

The JULES VERNE 2028 project

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Abstract

The aim of the JULES VERNE 2028 project, proposed for a FET-Open 2018 Horizon 2020 EU funding, is to update the ‘polymath’-like global approach, similar to that of the great naturalists of the 19th and 20th centuries, and progressively abandoned with the hyper-specialisation of modern scientists. Together with specialists in cognitive science, researchers from various domains will share and compare their protocols during field investigations and evaluative workshops dedicated to different environments then proposed new and innovative technologies and methodologies permitting to define the ideal protocols to explore new worlds, both on Earth and elsewhere in the Solar System.

1. Introduction

Space exploration of rocky bodies in the Solar System is arriving at the end of a cycle and at the beginning of a new one. Following the upcoming missions to Mars – ExoMars 2020 (ESA-Roscosmos) and Mars 2020 (NASA) – future missions will either focus on other bodies, such as Europa, the icy moon of Jupiter, or on the human exploration of Mars and the Moon. Humanity will thus enter into a new period comparable with the Age of Discovery. In this adventure, explorers will be assisted by new technologies, instrumentation and robotics. To be scientifically pertinent, the investigation of these new worlds must be conducted based upon a global interdisciplinary approach, similar to that of the great naturalists of the 19th and 20th centuries, in order to link very precise measurements

to their general context, taking into account the role of the chemical, biological, geological, etc. history of the sample.

Unfortunately, this notion of a ‘polymath’-like global approach has been progressively abandoned with the hyper-specialisation of modern scientists, and recent technologies have followed the same trend, becoming more and more specialised and adapted to very specific topics.

The aim of the JULES VERNE 2028 project is thus to update the global naturalist’s approach based on new and innovative technologies coming from various domains, and to define the ideal protocols to explore new worlds, both on Earth and elsewhere in the Solar System.

2. Toward a universal protocol

To understand and describe the process of discovery of an unknown place through a spectrum of different scientific domains, field trips will be undertaken with a focus on atmospheres, surfaces, subsurfaces, icy environments and aqueous environments (Fig.1). These will be followed by environment-specific workshops bringing together scientists and instrumentation companies to define a list of the critical data that must be obtained and to identify missing technologies. The field investigations and workshop discussions will be conducted together with specialists in behavioural and cognitive analysis, who will appraise and compare approaches and protocol. This has the aim of discovering the congruent data of crucial relevance for interdisciplinary purposes.



Figure 1: The different environments considered in the JULES VERNE 2028 project.

3. Universal guidebooks

The fieldtrips and workshops will permit to obtain the critical data that would be of paramount interest to measure *in situ*, or in laboratories, for each of the different domains. This will allow the construction of the “perfect” protocol permitting the full interdisciplinary description of any environment during the second stage of the project and the redaction of the 2028 UNIVERSAL GUIDEBOOK OF THE SCIENTIFIC EXPLORER and its SPACE EDITION proposing ideal protocols and instrumentation for future space missions. Until now, mission payloads have been designed prior to the definition of the missions, producing fragmented scientific results with knowledge gaps. This should be avoided in the future by providing integrated instruments and protocols that minimize these gaps. For example, instrumental constraints are mostly discussed prior to defining the target of the mission (i.e., the landing site). It is the principal aim of the JULES VERNE 2028 project to ensure that scientific objectives are prioritized, optimising protocols and instrumental payloads accordingly.

4. Toward a new technology

The JULES VERNE 2028 project will establish the optimal way for exploring different environments in order to obtain a universal protocol describing the workflow for the interdisciplinary characterization of unknown areas and their associated samples. This will be an ultimate global protocol that could not be achieved with current technology.

The originality of the JULES VERNE 2028 project is

to not limit ourselves by being technique-, instrument- or domain-specific; the ultimate goal is not to improve contemporary instruments but to propose a proof of concept for new technology. Major science-to-technology breakthroughs will be achieved throughout the course of the project. The project will conclude with the proposition of requirements specifications for new technology: THE POLYMAT. This could be developed by laboratories, start-ups, and existing private companies and SMEs during or immediately following the project.

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