European Astrobiology Network Association

Intl SPRING SCHOOL

Online MODE

Hydrothermal VENTS

May 17-21, 2021

The school will be held from May 17 – 21, 2021

Application deadline: May 14, 2021, 11.59 pm (CEST)

Keynote speakers:

M. J. Russell, *University of Torino, Italy*
May 17, 2021 / 9.30-11.30 am (CEST)

M. C. Macey, *Open University, UK*
May 18, 2021 / 9.30-11.30 am (CEST)

F. Westall, *Centre de Biophysique Moléculaire, CNRS, France*
May 19, 2021 / 9.30-11.30 am (CEST)

F. Pirajno, *University of Western Australia*
May 20, 2021 / 4.30-6.30 pm (CEST)

M. Fox-Powell, *Open University, UK*
May 21, 2021 / 9.30-11.30 am (CEST)

S. Vance, *Jet Propulsion Laboratory, California Institute of Technology, USA*
May 21, 2021 / 4.30 - 6.30 pm (CEST)

Free of charge!

Register online at
https://forms.gle/iF4JJZkrYsb8ti9h7

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PROGRAM

M. J. Russell, *University of Torino*
The submarine alkaline vent theory for the emergence of life
May 17, 2021 | Monday | 9.30-11.30 am (CEST)

M.C. Macey, *Open University*
The microbiology of hydrothermal vents and the limits of life
May 18, 2021 | Tuesday | 9.30-11.30 am (CEST)

F. Westall, *Centre de Biophysique Moléculaire, CNRS*
Hydrothermal activity and early terrestrial life
May 19, 2021 | Wednesday | 9.30-11.30 am (CEST)

F. Pirajno, *University of Western Australia*
Mantle plumes, intraplate tectonics and associated ore deposits
May 20, 2021 | Thursday | 4.30-6.30 pm (CEST)

M. Fox-Maxwell, *Open University*
Exploring the ice-covered oceans of the outer solar system
May 21, 2021 | Friday | 9.30-11.30 am (CEST)

S. Vance, *Jet Propulsion Laboratory, California Institute of Technology*
Geophysical controls on hydrothermal activity in Europa
May 21, 2021 | Friday | 4.30 - 6.30 pm (CEST)

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Hydrothermal systems are crucial environments for astrobiology: they are thought to be the theatre of life's origins, host unprecedented polyextremophilic biodiversity, and are key targets in the search for life throughout the Solar System, especially on Mars and icy moons. Join us for the first EANA online school to learn about hydrothermal systems from interdisciplinary perspectives at the interfaces of geology, biology and chemistry. From May 17th–21st, 2021, we will hold one talk each day on a particular aspect of hydrothermal systems. The school is free of charge and is an ideal opportunity to discover or deepen your understanding of these unique environments. For more information about our lecturers and to register for the school, please visit **http://www.eana-net.eu**.

The Organising Committee

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Michael J. Russell

The submarine alkaline vent theory for the emergence of life

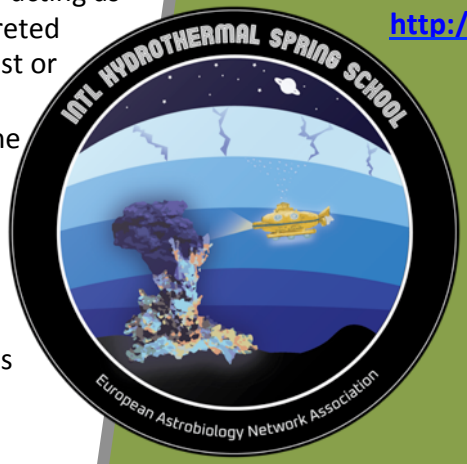
May 17, 2021 | 9.30-11.30 am (CEST)

Abstract: The first step to life was the formation of an active barrier separating the natural disequilibria on the early Earth between the basic interior and the relatively oxidized exterior. Spontaneously precipitated minerals formed this barrier which allowed harvesting of redox and pH disequilibria at a moderate temperature alkaline submarine hydrothermal vent. Organic molecules were synthesized from substrates H_2, ē, CH_4, HS^-, CO_2, H^+, HPO_4^- and NO_2^- "in house", i.e., in the sulfides and oxyhydroxide interlayers comprising the barrier acting as a membrane. One waste product, water, is excreted through a precursor to aquaporin, i.e., green rust or fougerite galleries, driven by osmotic pressure dependent on the contrasting osmolalities of the internally produced water with the ambient ocean water and the hydrothermal solution. There is no so-called "water problem". Nor is there a problem with the source of the substrates. Building life from the bottom-up (how else?) demonstrations of abiotic syntheses are becoming ever more numerous.

Dr. Michael J. RUSSELL

After working in the chemical industry Michael studied geology with chemistry and physics at Queen Mary College of the University of London, took his PhD in geochemistry at University of Durham, was Professor at the Universities of Strathclyde and Glasgow, and was NASA Senior Research Fellow and Principal Scientist at the Jet Propulsion Laboratory, California Institute of Technology until 2019. It was his study of the Irish mineral deposits and the discovery of fossil hydrothermal chimneys there which led to his insight that iron minerals may have provided the redox-active compartments for life's emergence. He now lives happily in Italy.

http://bip.cnrs-mrs.fr/bip09/Mikes_page.html



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The microbiology of hydrothermal vents and the limits of life

May 18, 2021 | 9.30-11.30 am (CEST)

Abstract: Hydrothermal vents are a rare type of environment where the microbial community is supported by chemosynthesis, the energy produced from the oxidation of chemical species, as opposed to photosynthesis. Combined with the gradient of extreme conditions that microbes must withstand to inhabit these environments, the study of hydrothermal vents can allow the investigation of key questions in microbial ecology and astrobiology. In this talk, we will cover the array of selection pressures at hydrothermal vents, the metabolisms and strategies that allow microbes to survive and thrive, and the relevance of this to astrobiology.

Michael MACEY

Dr. Michael C. Macey is an environmental microbiologist working as a postdoctoral research associate in AstrobiologyOU, investigating microbes that can survive in some of the most extreme environments on Earth and assessing if these microbes can grow under simulated extra-terrestrial conditions. He is part of a group of researchers who have developed a state-of-the-art system for simulating ground waters that may have existed on Mars and may continue to exist beneath the surface. Michael joined the Open University in 2017 having completed his PhD at the University of East Anglia investigating the impact of microbes on atmospheric trace gases.

http://www.open.ac.uk/people/mm34528

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Intl SPRING SCHOOL

Hydrothermal activity and early terrestrial life

May 19, 2021 | 9.30 - 10.30 am (CEST)

Abstract: The early Earth was volcanically active and hot. Rare, well-preserved terrains ~ 3.5 billion years old (Ga) document abundant extrusive and intrusive volcanic rocks intercalated with thin layers of sediments and widespread evidence for hydrothermal activity (Westall et al., 2018a). The sediments are particularly interesting because they contain abundant traces of life (Westall et al., 2015; 2018b), especially near nutrient-rich hydrothermal effluent where chemotrophic colonies abound. Anoxygenic phototrophic biofilms are common in shallow water environments, their development controlled mainly by the rate of volcanic ash deposition. The biosignatures are particularly well-preserved because of the rapid silicification of both microbes and sediments.

Frances WESTALL

Dr. Frances Westall

is Director of Research at the CNRS-Centre de Biophysique Moléculaire. After a doctorate in Marine Geology at the University of Cape Town, she worked at many institutions including the Alfred Wegener Institute in Bremerhaven, Nantes University, Bologna University, the NASA Johnson Space Center, and the Lunar Planetary Institute.

Her multidisciplinary scientific career encompassed geology, planetology, geomicrobiology, prebiotic chemistry, and astrobiology. She is internationally-renowned for her research on the geological context of the origin of life and the earliest traces of life on Earth. She is implicated in the European/Russian ExoMars 2022 mission and is Co-PI of the microscope CLUPI and Co-I on other instruments. She was president of the EANA (2013-2019), and is chair of the COSPAR Panel on Exploration. She received the Medal of the Italian Chemical Society (2013), the Alfred Dumont Medal (Belgium, 2016), and was awarded an Honorary Fellowship of the International Studies Institute, Bologna as well as numerous awards from NASA.

http://cbm.cnrs-orleans.fr/en/contact/westall-frances-2/

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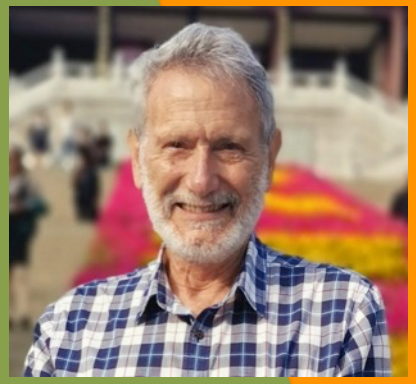
Intl SPRING SCHOOL

Mantle plumes, intraplate tectonics and associated ore deposits

May 20, 2021 | 4.30 - 6.30 pm (CEST)

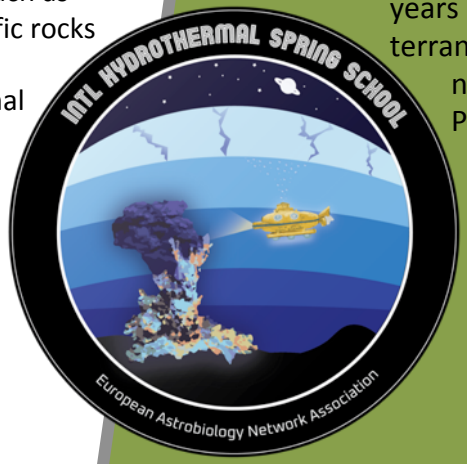
Abstract: Intraplate tectonic and magmatic phenomena are linked to deep mantle plumes and asthenospheric upwellings due to delamination of subcontinental lithosphere. Resulting magmas, which include layered mafic-ultramafic intrusions, sill complexes, continental and oceanic flood lavas, giant dyke swarms and anorogenic A-type granitic rocks, are responsible, directly or indirectly, for a large number of intraplate and anorogenic ore systems. These ore systems can be considered in terms of 1) magma-associated, such as orthomagmatic Ni-Cu-PGE, Cr in mafic-ultramafic rocks and magmatic-hydrothermal ore systems in anorogenic A-type magmas; and 2) hydrothermal systems powered by the large thermal energy that results from the emplacement of plume-derived melts into the crust. These hydrothermal ore systems include low-S epithermal, porphyry, VMS and Carlin style deposits.

Franco PIRAJNO



Prof. Dr. Franco Pirajno has considerable experience in tectonics, ore deposit geology and mineral exploration in many parts of the world. He received his PhD at the University Federico II, and after a post-doc at the Vesuvius Volcano Observatory, worked for the AngloAmerican Corporation South Africa Ltd. In '83 he was appointed to the Chair of Exploration Geology at Rhodes University, South Africa. In 1993 joined the Geological Survey of Western Australia till October 2015. Currently, he is Adjunct Professor at The University of Western Australia, Honorary Research Fellow at Natural History Museum, London. In the last 25 years he has worked extensively in Western Australia's Proterozoic terranes and was instrumental in the discovery of a new large igneous province in Australia. Visiting Professor at Peking University in 2003 and China University of Geosciences, Beijing in 2004. Appointed Editor-in-Chief of Ore Geology Reviews in March 2012 and Series Editor of Solid Earth Sciences (Springer) in November 2012.

www.francopirajno.com



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Intl SPRING SCHOOL

Exploring the ice-covered oceans of the outer solar system

May 21, 2021 | 9.30 - 11.30 am (CEST)

Abstract: Ice-covered moons in the outer solar system contain vast oceans of liquid water, where ongoing hydrothermal activity may provide the necessary conditions to support microbial life. While the oceans are locked under kilometres of solid ice, processes such as cryovolcanism can deliver ocean materials to the surface, where it can be studied by spacecraft. Using Saturn's moon Enceladus and Jupiter's moon Europa as case studies, I will describe the ways in which ocean processes, including hydrothermal activity, can be expressed on the surface. I will draw on examples from my own research to illustrate how experimental and field analogue research can help inform spacecraft observations, paving the way for upcoming missions such as NASA's *Europa Clipper* and ESA's *JUpiter ICy moons Explorer* (JUICE).

Mark FOX-POWELL

Dr. Mark Fox-Powell

is a Research Fellow in the AstrobiologyOU group at the Open University investigating the icy ocean worlds, such as Jupiter's moons Europa and Ganymede, and Saturn's moon Enceladus. His research focuses on processes such as 'cryovolcanism' that can deliver materials from the deep oceans to the surfaces of these moons where they can be studied by spacecraft. Mark's work involves experimental simulations of cryovolcanic processes and occasionally field analogue research in polar and sub-polar environments, including the Canadian High Arctic and Iceland. He completed a PhD in astrobiology at the University of Edinburgh, and held a postdoctoral position at University of St Andrews before joining the OU in February 2020.

https://www.markfoxpowell.com/

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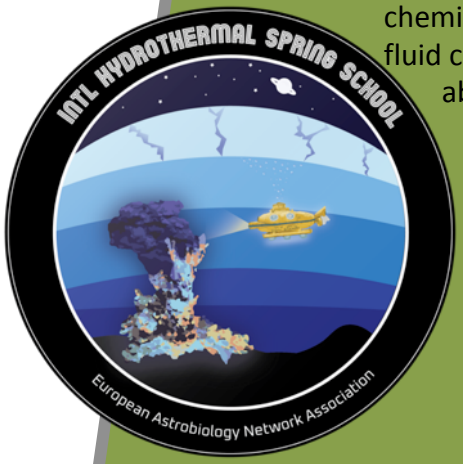
Geophysical controls on hydrothermal activity in Europa
May 21, 2021 | 4.30-6.30 pm (CEST)

Abstract: I will describe geophysical investigations into the habitability of icy ocean worlds, including recent research evaluating the magnetic induction characteristics of moons of Jupiter. I will describe why these investigations are important for understanding the extent to which hydrothermal activity has shaped Europa's ocean chemistry. I will also provide an overview of NASA's planned Europa Clipper mission, set to conduct multiple flybys of Europa toward the end of the decade.

Steve VANCE

Dr. Steve VANCE

He is an astrobiologist and geophysicist studying the workings of icy ocean worlds. After obtaining his PhD in Geophysics and Astrobiology from the University of Washington, in Seattle, Dr. Vance came to JPL as a NASA Postdoctoral Fellow. He joined JPL as a staff scientist in 2010. He is currently supervisor for Planetary Interiors and and Geophysics Group (3226). Steve studies the interiors of icy bodies like Jupiter's moon, Europa, drawing primarily on expertise in the chemistry and thermodynamics of materials at high pressures. Steve's work address questions of ocean composition, dynamics, and habitability through simulations of icy world ocean chemistry in the laboratory, coupled with theoretical models of fluid circulation in deep oceans. Major aims of this work are to be able to determine chemical signatures of habitability that may make their way to their host body's surface, and to enable joint inversions of spacecraft geophysical measurements to understand interior composition, structure, and dynamics.
https://science.jpl.nasa.gov/people/Vance/



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Organising Committee

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Deliverables: certificate of completion

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