SMMP Research Roundup – June 2021

For member publications from June 2020 – June 2021

Both peer-reviewed and general publications are listed by category, as designated by the submitting author. Up to 200 words of each abstract has been included only if the submitting author included the abstract in the form.

Categories:

EDUCATION & OUTREACH

General publications

Alonso-Perez, Raquel, Eloïse Gaillou, and Bryan Swoboda. Mineral Talks LIVE. Blue Cap Productions, 2020-present.

> Access videos on YouTube at
> https://www.youtube.com/watch?v=r4FzDmSC5Vg&list=PLYUSEUgiTprI9Vh7ZLXu8x_hHp0dN_TDJ
> See write-up in the Mineral Observer, Vol 26 issue 1, 2021. http://www.minbook.com/book.php?book=180

GEOLOGY/EARTH SCIENCE

Peer-reviewed

Alonso-Perez, Raquel, and James M. D. Day. "**Rare Earth Element and Incompatible Trace Element Abundances in Emeralds Reveal Their Formation Environments**." Minerals 11, no. 5 (May 13, 2021): 513. https://doi.org/10.3390/min11050513

Emeralds require the unusual association of typically compatible elements (Cr, V), with incompatible Be to form, and occur in complex tectonic settings associated with sediments (type IIB; Colombia) or, more commonly, with magmatism and regional metamorphism (IA). Precise rare earth element (REE) and incompatible trace element abundances are reported for a global suite of emeralds, enabling the identification of the environments in which they formed. Type IIB emeralds have nearly flat continental crust normalized REE patterns (La/YbCC = ~2), consistent with a sedimentary source origin. Type IA emerald REE patterns have upturns in the heavy REE (La/YbCC = ~0.3), a feature also shared with South African emeralds occurring in Archaean host rocks. Modeling of type IA emerald compositions indicates that they form from magmatic fluids of sedimentary (S)-type granite melts interacting with Cr, V-rich mafic–ultramafic crustal protoliths. This geochemical signature links emerald formation with continental suture zones. Diamonds, rubies, and sapphires have been considered as 'plate tectonic gemstones' based on mineral inclusions within them, or associations with plate tectonic indicators. Emeralds are distinct plate tectonic gemstones, recording geochemical evidence for origin within their mineral structure, and indicating that plate tectonic processes have led to emerald deposit formation since at least the Archaean.

Bevins, Richard E., Rob A. Ixer, Duncan Pirrie, Matthew R. Power, Tom Cotterell, and Andrew G. Tindle. "**Alteration Fabrics and Mineralogy as Provenance Indicators; the Stonehenge Bluestone Dolerites and Their Enigmatic 'Spots.'**" Journal of Archaeological Science: Reports 36 (April 2021): 102826. https://doi.org/10.1016/j.jasrep.2021.102826

Hodgin, Eben B., Lyle L. Nelson, Corey J. Wall, Arturo J. Barrón-Díaz, Lucy C. Webb, Mark D. Schmitz, David A. Fike, James W. Hagadorn, and Emily F. Smith. "**A Link between Rift-Related Volcanism and End-Ediacaran Extinction? Integrated Chemostratigraphy, Biostratigraphy, and U-Pb Geochronology from Sonora, Mexico.**" Geology 49, no. 2 (February 1, 2021): 115–19. https://doi.org/10.1130/G47972.1

> We present chemostratigraphy, biostratigraphy, and geochronology from a succession that spans the Ediacaran-Cambrian boundary in Sonora, Mexico. A sandy hematite-rich dolostone bed, which occurs 20 m above carbonates that record the nadir of the basal Cambrian carbon isotope excursion within the La Ciénega Formation, yielded a maximum depositional age of 539.40 ± 0.23 Ma using U-Pb chemical abrasion–isotope dilution–thermal ionization mass spectrometry on a population of sharply faceted volcanic zircon crystals. This bed, interpreted to contain reworked tuffaceous material, is above the last occurrences of late Ediacaran body fossils and below the first occurrence of the Cambrian trace fossil Treptichnus pedum, and so the age calibrates key markers of the Ediacaran-Cambrian boundary. The temporal coincidence of rift-related flood basalt volcanism in southern Laurentia (>250,000 km3 of basalt), a negative carbon isotope excursion, and biological turnover is consistent with a mechanistic link between the eruption of a large igneous province and end-Ediacaran extinction.

Wagner, Courtney L., Ramon Egli, Ioan Lascu, Peter C. Lippert, Kenneth J. T. Livi, and Helen B. Sears. "**In Situ Magnetic Identification of Giant, Needle-Shaped Magnetofossils in Paleocene–Eocene Thermal Maximum Sediments**." Proceedings of the National Academy of Sciences 118, no. 6 (February 9, 2021): e2018169118. https://doi.org/10.1073/pnas.2018169118

> Near-shore marine sediments deposited during the Paleocene–Eocene Thermal Maximum at Wilson Lake, NJ, contain abundant conventional and giant magnetofossils. We find that giant, needle-shaped magnetofossils from Wilson Lake produce distinct magnetic signatures in low-noise, high-resolution first-order reversal curve (FORC) measurements. These magnetic measurements on bulk sediment samples identify the presence of giant, needle-shaped magnetofossils. Our results are supported by micromagnetic simulations of giant needle morphologies measured from transmission electron micrographs of magnetic extracts from Wilson Lake sediments. These simulations underscore the single-domain characteristics and the large magnetic coercivity associated with the extreme crystal elongation of giant needles. Giant magnetofossils have so far only been identified in sediments deposited during global hyperthermal events and therefore may serve as magnetic biomarkers of environmental disturbances. Our results show that FORC measurements are a nondestructive method for identifying giant magnetofossil assemblages in bulk sediments, which will help test their ecology and significance with respect to environmental change.

Wagner, Courtney L., Ioan Lascu, Peter C. Lippert, Ramon Egli, Kenneth J. T. Livi, and Helen B. Sears. "**Diversification of Iron‐Biomineralizing Organisms During the Paleocene‐Eocene Thermal Maximum: Evidence From Quantitative Unmixing of Magnetic Signatures of Conventional and Giant Magnetofossils.**" Paleoceanography and Paleoclimatology 36, no. 5 (May 2021). https://doi.org/10.1029/2021PA004225

MINERALOGY

Peer-reviewed

Castellaro, F., G. Passarino, A.R. Kampf, and M. Esposito. "**Recenti Ricerche Mineralogiche Nella Sezione Cassagna Delle Miniere Di Manganese Della Val Graveglia, Genova – Novità e Conferme Di Mineralogia Sistematica.**" Micro 19 (n.d.): 34–59.

Cotterell, Tom, Brian Young, Andy Hopkirk, and J.A. Charles Lamb. "**Supergene Manganese Mineralisation in the Northern Pennine Orefields**." Journal of the Russell Society 23 (November 2020): 101–11.

> The occurrence and distribution of previously reported manganese oxide minerals within the Northern Pennine orefields of the Alston and Askrigg Blocks is reviewed and several hitherto unreported occurrences described. A supergene origin, resulting from the alteration of primary manganese-bearing iron carbonate minerals is proposed, but with significant chemical input from associated lead, zinc and barium minerals. The abundance and distribution of manganese oxides is consistent with the widespread abundance of primary iron carbonates in the Alston orefield and their much more restricted occurrence in the Askrigg orefield. In the main, the manganese oxides are lead- or barium-containing species, demonstrating the importance of primary galena, baryte and witherite in the oxidation process. In the Middle Fell area of Alston Moor, zinc-bearing manganese oxides occur, reflecting the extensive development of supergene zinc mineralisation in that area. Thin, poorly crystalline coatings of zinc-bearing manganese oxides reported on the walls of Hudgill Burn Mine caverns at Middle Fell, although uncharacterized, probably represent a similar but weakly developed extension of this mineralisation in the host limestone.

Hawthorne, Frank C., Stuart J. Mills, Frédéric Hatert, and Mike S. Rumsey. "**Ontology, Archetypes and the Definition of 'Mineral Species.'**" Mineralogical Magazine 85, no. 2 (April 2021): 125–31. https://doi.org/10.1180/mgm.2021.21

> Ontology deals with questions concerning what things exist, and how such things may be associated according to similarities and differences and related within a hierarchy. Ontology provides a rigorous way to develop a general definition of a mineral species. Properties may be divided into two principal groups: an intrinsic property is characteristic of the object and is independent of anything else; an extrinsic property depends on the relation between the object and other things. A universal is an entity that is common to all objects in a set. Here the objects are mineral samples, each entity is a specific property of these minerals, and the set of objects is all mineral samples of that mineral species. The key intrinsic properties of a mineral species are its name, its end-member formula and Z (the number of formula units in the unit cell), its space group and the bond topology of the end-member structure. These are also universals as they are common to all mineral samples belonging to that mineral species. An archetype is a pure form which embodies the fundamental characteristics of an object. Thus the archetype of a mineral species embodies the above set of universals. Real mineral samples of this mineral species are imperfect copies of that archetype, with a range of chemical composition defined by the boundaries between end-member formulae of this and other end members of the same bond topology. The result is a formal definition of a mineral species: A specific mineral species is the set of imperfect copies of the corresponding archetype and is defined by the following set of universals: name, end-member formula and Z, space group, and bond topology of the end-member structure, with the range of chemical composition limited by the compositional boundaries between end members with the same bond topology.

Kampf, Anthony R. “**Type Mineralogy of Brazil: A Book in Progress D. Atencio Instituto de Geociências – Universidade de São Paulo, Brazil.** 662 Pp. ISBN: 978-65-86403-01-5 Https://Doi.Org/10.11606/9786586403015.” Mineralogical Magazine 84, no. 6 (December 2020): 970–970. https://doi.org/10.1180/mgm.2020.94

Young, Brian, Tom Cotterell, and Andy Hopkirk. “**Mordenite from Glen Brittle, Isle of Skye**.” Journal of the Russell Society 23 (November 2020): 86–90.

> The occurrence of the comparatively uncommon zeolite mordenite is described from vesicles in a basaltic lava within the Skye Lava Group at Glen Brittle, Isle of Skye. The form of the mineral here differs from that at its sole previously recorded location on the island at Sgùrr nam Boc. At Glen Brittle mordenite is locally intergrown with quartz. Laumontite, prehnite, chabazite, calcite and saponite, are also present in very small amounts.

<u>Peer-reviewed - New minerals (abstracts omitted)</u>

Grey, Ian E., George Favreau, Stuart J. Mills, W. Gus Mumme, Catherine Bougerol, Helen E.A. Brand, Anthony R. Kampf, Colin M. MacRae, and Finlay Shanks. “**Galeaclolusite, $[Al_6(AsO_4)_3(OH)_9(H_2O)_4]\cdot 8H_2O$, a New Bulachite-Related Mineral from Cap Garonne, France**.” Mineralogical Magazine 85, no. 2 (April 2021): 142–48. https://doi.org/10.1180/mgm.2020.98

Olds, Travis A., Anthony R. Kampf, John F. Rakovan, Peter C. Burns, Owen P. Mills, and Cullen Laughlin-Yurs. “**Hydroxylpyromorphite, a Mineral Important to Lead Remediation: Modern Description and Characterization.**” American Mineralogist 106, no. 6 (June 1, 2021): 922–29. https://doi.org/10.2138/am-2021-7516

Rumsey, Michael S., Mark D. Welch, John Spratt, Annette K. Kleppe, and Martin Števko. “**Kernowite, $Cu_2Fe(AsO_4)(OH)_4\cdot 4H_2O$, the Fe^{3+}-Analogue of Liroconite from Cornwall, UK.**” Mineralogical Magazine, May 12, 2021, 1–8. https://doi.org/10.1180/mgm.2021.40

OTHER TOPICS

General publications

Simonini, Giulia, Andre Karliczek, Elaine Charwat, and Peter Davidson. **Nature's Palette: A Colour Reference System from the Natural World.** Thames and Hudson, 2021. https://thamesandhudson.com/nature-s-palette-a-colour-reference-system-from-the-natural-world-9780500252468

> This chromatic catalogue of the natural world pairs individual colour swatches with examples from the animal, vegetable and mineral kingdoms to create a beautiful and comprehensive colour reference system to grace every bookshelf.
>
> Marking the 200th anniversary of the publication of Syme's expanded edition of *Werner's Nomenclature of Colours* (1821), this lavish volume takes Syme's field guide of 110 standard colours and – for the first time – fully illustrates it with nineteenth-century depictions of his referenced species. Expert text explains the uses and development of colour standards in relation to zoology, botany, mineralogy and anatomy, while specimens from contemporary collector's cabinets (birds, butterflies, eggs, flowers and minerals) are matched to each colour swatch. Syme's groundbreaking guide attempted to establish a universal colour reference system to help identify, classify and represent species from the natural world: this landmark publication completes his endeavour.