

**SCIENCE TOURISM: EXPLORING THE POTENTIAL FOR ASTROBIOLOGY FUNDING AND OUTREACH.** J. H. Laing<sup>1</sup>. <sup>1</sup>Tourism Research Unit, Monash University, PO Box 1071 Narre Warren Victoria 3805 Australia, email [jennifer.laing@buseco.monash.edu.au](mailto:jennifer.laing@buseco.monash.edu.au)

**Introduction:** There is a growing trend towards developing tourism experiences that involve tourists accompanying scientists into the field and, in some cases, participating in, as well as observing field work [1]. This is seen as an alternative to mass tourism [2], which is potentially more sustainable [3] and taps into a desire for immersive experiences that promote greater awareness and understanding of important scientific issues, including wildlife conservation [4] and degradation of the natural environment [5]. This tourism niche might also highlight the value of supporting scientific research and help its funding, by defraying some of the costs or providing a stream of income to the research project.

This paper considers the potential for developing scientific tourism experiences to support astrobiology research, given the increasing focus and breadth of work currently being undertaken in this field, its general appeal and fascination as an area of study and the importance of this research for understanding life on Earth, as well as possible extraterrestrial life [6]. It also examines some of the most likely destinations for this kind of tourism, potential foci for these tourism experiences and the type and nature of resources and tour design that might be required to facilitate sustainable tourism development in an astrobiology context. The paper finishes with suggestions for a future research agenda connected to astrobiology tourism.

**Overview of Development of Science Tourism:**

*Science or scientific tourism* has been conceptualized by some as travel by researchers, academics and higher degree students, in order to conduct research [7]. This narrow definition has been broadened to encompass tourism offerings involving participation by the lay person in expeditions, excavations and other scientific activities [8]. It has also been termed '*knowledge-oriented*' tourism [9], as the tourist makes a contribution to academic scholarship/research, as well as potentially becoming more informed about scientific issues and principles, and a potential support base for future work. It could also be seen as an example of 'hard' *ecotourism*, where the tourist has a high level of active involvement and strong commitment to the ecotourism activity [10] or *alternative tourism* [11], which can be distinguished from the mass tourism experience. Examples of scientific tourism include involvement in archaeological digs and excavations [12], monitoring of populations at wildlife reserves and surveying flora and fauna [13] and observing the work of

data collection and analysis. It would appear that this type of tourism attracts a broad 'cross-section of society' [14], but its application to astrobiology research is still speculative. This paper aims to close some of this gap in knowledge by exploring the potential for creating a form of science tourism linked to this 'young and vigorous field' [15] and suggesting areas for future research.

**Potential for Developing Astrobiology Tourism:**

Astrobiology is the multidisciplinary 'study of all life in the Universe, including life on Earth' [16]. When considering potential for tourism development around astrobiology research, it is important to consider the destinations where this typically takes place, the type of research it encompasses and the nature of the resource requirements that stem from this. This may help to prioritise those destinations and type of research that will most easily accommodate this form of tourism, while ensuring that risks and challenges are not underestimated or overlooked.

*Likely Destinations.* Astrobiology research takes place in many dramatic landscapes on Earth that are reminiscent of or *analogous to* other planets, such as the lunar-like Devon Island [17], the Atacama Desert in Chile and the Mars analogue environment of Arkaroola in the Australian Flinders Ranges [18]. These analogue environments are often found in remote locations, that might present challenges for tourism, given their lack of infrastructure (such as hospitals and access routes by road and air) and potential safety issues, if tourists required evacuation due to ill-health or misadventure. Some destinations might be environmentally fragile or require a greater level of fitness or technical skill to be able to visit them [19]. Devon Island, for example, is expensive to visit and only able to be accessed a few months of the year due to the weather [20], whereas Arkaroola is accessible all year round and relatively inexpensive to visit [21]. While destinations such as the Arctic and Antarctic are logistically more difficult to service with tourism, this should be balanced against their potentially higher visitor appeal due to novelty, prestige and/or riskiness. Tourism activity in these places might help to subsidise research that is inherently expensive due to location and issues of access or where data or samples need to be transported to another site [22]. The cost of accessing the destination might however make tourism unaffordable for many potential tourists. The Mars Society oversees a number of simulated Mars research stations or bases

[23], which have been built for analogue research purposes. These bases might be useful for accommodating tourists in the field and make the research process 'come alive' for the tourist if they can see how future humans on Mars might be housed and conduct their research, including the use of laboratories and mission control facilities.

*Potential Foci for Astrobiology Tourism.* Current astrobiology research which might accommodate an accompanying science tourism program includes human factors, remote sensing, engineering hardware trials, paleontology and microbiology [24]. When considering the most suitable forms of astrobiology research to underpin science tourism development, it will be important to consider issues such as fidelity and safety. *Fidelity* of the analogue activity or research [25] might be under threat if the presence of tourists diminished its analogue quality. For example, human factors research might be compromised in a tourism setting where it is seeking to study the effect of isolation and group dynamics on a Mars mission. *Safety* concerns are also paramount, where tourists are accompanying researchers into places that are rugged, remote and potentially dangerous, including volcanic and geothermal environments [26] or sub-zero temperatures. Tourists may need to demonstrate a certain level of fitness or basic technical skills in order to reduce some of these risks [27].

*Resources and Tour Design.* While it has been observed that scientific tourists do not require 'a sophisticated general and tourist infrastructure [28], trained guides will be necessary, who have some research experience and are able to balance the needs of the tourists with the objectives of the research team [29]. Other issues to be considered include expedition route design and the type of interpretation offered [30]

**Conclusion:** This paper considers some of the factors that need to be taken into account if astrobiology research is going to be used as the focus of sustainable tourism experiences. A research agenda now needs to be developed, that considers level of interest in these experiences, likely motivations of tourists, the most suitable destinations and foci for the research activity, optimum tour numbers, tour design and resourcing and infrastructure requirements.

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