

**Postdoctoral Research Associate in:  
Autocatalysis and mineral/organic self-organization in the earliest Earth.**

Applications are invited for a postdoctoral research position (PRA) funded by the ERC Advanced Grant "[Pattern formation and mineral self-organization in highly alkaline natural environments](#)" (PROMETHEUS) within the laboratory of [Professor Juan Manuel Garcia-Ruiz](#). The project (see also below) is being carried out at the Andalusian Institute of Earth Sciences (IACT) located in Granada, Spain, a joint Research Centre of the National Research Council CSIC, the largest research institution in Spain, and the University of Granada. The laboratory of Prof. Garcia-Ruiz has an international and multidisciplinary environment with research focused on crystallization, pattern formation and mineral self-organization. The LEC is fully equipped to carry out the project and is integrated within a very dynamic environment, close to Granada's Life Sciences Technological Park. As part of the IACT, the LEC has direct access to all the facilities of the Scientific Instrumentation Centre (CIC) of the University of Granada.

**Description of the job:**

The successful candidate will investigate the coupling of geochemical reactions known to yield abiotic organic compounds with self-assembled mineral structures in alkaline environments. The research includes: a) the formation of self-assembled mineral structures of silica and metal precipitation (carbonate/phosphate/hydroxides) in current natural geochemical environments and in laboratory analogous to the earliest Earth; b) the role of self-assembled mineral structures in the formation and organization of abiotic organic compounds in the earliest Earth; c) the investigation of the preservation and modification of biomorph patterns during geological processes that might have affected the geological record of putative primitive-life hosting environments.

The work to be performed will involve: the experimental set-up of a laboratory analogous to earliest Earth alkaline silica-rich environments; the chemical and physical characterization of solutions and mineral structures arising in the

laboratory analogue; c) the chemical and physical characterization of the organic compounds forming in these experiments; d) the analysis of geological scenarios optimising the coupling of geochemical reactions known to yield organic compounds and the formation of self-assembled mineral structures.

**Duration:** Funding is available for 1 year in the first instance (starting any time from the first of February until the end of June 2016), with the possibility of extension for another 3 years upon mutual satisfaction.

**We are looking for a post-doc scientist who:**

- loves science, scientific exploration and big challenges
- has a Ph.D. in **Earth Sciences, Chemistry or Material Sciences** preferentially with the specialisation in **Organic Geochemistry, Experimental Petrology or Materials synthesis**.
- can provide evidence of previous research activity – including publications – in relevant topics, but most importantly evidence of skill in laboratory synthesis and characterization of mineral and organic compounds.
- has experience with hydrothermal synthesis and experimental petrology in general. Her/his familiarity with X-ray diffraction, micro-Raman and micro-FT-IR spectroscopy, atomic absorption spectrometry, UV-MS, ICP-MS, chromatography, mass spectrometry, thermometry and trace elements or isotope geochemical fingerprinting would also be considered an advantage.
- has proven ability to work effectively as part of a collaborative team as well as independently.
- has excellent oral and written communication skills.
- is capable of supervising Master and PhD students.
- Self-motivation, organisation, and adaptability to support evolving research needs will also be very much valued.

**Contact details:**

Interested candidates should send, before the 1<sup>st</sup> of January 2016, their CV and two reference letters along with a letter of interest explaining their skills and why they wish to join the PROMETHEUS team. Please send all the correspondence to Prof.

Juan Manuel Garcia-Ruiz's email: [juanmanuel.garcia@csic.es](mailto:juanmanuel.garcia@csic.es); Phone: +34 958230000; ext. 190201. For additional information about the project see (<http://garciaruij.net/prometheus>).

**General description of the ERC Project PROMETHEUS:** The precipitation of alkaline-earth carbonates in silica-rich alkaline solutions yields nanocrystalline aggregates that develop self-assembled autocatalytic structures. These purely inorganic hierarchical materials are formed under geochemically plausible conditions and closely resemble typical biologically induced mineral textures and shapes. The potential interest of these fascinating structures in Earth Sciences has not been explored mostly because of their complexity and multidisciplinary nature. PROMETHEUS aims to carry out an in-depth investigation of the nature of self-organised mineral structures such as silica biomorphs and chemical gardens and their role in alkaline geological environments. Prometheus focuses on two main goals: a) The study of the formation and preservation of inorganic patterns in past and present geochemical environments and their role in primitive life detection; and b) the investigation of autocatalytic mineral reactions in the earliest Earth and their role in the abiotic production and organization of organic compounds. The results will impact the current understanding of the early geological and biological history of Earth by pushing forward the field of inorganic biomimetic pattern formation to understand the transition from inorganic chemistry to prebiotic organic chemistry and ... life.