



Diamond Macle with Mineral Inclusions

From Gemology to Mineral Physics & Back Again

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

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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 and author. She serves 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.). She is an active member of the Society of Mineral Museum Professionals (SMMP), a world-wide network linking curators from large and small institutions from which members draw on combined expertise.

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 *InColor*, *Gems & Gemology*, *The Journal of Gemmology* and *Rocks & Minerals Magazine*. Passionate about gemology, she is actively involved in bringing this science into a university setting for the benefit of students and non-students alike – this is the quintessential theme of her paper “Scholarly Treasure: The Role of Gems in a University Setting” presented at the 2013 GIA-sponsored first-ever Gemological Session of the Geological Society of America (GSA) 125th Anniversary Annual Meeting. For her review of the Gemological Session please see: “Gemology bears triumphant tidings: a review of the historic 125th Anniversary Annual Meeting of the Geological Society of America (GSA)” http://www.nordskip.com/GSA_Gemmology_Session.pdf. Her speaking engagements have recently included the Manhattan Gemological Institute of America Alumni Association Chapter, the New York Mineralogical Club (co-founded by George F. Kunz in 1886), the Rochester Mineralogical Symposium and the 11th Annual Sinkankas Symposium [Ruby] held at the Gemological Institute of America in Carlsbad, CA.

Selected recent projects include:

- 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).
- Skalwold, E.A., Bassett, W.A., Jacobsen, S.D. and Koivula, J.I. (2014) **The riddle of the blue crystal: a diamond's enigmatic inclusion is an intriguing messenger from one of earth's last frontiers**. Annual Meeting of the Geological Society of America (GSA) Paper No. 127-11. Vancouver, British Columbia, 19–22 October 2014.
- 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.
- Jacobsen, S.D., Bassett, W.A., Skalwold, E.A. and Koivula, J.I. (2012) **Message in a bottle: secrets from the deep Earth in a diamond inclusion**. 2012 Packard Fellows Meeting, David and Lucile Packard Foundation, Monterey, CA, 5-8 September, 2012 (research funding provided by the Fellowship for Science and Engineering by the David and Lucile Packard Foundation).
- Skalwold, E.A. (2012) **Nano-polycrystalline diamond: circle the wagons or embrace as a gem of the future?** *The GemGuide, Gem Market News*, Vol. 31, No. 6, pages 8-11.
- Skalwold, E.A., Renfro N., Shigley J.E., and Breeding, C.M. (2012) **Characterization of a synthetic nano-polycrystalline 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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