From Río Tinto to Mars: Science popularization through a website

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The sharing of knowledge is a fundamental part of our society, and popular science is the most powerful tool that we have to engage people on the scientific field. For this reason, my main objective with this project has been to create a website where scientific topics where exposed. In particular, I have chosen to focus on Río Tinto's microbiology and NASA's missions to Mars, and how these places are related.

Why Río Tinto and Mars?

From the last years, scientists have obtained a lot of information about Mars features thanks to all the research projects carried out by NASA. On the search for **life beyond our planet**, Río Tinto has been key to understand how ecosystems in extreme conditions can be inhabitable. These places, even though they are distant, may very well have more in common than what we could have expected.

Who is the target user?

Anyone who wants to expand his scientific knowledge about microbiology and astrobiology might enjoy the website. It is based on a very **simple** and **intuitive** interface and the **technical terms are explained** so anyone can easily manage it.

Río Tinto

Río Tinto river is located over the Iberian Pyrite Belt. Its peculiar location enriches its flow with metals that are used by chemolithotrophic microorganisms as an energy source. This fact leads to the acidification of the water which indirectly dyes the river red.
Research projects like IPBSL and MARTE have studied different aspects of the river's basin (for instance, its mineralogy and its underground ecosystems). The main objectives relayed on the characterization of its habitat and the determination of environmental aspects. This could give us a hint about whether life on Mars may be exists or has existed and how we could detect it.

Every <u>underlined</u> word links to a **glossary** where its meaning is given.

Each **button** is linked with another page where further information about the topic is shown, including pictures and diagrams to make it easier to be understood.

These figures represent some of the website's content.

ATMÓSFERA
HÁBITATS SUBTERRÁNEOS
ECOSISTEMA ACUÁTICO
MINERALOGÍA

Río Tinto

El Río Tinto tiene aproximadamente unos 92 km de recorrido y fluye a través de una región minera que ha sido explotada durante, al menos, 5000 años, desde los habitantes paleolíticos, pasando por fenicios y romanos, hasta hoy. Está situado en la denominada Faja Pirítica Ibérica, al suroeste de España, una de las mayores áreas de sulfuros masivos polimetálicos de origen volcánico del mundo. Sus aguas contienen grandes cantidades de metales pesados en disolución en forma de sulfuros (0,4-20,2g/L de hierro, 0,02-0,7g/L de cobre, 0,02-0,56g/L de zinc). El metabolismo quimiolitótrofo de los microorganismos que lo habitan mantiene un pH muy ácido en el agua (entre 1,5-3,1). Esto provoca que el hierro y otros metales se mantengan en suspensión, otorgándole al río su característico color rojizo. Aunque antes se pensaba que este color y ambiente ácido eran consecuencia de la minería, hoy sabemos que se trata de un ecosistema natural que ha permanecido así desde mucho antes de que los seres humanos interviniesen en su destino.

Se considera un análogo importante a Marte ya que las condiciones acuáticas y ácidas de Río Tinto producen minerales muy similares a los que se han encontrado en ese planeta.

MÁS SOBRE ANALOGÍAS DE MARTE EN LA TIERRA

Créditos de imagen: https://riotintophotos.wordpress.com/

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MISIONES

Marte

Al estar más alejado del Sol que la Tierra y poseer una atmósfera muy fina, las temperaturas en la superficie de Marte pueden oscilar entre los -125Cª de los polos y los -20ºC en el ecuador a mediodía.

Su superficie se compone fundamentalmente de basalto, una roca de origen volcánico que se forma al enfriarse rápidamente la lava en la superficie. Este basalto contiene minerales como olivino, piroxeno y feldespato. La alteración hidrotermal y la meteorización del basalto dieron lugar a otros minerales secundarios como hematita, filosilicatos, goetita, jarosita y otros sulfuros de hierro. También se llegaron a detectar trazas de moléculas orgánicas en muestras de suelo analizadas por los rovers.

Todavía no tenemos pruebas de que exista agua líquida bajo la superficie de Marte actualmente, solo tenemos constancia de hielo subterráneo y cascos polares. Sin embargo, sí que hay pruebas de que en el pasado había agua líquida sobre la superficie (y en grandes cantidades), durante el periodo Noachiano (se han descubierto cauces fluviales y otras formaciones hidrológicas)[14].

Créditos de imagen: NASA/ JPL-Caltech/ MSSS.

Mars

Currently, Mars' surface is a hostile place; temperature and pressure prevent liquid water from forming and ultraviolet radiation from the Sun is very intense. However, many scientists have suggested that this surface may have sustained -or might very well be sustaining- life. This could be more plausible under its surface rather than on it. It has been theorized that there liquid water may endure as long as we know that Mars contained a big ocean a long time ago.
The first rovers we landed on Mars were Viking I and Viking II. This first approach to the planet concluded that the extreme conditions at the surface were an insurmountable obstacle for life developing on Mars. However, four decades after, Microbiology has discover many life forms which can live in such unfavorable conditions as where described on the planet. Nowadays, Curiosity rover sends daily data about the planet and NASA's Mars Exploration Program plans continuing the investigation in the future.

The purpose

There are not many educational websites where information is treated with scientific accuracy. This is the reason why I believe that we should improve scientific popularization as a field of study and prepare professionals who can do this work properly. As Carl Sagan said *we live in a society exquisitely dependent on science and technology, in which hardly anyone knows anything about science and technology*. With this project, I would like to contribute to the common knowledge, hoping it might be useful for many people.

The most important, helpful and/or worth-reading articles I have read to do this project are **referenced** at pertinent sections. In this way, people interested in learning more about some particular issue can easily find helpful information.

The website is responsive so people can consult it on their **phones**. Try it out with the QR Code placed at the top left-hand corner of this poster.