THEMATIC TOPICS IN 2018

Volume 14, Number 1 (February)

LUMINESCENCE DATING: RECONSTRUCTING EARTH'S RECENT HISTORY

Guest Editors: **Rachel K. Smedley** (Keele University, UK) and **Ann G. Wintle** (University of Cambridge and Aberystwyth University, UK)

Luminescence dating is a geochronological tool used to determine the timing of sediment burial, pottery firing, mountain evolution, mineral formation and the exertion of pressure. The luminescence dating technique covers a large age range from modern-day to hundreds of thousands of years using conventional methods, or even up to millions of years according to recent developments. The technique is inherently holistic, drawing upon disciplines such as physics (quantum mechanics), mineralogy (grain structure and composition), geochemistry (natural radioactivity), archaeology and Earth sciences. This issue brings together contributions on new and innovative luminescence dating methods and the latest findings related to Earth-surface processes and human existence.

- **Telling the Time with Dust, Sand and Rocks** Rachel K. Smedley (Keele University, UK)
- **Modelling Particle–Matter Interactions: The Missing Link** Guillaume Guerin (Université Bordeaux Montaigne, France)
- **Dates and Rates of Earth-Surface Processes** Tammy M. Rittenour (Utah State University, USA)
- **Timelines for Human Evolution and Dispersals** Richard G. Roberts and Zenobia Jacobs (University of Wollongong, Australia)
- **Seeing Snails in a New Light** Geoff A.T. Duller and Helen M. Roberts (Aberystwyth University, UK)
- **Mountain Evolution, Climate and Tectonics** Frédéric Herman (University of Lausanne, Switzerland) and Georgina E. King (University of Bern, Switzerland)

Volume 14, Number 2 (April)

COMETS

Guest Editors: **Michael E. Zolensky** (NASA Johnson Space Center, USA) and **Monica M. Grady** (Open University, UK)

It is now possible, for the first time, to synthesize what has been learned regarding the mineralogy, geochemistry, and geology of comets from the *Giotto*, *Vega*, *Stardust*, *Stardust NEXT*, *Deep Impact*, and *Rosetta* missions to comets Halley, Wild 2, Borrelly, Tempel 1, and Churyumov–Gerasimenko. Articles in this issue will describe the nature of cometary inorganic phases, volatiles, notable water, and organics. As will be shown in this issue, the relationships between the organics and the volatile inventories of terrestrial planets are critical. Processes that force comets to interact with other Solar System bodies will be also discussed. For example, dust shed by comets enters the atmospheres of planets every day, observed as meteor showers that can be traced back to specific parent comets. One implication of this fact is that the enigmatic methane observed in the Martian atmosphere may arise from meteor showers of cometary material.

- **Introduction to Comets: Mineralogy, Geochemistry and Geology** Michael E. Zolensky, NASA Johnson Space Center (USA) and Monica M. Grady (Open University, UK)
- **What We Have Learned from Missions to Comets Halley, Wild 2, Borrelly and Tempel 1** Donald E. Brownlee (University of Washington, USA), Benton C. Clark (Lockheed Martin, USA), Michael F. A'Hearn (University of Maryland, USA), Jessica M. Sunshine (University of Maryland, USA) and Tomoki Nakamura (Tohoku University, Japan)

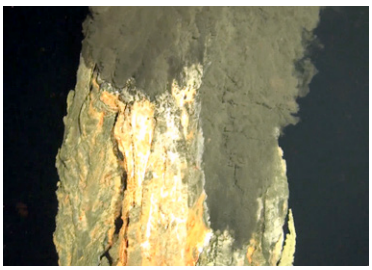
- ***Rosetta* Mission Takes the First In-Depth Look at a Comet** Ian P. Wright (Open University, UK), Monica M. Grady (Open University, UK), Sandra Siljeström (SP Technical Research, Sweden), and Cecile Engrand (CNRS/IN2P3, University Paris Sud, France)
- **Cometary Organics and Other Volatiles** Hikaru Yabuta (University of Osaka, Japan), Scott A. Sandford (NASA AMES Research Center, USA), and Karen J. Meech (Institute for Astronomy, University Hawaii, USA)
- **Comet Dynamics, Meteor Showers, and the Impact Record from Comets** Peter M. Jenniskens (SETI Institute, USA) and Olga Popova (IDG RAS, Russia)
- **Origin of the Solar System** Sara S. Russell (Natural History Museum, London, UK)

Volume 14, Number 3 (June)

DEEP-OCEAN MINERAL DEPOSITS

Guest Editors: **Paul A.J. Lusty** (British Geological Survey, UK) and **Bramley J. Murton** (National Oceanography Centre, UK)

Significant deposits of metal-rich minerals are known to exist on the deep-ocean floor, in some instances exceeding global land-based resources. In recent years, advances in understanding and technology coupled with an evolving regulatory regime have resulted in growing interest in mining these deposits. However, assessing the potential and challenges of exploitation is hindered by our relatively poor knowledge of this vast and inaccessible environment. This issue will introduce the reader to the deep-ocean mineral deposits that are attracting most interest, describing genetic models for their formation and future research challenges, including the possible role of microbes in concentrating metals. It will examine the potential for the low-carbon extraction of metals from these novel deposits, and provide readers with a better understanding of the host of environmental, social, economic, political and legal challenges that need to be addressed for the sustainable development of these resources.



- **Geological and Economic Significance of Seafloor Mineral Deposits** Paul A.J. Lusty (British Geological Survey, UK) and Bramley J. Murton (National Oceanography Centre, UK)
- **Modern Seafloor Hydrothermal Systems: New Perspectives on Ancient Ore-Forming Processes** Sven Peterson (GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany), Bramley J. Murton, and Berit Lehrmann (National Oceanography Centre, UK)
- **Marine Ferromanganese Deposits – Major Resources of High-Technology Elements** Paul A.J. Lusty (British Geological Survey, UK), James R. Hein (United States Geological Survey, USA), and Pierre Josso (British Geological Survey, UK)
- **Geomicrobiology of Deep-Ocean Mineral Deposits and Low-Carbon Extraction of Metals** Mikhail V. Zubkov (National Oceanography Centre, UK) and Pawel Plucinski (University of Bath, UK)
- **Mining Deep-Ocean Mineral Deposits and Ecology: What is at Risk?** Daniel O.B. Jones (National Oceanography Centre, UK) and Diva Amon (University of Hawaii, USA)
- **Governance of Deep-Ocean Mining** Philomène Verlaan (University of Hawaii, USA) and Michael Lodge (International Seabed Authority, Jamaica)

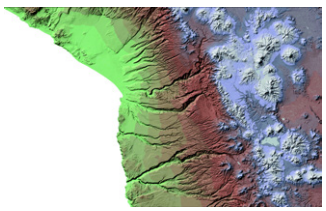
THEMATIC TOPICS IN 2018

Volume 14, Number 4 (August)

THE CENTRAL ANDES: MOUNTAINS, MAGMAS, AND MINERALS

Guest Editors: **Gerhard Wörner** (Universität Göttingen, Germany), **Taylor Schildgen** (GeoForschungsZentrumand Potsdam, Germany), and **Martin Reich** (Universidad de Chile, Chile)

The Central Andes in South America are a first-order geological structure on our planet of an active continental margin. The link between subduction-related magmatism and processes and timing of uplift and volcanism shaped the Andean Cordillera and provides unique examples of the andesite magma generation during passage through thickened crust. As one of the largest ignimbrite provinces, the Central Andes also show ignimbrite "flare-ups" that are linked to crustal thickening and increased mantle magma input. Ignimbrites and andesites are the "smoking gun" of crustal differentiation at active continental margins. The interplay between tectonics and magmatism produced the world's largest porphyry copper deposits, and the extremely arid climate conditions of the Atacama Desert has led to spectacular salt deposits, including the world's richest deposits of lithium, boron, iodine and nitrates.



- **Geomorphic, Geochemical, and Structural Signatures of Topographic Growth of the Central Andes** Taylor F. Schildgen (GeoForschungsZentrumand Potsdam, Germany) and Gregory D. Hoke (Syracuse University, USA)
- **Magma Evolution in the Central Andes Through Time and Space** Gerhard Wörner and Mirian Mamani (Universität Göttingen, Germany)
- **Cordilleran High-Flux Magmatism in the Central Andes: The Neogene Ignimbrite Flare-up** Shanaka de Silva (Oregon State University, USA) and Suzanne M. Kay (Cornell University, USA)
- **Magmatic Regimes and Reservoirs Feeding Central Andean Stratovolcanoes** Anita Grunder (Oregon State University, USA) and Barry A. Walker (Washington State University Vancouver, USA)
- **Ore Deposits in the Central Andes** Lluís Fontboté (University of Geneva, Switzerland)
- **Nitrate Deposits of the Atacama Desert: A Unique Geochemical Anomaly** Martin Reich (Universidad de Chile, Chile) and Huiming Bao (Louisiana State University, USA)

Volume 14, Number 5 (October)

TERROIR – SCIENCE RELATED TO GRAPE AND WINE QUALITY

Guest Editor: **Larry Meinert** (USGS Washington DC, USA)

This special issue will explore the physical environment that shapes the character and quality of wine, ranging from geology and soils to viticulture and climate. It will also discuss some of the technological advances such as drones, remote sensing, and precision agriculture, that are revolutionizing the production of fine wine. The French have a word for all aspects of the wine environment, *terroir*, and this special issue of *Elements* will explain to a general audience the modern understanding of terroir. It is common, although usually incorrect, to point to a single factor as the explanation: "It's the soil." "It's the water." "It's the limestone." Terroir is the integration of all individual factors that contribute to wine quality, and this is appropriately summarized by the phrase "in vino veritas".

- **Introduction, Overview, and the Geology of Terroir** Larry Meinert (USGS Washington DC, USA)
- **The Scale-Dependence of Wine and Terroir: Examples from Coastal California and the Napa Valley** Dave Howell (USA) and Jonathan Swinchatt (USA)

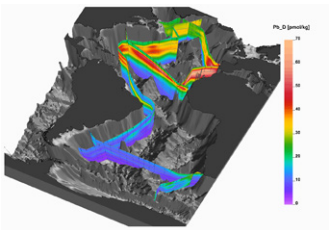
- **The Climate Component of Terroir** Gregory V. Jones (Southern Oregon University, USA)
- **Major Soil-Related Factors in Terroir Expression and Vineyard Siting** Kees Van Leeuwen (Bordeaux Sciences Agro, France)
- **Remote Sensing Applications in Viticulture** Andrew Hall (Charles Sturt University, Australia)
- **Terroir and Viticultural Mapping with Unmanned Aerial Vehicles** Andrew G. Reynolds (Brock University, Canada)
- **Environmental and Viticultural Effects on Grape Composition and Wine Sensory Properties** Stefanos Koundouras (Aristotle University of Thessaloniki, Greece)

Volume 14, Number 6 (December)

MARINE BIOGEOCHEMISTRY OF TRACE ELEMENTS AND THEIR ISOTOPES

Guest Editors: **Catherine Jeandel** (CNRS, France), **Vanessa Hatje** (Federal University of Bahia, Brazil), and **Zanna Chase** (University of Tasmania, Australia)

The field of marine geochemistry is exploding these last two decades. During the 1980s and 1990s, the scientific community developed a geochemical toolbox to study key ocean processes, based on the concentration and isotopic composition of trace elements. The multiple processes at play in the ocean led the community to join forces and combine, at a global scale, the information provided by individual tracers to tackle big questions in oceanography. These were the motivations to create GEOTRACES, an international program of marine geochemistry. The key questions include the sources, internal processes and sinks of the elements; the services and functioning of marine ecosystems; the ocean's role in climate variability; and the transport and fate of contaminants in the ocean. This issue will introduce the reader to the fascinating exploration of the big questions in ocean science using the chemistry of the infinitely small in seawater.



- **The Critical Importance of Trace Elements in the Oceans** Catherine Jeandel (CNRS, France), Vanessa Hatje (Federal University of Bahia, Brazil), Zanna Chase (University of Tasmania, Australia); Gideon Henderson (University of Oxford, UK) and Bob Anderson (Lamont-Doherty Earth Observatory, USA).
- **New Tools – New Discoveries** Catherine Jeandel (CNRS, France), Derek Vance (ETH, Switzerland)
- **Micronutrients: Trace Metals that are Essential for Life** Maeve Lohan (University of Southampton, UK), Geraldine Sarthou (CNRS Brest, France), and Alessandro Tagliabue (University of Liverpool, UK)
- **Processes that Regulate Trace Element Distribution in the Modern Ocean** Walter Geibert (Alfred Wegener Institute, Germany), Kazuyo Tachikawa (CEREGE, Aix en Provence, France), and Christopher Hayes (University of Southern Mississippi, USA).
- **Geochemical Tools to Reveal Conditions in the Past Ocean: Climate, Circulation, and Biological Productivity** Zanna Chase (University of Tasmania, Australia), Michael Ellwood (The Australian National University, Australia), and Tina Van de Flierdt (Imperial College London, UK)
- **Trace Metal Contaminants: Human Footprint on the Ocean** Vanessa Hatje (Federal University of Bahia, Brazil), Carl H. Lamborg (University of California – Santa Cruz, USA), and Edward A. Boyle (Massachusetts Institute of Technology, USA)
- **Future Changes in Ocean Trace-Metal Chemistry** Gideon Henderson (University of Oxford, UK); Eric Achterberg (GEOMAR Helmholtz Centre for Ocean Research, Germany), and Laurent Bopp (CNRS Laboratoire de Sciences du Climat et de l'Environnement, France)