International Mars Penetrator Ride-Share System (IMPRESS) to Screen Mars for Extant Life Before 2030

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Introduction: On page 537 of NASA's 2023-2032 Decadal Survey states this finding: *"NASA has not yet developed a planetary protection plan and related research activities specifically tailored to understand and mitigate the risk of forward and back contamination from human missions to Mars on timescales consistent with the earliest plausible human missions."* This document, nor any other public NASA plan, does not propose how to remedy this matter. The solution is however obvious: we must know if Mars holds an active indigenous biosphere close to its surface before we send humans there to inform our future steps.

Although astrobiologists worldwide concluded that extant life is likely in the Martian shallow subsurface (Carrier et al. 2020), we need to be certain about this. Surprisingly, the only mission the Decadal Survey proposes to seek extant life on Mars since the 1976 Viking missions, is Mars Life Explorer (MLE). MLE will be flown in ~2039, if the budget permits, but that launch date is too late to be relevant to address the previously cited finding.

Similarly, at the time of writing of this abstract, neither ESA nor any other space agency has any official viable plan to seek extant Martian life before humans arrive. Hence, according to the current plans, we might have humans on Mars before we know if it hosts extant indigenous life.

Regardless of the reasons behind this situation (discussed on primordialscoop.org), this must be remedied now. We no longer have time for the standard "slow and steady", "low risk but high cost" NASA mission development, which usually takes several decades from an astrobiological mission conception to execution.

Therefore, inspired by the first private interplanetary mission (Morning Star Mission; French et al. 2022), I present a privately organized ride-share mission with a payload of thousands of small impactor probes provided by international researchers and engineers. This mission democratizes exploration of Mars and engages universities, research organizations, and (citizen) scientists worldwide in one of the most exciting discoveries of the 21st century: the discovery of alien life.

Experimental: The International Mars Penetrator Ride-Share System (IMPRESS) will distribute the cost related to payload delivery to Mars among hundreds or thousands of research organizations and individuals.

The payload will consist of airbag "bouncy" landing probes and surface penetrator probes analogous to Mars 96 (Surkov et al. 1998), NASA's Deep Space 2 (Smrekar et al. 1999), penetrating Mars surface and conducting research up to several meters underground.

Using Falcon Heavy, the delivery of 16,800 kg of payload to Mars will cost $100 million. Hence the cost of useful payload will be about $10,000 per kg. At this price, the cost to re-deliver one of the Deep Space 2 probes, including the heat shield system, would be $25,000, a price affordable even to the smallest research institutions. The probes will be released from Mars orbit and dispersed over the north mid-latitudes, akin to dandelion seeds, either separately with individual heat shields or in clusters separating from the heat shield and each other just before the impact.

The only condition to join this mission will be to meet requirements for the forward contamination standards set by the Committee on Space Research. Priority will be given to extant life finding probes, than to various research payloads. The rest of the capacity will be auctioned for other, non-research objects: art pieces, time capsules...etc.

The market for the probes. Many planetary penetrator missions and penetrator arrays were already proposed, including life-finding ones, (Levin 2011) designed, and several were even flown. Many already developed penetrator probes are still waiting for a mission to piggyback on (Lorenz 2011), or as may be the case to share a ride with a mission such as IMPRESS. The customers already exist. If launch for a fixed price is guaranteed I expect that we will make a completely new market. Alike the Deep Space 2, which was conceived, designed and developed in 3 years, the first Morning Star Mission will fly 4 years after its conception. Hence the 4-year timeline from mission announcement to execution is realistic.

And so here I present an optimistic vision showing that exploration of thousands of (sub)surface sites in the vicinity of future human habitat or other places of interest can be done for a fraction of NASA planned mission cost and before humans arrive on Mars. This can be achieved through crowdsourcing the research, probe design, and mission cost via private rideshare mission.

By offering a low-cost, speedy and guaranteed delivery system, Mars will be open to high-risk high reward pursuit, bringing much needed competition of ideas to space exploration, inspiring future generations.

This mission will be administered by Agnostic Life Finder Association Inc. in parallel to the ALFA Mars project. NASA's help is welcomed.

This mission is designed to IMPRESS the world.

References:

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