



From Gemology to Mineral Physics & Back Again

Including an Update on a Gem of the Future:
Nano-Polycrystalline Diamond

Presentation by

Elise A. Skalwold

In the author's ever-expanding experience of the world of gems, the study of gemology has led her on an unexpected and fascinating journey into the realms of mineralogy and high-level mineral physics research. Through a behind-the-scenes tour of her own collaborative research projects, this presentation gives the audience a taste of the complex scientific efforts which directly or indirectly support the day-to-day gemological science on which the gem industry relies, but which often remain relatively invisible. Central to the story are her co-researchers and other colleagues who enrich the quest for understanding and interpreting this fascinating world.

The thread which binds this journey is the intense investigation of a blue crystal included within a diamond macle. Over a four year period, some of the most technologically advanced instrumentation in the world has yielded volumes of data and a conclusion that this pleochroic crystal is olivine, though as yet no conclusive reason for its anomalous color. Nonetheless, the high degree of scrutiny to which this diamond and its inclusions have been subjected is in itself a remarkable story and provides insights into a world deep within the Earth – arguably one of its last frontiers and one which is otherwise inaccessible.



Inextricably linked to this story is the Diamond Anvil Cell (DAC), a remarkable instrument used in high pressure research. Not only does the DAC utilize gem quality diamonds in its own construction, it is also used to study the Deep Earth environment in which diamonds form. Gemmy nano-polycrystalline diamond (NPD) plays an important role in both the DAC and in our understanding of natural gem diamonds.

Elise A. Skalwold is an Accredited Senior Gemologist, independent researcher, educator, author, and photographer. She has served as Consulting Gemological Curator at her alma mater Cornell University (B.Sc. 1982) and is Contributing Editor and author for the quarterly column *G&G Micro-World* featured in *Gems & Gemology*, the peer-reviewed scientific journal of the

Gemological Institute of America (GIA). Ms. Skalwold is a Graduate Gemologist (G.G.) trained in residence at the Gemological Institute of America Robert Mouawad Campus located in Carlsbad, CA. While living in Thailand she worked in the famous gem markets of both Chanthaburi and Bangkok and pursued studies at the Gem & Jewelry Institute of Thailand for which she was subsequently elected a Fellow of the Gemmological Association of Great Britain (F.G.A.) in London.

As well as having co-authored the 415 page book [The Edward Arthur Metzger Gem Collection](#) and presently working on a companion volume to it, Ms. Skalwold is an author/co-author of gemology and mineralogy papers featured in *Rocks & Minerals Magazine*, *Gems & Gemology*, *The Journal of Gemmology*, *InColor*, and (most proudly) two optical mineralogy booklets published by the Mineralogical Society of America. Passionate about her work, she takes great pride in representing gemology as a relevant geoscience around the world and with having done so at Cornell University; birthplace of the 125+ year-old Geological Society of America (GSA). A quintessential theme throughout her work was represented by the paper “Scholarly Treasure: The Role of Gems in a University Setting” presented at the 2013 GIA-sponsored first-ever Gemological Session of the GSA (for her review of the event, please see: “Gemology Bears Triumphant Tidings: a Review of the Historic 125th Anniversary Annual Meeting of the Geological Society of America” http://www.nordskip.com/GSA_Gemology_Session.pdf).

An internationally sought-after speaker, her engagements have recently included: 2018 Keynote Speaker at the Scottish Gemmological Association Conference in Dullatur, Scotland; the Scandinavian Gem Symposium in Kisa, Sweden; the Accredited Gemologists Association Conference in Tucson; several chapters of the Gemological Institute of America Alumni Association; Banquet Speaker, as well as, past speaker for the New York Mineralogical Club (co-founded by George F. Kunz in 1886); repeat speaker for the Rochester Mineralogical Symposium; and was the only female speaker for the prestigious 11th Annual Sinkankas Symposium [Ruby] held at the Gemological Institute of America in Carlsbad, CA.

Selected recent projects include:

- Skalwold, E.A. and Bassett, W.A. (2017) **Ametrine optical dishes: windows into the effects of crystal structure.** *Gems & Gemology*, Vol. 53, No. 1, pages 102-103.
- Bassett, W.A. and E.A. Skalwold (2017) **Diamond cleavage: importance to high pressure research.** *High Pressure Research*, Vol. 37, No.1, pages 1-13.
- Skalwold, E.A. (2016) **Synthetic quartz: a designer inclusion specimen.** *Gems & Gemology*, Vol. 52, No. 4, pages 425-426.
- Skalwold, E.A. and W.A. Bassett. (2016) **Blue minerals: exploring cause & effect.** *Rocks & Minerals*, Vol.91, No.1, pages 61-75
- Skalwold, E.A. and W.A. Bassett. (2015) **Double Trouble: Navigating Birefringence.** Chantilly, VA: Mineralogical Society of America. 20 pages (booklet).
- Skalwold, E.A. and W.A. Bassett. (2015) **Quartz: a Bull’s Eye on Optical Activity.** Chantilly, VA: Mineralogical Society of America. 16 pages (booklet).
- Koivula, J.I. and Skalwold, E.A. (2014) **The Microworld of diamonds: images from earth's mantle.** *Rocks & Minerals*, Vol. 89, No. 1, pages 46-53 (2014 Best Article of the Year).
- Skalwold, E.A., Renfro N., Shigley J.E., and Breeding, C.M. (2012) **Characterization of a synthetic nanopolycrystalline diamond gemstone.** *Gems & Gemology*, Vol. 48, No. 3, pages 188-19.
- Skalwold, E.A. (2012) **Nano-polycrystalline diamond sphere: a gemologist's perspective.** *Gems & Gemology*, Vol. 48, No. 2, pages 128-131.

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