

Diamonds in the Rough

Synthetic Gems from Pliny to Lightbox

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IN MAY 2018, THE FAMOUS DIAMOND company De Beers introduced Lightbox as a fashion jewelry label that offered low-budget diamonds with mass-market appeal. Lightbox’s pink, blue, and white diamonds were targeted to a market looking for Sweet Sixteen or bridal party gifts and priced from \$200 for a quarter carat to \$800 for a single carat. But these were—*are!*—no ordinary, natural diamonds. Instead of taking billions of years to form under heat and pressure in the earth, Lightbox’s diamonds are grown in a matter of mere weeks in a laboratory at De Beers’s Element Six Innovation Center in Oxfordshire, England.

De Beers’s introduction of Lightbox was—and is—a significant shift in the company’s treatment of laboratory-grown diamonds. For decades, De Beers, as well as a plethora of other jewelry companies and gemological associations, has been reluctant to acknowledge laboratory-grown diamonds as “real” gems. And even at its launch, the fashion label Lightbox was careful to not pit its laboratory-grown diamonds against De Beers’s natural ones. On its website, Lightbox brags, “We love science and sparkle.”

In a 2018 interview with *The New York Times*, Sally Morrison, Lightbox’s head of marketing, emphasized that these

laboratory-grown diamonds were to be playful gems. According to Morrison, Lightbox’s diamonds are geared toward “the self-purchasing professional and younger woman, the older woman who already has a jewelry collection” as well as any woman “who doesn’t want the weight and seriousness of a real diamond for everyday life.” This implies that “real diamonds” are not those grown in labs and that people—at least people making and selling diamonds—believe that there is a sincere difference between the two. But this begs the question of why. Why do the two types of diamonds carry such different cultural cachet?

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As recently as 2016, De Beers championed the “Real Is Rare” campaign that specifically sought to combat the growing jewelry market of laboratory-grown diamonds. (“Real Is Rare. Real Is A Diamond.”) Through “Real Is Rare,” De Beers and other diamond sellers pushed the idea that a diamond was real only because it was something that had come from the natural world; thus, anything non-natural was simply not really a real diamond. Two years later, De Beers might not concede that laboratory-grown diamonds are “real,” but was willing to sell non-natural diamonds if customers wanted to buy them.

The first laboratory diamonds—diamonds that were grown with a method that could be successfully replicated—were created at General Electric’s labs in Schenectady, New York, in December of 1954 by a team of scientists codenamed “Project Superpressure.” (The scientist Howard Tracy Hall is credited with creating the first of the group’s laboratory-grown diamonds.) A year after the project’s initial success, in December of 1955, another team member, Robert Wentorf, went to the local food co-op in Niskayuna, New York, bought

a jar of crunchy peanut butter and brought it back to the General Electric lab. Wentorf ran the crunchy peanut butter through the Superpressure's experiment protocols, theatrically demonstrating that, given enough heat and pressure, any carbon-based source could produce a diamond.

Also known as synthetic diamonds, laboratory-grown gems are, like their natural counterparts, pure carbon with atoms arranged in a 3-D lattice structure. These diamonds are, for all intents and purposes, chemically identical to gems that were found in nature—nature just hasn't grown them. Experts, however, can tell a lab-grown diamond from a natural one, much as they can source where natural diamonds are from. While industrial markets were quick to embrace General Electric's laboratory diamonds for grit and for drill bits, the jewelry side of the diamond market has historically dismissed the laboratory-grown diamonds as gems that are somewhere between gimmicks and fakes. In the ensuing decades, these new diamonds began to challenge just what we think authentic, real diamonds could be.

"It's like a man catching a trout out of a hatchery pond," William S. Preston, a former president of the American Gem Society said in an interview for *The Burlington Free Press* on April 8th, 1955, after seeing what General Electric had created. "Their appearance is much the same but it's not the real thing." Twenty-five years later, chemist and mineralogist Kurt Nassau elaborated the same point. "Some gemstone experts are apprehensive about synthetic gemstones," he offered in the introduction to his 1980 book *Gems Made By Man*, as tensions built in the gemmological world about how to make sense of non-natural diamonds. "They regard them as intruders to be shunned."

Part of the anxiety about these then-new diamonds was financially motivated, of

course. (If diamonds could simply be conjured out of a lab in a matter of weeks, what would that do the market for natural diamonds?) But part of the unease about laboratory-grown diamonds draws on thousands of years of history during which any manufactured or made gem was, by definition, an imitation or a fake. What would it take, then, for people to consider a human-made gem as real and as authentic as ones found in nature?

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Fake gems are nothing new. Although Lightbox has been able to tap into shifting millennial consumer expectations about diamonds—laboratory-grown diamonds get around tricky provenance questions and remove concerns about purchasing conflict diamonds—the push to accept laboratory-grown diamonds as real, authentic diamonds is an uphill battle, with a complex history. But, as it turns out, making fake gems isn't necessarily easy. Just as General Electric had to combine science, artistry, and expertise to manufacture their diamonds, so too, have other makers of imitation gems.

The earliest fake jewels trace back to ancient Egypt where glass gems were sometimes substituted for the real thing in burial goods. By the first century CE, the Roman author and natural philosopher Pliny the Elder took on the question of "rampant" fake gems in ancient Rome's markets in the mineralogy section of his famous *Historia Naturalis*. Pliny calls his reader's attention to the proliferation of such fakes—specifically, instances where fraudsters simply substituted cheap look-alikes for the genuine thing. He attributes the abundance of fakes to humanity's obsession with precious gems as "... there is no other kind of fraud practiced, by which larger profits are made."

In order to combat such gem deceptions across the classical world, Pliny offered what we might call a scratch test to differentiate real diamonds from fakes—Pliny notes that real diamonds would scratch other minerals, but not vice versa. Pliny further claims that fake gems can be ferreted out by “blisters in the body of the fictitious stone...filaments...and an unequal brilliancy.” This method was particularly useful for finding fake rubies as, Pliny writes, “They are counterfeited, too, with great exactness in glass...and they present small blisters within.”

There are a plethora of reasons for people to make imitation gems—some legitimate, some not. Some of the non-natural gems were purposefully designed and commissioned as such to ensure that they would be more permanent than the “real” thing. (Natural gold, for example, can be melted down and reworked into a different object. Non-natural gems, enamels, and the like meant that the longevity of an object could be guaranteed in a way that the “real thing” could not.) For more than a millennia, several artists’ handbooks, for example, the *Mappae Clavicula* (ca. 600 CE), offered considerable attention and space to helping artists find acceptable worked-glass substitutions and the like for gems. For example, Theophilus, a Benedictine monk who compiled information about the art and craft of stained glass during the Middle Ages, notes that imitation emeralds, hyacinths, sapphires, and other jewels could be found “in figures upon windows, in crosses or books, or in ornaments of draperies...,” which might be better suited for the budget and the artwork than actually using the real thing. Theophilus’s work demonstrated that there was an art to the imitation, but there was never any question that the art was an imitation of what could be found in nature.

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And there’s more than one way to make a fake. While substituting glass was an incredibly straightforward way to make a fake, other less-than-genuine gems were made drawing on alchemical traditions. These sorts of “precious stones” were made from non-gem materials. According to historian of science Marjolijn Bol, an expert on alchemic craft, art, and material culture from the Middle Ages, the alchemic tradition of dying one kind of stone, such as a crystal or selenite, to pass for something more precious, like an emerald or ruby, was extremely effective and made it difficult for even experts to tell the difference between the real thing and the fake. The gullible gem-buyer wouldn’t stand a chance against those commissioning non-natural gems in works of art.

The first examples of artificial stones made from a different parent material come from the ancient Mesopotamian city, Mashkan-shapir, in southern Iraq about 4,000 years ago. Ancient artisans heated a very fine-grained alluvial silt to a melting point and then let the silt slowly cool so that the molten mixture formed a thick slab that resembled a local basalt. Contemporary archaeologists think that these “synthetic” volcanic rocks would most likely have been used to grind grain, as were the natural basalt slabs in the area. Although the Mashkan-shapir cooked rock is an example of a developing technology, rather than an outright fraud, it’s a perfect example of how artistry and expertise are needed to have one material pass for another.

Fast forward from ancient Mesopotamia to the third century CE and we find a burgeoning industry of alchemists, artists, and fraudsters looking to create fake gems rather than just synthetic groundstones. Not only does Pliny the Elder discuss substitutions as a specific type of gem fraud in *Historia Naturalis*, but Marjolijn Bol notes in her research that Pliny is also well-aware

of fake gems being made through dyes and transformations, so convincingly that, according to Pliny, “...there is considerable difficulty in distinguishing genuine stones from false; the more so as there has been discovered a method of transforming genuine stones of one kind into false stones of another.”

It’s not an easy thing to transform one material into another or to make one material mimic something else. Just as artists needed handbooks for successful crafting of glass, alchemists needed “how-to” guides for “transforming” stones from one thing to another through dye—and the Stockholm Papyrus was one such handbook.

The Stockholm Papyrus was a collection of alchemic recipes from 200-300 CE compiled from Egypt and written in Greek on fifteen loose papyrus leaves. The entire manuscript measures about 30 centimeters in length, something like 16 centimeters in width, with 41 to 47 closely written lines of Greek capital letters on each page. The pages are numbered consecutively, with 71 how-tos for creating fake gems.

The papyrus walked its readers through how to take selenite, topaz, or moonstones and color them to look like emeralds, rubies, or beryls. For over a thousand years, the document was the “go-to” recipe book for forgers, fraudsters, and alchemists to create fake and less-than-genuine gems—again, for any number of reasons. Each recipe used an acid and a pigment, chemically bound together that, when applied to a less-valuable stone, like quartz or selenite, would render the clear stone the color of something precious or semi-precious.

The recipes used dyes that were familiar to textile dyers and artisans. A red dye could, for example, be made from alkanet root and was in the recipe for making fake rubies. The instructions from the Stockholm Papyrus come across to the contemporary reader as both specific and cryptic:

19. Production of Ruby

The treating of crystal so that it appears like ruby. Take smoky crystal and make the ordinary stone from it. Take and heat it gradually in the dark; and indeed until it appears to you to have the heat within it. Heat it once more in gold-founder’s waste. Take and dip the stone in cedar oil mixed with natural Sulphur and leave it in the dye, for the purpose of absorption, until morning.

Marjolijn Bol has actually recreated one recipe from the Stockholm Papyrus—for fake emeralds. “Would it be possible, as the recipes suggest, to make a convincing imitation of a precious stone?” Bol asks in her description of her 2014 experiment. “Could such a ‘fake’ potentially fool the innocent eye into thinking it was real?” Using ground verdigris (the green oxidation product of leaving copper in vinegar) and linseed oil as the dye, Bol let several topaz, crystal, and selenite stones soak overnight in the alchemic brew. The following morning, she pulled out emerald-like stones, with a green hue that coated the less-precious stone. “These first experiments show that, when ancient sources insist how visually convincing the imitations of precious stones could be, they are probably not exaggerating,” Bol concludes.

Reader, I attempted to recreate Bol’s experiments myself to make fake emeralds using the recipe from the Stockholm Papyrus. Regrettably, my “emeralds” would never fool anyone into thinking that they were the real thing. (I think I didn’t have a high enough concentration of verdigris, and so the stones came out simply a pale hue of green...) I did, however, walk away from the experience with an appreciation for the alchemic expertise that would be needed to successfully pull off the recipe. I also could appreciate how attempts to morph one material into another would inevitably create a sense that anything non-natural was simply unreal.

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“F or although art may imitate nature nevertheless it cannot reach the full perfection of nature,” Albertus Magnus, the thirteenth-century Dominican bishop and natural philosopher, wrote in his *Book of Minerals*. Specifically, Magnus was talking about glass—glass could look exquisite and sparkle like a diamond because it was only as an imitation. Since glass was not natural, it could never be a “real” gem. And this divide between nature and non-nature continues to hold sway. After thousands of years if glass substitutes, dyed fakes, and other imitations, it’s easy to see how history has set a precedent about manufactured gems that is difficult to break.

Which bring us back to the question of why Lightbox could be so reluctant to talk about laboratory-grown diamonds as “real.” In order for laboratory-grown diamonds, like those sold by Lightbox, to carry the same cultural cachet as De Beers’s other, natural diamonds, how we think about a diamond is going to need to become more flexible. We need to move past the simple binaries of “real” and “fake” and to think about authenticity as a continuum. Consequently, any changes in the cultural lives of diamonds will most likely come from consumers, not from the diamond manufactures, themselves.

For millennia, gems—those that are real and those that are less-than-real—have existed along a continuum authenticity and how we make sense of those gems hinges on their cultural contexts. The stones from Mashkan-shapir, for example, are a very different sort of attempt to mimic nature than were the fraudulent gems that so irked Pliny. The diamond industry’s move to embrace and sell laboratory-grown diamonds marks a powerful new direction in the history of diamonds and consumers’ growing flexibility about what sort of gem ought to be considered authentic and why. **A**

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