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Cameron M. Smith

Principles of Space Anthropology

Establishing a Science of Human Space
Settlement

 Springer

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Foreword

It is not often that one is fortunate enough to see the beginning of new science (let alone be among the fortunate few to know one of the primary progenitors of it), yet that is exactly where I am and where you, the reader, are as you pick up this volume and begin to read and understand the new science of Space Anthropology. We are in a new age of space exploration in which the first real migration of humans from Earth to space may finally begin. In this 50th anniversary year of the first Apollo moon landing, it is more than a little disappointing to realize that the space settlement and diaspora envisioned in those early, heady days have not already occurred. But this lull in spaceward expansion may have been what was needed for the technology (aerospace and biological) to mature to the point where it might actually be a realizable goal. Ultrawealthy space entrepreneurs at companies like Blue Origin and SpaceX are upending the traditional aerospace industry with the goal of establishing a permanent human presence beyond Earth—a goal very different from their more established corporate competitors. Assuming they are successful, what then? How will the first space settlements be structured to maximize their chances of success?

Once the first groups of humans emigrate beyond Earth, they will begin an inevitable biological, social, and cultural evolution that can be studied and (somewhat) predicted by this new science. Toward this goal, Dr. Cameron Smith has written this comprehensive space anthropological guide that should be required reading for every current and aspiring astronaut and those planning the coming diaspora.

Dr. Smith does not limit his examination of Space Anthropology to the Space Age, as many would assume to be the natural starting point. He comprehensively examines ancient cultures to understand their adaptive traits and technologies, and the subsequent “lessons learned” that might be applied to future human space settlements. He draws from evolutionary biology (on Earth) to consider how humans might adapt and evolve beyond the terrestrial biosphere—carefully connecting human cultural and social evolution to the biological, noting the complex interplay between them.

What might be most interesting to the field of anthropology in general (at some future date) would be a study of the divergence from Earthbound cultural norms that space settlers exhibit. Aboard a multi-generational starship, what will become of families? Will the crew have religion and religious rites? If they do not begin with a religion, might they invent, or reinvent, one or more of them over time? What of the critical skills required to keep the ship functioning—how will those born during the journey or in the colony decide what roles to assume? Assuming the crew speaks a common language at the start, how might it change over centuries of isolation? Will the crew develop new forms of communication that are uniquely relevant to the environment in which they live? What will be the physical and cultural adaptation to life in space that might have no natural sunlight, low or nonexistent gravity, long-term risk from galactic cosmic radiation, and the ever-present risk of disaster just beyond the relatively thin skin of the ark or colony wall? It is likely that each space settlement, separated from kin by perhaps light-years of distance, and each in their own unique environment, might independently evolve similarly or take separate and divergent paths. Time will tell.

For those interested in a serious examination of what it would take to implement a fully independent space settlement, whether it be in Earth orbit, on the Moon, or in an ark on a millennium-long journey to another star, understanding the possible, even likely, anthropological changes the colonists may experience is a must. There is no better resource available to inform such studies than *Principles of Space Anthropology*. I fully expect it to be the most-referenced resource as this exciting new field of study blossoms.

Ad Astra!

Huntsville, USA

Les Johnson
Scientist, Author, and Space Technologist

Preface

In 2012, I co-authored *Emigrating Beyond Earth* with E.T. Davies. That book presents a comprehensive anthropological and evolutionary context for human space settlement. It argues that human space settlement will be a continuation of ancient evolutionary patterns of Earth life dispersal and adaptation to new environments. It also delves into the argument of whether humanity should attempt space settlement. In just the ten years since I started writing that book (2009) and the completion of the present volume (January 2019), concrete steps towards human space settlement have been taken, largely in the proliferation and diversification of the private space industry. In this book, I do not revisit the issue of whether space settlement is warranted or morally good except in a brief Appendix; for a deeper exploration, please see Chap. 4 of *Emigrating Beyond Earth*.

In this book, I wanted to get very specific about how humanity would settle space—not just by nebulously stating ‘well, we’ll just adapt’, but by identifying just how humanity adapts and what that means for space settlement and space settlement planning. Humanity adapts both culturally and biologically, on various timescales. In this book, I attempt to specify what we can learn about how to successfully settle space when informed about our cultural and biological tools of adaptation.

In the sections on cultural adaptation, I mention aspects of life that will change as people adjust their ways of living to new conditions beyond Earth. For example, our musical instruments, our cuisine, our literature and even religions, all will be adjusted because they will be used in situations different from the planet on which they emerged. When I mention this in casual conversation, I often find that people feel these would be trivial changes. Individually, they may be, but taken together they constitute cultural change. New species arise by the accumulation of biological novelties, and new cultures emerge by the accumulation of cultural novelties. Over time, cultures beyond Earth will diverge from those of Earth. And this is not just some by-product of any ‘larger picture’ because there is no larger picture; it is our artistic expression, philosophies, religions and so that we wish to preserve by the method of space settlement. We would not take up this project to preserve, say, the

rocket engines that get us to space or the guidance computers that will take us to Mars and Ceres; those, magnificent as they are, are simply tools that support humanity.

From my perspective, space settlement is about cultures, and life and living things, not the tools meant to support life. For these reasons, the extensive investigation into what aspects of our cultures are likely to change when we adjust to conditions beyond Earth should not be read as somehow secondary material, they are central to the whole project of permanent space settlement.

Portland, USA

Cameron M. Smith

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I thank Andreas Hein, Ph.D. (Initiative for Interstellar Studies and Ecole Centrale Supelec School of Industrial Engineering), for first reaching out to me in 2011 to participate in the 2012 Hundred Year Starship Conference in Houston, Texas. At this meeting, I delivered an exploratory paper outlining an anthropological approach to space settlement, and Icarus Interstellar's Dr. Richard Obousy asked me to estimate a viable population for interstellar voyaging. This resulted in a paper written in 2012–2013 and published in *Acta Astronautica* in 2014. Soon thereafter I formally began writing the present book with the encouragement of Mr. Les Johnson (NASA Science and Technology Office, Marshall Spaceflight Center), who kindly invited me to speak at several of his Tennessee Valley Interstellar Workshops. More recently, I have had the pleasure to collaborate with Kai Staats, M.Sc. (Arizona State University's Interplanetary Initiative), and Dr. Frederic Marin (L'Observatoire Astronomique de Strasbourg), whose work is mentioned in this book.

I also thank the late Dr. Ben Finney (University of Hawaii), whose 1985 book *Interstellar Voyaging and the Human Experience* (University of California-Berkeley Press) paved the way for my own research in this field: in a 2012 email, he welcomed me 'to a very small club' of people who think about the astounding prospect of human space settlement, which requires certain discipline.

I also thank my students over the last 20 years, for asking good questions about human biology and behaviour that have led me to many lines of research that have contributed to the biocultural approach that shapes this book. My late mentor, Prof. Kenneth M. Ames, did not share my specific fascination with human space settlement, but he supported my research in the field and encouraged me to publish about it in the research journals to shape and legitimize the work. I also thank the many students and interns of my *Pacific Spaceflight* research group (2013–present) who have helped with envisioning very practical aspects of human space settlement as we have designed, built and tested many spacesuits, one of the most immediate

and bodily conditioned technological adaptations humanity will use beyond Earth; in particular I thank Michelle Yan, Alexander Knapton, Amy Magruder, Ben Wilson, Winnie Black, Sarah Taylor, Mathew Lippincott, Trent Tresch, Michael Rudis and Peter Dukluyver.

Finally, I thank my parents, Dr. Donald E. Smith and Margit J. Smith, who have always encouraged my research. My mother has given me a lifelong love of books and research deriving from her professions in library sciences and ancient book restoration. My father gave me a NASA publication on space settlement (*Space Settlements—A Design Study*) in the 1970s that has been a source of inspiration for decades, now. And, Dad's *Ranger* series of prints, displayed at the Jet Propulsion Laboratory just as the moon was being explored robotically in advance of humans, are a reminder of the human element of space programmes (*Ranger II* is displayed below). As fascinating and impressive are the technologies, they are meant to ultimately support and perpetuate humanity, which is characterized among all species by its uniquely creative mind. Thanks, Mom and Dad, for your love and encouragement in my project of contributing one little block of stone to the cathedral of permanent human space settlement, a project requiring both research and imagination.



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