International Mineralogical Association

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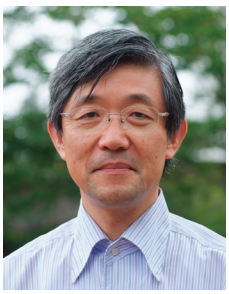
2019 IMA MEDAL TO EIJI OHTANI



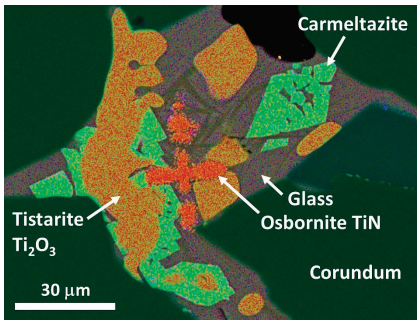
The International Mineralogical Association (IMA) is honored to present its 2019 Medal of Excellence in Mineralogical Sciences to Professor Eiji Ohtani. Professor Ohtani received his BSc degree in petrology in 1973 from Tohoku University (Japan). He received his MSc degree (1975) and his PhD degree (1979), both in geophysics, from Nagoya University (Japan). His professorial career began in 1980 at Ehime University (Japan), where he stayed until 1988. From then he continued at the Department of Earth and Planetary Materials Science at Tohoku University, from where he retired in 2016.

Professor Ohtani was the first person to perform successful melting experiments on minerals and rocks at $P > 10$ GPa using the then-revolutionary multi-anvil technology. He determined the precise melting relations of major mantle minerals, and he modeled phase relations at pressures equivalent to those of the uppermost lower mantle. He also invented techniques to measure density changes in molten rocks under very high pressures and used these techniques to constrain density contrasts between melts and minerals in the mantle. This pioneering work led to the development of the deep magma ocean model in 1985. Since the mid-1990s, Professor Ohtani has built an international reputation with his studies of water storage in the mantle. He measured the solubility of hydrogen in such nominally anhydrous minerals as olivine, majorite, and bridgmanite and demonstrated that the presence of water in mantle phases significantly affects their phase boundaries, something that could explain the topographic variations in the 410 km and 660 km seismic discontinuities.

In parallel with probing the mantle, Professor Ohtani actively explored the Earth's deepest interior and made impactful contributions on element partitioning between the mantle and core and on phase relations in the Fe–O (± Si, H, S) systems. In particular, his research demonstrated that both O and Si are the most likely light-element constituents in the outer core. In addition, his investigations of high-pressure polymorphism in shocked meteorites led to the discovery of coesite, stishovite, and seifertite (one of the densest SiO_2 polymorphs) in lunar materials, and of olivine breakdown to periclase plus bridgmanite in a shocked Martian meteorite. Professor Ohtani's publication record comprises over 360 peer-reviewed articles and is remarkable for its originality and influence.

Professor Ohtani has received a large number of honors, including the Mineralogical Society of Japan Award (1997), the Reimei Research Award from the Atomic Energy Research Institute of Japan (1998), the Norman L. Bowen Award (2007) from the American Geophysical Union, the Medal of Honor (Purple Ribbon) from the Government of Japan (2010), the Urey Award from the European Association of Geochemistry (2017), and the Humboldt Research Award (2017). He holds fellowships in the Mineralogical Society of America, American Geophysical Union, Geochemical Society, and European Association of Geochemistry, and has received many prestigious guest-, distinguished- and visiting-professor appointments, most recently as Distinguished Affiliated Professor at the University of Bayreuth (Germany) to run from 2016 to 2021.

MINERAL OF THE YEAR 2018



At long last, and after much deliberation, the IMA Commission on New Minerals, Nomenclature and Classification is pleased to announce its chosen Mineral of the Year 2018. The "race" was tight and there were many worthy contenders. But the winner is a true gem, or, at least, was presented as such in the media. The new complex oxide **carmeltazite ($ZrAl_2Ti_4O_{11}$)** forms black inclusions in blue corundum crystals ("Carmel Sapphire™") from Cretaceous pyroclastic rocks and associated alluvial deposits at Kishon Mid-Reach in northern Israel. Its name alludes to the type locality at Mt. Carmel and the three principal metals in its formula (Ti, Al and Zr). Carmeltazite was discovered by William L. Griffin (Macquarie University, Australia), Sarah E.M. Gain (University of Western Australia), Luca Bindi (Università degli Studi di Firenze, Italy), Vered Toledo (Shefa Gems Ltd., Israel), Fernando Cámara (Università degli Studi di Milano, Italy), Martin Saunders (University of Western Australia), and Suzanne Y. O'Reilly (Macquarie University). Since its description was published in *Minerals* (Griffin et al. 2018), the mineral has gained much publicity online as "the world's newest gemstone" (Andrews 2019), and even an "extraterrestrial mineral harder than diamonds" (Flatley 2019). Although perfectly terrestrial in origin and not particularly gemmy, the Mineral of the Year 2018 does contain Ti^{3+}, altogether rare in the geological environment, and possesses a peculiar crystal structure, which is remotely related to the close-packed arrangement of spinel. As can be seen from its formula, the structure of carmeltazite is cation- and anion-deficient relative to spinels, while its symmetry is reduced to orthorhombic. Perhaps even more remarkable than its public image or structure is the association of carmeltazite with other Ti^{3+} and carbide minerals, which indicates very unusual geological conditions in their volcanic cradle and promises new exciting discoveries in the future (Griffin et al. 2018).

We would also like to acknowledge here the close runners-up, which included the modular carbonate-phosphate-silicate aravaite from pyrometamorphic rocks of the Hatrurim Complex in Israel (Krüger et al. 2018) and the first-ever tin sulfate genplesite from the Oktyabr'skoe Cu–Ni–Pd–Pt deposit in Siberia (Russia) (Pekov et al. 2018). Once again, we congratulate Bill Griffin and his co-authors on their discovery and encourage all readers of *Elements* to find out more about this remarkable mineral from the *Minerals* article.

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Bulgarian Mineralogical Society

www.bgminsoc.bg

HISTORY

Have you heard of the International Conferences on Mineralogy and Museums? If you have not, the next one (MM9) is being organized by the Bulgarian Mineralogical Society (BMS) and will take place 5–7 July 2020 at the Earth and Man National Museum in Sofia (Fig. 1). The BMS (Българско минералогическо дружество) is one of the oldest members of the IMA: two of its members attended the inaugural IMA meeting in Zürich (Switzerland) in 1959. The eminent Bulgarian mineralogist Ivan Kostov (1913–2004) served as a national representative in the IMA from 1959 to 2004, further contributing as a councilor (1970–1974), vice-president (1978–1982), president (1982–1986) and past-president (1986–1990). Bulgaria hosted the 13th IMA General Meeting in the beautiful seaside city of Varna in 1982. The Bulgarian mineralogical community has made significant contributions to the activities of various IMA commissions and working groups.

Figure 1 Earth and Man National Museum, Sofia.

The BMS was founded as an independent professional organization on 21 February 1990 in Sofia. Prior to that, mineralogists, as well as some geochemists and petrologists, had been an active group within the Bulgarian Geological Society (BGS) (www.bgd.bg) in its Mineralogical Section. For example, the first President of the BGS, elected in 1925, was the pioneer Bulgarian mineralogist and petrographer Georgi N. Bonchev (1866–1955) (Fig. 2), who also served as Rector of Sofia University (1914–1915). One of his greatest contributions to the advancement of mineral sciences in Bulgaria was writing the first university textbooks on mineralogy, crystallography, and petrography in Bulgarian. Classification of minerals on a geochemical and crystal chemical basis was the backbone of Ivan Kostov's 1957 textbook *Mineralogy*, its subsequent 1973 and 1993 editions, and its translation into English in 1968 and Russian in 1971.

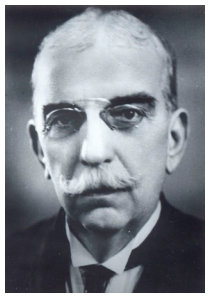

Figure 2 Georgi Bonchev

The BMS membership has, over the years, remained at a roughly 50 professionals (mineralogists, crystallographers, geochemists, petrologists, and mineral deposit geologists), as well as some amateur mineral enthusiasts. Most of the professional members are affiliated with universities or institutions of the Bulgarian Academy of Sciences (Sofia University "St. Kliment Ohridski"; University of Mining and Geology "St. Ivan Rilski"; Geological Institute "Acad. Strashimir Dimitrov"; Institute of Mineralogy and Crystallography "Acad. Ivan Kostov"; National Museum of Natural History), as well as the Ministry of Culture (Earth and Man National Museum). Academician Ivan Kostov (Fig. 3) was elected the first President (1990–1995) and Honorary President of the BMS. Several other mineralogists served as its presidents later on, and two of them – Jordanka Mincheva-Stefanova and Dobrinka Stavrakeva – were also elected as its honorary presidents.

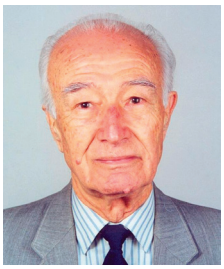

Figure 3 Ivan Kostov

ACTIVITIES

The BMS organizes annual meetings, either on its own or jointly with the BGS. General meetings take place every three years. Both Bulgarian nationals and foreign scholars who have made significant contributions to the advancement of mineralogy in Bulgaria can be elected as honorary members of the society. Preparations are currently underway for MM9 (http://www.bgminsoc.bg/wp-content/uploads/2019/06/MM9Circular1Web.pdf). (Tune in regularly for COVID-19 related updates!). The scientific program will include four sessions: Mineralogical Research and Museums; Archaeomineralogy and Cultural Heritage; Collection Management and Development; Museums, Environment and Society.

Members of the BMS have been principally responsible for the systematic regional study of Bulgarian mineralogy, as well as of crystal morphology and the chemistry of different ore and associated minerals. Among these, of major importance to Bulgaria, has been the study of Cu–Au deposits in the Srednogorie Zone and of the Pb–Zn deposits in the Rhodope Mountains. To date, some 500 minerals, including 11 new species, have been identified in Bulgaria. A few of these new discoveries remain unique. Other "Bulgarian" minerals, such as strashimirite [$Cu_8(AsO_4)_4(OH)_4 \cdot 5H_2O$] and kostovite ($CuAuTe_4$), have since been reported from many other places around the world. During the 1980s, Bulgarian mineralogists, led by I. Kostov, were involved in a major collaborative program with their Russian colleagues (D.P. Grigoriev, N.Z. Evzikova, and others) aimed at establishing how spatial and temporal changes in crystal morphology were linked to the natural processes of crystal nucleation and growth. The outcome of this program was the recognition of evolutionary trends in crystal habits peculiar to individual mineral bodies, deposits, and ore fields. These ideas were initially reported at the 13th IMA meeting in Varna in 1982.

An essential part of current BMS activities is the publication of *Geochemistry, Mineralogy and Petrology* (ISSN 0324-1718), which in 1975 succeeded the *Bulletin of the Geological Institute, Series Geochemistry, Mineralogy and Petrography*. It is a nonperiodic journal, which is distributed in some 30 countries by the library exchange department of the Bulgarian Academy of Sciences.

BULGARIA'S HERITAGE

Besides the two national museums mentioned above, both universities and research institutes house mineral collections representing Bulgarian and foreign localities. Thanks to the discovery of emeralds (Fig. 4) and other rare minerals, the Urdini Ezera site in the Rila Mountains was declared a national mineralogical reserve in 1984. Because Bulgaria is richly endowed in prehistoric and historic cultural heritage, a large volume of recent publications and other forms of research activity have focused on archaeometry, archaeometallurgy, and related fields. Some of the noteworthy examples include the Neolithic Balkan nephrite culture, some of Europe's oldest copper mines (near Stara Zagora), the prehistoric salt works at Provadia–Solnitsata (from six millenia ago), the world's oldest gold treasure in the Varna Necropolis, plus gold- and graphite-decorated pottery and other artifacts from a variety of prehistoric sites. Do not miss your opportunity to see Bulgaria's mineral heritage and its extraordinary history. We look forward to seeing you at MM9!

Figure 4 Beryl (emerald) from the Urdini Lakes area of the Rila Mountains.

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2020 IMA MEDAL FOR EXCELLENCE TO GEORGES CALAS

The International Mineralogical Association (IMA) is delighted to present its 2020 IMA Medal for Excellence in Mineralogical Research to Georges Calas, Professor Emeritus at the Institute of Mineralogy, Materials Physics and Cosmochemistry, Sorbonne University (Paris, France) and Honorary Member of the University Institute of France. Georges has been praised as "a luminary of our generation across a wide range of activities of relevance to the IMA", "an intellectual pioneer" and "an ambassador for the mineral sciences worldwide". His work spans a wide range of Earth materials, experimental techniques and theoretical approaches to tackle such challenging problems as the stereochemistry of disordered materials, the structure and properties of melts, and radiation damage in crystals and glasses. Georges' trailblazing research has integrated mineralogy, geochemistry and state-of-the-art spectroscopic and diffraction techniques to promote and set future trends in the areas of environmental geochemistry, structure of materials, trace-element chemistry of minerals and glasses, and nuclear waste management. Most of his work focused on materials that are highly disordered and, thus, extremely difficult to characterize at the atomic level, which is why there was little understanding of their structure and properties prior to his work. George's recent appointment to the technical committee charged with the restoration of fire-damaged windows of Cathédrale Notre-Dame de Paris is a measure of his expertise on glass. He had the foresight to recognize the scientific, societal and environmental importance of these classes of materials and had the insight to develop new approaches to their analysis. In the early 1980s, he was one of the first among European scientists to utilize synchrotron radiation to study minerals and has since become a leading international expert in the applications of these methods to Earth materials of all levels of complexity. With more than 15,000 citations, his published record includes over 310 peer-reviewed contributions, 45 of which have been cited more than 100 times!

The impact and breadth of Professor Calas' contributions to mineral sciences is well illustrated by his contributions to eight (!) different thematic issues of *Elements*: on user research facilities (Brown et al. 2006), arsenic (Morin and Calas 2006), glasses and melts (Calas et al. 2006; Henderson et al. 2006), kaolin (Balan et al. 2014), societal and economic impact of geochemistry (Calas et al. 2015), and mineral resources and sustainability (Calas 2017; Brown et al. 2017). In addition to serving as Principal Editor of *Elements* (2011–2013), Georges guest-edited two special issues of the magazine (2006, 2017) and was involved in various editorial capacities in ten other periodicals. The importance of his research on the behaviour of various geomaterials in the surficial environment (particularly those that are poorly or non-crystalline but geochemically active), on their interaction with organic and biological components, and on various types of contaminants in groundwater and soil is impossible to overemphasize, particularly in light of the recent problems with drinking-water contamination, nuclear waste disposal, and environmentally responsible resource extraction at various sites around the globe. Georges has also been very active in educating the Earth science community about the significance and efficacy of spectroscopic techniques in a wide variety of applications. Throughout his career, he has received numerous awards and recognitions, including fellowships of the Mineralogical Society of America (1989), European Association of Geochemistry and Geochemical Society (2009), Society of Glass Technology (2010), American Ceramic Society (2020), an Honorary Fellowship of the Mineralogical Society of Great Britain and Ireland (2018), Léon Bertrand Prize from the French Geological Society (2006), Dolomieu Grand Prize from the French Academy of Sciences (2014), Merit Award from the French Mineralogical Society (2020), and a Schlumberger Medal from the Mineralogical Society of Great Britain and Ireland (2011). In addition to his invited professorships at Stanford University (California, USA) and the Collège de France, he was elected a member of Academia Europaea (2011) and the Royal Society of Canada (2014).

We congratulate Professor Calas on his 2020 IMA Medal for Excellence in Mineralogical Research and look forward to reading about his new exciting discoveries in the Notre Dame glasses and beyond!

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MINERAL OF THE YEAR 2019

In 2019, the prestigious title went to **tewite**, which has an unusual crystal structure related to that of tungsten bronzes (Li et al., 2019). The new mineral was discovered near Nanyang village in the Panzhihua–Xichang region of China and named for the presence of major tellurium and tungsten in its chemical composition: $(K_{1.61}Na_{0.06}\square_{0.33})(Te_{1.06}W_{0.35}\square_{0.59})W_5O_{19}$. It occurs in lightly weathered biotite–quartz monzonite near its contact with gabbro, and is associated with feldspars, biotite, hornblende, ilmenite, zircon, zoisite, tourmaline, monazite-(Ce), allanite-(Ce), scheelite and tellurite. Notably, tewite developed after another mineral related to tungsten bronzes and approved recently under the name wumuite, $KAl_{0.33}W_{2.67}O_9$ (Xue et al. 2020). The structure of tewite derives from tungsten bronzes, but, unlike the latter, contains ribbons of corner-sharing WO_6 octahedra separated by highly distorted TeO_6 polyhedra. Like in true tungsten bronzes, K occupies hexagonal channels within an octahedral framework in the tewite structure. We would like to congratulate Guowu Li, Yuan Xue and Ming Xiong on this award and encourage everyone to read about their discoveries in the *European Journal of Mineralogy*.

The IMA Commission on New Minerals, Nomenclature and Classification would also like to acknowledge two close runners-ups: rudabanyaite, a new chloroarsenate with $[Ag_2Hg_2]^{4+}$ cluster cations, discovered by Herta Effenberger and her coauthors (2019) at the Rudabánya ore deposit (Hungary), and davidbrownite-(NH_4), a new phosphate-oxalate phase from the Rowley mine in Arizona (USA), described by Anthony R. Kampf and colleagues (2019).

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