Sustaining indigenous geographies through world heritage: a study of Uluṟu-Kata Tjuṯa National Park

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Abstract In this article, the author will argue that development of the Uluṟu-Kata Tjuṯa nomination dossier involved collaborations between multiple actors, involved the recognition of indigenous knowledge systems, and resulted in the co-creation of hybrid mapping representations. This empirical research examines data sources like World Heritage dossiers and state/UNESCO correspondence letters held at the UNESCO World Heritage Centre archives in Paris, France and cultural site dossiers archived at the International Council on Memorials and Sites (ICOMOS) in Charenton-le-Pont, France. Actor-network theory informs this research and will act as a heuristic tool for collection, organizing, and analyzing the archival documents. A framework called postcolonial centers of calculation will be introduced to untangle technoscientific processes associated with World Heritage nomination documents. A case study of the Uluṟu-Kata Tjuṯa nomination dossier reveals historical cycles of accumulation geographic information around Uluṟu-Kata Tjuṯa, a strong network of indigenous and state collaborations, and the creation of hybrid geographic representations. The discussion and conclusion section relate this research to sustainability science and indigenous geographies, and suggest future research directions.

Keywords Sustainability science · Indigenous geographies · Actor-network theory · World Heritage · Uluṟu-Kata Tjuṯa

Introduction

The recent nomination and acceptance of the Great Rift Valley Lake System, in Kenya, as a World Heritage site have generated a controversy within the United Nations Educational, Scientific, and Cultural Organization (UNESCO) World Heritage Convention (WHC). One source reports that the World Heritage Convention (WHC) accepted the Great Rift Valley Lake System nomination without consulting the local indigenous population. Demarcation of the new heritage site may have negative impacts on the mobility, economics, and culture of the Endorois people (IWGIA 2012). This action highlights the "urgent need to make the implementation of UNESCO's World Heritage Convention (WHC) consistent with the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)" (UNESCO 2012a). At stake here is the effective and fair co-management of lands, territories, resources, and the sustainability of culture (UNESCO 2012b). In the meantime, scholars and activists are beginning to examine possible collaborations between UNESCO, the WHC, federal governments, state governments, and indigenous people associated with past World Heritage site nominations.

The International Expert Workshop on the World Heritage Convention and Indigenous People took place in Copenhagen, Denmark in September 2012 and addressed issues pertaining to the World Heritage nomination process and the inclusion of indigenous peoples (UNESCO 2012a). A committee of indigenous representatives, scholars, and activists demanded that UNESCO, the WHC, the World Heritage Centre, and State parties recognize principles found within the UNDRIP, recognize indigenous people as rights holders, include indigenous participation at all stages of the WHC nomination process, provide free and prior

informed consent regarding use of territory, and promote indigenous involvement in the co-management, monitoring, and evaluation of World Heritage sites (UNESCO 2012a). The task of implementing these new principles will be difficult because at the time of the workshop, the WHC did not know exactly how many World Heritage sites existed within or nearby traditional territories of indigenous people (UNSR 2012). Participants at the Expert Workshop did discuss nineteen nominated World Heritage sites and three tentative sites associated with indigenous territories (UNESCO 2012a). However, several important sites like Uluṟu-Kata Tjuṯa National Park (Australia), Tongariro National Park (New Zealand), or Cakhokia Mounds National Historical Site (United States), just to mention a few, were missing from the workshop list. As a result, there is an urgent need to conduct a study of UNESCO World Heritage nomination dossiers of properties within or nearby traditional indigenous territories.

The purpose here is to shed light on one recent historical account of collaborations between important actors, some of the materials they used, project goals, and the geographic representations created to support the Uluṟu-Kata Tjuṯa World Heritage nomination. Inscribed to the World Heritage list as a natural site in 1987 and re-inscribed as a mixed cultural and natural site in 1994, Uluṟu-Kata Tjuṯa is an excellent case study to investigate collaborative network-building between federal, state, and indigenous groups during the nomination process. This study can inform UNESCO scholars, activists, sustainability science scholars, and indigenous geographers on postcolonial geographies, reconciliation, and collaboration. Although the UNDRIP influences current World Heritage policy-making, examination of UNDRIP goes beyond the scope of this article.

In this article, the author will argue that development of the Uluṟu-Kata Tjuṯa nomination dossier involved collaborations between multiple actors, involved the recognition of indigenous knowledge systems, and resulted in the co-creation of hybrid mapping representations. The first section will introduce the data sources and methods used in the case study. World Heritage dossiers and state/UNESCO correspondence letters are held at the UNESCO World Heritage Centre archives in Paris, France. Cultural site dossiers are also housed at the International Council on Memorials and Sites (ICOMOS) in the Paris suburb of Charenton-le-Pont. The second section introduces postcolonial centers of calculation as a conceptual framework that combines insights from science and technology studies (STS) and postcolonial indigenous geographies. This framework offers a detailed engagement with postcolonial technoscience processes and reveals the inclusion/exclusion of indigenous participation. Technoscience refers to the social, cultural, and technical contexts of science. STS

rarely engages with indigenous perspectives, but has contributed much to our understanding of science and technology. The postcolonial center of calculation framework is designed to be a hybrid tool for tracing and describing the technoscientific processes. A case study of the Uluṟu-Kata Tjuṯa nomination dossier is found in section three, identifying cycles of accumulation, primary actors, translations, and the processes associated with creating a select group of co-created indigenous mappings present in the dossier. The discussion and conclusion section will relate this research to sustainability science and indigenous geographies, and suggest future research directions.

Data and methods

UNESCO World Heritage nomination dossiers hold good primary and secondary source materials to study and identify the existence of collaborative work and hybrid geographies. Uluṟu-Kata Tjuṯa National Park is an example of a WHC dossier that contains clear evidence that conservation scientists, stakeholders, and indigenous people worked together on management plans, interpretive materials, and geographic representations. However, this may not be the case for all World Heritage nomination dossiers and sites connected with indigenous people living within park boundaries, near the park, or have historical ties to landforms and places within the park. At the moment, it is unknown exactly how many World Heritage sites are associated with Indigenous communities. The dossiers can give us some indication of a nation-state's recognition of Indigenous people, level of participation in co-management efforts with indigenous people, and the presence of hybrid systems that can support the sustainability of cultural landscapes around the world. Studying World Heritage nomination dossiers can help UNESCO and other stakeholders understand the in-between spaces where local people and scientific experts negotiate management plans and resource use.

The Uluṟu-Kata Tjuṯa nomination forms and documentation are filed as dossier number 447 and 447Rev at the World Heritage Centre in Paris, France and the International Council on Monuments and Sites (ICOMOS) Document Centre located just outside of Paris in Charenton-le-Pont. The primary data sources for this research project are World Heritage Site nomination documents. Each nomination file contains, among other things, the following items: description of the property, justification for nomination, plans of management, and administrative arrangements for monitoring the property. Supporting documents include maps, photographs, slides, site management plans, legislation, and other legal instruments. Some documents are for public consumption and are held

on public database websites at the UNESCO archives and ICOMOS. The UNESCO database contains World Heritage site nominations for cultural landscapes and is very organized. Furthermore, the UNESCO archives hold Australian and UNESCO correspondence in bounded folders. The folders and letters are only released to the general public twenty years after the nomination and inscription of a site. This study contains state and UNESCO correspondence letters released in late 2007 and late 2014.

The first task of analyzing postcolonial centers of calculation involves the tracing and documenting the actors and materials associated with the WHC nomination dossier for Uluṟu-Kata Tjuṯa National Park in Australia. The author used actor-network theory as a heuristic tool to guide the collection, organization, and coding of information relevant for tracing mapping actor-networks. Who are the accountable actors? What materials did they use in the construction of maps? What kinds of geographic representations are present in the dossier? Are indigenous actors included or excluded? The second level of data analysis involved the identification of important materials used by the actors to create maps and other geographic representations. Listing all relevant materials was a staggering task. However, this seemingly overwhelming task was overcome by limiting to the analysis to text inscriptions (map documents, GIS manuals, reports, plans of management, articles, letters, memos), technical artifacts (machines, hardware, software), and human beings (skills) (Martin 2000; Callon 1991). Third, the author identified, recorded, and described one important translation associated with co-management and mapping between actors —the Aṉangu knowledge system called Tjukurpa. Translations stabilized the nomination dossier actor-network, allowing the network to extend, and contribute to science and technology travelling from Uluṟu-Kata Tjuṯa National Park to Paris and other locations around the world. The fourth task involved describing processes associated with the creation of hybrid indigenous mappings. Actors made the maps and geographic representations immutable so that they could travel with the dossier to the recipients around the world. The last step involved determining the level of inclusion or exclusion of Indigenous place names, languages, maps, and rights policies within WHC mapping/GIS actor-networks found within the Uluṟu-Kata Tjuṯa nomination dossier.

Postcolonial centers of calculation

The postcolonial centers of calculation concept describe the reach of colonial institutions that go out to the periphery and collect geographic information on indigenous people and their territories (Palmer 2012b). During the age

of European imperialism (15th–20th centuries), most indigenous people resided far away from the European centers. Centers are also important locations within the internal colonialism of settler societies where enclave indigenous lands are often marginal and on the periphery, away from most urban areas. This framework presents a modified version of Bruno Latour's centers of calculation and actor-network theory (Latour 1987) flavored with elements of indigenous geographies and postcolonialism (Turnbull 2000). Here, texts, maps, and GIS created by and for indigenous people are not studied as isolated constructs or as pure indigenous representations. Arguing for indigenous purity would ignore complex heterogeneous mapping processes that become alternative representations. Examining indigenous mapping in isolation would also deny the connections that the texts and maps have with other important World Heritage dossier actors and materials. People, texts, stories, and maps do not act alone here. Rather, they are related through a process called actor-networks (Latour 1987, 2005; Callon 1991). Mapping becomes a form of technoscience tying all the elements to the WHC dossiers together. Elements of technoscience, here, include the cycles of accumulation, the centers, accountable actors, materials, networks, and maps as immutable mobiles.

Cycles of accumulation

Going out and collecting geographic information and knowledge on distant places can give postcolonial centers of calculating a strategic advantage of being able to act on distant places from afar (Latour 1987). One goal of colonial explorers, surveyors, naturalists, resource extractors, and scientists is to bring knowledge of the periphery back to the center (Latour 1987). The processes of collecting, inventorying, and archiving are some of the primary tenets of imperial resource exploration. Latour argued that empires send actors such as naturalists, conservationists, cartographers, geographers, anthropologists, and surveyors out into the world to collect and make initial observations of people, landforms, or natural resources located in far-away places (1987). They write down the information or sketch out maps showing the geography of a place. The process of exploring, observing, collecting, and bringing materials back to the center is known as a cycle of accumulation. There are often multiple cycles of accumulation that is associated with the historical geography of any given nation-state. Each time an expedition goes out and returns, explorers bring back more geographic information that is scientifically mapped and now digitized. Scientific maps and GIS are studied and used to return to the periphery to claim additional natural resources or other materials.

Cycles of accumulation usually involve a two-way exchange of information between the local indigenous population and explorers, but evidence of indigenous participation is often erased from official documents and maps. Historically, colonial expansion and the building of empires resulted in many of the encounters and exchanges that occurred between Indigenous peoples and Europeans around the globe over the past 500 years. Early European explorers gathered information from indigenous peoples on local geography, cultures, and environmental resources to take back to the European or American sponsors who funded their journeys (Latour 1987; Palmer 2012b). Information obtained from indigenous people often led to the creation of scientific maps. However, written records like journals, diaries, and scientific ethnographies detailing the exchange of information between explorers and indigenous people are extremely rare or even non-existent (Lewis 1998). Historically, the mapping of indigenous lands has occurred with or without consent and participation by indigenous people. This kind of erasure and neglect is yet another tenet of imperial resource exploration. Here are examples of the cycles of accumulating geographic information on and from American Indians in the United States:

1. *15th–19th centuries* Early colonial contact and exploration in the American west like Lewis and Clark; using indigenous geographic knowledge to locate resources and passages west (Lewis 1998),
2. *mid-19th century* The Great Surveys of the American West used American Indian knowledge in the development of the US topographic map series (Bartlett 1980),
3. *mid-19th to early 20th centuries* Mapping of reservations and land allotments by the US Bureau of Indian Affairs during the late nineteenth and early twentieth centuries resulting in land dispossession (Palmer 2011),
4. *mid-20th century* Indian land claims and Royce Commission (Lewis 1998),
5. *late 20th–early 21st century* GIS development at the BIA as the most recent cycle of accumulation (Palmer 2012b; Palmer and Rundstrom 2013).

The UNESCO World Heritage dossier nomination process is yet another cycle of accumulation. Are World Heritage nomination processes similar, different in some way, or radically different than past colonial processes?

The construction of scientific knowledge, tied to economic and political systems, gives those in the center an advantage over people, places, and things that are geographically distant. Contemporary scientists construct facts within their laboratories, allowing government officials and natural resource managers to exert a degree of control on the physical environment. The development and implementation of biological surveys, geological surveys, and maps are very important components of the control process. By collecting and processing real-world data, people create virtual maps, models, and simulations, allowing them to experience the physical environment from within the controlled confines of the postcolonial center of calculation. Engagement with models and simulations allows scientists and natural resource managers to mimic techniques the flow of a river or the management of natural resources before experiencing the real thing (Latour 1987).

To summarize, the construction of technoscience is embedded within the historical contexts colonial explorations and mapping known as cycles of accumulation. Geographic information arrives at postcolonial centers of calculation and is turned into scientific maps, management plans, and nomination dossiers. Collection and stability of these materials give the center a distinct advantage over the periphery in terms of planning future explorations or the development of new master plans. The next section addresses the individual components that drive the centering processes including accountable actors, materials, translations, and the creation immutable mobiles.

Actors, translation, and immutable mobiles

Actors at postcolonial centers of calculation mobilize, stabilize, and combine data to create nomination dossiers and supporting documents like maps. In this framework, actors are authors who combine, mix, digitize, and prepare materials to create the new documents, statistical reports, maps, or GIS databases (Callon 1991; Latour 1987). Actors are also mobilizers who put materials into motion. Furthermore, actors can be human or non-human (Latour 1987, 2005). Likewise, within indigenous geographies, non-humans are actors too. Skeptical scientists and resource managers may view non-human actors, like animals or ancestral beings, as elements of competing networks. However, when science and indigenous knowledge complement one another, the networks may become strong and durable like those associated with some UNESCO World Heritage nomination dossiers (combining federal government, state government, indigenous communities, scientists, and technicians). To achieve the goal of nomination, scientists may put their own worldviews aside to accommodate indigenous knowledge, and work toward the larger goal of gaining a World Heritage nomination or successfully acquiring a grant. When reciprocity occurs, agency and power are embedded within networks and collaborative relations, not single individuals or selective worldviews. Scientists and resource managers may not subscribe to these views, but they must respect intangible elements (Rössler 2006) and work with them so that World Heritage nomination processes are successful.

The origin of an actor-network begins as a flow of materials between actors. Materials like maps and texts carry meaning and give networks their shape or typology (Callon 1991; Latour 2005). For example, maps, GIS, or government reports pass between actors and define their relationships with one another (Callon 1991). Actor-networks are a combination of actors and materials (Latour 2005; Martin 2000; Callon 1991). Actor-networks are not autonomous constructions. Much work is required to build and maintain them because agency, power, or the ability to do work is embedded in the networks (Latour 2005). Most importantly, actors need to be aligned with other actors and materials to maintain the stability of the networks through a process called translation. Translation is the process of making two different actors equivalent (Callon 1991). If the translation of goals and objectives does not succeed, it is unlikely that a network will extend and grow stronger. Translation of World Heritage nomination dossiers may involve taking local knowledge out of its context and placing it into a scientific classification scheme and incorporating standards so that new materials and inscriptions can be made combinable. For example, if an Elder sings indigenous geographies, knowledge or information about places may not translate successfully to government officials in a court of law or to members of the World Heritage selection committee, but the mapping of place names found in songs onto topographic maps can be successful (Sparke 1998).

Postcolonial centers of calculation combine past and present materials and construct maps, database layers, tables, and charts (Latour 1987). These materials are known as immutable mobiles (Latour 2011). Once the materials are stable, standardized, and combinable, the information and knowledge produced by anthropologists, geographers, and geologists can be combined with entities such as funding agencies, supranational organizations, academic institutions, or transnational corporations to perform action at a distance (Latour 1987).

But documents, maps and GIS are not a universal as one would think. For example, government agencies around the world map use standard map projections and coordinate systems as the foundation of their maps that can travel from place to place and are readable in the United States, Australia, and Cambodia. However, the individual government agencies, their cartographers, and institutional cultures have particular ways of designing maps and focus on particular types of content. As a result, the immutability of maps and GIS is an illusion, but maps still do work in the world (Kitchin et al. 2007). Yet, locally produced maps become a part of UNESCO's standard nomination process; a supranational organization that stresses universality. This means that there is room for the presentation of indigenous knowledge on World Heritage nomination dossier maps and supporting materials.

The Uluṟu-Kata Tjuṯa mapping actor-network

Cycles of accumulation geographic information on what is now called Uluṟu-Kata Tjuṯa National Park began in the nineteenth century as a series of land dispossessions. The Uluṟu-Kata Tjuṯa World Heritage nomination documents for 1987 and 1994 revealed a history of exploration and surveys in the area. William Gosse and Ernest Giles were the first Europeans to encounter the landforms, naming them Ayers Rock after then Chief Secretary of South Australia Henry Ayers and Mount Olga after Queen Olga of Wertemberg. Uluṟu-Kata Tjuṯa dazzled both explorers laying the foundation for future tourism at the site. Another cycle of accumulation occurred as a period of exploration for pastoral expansion made possible by the construction of the Overland Telegraphy in the 1870s. A third cycle of accumulation occurred in the early twentieth century with the survey and development of reserves to hold Aṉangu speakers, to protect them from contact with white Australians, while acting as spaces of assimilation. Cycle number four took place in 1958 when Uluṟu-Kata Tjuṯa was removed from the South West Reserve and inscribed within the Northern Territory Crown Lands Ordinance. The land status of the area changed to recognize the existence of Ayers Rock—Mount Olga National Park. Early Reserve Board management did not want the Aṉangu people to live within the park (ICOMOS 1994). But this would change during the decade of the 1970s.

The recent history of Aṉangu repossession of land represented a period of increased sustainability of Aṉangu knowledge systems expressed through co-management practices. The process of land repossession began slowly as an Australian federal parliamentary inquiry recommended that Aṉangu sites be protected and that Aṉangu community members receive training as park rangers. This proposition occurred in 1973. By 1979, the Aṉangu made a claim for vacant crown land situated around the park. Although the claim was not recognized because of 'legal technicalities,' Aṉangu traditional ownership of the site was recognized. And in 1983, the Australian Prime Minister announced that the federal government intended to grant title of Uluṟu back to the traditional landowners. This transaction took place in November of 1985 when the Australian government granted a land title of Uluṟu to the traditional owners, who leased the land back to the Director of National Parks and Wildlife to sustain the existence of the park. A Board of Management, made up of primarily Aṉangu community

members, began a co-management agreement with Australian National Parks and Wildlife Service in April of 1986 (ICOMOS 1994).

Australia nominated Uluṟu-Kata Tjuṯa National Park as a UNESCO World Heritage natural site during the eleventh session of the WHC in December 1987 (UNESCO 1987), and re-nominated Uluru again as a cultural landscape site during the eighteenth session of the WHC in December 1994 (UNESCO 1994). In 1993, the official name of the site was changed to Uluṟu-Kata Tjuṯa National Park "to reflect the Aboriginality of the Park and its cultural landscape" (UNESCO 1994; DEST 1994a). In September of 1994, the Australian Department of the Environment, Sport, and Territories World Heritage Branch sent three copies of the nomination dossier to the Australian Embassy who reviewed and sent the dossiers to the World Heritage Centre in Paris, France (DEST 1994b). Australia received a letter from the World Heritage Centre, dated 20 February 1995, formally notifying stakeholders that Uluṟu-Kata Tjuṯa was inscribed as a cultural landscape property by the World Heritage Committee (UNESCO 1995).

Supporting documents and forms within the Uluṟu-Kata Tjuṯa dossier showed that members of the Aṉangu community, living near Uluru, called for greater participation and decision-making regarding the management, protection, and interpretation of the park during the 1994 re-nomination process. Participation also included the co-development of scientific management materials. One of the primary scientific management documents included with the 1994 cultural landscape property dossier was The Uluṟu-Kata Tjuṯa Plan of Management (PoM). The PoM presented a set of objectives to address Aṉangu concerns including (1) inclusion of Aṉangu cultural interpretations of landscape through park management and development, (2) recognition of Aṉangu ecosystem knowledge through park management and visitor interpretation materials, (3) the use Aṉangu landscape mapping and geography for planning purposes, and (4) to support Aṉangu responsibility for their land through decision-making and through park work (Uluṟu-Kata Tjuṯa Board of Management and ANPWS 1991). In addition, the correct Pitjantjatjara orthography was used throughout the PoM.

Actors

The PoM was authored by a network of heterogeneous actors and through the use of materials that formed the foundation of park management by 1994. Major actors such as the Uluṟu-Kata Tjuṯa Board of Management, the Director of the Australian National Parks and Wildlife Service, stakeholders, and Aṉangu community members participated in the revision of the PoM between nomination cycles (Uluṟu-Kata Tjuṯa Board of Management and

ANPWS 1991). At the time, the Uluṟu-Kata Tjuṯa Board of Management consisted of six members nominated by the traditional Aboriginal owners, one member nominated by the Federal Minister responsible for tourism, one member nominated by the Federal Minister responsible for the environment, one ecologist, the Director of National Parks and Wildlife, the Australian National Parks and Wildlife Service, the Mutitjulu Community of Aboriginal people, and traditional owners as defined by the Aboriginal Land Rights (Northern Territory) Act of 1976 (Uluṟu-Kata Tjuṯa Board of Management and ANPWS 1991). Aṉangu involvement included participating in decision-making processes, development planning, staff selection, work programming, planning for public interpretation, and designing training programs. This involvement also included employment of minyma pampa (old women) and tjilpi (old men) as full-time rangers and park employees (Uluṟu-Kata Tjuṯa Board of Management and ANPWS 1991). Another significant actor was the Commonwealth Scientific and Industrial Research Organization (CSIRO). CSIRO was Australia's national scientific agency, and the leader of an ecological survey of Uluṟu-Kata Tjuṯa (1987–1990) that was an element of the dossier. CSIRO scientists authored a monograph entitled, Uluru Fauna: The Distribution and Abundance of Vertebrate Fauna of Uluru National Park in 1993. The monograph included a chapter on Aṉangu knowledge of vertebrates and the environment (Reid et al. 1993).

Translating Tjukurpa

Assembling materials and documents to support the nomination of Uluṟu-Kata Tjuṯa as a UNESCO World Heritage cultural landscape site required collaboration with the Aṉangu people and translation of their knowledge systems. Making the translation successful between stakeholders and the Australian government was important because the World Heritage Convention gives states the power within the United Nations organizational structure, which makes states "impossible to bypass or dislodge (whether one is talking about human rights or heritage rights)" (Meskell 2014). The Australian state recognized indigenous rights through the development and implementation of its own treaties and rights; most beneficial for cultivating state and Indigenous relations in Australia. The dossier materials often made reference to Australia's policies on the rights of indigenous people, their impact on the nomination process, and helped define the dossier actor-network. For example, the Aboriginal Land Rights (Northern Territory) Act 1976 gave the traditional owners of the land the legal right to claim unalienated land held by the crown, but held in trust by the Australian government. The Aboriginal Land Rights (Northern Territory)

Amendment Act 1985 and National Parks and Wildlife Conservation Amendment Act of 1985 enabled Uluru National Park to be granted as inalienable freehold land to the Uluru-Kata Tjuta Land Trust, and set in place the new procedures necessary to establish the Board to manage the Park in conjunction with the Director. And finally, a lease agreement negotiated among the Uluru-Kata Tjuta Land Trust and the Director of National Parks resulted in an annual rental of $75,000 and 20 % of the entrance fees going to the traditional owners (Uluru-Kata Tjuta Board of Management and ANPWS 1991).

The Uluru-Kata Tjuta dossier and *PoM* held information on the Anangu worldview called Tjukurpa. Translation of alternative knowledge like Tjukurpa was important for moving the cultural landscape nomination forward and was also important for maintaining the sustainability of human and natural systems in Australia. Tjukurpa was a way of putting Anangu knowledge into practice, keeping the knowledge functional while sharing an alternative view of Uluru-Kata Tjuta to scientists and the general public. Throughout *PoM* Tjukurpa, the Australian government and indigenous rights holders translated Tjukurpa as an indigenous philosophy that advocated for collective responsibility for the earth. The Tjukurpa philosophy provided the Anangu people with answers to questions such as the origin of things, the meaning of things, and how to live responsibly on the land (Uluru-Kata Tjuta Board of Management and ANPWS 1991).

> "When Anangu speak of the many natural features within Uluru National Park, their interpretations and explanations of these features are expressed in terms of the activities of particular Tjukurpa beings rather than by reference to geological or other types of explanation… In traditional terms therefore, Anangu speak of the meaning of the Park, not just what shapes its surface features take" (Tjikatu et al. N.D.).

The Anangu people transmitted knowledge of the land and ancestral beings orally through songs, art, myths, and origin stories (Creagh 1991), While Anangu knowledge holders encouraged young Anangu to listen closely to oral stories in order to understand the details embedded within Tjukurpa (Tjikatu et al. N.D.). As one's knowledge increased, so did Anangu responsibility for the land. Thus, caring for the land was another major tenet of Tjukurpa, not a separate concept, but one that related the ancestors and the community members with one another, or in the terminology of this research, an actor-network. Everything was related to the land.

> "For Anangu, that physical feature, whatever its form, animate or inanimate, is the Tjukurpa: it may be a sand hill, an area prone to flooding, a rocky outcrop, a grove of trees or a regularly lush clump of harvestable plants. For all of these, the creative essence remains forever within the physical form" (Uluru-Kata Tjuta Board of Management and ANPWS 1991).

Likewise, the *PoM*, Uluru Fauna: The Distribution and Abundance of Vertebrate Fauna of Uluru National Park, and other publications showed relatedness between conservation science and Tjukurpa. Although Uluru-Kata Tjuta consisted, at one level, of rock formations, Tjukurpa recognized the entire landscape as being animate and significant. For example, all plants and animals owed their existence to Tjukurpa. But in a similar way, conservation scientists understood relations between plants, animals, and habitats, all components of Tjukurpa, too. Anangu community members applied their knowledge of the land to everyday activities such as the gathering of food, hunting, and place-based ceremonies. It was the direct interaction or engagement with the land that helped teach the principles of Tjukurpa, leading to responsibilities to protect the land and water (Uluru-Kata Tjuta Board of Management and ANPWS 1991). The Uluru-Kata Tjuta dossier was an example of technoscience shaped by encounters and exchanges between Anangu knowledge holders (Creagh 1991) and the translation of Tjukurpa.

Immutable mobiles

CSIRO reports, monographs, and publications found within the dossier revealed that the combination of Anangu local knowledge with biological science was the foundation of a CSIRO fauna survey at Uluru-Kata Tjuta "conducted from September 1987 to March 1990" (Reid et al. 1993). The aim of the study was to gather information about the functional processes associated with the environment around Uluru-Kata Tjuta, and vertebrate fauna (Reid et al. 1993). One of the primary goals of the survey was to bridge Anangu and scientific knowledge of sustainable ecological processes. The ecological knowledge held by scientists connected with some of the principles of Tjukurpa regarding human responsibilities for the land. In fact, Anangu knowledge of the local fauna was vital to the success of the survey and to the scientist's knowledge about the distribution of species (Creagh 1991). For example,

> "Dr. Peter Bridgewater, Director of ANPWS and thus the overall manager of Uluru National Park, regards the fauna survey as a 'terrific combination of Aboriginal knowledge and scientific investigation… He says melding of Anangu knowledge and science provides a fantastic model for future management" (Creagh 1991).

An actor-network of Aṉangu knowledge holders and conservations scientists successfully translated and formed important relationships between their respective classification systems for the identification of fauna and associated landscape features. For example, the Aṉangu classification system appeared to animate the landscape referring to red kangaroo (malu) habitat or places where red kangaroos prefer to inhabit. Malu habitat was classified as being open, having persistent winds, relatively moist soils, green vegetation, and the absence of prickles, all based on malu preferences. Scientific classification of malu habitat was referred to as alluvial fans and deposits. Overall, Uluru-Kata Tjuta included six habitat type recognized within the Aṉangu classification system. These included the "Kata Tjuta monoliths (puli in Pitjantjatjara); flat, sometimes stony rainfall run-off fans and alluvial deposits (puti); mulga (wanari); transitional, flat to undulating plains dominated by spinifex (pila); sandy landscapes supporting a plant community of spinifex and shrubs (tali); and mallee" (Creagh 1991). These collaborations were the result of successful translations between Aṉangu knowledge holders and scientists. Thus, localized, hybrid knowledge made its way into the *PoM* and into the Uluru-Kata Tjuta cultural landscape nomination in 1994.

Aṉangu geographic knowledge was an important component of the dossier actor-network. Tjukurpa referred to all of the travels and trails left by Aṉangu ancestors. Uluru-Kata Tjuta's connections with other sites in the world could be traced through the many ancestral travels that converged at the site (Uluru-Kata Tjuta Board of Management and ANPWS 1991). The *PoM* revealed that Uluru and Kata Tjuta was a part of an extensive network connecting important sites. The web connecting the sites consisted of old iwara (tracks) created by Aṉangu ancestors as they travelled across the landscape.

> "Uluru National Park forms part of a much larger network of sites and the iwara (the physical parts over which ancestral beings traverse the land) the connect them. It is important that planning in the Park take into account the Aṉangu perception that, through these linkages, areas in the Park derive their meaning from, and contribute meaning to, locations outside the Park. These connections with other locations form an integral part of the way in which Aṉangu 'map' the landscape of the Park which, in turn, has implications for their decisions about areas within the Park and the relationships they wish to maintain strongly with the entire Western Desert area" (Uluru-Kata Tjuta Board of Management and ANPWS 1991).

Mapping as a travel narrative was an Aṉangu geographic information system. Aṉangu mapping and scientific mapping come together in the dossier materials as

hybrid constructs, and this condition was added by early successes, between actors, to translate and stabilize actor-networks like the biological survey.

The first set of hybrid representations included maps. Two important place-name maps appeared in the Uluru-Kata Tjuta dossier. The maps found within the *PoM* included Aṉangu place names. Both of the maps are also included in other dossier documents and also the Aboriginal Culture of Uluru-Kata Tjuta National Park, Tour Operator Workbook. The first map is entitled, 'Some Aṉangu Place Names at Uluru' and contains twenty-three names with simple lines connecting the names with approximate locations (Fig. 1). The Aṉangu ancestors Mala, Kuniya, and Liru created Uluru and the surrounding cultural landscape. All of the Aṉangu place names gave the site meaning by connecting with the ancestors, their stories, and travel paths. In addition, the map was framed as a scientific cartographic representation, complete with a 2 km scale bar, north arrow, and a polygon representing Uluru. A second map entitled, 'Some Aṉangu place names at Kata Tjuta' contained six names and was represented as a more secretive male site (Fig. 2). It too contained a 2 km scale bar, north arrow, and several individual polygons representing the geography of Kata Tjuta. The Aṉangu place-name maps were prominent features displayed in the nomination dossier.

The second hybrid representations included oblique maps and Aṉangu travel narratives. A workshop brought Aṉangu community members together with conservation scientists with the purpose of forming trust relations and to develop materials that would express Aṉangu worldviews alongside those of science. The workshop focused on designing an interpretive guide called the Liru Walk and Mala Walk (Tjikatu et al. N.D.) (Fig. 3). These interpretative guides contained publicly accessible Aṉangu geographic knowledge about Uluru-Kata Tjuta. However, there was much that Aṉangu knowledge holders did not reveal about Tjukurpa and the landforms because it was proprietary. Some of the Tjukurpa teachings contained knowledge only accessible to men or only accessible to women. Other Important areas associated with ancestral tracks and ceremonies were fenced off to restrict unwelcome access to several culturally important sites (Uluru-Kata Tjuta Board of Management and ANPWS 1991 23). The self-guided tour brochure called An Insight into Uluru: The Mala Walk and the Mutitjulu Walk contained three important geographic representations of Uluru. First, the Mala and Mutitjulu stories, second, oblique maps of Uluru connecting the stories with locations on and around Uluru, and third, the inclusion of map that contained numbers associated with locations around Uluru mentioned in the Mala and Mutitjulu stories. Presumably, the travel geography oriented the visitors in the direction of significant

Fig. 1 Uluru place-name map. *Source* Aboriginal Culture of Uluru-Kata Tjuta National Park, Tour Operator Workbook, World Heritage Dossier 447 rev, Austalie, Parc National d'Uluru-Kata Tjuta, ICOMOS Document Centre, Paris, France
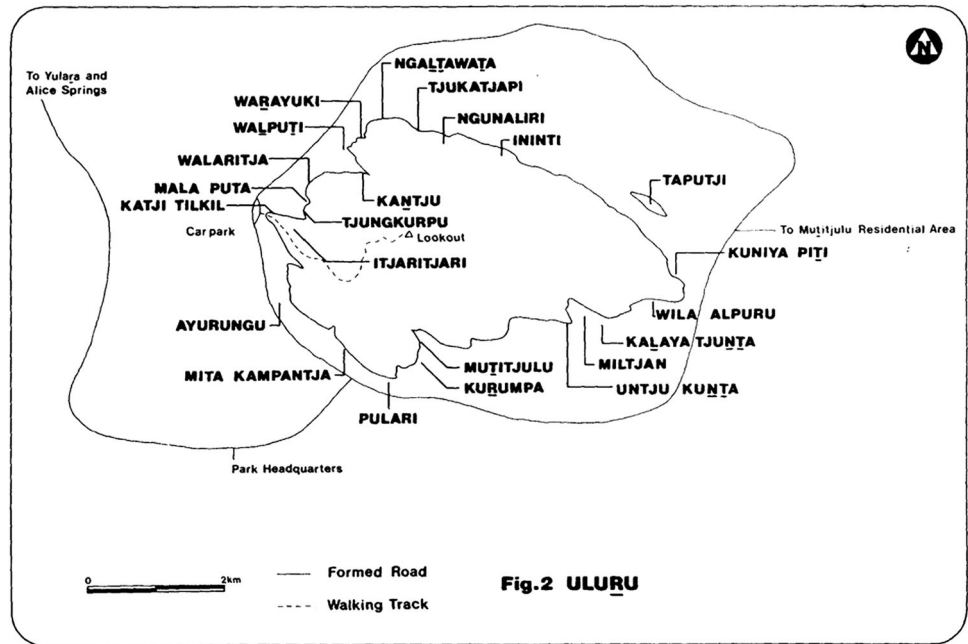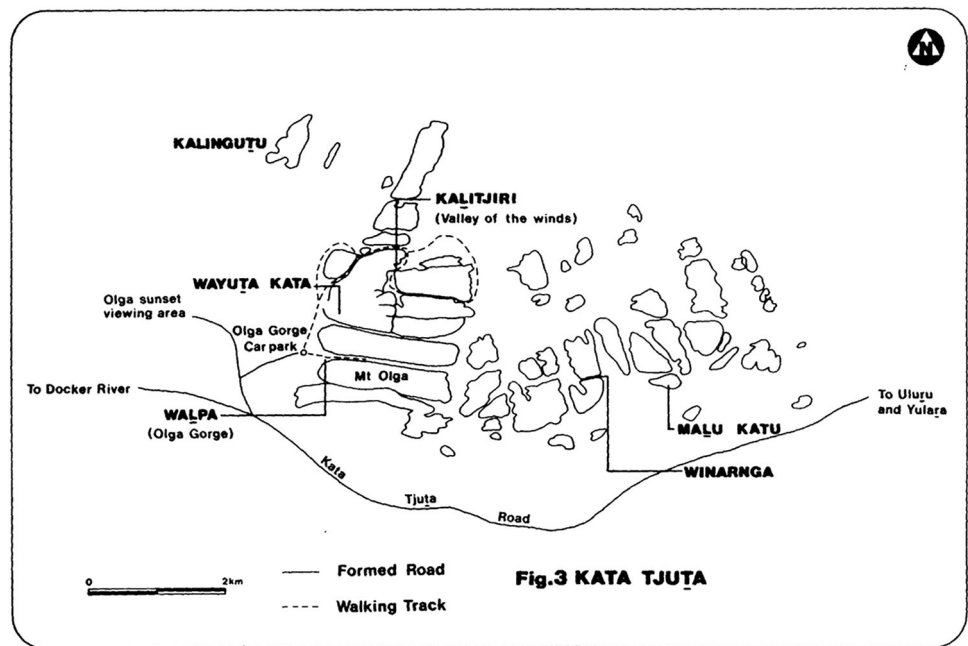

Fig. 2 Kata Tjuta place-name map. *Source* Aboriginal Culture of Uluru-Kata Tjuta National Park, Tour Operator Workbook, World Heritage Dossier 447 rev, Australie, Parc National d'Uluru-Kata Tjuta, ICOMOS Document Centre, Paris, France

cultural sites as well as guiding visitors through story geographies of the Anangu traditional owners.

Discussion and conclusion

This research has attempted to combine ideas from STS and indigenous geographies to inform sustainability science scholars on UNESCO World Heritage mapping processes. As time goes on, scholars will find that there are many ways to engage with sustainability science and accompanying research. Perhaps the early stages of research should examine the processes that contribute to successful sustainable systems. One processual framework has been presented in this article. Postcolonial technoscience was useful for examining the historical cycles of accumulating geographic information on indigenous people, major actors involved, some to the materials they used, and the maps and geographic representations they created. As a case study, the Uluru-Kata Tjuta nomination dossier held

Fig. 3 The Mutitjulu Walk
oblique view map. *Source* An
Insight into Uluru: The Mala
Walk and The Mutitjulu Walk,
World Heritage Dossier 447 rev,
Australie, Parc National
d'Uluru-Kata Tjuta, ICOMOS
Document Centre, Paris France
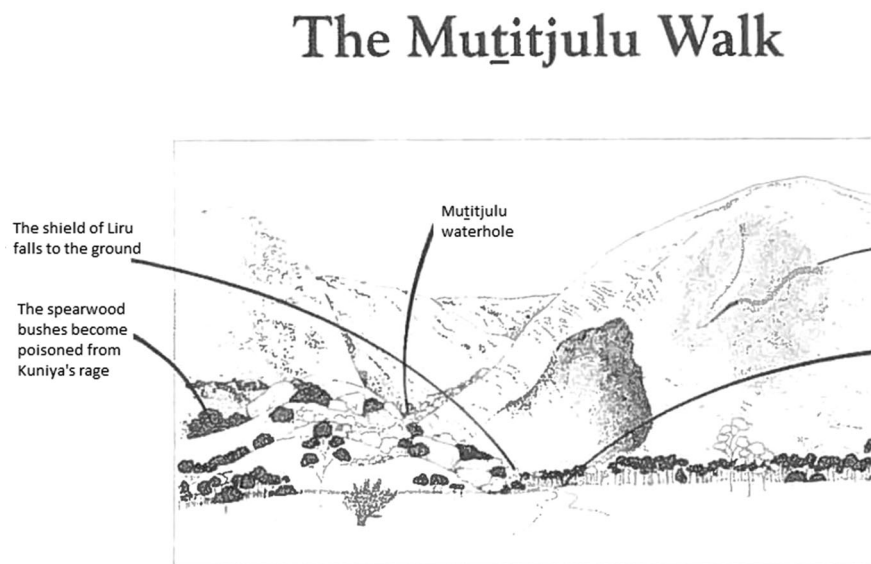
important archival documents that showed proof that sustainable collaborations have occurred between indigenous knowledge holders, scientist, and state actors in relation to the UNESCO world heritage convention. Documents found in the dossier, including maps and geographic information systems and government documents did not stand alone in isolation, but rather were a part of a durable, heterogeneous actor-network.

This research informs an emerging debate on sustainability science in the context of UNESCO stresses the importance of indigenous participation at UNESCO designated sites including World Heritage properties (Arico 2014; Kauffman and Arico 2014). At present, "sustainability science research is seeking to support the integrative task of managing particular places where multiple efforts to meet multiple human needs interact with multiple life-support systems in highly complex and often unexpected ways" (Clark 2007, 1737). UNESCO is aware of the global challenge of implementing sustainability science, dealing with multiple approaches, diverse epistemologies, ontologies, and knowledge systems that can inform processes like the nomination of World Heritage sites around the world. UNESCO hosted a symposium dedicated to addressing the need to 'interconnect' and 'interface' between science, society, and policy and reach out across geographic and disciplinary boundaries in the development of sustainability science (Kauffman 2014). Sustaining effective and fair co-management, as shown at Uluru-Kata Tjuta, within the UNESCO World Heritage nomination process will require an acceptance of plurality and the implementation of nomination processes that contain indigenous languages, story maps, and travel narratives combined with resource management plans, scientific cartography, and geographic information systems (GIS). UNESCO has been

encountering hybrid forms of knowledge and practice for years; a process recently referred to as hybridizing sustainability (Benessia et al. 2012). Sustainability science scholars are witnessing at very least an intellectual transformation and possibly a paradigm shift (Martens 2006).

The author has tried to show the processes associated with what might be called postcolonial technoscience and mapping. The findings should be of particular interest to scholars of indigenous geographies who engage with postcolonial theory (Coombes et al. 2012) to address spaces of mobilization (Blunt and McEwan 2002; Gombay 2012; Radcliffe 2012), alliance building (Barker and Pickerill 2012; Morgensen 2011), reconciliation and collaboration (Johnstone 2007; Pickerill 2009; Howitt 2010; Lloyd et al. 2012; Nakamura 2012; Brugnach and Ingram 2012), and the creation hybrid indigenous spaces (Pieris 2012; Short 2011; James 2012). Understanding indigenous mapping processes and the use of geospatial technologies is very congruent with the geographic requirements of the World Heritage nomination process. As this study shows, when indigenous people are included in the nomination process there are opportunities to include indigenous ways of mapping out dwelling spaces (Roth 2009), supporting critical cartographic literacies within Indigenous communities (Johnson et al. 2005), and creating innovative place-based indigenous mapping (Pearce and Louis 2008).

Like the UNESCO World Heritage process, the mapping of indigenous land by or for indigenous people in Asia, Australia, New Zealand, Africa, Latin America, and North America (Chapin et al. 2005) is a global phenomenon. And ultimately, when cultures come together, new constructs are created like hybrid indigital geographic information networks (Palmer 2012a) and mapping centers of calculation (Palmer 2012b). The Hi'iaka Working Group (2011)

outlined a research agenda that focused on new ways of combining Western technologies with indigenous knowledge systems. The Group made the recommendation for increasing case study research and providing more empirical evidence to support existing theories. The case study of the Uluṟu-Kata Tjuṯa nomination dossier provides empirical evidence and links research on sustainability science, UNESCO, and indigenous geographies.

Construction of the Uluṟu-Kata Tjuṯa dossier actor-network is a good example of alliance building, collaborative work, and hybrid geography. All in all, mapping and geographic information system processes associated with the dossier show indigenous participation as well as elements of one indigenous knowledge system. Anangu knowledge holders actively participated in the development of co-management policies and public materials. The collaboration and reconciliation expressed in this study were refreshing when compared to other indigenous/settler colony mapping projects. For example, the United States Bureau of Indian Affairs lacked indigenous participation in the development of their in-house GIS. And while the nomination dossier process represented yet another cycle of accumulating geographic information on indigenous peoples, it also represented a departure from past mapping activities that did not give indigenous informants credit for their contributions. In addition, indigenous geographies were present and very visible within the dossier materials.

And finally, the study provides some proof that the demands of the indigenous expert panel, expressed in Copenhagen Denmark in 2012, can be achieved. This research has shown that UNESCO world heritage nomination process in Australia did recognize indigenous people as rights holders, did include indigenous participation throughout the nomination process, provided informed consent regarding use of the territory and promoted indigenous co-management at Uluṟu-Kata Tjuṯa National Park. Such collaborations provide evidence that the geographies of hope can indeed emerge within postcolonial landscapes. The Australian variety of collaboration between state parties in indigenous people may not be universal. In fact, such collaborations may be the exception. The UNESCO world heritage nomination process gives much power to state parties. It is from the postcolonial centers of calculation located within nation-states where actor-networks and collaborations including indigenous people may occur. If states do not recognize the existence of indigenous peoples within their territorial boundaries or make claims that they do not understand the definition of indigenous people as applied to their particular countries, then it is highly unlikely that demands presented by the expert panel in Copenhagen or the UNDRIP will be implemented in future world heritage nominations.

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