Crowdsourcing Indigenous Knowledge to engage alternative ontologies of Space Exploration: A case study among the Khasi of Meghalaya

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Abstract

Whether it was the pulse and bloom that is the lunar cycle, the iridescent swirls of dust that span across the Milky Way, the shimmering clusters of constellations that pinprick against the inky depth of the night sky. The vast canopy of space has had civilizations straining their necks skyward, seeding origin mythologies amongst the heavens, straining to make journeys that lay the horizon at their feet long before the existence of the nation state or the modern institution that is the corporation. Indigenous people the world over have a distinguished provenance of origin stories that invoke the cosmos. They have evolved centuries of rich cosmology and star knowledge that relate to space and its exploration. The Khasi are one such community, who trace their ancestry back to the stars. Hailing from the North eastern state of Meghalaya in India, the Khasi are an indigenous tribe who are famous for having evolved a synergistic technology of weaving living architecture by braiding tree roots into architectural structures, like bridges, platforms and stairs. Their origin mythology is replete with allusions to the cosmos, their origin mythology abound with stories of space travel to meet their sister tribes in the sky. It offers a wealth of nuance in considering space explorations relationship to the environment and climate change. This paper the design of a tool SCRIBE in a case study with the Khasi community to crowdsource and document oral histories, ecological memory and indigenous knowledge and practices relating to ecosystem management using new media. In crystallizing process into product and research into a technology that can be used for conservaion, the paper seeks to dwell deeply on devising the methodology of interaction with the communities, on the co-creation of a structure of engagement, of humbling learning from both their knowledge and their ontologies to inform the design principles for a tool that can address the complex questions of justice that underly the politics of knowledge conservation.

Keywords: Indigenous Knowledge, In situ-conservation, cosmology, marginalization, de-colonisation

Acronyms/Abbreviations

Indigenous Knowledge (IK)

1. Introduction

The Soligas of the Biligiri Ranga hills are an indigenous tribe living in the Western Ghats of India. With 27 words for rain. Burnt soot rain, rain that kisses the leaf litter but doesn't wet the ground, the rain that makes elephants shiver… The coherence of the Soliga language is inseparable from the coherence of their surrounding ecology. Culture emerges from the expressive vitality of the terrain. For them, their sylvan universe is semiotically laden, the sight of a plant, the migration of the bees, the pregnant elephant are all signs that communicate with them. They practice a rain based ecology in which each type of rain signals the performance of a reciprocal ritual, each type of rain dictates the hunting or harvesting, the consumption or prohibition of a specific diet. This allows the community to fine tune and manage the equilibrium conditions of their constitutive ecology thereby allowing keystone species to thrive. Subject to historic policies of marginalization and dispossession, today they are a diminutive population vulnerable to the machinations of poverty, politics and profiteering. Among the Padhars of Jamnagar, in Gujarat, a bare handful of people still remember the old ways, from when their predecessors would peer into the inky depths of their ancestral wells, onto the crusty salt deposits that line the bottom, and through careful observation of the small shifts and cracks on the pattern of the surface, predict with reasonable certainty, imminent earthquakes in the region. For them, the salt deposits register movements of the tectonic plates as discernible patterns, which they then use to foretell natural disasters. There are only 9 people alive who keep this knowledge from passing beyond the veil into oblivion1.

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1 Based on field research gathered by author in August 2017.
These two examples illustrate that the ecological crisis\(^2\) on which we are at the precipice is not only a crisis of nature resulting from a loss of biodiversity, but it’s also a crisis of culture stemming from a poverty of ethno-diversity. Some of the most pristine habitats in the world, areas rich in biodiversity and systems essential to our global climate, fresh water, and food security have historically flourished under the guardianship of indigenous peoples. With more than 400 million self-identified peoples scattered over 70\(^3\) countries around the world, their traditional lands guard over 80 per cent of the planet’s biodiversity. 140 million of these indigenous people live in Indian forests alone. Having evolved rich and ancient cultures in reciprocity with the changing ecology, they are stewards of complex traditional knowledge, ritual and practices of ecosystem management and sustainable subsistence based inhabiting. These cultures epitomize the old growth forests\(^4\) of the mind, cultural ecosystems that are the last bastions of diversity in an increasingly homogenizing world and yet indigenous people across the world “are also among the world’s most vulnerable, marginalized and disadvantaged groups.” It is a cruel paradox that the guardianship of world’s most healthiest ecosystems fall to its most vulnerable.

As forces of globalization increasingly demand of varying cosmologies a revision of their cultural architecture into a homogenous ideal, the culture capital invested within indigenous knowledge practices across the earth are under threat of rapid and irrevocable erosion. The loss of elders, unprecedented scales of migration, language loss, environment and habitat loss, systematic marginalization at the hands of government, regimes of extraction, acute poverty are only some of the forces that threaten the cultural erosion of indigenous knowledge today. The urgency and immanence of cultural loss has motivated a resurgence of regard for indigenous knowledge, one that can be traced back to the result of a ‘successfully posited connection with development and environmental knowledge’ (Warren, Werner, 1980). Scholars like Brokensha, Brush, Chambers, Richards and Warren among others, have advocated the deployment of indigenous knowledge for development, cautioned against the dismissal of indigenous knowledge as heresy and have been instrumental in drawing attention to the benefits of indigenous mythologies of knowing for policy makers and neoliberal reformers alike. While the valorization of indigenous knowledge is a much-needed shift, the recasting of indigenous knowledge as valuable only in so far as it is useful or applicable to the larger project of development or conservation can be alarmingly reductive. This paper explores a method of conservation that restores to indigenous people a means to protect and safeguard their cultural heritage from disappearance. It merits mentioning at this critical juncture that the original objective for this paper, in the pre-pandemic landscape was twofold: to explore and document the Khasi cosmology and collaboratively develop an artistic piece, a ritual object for spaceflight to briefly experience the low earth orbit. Faced by the need to change our original plans out to the CO-VID pandemic, we have shifted our focus slightly towards conceptualizing and developing the digital infrastructure using satellite-based positioning service to document indigenous knowledge, devising a method of interacting with the communities, co-creating of a structure of engagement and humbly learning from them.

**a. Context**

Since the primary case study is located in India, among the Khasi of Meghalaya, a brief overview of the Indian context might be pertinent. The fissured landscape of Indian forests draws its roots from a history of conflict and social injustice. The legacy of colonial institutions and policy deeply exaggerated the existing scarcities of access, and gave birth to a wide range of conflicts around the issues of property rights. The confluence of forest practice, policy measures, conservation protocol and extraction agenda creates a power nexus that is enacted through top down regulation that marginalizes the dispossessed making the forest-dwelling indigenous tribal an alien in his own land. (Guha, 1997) The colonial appetite for forest resources pit them in competition with the autochthonous\(^5\) forest dwellers and led to the classification and criminalization of entire communities as backward castes or tribes. The

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\(^2\) Although the term ‘ecological crisis’ is a catch all phrase that can come to stand for many aspects of climate change, it is used here to refer to ecological crises stemming from the practice of operating as monocultures, whether it is in energy consumption, the global supply chain for diet and its impact on resource extraction, industrial agriculture and husbandry, rapid loss of biodiversity, water scarcity and the like.

\(^3\) [https://www.un.org/development/desa/dspd/](https://www.un.org/development/desa/dspd/)

\(^4\) An old-growth forest is a forest that has attained great age without significant disturbance and thereby exhibits unique ecological features and might be classified as a climax community.

\(^5\) indigenous rather than descended from migrants or colonists
“People of India” census recruited quasi-scientific ideas to support the criminalization of entire communities. It marked a period of transformation in the bureaucratic use of ethnographic data to substantiate native criminals. By 1924, the British government has developed elaborate ‘scientific taxonomies’ that were recast as legal parlance in the Criminal Tribes Act. (Bose, Arts & Van Dijk, 2001) Citing dubious eugenic motivations, they dubbed these communities as ‘depressed classes’ or ‘criminal tribes’. The measure was part of a wider attempt at social engineering in which the categorization of indigenous castes and tribes was means of facilitating the curtailment on forest rights. Post-independence, Indian forestry was rechristened with a series of policy shifts beginning with the nationalization of forests. The criminal act was repealed, and tribes were set free, at least from their legal shackles. However, the categorization remained as the new government re-christened these communities as scheduled castes and scheduled tribes, slated for protection through affirmative action. Across the landscape though, forestry for commerce, in competition with the paranoia of protectionism remained the prevailing patterns. It resulted in the constitution of large forest sanctuaries and a totalizing embargo on human ingress within the core areas. (Rangarajan, 1996) But the old tendencies remained, forests that were administered through the language of state simplification still retained those methods of administration. Consider the inherent conflict of an administrative method of forest protection that conserves but cutting up the land into working grids. A top down approach to conservation unfolds spatially, preferring the language of maps, satellite data, human resource heavy interventions. This lies in sharp contrast to a rain based ecology like the Soliga epistemology, that unfolds in time rather than in space, that prefers the semiotic language of rain, the shifting states of species with the forests, the logic of ritual as a method of dwelling that simultaneously results in a conservation output. This presents an interesting example of the dualities inherent within the landscape of forest conservation today. Who should govern and manage wilderness areas, should it be the mandate of the state, using the methods of state simplification6 and scientific knowledge? Or should it fall to local communities through the manifestation of traditional knowledge? Should western science or local knowledge come to provoke policy? Are people allowed to continue to occupy forest lands or should these areas be purged of its population? Is protection a panacea or a problem? (Muniyappa, 2018) These dualities have stirred up the debate, with scales tipping towards the protection of charismatic mammals like tigers and elephants, towards the rights of large corporations seeking exclusive rights to mine the earth, to lobbyists in the tourism industry while continuing the historic marginalization of indigenous forest dwellers and pushing them towards a further dispossession of their homes. The Khasi people are one such community, designated as scheduled tribes, living in north-eastern state of Meghalaya who possess a wealth of knowledge that has evolved in reciprocity with its constitutive environment.

On February 20th 2019, the Supreme Court ordered the governments of 17 states in India to evict an estimated 1 million tribals7 and forest dwelling households from their historic habitation of Indian forests. This forced exodus is not only a cultural genocide that threatens to destroy centuries of accumulated ethno-botanical indigenous knowledge and culture associated with resource management and ecologies, but also an ecological disaster that is unprecedented in India’s environmental history. India’s environmental ministry recently announced a controversial bill to further augment its policies of dispossession. The contentious draft Environment Impact Assessment (EIA) citing a rationale to promote the “ease of doing business”, dilutes the assessment process, and effectively shuts out the public from having a say on how new projects get environmental clearances. The most controversial rule change the draft proposes is the provision that projects can receive clearances post facto, which is a blatant derogation of the fundamental principles of environmental jurisprudence and has the potential to lead to irreparable degradation. These policies of the government adopt a radically extractive position. An extractive gaze that sees a forest only for the material resources that it can provide rather than perceiving it as a site of cultural production, as the home of vulnerable populations. There are nearly 270 million people that are living in or around forests in India, a large percentage of whom are involved in some conflict with the state, at the very extreme of the gradient is the Naxalite movement, in which corporate extraction backed by government policies led tribes to abandon their way of life and take up arms in militant response. A war that according to Arundati Roy, is India’s longest raging war, that is still being waged today against its indigenous people.

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6 The concept of State Simplification is drawn from James C. Scott’s fascinating and seminal book, Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed, which describes process by which state machinery uses administratute or beurocratic procedures to make legible or visible arenas that were historically illegible to the state. For eg: a forest is an illegible territory in the eyes of a state, but once tamed, cleared and transformed into a plantation, into yield and profit and loss sheets, this resource is now legible to state machinery.

7 As per the stipulations of a greatly contested Indian Forest Rights Act 2006. The law provides for giving land rights to those living on forest land for at least three generations before December 31, 2005, but many communities find this hard to prove due to lack of official documentation. The Forest Rights Law itself has been criticized by both wildlife activists and those fighting for the rights of tribespeople and forest-dwellers, albeit for different reasons. The former believe giving people rights to live in forests will eventually harm the forests themselves and also wildlife. The latter believe that the implementation of the law is far from perfect and that deficiencies in this have resulted in many valid claims being rejected by the states.
Indian forests have never been natural, never been free of its human inhabitants, they are synthetic entities that have co-evolved with the symphony of the monsoon in concert with human stewardship. Faced with an overwhelming onslaught of external factors, starting with dispassion of land across the gradient to factory schools that promote cultural assimilation and instigate a re-organisation of community occupation of territory, there is an increasing need to equip indigenous people with the means to protect their knowledge and heritage against cultural erosion.

c. Objective

This research aspires to develop a methodology of in-situ conservation by crowdsourcing indigenous knowledge and documenting oral histories, ecological memory and practices relating to ecosystem management to soften the threshold into oblivion. This paper describes the design of a tool called SCRIBE that is designed to address twin problems that plague indigenous communities: the sustained survival of knowledge and the conservation of indigenous culture. It attempts to document, bear witness and conserve while protecting communities from bio-piracy where indigenous knowledge is patented for profit, bio-prospecting and strengthening indigenous agency. This paper will describe:

1. The design and development of SCRIBE and its testing with the Khasi community.
2. Documentation and multimodal data collection of the Khasi’s traditional knowledge and cosmology.

The design of this tool will address indigenous knowledge as valid, not necessitating a justification by the scientific method. It seeks to re-position the authority of the ‘first voice’ and affirm indigenous agency through the framing of their own narratives outside the confines of the academic canon. Traditional indigenous knowledge has historically been a degraded landscape subject to extraction and translation in the service of science, with little regard to issues of authorship leaving Indigenous communities vulnerable as a result. This paper explores design solutions that protect against extractive agendas. It also suggests that different methods of investigation reveal different relationships and espouses a non dualistic approach that privileges both the scientific as well as indigenous ways of knowing.

2. Research methodology

The methodological approach underpinning this research draws heavily from several disciplinary domains. Foregrounded by the identification of individuals/organizations who would serve as community partners, the research methodology defers to the wisdom inherent in their cultural practices in organizing all interactions with the relevant stakeholders. With a specific focus on gathering of data from various community members and stewards of traditional knowledge. The research began with a consultation with community leaders and takes a qualitative approach to data gathering. Data collection for this research has two objectives, the first is the documentation of indigenous knowledge, using photography, audio recording and video. Inspired by the discipline of multimodal anthropology the data collection adopts an participative, empirically-based, qualitative framework, built on systematic observation, identifying the research cycle that begins with data gathering and leads to visual ethnographic construction that is anthropological in method, process, and product. The second cycle of data collection involves registering user feedback on the development of the tool SCRIBE. In designing the tool, the work draws upon methods from the design canon, of design thinking, community centered design operating under the transition design framework developed in Carnegie Mellon. The epistemological structure of this research is positioned within the frames of critical conservation, interpretivism, and subaltern and critical indigenous studies.

This paper aims to present a methodology for in-situ conservation using new media and technology. The theories employed in this study aim to respect indigenous self-determination, and recognizes communities right to self

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8 Culture is a dynamic entity, subject to pulses and blooms. Things are devolving toward, or evolving from, nothingness, and in ecology it is disturbance that mediates the transition. We are all born with the promise of death. It is this immutable fact of death that informs different cultures’ particular dialogues in negotiating the duality of transience and permanence. However western frameworks of conservation, especially heritage conservation, takes on a position of swimming upstream against the current of time to stave off its degenerative effects and preserve a moment, an artifact, an entire culture in a state of ‘authenticity’ to an original moment. The authors espouses a view of conservation that recognizes time’s arrow a morphological force, demanding a creative conservation of culture, where the objects, artifacts and cultural practices are given the opportunity to evolve in response to the changing content to thereby ensure its survival. However when the rate of change is so rapid that culture can longer survive, a method of intervention, in the author’s own opinion can serve to soften the threshold, create a holding ground for cultural practices that would have been lost to a flooding onslaught of accelerated change.

9 First voice is a term coined by Dr. Amareswar Galla to refer to first nations’ communities having the right to self representation and self articulation in direct contrast to be spoken for or spoken about.
representation while exploring a design solution that aligns the aims and objectives of all associated parties. The data obtained has been used to develop a design direction that fosters indigenous agency, cultural authenticity and respectful engagement with Indigenous knowledge with a deep awareness of the embedded power asymmetry. The analyzed data was then used to inform the design considerations for SCRIBE, as a method of in-situ conservation. The design of the SCRIBE tool, is far from complete and only represents a first draft of a conceptual design.

User testing and stakeholder feedback have been used to test the viability of the tool and provoke further design iterations, suggesting lessons for design practitioners and researchers (Indigenous and non-Indigenous) in methods of ethical engagement with indigenous knowledge as it pertains to issues of representation, documentation and conservation. The qualitative frame is a necessary condition for this method of research because it gathers and makes room for the myriad cultural ontologies that indigenous knowledge can comes to possess, as well as the diverse demographics of stakeholders who are charged with its protection. This research position is deeply cognizant of the dramatic power imbalance between the community and the researcher knowledges this cultural, professional and power asymmetry as intrinsic to the research question (see section 3d and 3e). First, we submit to the community by asking for their permission to work with them and to share their knowledge so we depend on them and we choose to position ourselves that way. Second, our mobility and access to intellectual status does give us an unfair power position, so we seek to not abuse the position we hold as members of a well established research institution. We also engage discursively with the notion of free, prior, informed consent as always contingent and subject to change, where consent can be withdrawn at anytime depending on a change in circumstances. (refer to section 3d, 3e for a more nuanced exploration on the asymmetry of power between Indigenous people and researchers)

b. Literature review of the Design and Anthropological methods

Though most designers today still ground the early investigations of their design practice using Design thinking, it fails to capture the complexity of most problems because it is ill suited to deep collaboration. The anthropocentric view it espouses through an explicit focus on user centric/human centered design makes it a flawed tool especially when working with ecosystems and non human actors. Design thinking evolving as it did from a history of commercial use and application also fails to capture the complexity and nuance necessary for working with historically marginalized communities.

The discipline of design saw a reflexive shift during the historical moment when Elinor Ostrom, won the Nobel Prize in Economics. It represented a shift from regarding the individual as the fundamental unit of systems to a pronounced emphasis on the network as the fundamental unit of systems, while studying methods of engaging with the commons. The popularity of user centric and human centered design gave way for a Community-Centered Design with a focus on ecological congruent solutions. By studying the community as the focal point of design research, this methodology expands its ambit in the consideration of stakeholders. The evolution of participatory design extends upon these ideas by shifting the role of the community from a passive to active state, where they are invited to cooperate/co-design with designers, researchers and developers. (Pieters, Jansen, 2017) This collaboration takes place during several stages of the design cycle: from the initial exploration, problem definition, ideation, devising solution and evaluation. According to Pieters and Jansen, it is a “transparent process of value creation in ongoing, productive collaboration with, and supported by all relevant parties, with end-users playing a central role” and covers all stages of a development process. With its emphasis on methods like storytelling, workshops and engaging community input to develop shared design objectives, it provides an important foundational methodology upon which to ground this research. However it fails to address the important issue of transforming the inherent power relations embedded within the discourse of indigenous knowledge and therefore I draw upon the principles of transition design. Transition Design is a radical area of design practice, study, and research that advocates design-led societal transition toward more sustainable futures. Arguing for a transformation at the scale of paradigm rather than at the scale of product or practices, transition design demands a re-imagination at a systemic level accommodating shifts in energy infrastructure, economy, health education and lifestyle to name a few. It exhorts the need for a “cosmopolitan localism,” that is place based and regional despite being global in arenas of information and technology (Irwin, 2015) . Designers well versed in this method are expected to have deep operational knowledge of the interconnectedness of social, economic, and natural systems and the Transition Design framework propounds four dynamic areas in which narratives, knowledge, skills, and action can be developed. They are Vision; Theories of Change; Mindset & Posture and New Ways of Designing. While considering the unequal position of indigenous people as explicated in earlier sections of this paper, with a simultaneous motivation to seek to shift these embedded power imbalances, a transition design framework provides a more robust methodology within which to ground this research. I also draw in part from the discipline of Systems architecture, an emergent response within the engineering discipline that attempted to redress the weaknesses of traditional engineering by focusing on contextual and
stakeholder perspectives within the engineering and design processes. The merit of a Systems Architecture Framework lies in its ability encapsulate discrete but interconnected elements as components within a system whose architecture enables a formal representation of its constituent parts that highlights their relationships. Crawley et all define systems architecture as an “abstract description of the entities of a system and the relationships between those entities” Despite its usefulness in providing a model to unpack and design complex systems, it is also important to consider its provenance in the military industrial complex, an epistemic grounding that presents this method with its own set of limitations.

The objective of documenting indigenous knowledge thorough an emphasis on ethnographic research suggests a grounding in the anthropological method. The discipline has evolved greatly since its inception and has reflectively expanded to incorporate dynamic media perspective under its ambit. Multimodal anthropology is a recent species within the discipline of social cultural anthropology that comprises anthropological research with knowledge production across myriad traditional and new media platforms and practices including but not limited to documentary film, ethnification, video, still photography, theatre, design, mobile applications, virtual and augmented reality, web-based interactive gaming, social networks. (Collins et all, 2017) The advantages of the multimodal approach is that it captures ethnographic data in the moment of its production with the greatest accuracy considering the loss (of information, context) that data is subject to in the act of translating, from medium to medium or as Latour viscerally reminds us through the circulation of reference. (Latour, 1999) It also offers an invitation to consider the consider the role of these technologies themselves as actants in the lives of the interlocutors, ensuring that the method itself is subject to critical analysis.

As a designer trained exhaustively under a western pedagogy, it is natural and almost instinctive to reach for methods that emerge from my own educational framework, but its also imperative to pause briefly to consider the history of these methods emerging as they did from the exigencies of industry and capitalism. These are the same forces whether by design or unintentionally have served as catalysts for cultural appropriation the world over. Design has performed great acts of extraction, mining cultural symbols, sacred iconography and transposing these cultural presences into commercial artifacts. The engineering discipline and its constitute tools have provided the mythological impetus to enable the majority of high modernist projects, and early anthropology while drawing our gaze to indigenous people drew our gaze there only to label them as primitive, to etch them into categories of the other. It is imperative to consider how to investigate issues of identity, cultural representation and de-colonisation while employing these methodologies. It also imperative to consider the hegemony of the design aesthetic as a language. With the increasing standardization and homogenization of what is beautiful or considered aesthetic from a graphic design, software design or ergonomic perspective, these notions of beauty and harmony are notions that have emerged from a very specific context. Even today arbiters of taste and refinement, still occupy an institutional presence among the world’s leading museums and art galleries and there is a great danger of imposing the hegemony of an alien aesthetic upon an indigenous context.

3. THE TERRAIN OF MARGINALIZATION

Academic interest in Indigenous knowledge finds its provenance in development literature. Indeed perhaps the earliest use of the term ‘indigenous’ was recorded in 1979 by the Robert Chambers’s group at the Institute of Development Studies (Warren 1998) The notion that indigenous knowledge could be seen as a reservoir of alternative wisdom that could be useful for sustainable development emerged in response to the failure of top-down technocratic models of development employed the world over, models that failed to account for the specificity of local conditions or place based knowledge emerging from a relational affective sociality. (Ferguson 1997, Grenier 1998, Scott 1998)

The term indigenous knowledge has undergone several transformations in perception as well as popularity. This chapter traces the historical vicissitudes of this changing attitude and its subsequent polarization into a category as distinct from science. At first, spurred by an anthropological interest, Indigenous knowledge was brought into the realm of popular imagination, and although the presence of a rich and complex heritage of knowledge was alluded to, more mysteriously through its absence than its explicit presence, it was cast as primitive and unscientific as the superstition of the savages. The blind faith in the scientific method as the answer to progress continued well into the industrial revolution and the project of modernity. It was only after the radical failure of high modernism that saw a resurgence of interest in Indigenous knowledge, this interest positioned indigenous knowledge in sharp contrast to science and hailed the knowledge held by local communities as complex, holistic and critical to any development project. These views professed an arduous almost romanticized view of indigenous knowledge as a irreplaceable fount of wisdom that could serve to correct the fatal flaws of the high modernist vision. It also pledged the value and
future of indigenous knowledge to be tied to a future of development based agenda. Although there has been a wealth of academic attention drawn to the discourse of the dichotomous categorization that pits indigenous and scientific knowledge as two separate and distinct categories, I find such arguments a rather tired dialectic that are not very useful in truly engaging complex questions of indigenous knowledge conservation. It is much more valuable to adopt a non dualistic agenda, and consider how the two ontological categories enter into dialogue with one another. If distinctions must be made however between forms of knowledge, there is merit in considering what forms of knowledge are inherently ascribed, or generate power for its holders, how do we explore power and its relationship to knowledge as constructive and restraining force. To consider issues of power and powerlessness is central to understanding the position and transformation of indigenous knowledge, as well as its deployment as a political presence to secure justice for its constitutive communities.

a. To be primitive and unscientific.

In its earliest articulations, the local knowledge held by autochthonous cultures was disregarded as superstitious and primitive. The civilizing mission, the radical ethnocentrism and the elitist gaze of twentieth century science deemed such forms of knowledge emerging as they did outside the canon of western science, or the sites of production of formal knowledge, i.e institutions, laboratories as ‘primitive’ and ‘unscientific’. (Agarwal, 1995) It justified its position with a hammer of methodological reductionism and evaluative parameters drawn up by the scientific method. The phantom presence of indigenous/local knowledge is seen and felt viscerally, through the poetics of absence. Fieldwork that swelled the canons of scientific literature during the late colonial period drew heavily upon the foundation of indigenous knowledge, with a characteristic elitism that obscured names of sources or muted indigenous voices.

As the post colonial landscape bloomed into the modern, it saw the continued condemnation of indigenous traditional knowledge as ‘unscientific’. Modernity’s teleological push towards progress and development meted out models and theories developed and christened in formal institutions as ‘technology’ which was subsequently used upon the constituents of the underdeveloped nations (Ellen and Harris 2000). From the ivory tower of modernism, advocates of development projects still considered indigenous knowledge to be fundamentally irrational, mystical and superfluous (Howes and Chambers, 1980, Brokensha and Riley, 1980) These denigrating views continued to enjoy a measure of popularity until the persistent failure of authoritarian high modern development projects that eschewed a top-down approach. For example, where previously dams were hailed ‘as the temples of modern India’, these development projects failed across several verticals as they released greenhouse gases, destroyed carbon sinks in wetlands and oceans, deprived ecosystems of nutrients, destroyed habitats, increased sea levels, waste water and displaced poor communities. The green revolution despite its early promise saw a loss of soil fertility, massive soil erosion and soil toxicity, a diminishment of water resources, the pollution of underground water, increased salinity of underground water, increased incidence of human and livestock diseases and global warming, or even the famine that followed China’s Great Leap Forward. The catastrophic failure and development disasters of the twentieth century were rooted in a noxious fusion of epistemic arrogance and authoritarian power, including especially an excessive confidence in the ability of principles of “scientific management” to order and organize human activity. (Scott, 1998)


The surge of interest in Indigenous knowledge in dialectic opposition to the failure of high modernism based development emerged with a fervor that has been characterized by some scholars as a ‘revolution’ (Stilltoe, 1998). Signifying a much needed paradigm shift in focusing attention and resources away from technocratic, centralized systems towards the historically marginalized poor, theorists of indigenous knowledge gained a vocal platform on the theatre of development, of ‘a sustainable development’ as a solution to the failures of high modernism. The fascination with indigenous knowledge is motivated largely from four types of sources: development and environmental management strategists and researchers, business interests, and indigenous people themselves.

Though couched in the undertone of romanticization that painted indigenous people and communities as if perpetually dwelling in idyllic harmony with nature, the importance of this traditional knowledge practices for the protection of biodiversity and the achievement of sustainable development gradually gained universal recognition (Gadgil et al, 1993). Communities, cultures and people that are stewards of such knowledge, who employ it in their practices of dwelling act not as mere technicians but as scientists operating using complex notions of classification, abstractions and philosophical ontologies that provide a systematic account of the world (Sundar, 2000) The radical romanticization that underpins some of the interest in Indigenous knowledge runs the risk of oversimplification, generalization and decontextualization while exacerbating the tired trope of a binary duality. The consumers of such knowledge often endorse the packaging, extraction of knowledge by the use of blanket terms like participation,
empowerment, democratization while accelerating self serving objectives of development, whether these are NGO’s, international institutions like the World Bank that still espouse objectives of high modernisms couched in Neo-liberal camouflage. Though Indigenous people do welcome the elevation of status that comes with increased recognition of their knowledge systems after centuries of dismissal and disintegration, and have strategically launched campaigns of activism to secure a modicum of political influence, nothing comes without a cost (Eyzaguirre, 2001). In a move that resembles colonization, development’s interest in the Indigenous Knowledge enterprise may yet displace the indigenous from their historic possession of their knowledge.

c. Towards radical non dualism.

In a piercing insightful critique that systematically disproves the dualism described above, Arun Agarwal (1995a, 1995b) acts a torch bearer for the school of thought that espouses a non dualistic perspective. Suggests a move past time tired dialectics like western/scientific, traditional/modern towards a reconciliation that celebrates the diversity inherent in these two categories. In recognizing how cultural knowledge or tradition comes to be transformed as scientific knowledge and eventually accretes into scientific practice, it recognizes previously muted accounts in which western science has historically extracted, recruited, translated and assimilated local knowledge. It invariable alludes to the entangled relationship between the categories indigenous and scientific knowledge and complicates our ability to neatly distinguish between the two. He demonstrates the absurdity of fixing knowledge permanently as ‘indigenous’ or ‘western’ especially considering the contradiction that the same knowledge can be classified either way depending on the agendas concerned. As Korzybski described, ‘the map is not the territory’ suggesting that different maps reveal a diversity of differences across the same territory, similarly different ontologies reveal a new perceptions and knowledge about the material world. The representation a function of the observer’s view. It paves the way for the perception of several embedded diversities, (even several different contesting indigenous perspectives perhaps operating within the same locality) across a spectrum of ontological difference rather than across binary categories.

The emancipation of indigenous knowledge as a dualism separate from western/scientific knowledge is critical because it disentangles itself from the agenda of sustainable development and demands a deeper investigation into inherently coupled relationship that power holds with knowledge. Sustainable development necessitates the cooperation of grassroots organization, it demands local participation and support of culturally situated actants to ensure success. Political mobilization may depend on using indigenous knowledge as a strategic toehold (Baviskar, 2000) opening up a domain for representation in national politics or international forums, aid agencies and human rights organizations. The marketization of such forms of knowledge, as well as the scientization of indigenous knowledge is based on a litmus test of use. Such knowledge is considered valuable and indeed demands a conservation based on its usefulness to industry, development or progress. In ignoring the inherent validity of such forms of knowledge, it draws attention away power asymmetry between indigenous actors and the other constituents, ie state, development actors, academia, corporations, from the responsibility of transforming this disproportionate power balance and while furnishing formidable social actors to appropriate useful indigenous knowledge to serve their agendas. In order to truly engage indigenous knowledge, and consider its conservation, it is imperative that we push past polarizing dichotomies and focus on strategies that evoke substantial autonomy for indigenous peoples.

d. Power and Knowledge

Although the assertions of sustainable development often cite the objective of ‘empowering’ marginalized groups, it rarely pulls focus towards redressing and transforming the existing power relationships that are crucial to the flourishing of indigenous people. It becomes critical to consider how the category of ‘indigenous’ is constructed by the workings of power, and how power becomes the property of what comes to be categorized as Indigenous (Agarwal, 2005) for its viability in making legible the nature of political strategy used by proponents and critics of indigenous knowledge. As Foucault explicates, science’s crusade for truth is less about the cluster of truths waiting to be discovered and established than it is about a cluster of truth that separates true and false that applies specific attributes of power to those that are designated as true. A process that Bruno Latour explores in some detail as he describes how some knowledge systems, based on the strength and length of their networks merit designation as universal or become discarded as parochial. Where explanatory power relies less on truthfulness than the successful cooperation of political, cultural and biophysical actants. (Latour, 1986) The Global penumbra of scientific rationality, casts its shadow upon the indigenous world with the objective of transforming of indigenous knowledge and assimilating it to suit to the mandate of Western scientific–technological rationality. In assessing the protocol relating to the interaction of actants (be they motivated by research, state sanction, development agenda or market forces) with indigenous knowledge, it becomes critical understand how they manifest their agendas in relation to...
their inherent power—do they articulate their position with the primary intention identifying indigenous knowledge, protecting indigenous culture, reactivating local knowledge so that it stands without being subjugated; or do they primarily insist on exercising a power over the object/subject of its investigation dispassionate towards notions of indigeneity that presents a challenge to the juridical assertion of modern science? (Swazo, 2005)

Power can be regarded as a negative articulation in so far as it acts a constraint upon the freedom of the subject or be regarded as a positive articulation by enabling in the subject a freedom to overcome constraints. Agarwal suggests trying to understand this distinction by considering the difference between power to and power over, a whole world of difference from this subtle shift of prepositions, the latter is self directed while the former relational in order to thicken the language used to describe perceptions of power politics among indigenous actants and other constituencies to understand their agency over processes of marginalization in matters of economic growth, expansion of political processes, and state interventions. A Foucauldian critique of modern forms of knowledge and power invests us with a heightened desire for vigilance in engaging with indigenous knowledge in so far as the knowledge/power relation expressed by the contraposition of development/state intervention/academic research/market intervention/political mobilization and indigeneity. The need of the hour is to defer to the authority of indigenous people as they take up defensive strategies of self determination against ethnocide and politics of assimilation while dismantling the cultural hegemony of euro-centric and techno-centric paradigms of power as it relates to knowledge. It behooves us to create systems of engagement that restore autonomy to indigenous people in matters of decision making regarding their indigenous knowledge.

e. The Politics of Representation

Spivak’s ‘Can the Subaltern Speak?’, was an inaugurating moment in subaltern studies with powerful significance for indigenous studies. Spivak contends that the necessarily Western perspective of post-colonial studies serves to silence the third world ‘Other’. She traces the silenced voice of the other, its historical muteness as a result of the processes by which the discipline of postcolonial studies paradoxically inscribe, co-opt, and rehearse neo-colonial imperatives of political domination, economic exploitation, and cultural erasure. To apply this lens to the domain of indigenous knowledge particularly from the motivations of development actors, reveals that one rarely enters the testament of the indigenous’s voice consciousness, the processes of scientization described above, despite how realistic or useful, are merely representations created and framed by a western perspective. Remembering Latour’s assertion of science as a colonizing force, now a rupture emerges, dividing the “true” knowledge of those colonized and the myriad invented representations by the colonizer. In terms of power alone, the western perspective is painted as vastly superior to that of the subaltern, offering a voice in the chorus for those with the power to speak for those who cannot. Though emerging from the context of a global south, or in Gramsci’s case, using the military term ‘subaltern’ in reference to asymmetric national development, indigenous critical theory emerging from the west, that interrogates the concept of indigeneity may share much resonance to the notions subalternity by postcolonial thinkers. The focus on systemic silencing of the indigenous or the subaltern voice by extension leads us ‘to cast doubt on the benevolence of the “information retrieval” technologies of the colonial and neocolonial powers including those technologies of knowledge deployed by apparently sympathetic scholars and activists.’ (Byrd & Rothberg, 2011) and draws focus on structures that contribute to our inability to hear voices from the margin. The political stake of listening to the subaltern/indigenous voice is co-mingled with the transformation of the conditions of reception of the voice. By non reception, it refers to the entire gamut, of radical apathy, a relegation to silence, absence and non recognition, or even more dangerous a partial reception whose bandwidth of listening extends derives from power hierarchies. Hegemonic powers, have had a history of partial listening to subalterns in matters of surveillance, subjugation, bio-piracy or consumption. It becomes crucial therefore to investigate how various medium entrust power to speak over those that cannot, and the influence to listen. (Byrd & Rothberg, 2011)

It is therefore of critical importance to consider the history of the politics of assimilation, the historical silencing, the mechanics of non recognition that are embedded with the notions of indigeneity and the subalterns, and therefore crucial to consider as a design principle practices of in situ conservation that recognize and defer to maintaining the first voice (Galla, 2008). In the particular case of indigenous knowledge, it also becomes particularly important to consider the politics of ownership and the genius loci embedded with in.

4. DESIGNING FOR THE NON DUAL MIND

The System Architecture Framework unfolds in a 6 step process: Describe the Context at several scales, Identify and categorize Stakeholders, Describe Stakeholder Needs and Desired Outcomes, Identify Desired System Objectives, Describe current Functions and Form, Describe proposed Functions and Forms and evaluate them according to the System Objectives. Having begun the design of the tool in a systems architecture class, I began the design process...
using the guiding principles of steps 1 and 2 by Identifying stakeholders and describing the desired functions and objectives for SCRIBE. As a robust method of describing and visualizing, it provided me with a theoretical foundation within which to launch the investigation. It is important to pause here and consider that this method has its origins in the military industrial complex, a force that has led to conflict and injustice among indigenous people and that there is a certain bittersweet quality in employing tools drawn from this history and context to target a solution to this self same problem of injustice.

a. Identifying stakeholders

The Design of SCRIBE as a platform/mobile application to enable in-situ conservation of indigenous knowledge followed a traditional design process. The first stage was to map the stakeholders or users of the application. With the objective of being used by a range of different profiles of people. Scribe is meant to cater to a diversity of users and stakeholders. Drawing from Crawley et all, Professor Wood describes these categories through the arena of influence: They can be loosely categorized across three rubrics:

1. Primary (Make direct decisions about the design of the System) : Indigenous community members, Knowledge protectors
2. Secondary(have influence on the Primary Stakeholders via authority or funding): Conservationists, Researchers, Academics, Policy makers.
3. Tertiary (exert little or no control over the system but are impacted by it): National and International Institutions associated with Indigenous knowledge conservation. i.e Ministry of Culture, National Archives, UNESCO.

The categorization of stakeholders is a concept that is shared by several disciplines from development to conservation, it may be of note to pause and reflect on how a systems architecture framework presents a nuanced tool for describing the various hierarchies of stakeholders based on where the system boundary is drawn. In this case, if one were to consider SCRIBE from a users perspective, then community members remain primary stakeholders, but if one were to consider SCRIBE solely as a design based agenda, the system country shifts, and designer becomes the primary stakeholder, while the communities become tertiary stakeholders.

b. Desired Functions and objectives

1. Documentation (for Primary, secondary and Tertiary stakeholders)

Passed down from mouth to ear, in an unbroken line stretching centuries into the past is a veritable treasure of oral traditions, folk practices and intimate knowledge, a significant percentage of which has never yet been written down or recorded. SCRIBE should enable comprehensive and systematic documentation that honors local specificity, the tacit nature of the traditional knowledge in a transparent manner with prior and informed consent of the stakeholders. The design should consider that documentation will necessarily be fragmented, arriving from several different voices within the community, and consider how to make discrete parts from a boundless whole.

2. Preservation (for Primary, Secondary and Tertiary stakeholders)

We are at a precipice. With the loss of elders, in the span of a generation or two, we stand to lose centuries of accumulated knowledge in one fell swoop. Indigenous knowledge is at incredible risk of erosion, with increasing globalization, high rates of assimilation, weakening of ancestral customs, livelihoods and traditional knowledge systems and a rapidly changing environment. The safeguarding and preservation of such intangible heritage is a critical objective. SCRIBE should enable sensitive management of documentation efforts such that protection and preservation can be mutually reinforcing for the benefit of future generations.

3. Capability building: Training in documentation techniques (for Primary, Secondary and Tertiary stakeholders)

One of the pitfalls inherent in the documentation of traditional knowledge is that of intellectual property rights. A crucial step in the documentation process is the recording, or “fixation”, of the Traditional Knowledge (TK) in a material form or when TK is transferred from one medium to another. This recording or fixation is often the point at which intellectual property rights come into existence. In such instances copyright does not protect ideas or knowledge as such, but rather the form in which they are expressed. Therefore a critical aspect of SCRIBE should be defensive intellectual property protection through training and ensuring that community partners are protected by using documentation methods and techniques and the use of technology that establishing positive rights in relation to their traditional knowledge. An important distinction here is the difference between capability building as a
measurable indicator and capacity building, which is often a catch all term used in development projects. Drawing from Dr. Wood’s extensive work in the realm of capability building (Wood, 2012) as the ethic that underlies the projects undertaken by Space Enabled Group.

4. Enable indigenous agency (for Primary, Secondary and Tertiary stakeholders)

By using tools and techniques, that enable indigenous self representation, and retain indigenous agency in the dissemination of their own cultural narrative and cosmologies, SCRIBE’s objective is to preserve the first voice and facilitate indigenous agency. A critical goal of scribe is to develop and establish a community authentication process. This is important because it is a complex task to develop a process or procedures by which to authorize or verify the information included that the whole community recognizes. Since indigenous knowledge is shared knowledge, it doesn’t necessarily map to notions of individual(s) intellectual property rights.

5. Protection against misappropriation. (for Primary, Secondary and Tertiary stakeholders)

SCRIBE should be designed to be sensitive to the misappropriation that indigenous knowledge has historically been subject to. Positive protection against misappropriation especially considering the ease with which digital content, can be plagiarized, altered, or divorced from context. It should also demonstrate sensitivity in representing potentially offensive or upsetting material. Indigenous practices emerging as they do from specific ontologies may be unfamiliar to outside perceptions. Having experienced negative consequences from the imbalance of trade in cultural knowledge and resources, SCRIBE will be designed to protect communities digital content.

6. Allow for varying levels of special access (for Primary stakeholders)

SCRIBE will be designed to have varying levels of access to special content based on community deliberation, such as password-protected access to sacred or secret knowledge in order to prevent widespread access to information that has the potential to make a community vulnerable. Communities will retain agency and control access to sacred or secret information, digital or otherwise.

7. Knowledge exchange (for Primary, Secondary and Tertiary stakeholders)

SCRIBE should be designed to facilitate knowledge exchange, dialogue, collaborative research and development between scientific and artistic communities and indigenous partners in a mutually respectful manner that is deeply sensitive to any underlying power asymmetries.

8. Explore alternate media (for Primary, Secondary and Tertiary stakeholders)

Traditionally large scale documentation efforts employ the use of banal media. SCRIBE will have the opportunity to host alternate media like Virtual Reality, augmented reality and harness the expressive capacity of the arts not only to document indigenous knowledge but also to creatively conserve.

9. Education and Outreach (for Primary, Secondary and Tertiary stakeholders)

With a heavy emphasis on the quality of the output (of the documentation) the final media can be used for outreach that target community-oriented objectives (education, awareness raising, cultural preservation, etc.) on one hand, and the public and policy arena on the other.

10. Economic support (for Primary stakeholders)

A key objective of SCRIBE is to ensure that it does not become extractive i.e. taking knowledge from the community without remuneration in kind, therefore a key objective of this project is consider (in future iterations) how to supplement economy, stimulate livelihoods and give back to the community economically even at a small scale.

c. Initial Design of SCRIBE:

Scribe is designed as a tool to enable various profiles of users to document and record indigenous knowledge. It is designed with several layers of protection with deference to community ownership of digitally transcribed knowledge. The app opens with a comprehensive list of ethics and guidelines we want our users to adhere to as part of the terms and conditions for its use. Each new user must complete a training video and a small exam to begin
Fig 1: Screen shots of the SCRIBE app
scribing. The training videos are designed based on best practices from UNESCO conventions on safeguarding cultural heritage and World Intellectual property organization’s guidelines for the same. There are 4 different ways to record data available within the app, uploading or shooting images, audio recordings, video, or a 360 degree video for virtual reality environments. Media can be uploaded or shot in real time. All projects/data that is uploaded will be listed with collaborators, this is a feature to ensure that there is a community member always associated with every single data entry point. This is an important feature to establish the communities’s rights to their knowledge. Once the media is uploaded, the app will reveal a project page which contains various other information about the project, its description, geolocation, tags and the like this landing page prepare it to be published. Each post has several different privacy settings. Every single post needs permission from the community partner to be published. Upon request permission from a community partner to publish, files, text messages can be shared with your selected community partner until they offer consent to publish. This page establishes positive intellectual property protection. The app offers community verification of information. All tags are geolocated as well as tagged with keywords. SCRIBE is also designed to search and show various other forms of data that co-relate to a specific entry, for example, if one were to document root bridges in Meghalaya, a search result would show up all the SCRIBE posts relating to the root bridges, but also the scientific papers, GIS data on the same subject. In accreting or entangling together two models of knowing that rarely have a chance to engage in a dialogue, SCRIBE espouses a non dualistic gaze.

5. IN SITU DOCUMENTATION: A Case study among the Khasis of Meghalaya

a. A portrait of the stakeholders: The Khasis in literature and a snapshot of their cosmology

One of the more prominent tribes of North east India, the Khasi dwell in the state of Meghalaya and are spread across the East and west Khasi hills, Ri Bhoi and Jaintia hills. Primarily a mountainous people with a unique culture, language and identity, they have earned according to the Khasi author, R.T Rymbai the distinction of being an island onto themselves. They have animistic beliefs and they draw their incredible nuanced cosmology from Ka Niam Khasi, their religion. They are matrilineal society and boast a complex political life that is deftly woven into their socio-cultural and religious organization. They have a rich oral culture with complex mythology, stories and folklore which is perhaps co-related to the absence of a written script. This absence, as the poet U Soso Tham has suggested strengthened the Khasi reliance on the oral tradition as the primary medium for holding history and cultural knowledge. The Khasi people are composed of several subgroups, the Nongphlang, the Pnars, the Marams and the Bhois scattered geographically across the state, despite sharing the same language and culture, these groups differ across dialects, economy, social and political organization and also ecological history. They possess a distinct political system, that can be described as a democratic monarchy, the Syiem (king) is a democratic head rather than an autocratic monarch. The political organization consists of dorbars a legislative, administrative and juridical body that exists across different scales, from the clan, village, region and state. Apart from being a political body, the dorbar is a moral and religious institution.

The Khasi are also famous for possessing complex knowledge of synergistic architecture. They weave living architecture by braiding tree roots of the Ficus Elastica into architectural structures, like bridges, platforms and stairs. Locally referred to as Jing Kieng Jri, they use these aerial roots to grow bridges that span anywhere from 10-250 ft in length. These bridges take years to grow and over 15-30 years to reach structural maturity. Owning to the mountainous terrain of Meghalaya, Khasi villages are often nestled in small hamlets deep within valleys and across waterfalls subject to ecological disturbance. Such practices of growing architectural structures present incredibly resourceful solutions to the problems stemming from being remotely located with an enduring lack of access to building material. Their origin mythology is replete with allusions to the cosmos, their origin mythology abound with stories of space travel to meet their sister tribes in the sky. Their Khasi cosmology offers compelling narrative accounts of how the tribes settled the earth, entered into kinship relations with the sky, the land, the creatures and other non-human entities. Tales of a tree whose roots sank into the very depths of the earth and whose trunk was so tall that its canopy reached the heavens, a tree that was a celestial stairway for space exploration, arising from the very navel of the earth, called U Lum Sohpetbneng forms the fulcrum of their origin mythology. The story goes something like this:

In a time so long ago, long before any living memory, in the time made of the same material as the memory of ancient stones, a time we call the ancient past, she holds and protects all the days that were once young but have now grown old, that were once new but have now aged. No one has ever seen her, but we all know her. Khasis call her Myndai or Ki Sngi Barim- the days that make up the time long gone.
In that Time everything was bathed in peace and harmony guarded by the Seven Families, who, in answer to the prayers of the Great Spirit of Earth, Ka Ramew, were sent down by God to care for and enter into kinship relations with all living creatures and forces — rivers, trees, animals, flowers, fruit. From their grass-thatched homes (Ki Trep) the Seven (Hynñiew) settled the earth and lived in communion with its song. These Seven Families were, the first clans, the ancestors of all the Khasis today. They are the Hynñiew Trep.

Although they lived on earth, the Hynñiew Trep were space travelers, they were able to visit the other Nine Clans, their sister tribes who lived in the sky. They could do this because there was a tree who acted as a Golden Ladder bridging the space between heaven and earth. It was on the sacred mountain — U Lum Sohpet Bneng — a mountain that stood at the centre of the world and was therefore known as the navel of heaven — u sohpet. This tree was an umbilical cord linking terrestrial beings to their celestial beginnings.

The peace regained or several years until the seven clans to the earth and its creatures, to the land and its rivers and to one another — to Tip Blei, Tip Briew — to know and honour life and non-life and one another other. Swallowed by Greed they no longer saw with the eyes of contentment, no longer revered the might of the great mountains and waterways that protected and fed the green world they lived in. They feverishly took from the earth, refusing to listen to her cries of protest. Finally, exhausted, the earth fell silent. The silent mounting greed churned into the gospel of the axe and they destroyed the celestial tree, their stairway to the cosmos. From that day onwards the Hynñiew Trep never again knew the freedom of being allowed to soar through the skies.

Their cosmology offers a wealth of nuance in considering space exploration's relationship to the environment and climate change. The rationale for space exploration has several recurring themes and perhaps the most compelling of them is ‘motivational in nature’, invoking the allusions that as a species ‘we humans are natural explorers and that space is the next great frontier’. The urgency of space exploration has been cited by the US President’s Science Advisory Committee, in March 1958, in which a report extolled, the compelling urge of man [sic] to explore and to discover as a primary reason to rewrite the territory of the frontier. Could it have also been this same compelling urge that hasten the footsteps of the Leatoli Homo Erectus that charted the species out of Africa, maybe this urge was the wind in the sails that hastened Columbus’ arrival to America, and eventually through the long interconnected arc of history culminated in Armstrong’s historic footstep on the surface of the moon. As Rebecca Solnit reminds us, sometimes it is important to call a thing by its name, and language’s ability to romanticize can cloak narratives of space exploration obscure other motivating forces from military advantage, national prestige, economic clout, international soft power, access to resources and even colonization. In today’s climate though, space colonization is a term that is thrown about without any allusions to the history of past colonial endeavors, it is not concealed under the sleight of hand of language; with its brazen use of the same terminology of previous colonial endeavors in its barefaced use of terms like ‘frontier’, ‘settlement’, ‘conquest’, ‘exploration’, ‘progress’, ‘development’ and ‘discovery’. Such terms carry hegemonic undertones and refer to deeply entrenched colonial attitudes even when the motivations for space travel are more expansive than the language describing it.

The notion of terra nullius, of an empty territory was crucial to the colonial enterprise. Delineating the conquest land, the symbolic object of desire ‘out there’ as terra nullius provided the rationale for colonization. Virgin wilderness, unpeopled, uninhabited and untamed demanded, in the colonial imagination a fertile ground for conquest, swept clean of guilt and brimming with opportunity. Of all the territory that has ever encountered the human imagination, Space is distinct in its qualification for being a pure ‘wilder-ness’, a real ‘terra nullius’ that could perhaps invoke a ‘compelling urge to explore and discover’. Perhaps it is no coincidence then that an overarching zeitgeist of several nationalistic narratives leans towards the conquest of space and by extension its colonization.

It is critical also to explore the relationship between resource extraction and colonization. Colonialization was felled by a desire for economic dominance, it has had a long history of resource extraction and was primarily motivated by an economic agenda. It can be argued that Climate change has a colonial legacy. The attitude of most colonizers was largely to perceive and utilize ‘new’ territories as a virgin and inexhaustible fount of resources, an attitude that was a front runner of the early modern state-making and capitalist development that eventually birthed the current environmental crisis. A rich history of swapping the wildness of the rainforests for the logical of the climate and the extraction of resources for the appetite of industry and empire alike, the near traumatic exploration of slave labour and natural resources alike can traces its provenance to early exploitation colonialism. One can make the argument that the same pattern finds parallels in the newly burgeoning arena of asteroid mining and resource extraction in space colonization. In 2017, a feasibility study by Laszlo Kestay, a research geologist at the U.S.
The gargantuan scale of the present climate crisis, our fast shrinking resource pool and the malthusian swell of human population present us with an uncertain future, we turn our eyes skyward and set our sights on space because our territory is heading towards extinction on earth. In the recent past space colonization has been rapidly transforming from a science fiction trope to a brick and mortar reality, with this transformation immanent, it behooves us to pause and reflect critically on its relationship to climate change, on environmental crisis as a product of colonialism. When one considers that the most marginalized people in the earth’s history, its indigenous people are the survivors of that colonial history, who bear centuries of ancestral knowledge and resilience having lived through the worst consequences of colonization. Their tragic dispossession and acute vulnerability is still a unhealed wound that never healed from the colonial endeavor. If space exploration continues to reproduce and invoke the narratives of its past colonial legacy, there is no-one better to learn from than the communities that have survived colonial occupation, in order to prevent repeating the mistakes of the past. Recognizing the climate crisis’ colonial ancestry and extrapolating it the conquest and future territorialization of space will be critical to breaking history’s vicious cycle. In the Inspiration Mars press conference, Dennis Tito extolled his impatience for space exploration, he said we have “waited long enough. [i]f we don’t seize the moment, we may miss the chance to become a multi-planet species, and sooner or later, humanity will cease to exist. There are always reasons not to do it, we can talk about the cost, the risks, the rationale, Columbus or Magellan would never have left the harbor if they dwelled on these worries. Sometimes you just have to weigh anchor and shove off, and that's what Inspiration Mars is all about” The ‘discovery’ of America by Columbus was no noble act, it was a story of egregious violence, writ in blood, rape, A genocide and ecocide whose ripples still echo in the lived experience of millions today. Now in an era where space exploration still lures the use of terminology like ‘conquest’ and ‘discovery’, it may present an opportune moment to pause and consider how different cosmologies like that of the Khasi, embedded with the knowledge of communion with the the environment as well as a successive failure, and the lessons it imparted can come to act as compasses for future space exploration.

There is a need to ensure that space exploration today include the voices of those historically silenced by their non-participation in the theatre of technology, scientific innovation or nation-hood. For communities who have had such rich cosmologies, who draw their origins from the cosmos but now remain dangerously disenfranchised from endeavors in space, it becomes interesting to consider if devices like myth, ritual and folklore have always been vehicles to make the journey to impossible terrain.

b. Structuring allyship

The primary objective was to develop a method of in-situ conservation through the crowdsourcing of indigenous knowledge and documenting oral histories and ecological knowledge. A combination of factors, the rich cosmology and community’s incredible knowledge of synergistic architecture, my professional practice as a conservator and some acquaintances among the Khasi community were factors that led to the selection of the Khasi community, Pynursula as a case study to situate the research. At the outset of the research, under the advice of Mr. Kyntiewbor War, a respected community elder, eco-museologist, Naturalist, Explorer, Caver, Photographer and collector, we made contact with the Living Bridge Foundation, a nascent organization whose mission is the preservation of existing living root bridges, community development, environment protection, building new bridges and the protection of traditional knowledge practices. The organization is founded and led by Morningstar Khongthaw.

Acutely aware of my position, as an uninvited researcher situated in an elite institution and acknowledging the underlying power relationships that characterized our relationship, I spent several weeks of my limited time in the field trying to establishing a foundation of trust with the community partner, the Living Bridge foundation. Over several semi-structured meetings we were able to agree upon mutual goals for this partnership. The Living Bridge Foundation ideologically contested research that frames them within a deficit discourse, research that is done ‘on


them’ rather than ‘with them’, ensuring them that self representation was a chief motivation for the technology design was a significant first step towards building trust and securing allyship. Engaging with the community with an ‘outside’ project seeking to look ‘inside’, it was crucial to be transparent and communicate clearly my motivations for initiating this work. Although protection and conservation of community knowledge is a goal of the living bridge foundation, systematic digital documentation has not been a priority in their practice which mostly focuses on material conservation, knowledge sharing through workshops, training and community based conservation initiatives. Over a few weeks as a participant observer immersed in conservation activities under the aegis of the living bridge foundations mandate, we arrived at the following mutual goals/guidelines for our partnership

i. Protection and conservation of community knowledge.

The designation of what knowledge is valorized as meriting protection will come from the community, as a researcher I am at liberty to discuss that a certain ritual, practice, story might merit documentation, but the most ideal situation is one in which community members and individuals retain full autonomy.

ii. Collaborative Design Iteration and Decision making

Although the Initial design concept was already in place before working with the living bridge foundation, future iterations would be prompted by a process of collaborative decision making and community feedback. All instances of output, whether it is presentations, papers, demos will be whetted by the community partners. In instances where the research will be presented, the foundation will be invited to speak or make a statement, and the foundation will be consulted in matters of future fundraising as it pertains to the specific research.

iii. Facilitate skill sharing, knowledge transfer and introduction to networks as the research progresses depending on access.

Engaging in research with community’s that have been historically economically disadvantaged can often be one sided, with the benefits accruing to the researcher alone. A long term goal for this research is to ensure that there was a mutual reciprocity in terms of skill sharing and knowledge, and facilitate the shared growth of each other’s networks. For example, during a discussion with the Morningstar, the director of the foundation on how new technologies to be deployed in this context, we discussed inviting synthetic biologists to discuss how genetic modification might enable the evolution of synergistic architecture. I was able to invite a synthetic biologist to begin a cautious and respectful dialogue with the foundation.

iv. Defer to the community partner in practices of community engagement

As experts situated in an intimate relationship with the community and the environment, the research defers to their insight in devising the time, organizing the method of engagement, explaining the principles of free, prior informed consent, collecting information about community members local knowledge, operating within the local context and engaging with political representatives. The partner will advice on the method of consultation with multiple levels of authority within the community, from the individual to the organizational level to adequately seek consent.

v. Defer to local knowledge and the medium of its production

The research defers to the knowledge held by the locals as significant and adopts an attitude of humbling learning from their expertise. It also assumes that intimate knowledge is an embodied entity that inherently resists any documentation, digital or analogue, no matter how comprehensive its objective. By assuming that there are aspects of knowledge held by the community that cannot be communicated, let alone documented, it aims to explore the limits of the documentation method. The research will also treat all data documented horizontally, whether primary or secondary as being equally valid regardless of ‘scientific validation’

vi. Maximize community control over knowledge resources.

The research will seek to develop a method that enables maximum community control over documentation, self representation but also seek to address instances of bias in representation. This is critical to ensure that there is representation from various demographics and marginalized constituencies with the community.

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12 I use this term to refer to the research as an entity that didn’t originate from or wasn’t solicited by community invitation
c. Participatory documentation

What does the term ‘Participatory’ entail when it is used in conjunction with visual and digital methods of inquiry? Gubrium and Harper offer an interesting explanation, “methodologies, approaches or techniques that afford the ‘subject,’ ‘community member’ and/or ‘field site’ greater narrative latitude when it comes to ethnographic knowledge production and a larger role in determining why and how research outcomes are produced by lay and academic audiences alike.’ Participatory methods explored include photovoice, an ethnographic method that has been hugely successful for advocacy, in which people often those who possess limited power as a result of poverty, language barriers, race, class, ethnicity, gender, culture, or other circumstances – use video and/or photo images to capture aspects of their environment and experiences and share them with others and participatory video making or collaborative documentation. (Gubrium, Harper 2016)

We conducted documentation activities across 4 villages, Pynursula, Burma, Riawai and Nongriat. We visited 11 bridges in varying states of maturity and age. Morningstar Khongthow, Shiningstar Khongthow and Boldness Nongum13 conducted the documentation activities, recording practices, co-conducting interviews, documenting bridges, relying oral histories, folk narratives, stories and cosmology. Data was also collected as Audio interviews. During this stage of documentation, we adopted a passive state of involvement, preferring to make space for the community partners voice to emerge through the process. Considering that the Living Bridge Foundation’s headquarters were located in Pynursula, Morningstar and Shiningstar decided to begin with a documentation of the bridges in that geographic vicinity. They also wanted to document various stages of the bridge in terms of maturity. Though their initial impulse was to document existing bridges, over the span of two weeks they quickly shifted gears to incorporate content that focused on building new bridges. Inspired by two ongoing projects that they have within the foundation to build a school for living architecture and a project to build new bridges in the Garo hills, a constituency nearby that does not have a history of building living architecture, they considered shooting a video that explains the ‘how to’ of building living architecture. They also interviewed bridge-builders within the region and these interviews were extremely diverse, speaking about minute shifts in the weather, agricultural techniques as well as its cosmological attributes. There were moments however which merited intervention, to ask them to explain something in greater depth, with questions that asked them to provide more context. It was an interesting experience to watch this process unfold in real time and watch my own response, in trying to mentally sift the data we gathered into my categories. It was a challenge to reflexively preventing myself from performing extractive vivisecting mental maneuvers, and let the logic of my design practice slip away for an organic and directed documentation undertaken largely by the community members themselves. There were instances which demanded pausing, and prompt our

13 The author recognizes the lack of gender and demographic diversity among the documenters as a result of resource and time constraints and hopes to address this in future research.
community partners to document female voices and perspectives. Since the Living Bridge Foundation is an organization that is intrinsically connected to an eco-tourism model of conservation, it merits how much of the documentation was inward facing, for community viewing and protection and how much was generated with the objective of being outward facing, for educating outsiders through self representation of indigenous knowledge.

Fig 3: Morningstar recounts Khasi cosmologies

Fig 4: Documenting community based construction and conservation techniques

Fig 5: User testing of SCRIBE among the living root platforms
The content that was documentation spanned a diverse range of subjects, which are loosely classified for descriptive ease into the following six categories.

It merits mentioning that this categorization is merely for descriptive and illustrative purposes for this paper, and that in actuality the Khasi themselves do not subscribe to the categorization of domains of knowledge as distinct or separate.

6. REFLEXIVITY

a. User testing and feedback

Beta testing of SCRIBE was conducted during fieldwork in January 2020. The tool running a limited number of features was tested on site with our community partners. This round of testing and user feedback will serve as guidelines for future iterations and design development. The testing consisted of a semi structured on boarding with six individuals from the community, where the tool was introduced and guidelines for use were explained. The participants were allowed a few days to interact with the tool of their own volition and then asked to complete two surveys in addition to giving qualitative feedback about SCRIBE. Among the qualitative feedback were responses from the participants who voiced concerns about the ease with which digital content can be plagiarized, altered, and/or removed from context. They voiced the need for further reassurances against misappropriation, a task for the design of the tool to take into consideration. A feature that the participants were pleased with was the established community authentication process, as well as the autonomy with which the community members could take charge of documentation without outside support. The participants mentioned the need for robust security and privacy of data assets. While most of the participants admitted to the value of SCRIBE in providing digital infrastructure to safeguard their heritage, they expressed severe doubts about the long term validity of the process if it failed to deliver/or be supplemented with economic incentive for the community. For vulnerable communities, conservation rarely demands immediate attention and feedback from the participants overwhelming described the need to bolster SCRIBE with an economic incentive.

Of the surveys administered to the participants, the first consisted of questions that inquired after SCRIBE’s success in meeting its desired objectives. The second attempted to excavate the tool’s user interface design using a Human-Computer Interface Framework for testing mobile app usability.

Fig 6: Results of the user testing surveys

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Strongly Agree</th>
<th>Somewhat Agree</th>
<th>Neutral</th>
<th>Somewhat Disagree</th>
<th>Strongly Disagree</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The design of the user interface:</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The user interface must be designed consistently</td>
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<tr>
<td>Design Consistency</td>
<td></td>
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<td></td>
<td></td>
<td>The user interface must be easy for users to remember how to use the mobile phone</td>
</tr>
<tr>
<td>Design memorability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The user interface must be designed for user to learn easily the use of mobile phone</td>
</tr>
<tr>
<td>Usability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The user interface must be organized purposefully, based on clear, consistent models that are apparent and recognizable to others</td>
</tr>
<tr>
<td>Structure principle</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>The user interface must be familiar to users</td>
</tr>
<tr>
<td>Familiarity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The user interface should always keep users informed about what is going on, through appropriate feedback within reasonable time</td>
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<tr>
<td>Validity</td>
<td></td>
<td></td>
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<td>Make simple, common tasks simple to do, communicate simple in the users own language</td>
</tr>
<tr>
<td>Simplicity</td>
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<td></td>
<td>The user interface must keep users informed of actions or interpretations, changes of state or conditions</td>
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<tr>
<td>Interaction Support feedback</td>
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<td>The representation of errors must be clear to users</td>
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<tr>
<td>Error indication</td>
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<td></td>
<td></td>
<td>The system must respond in an appropriate time</td>
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<tr>
<td>Responsiveness</td>
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<td>If the user makes a mistake or the operation is ill, the user must be able to recover from the work</td>
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<tr>
<td>User support recoverability</td>
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<td></td>
<td></td>
<td>The user interface must be flexible so that adapts to various environments and users</td>
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<tr>
<td>Flexibility</td>
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<td>The users must be able to control the system by their own decisions</td>
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<tr>
<td>User control</td>
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<td></td>
<td>The user must be able to modify the interface in order to improve efficiency</td>
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<tr>
<td>Customizability</td>
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<td></td>
<td>The required range of tasks must be accomplished at better-than-average required level of performance</td>
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<tr>
<td>Performance Effectiveness</td>
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<td></td>
<td>The system should be efficient to use on that once the user has located the system, a high level of productivity is possible</td>
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<tr>
<td>Efficiency</td>
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<td></td>
<td></td>
<td></td>
<td>The user interface should be designed to minimize the user's effort for using the system</td>
</tr>
</tbody>
</table>

Fig 6: Results of the user testing surveys
b. Considerations for future iterations

The design of SCRIBE will be subject to further revision and subsequent iterations will incorporate feedback derived from the first round of user testing with the Khasi community. It will be important to consider how to integrate secondary data like GIS information, earth observation data, academic papers seamlessly with the primary data inputted by the communities. Future iterations of the SCRIBE will also need focus on collections analysis and the back end. The documented data will also need to be subjected to a comprehensive analysis, verifying that the originally planned documentation objectives have been met. It will also be supplemented by secondary research from existing documents, audiovisual archives, recordings, books, databases, research theses, file archives, specialized journals, memoirs and the like. The management of the database will be need to be undertaken by trusted professionals and remain easily accessible to community members. It will demand periodic reviews of compliance with requirements for storage, maintenance and control, such as electronic safeguards and restrictions in web-based databases, in order to keep the database or register operational and, ultimately, safeguard indigenous peoples’ and local communities’ interests. We will need to aim to establish, wherever possible technological measures to establish ownership over the documentation, by protecting the documentation against unauthorized access by third parties, securing the content, protecting the database servers and securing the mobile application.

In considering a long term vision for SCRIBE from the perspective of conservation. It should reflect an ideological design structure of conserving fragments that are nonlinear and emergent, in which local events can manifest as global phenomena, spatially organized but disciplinarily coterminous. Rather than viewing data as a unified narrative, the design should enable an unraveling, arranging a set of disparate (data) events that are entropically emergent. Its methodology should speak to a combination of fragments that are put together in such a way that the parts are generative of a dynamic whole. Inspired by the paradigm of a creative conservation, fragments from different moments can be brought together by a designed disturbance, reordered through a creative composition to be generative of new meanings and temporalities constituted on a single digital plane; the present can becomes a binding medium on which to compose the past and the future.

7. CONCLUSION

The reality of Climate Change necessitates a radical re-imagination of previous modes of consumption, extraction and inhabitation and even exploration. As forces of globalization increasingly homogenize us, indigenous cultures remain the last bastions of different ways of being human in this world. There is a powerful need to invoke culture within the role of future space exploration, a powerful need to have diverse voices participate in the imagination of our our collective space future. To include these voices, to make room for these perspectives and to champion these cosmologies forces us to imagine what might an indigenous ethics for space exploration look like?

An indigenous ethics of space exploration can begin to explore a range of issues from de-colonisation, it can begin to provoke nuanced questions regarding the rights of land, rather than the right to land in outer space, a reframing of the inherent rights of autochthonous entities of celestial bodies, whether they are geological or vegetal, life or non life against modes of exploitation might be critical for future space endeavors. Drawing inspiration from indigenous gift economies may provoke future space economies to discard existing modes of articulating capitalist relations for ecological reverent models that use soil and water as a ‘gold standard’. Indigenous ecological thought and frameworks compels us to consider climate justice’s relationship to and space exploration, it may help us articulate ethics and mandates for the ones who leave and those who stay. It may offer a speculative ground to consider the role of non normative bodies in space. Indigenous cultures have a vivid history of Shamans and other journey people whose non-normative bodies and perceptual abilities are predisposed to become voyagers among indigenous communities paves the imagination to conceive of non normative bodies in space, where disabilities can be regarded as serving a unique advantage. These examples merely hint at the types of speculative futures an indigenous lens might inspire. There is a radical dearth of diversity in the representation of human futures in space. Emerging trends like afro-futurism and indigenous futurism in literature suggests the desire for representation of marginalized bodies in space culture. Such projects may well instigate their popularity in the mainstream discourses of future space exploration. There is an increasing need to expand the theater of space exploration’s landscape and art’s capacity for radical provocation as a discipline that is historically possessed with the ability to break new ground presents us with a tool to navigate this tenuous terrain. Indigenous communities have always confronted their barriers of access with symbolic technologies of transcendence, using culture art and ritual as vehicle for space exploration.

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14 The Mohawk artist Skawennati explores indigenous self-representation in media and the construction and narrative of indigenous futures.
7. ACKNOWLEDGEMENTS

Morningstar Khongthow, Shiningstar Khongthow, Mr. War and the Livingbridge Foundation. Zach Lieberman
Dr. Amareswar Galla

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