Value Factors, Design, and Cut Quality of Colored Gemstones (Non-Diamond)

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In this comprehensive article, the author discusses the value factors of colored gems in five parts. Parts one and two appeared in Gem Market News, January/February 2016, Volume 35, Issue 1. What follows are parts three and four.

Part 3: Darkness and Brightness

Part 1 discussed the major value factors that affect the price of a colored gemstone, and broke down the various aspects of cut quality (one of the factors of value). Part 2 defined aspects of cutting styles to establish some common language, with a focus on basic faceting styles, and a short discussion on cabochons and beads. Since the color quality is such an important part of the value, parts 3 and 4 will focus on factors that affect value related to color, and examine how a cutter makes choices when cutting a gem.

Wireframes or depictions of facet arrangements (such as the left side of Fig. 3-09) are from scans of real gems so as to illustrate aspects of gem cutting. Face-up patterns (such as the right side of Fig. 3-09) were made using the program DiamCalc; adjustments were made to the refractive index to represent the gem material being demonstrated. DiamCalc does not show double refraction.

Tradeoffs

Before discussing how the trade assesses relative value of colored gems, it is important to realize that you will often see examples where the cutter had to choose between various tradeoffs. For example, a cutter has a very thin piece of rough that happens to be very rare. Do they cut several small gems from the rough or do they cut a single, larger gem that will be quite shallow and badly windowed? In many cases the resulting value in either scenario above will be about the same. However in some cases, one or the other may be significantly more valuable. Perhaps if cutting that rough into a single gem will result in the largest-cut gem of that species, the cutter may opt for cutting the single gem. There are many tradeoffs to be considered.

Dark Patterns in a Gem

- ***Darkness—Good and Bad***

Extinction is considered by many in the jewelry trade to be the dark areas seen when looking at the gem face-up. That's not quite enough information. There are four different causes of the dark or black portions of the pattern observed in a gem (three are illustrated in Fig. 3-01—

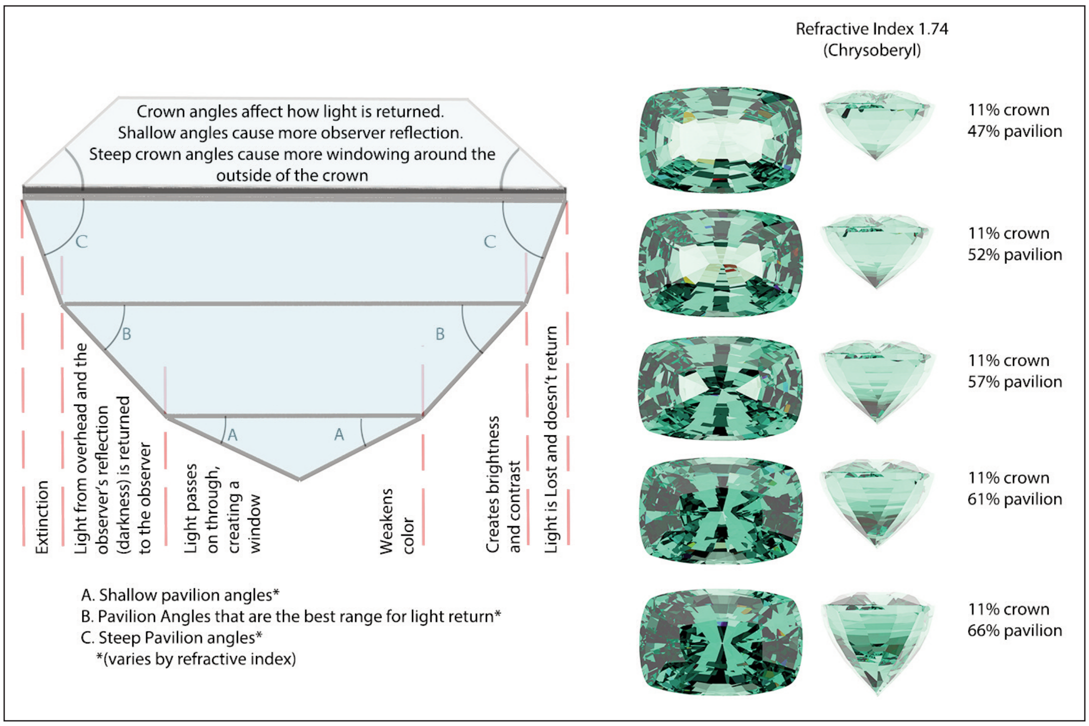

Fig. 3-01. Illustration by Al Gilbertson, © GIA.

parts of the figure borrowed from Richard Hughes—*Gemological Digest* 1988, Vol. 2, No. 1 & 2, pp. 10–15):

(a) Absorption. The material is very dark (see Fig. 3-02) and light just can't get through it. Virtually the entire spectrum of the visible light passing through the gem is absorbed. This type of darkness is bad.

(b) Windowing. Light passes through the gem and is not bounced back in any direction by the pavilion facets to the observer. The effect is that you are seeing though the gem. This creates gray and dull areas in the middle of the gem (see Fig. 3-01), which are negative factors.

(c) Extinction. Light goes into the gem and makes at least one bounce off a pavilion facet, but is not returned back to the observer through the crown. The observer sees a reflection from that steep facet that is coming from a low angle outside the gem. Compared to the adjacent facets that are reflecting from a bright light source (highly illuminated area), the strong contrast causes the low-angle reflection to be so dark that it is near-black or extinguished. You aren't seeing through the gem, even though you should be seeing a reflection from that facet of something outside the gem; all that is seen is darkness. This is true extinction and is the result of steep angles on the pavilion (see Fig. 3-01). The steeper the pavilion, the more extreme the extinction. An accomplished cutter can use extinction to their advantage. For instance, cutting a pale material (kunzite or citrine) with a deep pavilion not only allows stronger absorption of light that travels a longer path through the gem (this improves some gems only slightly), but also renders the gem's color more distinct. The resulting extinction seems to increase the saturation of the color through contrast (more on this later). Purposely choosing angles that create extinction gives the illusion of a more saturated gem, and creating angles that produce higher light return with minimal extinction create the illusion of a less saturated gem.

Fig. 3-02. Spinel. Photo by Robert Weldon, © GIA.

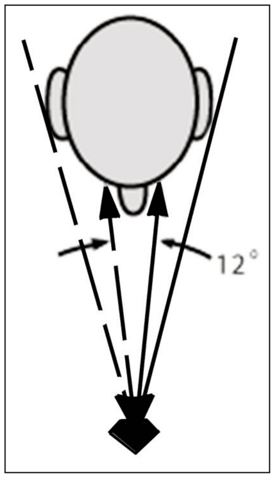

Fig. 3-03. Illustration by Harding, © GIA.

(d) Observer and object reflection. Observers usually hold a gem 8 to 20 inches away from their eyes. Light is typically coming over their shoulders, entering the gem, and returned back for them to see. The observer is reflected as dark compared to the light source around them (see Fig. 3-03). This should be thought of as observer and object reflection (Harding, 1975; Gems and Gemology Fall 1975; see http://www.gemology.ru/cut/english/faceting/; and Gilbertson, 2013; http://www.gia.edu/gems-gemology/Optimizing-Face-Up-Appearance-in-Colored-Gemstone-Faceting). This type of darkness can be good if in moderation. The contrast pattern we see in many gems is a result of this reflection of the observer's head and upper torso (see Figure 3-04). Observer reflection is important; the resulting contrast pattern affects the impression of brightness or dullness in a gem. To better understand this, consider what a faceted gem might look like in a totally diffuse white-lit environment. If the gem were not reflecting anything but white light, it would not have any contrast (see Fig. 3-05a). If you were to cover your face and shoulders with a fluorescent red mask (see Fig. 3-05b) and look at the gem in that diffused white light-only environment, this is what you would see (see Fig. 3-05c). If you were closer to the gem, there would be more of the red reflected throughout the gem (see Fig. 3-05d). If the room was not lit and the observer's face had a light shining on it, the result would be just the opposite, and the gem would be primarily dark with the observer's face reflecting as a

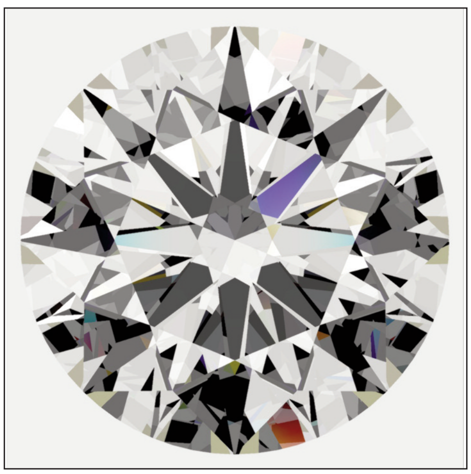

Fig. 3-04. Illustration by Al Gilbertson, © GIA.

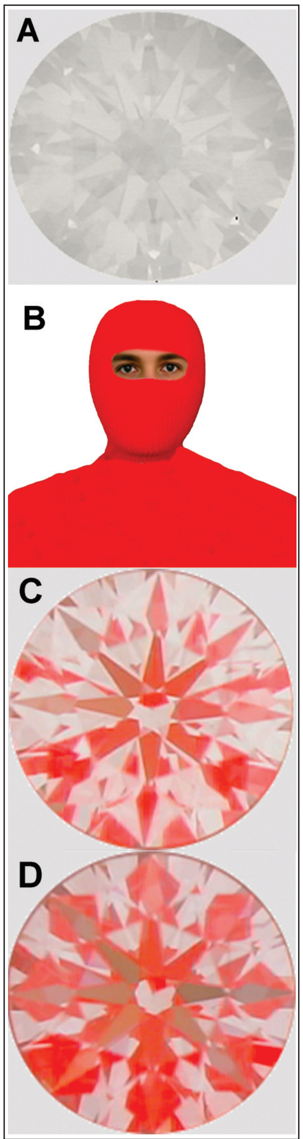

Fig. 3-05a. Diamond. Illustration by Al Gilbertson, © GIA.
Fig. 3-05b. Illustration by Al Gilbertson, © GIA.
Fig. 3-05c. Diamond. Illustration by Al Gilbertson, © GIA.
Fig. 3-05d. Diamond. Illustration by Al Gilbertson, © GIA.

bright area. Another example of observer reflection that is rather obvious is the dark bowtie. Figure 3-01 shows an example of how the bowtie (at 12 and 6 o'clock) in the sample gem is changed as the pavilion angles change. It is simply a result of observer reflection which occurs for a narrow range of angles on the pavilion.

The contrast pattern seen in a gem, whether from observer reflection or extinction, affects the appearance of color, brightness, and appeal. Contrast pattern is a result of the facet placement (angles and position). More traditional cutting styles de-emphasize the contrast pattern, and make the apparent color more uniform and softer. However, strong contrast, best exemplified by the dark accent areas of fantasy-style cutting, creates a stronger impression of the color and a more dynamic appearance (see Fig. 3-06). This series of circles has the same blue color (see Fig. 3-07), but the circles on the left have stronger contrast than the circles on the right. The overall impression of the blue on the right is weakened due to the lesser contrast with the gray. This illustrates that strong contrast is more appealing, resulting in more vibrant colors.

Unfortunately, the strong contrast in many designs may also render the impression of color as being much darker and even too dark when used with gem material that is already strongly saturated.

Experimentation, a form of TRADEOFF: Designers often try to think outside of the box and experiment with

Fig. 3-06. Sunstone and tourmaline cut by John Dyer. Photo courtesy of John Dyer & Co.

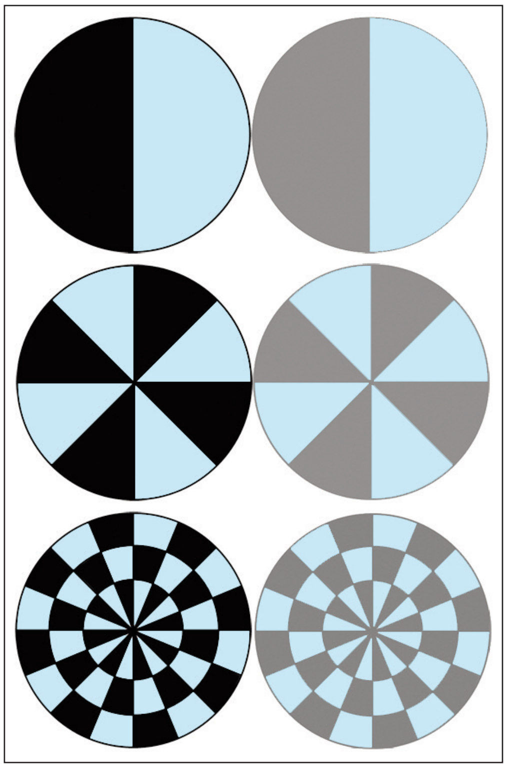

Fig. 3-07. Illustration by Al Gilbertson, © GIA.

new ideas of contrast and pattern in a gem. A designer who utilizes windowing may be trying to create a design that is unique and striking, even if the color is uneven or sometimes weaker. Additionally, some designs focus on returning bright light from under the table to the observer, while the color can be weakened by the excessive bright light return with little contrast. That brightness

Fig. 3-08. Three spinels. Photo by Robert Weldon, © GIA.

may have been part of the intended pattern. Ultimately, the success of their experimentation lies in the acceptance of sales of that final "look" that they gave the gem.

• ***Windowing***

As mentioned above, strong contrast can strengthen the impression and uniformity of color. Weak contrast does the opposite. Here are three light pink gems (see Fig. 3-08), each with a windowed area under the table. As the window gets larger, the color in the middle of the gem weakens and becomes less uniform. TRADEOFF: A cutter had to decide whether to finish with a larger diameter and more weight (and a larger window), or if cutting a smaller diameter gem that didn't window would yield as much value. In Figure 3-01 a cutter may choose to use a slightly shallow pavilion (57%) because the saturation of color is strong enough that the windowing will minimally impact the face-up appearance and value. This may also mean that they can recover a higher yield from the rough, and the final value of the gem will be higher than if they were to cut a smaller diameter with a 62% pavilion depth. Others may feel that the depth has to be at least 62% to achieve a prime color and that is more important.

Note that in Figure 3-09, the depth gets a little shallower (moving from top to bottom). The diagrams on the left reflect the exact proportions used for the gem materials displayed on the right—jewelers tend to avoid gems as deep as the first two rows. The difference in face-up appearance is because of the refractive indices (RI) of the gems. Refractive index is a measurement of how far a particular gem material can bend light. The higher the RI, the less deep it needs to be cut to avoid windowing. That's why well-cut diamonds (RI 2.417) can be cut much shallower and do not window even when tilted. These examples are beryl (such as aquamarine with an RI of 1.589), grossular garnet (RI 1.74), and grossular garnet tilted 15 degrees. In the illustration there is no windowing for garnet, until tilted for the steep proportions or until the proportions are shallower. For beryl, the degree of windowing is minimized in the two deeper stones. The first one is not deep enough to avoid windowing. Note how the placement of facets in the oval-shaped beryl (second from the top) closes in to reduce the window. If the cutter is working with quartz (RI 1.54, which is lower than beryl and garnet), the gem would require deeper proportions than any of the diagrams shown to avoid windowing.

Besides not reflecting light back up to the observer, the disadvantage of a window means that whatever is behind the gem affects the color. When a windowed gem is set in a pendant, the skin color or the fabric it rests on affects the apparent color. This is more obvious in lightly colored gems. Note that when there is a strong saturation of color, small windows are less noticeable and less distracting and can be beneficial by slightly weakening an overly-saturated color.

• ***Brilliance and Depth (Shallow, Deep, and Acceptable)***

In the jewelry trade, it is not uncommon to use the term 'brilliance,' but not everyone means the same thing when they use

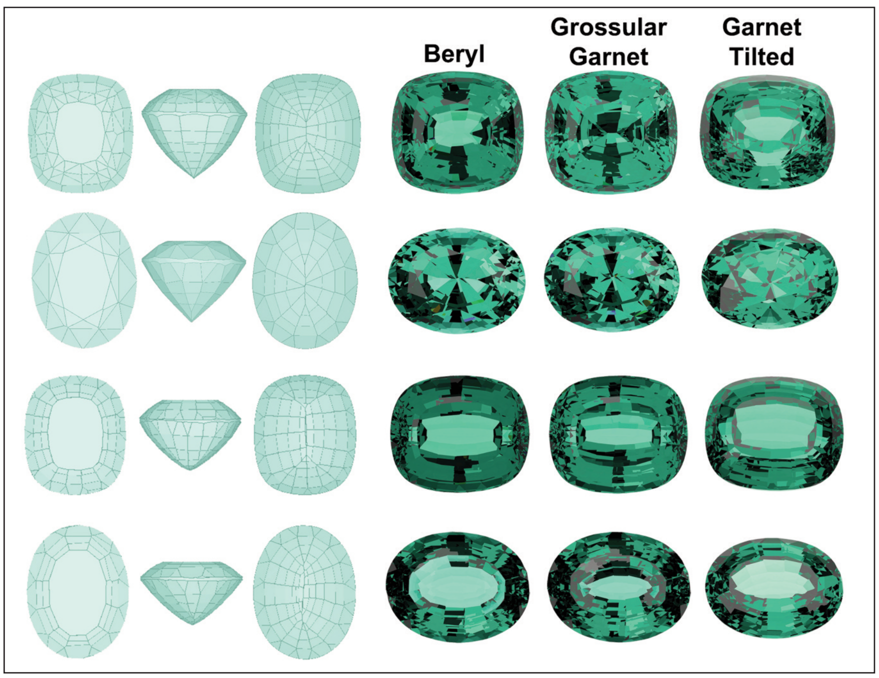

Fig. 3-09. Illustration by Al Gilbertson, © GIA.

it. Because of that confusion, GIA started using the term 'brightness' when it released information in 2004 about its upcoming cut-grading system for diamonds. Their definition for brightness is, "The appearance, or extent, of internal and external reflections of "white" light seen in a polished diamond when it is viewed face-up." (http://www.diamondcut.gia.edu/12_glossary.html)

For some, brilliance refers to the amount of 'life' a gem has. Does it sparkle when you rock and tilt it? Does the light dance around in the gem? For others, the not-so-technical term brilliance may not refer to the white light reflected from within the gem, but to colored light. Color is still king and in a well-cut gem, most of the light that returns needs to be saturated with color. A poorly cut colored gem will have areas of dullness and weakened color and will thus lack brilliance.

I'm going to use the term brightness, but not in the sense that GIA meant for diamonds as it doesn't really work with colored gems. Brightness needs to include the color saturation when talking about colored gems. Unfortunately good brightness depends upon good color depth to get that desired saturation. If we want to cut a gem that is uniform in color, bright white light reflected from within the gem can wash out that color.

Richard Hughes, author and one of the world's foremost experts on ruby and sapphire, points out that in cutting colored gems, "Generally, the pavilion facets closest to the girdle are cut too steep while those at the culet are too shallow; often only those in between are cut at the proper angle. This results in three distinct zones: extinction near girdle, windows near the culet and brilliance in-between…" (http://www.ruby-sapphire.com/ brilliance_windows_extinction.htm). Figure 3-01 demonstrates this in general terms (parts of the figure borrowed from Richard Hughes) and it is evident that cutters should avoid faceting gems too shallow or too deep. What is too deep or too shallow? TRADEOFF: Many jewelers shy away from gems with deep proportions because they don't fit their view of what looks good in a piece of jewelry, even if those gems are not windowed. The jeweler looks at the profile of the gem and decides it is too deep. The jeweler will probably never find a gem shallow enough without a window. In this way the jeweler influences the cutter, and even some of the market prices since the cutter will have a harder time selling the deeper gem even though the color is more even and faces up better. This Kunzite has a small window. The face-up color is more saturated than the color from the side, due to the deeper proportions (see Fig. 3-10).

Fig. 3-10. Kunzite top and side view. Photo by Orasa Weldon, © GIA.

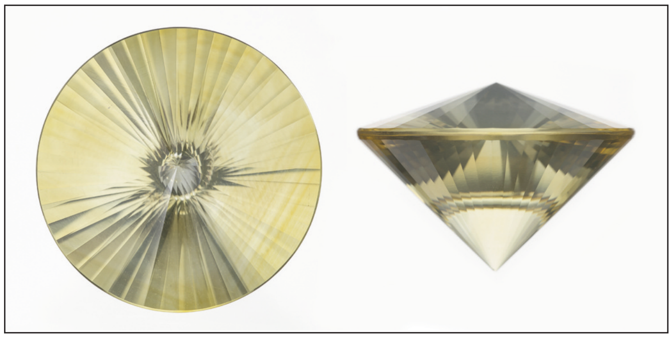

Fig. 3-11. Citrine top and side view. Pre-formed by Werner Anschvetz, cut and polished by Hans J. Roehrig. Photo by Orasa Weldon, © GIA.

At this point the discussion of brilliance has focused on more traditional cutting styles. Designer cuts bring a different approach, where scintillation and apparent brightness are the primary goals much like in diamond cutting, and the emphasis on evenness of color and saturation takes a back seat. Within this style of cutting, windowing is frowned upon and the face-up pattern is very important. The Spirit Sun, developed in the early 1980s (see Fig. 3-11), exemplifies this concept. All of the facets are designed to reflect white light back to the observer resulting in very little contrast pattern (this also causes the slight color zoning of this pale citrine to become more visible face-up).

The concept of brightness and what gives us the impression of brightness is not just a matter of how much light is sent out of the gem for us to see (the Spirit Sun in Figure 3-11 sends back most of the light going into it). It is also a question of perceived pattern. Cognitive scientists (they study our vision and how we perceive things) tell us that the stimuli our eyes and brain (our visual system or VIS) process are not simple (http://www.gia.edu/gems-gemology/Optimizing-Face-Up-Appearance-in-Colored-Gemstone-Faceting). Our

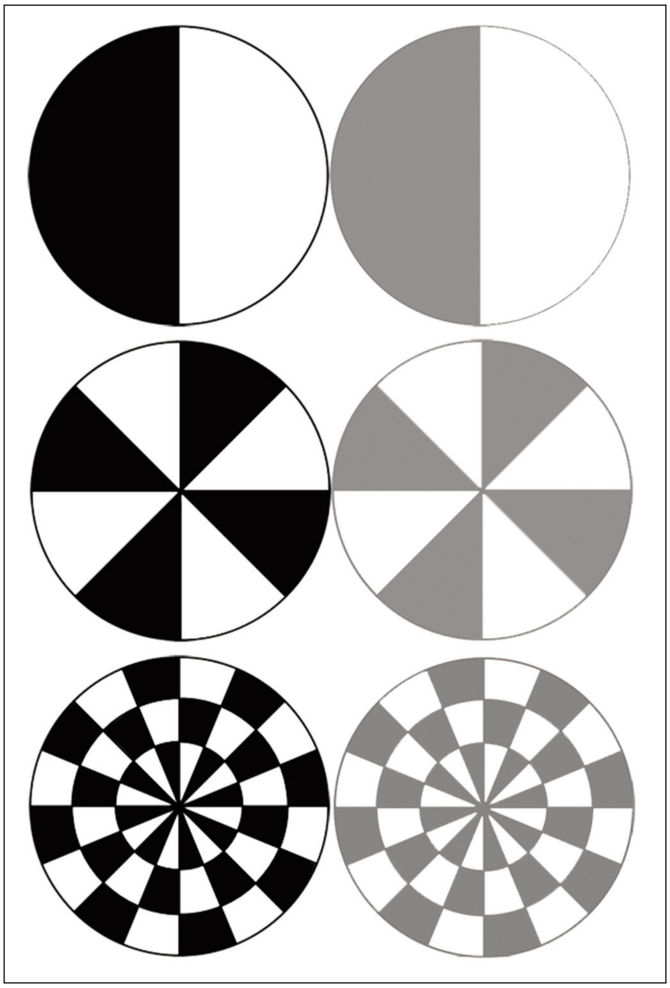

Fig. 3-12. Illustration by Al Gilbertson, © GIA.

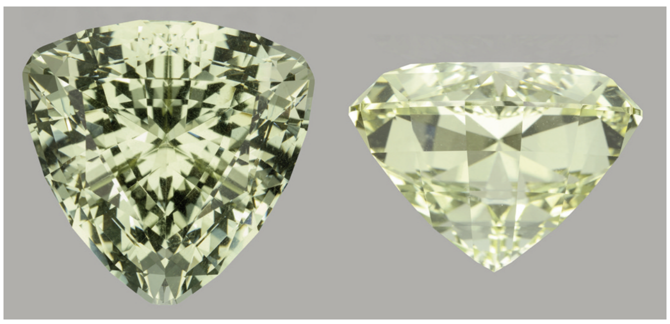

Fig. 3-13. Beryl top and side view. Cut by Maria Atkinson. Photo by Orasa Weldon, © GIA.

Fig. 3-14. Amethyst top and side view. Photo by Orasa Weldon, © GIA.

VIS also works with all of the available cues; for instance we perceive that a gem generates light from within itself in a pattern that changes as the gem moves. This pattern is created by the interaction of light with the faceting design of the gemstone. That pattern affects our perception of brightness.

Each of the circles in Fig. 3-12 is 50% dark and 50% white light (by surface area). "A light meter confirms that each one is equally bright when printed on paper (even the gray ones). The checkered pattern of the bottom left circle makes it perhaps the most visually interesting. If a gem were able to return 100% of the light (all white), and no dark areas were visible, it would measure brighter than a stone with dark areas of contrast—but its appearance would be far less appealing. For instance, the right column in Fig. 3-07 seems duller than the left due to weaker contrast. These images show that while good light return is an important aspect of 'brilliance,' contrast is a critical factor in face-up brightness. Obviously, there comes a point when too much darkness or a poor distribution of darkness is less pleasing." (http://www.gia.edu/gems-gemology/Optimizing-Face-Up-Appearance-in-Colored-Gemstone-Faceting)

An example of perhaps too much added pattern darkness can be seen in the yellow triangular-cut beryl (see Fig. 3-13). In a pale gem, this adds to the impression of darker color and can help the gem's salability. Similar to diamond cutters, some colored gem designers work to create strong contrast within a gem. This strong contrast brings about different, interesting patterns. Some designers create more subtle designs with less contrast. Both types can have their appeal. In a saturated color, adding a lot of dark contrast will make the gem overly dark (see Fig. 3-14). When the cutter is sensitive to what the pattern creates, it can enhance the gem. When the cutter fails in their choice of design, the gem's color is weakened (made too dark by too much strong contrast or too light by weak or non-existent contrast such as the Spirit Sun).

Cut designers like to experiment with variations of 'brilliant' styles of cutting which have been welcomed in the diamond trade, such as the radiant cut. Yet some in the colored stone industry don't care for designer-cut sapphires, rubies, or other colored gems because they feel the older styles of cutting bring out the color better (and generally make the color more even). This is another TRADEOFF that centers on the term 'brilliance.'

Many designers carefully modify facet arrangements using computer programs, such as GemCad and GemRay, to see how their plans will impact their design (Fig. 3-15 is from GemRay). Some years back, an effort was made to collect GemCad generated diagrams

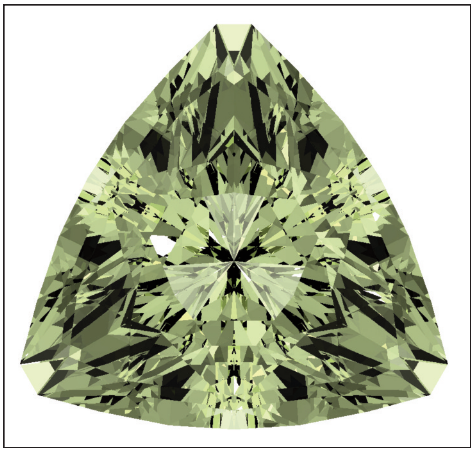

Fig. 3-15. Illustration by Al Gilbertson, © GIA.

(cutting plans) into a database. At that time, there were over 4,000 of these diagrams (some copyright protected). Since then more diagrams have come forward, and there is now an on-line repository for many published designs (http://www.facetdiagrams.org/).

We've talked about concepts that influence our perception of brightness. Now let's talk about evaluating the overall impact of the gem's cutting in reference to brightness. Remember that good color brightness depends upon color depth. Begin by picking up the finished gem. As you tilt and move it, most of the gem should return good brightness (with good color). Gems with 50% brightness are still considered appealing in the jewelry trade. However, gemstones with too many dark areas (from deep proportions) or windowing (from shallow proportions), and less colored brightness are not as valuable. Less brightness means less value. Uneven patterns also start to have greater impact as cut quality worsens.

Part 4: Some Factors that Interact to Affect Value

Part 3 spoke about dark patterns and bright areas in a gem, what causes them and their effect on color appearance. Part 4 will dig deeper and explore additional factors used in the trade to assess relative value, and explain some of the additional choices cutters have to make. Part 5 will discuss craftsmanship.

Wireframes or depictions of facet arrangements (such as Fig. 4-02) are from scans of real gems so as to illustrate the certain aspects of gem cutting.

We previously said that it is important to realize that the cutter had to choose between various tradeoffs. For instance the thickness of the rough might dictate their choices. There are many other tradeoffs that will become apparent as we talk about more factors that interact to affect value.

- ***Color Zoning (Lack of Uniform Color)***

As a value factor, we have mentioned color zoning and

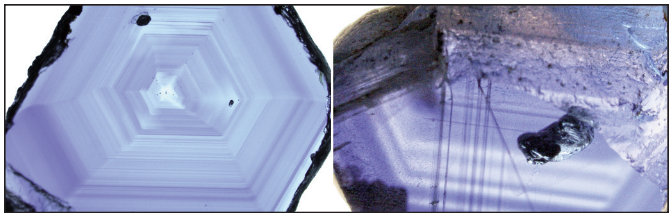

Fig. 4-01. Rough sapphires. Photo by Jonathon Muyal, © GIA.

described it as any uneven distribution of color within a gemstone. Color zoning is often due to temperature changes or the uneven incorporation of certain trace elements during the gem's formation, such as in these sapphires (see Fig. 4-01). Visible color zoning can range from minor to obvious. As with clarity, the location and contrast are important. If the cutter has hidden it well through careful planning of facet arrangements, there is little impact on value. An experienced cutter mutes the face-up effects of color zoning by arranging uneven color zones to run parallel to the girdle, or by placing a small bit of concentrated color at the culet. Remember the native cut gem from Part 1 with the culet off-center (see Fig. 4-02)? This type of cutting used a spot of strong color that is placed at the culet, which spreads that color throughout the face-up appearance. That spot of color was not at the center, so the cutter made the culet off-center to use that spot of color to evenly distribute its effect. Re-cutting the culet to center will remove that spot of color and the final gem will have much weaker color.

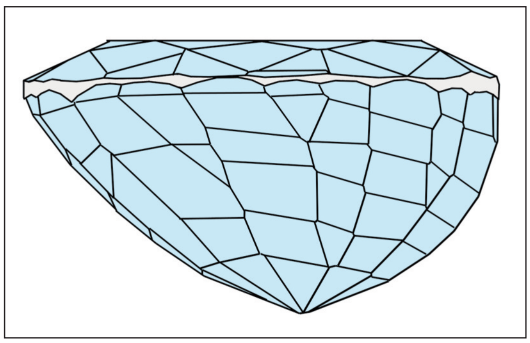

Fig. 4-02. Illustration by Al Gilbertson, © GIA.

Sapphires are well known for their color zoning, which presents some challenges to the cutter (see Fig. 4-03). Many of the green sapphires from Australia and Thailand, when viewed under magnification, show that the green color is actually a function of blue and yellow color zoning. Some of these sapphires display interesting blue-green color zoning that is visible to the naked eye, and less expensive parti-colored sapphires (showing different colors, such as blue and orange, green and blue, etc.) have sold well in some markets.

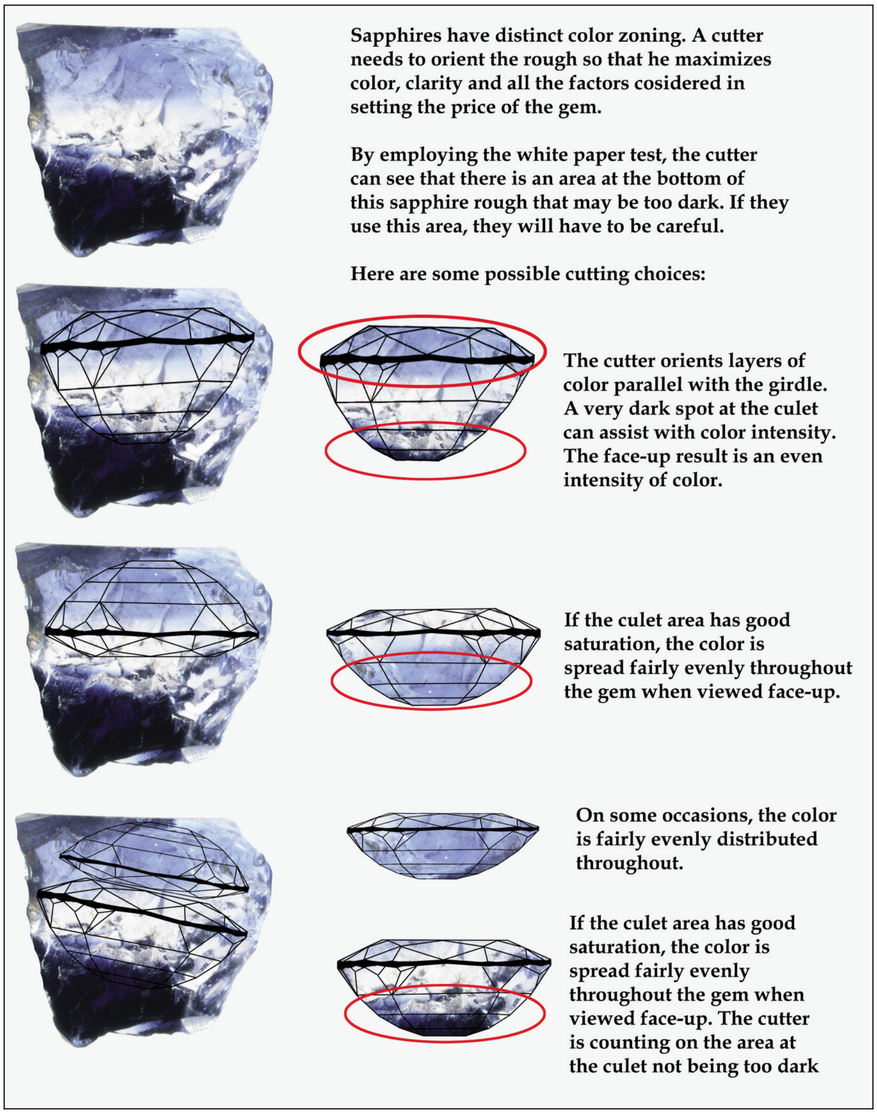

Fig. 4-03. Sapphire. Photo by Jonathon Muyal, © GIA.

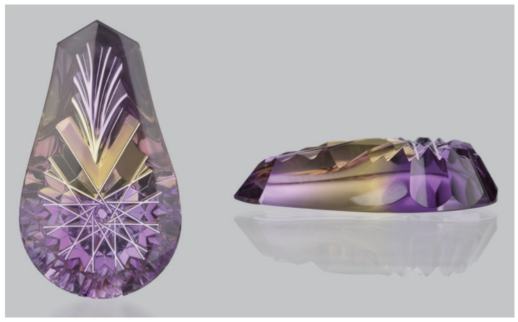

Fig. 4-04. Ametrine top and side view. Cut by Dalan Hargrave. Photo by Orasa Weldon, © GIA.

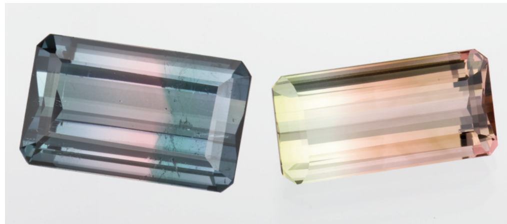

Fig. 4-05. Tourmalines. Photo by Robert Weldon, © GIA.

It is important to remember that many natural gems will exhibit some degree of color zoning, which is often an indicator of their natural origin. There are a few gemstones that are valued specifically because of their distinctive color zoning. Both ametrine (see Fig. 4-04) and some multicolored tourmaline (see Fig. 4-05) display well-defined zones of color. Ametrine combines amethyst and citrine in the same crystal, and the color zoning is due to differing oxidation states of iron within the crystal (http://www. mnh.si.edu/earth/text/dynaicearth/ 6_0_0_GeoGallery/geogallery_browse.cfm?categoryID=1&browseType=type&typeName=Quartz&typeID=127). The cause is believed to be temperature differences across the crystal during its formation. A gem with the color zoning that creates interesting patterns of contrast has higher demand in the market as opposed to the gem with blended colors. In these cases color zoning is intentionally displayed face-up.

- ***Double Refraction***

Gems that split light into two separate rays that are polarized into right angles to each other are called doubly refractive (e.g. tourmaline, peridot, and tanzanite). Singly refractive gems do not split light into separate rays (e.g. spinel, opal, amber, and diamond). In doubly refractive gems, each of those rays has a different refractive index measurement. The difference in the RI values of the two rays is called birefringence and is also a measured value. Gems like beryl (aquamarine), corundum (sapphire and ruby), or tourmaline are examples of gems that are doubly refractive but with lower birefringence. Those that have a large RI difference (such as zircon) are easier to spot; the facet edges appear doubled under 10X magnification. The blurred facet edges are associated with higher birefringence (over .10).

There are two types of doubly refractive gems. In a uniaxial gem, there is a direction that behaves like it is singly refractive (light entering that direction is not broken into two beams) called the optic axis. Biaxial gems have two directions that act as an optic axis. The cutter should try to take this into consideration. As a general rule, the table of a doubly refractive gem should be cut exactly at right angles to its optic axis. There are notable exceptions to this and for a better understanding, read Richard Hughes' article on pleochroism (http://www.lotusgemology.com/index.php/library/articles/296-pleochroism-in-faceted-gems-lotus-gemology). A gem that is singly refractive, such as garnet or spinel, can be oriented in any direction when cutting.

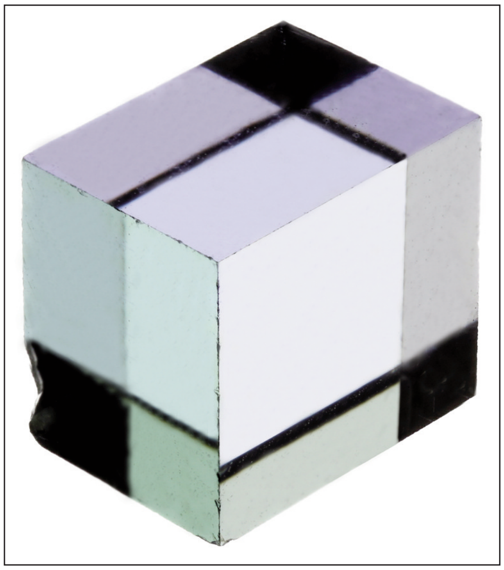

Fig. 4-07. Tanzanite. Cut by Nathan Renfro. Photo by Jonathon Muyal, © GIA.

- ***Pleochroism***

When light is split into two rays (doubly refractive), those two rays may emerge as different colors, or in two shades and intensities of the same color. Different parts of the spectrum are absorbed in the different directions causing the apparent difference in color. Examples of gems which show the strong pleochroism are andalusite, corundum, spodumene, tourmaline, and tanzanite. Here the cutter needs to pay close attention to cut the gem so that it faces up with the best color. They can lower the potential value by introducing weak or less desirable colors.

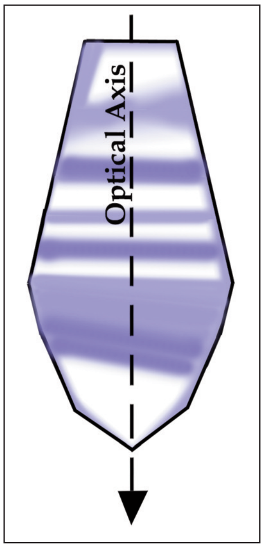

Fig. 4-06. Illustration by Al Gilbertson, © GIA.

This cross-section of a sapphire crystal (see Fig. 4-06) shows common color zoning and the optic axis. Colors seen at right angles to the optic axis are frequently a different intensity or of a different hue. This is particularly true for sapphire, aquamarine, and tourmaline. Other times, mixing the colors in the face-up position is attractive, such as with tanzanite. This block of tanzanite was cut with faces perpendicular to an optical axis (see Fig. 4-07). Each face (top, right, and left) shows a different color. This cube is small, so the colors are not well-saturated. A larger cube would have more saturated colors. When tanzanite is cut and the colors mix, sometimes the face-up appearance can be improved as two different colors blend so that we view them as one color.

TRADEOFF: Cutters are often faced with a dilemma; weight retention or best color. The best color may lie in a direction of the piece of rough that will only allow recovering a couple of small gems, rather than cutting a large one but of weaker or less desirable color. The expected final weight and estimated selling price of the finished gems influences which direction is most profitable for the cutter.

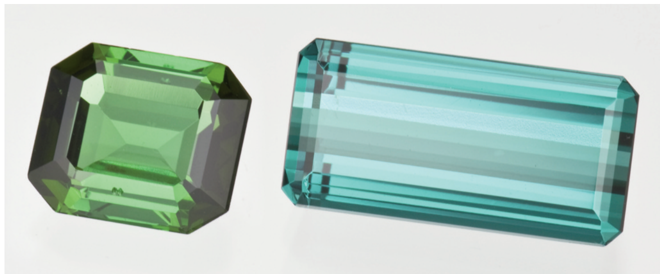

Fig. 4-08. Tourmalines. Photo by Robert Weldon, © GIA.

Green tourmaline sometimes has what cutters call a closed c-axis. This means that the optic axis absorbs all of the light entering the gem in that one direction and the result is a black opaque direction. In this case the cutter must cut at a right angle to the optical axis, even then the darkness will be reflected back into the gem. Figure 4-08 shows two tourmalines, the one on the left has a closed c-axis compared to the tourmaline on the right with an open c-axis. To mute the effect of the closed c-axis, most cutters cut the end facets along the c-axis very steeply so that the black end is not reflected into the face-up position of the gem (not done in Fig. 4-08, which is why the ends are black). TRADEOFF: When working with a closed c-axis, choices are limited to step-cut styles and cutting the ends with steep angles. If the rough is an odd shape, it may be that the cutter has to introduce these dark areas of absorption rendering the color less desirable.

Strongly pleochroic gems cut in rounded shapes with the c-axis parallel to the table facet show a pleochroic "bow tie", visible as blue-green and yellow-green in this tourmaline (see Fig. 4-09). TRADEOFF: Cutters must decide if the pleochroic colors will be attractive or diminish the potential value of the finished gem. For some gems, that's easy. For tanzanite, they often try to bring together the two opposing colors, whereas for tourmaline the two different colors can create a less attractive gem.

• ***Size***

TRADEOFF: A uniformly colored piece of rough yields gems of different color intensity as the sizes and proportions vary. For example, a gem cut from light colored rough is considered attractive if it reaches a certain size to produce enough color saturation. If the rough seems quite pale, a cutter might plan for one large, deep gem rather than several lightly colored, well-cut ones. In the case of dark rough, some cutters use the "white paper test" to determine the best yield from the piece of rough. A piece of rough is placed on white paper, and viewed under incandescent and then fluorescent light, each time staying away from any other bright sources of light. The color seen through the rough is from light that is reflected from the white paper underneath. By using both light sources you see the colors the gem will have under both types of lighting. If the rough is too dark to see much color, it should be cut into smaller gems to optimize the color. In Figure 4-10, there are four gems cut from material that is very evenly colored (only half of the image is shown because of space limitations). The largest two gems are too dark (left). The third gem has good color saturation and the last gem is starting to become too light. To achieve the best range of color, this large piece of rough should be cut in a range of sizes around the third gem (7.5 mm), probably from 6 to 12 mm.

Fig. 4-09. Tourmaline. Photo by Robert Weldon, © GIA.

Summary

Face-up color is dependent upon a number of things, including orientation to mute the effects of pleochroism and orientation of common color zoning. The gem also has to have the right amount of color saturation. Increasing the gem's size can increase the color saturation, both of which are dependent upon the features of the rough.

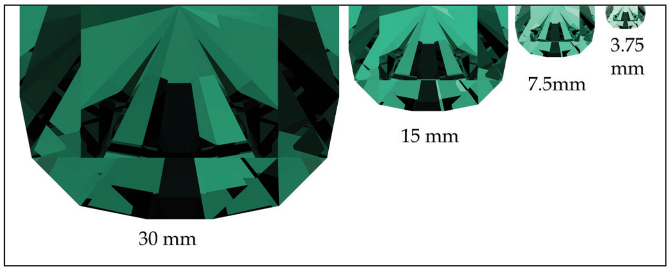

Fig. 4-10. Illustration by Al Gilbertson, © GIA.

There is no question that beauty is in the eye of the beholder, but gems have been faceted to attract our eye for hundreds of years. During that time, many forms have disappeared because they are visually less interesting. This section dealt with the heart of what makes a gem's fashioning appeal to us (or not). We want to see vibrant color. We want to see an interesting visual pattern. Instead of settling for 'good enough', ask yourself if the gem you are considering to purchase was cut to enhance the color, make it more vibrant, and ultimately create an interesting visual pattern. The gem should have some kind of 'Wow' factor. ◆

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***About the Author:** Al Gilbertson is the Project Manager, Cut Research at the Gemological Institute of America Laboratory Carlsbad. He made significant contributions while functioning on the American Gem Society (AGS) Cut Task Force, when his patent was acquired by AGS and is the foundation of their ASET technology for cut grading. Hired by GIA in 2000, he became part of GIA's team that created the current cut grading system for round brilliant diamonds. Al is also the author of* American Cut—The First 100 Years.

Correction to photo in January/February issue part two of this series. Fig. 2-19 Cubic zirconia patented design by Rudi Wobito. Photos by Orasa Weldon, © GIA.