What's new in diamond research - the last 3 years

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The International Diamond Schools (IDS) have been hosted by the University of Padua and the University of Alberta under the stewardship of Profs. Fabrizio Nestola and Graham Pearson at irregular intervals since 2011 (2011, 2015, 2016, 2018, 2023). In addition to the home institutions, generous financial support has been extended by the Deep Carbon Observatory (DCO) when it was active at the Carnegie Institution (2010-2020) and throughout the years from the Gemological Institute of America (GIA).

The IDSs have been major catalysts to research and thinking by mixing students and professionals from academia and industry. Their goals have always been to introduce students to the latest advances in natural diamond science and cross-fertilize knowledge among research leaders. Some new research advances are listed below that fall within the topics for keynote speakers for the 6th IDS, chiefly as identified by the author from the period from 2023 through 2025.

Collectively, these advances show that our understanding of the mineralogy, geochemistry, petrology, and geodynamics of Earth's mantle from the lower mantle to the continental lithosphere is perhaps the most scientifically fertile and vibrant sector of igneous petrology in the geosciences today —due mainly to the study of natural diamonds and their inclusions.

Research Topics	Advances in Understanding (2023-2025)	References
cratons	lateral accretion, compressional tectonics, craton growth	1, 2, 3
lithospheric diamonds	fluid/melt interaction with SCLM substrates DHMS and subduction of fluids DEW modeling of C in diamond forming fluids diamond surface textures and kimberlites diamond dissolution and diamond potential	4, 5, 6, 7, 8, 9, 10
petrology	petrogenenesis of inclusions, lithospheric and sublithospheric	11, 12, 13
sublithospheric diamonds	aluminum content of ferropericlase w/ith depth dehydration/crystallization model for fp crystallization details of cold slab subduction attachment of sublithospheric mantle to supercontinent keels cataloguing and description of all large IIa and IIb diamonds	14, 15, 16, 17, 18
geochemistry, geochronology	DHMS and subduction of fluids age of sublithospheric diamonds effect of fluid films around inclusions of ages fibrous diamond Rb-Sr ages	4, 7, 16, 17, 19
stable isotopes	C isotopic heterogeneity of mantle C and N and sublithospheric diamond paragenesis non-traditional stable isotopes (Mg, Fe, K, Ba)	13, 20, 21

Research Topics	Advances in Understanding (2023-2025)	References
kimberlites	framework for kimberlite sources worldwide primary source characteristics of deep-seated kimberlite	22, 23
lamprophyres	systematic petrogenesis vs diamond content	24
spectroscopy	H and N defects during diamond formation	25
classification	revised diamond classification from N	26
FTIR	more accurate lithospheric cooling rates Ca-perovskite compositions with depth syngenesis vs protogenesis	27, 28
fluid inclusions	high power laser ablation of fibrous diamonds radiogenic isotopic composition of diamond fluids fluid interaction with eclogitic and harzburgitic substrates	4, 29, 30
mineral inclusions	study of diamond nano-assemblages by electron diffraction	

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