Rooftop of a Hopi kiva in the village of Mishongnovi, ca.1901

ROUTLEDGE HANDBOOK

Anthropology and Contemporary Space Exploration, with a Note on Hopi Ladders

> "Beautiful ladder beam, beautiful ladder rungs, fastened to the ladder with turquoise. Thus we came out."
>
> *Muyingwa*, the kachina responsible for the germination of seeds, during an initiation ritual for Hopi children (Geertz 1994: 234)

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At first sight, anthropology has no business in outer space. So far, no alien humanities have been discovered. Within anthropology's traditional remit — academic scholarship about human beings — the study material is very limited: a handful of astronauts and cosmonauts in the International Space Station and nowadays also the occasional ultra-rich space tourist. From this vantage point the anthropology of humans beyond Earth appears like a niche interest; and the potential contribution of the discipline to the broader endeavour of contemporary space exploration seems marginal. In this chapter I make the case that 'off Earth anthropology' has much more to offer than the major space agencies have fathomed so far. The long-standing expertise of anthropologists with questions of inclusion and exclusion (colonialism, racism, sexism, etc.) also has pertinence across the terrestrial/extraterrestrial divide. In what follows I provide an overview of how that expertise shapes the emerging field of outer space studies and outline its prospective relevancy for the space sciences more widely. And I will pay particular attention to the way in which anthropologists reconfigure debates regarding human exceptionalism. Outer space studies, it should be noted, is distinct from the comparative study of human conceptions of the cosmos, which has a long tradition in anthropology and is commonly known as *cultural astronomy* (e.g. Baity 1973, Ruggles and Saunders 1993, Holbrook, Medupe and Urama 2008, Urton and Ruggles 2010, Kelley and Milone 2011). To begin this overview it is useful to dwell on this distinction for a moment. Consider a classic example in the cultural astronomy genre: the role of *kachina* star-beings in Hopi cosmology.

In the ethnographic literature Hopi ceremonialism is routinely characterised as staggeringly complex, eerily beautiful and mesmerisingly alien. The various annually recurring ceremonies are timed according to the position of certain star constellations and involve a colourful cast of *kachinas*, impersonated by dancers pertaining to specific clans. They take place in Hopi villages perched on three adjoining mesas in northern Arizona. The whole area is envisaged as the axis of the world and indeed the centre of the cosmos. The open-roofed kivas where the ceremonies are performed also function as sky observatories. In fact, the kiva connects multiple worlds for the present one is the fourth in a sequence of seven according to one strand of Hopi cosmology (the seven stars of the Pleiades — *chööchökam*, 'the stars that cling together' — represent those seven worlds). As visitors from the stars and from other worlds, the *kachinas* descend from the sky and enter the kiva via a ladder through the roof. At winter solstice, the turquoise-helmeted *soyal kachina* and the black-masked *mastop kachina* appear — they come from very faraway, as testified by the three white stars painted on each side of the latter's head, representing the three stars in Orion's belt. In fact, dozens if not hundreds of these 'visitors from afar' emerge during the ceremonial season, each with their own antics, their own clownish tricks and ritual powers, their own costumes, masks, body decorations and accessories. Taken as a whole, the ceremonies constitute a veritable cosmology — they can be interpreted, as a number of ethnographers have done, as the cyclical reenactment of cosmic history and the emergence of life (e.g. Waters 1963, Geertz 1984). This cursory sketch suffices to highlight a key characteristic of the cultural astronomy approach: natural scientists — whether they are space researchers, planetary scientists or astrobiologists — can safely ignore it. [1]

By definition, cultural astronomy limits itself to examining *representations* of the cosmos. The cosmos itself — the 'actual' cosmos — is quite happily left to physical cosmologists, scientific astronomers and assorted natural scientists. One can say there exists a tacit entente between cultural astronomers and space scientists: the former restrict themselves to how reality is represented, the latter can claim sole ownership of the domain of reality itself without having to fear any interference. The tasks are neatly divided: the first only deal with culture, the second exclusively study nature. That the modern divide between culture and nature may be equally provincial and equally exotic as the costumes of *kachina* dancers is a thought that neither side seems to have given much attention. At any rate, no cultural astronomer has ever challenged that convenient division of labour as far as I know. The upshot of their line of thinking is this: Hopi cosmology is interesting, to be sure, but can only be taken seriously up to a certain point. The idea that one can travel between worlds by means of a humble ladder, rather than by using rockets or high tech spacecraft, is dismissed

out of hand. And so are the Hopi tales wherein *kachinas* journey across the sky piloting *paatuwvota*, flying shields made of lightweight cotton woven in the manner of Hopi wedding dresses (cf. Malotki and Gary 2001: xi). The social scientist/cultural astronomer and the natural scientist/modern space explorer are in perfect agreement on all this; human fictions and proper facts can and must be kept separate at all times. *Kachinas* 'returning home' to their otherworldly abodes at summer solstice, kitted out with ritually procured spruce branches and eagle feathers, are of a different order than NASA astronauts in their next-generation space suits. An unbridgeable gulf divides religious belief and scientific exploration.

If the emerging field of outer space studies has one outstanding characteristic it must be that it radically breaks with this traditional, mutually agreed division of labour between social scientists and natural scientists. What unites scholars in outer space studies is that they refuse to accept the cultural astronomers' self-imposed constraint, namely that they have nothing to say about 'the cosmos itself'. Whatever it is that off Earth anthropologists are after, it is not limited to meta-level representations of a supposedly more fundamental reality ('nature'). They are metaphysical troublemakers who have come to realise that they cannot be 'safely ignored' by their colleagues in the natural sciences. In their hands, outer space is no longer the exclusive domain of accredited space researchers based at major space agencies or elite universities. What connects them is that they systematically challenge the age-old prerogatives of space scientists working under the rules of modern metaphysics. What distinguishes them is an awareness that the access to nature of an astrophysicist, a planetary geologist or an astrobiologist is not more direct than anyone else's. Modern scientists' apprehension of the cosmos is commonly hailed as supremely objective but outer space studies scholars know that objectivity did not fall from the sky readymade — it has both a history and an anthropology. What scientists deem 'objective', and which criteria they use to define that epistemic virtue, changes over time and across disciplines, sometimes subtly and sometimes quite abruptly — rival notions of objectivity may even co-exist within a single discipline.

The anthropologists Sophie Houdart and Christine Jungen have done pathbreaking work to overcome the divide between what they refer to as the cosmologists' cosmos and the anthropologists' cosmos. In *Cosmos connections* Houdart and Jungen (2015) refrain from making a hard distinction between the physical mechanisms that constitute the 'actual' cosmos and its 'subjective' representations. Instead, they foreground various possible *connections* with the cosmos. What is radical about their move is that no single connection is priv-

ileged. In essence, Houdart and Jungen show that there are many valid (and I dare add 'objective') ways of connecting with the cosmos. The rather droll image they invoke is that of a plumbing system: researchers have a plethora of tubes, pipes and conduits at their disposition. The preeminence of visual connections, of which the famed blue marble picture is the prototype, is not set in marble. As a consequence, the history of cosmological science has to be reimagined:

> We arrive at something that is very different from a linear history, very different from a history that goes from a closed world to the infinite universe, as Alexandre Koyré phrased it in the mid-twentieth century. We are no longer dealing with the progression from a subjective, anthropocentric cosmos to a more objective comprehension of an endless cosmos with laws of its own anymore. The cosmos now appears as a fragile and equivocal object, something one can easily lose track of as one approaches it. An object with a remarkable tendency to dodge those who investigate it, an elusive object which only ever reveals itself partially, an object that requires a lot of work in order to stabilise it, however provisional that stabilisation may be. Whatever one's way of approaching it, the cosmos is a matter of connections, canals and tubes, of wavelengths, vibrations and tuning. [2]

Such connections are key to apprehend the immensely large but are equally determinant to fathom the infinitely small: they apply both at the galactic scale and at the molecular scale. Methodologically, macrocosm and microcosm confront researchers with perfectly comparable problems of capture and representation. In a complementing publication Houdart, Jungen and Tiziana Beltrame (2017) again emphasise the endless *work* that is involved to stabilise evanescent minuscule beings: techniques of amplification, sensorial translation, operations of capture, visualisation, manipulation and transformation. All of this, they are at pains to explain, is never merely a matter of automatically zooming in or zooming out.

In fact, insights in the same vein had already been acquired in the early 2000s by anthropologists such as Gíslí Pálsson and Stefan Helmreich. In *Celestial Bodies: Lucy in the Sky*, a seminal text for outer space studies, Pálsson (2009) focussed on the cross-disciplinary recurrence of idioms of voyaging and mapping, and on the remarkable, more-than-metaphorical similarities between research into what is often referred to as 'the universe within' (i.e. the human body, particularly the genome) and the exploration of outer space. And in subsequent work he has consistently endeavoured to bridge the divide between the social and the natural sciences, notably by means of the theoretical concepts of biosociality and geosociality (cf. Ingold and Pálsson 2013, Pálsson and Swanson 2016). Helmreich, for his

part, has pioneered social scientific research on so-called extreme life in analogue environments. It may seem a little odd to refer to his *Alien Ocean. Anthropological Voyages in Microbial Seas* — essentially a fine-grained ethnographic study of marine biologists and oceanographers — as one of the foundational books of outer space studies. Yet insofar as it is the first sustained anthropological interrogation of how contemporary scientists employ the category of 'the alien' it unquestionably merits pride of place. Just as critics of cultural astronomy may formulate doubts on whether Hopi *kachinas* necessarily have to be envisaged as mere make-believe aliens Helmreich makes one wonder whether oceans are best captured as terrestrial (the modern habit) or as extraterrestrial (a novel metaphysical option, increasingly toyed with in fields such as astrobiology). A key lesson is that what counts as extreme or alien may be in the eye of the beholder — it should never be considered a given; such designations must always be the target of anthropological enquiry. From the standpoint of a luminescent octopus living in the dark, high-pressure depths of the Atlantic we, non-shiny surface dwellers, may be the extremophiles. What makes Helmreich's work stand out is that it has the temerity to systematically question some of the most basic conceptual underpinnings of modern thought. By asking deceptively simple and seemingly un-anthropological questions (e.g. "What is water?") Helmreich in effect *provincialises* modern science as it developed since the so-called Scientific Revolution in the 16th and 17th centuries. It is a technique he perfects in *Sounding the Limits of Life*, which offers — among other things — an ethnographically-informed portrayal of the scientific search for extraterrestrial life (Helmreich 2015).

In the United States the anthropology of outer space came of age with the appearance of groundbreaking books such as *Placing Outer Space. An Earthly Ethnography of Other Worlds* and *Into the Extreme. U.S. Environmental Systems and Politics Beyond Earth*. In the former Lisa Messeri (2016) describes how planetary scientists and astronomers familiarise faraway celestial bodies through specific practices of mapping and visualising — the strange and the unknown are translated into the sensorially relatable. By making outer space 'rich with place', as she puts it, scientists are able to scale the infinite cosmos down to the level of human experience — this announces a metaphysical regime change of sorts, 'a new vision of the universe' (ibid. 23). In the latter Valerie Olson (2018) investigates how North American scientists and engineers have redefined the Solar System in environmental terms. Her book's central innovative feature is that it shows how outer space is increasingly grasped through the lens of political ecology and is no longer thinkable just in terms of political geography or political economy. The heliosphere, the wider solar neighbourhood, is de facto becoming an ecosystem. But the originality of authors such as Messeri and Olson also sits in

their methodology and, more particularly, in their unconventional choice of field sites: a Mars analogue site in Utah, an astronomical observatory in the Atacama Desert of Chile, the MIT laboratories where exoplanet hunters visualise super-Earths and mini-Neptunes, an undersea astronaut training facility off the Florida coast, the NASA Johnson Space Center in Houston. With hindsight this move may seem straightforward but a decade ago — when outer space anthropology was deemed a frivolous fantasy by all but a handful of their colleagues — it was actually quite bold (if only in terms of career prospects!) The gamble seems to have paid off and their lead has since been followed by a number of scholars: in US academia there now exists a thriving scene of anthropologists focussing on space exploration. David Valentine (2012, 2017) has written on prospective Mars settlement schemes and continues to develop critical angles on the (extra)geopolitics of commercial space ventures. Zara Mirmalek (2020) has published *Making Time on Mars*, in which she describes how mission scientists and engineers who remotely control the Mars rovers struggle to synchronise earthly and martian temporalities and reflects on what it takes to make an interplanetary workplace function well. Micha Rahder (2020) has published *An Ecology of Knowledges*, a book on how conservation practices and scientific knowledge are enabled by remote sensing technologies (e.g. satellite imagery) in the context of Guatemala's Maya biosphere reserve. Iokepa Casumbal-Salazar (2017) has written on the conflict between native Hawaiians and the astronomers who seek to build yet another huge telescope on the summit of the sacred Mauna Kea volcano. From this angle, he develops the provocative argument that the logics of colonial settlement remain inherent to Western science to this day. Janet Vertesi is the author of *Seeing like a Rover* (2015), a ethnographically-informed book on how NASA teams and their robotic rovers visualise the martian surface and thus create knowledge of Mars. More recently (2020) she also published *Shaping Science. Organisations, Decisions, and Culture on NASA's Teams*.

In Europe the anthropology of outer space has taken root as well in the past five years or so. And there are two main clusters: one in London and one in Paris. At University College London Victor Buchli has initiated ETHNO-ISS, an EU-funded project which aims to provide the first systematic and comparative ethnographic study of what is in effect the oldest extraterrestrial society in low Earth orbit: the International Space Station (ISS). Buchli (2020a, 2020b) and his team have set up a direct video-link with the space station and are particularly interested in micro-gravity material cultures and radically new forms of human habitation. David Jeevendrampillai, who directs the newly established Centre for Outer Space Studies at UCL, and Aaron Parkhurst, who focuses on medical and bodily aspects of

human spaceflight, have extended this anthropological examination of habitability and materiality to all forms of off Earth architecture, including designs for prospective Mars settlements (Parkhurst and Jeevendrampillai 2020). At the Paris Sciences et Lettres University Perig Pitrou is one of the principal coordinators of the PSL IRIS OCAV project, which seeks to investigate the origins and the conditions of the appearance of life from a variety of disciplinary perspectives spanning the natural and the social sciences. It arguably constitutes the first long-term collaboration between planetary scientists, astrobiologists, anthropologists, STS scholars and historians of science. The emphasis on 'life' (rather than materiality or systems or place-making) is one of its characteristic features. Another specificity of the French group is that many of its members and associates came to outer space studies indirectly. Pitrou himself, for example, did not start out as an anthropologist of science but as an Americanist with a focus on non-Western notions of vitality and on indigenous conceptions of the relation between microcosm and macrocosm — only later onwards did he develop an interest in modern scientific ideas of life (see, e.g., Pitrou 2012, 2014, 2015). Yet it turns out that this extensive comparative scope has distinctive advantages that benefit the joint effort of outer space studies scholars to nuance dominant narratives of cumulative progress and to provincialise modern forms of space exploration in unexpected ways. The group also has significant expertise in human-robot relations, biomimicry and the modelling of artificial life in closed environments, all of which is relevant to scholarship on space travel and extraterrestrial settlement. Joffrey Becker (2015, 2019, 2021) may be the only anthropologist in the world who has not only written about living *with* robots but also about living *in* robots. Lauren Kamili (2020), for her part, has reexamined the life/non-life divide through a study of a biomimetic lamp modelled on a luminescent fungus. Finally, I cannot fail to mention Charlotte Bigg and Elsa De Smet, two historians of science with a strong interest in visual anthropology (see especially Bigg 2012, 2015, 2018 and De Smet 2018). Their idea of studying space exploration after the manner of art history is one that I myself have also strived to put into practice in some of my latest work, albeit in a slightly idiosyncratic way (Praet 2017, 2021 and forthcoming).

Elsewhere in Europe and in the rest of the world, the anthropology of outer space is going strong as well. Valentina Marcheselli (2019, 2020) has conducted ethnographic research at astrobiological analogue sites in Sardinia and in Iceland and has also written about 'weird life' and 'shadow biospheres' from a sociological perspective. Filippo Bertoni (2018, 2020) has used the notion of *mesocosm* — miniaturised environments with characteristics that mirror the real-life-scale cosmos at large, but more tractable and open to experiment and control — in his studies of earthworms, 'global worming', and the potential role of

worms in soiling Mars. Davide Chinigò and Cherryl Walker (2018, 2020) have studied the Square Kilometre Array radio telescope project in South Africa's Karoo region, critically reflecting on the manifold tensions between big science and local development concerns. Tamara Alvarez (this volume) has ethnographically investigated Euro-American schemes to settle the Moon, 'our eighth continent'. Juan Francisco Salazar (2017, 2020) has used his fieldwork experience in Antarctica to rethink how space scientists engage with extreme environments and terrestrial analogue sites (see also Praet and Salazar 2017). Matthew Kearnes and Thom van Dooren (2017) have started to think about 'an ethic of interstellar flourishing' in the context of meteorite mining and the unfolding corporate 'gold rush in space' (see also Klinger 2018). Denis Sivkov has conducted ethnographic research on 'amateur cosmonautics' — non-commercial and non-professional DIY projects of space exploration in contemporary Russia. Space amateurs, Sivkov argues, are the 'hidden figures' in the history of space research and exploration: in light of their manifold yet generally ignored contributions to the space sciences, further neglecting them is unjustified. And Julie Patarin-Jossec (2020) has written on the training of foreign astronauts in Russia, showing that becoming an astronaut implies cultivating a 'legitimate body' in line with cultural and gendered models informed by Soviet heritage and ideals of 'heroic' masculinity.

Last but not least, an increasing number of native American scholars are engaging with some of the burning questions of the so-called Space Age in distinctive ways. Lou Cornum (2015), who has written on Black and indigenous science fiction, has shown how authors of colour use sci-fi to subvert a genre that has always been prone to reproducing colonial imaginaries. Writing from the standpoint of the "colonizee" such authors seek to reverse "the telescope's gaze of who is exploring who." This is not a mere literary gimmick, Cornum emphasises, but a profound rethinking of how we moderns imagine time, progress, and who is worthy of the future. As they put it: "In the colonial imaginary, indigenous life is not only separate from the present time but also out of place in the future, a time defined by the progress of distinctively western technology." Why, Cornum wonders, can't indigenous peoples also project themselves among the stars? And: might their visions of the cosmos forge less harmful relationships than colonial visions of a final frontier, both here on Earth and beyond? In a similar vein, the cultural geographer Deondre Smiles (2020) has examined various possible ways of viewing outer space through a 'decolonial' lens and to avoid replicating colonial frameworks of space occupation and resource extraction when exploring celestial bodies such as Mars. Besides the direct and active involvement of indigenous peoples in contemporary space exploration, Smiles points to another option which has been ignored so far: engaging with alternative, non-Western ways of thinking 'space' here on Earth. The

basic idea is that understanding how indigenous people make and remake space "can provide another blueprint for how we might engage with space beyond Earth." Recent archaeological studies of Hopi walking trails exemplify this line of reasoning. In cooperation with anthropologists and archaeologists, Leigh J. Kuwanwisiwma has examined *kukhepya*, a Hopi notion that can be translated "to go along looking for footprints." Such footprints are ruins, petroglyphs, potsherds and shrines left behind long ago by the ancestors during their epic migrations towards the current Hopi homelands, which are conceived of as the centre of the cosmos (cf. Colwell-Chanthaphonh and Ferguson 2006). They embody "the faraway" both in terms of time and in terms of space — they are generally understood as entry points to or from other worlds. As such they may be a reasonably close equivalent to modern notions of the extraterrestrial. The so-called Salt Trail to the Grand Canyon and the trail to the Zuñi Salt Lake are ancient and are associated with ceremonial pilgrimages and trading expeditions. That these trails often lead to what astrobiologists refer to as extreme environments (the halophile organisms that inhabit them can be studied as analogues to lifeforms on early Mars or elsewhere) is interesting in itself. But these trails also suggest that the modern metaphysics that became dominant from the 17th century onwards has configured the cosmos in a highly peculiar way, in the sense that outer space is by and large associated with the alien and the unfamiliar. Hopi pilgrims, however, travelled in a cosmos that was never conceived of as a totally alien space, a terra nullius or a cosmic wilderness but as a cosmos stuffed with things one can relate to, by ancient kin and old friends, by star-beings.

For all their quirks and idiosyncrasies, outer space studies scholars share at least one conviction: they have realised that knowing the cosmos is as much a conceptual adventure as it is a collective effort to grasp the workings of nature with ever greater exactitude. Understanding it merely as the inexorable accumulation of ever more precise data — along the lines of which it is invariably covered in journals such as *Nature* or *Science* — is reductive and fails to do it full justice: space exploration is about physics, yes, undeniably, but also about metaphysics — i.e. about something that modern scientists thought they had evacuated long ago, once and for all (the conviction that its conclusions are or at least should be "certified metaphysics-free" has indeed *defined* modern science ever since the so-called Scientific Revolution). Outer space studies scholars have begun to realise that this traditional conception of science is no longer fit for purpose, in the sense that it does not adequately reflect what is actually happening in the space sciences. Anthropologists who conduct ethnographic research with astronomers, planetary geologists or astrobiologists are starting to notice that the meanings of "science" itself are mutating. And there is an emerging consensus that the exploration of outer space — notwithstanding its global entanglements, its high tech

infrastructure and its cosmic reach — is also very much a provincial endeavour which takes place within highly specific and historically contingent metaphysical circumstances. Understanding that peculiarly modern conceptual framework, and the surprising ways in which it is currently changing, is the common purpose of outer space studies scholars and off Earth anthropologists. A number of received ideas may turn out to be much more fragile than scientists typically realise.

To conclude I would like to illustrate this by homing in on a notion that is essential to how modern scientists, and modern thinkers in general, conceive of their place in the cosmos: human exceptionalism. That there is only one known humanity is commonly deemed an incontestable fact. As scientists like to express it: n=1. Astrobiology tells us that we, members of the species *Homo sapiens*, are alone in the universe until further notice: so far, no alien humanoids have been reported; SETI research which for many years now has aimed to pick up signals of extraterrestrial intelligence is vexingly inconclusive. If one goes along with that view off Earth anthropology is indeed a vain enterprise: a scholarly field without subject matter (save for the odd astronaut). Yet could it be that this grim predicament of cosmic loneliness is self-imposed in the sense that it has been built into modern modes of scientific thinking by default? Or, to put it more crudely: does our habitual way of looking prevent us, moderns, from spotting alien humans? By way of experiment I propose to tackle this at first sight rather preposterous question not by taking recourse to SETI radio telescopes but by employing another highly sophisticated yet unjustly underestimated technological device: Hopi ladders. These ladders, I would suggest, are the structural equivalent of spacecraft and modern rockets in the Space Age: they are a means to travel between worlds. It is along these ladders that the *kachina* star-beings enter the kivas during the great ceremonies. If the kiva is a veritable microcosm, the ladder sticking out of the opening in its roof symbolises the *axis mundi*. In fact, each kiva has two openings: besides the one towards the sky, there is also the *sipaapu*, a small hole in the floor usually covered by a wooden plug — it refers to the place where the Hopi first emerged from the flowery underworld. The current world is conceived of as just one world somewhere in the middle of a stack of multiple superposed worlds, all connected via ladders. The anthropologist Patrick Pérez (2012) rightfully speaks of a “metaphysical cathedral”; some interpreters envisage the Hopi cosmos as a Klein bottle — go up long enough and you arrive back at the bottom. [3]

At any rate, ladders are omnipresent in Hopi cosmology. They are closely associated with flight, with celestial travel and with birds. When a previous world became too chaotic the clan chiefs decided it was time to escape: “They had heard some sounds away up, as of footsteps, as if somebody was walking there [...] they wanted to investigate above and see

how it was there [...]" [4] In their kiva they manufactured a bird, a 'strong one', which they instructed to fly straight upwards into the firmament. The strong one perched on top of the ladder, went up, and discovered an opening that exactly resembled a kiva hatchway. That was the entrance to our present world. On hair-washing day, an initiation ritual for Hopi children, this ascent is ceremonially enacted by planting spruce trees and reeds (which are also ladders; every node of the reed being a rung of the ladder). The Hopi did indeed emerge into the present world through a reed in some myths. That is why — as a follow-up to the hair-washing — they used to undertake arduous pilgrimages to a reed-bordered water-hole/sacred salt cave in the Grand Canyon which they refer to as *sipaapu*, just like the hole in the kiva floor. In fact, the entire landscape is littered with such places of emergence: this goes from ancient pueblo ruins to oddly coloured rocks, red-flowered cactuses or even ant-hills. On the night of the hair-washing, as specific constellations have risen into view through the ladder opening star-masked kachinas would descend from the roof into the kiva, visitors from faraway who hum eerily. As their low humming became louder and more intense and the ritual reached a climax, all those present would strip naked and riotously "leap for the ladder to get out unscathed before the world is destroyed." [5] Ladders, in other words, are instruments to leap between worlds; they are Hopi rockets. Otherworldly visitors — whether they are eagle kachinas, parrot kachinas, hummingbird kachinas, cloud kachinas, corn kachinas, snow kachinas or any other clownish star-being — invariably use ladders to arrive on this world, but also to depart from it. The captured eaglets that were traditionally sacrificed at the midsummer sending back ceremonies, when the kachinas return to their heavenly abodes, were always buried with a wooden stick that represents the ladder by means of which the star-beings ascend.

I no longer need to labour the point: Hopi cosmology is suffused by ladders. But what is the point of dwelling on all this, some readers are bound to wonder with increasing impatience. What does all this have to do with *actual* space travel, or with the idea of human exceptionalism for that matter? Surely one cannot seriously advise NASA to invest in ladders rather than rockets or — to co-opt a phrase from Armin W. Geertz (1984) — to grow reeds that pierce the sky? Of course not. Yet I still contend that Hopi ladders cannot be reduced to safely ignorable cultural fluff. That would amount to giving in to the cultural astronomy position. What is much more productive, in my view, is to consider why the Hopi do not seem to suffer from the same sense of cosmic loneliness that plagues modern scientists and modern thinkers more generally. The ethnographic record is unequivocal: no sane-minded Hopi would ever ask something along the lines of "are we alone?" From their perspective, the question that is so central to current astrobiology is downright silly. Within Hopi cosmology,

the existence of humanoid aliens is blatantly obvious: all kachinas, even the most grotesque ones, qualify as such. All the star-beings — butterfly kachina, bean kachina, ant kachina, gourd kachina, frog kachina, thunder kachina, moon kachina, sun kachina, the entire pantheon of kachinas — are Hopi-like aliens. Any entity that is "a ladder away" from the Hopi is on the one hand deeply unfamiliar and clownishly weird but on the other hand fundamentally convergent: they have arms and legs, and heads with eyes and mouths, they sing and dance and behave in ways that are instantly recognisable and relatable. Hopi metaphysics posits a cosmos populated by convergent aliens, by 'Hopi-oids'. For the Hopi it leads no doubt that they are in no way unique or special: nothing could be more incompatible with their outlook than the idea of human exceptionalism. The originality of Hopi metaphysics, with its emphasis on convergent aliens, cannot be overemphasised. Modern metaphysics has long been and continues to be premised on the opposite axiom: that of divergent familiars. All human beings, and indeed all living beings, are ultimately related through evolutionary processes. Organisms may be different from each other, but only just a little bit. To speak of terrestrial aliens is forbidden under the terms and conditions of modern metaphysics. The Hopi manifestly have no such qualms. Bumblebees, corn, parrots, prickly pear cactuses, bears: all are star-beings, all are conceived of as alien humanoids.

If modern metaphysics is essentially about connecting familiars (through DNA), Hopi metaphysics centres on separating aliens (through ladders). If modern science has been built around the biological notion of the organism, Hopi cosmology attributes a central role to the idea of the kachina. Connection is the default setting in the former (terrestrial life envisaged as one unified whole — hence the *we* in "Are we alone?"), separation is the preferred option in the latter (the Gruyère cheese cosmos and its cavernous, kiva-like worlds are suffused by Hopi-like aliens — the kachinas). Crucially, I use the concepts of the organism and the star-being at eye level here: thinking with kachinas is in no way inferior to thinking with organisms. Cultural astronomers are bound to protest here of course: they will point out that kachinas are merely make-believe-aliens. To encounter 'actual' aliens, these detractors will say, one needs to cross the interplanetary medium to Mars or Venus at a very minimum, and to contact alien humanoids even that will not do: here one is obliged to look into SETI-style interstellar communication. This is not the place to go into Space Age moderns' strange and protracted obsession with the interplanetary and the interstellar mediums as the only thinkable serious boundaries: suffice it to say that they have for some reason convinced themselves that, to meet aliens, you require rocketry and fancy space suits or radio telescopes and suchlike. How curiously folkloristic this dominant Western idea is was already noted by an

artistic researcher who happens to work in the Hopi territories-of-old: "We [modern Americans] are so literal," James Turrell famously complained, "we actually have to go to the Moon, we can't just look at a rock." Or, to slightly reframe this lament for off Earth anthropology purposes: to find alien humans, we have to beam messages to Sirius, we can't just have a look at, say, parrots or clowns. Under the regime of modern metaphysics — it is worth repeating as the move is far from self-evident — terrestrial aliens have been banned quite effectively. All those who dwell on Earth, all DNA-based organisms, are taken to be 'like us'. But my response to the stance that kachinas are just make-believe aliens is not denial: rather, I retort that organisms are every bit as much make-believe familiars. And that should not be read as an attempt to devalue the perfectly honourable concept of 'the organism' or as a critique of the venerable academic discipline of biology — outer space studies scholars are not in the business of debunking science. It is only to say that the modern sciences, including all space sciences, are inescapably premised on particular metaphysical choices. To view the Earth as one unified planet populated by divergent familiars whom are without exception connected to the terrestrial tree of life and as a celestial globe beyond which everything is alien by default (e.g. 'biodiversity', 'blue marble', 'the extraterrestrial') is indeed a choice. It does not directly mirror nature but rather reflects a specific *anthropology of nature*. It is an eminently provincial way of looking at the cosmos (and I underline, again, that this is not meant as a critique — there simply is no way around this provincialism; only moderns implausibly insist there is). To view the world as a disunity of 'macro-kivas' populated by convergent aliens and disconnected by ladders is an equally reasonable and I daresay an equally objective choice. What the Hopi are hinting at, then, is the possibility of a different *mode* of objectivity and the prospect of another *style* of space exploration, one that replaces the tenet of human exceptionalism by a principle of humanoid abundance.

What intrigues off Earth anthropologists is that such alternative styles of space exploration are by no means restricted to Hopi or other indigenous cosmologies — they have begun to blossom within the fields of astrobiology and planetary science as well. Astrobiologists' notable fascination with octopuses is a case in point. They study them as analogues for intelligent aliens and their capacity to 'speak' to each other through cutaneous colour changes has been taken as a possible model for extraterrestrial forms of communication. Cephalopods, an astrobiologist once told me, are the primates of the sea. Some are even inclined to describe them as marine humanoids. The philosopher Vinciane Despret (2021), for one, has interpreted octopuses' well-known habit of spouting ink as a form of wilful expression rather than as just an evolutionary adaptation — as an otherworldly form of writing. Think of the ink cloud as a poem you have not (yet) learnt to read, or as a joke you do not

(yet) get. Octopuses, Despret insists, are consummate poets and comedians — in other words, they are convergent aliens just as kachinas are for the Hopi. Or consider another alien humanoid and playful comic, as described by an early 20th century observer: "They seem to be ever on the look-out for mischief; and, when a good joke is in view, they take good care not to lose it." [6] These mischievous humanoids may be olive green but they are able to walk like humans (albeit with a an odd, skipping gait); they eat like humans (they are omnivores who know how to hunt); they relish novelty and are unstoppably inquisitive; and they even have the equivalent of facial expressions: by fluffing their head feathers in certain ways they can do 'submissive' or 'aggressive' and a number of subtle emotions in between. I am referring to an alpine parrot of New Zealand, the kea, whom in the words of the ornithologists Judie Diamond and Alan B. Bond (1999:1) is endowed with "an extraordinary, alien intelligence". And this reference to the alien is not a slip of their pen, for Diamond and Bond immediately add that New Zealand, because of its geological isolation, "is as close as we will get to the opportunity to study life on another planet" (ibid. 2). Keas, 'the clowns of the mountains', as they are also referred to, are here explicitly staged as convergent aliens and not as divergent familiars, along the exact same lines as the Hopi stage kachina clowns. Why go to outer space if New Zealand is just a ladder away? More examples in the same vein are easy to find: suffice it to say that it is not a coincidence that astrobiologists champion a growing list of 'honorary humans' such as octopuses and parrots; nor is it by chance that they are showing such a marked interest in questions of convergent evolution. [7] What these scientists intuit is that 'shadow humanities' may be all around us; it is just that they have not yet learnt how to look for them. Helping them in this endeavour is a key task for outer space studies. At present there are many signs that a major metaphysical rearrangement is upon us. Some of the most creative researchers, both in the space sciences and in the environmental humanities, have de facto already abandoned the notion of human exceptionalism. Today anthropologists look back with some embarrassment at the colonial and racist attitudes exhibited by their predecessors in the Victorian epoch. One day they may well find themselves a touch embarrassed that the pages of the great journals of their discipline, until well into the 21st century, were exclusively reserved for articles on members of the genus *Homo*. If there is anything that unites off Earth anthropologists it surely must be that they are imbued with a specific sense of urgency: a dedicated *Journal for Alien Humanities* is long overdue.

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Notes

[1] But see Hamacher (2011) for a study in cultural astronomy that attempts to break with that template.

[2] Houdart and Jungen 2015: 7, my translation

[3] Cf. Geertz 1984: 219

[4] Geertz 1994: 375

[5] Waters 1977[1963]: 145

[6] Marriner 1908: 65

[7] E.g. Conway-Morris 2003

Image

https://commons.wikimedia.org/wiki/File:Walapi_Antelope_Kiva_of_the_Hopi_Indians_in_the_village_of_Mishongnovi,_ca.1901_(CHS-1056).jpg

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