Figure 15. Left: This 3.07 ct purplish pink "dragon" garnet, as seen in daylight-equivalent lighting, displays eye-visible blue apatite inclusions. Right: Red fluorescence in the garnet due to chromium, as seen using long-wave UV. Photos by Jessa Rizzo; courtesy of Ravenstein Gem Co.

tered throughout the chalcedony matrix. Advanced testing, including Raman spectroscopy and energy-dispersive X-ray fluorescence analysis combined with microscopic observation, confirmed the presence of chrysocolla, malachite, native copper, and cuprite.

Melas plans to market this new material under the trade name "Aquadite." This fascinating chalcedony from Indonesia should be a popular gem for any collector who enjoys unique examples of vibrantly colored chalcedony.

Nathan Renfro

Garnet with Apatite Inclusions

The authors recently examined a 3.07 ct garnet sample acquired from Ravenstein Gem Co. by author NR. This gem material, marketed online as "dragon" garnet as an allusion to the mythical creature's changing eye color, was reportedly from a new find at an undisclosed locality in Africa. It is also notable that Lotus Gemology has reported similar material from Tanzania (Summer 2022 *G&G* Micro-World, pp. 226–227). The garnet was a delicate purplish pink color under daylight-equivalent lighting (figure 15, left) and showed a fairly strong red fluorescence when exposed to long-wave ultraviolet light (figure 15, right). Also of note, this sample, as well as many of the other examples showcased online, contained vibrant blue inclusions of apatite (figure 16) as well as typical needle-like silk and minute fluid inclusions.

Gemological testing revealed a refractive index measurement of 1.741 and a hydrostatic specific gravity of 3.81. Further gemological testing with laser ablation–inductively coupled plasma–mass spectrometry revealed the major composition to be pyrope (61.5 mol.%), spessartine

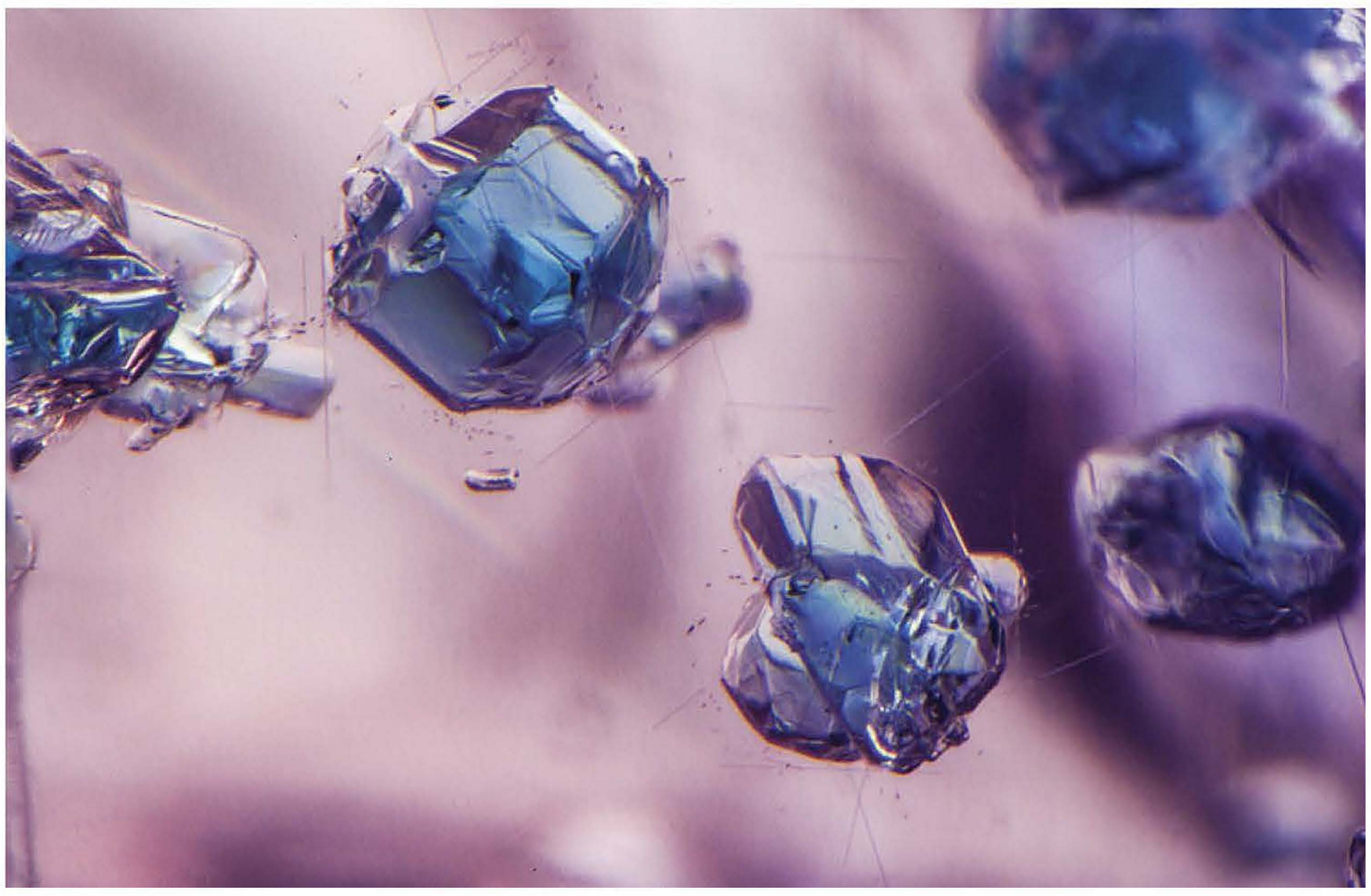

Figure 16. Blue apatite inclusions and rutile needles were prominent throughout the "dragon" garnet reportedly from a new find in Africa. Photomicrograph by Nathan Renfro; field of view 2.40 mm.

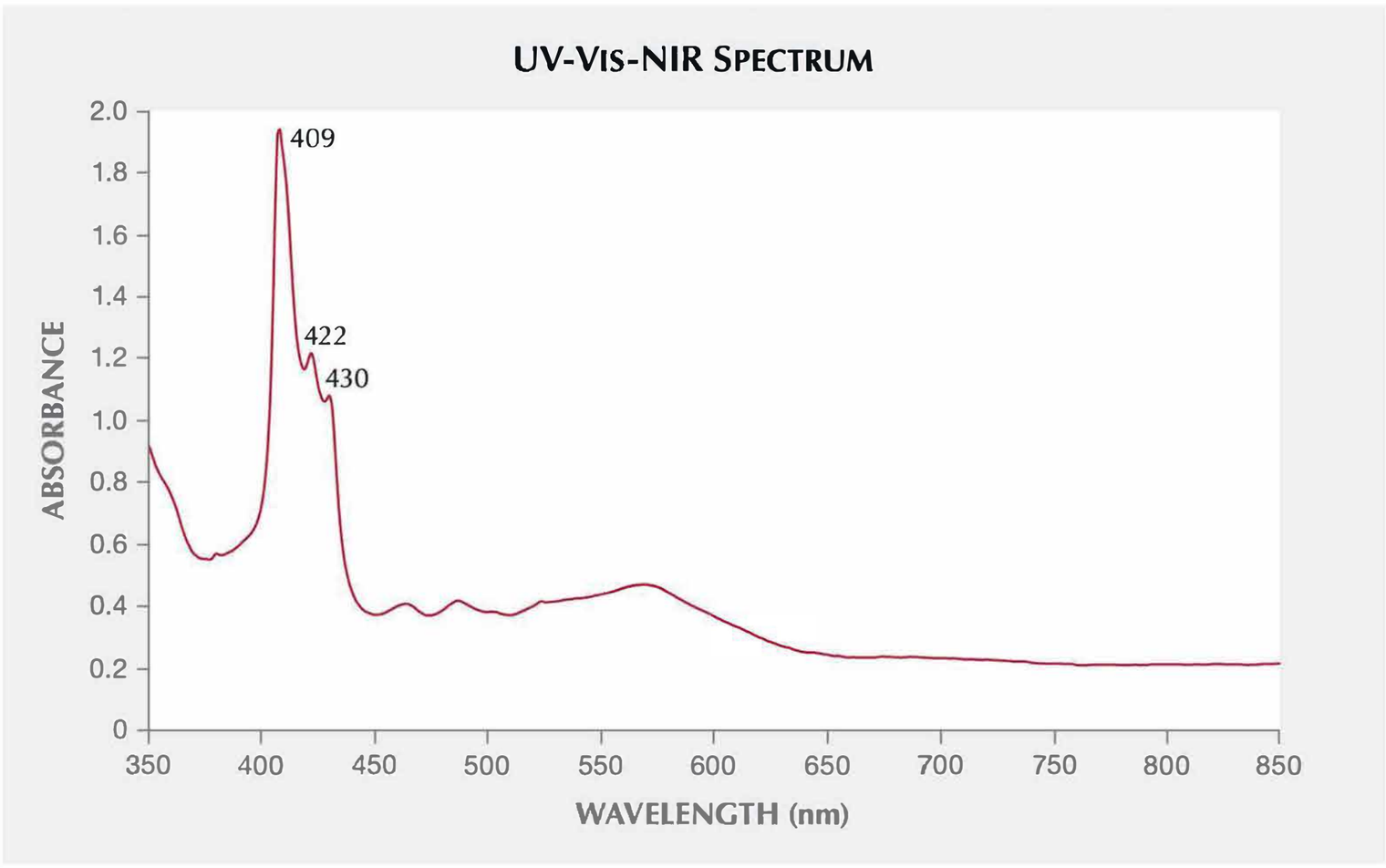

Figure 17. The garnet's UV-Vis-NIR spectrum suggests the color results mainly from manganese, iron, chromium, and vanadium. Narrow bands at 409, 422, and 430 nm are related to manganese in the garnet structure, while absorption bands related to iron are at ~465 and 488 nm (Z. Sun et al., "Quantitative definition of strength of chromophores in gemstones and the impact on color change in pyralspite garnets," Color Research and Application, Vol. 47, 2022, pp. 1134–1154). A broad band centered at ~572 nm is from vanadium and chromium absorption.

(29.0 mol.%), grossular (6.5 mol.%), and almandine (2.6 mol.%), a chemistry consistent with pyralspite-series garnets. Notable trace elements in significant quantities were chromium (660 ppmw) and vanadium (343 ppmw) in addition to the rare earth elements yttrium (1206 ppmw), erbium (222 ppmw), and ytterbium (420 ppmw). The ultraviolet/visible/near-infrared (UV-Vis-NIR) spectrum revealed absorption bands that were consistent with the chemical analysis (figure 17), indicating that the color of the garnet results from a mixture of manganese, iron, chromium, and vanadium. Raman analysis confirmed the blue inclusions as apatite. It is also notable that the garnet sample showed a weak color change in daylight compared to various non-standardized, commercially available LED types of lighting, changing from purplish pink to pink-orange. Photoluminescence testing with a 514 nm laser revealed a strong chromium-related emission, consistent with the red fluorescence observed with long-wave UV exposure (figure 18).

The strong red fluorescence, color change under certain LED lights, and presence of significant rare earth elements and vibrant blue apatite inclusions make it quite interesting for any gem collector.

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Quarterly Crystal: Etching on Laurentthomasite

The micro-world of gems and minerals involves the study of not only fluid and solid inclusions but also any significant surface features caused by growth and/or etching. When a rough crystal is fashioned into a gemstone, most

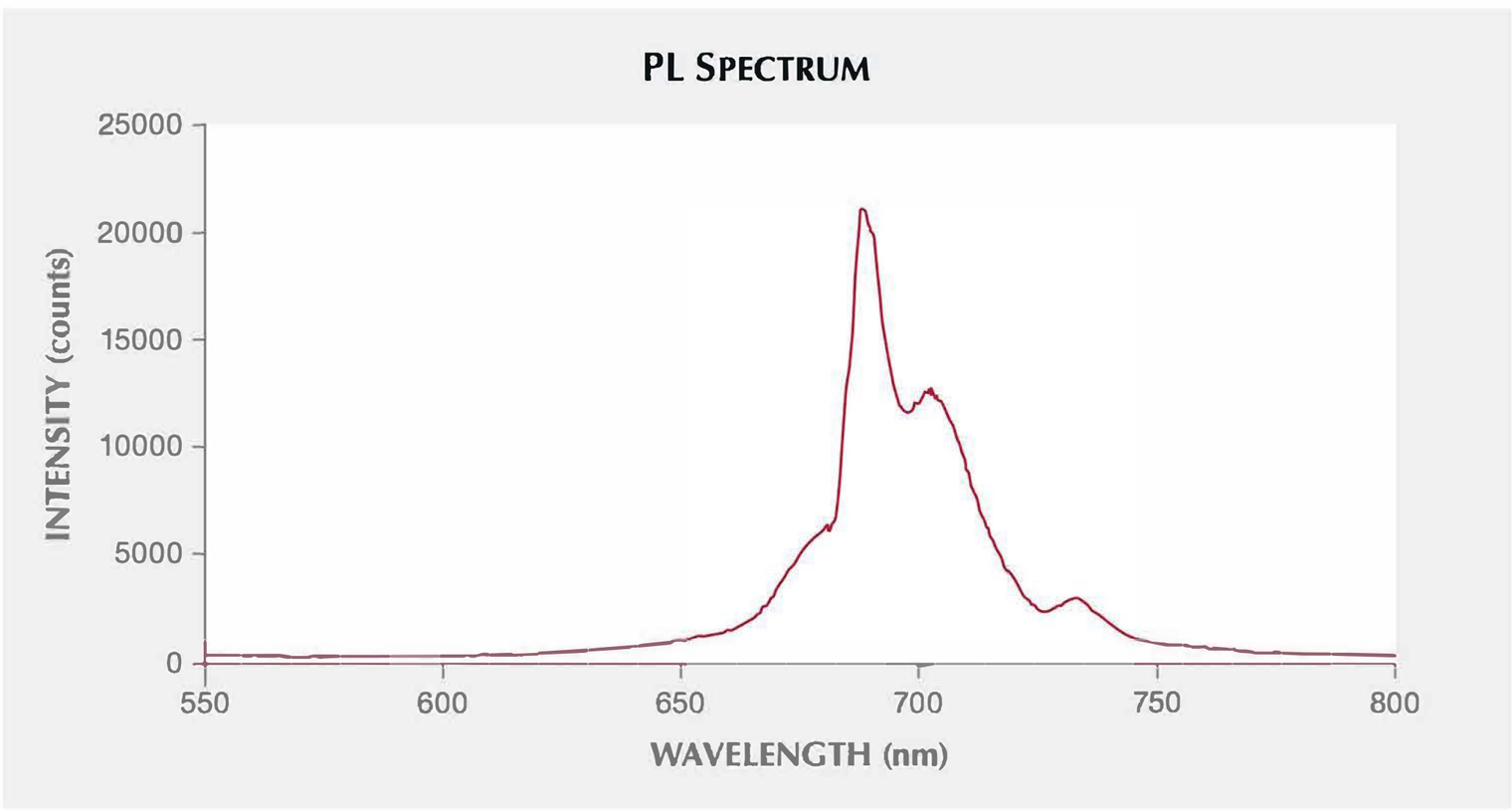

Figure 18. The photoluminescence spectrum collected from the garnet using a 514 nm laser revealed chromium-related emission consistent with the observed red fluorescence under long-wave UV excitation.