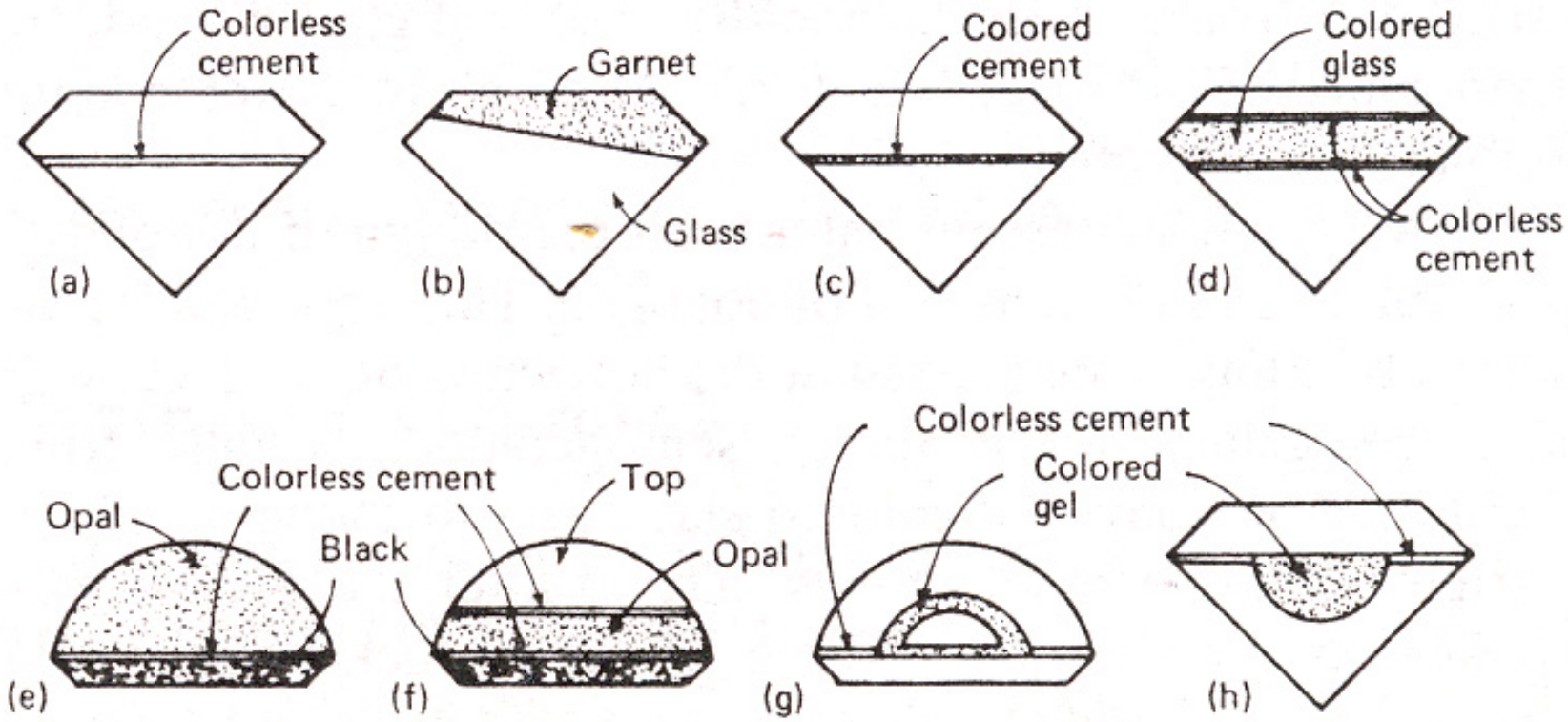


Figure 5.7 Different forms of doublets and triplets: (a) doublet; (b) garnet-top doublet; (c) triplet; (d) triplet; (e) opal doublet; (f) opal triplet; (g) + (h) gel-filled triplets

Doublets (cont…)

- The colored part is often a softer substance such as glass or glue and is protected by harder outer portions (see p. 189-190 in Read)

- Opals are often made into doublets or triplets. This in not to deceive, but to protect the delicate opal that easily fractures.

Opal Doublet and Triplet

A Cheat

- Sapphire doublet with glue dyed blue

Irradiation

This can be done in a :

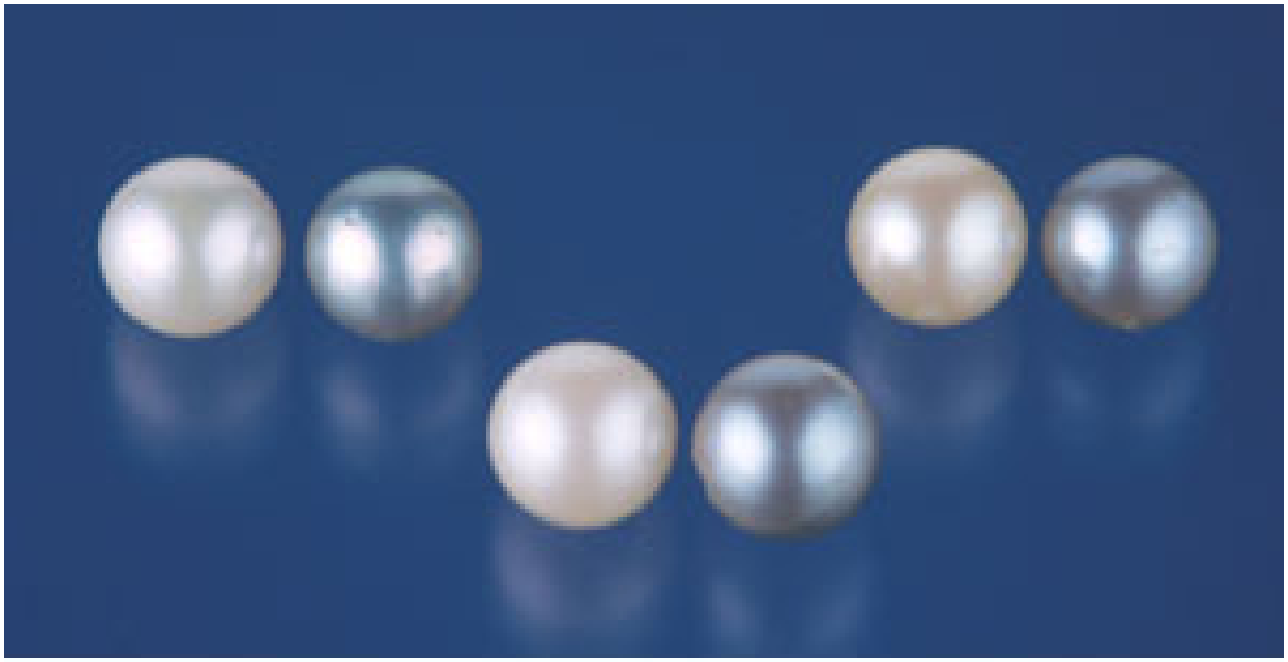
- Nuclear reactor
- Accelerator
- By using radioactive substance such as radium, etc.
- Stone such as diamonds, topaz, beryl, etc., are colored by this method
- It may not be permanent

An Accelerator

Cobalt 60 Gamma Ray

Courtesy of the US Post Office

- Pearls color altered by a linear accelerator that creates a beam of high-energy electrons typically used to kill the microorganisms



Cultured pearls before and after "sanitization" procedure.

Coloration by irradiation

Examples:

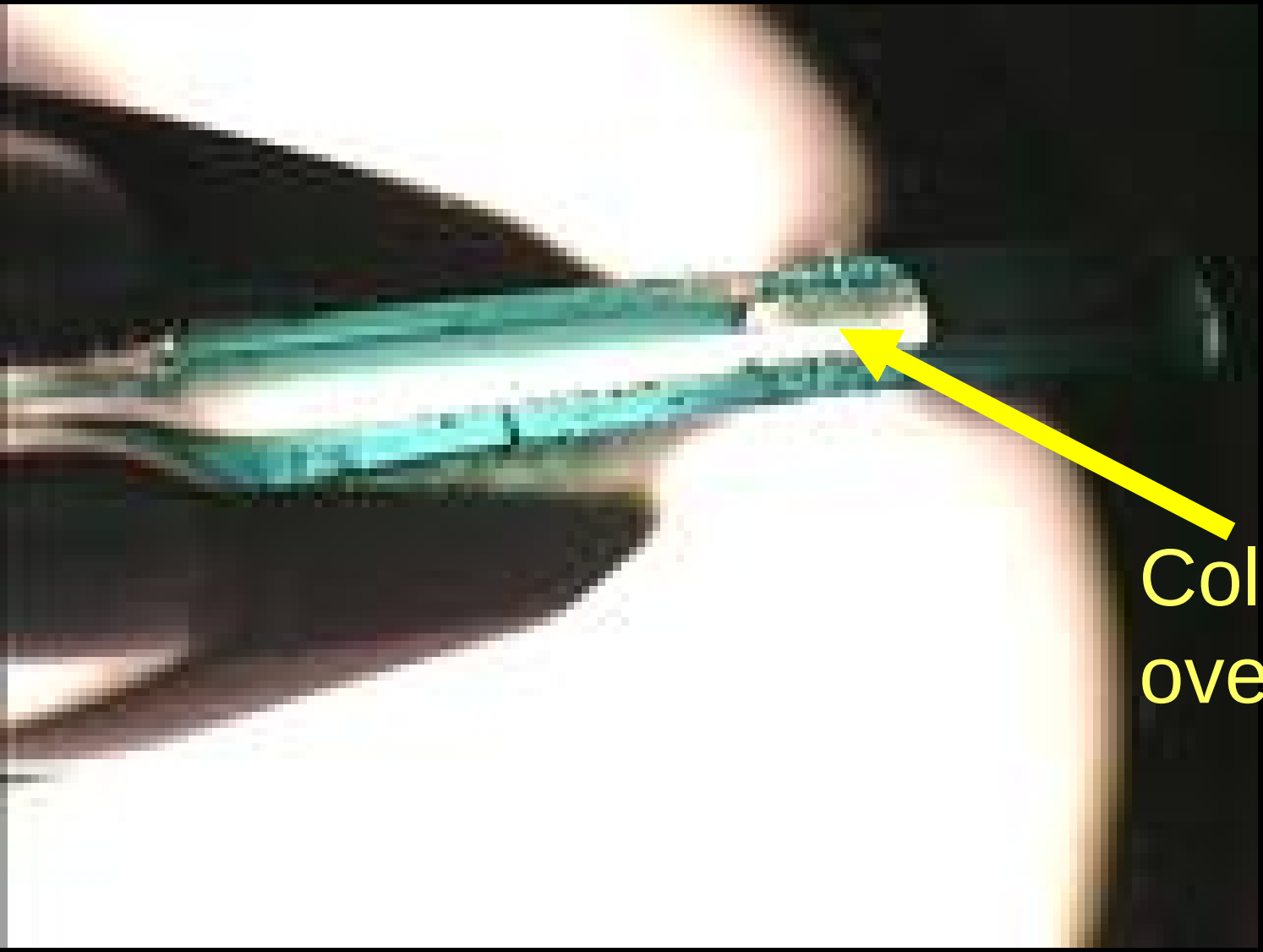
- Colorless quartz to smoky quartz
- Intensifying yellow in diamonds
- Diamonds: blue, black, yellow, etc.
- Topaz to intensify the blue
- Aquamarine to increase blue
- Tourmaline to intensify red

Synthetic Overgrowth

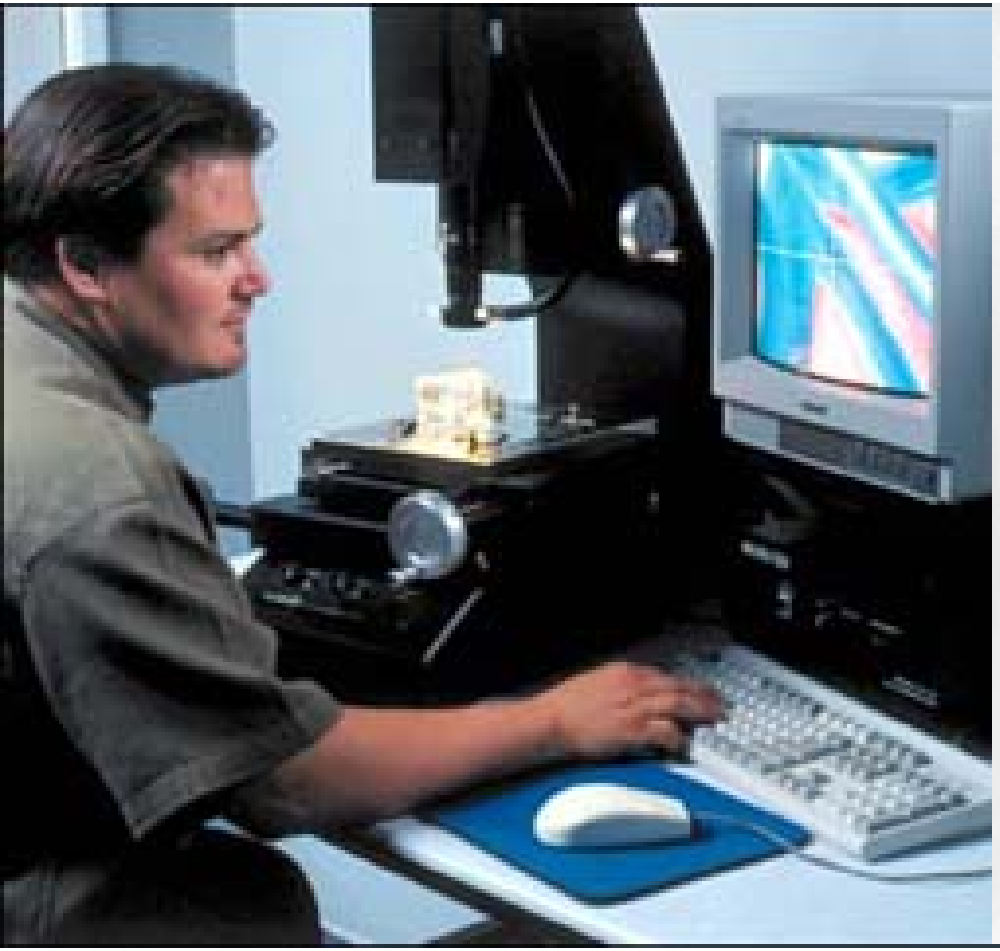
- A stone can be used as nucleus to grow an overgrowth of synthetic material
- The synthetic may have better color
- The stone is enlarged
- Only emeralds have been done on a large scale

- Both hydrothermal and *flux-growth* synthetics methods have been developed for producing an emerald overgrowth on light-colored to colorless beryl

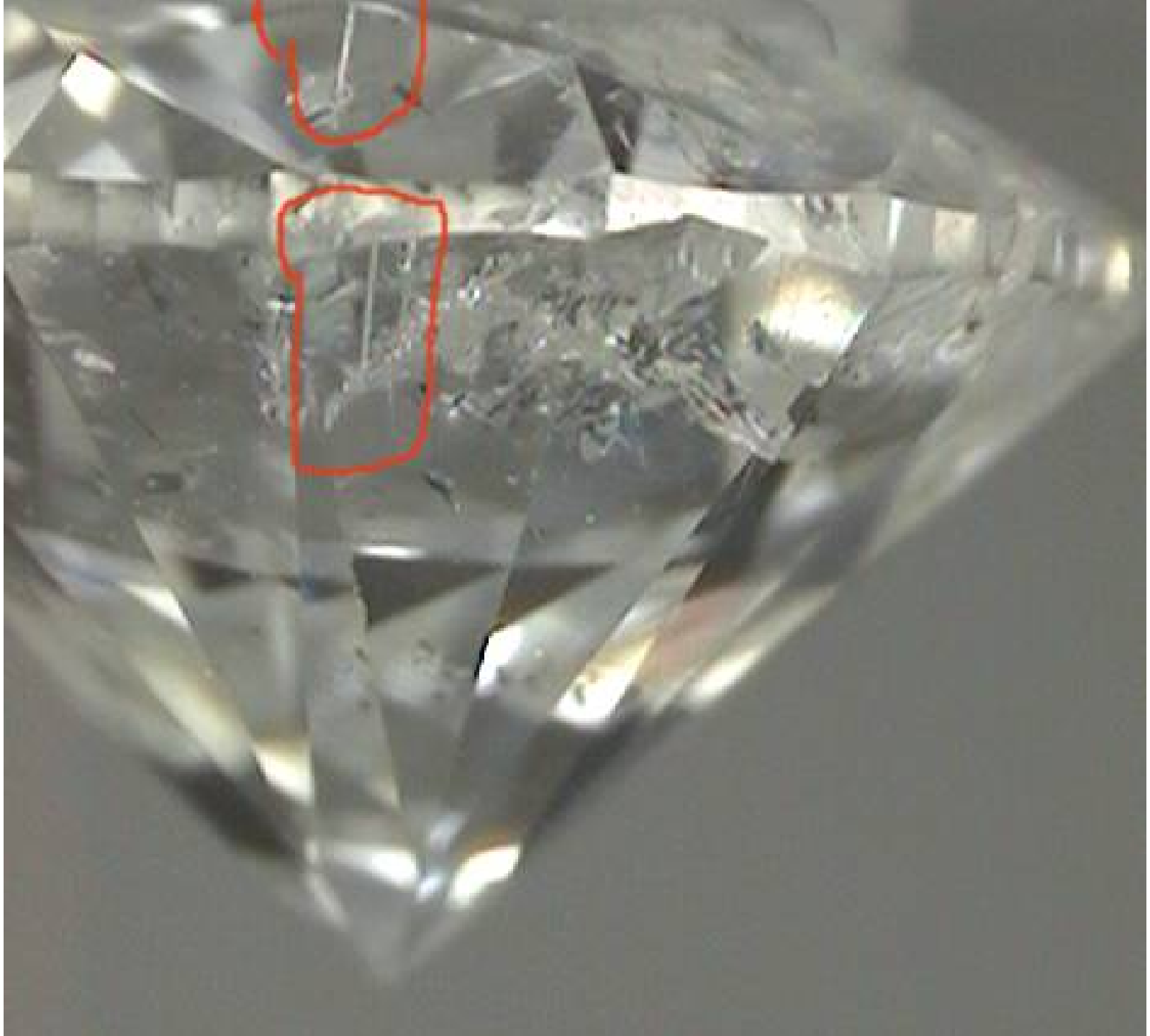
- For instance the **Lechleitner** synthetic overgrowth is grown on a faceted beryl plate


Colorless
overgrowth

Laser Drilling (p. 170)



Laser Drilling (cont…)



Laser Drilling (cont…)

Laser Drilling removes flaws such as:

- Black spots
- Allows chemicals to be forced into holes to dissolve unwanted minerals
- Fracture filling may follow

Fakes-CZ has been laser drilled to make it appear to be an enhanced diamond!

Impregnation

- Some stones are porous and the addition of colorless oil, wax, or plastic may make the surface appear superior.

Example, Turquoise, lapis, emerald, etc

- Also filling of fractures to hide flaws in transparent stone (similar to oiling)

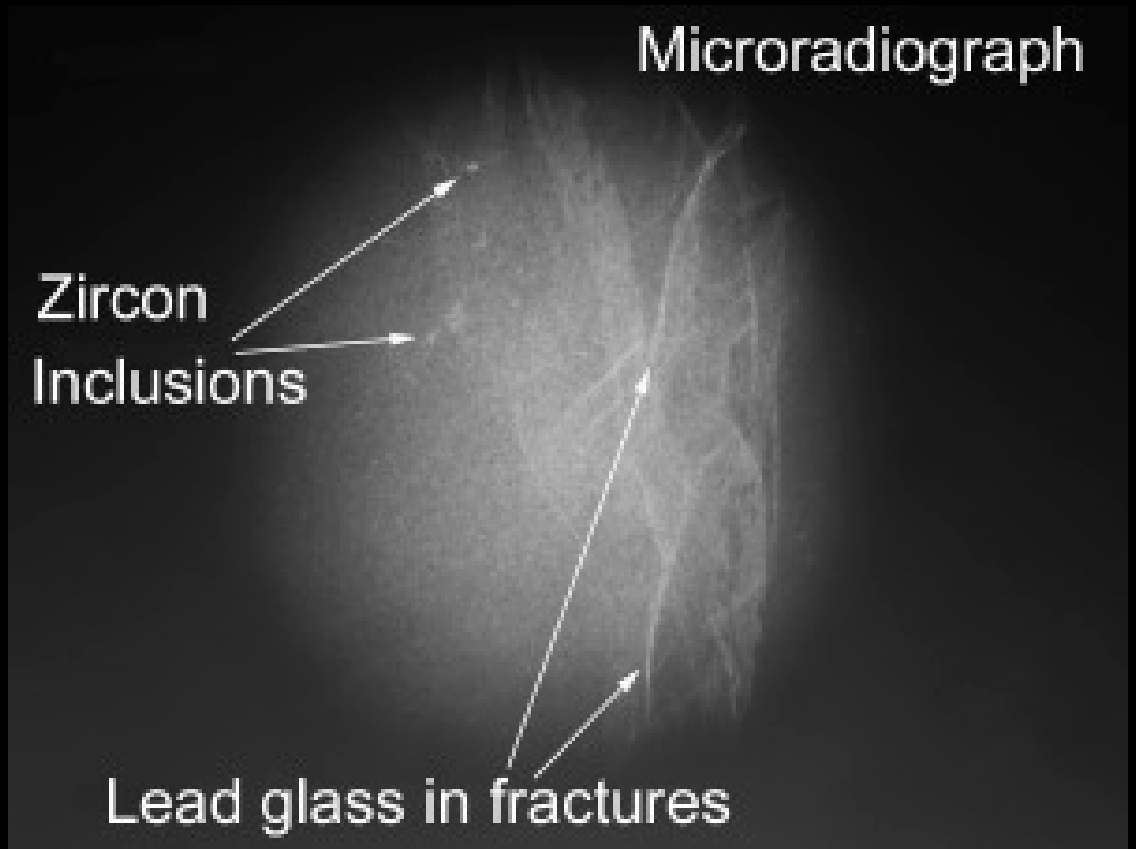
Example Diamond and Ruby

Fracture Filling

- Detected with X-rays
- Recently lead glass has been used to fill fracture in rubies

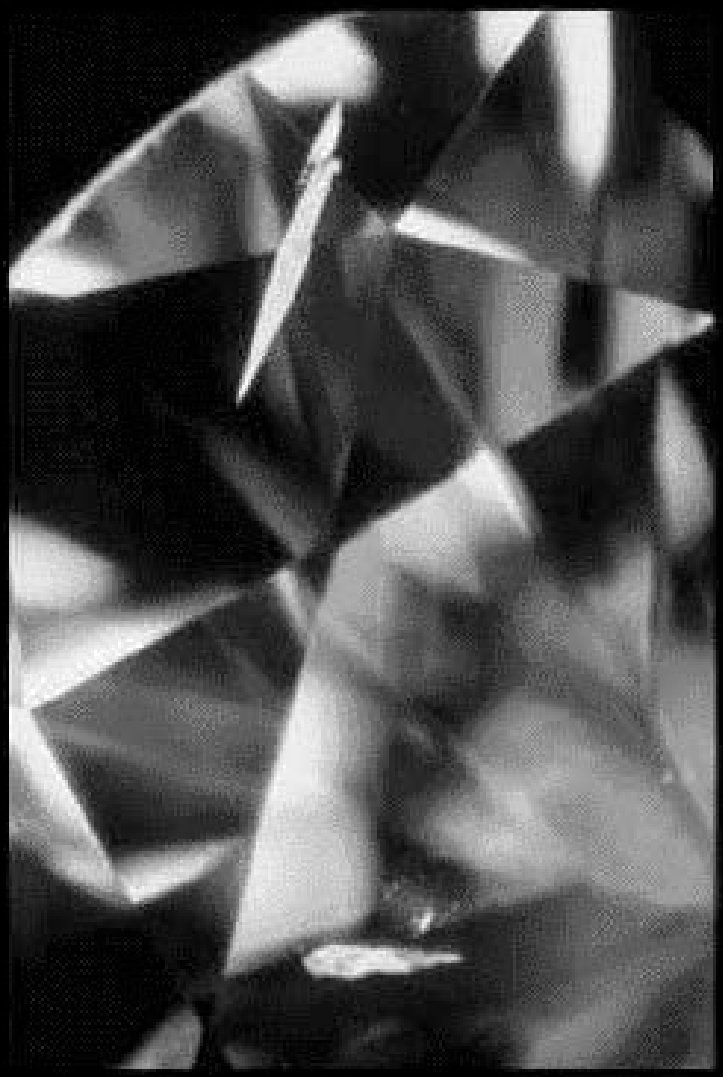
Fracture Filling

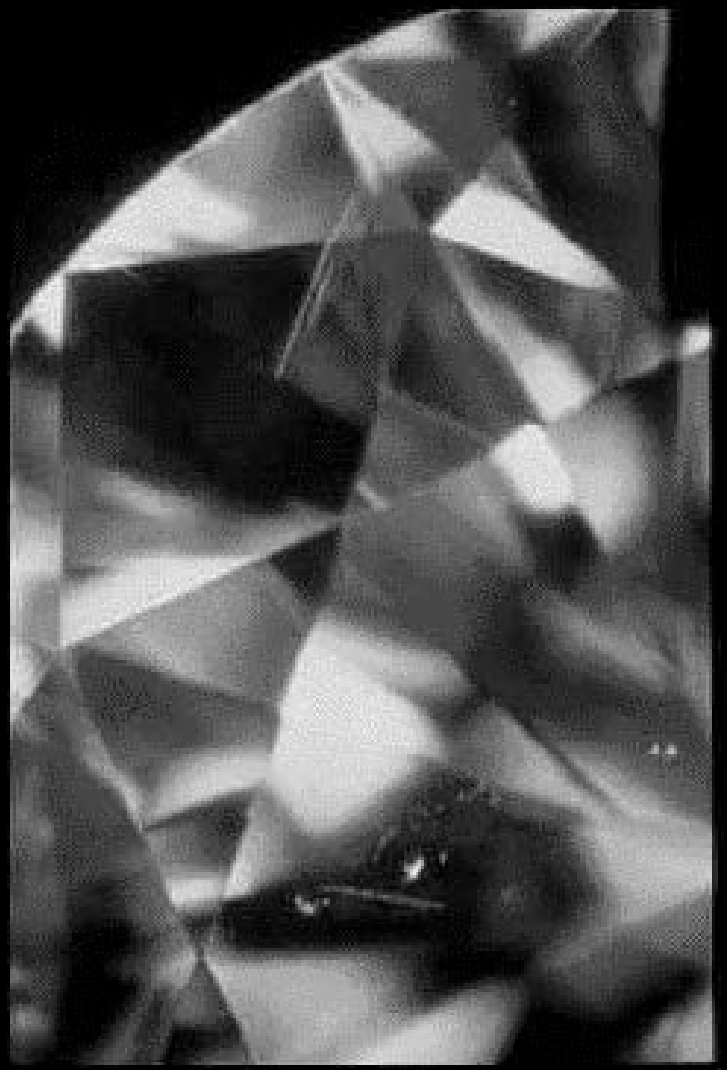
- Lead glass and resins (epoxy, etc.) can be forced into cracks to fill flaws in stones




REJ : 123 SAT : 151 EDGE : 7~ SHARP : OFF

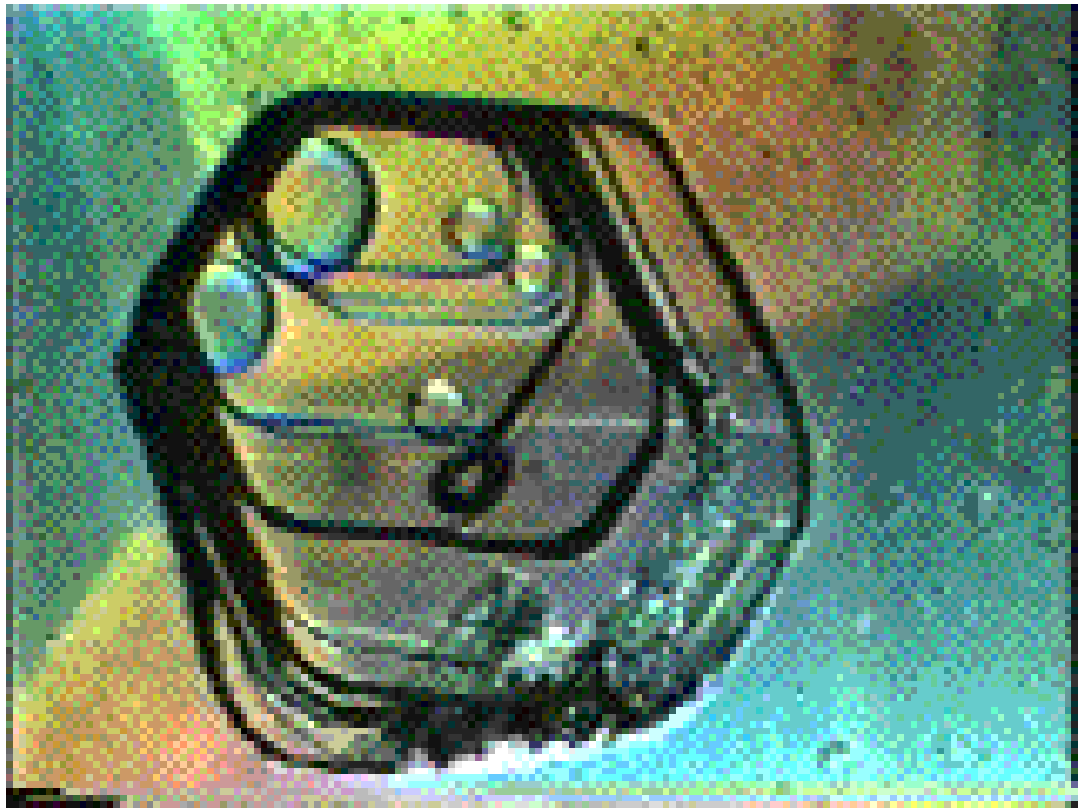
Fracture Filled Diamond Before and After





Imitations and Simulants

- Glass
- Plastic
- CZ
- Moissanite



Thank you Tairus Created Gems!

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