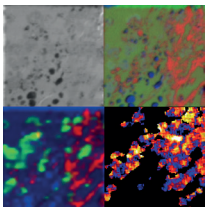
2024 THEMATIC PREVIEW

Volume 20, Number 1 (February)

EXTRATERRESTRIAL ORGANIC MATTER

GUEST EDITORS: **Mehmet Yesiltas** (Kirklareli University, Turkey) and **Yoko Kebukawa** (Tokyo Institute of Technology, Japan)



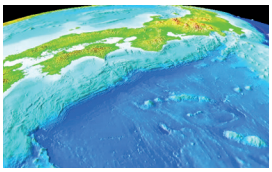
Extraterrestrial organic matter is found in various extraterrestrial environments and in various forms. It forms in a variety of locations through different mechanisms in space. As such, its nature, distribution, formation mechanisms and locations are of particular interest. Some organic molecules are even considered as key players for the emergence of life on Earth and possibly beyond. Therefore, their detection and characterization can contribute to the understanding of the early solar system evolution as well as the origin of life. Despite decades of work and research, there are still many questions and unknowns on this topic. The aim of this issue of *Elements* is to offer an overview of the concept of extraterrestrial organic matter as well as the latest scientific findings.

- **Extraterrestrial Organic Matter: An Introduction** Mehmet Yesiltas (Kirklareli University, Turkey) and Yoko Kebukawa (Tokyo Institute of Technology, Japan)
- **Formation and Evolution Mechanisms of Organic Matter in Space** Hikaru Yabuta (Hiroshima University, Japan), Hideko Nomura (National Astronomical Observatory of Japan, Japan), and Queenie H.S. Chan (Royal Holloway University of London, UK)
- **Delivery of Organic Matter to Early Earth** Zita Martins (Universidade de Lisboa, Portugal) and Matthew A. Pasek (University of South Florida, USA)
- **Diversity of Complex Organic Matter in Carbonaceous Chondrites, IDPs, and UCAMMs** Bradley T. De Gregorio (US Naval Research Laboratory, USA) and Cécile Engrand (Université Paris-Saclay, France)
- **Asteroidal Organics from the Sample Return Mission *Hayabusa2* and their Implication for Understanding our Origins** Shogo Tachibana (University of Tokyo, Japan) and Nami Sakai (RIKEN Cluster for Pioneering Research, Japan)
- **Analytical Techniques for Identification and Characterization of Extraterrestrial Organic Matter** Yoko Kebukawa (Tokyo Institute of Technology, Japan), Mehmet Yesiltas (Kirklareli University, Turkey), and Timothy D. Glotch (Stony Brook University, USA)

Volume 20, Number 2 (April)

PAIRED METAMORPHIC BELTS OF SW JAPAN: METAMORPHIC RECORDS OF A SUBDUCTION SYSTEM

GUEST EDITORS: **S. R. Wallis** (University of Tokyo, Japan), **K. Miyazaki** (Geological Survey of Japan, AIST, Japan), and **U. Knittel** (RWTH Aachen University, Germany)



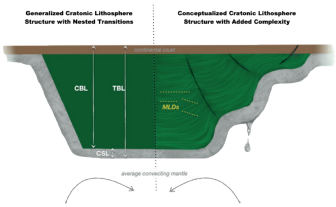
Subduction, where one plate dives beneath another, controls long-term whole-Earth cycling of rocks, fluids and energy. Plates subduct faster than they heat up, making them the coldest parts of the Earth's interior. Fluids released from these cold plates rise into hotter overlying rocks forming magma that feeds surface volcanism. Cold deep conditions associated with subduction complemented by hot shallow conditions under volcanic arcs are reflected in the presence of pairs of metamorphic belts representing sites of ancient subduction—the Cretaceous Sanbagawa-Ryoke metamorphic pair of Japan is a premier example. Estimates of pressure, temperature, the age and duration of metamorphism, and the tectonic framework in which metamorphism took place help us develop quantitative models both for the evolution of SW Japan and subduction systems in general.

- **Paired Metamorphism in SW Japan** S. R. Wallis (University of Tokyo, Japan), K. Miyazaki (Geological Survey of Japan, AIST, Japan), T. Okudaira (Osaka Metropolitan University, Japan)
- **Sanbagawa Subduction: What Went In, How Deep, and How Hot Did It Get** S. Endo (Shimane University, Japan), Y. Kouketsu (Nagoya University, Japan), M. Aoya (Tokushima University, Japan)
- **Mantle Wedge of the Sanbagawa Subduction Zone** A. Okamoto (Tohoku University, Japan), S. Endo (Shimane University, Japan), and T. Nagaya (University of Tokyo, Japan)
- **Geochronology of the Sanbagawa Belt: Younger and Faster Than Ever Before** U. Knittel (RWTH Aachen University, Germany), T. Tokiwa (Shinshu University, Japan), Y. Tsutsumi (National Museum of Nature and Science, Japan), S. Endo (Shimane University, Japan), and S. R. Wallis (University of Tokyo, Japan)
- **Metamorphism beneath the Ryoke Volcanic Arc: Timing and *P–T* conditions** T. Okudaira (Osaka Metropolitan University, Japan), T. Kawakami (Kyoto University, Japan), T. Ikeda (University of Kyushu, Japan), and E. Skrzypek (University of Graz, Austria)
- **Cretaceous Plate Movements in the Eastern Pacific Domain and the Geology of Japan** Jonny Wu (University of Houston, USA), Sung-Jui Wu (University of Houston, USA), and Ken Yamaoka (Geological Survey of Japan, AIST, Japan)
- **Thermal Models of the Ryoke and Sanbagawa Metamorphic Domains** K. Miyazaki (Geological Survey of Japan, AIST, Japan), K. Ishii (Osaka Metropolitan University, Japan), S. R. Wallis (University of Tokyo, Japan), and C. Annen (Institute of Geophysics Czech Academy of Science, Czech Republic)

Volume 20, Number 3 (June)

CRATONS RECEIVE THE HIGHEST GRADES

GUEST EDITORS: **Paul Mueller** (University of Florida, USA) and **Carol Frost** (University of Wyoming, USA)



Archean continental crust is present on every continent, but does not constitute a dominant part of any continent's surficial exposures. Nevertheless, Archean cratons are the longest-lived coherent physical structures on earth. Viewed holistically they comprise a welded combination of continental crust and as sub-continental lithospheric mantle keel. They are survivors of what may, or may not, have been a more numerous and varied population of protocontinents. Many of these crustal blocks have origins in the Hadean and have survived for billions of years through many supercontinent cycles. Consequently, these craton-keel structures have influenced the physical and chemical evolution of the silicate earth. This issue of *Elements* provides an overview of Archean cratons and the information they retain about the early development of Earth's continental crust.

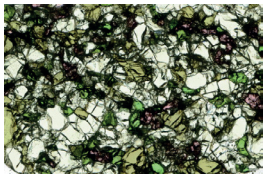
- **In the Beginning There Were Cratons** Paul Mueller (University of Florida, USA) and Carol Frost (University of Wyoming, USA)
- **Earth's Earliest Crust** Jonathan O'Neil (University of Ottawa, Canada), Hanika Rizo (Carleton University, Canada), Jesse Reimink (Pennsylvania State University, USA), Marion Garçon (Université Clermont Auvergne, France), and Richard W. Carlson (Carnegie Institution for Science, USA)
- **At the Dawn of Continents: The Archean Tonalite-Trondhjemite-Granodiorite Suite** Oscar Laurent (CNRS, Géosciences Environnement Toulouse, France), Martin Guitreau (Université Clermont Auvergne, France), Emilie Bruand (Université Clermont Auvergne, France), and Jean-François Moyen (CNRS, Geo-Ocean, Brest, France)
- **Structural Evidence for Plate Tectonics in Archean Cratons** Brian Windley (University of Leicester, UK)
- **Decoding the Surface of Archean Cratons** Patrice Rey (University of Wollongong, Australia), Nicolas Coltice (École Normale Supérieure, Paris, France), and Nicolas Flament (University of Sydney, Australia)
- **Embracing the Complexity at Depth: Exploring the Heterogeneity within Cratonic Lithosphere** Catherine Cooper (Washington State University, USA) and Meghan Miller (Australian National University, Australia)

2024 THEMATIC PREVIEW

Volume 20, Number 4 (August)

THE INVISIBLE OCEAN: HYDROGEN IN THE DEEP EARTH

GUEST EDITORS: **Sylvie Demouchy** (Univ. Clermont Auvergne, France), **Hélène Bureau** (Sorbonne University, France), and **Hans Keppler** (Univ. Bayreuth, Germany)



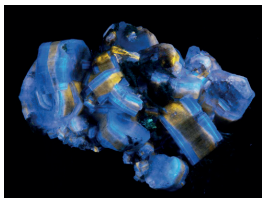
Hydrogen is the most abundant element in the universe and its distribution, transfer, and speciation in the deep Earth remain a fascinating topic of ongoing research. We review the most notable discoveries constraining the H cycle in the deep Earth. This includes new methods for detecting hydrogen, insights into the size of deep reservoirs, and new constraints from inclusions in ultradeep diamonds. Advances in seismic and magneto-telluric imaging provide unique data on the storage and mobility of water in Earth´s interior. Models of the early Earth and of its habitability critically depend on the behavior of hydrogen in a magma ocean–atmosphere system. Later in Earth history, water may have been essential for establishing plate tectonics, a phenomenon making Earth a unique planet.

- **Hydrogen in the Depth Earth** Jed Mosenfelder (Univ. Minnesota, USA), Anthony C. Withers (Univ. Bayreuth, Germany), and Hélène Bureau (Sorbonne University, France)
- **Fuel for Plate Tectonics? The Burial of Hydrogen During Subduction** Hans Keppler (Univ. Bayreuth, Germany), Eiji Ohtani (Tohoku University, Japan), and Xiaozhi Yang (Univ. Nanjing, China)
- **Deep Hydrogen Reservoirs and Longevity** Davide Novella (Univ. Padova, Italy), Sylvie Demouchy (Univ. Clermont Auvergne, France), and Nathalie Bolfan-Casanova (Univ. Clermont Auvergne, France)
- **Hydrous Melting and its Seismic Signature** Stéphanie Durand (Univ. Lyon, France), Marija Putak Juricek (Univ. Göttingen, Germany), and Karen Fischer (Brown University, USA)
- **Probing Deep Hydrogen using Electrical Conductivity** Takashi Yoshino (Okayama University, Japan), Geeth Manthilake (Univ. Clermont Auvergne, France), Anne Pommier (Carnegie Inst. for Science, USA)
- **Hydrogen in the Early Earth and through Geologic Time** Fabrice Gaillard (University of Orléans, France) and Lars Rüpke (GEOMAR, Germany)

Volume 20, Number 5 (October)

BEHIND AND BEYOND LUMINESCENCE IMAGING

GUEST EDITORS: **Lutz Nasdala** (Universität Wien, Austria), **Emmanuel Fritsch** (University of Nantes, France), and **Jens Götze** (TU Bergakademie Freiberg, Germany)



Luminescence-based optical or SEM images are increasingly used in Earth sciences research. Examples include formation and post-growth history of minerals from their internal textures, taking into account multiple interior regions of complex crystals. For such simple approaches it is actually unnecessary to understand the particular causes of emissions. During the last decade, however, spectroscopic research has led to substantial progress in our understanding of the emissions of minerals. The main objective of this issue is to convince readers that luminescence is not at all restricted to interesting pictures that show "something", but analysis of the emissions may bear a wealth of information on what exactly is observed. Luminescence spectroscopy has become a versatile, quantitative group of techniques whose successful applications virtually cover all geoscientific sub-disciplines.

- **Luminescence: The "Cold Glow" of Minerals** Lutz Nasdala (Universität Wien, Austria) and Emmanuel Fritsch (University of Nantes, France)
- **Activators in Minerals and the Role of Electronic Defects** Glenn A. Waychunas (LBNL and Caltech, Berkeley, USA) and Ulf Kempe (TU Bergakademie Freiberg, Germany)
- **Luminescence Images: What is it That You See?** Jens Götze (TU Bergakademie Freiberg, Germany), Colin MacRae (CSIRO Clayton, Australia), and Lutz Nasdala (Universität Wien, Austria)
- **Luminescence Applications in Petrology** Adrian Finch (University of St Andrews, UK), Magdalena Dumańska-Słowik (AGH University of Krakow, Poland), Laura González-Acebrón (Universidad Complutense de Madrid, Spain), and Hans-Peter Schertl (Ruhr-Universität, Bochum, Germany)
- **Analyzing the Luminescence of Gems** Thomas Hainschwang (GGTL, Balzers, Liechtenstein, and Antwerp, Belgium), Emmanuel Fritsch (University of Nantes, France), Eloïse Gaillou (MINES ParisTech, Musée de Minéralogie Paris, France), and Andy Shen (China University of Geosciences, Wuhan)
- **Luminescence Applications in Ore Geology, Mining, and Industry** Michael Gaft (Ariel University, Israel), Peter K.M. Megaw (IMDEX Inc., USA), Lex Lambeck (MAG Silver, USA), and Samuel F. Cantor (Seequent, USA)

Volume 20, Number 6 (December)

HIMALAYAN LEUCOGRANITES

GUEST EDITORS: **Fang-Zhen Teng** (University of Washington, Seattle, USA) and **Fu-Yuan Wu** (Institute of Geology and Geophysics, Chinese Academy of Sciences, China)

Himalayan leucogranites crop out intermittently over 2000 km along the Himalayan crest in the Himalayan–Tibetan plateau. They constitute some of the most well-studied granites in the world. They are considered to be purely crustal-derived melts and indicators of collisional orogenesis, and have greatly improved our general understanding of crustal anatexis, differentiation of felsic magmas, and tectonic evolution of the Himalayan–Tibetan Orogen. They provide a rare opportunity to explore the feedback relationships among geodynamics, tectonics, and magmatism in a classic continental collisional context. In this issue, we will describe our current understanding of the petrogenesis and significance of the Himalayan leucogranites by focusing on their tectonic and geodynamic background, source rocks, petrology, geochemistry, and links to orogenesis and economic resources. This issue will not only summarize the state-of-the-art research on leucogranites but also present an example of how a multidisciplinary approach can be used to constrain the petrogenesis of granites and the associated mineralization and orogenic evolution.

- **Himalayan Leucogranites: Petrogenesis and significance** Fang-Zhen Teng (University of Washington, Seattle, USA) and Fu-Yuan Wu (Institute of Geology and Geophysics, Chinese Academy of Sciences, China)
- **Himalayan Leucogranites: Tectonics and geodynamics** Mike Searle (University of Oxford, UK) and John Cottle (University of California, Santa Barbara, USA)
- **Himalayan Leucogranites: Orogenesis and crustal flow** Matt Kohn (Boise State University, USA), Sean Long (Washington State University, USA), and Mark Harrison (University of California, Los Angeles, USA)
- **Himalayan Leucogranites: A petrological perspective** Bruno Scaillet (Orleans University, France) and Michel Pichavant (Orleans University, France)
- **Himalayan Leucogranites: A geochemical perspective** Ze-Zhou Wang (University of Washington, Seattle, USA), Fang-Zhen Teng (University of Washington, Seattle, USA), Ling-Sen Zeng (Institute of Geology, Chinese Academy of Geological Sciences, China), and Zhi-Chao Liu (Sun Yat-sen University, China)
- **Himalayan Leucogranites: Rare-metal resources** Fu-Yuan Wu (Institute of Geology and Geophysics, Chinese Academy of Sciences, China), Xiao-Chi Liu (Institute of Geology and Geophysics, Chinese Academy of Sciences, China), Fang-Yang Hu (Institute of Geology and Geophysics, Chinese Academy of Sciences, China), Lei Xie (Nanjing University, China), and Ru-Cheng Wang (Nanjing University, China)