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On Material Engagement with Nature: Reviewing the Construction of Diasporic Space

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Abstract

With the acceleration of globalization, studies in diaspora have increasingly absorbed geographic ideas. Research on the relationship between nature and humankind has thrown new light on discussions of diaspora. However, there are few in-depth studies addressing the construction of diasporic space in relation to the materiality of the natural world. Considering the relative absence of the natural environment as a serious subject in contemporary diaspora studies, the starting point of this article is to review the implicit understandings of the natural world in diaspora research (Clifford: *Diasporas*; Brah: *Cartographies of diaspora*; Gittins: *The diggers from China*; Ma and Cartier: *The Chinese diaspora*). This article attempts to explore the connections between diasporic experiences and the living natural

environment, as presented in previous theoretical writings (James Clifford, Avtar Brah, Rod Giblett) and case studies (Anna Tsing and Cruse Beryl etc.), most notably those focusing on the relationships between space, place and people.

However, in most of the existing works, diasporic-related concepts of nature, place, and space are abstractions and generalizations. In this article, I suggest that specific embodied and material engagement with the natural environment needs to be factored into notions of diasporic space. Through analyzing the cases of the matsutake mushroom in the United States and the abalone in Australia, this article argues that "diasporic space" is an ecocultural construction comprising cultural spaces and natural places, and related to a range of diasporic social practices and human experiences in different natural environments. Diasporic space is both cultural and natural, both abstract and material.

Introduction

"Mr Chau 'fell in love with Perth at once.' He liked its spacious streets, its bright shops, its beautiful gardens and its meandering

river, its tempo"[1]. These lines describe the first impression that Perth's natural environment made on a new Chinese arrival. Indeed, wherever a person migrates, there is always something natural attracting him, touching him, changing him, and communicating with him. This something in nature may be as large as a mountain or as tiny as a seed; it possesses vital importance in the formation of the migrant's new living space and the relocation of his traditional cultural values. It is clear from the above quote that a new space for diaspora is constructed at the intersection of the cultural space and the natural place, despite the relationships between nature and human beings being given only peripheral attention in paradigmatic studies in diaspora (including research into transnational identities, hybridity, attachment to motherland, and social contexts of diaspora).

With respect to contemporary research into "diasporic space", there is a need for further research into the relationships between the natural environment and diasporic groups, particularly within the frameworks of cultural space articulated by cultural studies and natural place as theorized by the environmental humanities. This is the starting point for this article in its investigation of nature's influence on the establishment of a diasporic space. The approach used in this article is to review cross-disciplinary theories to develop a definition of diasporic space that includes

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[1]"Chinese Likes 'Us Blokes'." *The Daily News* (Perth: The Daily News, Saturday 28 October 1944), 29.

material engagements with the natural world. Clifford's "travelling culture" theory opens a door to a broader framework of diasporic research, in which diasporic identities and cultures are no longer exclusively studied within nation-state boundaries, and places are not regarded as static geographic areas but the dynamic sites of spatial practices. Therefore, his theory articulates the concept of "diaspora space" [*sic*] as observed by Brah in which a site encompasses the dialectic identities of both the diasporans and the "natives"[2]. In regard to natural environment, this article will absorb Ma's geographic ideas of space and place in the view of diaspora while borrowing the concept of cultural studies of nature posited by Giblett, which is regarded as a fundamental perspective to explore the synthesis of the natural world with diasporic space. Moreover, the distinctive human-nature work of Tsing invites a comprehensive understanding of diasporic space constructed by cultural, historical, economic, social and also natural influences.

In contrast to the absence of nature in mainstream diasporic studies, some significant research into diaspora, particularly the Chinese diaspora, has pointed to an interest in landscape modification in the hostland by the diaspora. In particular, Chinese market gardening and gold mining have been outlined in the historical research into early Chinese immigrant

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[2]Avtar Brah, *Cartographies of Diaspora: Contesting Identities* (London and New York:

Routledge, 1996), 209

experiences in North America or Australia[3]. However, recent studies have not contributed nuanced views of the relationships between humankind and the natural world in the reconstruction of the vocabulary of diasporic space. This article will attempt to articulate the profound influence of the natural environment on the establishment of diasporic space through the case analysis of abalone fishing by the Chinese diaspora in Australia. Not limited to the notion of spatial networks linking homeland and hostland, diasporic space involves both cultural space and natural place. The cultural space includes facets such as cultural traditions, transnational identities and local cultural experiences while the natural environment is the material, embodied place involving humans' livelihood practices.

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[3]Marilyn Dawsor, "Gardening: Chinese Vegetables Successful." *The Globe and Mail* (Apr 22, 1982): T.8.

Jean Gittins, *The Diggers from China: The Story of Chinese on the Goldfields* (Melbourne: Quartet Books Australia, 1981).

Tom Maccubbin, "Flavors from the Far East Exotic Veggies Find a Home in Local Gardens." *Orlando Sentinel* (Nov 17, 1990): G15.

Barry McGowan, "Chinese Market Gardens in Southern and Western New South Wales." *Australian Humanities Review*, no. 36 (2005), http://www.australianhumanitiesreview.org/archive/Issue-July-2005/10McGowan.html.

Jan Ryan, *Ancestors: Chinese in Colonial Australia* (South Fremantle: Fremantle Arts Center Press, 1995).

Diasporic Space and Natural places

The word "diaspora", stemming from the Greek words "*speiro*" (sow) and "*dia*" (over), referred to migration and colonization in Ancient Greek thought[4]. In the histories of earlier diasporic movements, such as those of Jews, Africans, and Palestinians, the term encompasses ethnic exile and collective nostalgia for mother countries. However, in recent transnational studies, diaspora is also applied to the people who voluntarily migrate in globally spatial flows, with no colonizing purposes or other reasons, such as fleeing persecution. Accordingly, diaspora is studied variously as "a process, a group of people, a geographic area and a spatial network"[5].

It is widely accepted by geographers and many other researchers that space and place are the pivotal concepts in the understandings of the ideas of diaspora. Following Harvey, Relph, Massey, and Silverstone, Barker[6]argues that in contemporary social and cultural studies, the absence (relations between absent others)-presence (face to face) distinction between space and place is rigid. Instead, "space and time constitute each other" in which human interaction is infused with

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[4]Robin Cohen, *Global Diasporas: An Introduction* (Florence: Routledge, 1987), ix.

[5]Laurence J. C. Ma and Carolyn Cartier, eds., *The Chinese Diaspora: Space, Place, Mobility and Identity* (Lanham: Rowman & Littlefield Publishers, 2003),7.

[6]Chris Barker, *Cultural Studies: Theory and Practice* (London: Sage Publications, 2003), 347-350

various social meanings. Meanwhile, the places are not only geographical locations but also focal points of "human experience, memory, desire and identity". From the perspective of human experience, Tuan argues that "place is security, space is freedom: we are attached to the one and long for the other"[7]. Thus, despite its conceptual incompleteness in diaspora research, a diasporic space is a "place-centered and network-based" space[8]. Echoing Clifford's argument for "culture as a site of travel", Brah[9]claims that "diaspora space" is an "inhabited" site in which a diasporan is constructed and represented as indigenous. The cultural point of "place", for Giblett, is not so much the geographic meaning, as it is about nature, which is a cultural construction involving "biological processes that make life and culture possible"[10]. Intertwining the existing concepts of diasporic space with the notion of culture of nature, a diasporic space can be understood as both a conceptual space and a material place hybridising culture and nature.

Although close relationships between diaspora and nature have not been figured into the theorisation of diasporic space, some implicit descriptions lie in varied relevant studies. One

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[7]Yi-Fu Tuan, *Space and Place: The Perspective of Experience* (London: Edward Arnold,1977),3.

[8]Ma and Cartier, eds., *The Chinese Diaspora: Space, Place, Mobility and Identity*,9.

[9]Brah, *Cartographies of Diaspora,* 208-209.

[10]Rod Giblett, "Nature Is Ordinary Too." *Cultural Studies* 26, no. 1 (2012), 12.

established principle is the idea of space and place in the application of diaspora research. Even though Clifford does not explicitly discuss the notions of "place" and "space", in terms of spatiotemporal practices, he distinguishes diaspora from travel, which he defines as a practice only undertaken in a short period. Diaspora "involves dwelling, maintaining communities, having collective homes away from home"[11]. In addition, he argues that diaspora has a dialectic relationship with "the norms of nation-states", the "indigenous", and the "especially autochthonous"[12]. The terms of dwelling, home, indigenous, and autochthonous implicitly point to the context of the natural world.

Another indication of the relationships between nature and diaspora comes from Clifford's research into specific diasporic groups. While discussing diaspora's resistance to the hostland, he refers to the examples of "anti-Zionist Jewish writing" and the "religion of the land" in Jewish tradition[13]. He states that autochthonous people "stress continuity of habitation, aboriginality, and often a 'natural' connection to the land", which contrast to the considerable practices of travel and settlement of diaspora[14]. The influence of the natural world does

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[11] James Clifford, "Diasporas." *Cultural Anthropology* 9, no. 3 (1994), 308.

[12] Clifford, "Diasporas", 307.

[13] Clifford, "Diasporas", 307.

[14] Clifford, "Diasporas", 307.

not appear in his discussion, yet it is vividly implied through the concepts of land, habitation, and aboriginality.

Similarly, as a geographer, Ma integrates geographic principles into research on Chinese diaspora. He contends that geography means "dynamic spatial and place-based processes"[15]. For Ma:

> Diasporas are functional spaces, characterized by the movement of people, capital, goods and information between homeland and hostland or among the places where a diasporic population is settled. A diasporic place is a located context for spatial interaction, and various interconnected places give rise to a diasporic activity space.[16]

His definition implies an interconnection between motherland and "settleland". The natural world is a part of both motherland and settleland, and influences the construction of human memory, experience and desire. Indeed, these relationships between diaspora and the natural world are the precise foundation for diasporic processes, peoples and spaces. Yet, the natural environment has been largely left out of diasporic research (although implicit references to nature do exist in

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[15]Ma and Cartier, eds., *The Chinese Diaspora: Space, Place, Mobility and Identity*,7.

[16]Ma and Cartier, eds., *The Chinese Diaspora: Space, Place, Mobility and Identity*,8.

various forms, as I have shown), and has largely been overshadowed by abstractions of space and place.

A further example is in Brah's work *Cartographies of Diaspora*. For Brah, who has had 'homes' in Asia, Africa, America, and Europe, the key point for the understanding of diaspora and "diaspora space" is politics. Despite the absence of the idea of the natural world in her new concept of "diaspora space", she outlines her memories of home in Uganda with a detailed description of nature:

> The hours spent as a child combing the Shamba at Naviwumbi; monitoring with incredible patience every detail of the metamorphosis of a pond of tadpoles into frogs; playing in the warm rain that would begin to beat down in huge bursts, quite out of the blue, and dry up just as suddenly; the aroma of the red soil after the first rain drops, and the sheer pleasure of climbing trees to pick mangoes or jamuns; the gentle murmur of the Nile as it springs out of Lake Victoria; journeys through the lush green forest lining the road from Jinja (my hometown) to Kampala; the trials and tribulations, as well as the joys, of

adolescence…all this and much more was part of
my very being.[17]

She regards these memories as an important part of the political
character of "nation", one of the driving forces to construct "the
multiaxiality of power"[18]. However, the diasporan's sense of the
natural environment, not only contributing to the formation of
politics of location, but also having profound influence on
everyday practice in both homeland and hostland, is essential for
distinguishing a diasporic space.

Other examples that support the argument of the implicit
influence of the natural world in diasporic space can be seen
from some studies of diasporic Chinese. Since the beginning of
the nineteenth century, escaping from wars or poverty, Chinese
laborers (also known as Coolies) and tradesmen immigrated to
almost every continent of the world in search of a better life.
"Mining was still their main pursuit but thousands of other
Chinese were laundrymen, hotel cooks, fishmongers, furniture
makers, and pastoral workers"[19]. Gittins depicts the general
living conditions of the Chinese diggers in the Australian
goldfields. Besides a complete difference in physical
appearances from Europeans, particularly in relation to diet and
eating habits, Chinese workers did not always make use of the

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[17]Brah, *Cartographies of Diaspora,* 2.

[18]Brah, *Cartographies of Diaspora,* 16.

[19]Gittins, *The Diggers from China: The Story of Chinese on the Goldfields*, v.

local food resources of the hostland despite there being plenty. "Mutton was cheap and plentiful, but as they found its odor offensive, it was seldom included in their diet. They lived instead on beans and vegetables – they were past masters in the cultivation of all vegetables"[20]. Following this, Gittins[21] presents a very interesting case of how Chinese count their lunar calendar through planting lotus lily roots to remind themselves of necessary agricultural activities:

> If planted before the birthday of the Buddhist goddess Kwan Yin, which falls on the sixteenth day of the second month of each lunar year, the flowers will rise above the leaves in the pond, but if for some reason the day is missed and the planting delayed, the flowers will form and open under the large, round leaves…so that they would know when to sow which vegetable seeds and when to expect the harvest.[22]

In this case, connected to the natural environment, the diasporic group of early Chinese in Australia experienced alienation in the new place-based space. Researching Chinese diaspora in Perth, Western Australia, also during the era of cheap labor (the earliest Chinese worker came to Western Australia in 1829, even before

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[20]Gittins, *The Diggers from China: The Story of Chinese on the Goldfields*, 113.

[21]Gittins, *The Diggers from China: The Story of Chinese on the Goldfields*, 114.

[22]Gittins, *The Diggers from China: The Story of Chinese on the Goldfields*, 114.

the gold rush), Ryan sketches how enterprising Chinese gardeners modified the landscape along the South Perth foreshore, how "the land was crisscrossed with hand-dug canals, and pitted with wells. Vegetables, varying seasonally, made a changing kaleidoscope of color, their organized rows contrasting starkly with the unruly bamboo which flanked the gardens"[23]. Ryan argues that the attraction of this area was the natural conditions of "moderate weather" and "Western Australian waterways", which were suitable for "traditional Chinese farming methods"[24]. The adaptive and intimate relationship between diaspora and the natural world provides an insight into the understanding of diasporic space. In terms of the existing concepts of diaspora space, material practices of living and livelihood ought to figure more prominently in conceptualizations of the diasporan and the indigenous person.

Cases of Matsutake in the U.S. and Abalone in Australia

Reflecting the perspective of the environmental humanities, Tsing's research into mushroom foraging by Japanese Americans and Southeast Asian Americans is an exemplary study of the intersection between diaspora and the natural world. Matsutake, a special kind of aromatic wild mushroom, is a precious ingredient in Japanese traditional dishes. Through the

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[23]Ryan, *Ancestors: Chinese in Colonial Australia,* 11.

[24]Ryan, *Ancestors: Chinese in Colonial Australia,* 11.

large demand of Japanese consumers, it has been foraged from forests across the northern hemisphere. In the forests of the US Pacific Northwest, compared with Caucasian commercial pickers such as Vietnam veterans and loggers, Japanese American pickers are a distinct group that harvests mainly for the purposes of maintaining cultural heritages and for personal enjoyment and family bonding. The mushroom harvest history of the diasporic Japanese community has lasted for a century. Today this tradition has developed as a symbol of Japanese culture through sharing the mushrooms among community members. One of their favorite picking sites is Oregon's Mt. Hood, "a volcanic cone whose dramatic shape reminds the community of Japan's iconic Mt. Fuji"[25]. Tsing concludes that for the Japanese Americans, "matsutake builds a sense of pleasure and community"[26]. Further, "all of this history is layered on the landscape, threaded in and out of the spots we check for new life emerging"[27].

In her work, another group of families, war refugees from Lao, had entirely different experiences of American citizenship. Without the cultural history of mushroom picking, their foraging work is "both a livelihood and a vacation" because living in the mushroom camp is "a chance to re-create village life" while

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[25]Anna Tsing, "Dancing the Mushroom Forest." *PAN: Philosophy, Activism, Nature* 10 (2013), 7.

[26]Tsing, "Dancing the Mushroom Forest," 10.

[27]Tsing, "Dancing the Mushroom Forest," 10.

"hiking the Oregon forests reminded them of the hills of Laos"[28]. These cases offer an instructive model of diasporic lives intertwining with the natural environment, including the memories of the homeland nature and the communal landscape in the hostland. It is the recognition of common diasporic life that forms the foundation of a diasporic space in the natural world. In the Southern hemisphere, over ten thousand miles away from the United States, abalone fishing narrates comparable relations between Australian Chinese and nature, just as mushroom foraging does in the Pacific Northwest.

Abalone, named *Baoyu* in Chinese, is mentioned in Chinese literature two thousand years ago as an expensive delicacy for the nobility[29]. Hitherto, it has been one of the most luxurious ingredients (the others are sea cucumber, shark fin, and bird's nest) of Chinese cuisine, which is usually prepared for lavish banquets[30]. Inheriting the thinking of their ancestors, Chinese people believe that abalone meat provides abundant nutrition while abalone juice has been shown in the oldest medicine

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[28]Tsing, "Dancing the Mushroom Forest," 11.

[29] Gu Ban, *Han Shu* (Beijing: Zhonghua Shuju, 1962), Vol. 99.

[30]Tong Zhou, "Baoyu: Meishi, Fugui Yu Quanli [Abalone: Delicacy, Wealthy and Power]." *Chinese National Geography* 519, no. 1 (2004).

[31]Boping Ye and Wutong Wu. "Xiandai Shengwu Jishu Zai Haiyang Yaoyong Shengwu Ziyuan Kaifa Zhong De Yingyong [the Application of Contemporary Bio-Technologies to the Exploration of Marine Biotic Resources in Medication]." *China natural medication* 4, no. 1 (2006), 6.

textbooks to be an effective treatment for some blood diseases[31]. According to an article in *Chinese national geography*, there are over seventy species of abalone known in the world and eight of them are found in Chinese marine areas, in which the species *Haliotisassimilis, Haliotisroei*, and *Haliotisdiversicolor* are the three with highest market value. Although since the late 1980s, abalone farming along Chinese coastlines from the north to the south has been successfully increasing to supply the gap between consumption and harvesting, only a small percentage of the Chinese population has tasted this delicious mollusc. Even some seaside inhabitants have had no opportunity to try it during their lifetime[32]. In Chinese history and culture, the uncommon dishes prepared with abalone symbolize an elite social, economic and political status.

For centuries, abalone has been widely used by Indigenous people living by the seas, mainly in Australia, New Zealand, East Asia, and North America, as an important food resource. In the book *Mutton Fish*, the Australian Aboriginal authors mention that abalone is "easy to find and harvest, extremely rich in energy and accessible for as long as the beaches are freely open to all, this has always been a subsistence food"[33]. Certain

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[31] Zhou, "Baoyu: Meishi, Fugui Yu Quanli."

[32] Zhou, "Baoyu: Meishi, Fugui Yu Quanli."

[33] Beryl Cruse, Liddy Stewart and Sue Norman, *Mutton Fish: The Surviving Culture of Aboriginal People and Abalone on the South Coast of New South Wales* (Canberra: Aboriginal Studies Press, 2005), xi.

Australian Aboriginal cultures have a strong attachment to the coastal environment. In the south coast of New South Wales, the oldest archaeological find of walkun shells in a midden of the ancient people may be traced back to about 3700 years ago[34]. The authors point out how the name of abalone changed as Aboriginal people progressively engaged with modern society on the south coast of New South Wales. In 1844, George Augustus Robinson recorded that abalone was called *walkun* by the Nullica people of Twofold Bay. This period in Australian history was of "the pre-contact story of the Aboriginal use of shellfish resources"[35]. The second period in this book is presented as the "mutton fish" section covering a phase from the earliest contact between the Aboriginal people and the European arrivals in eighteenth century to the 1960s, when large-scale abalone fishery for commercial purposes started increasing[36]. In the second period, the early European explorers and settlers named the mollusc "ear shell" by its shape or "mutton fish" because its smell and taste resemble mutton flaps. "Mutton fish" is also regarded as a name that originated from the Aboriginal tribe Koori's language because these people still use the term today. Since the 1960s, under fervent worldwide demand for the mollusc, the Spanish American name "abalone" has become popular in international trades.

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[34]Cruse, Stewart and Norman, *Mutton Fish,* 8.

[35]Cruse, Stewart and Norman, *Mutton Fish,* xii.

[36]Cruse, Stewart and Norman, *Mutton Fish,* 15.

It is quite difficult to specify the exact year when ancient Chinese people and Australian Aboriginal people began to use abalone in their diet. However, there is no doubt that far beyond the range of food resources, abalone acts as a cultural metaphor for the both cultures and their histories. Chinese people introduced abalone into the recipes of Eastern Asian countries before the 6th century and later this ingredient became globally popularized by Asian immigrants, even to some areas where it had not been eaten previously[37]. Despite the abundant distribution of abalone along Chinese coastlines, due to its slow growth cycle and overfishing for years, abalone is still a scarce resource only accessed by the privileged class according to centuries-old tradition. Unlike the role of abalone in Chinese culture, which is usually recognized as a ritual of eating in the social life, for modern Australian Aboriginal people, the culture of walkun inscribes the development and the alteration of their lifestyle while walkun also symbolizes their history and their heritage. From this perspective, these two cultures provide convincing evidence to demonstrate that the local material resources of the natural environment have profound influences on the formation of a unique culture.

Interestingly, the history of this little mollusc encompasses Chinese and Aboriginal people, as well as European settlers,

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[37]Zhou, "Baoyu: Meishi, Fugui Yu Quanli."

especially with the arrivals of large numbers of Chinese gold miners after 1855:

> In New South Wales, Chinese entrepreneurs set up fishing and fish drying operations in the 1860s just north of Sydney to supply the goldfields. Aboriginal people were employed to collect mutton fish for these traders. At this time, Chinese Entrepreneur Ah Chouney was reported to have owned up to twenty boats, employing mainly European crews.[38]

These Chinese fish factories provided not only a delicacy to China and other Asian countries, but also the buttons made of abalone shells for widespread use in the clothing industry. It is said that the reason for the extinction of abalone in the area of Palm Beach was the sky-rocketing interest in muttonfish for Chinese trade. After the gold rushes, some Chinese living in South Australia continued lucrative muttonfish trades. "Aboriginal people were able to use their traditional diving skills and their extended family labour in their beach camps to work with the Chinese, right along the south coast"[39]. Afterwards, some Aboriginal employees who had learned the skills to dry and preserve fresh abalone from their Chinese workmates started their own family manufactures to trade with Chinese[40]. From this

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[38]Cruse, Stewart and Norman, *Mutton Fish,* 29.

[39]Cruse, Stewart and Norman, *Mutton Fish,* 29.

[40]Cruse, Stewart and Norman, *Mutton Fish,* 31.

case study of abalone, it is obvious that cultures, such as Chinese, Australian Aboriginal, and also European, which had introduced ideas of modernization to China, are closely involved with everyday practices related to the living materiality of the natural world.

Abalone, a treasure of nature, is a bridge joining the cultures of Chinese motherland and the nature of Australia. On this bridge, traditional Chinese culture brought by Chinese diaspora has relocated in the embrace of the Australian natural environment. Meanwhile, the abalone is an agent of the combining of Chinese and Australian Aboriginal cultures, as well as local cultures of various regional backgrounds. The interdependent relationships between ethnic cultures have lasted for centuries via the communication in abalone exploration. Furthermore, abalone is a carrier to assist the passing of Chinese traditions to diasporic generations, particularly to the Australian born Chinese who are increasingly alienated from Chinese culture and heritage. All these dimensions of abalone demonstrate the importance of the natural environment in the construction of the living space for the diaspora. Rather than focusing on confusing transnational identities, the consideration of the materiality of nature in the conceptualization of a diasporic space offers a more specific perspective in relation to the everyday aspects of diaspora.

A Cultural Construction

In contrast with the original sense of exile, contemporary knowledge of diaspora broadly involves transnational travel, resettlement in a new place and everyday experiences during the process of geographic relocation. In the establishment of a diasporic space, one of the basic components identified by theorists is the travelling culture. Clifford remarks that cultures are travelling in terms of "cosmopolitanisms" "by tourists, by oil pipelines, by Western commodities, by radio and television signals"[41]. He insists that if culture is the "representable whole form" of an organizing set of time and space, culture "comes to resemble as much a site of travel"[42]. For Clifford, travelling culture is also a distinction between immigration and diaspora:

> Immigrants may experience loss and nostalgia, but only en route to a whole new home in a new place. Such ideologies are designed to integrate immigrants, not people in diaspora. Whether the national narrative is one of common origins or of gathered populations, it cannot assimilate groups that maintain important allegiances and practical

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[41] James Clifford, *Routes: Travel and Translation in the Late Twentieth Century* (Cambridge: Harvard University Press, 1997), 28.

[42] Clifford, *Routes: Travel and Translation in the Late Twentieth Century*, 25.

connections to a homeland or a dispersed community located elsewhere.[43]

From his perspective, a definition of "immigrant" relates to groups of people who are in the process of relocation while the concept of diaspora is tightly connected to the reconstruction of the original cultures in a new environment, within which the process intrinsically includes travelling. Applying the concepts of cultural site and cultural travelling to the category of diaspora, a diasporic space might be regarded as not merely a site for the transferable identities between the diasporan and the native as Brah argues. Diasporic space is also the convergence of traditional cultural experiences and the hostland's cultural influences, as Clifford[44] identifies that "diaspora culture" is "maintained and transformed by the new environment". In addition, constructive memory is crucial to retain a collective sense in the diasporic community, and to transmit "a relatively continuous, if rearticulated, cultural substance"[45]. The terms "new environment" and "cultural substance" are precisely manifested by the "mushroom" for the American Japanese diaspora or "abalone" for the Australian Chinese diaspora. However, Clifford only highlights that "cultural dwelling cannot be considered except in specific historical relations with cultural travelling", marginalising the importance of material

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[43] Clifford, *Routes*, 251.

[44] Clifford, *Routes: Travel and Translation in the Late Twentieth Century*, 44.

[45] Clifford, *Routes*, 44.

engagements with the natural world, which are also included in the cultural substance, in the formation of memories and the dwelling of diasporic cultures.

Nature features in the categories of diasporic cultural studies. In previous studies it has featured as a conceptual framework; in my study it features as a material category focusing on everyday experience and use of nature. Giblett[46] critiques previous cultural research approaches that exclude cultural studies of nature. Despite its absence at the beginning of "cultural studies" in the late 1950s, nature should be included within the cultural construction because it is regarded as "the biological processes that make life and culture possible, and the nature as a surface of inscription for the culture"[47]. He contends "culture and nature as ordinary"[48] from the perspective of ecocultural studies, echoing Williams' argument that culture is ordinary and "a whole way of life"[49].

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[46]Rod Giblett, *Landscapes of Culture and Nature.* Basingstoke and New York: Palgrave
Macmillan, 2009.

——— "Nature Is Ordinary Too." *Cultural Studies* 26, no. 1 (2012): 12.

——— *People and Places of Nature and Culture.* Bristol and Chicago: Intellect, 2011.

[47]Giblett, "Nature Is Ordinary Too," 4.

[48]Giblett, "Nature Is Ordinary Too," 4.

[49]Raymond Williams, "Culture Is Ordinary." In *Resources of Hope: Culture, Democracy,*
Socialism, ed. R. Cable (London: Verso, 1989), 4.

[50]Giblett, *People and Places of Nature and Culture*, 50-51.

Demonstrated by the "mushroom case" and "abalone example", these views are also relevant to studies of contemporary diasporans. Mushroom and abalone are natural materials, as survival food resources for the first peoples or traditional diet ingredients for diasporans. The initial purpose of mushroom foraging and abalone harvesting for the diasporans is earning a living, regardless of personal or commercial use, in the process of resettlement in a new environment, as part of "a whole way of life". In addition, in developing Habermas' argument that the "objective environmental nature" is constituted through "processes of social labour", Giblett advocates that these processes should include domestic labor in the house, ecological work in the earth-household, and "multi-sensory engagement and enjoyment" in our own bodies[50]. Thus, he concludes that "nature is constituted as the ordinary stuff of work and everyday life"[51]. Life is ordinary in the discourse of geographic place and daily living. As Ma argues the diasporic space is "place-centered"[52], a diasporic space is also ordinary as a cultural construction in constant relation to the local nature of a new place.

Following this line of thinking, natural materials are also cultural substances in the construction of a diasporic space, which

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[51]Giblett, "Nature Is Ordinary Too," 6.

[52]Ma and Cartier, eds., *The Chinese Diaspora: Space, Place, Mobility and Identity*,9.

definitely is a "network-based" space[53]. The "network" may be understood in several phases. The first one is embedded in the fundamental meaning of connections between the members of dispersed groups from the same original homeland. The second meaning is associated with the global spatial practices of capitals, trades, labour forces, and information. The third sense of the network takes root within "intra-diasporic contexts and events"[54]. These diasporic contexts and events, based in everyday life, decide the cultural substance inherited from diasporic generations through constructive memories. Reflecting on the mushroom and abalone cases, on one hand, they represent memories of traditional foods in particular cultures gained from the senses of sight, smell, and taste in the dishes. On the other hand, the processes of foraging and fishing add a new sense of touch, a fresh embodied memory developed in the new land. Therefore, cultural substance, involving the natural materials of places, combines two phases of memories from the homeland and the hostland. Through memory clusters of this kind, a diasporic space is built on the networks between diasporic experiences and embodied places.

Tuan's argument about the close relationship between the natural environment and world view is creditable, notwithstanding his insistence on ocularcentrism in human's perceptions of the environment, which is unsuitable for an

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[53]Ma and Cartier, eds., *The Chinese Diaspora*,9.

[54]Ma and Cartier, eds., *The Chinese Diaspora: Space, Place, Mobility and Identity*,9.

overall understanding of diasporic experiences through all the senses. He sums up that the *world view* is "constructed out of the salient elements of a people's social and physical setting"[55]and "space and place are basic components of the lived world"[56]. In this vein, contemporary diasporic space is conceived as a cultural construction by cultural spaces and natural places, involving social experiences with the dual identities as both diasporic and local, and continuous living practices in the context of nature.

In other words, a diasporic space is both natural and cultural. It is erroneous to divide the natural from cultural components because a diasporic space integrates all cultural and natural substances during diasporic processes; a diasporic space is ecocultural. Furthermore, unlike the existing concepts, a diasporic space should be regarded as, simultaneously and always, abstract and material. According to Tuan, space is open, free and dynamic while place is secure and stable. "If we think of space as that which allows movement, then place is pause; each pause in movement makes it possible for location to be transformed into place"[57]. However, in diasporic stories, which are inherently involving movement and dislocation, the meaning

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[55] Yi-Fu Tuan, *Topophilia: A Study of Environmental Perception, Attitudes, and Values*

(Englewood Cliffs: Prentice-Hall, 1974),79.

[56]Tuan, *Space and Place: The Perspective of Experience*, v.

[57]Tuan, *Space and Place: The Perspective of Experience*, 6.

[58] Quoted in Sarah Pink, *Doing Sensory Ethnography* (Melbourne: SAGE, 2009), 30-31.

of place is, as Edward Casey describes, gathering things with "various animate and inanimate entities", and "experiences and histories, even languages". Doreen Massey suggests "space might be something abstract that might be mapped out, flattened or occupied by places"[58]. Pink comments that, for Casey and Massey, space is primary in the relationship with place while both Casey's and Massey's approaches "acknowledge the human and non-human elements of place and suggest how place as event is constantly changing through social and material relations and practices"[59]. Pink concludes that Ingold's definition of place constructs a sense between the former two approaches. If places are "occurring through the intersections and proximities of pathways as they are entangled", then they are events constituted in "a meshwork of paths"[60]. This argument demonstrates the construction of a diasporic space as a "place-centered" and experience-based network. In the frame of space, the sense of diasporic space is abstract; in the context of place, associating with natural materials, the diasporic space becomes physical and embodied. A diasporic space, comprising natural and cultural substances, crosses between material experiences and abstract conceptualisations.

This understanding of diasporic space is not intended to supersede or render obsolete previous theories. On the contrary,

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[58] Quoted in Pink, *Doing Sensory Ethnography*, 31.

[59] Quoted in Pink, *Doing Sensory Ethnography*, 32.

[60]Pink, *Doing Sensory Ethnography*, 32-33.

this approach to reinvestigating the definition of diasporic space shares common ground with existing ideas, which, when brought together provide more comprehensive insights into studies of diaspora. Clifford stresses that "specific histories of population movement, exile, and labor migration require new approaches to the representation of 'diaspora cultures'"[61]. Since the last few decades, established theories have gradually absorbed cross-disciplinary ideas, notably "space and place" from geographic research, into the studies of diaspora. However, these notions of space and place are still abstractions, removed from the material, embodied and ecological basis of nature. With new diasporic phenomena appearing in recent years it would be worthwhile to inspire more exploration into diasporic studies that traverses the environmental humanities, particularly through the perspective of the relationships between humankind and nature.

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Imagining Plant-Like Futures? Vegetal Intelligence in Brian Aldiss' *Hothouse* (1962)

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Abstract

In *Through Vegetal Being* (2016, written with Luce Irigaray), Michael Marder asserts that "by robbing plants of their time, and especially of their future, we deny a future to human and all other living beings" (144). For Marder and other critical plant studies scholars, the future of humanity is contingent on our alignment with vegetal temporality and the envisaging of a societal order with peculiarly plant-like attributes. In his

deconstruction of Western metaphysics, Marder appears in alignment with the ethnobotanist and psychonaut Terence McKenna (1989), whose heuristic "plan/plant/planet" positions the botanical kingdom as a creative organisational matrix for the twenty-first century. How might we imagine humanity in 2050 as more plant-like—as in higher synchronisation with vegetal temporality in our scientific, technological, cultural, and interpersonal pursuits? How might we resist denying a future to plants and, thus, to ourselves and other beings? And how might the genre of science fiction enable us to build up the imaginative faculties and transgressive outlooks required for doing so? In the context of these questions, this article will undertake a reading of Brian Aldiss' *Hothouse*, recipient of the 1962 Hugo Award for Best Short Fiction. The novel is a work of futuristic science-fiction with prominent vegetal protagonists, such as omnivorous spider-like plants. Humans grapple in the narrative with the threat of extinction by, for instance, seeking refuge in the canopy of a gargantuan banyan tree. I argue that works of science fiction, such as *Hothouse*, narrativize the ideas of Marder and McKenna by allowing readers to suspend chronos-inflected, reductionistic conceptions of plants. The first step toward a plant-like future—if that is even desirable in the first place—is the eschewing of conventional ideas of vegetal nature as a relatively unmoving, unfeeling, non-sentient constituent of our perceptual domains.

Keywords: critical plant studies; science fiction; Brian Aldiss

Introduction

In its analysis of thirteen-thousand plant species worldwide, the International Union for Conservation of Nature calculated a sixty-eight percent rate of critical endangerment.Other estimates, such as the *State of the World's Plants Report* by Kew Gardens, suggest that twenty to twenty-five percent of the world's plants are threatened with extinction. When we consider the profound interconnections between plants and humanity through food, drink, medicine, fiber, elemental exchange, cultural heritage, and spiritual sustenance, these become especially harrowing statistics.How might we imagine humanity in 2050 as more plant-like—as in higher synchronization with vegetal being in our scientific, technological, cultural, and interpersonal pursuits? Perhaps the world in 2050 will be committed to halting plant loss, bringing species frozen in seedbanks back to life, and valuing the botanical heritage of the earth. Perhaps it will be a world in which countries enact laws protecting plants and granting them moral standing. A world in which plant research at educational or governmental institutions requires ethical clearance. A post-petroleum world energised by highly efficient and quiet renewable photovoltaic sources. A world that increasingly greens its cities—as in the Beirut Wonder Forest model—as a counterforce to exponentially growing urban populations. Or would the plant-like future involve a metaphysical shift towards vegetal forms of being and becoming that would transform culture and society at a fundamental level?

And how can the genre of science fiction enable us to build up the imaginative faculties required for breaking down the ontologies that divide humans from flora, fauna, and fungi?

In approaching these latter questions, this article look towards Brian Aldiss' vision of a vegetal future in his 1962 novel *Hothouse*. In Aldiss' narrative, humans grapple with the threat of their extinction by seeking refuge in the canopy of an immense banyan tree. Intelligent forms of plant life—including giant spider-like traversers, superbirds, whistlethistles, bellyelms, wiltmilts, and other with intriguing names—have come to preside over the earth, one side of which perpetually faces the sun: "Obeying an inalienable law, things grew, growing riotous and strange in their impulse for growth […] It was no longer a place for mind. It was a place for growth, for vegetables. It was like a hothouse" (1). After the techno-industrial collapse of human society, monstrous vegetal creatures pushed tribal groups to the hostile margins between day and night. As Aldiss later tells us, "they had finally triumphed, the vegetables had triumphed as much by weight of numbers as by inventiveness. Time and again, they succeeded simply by imitating some device used long since—perhaps on a smaller scale—in the animal kingdom" (92). Yet, in *Hothouse*, monstrous plant creatures occupy an ambiguous ontological terrain that is indicative of contemporary Western societies' somewhat dysfunctional approach to the vegetal world. Aldiss' plants are intentional and inventive yet imitative of animals, percipient yet

consumed by the same mindless over-proliferation that beleaguered humanity before its collapse.

Critical Plant Studies and Science Fiction

The question of future and flora is timely. The last five years have seen a growth in plant studies from cultural, literary and philosophical perspectives. Scientific research into plant signaling and behavior has supplied a catalyst for re-evaluating plants and our relationships to them. In *Through Vegetal Being* (2016, written as a dialogue with French philosopher LuceIrigaray), Michael Marder asserts that "by robbing plants of their time, and especially of their future, we deny a future to human and all other living beings" (144).For Marder, an alignment between human beings and vegetal temporality may lead to a societal order with increasingly plant-like attributes. A vegetal future involves a revitalised temporal sense and an experience of time located in place "that does not hasten to transport me to the past or to the future beyond the current horizon. The closest analogy to this experience, perhaps, is the feeling of one's own body—feeling oneself feel" (151). The future is embodied emplacement that resists the entrenched psychological divisions between past, present and future. More specifically, Marder sees a paradigm for human empowerment within the non-extractive photosynthetic mode of being: "That is still another vegetal lesson to be learned: how to energize

oneself, following the plants, without annihilating the sources of our vitality" (185).

Similarly, in an essay from 1989, the ethnobotanist and psychonaut Terence McKenna proposed the heuristic "plan/plant/planet," positioning the botanical kingdom as the creative matrix for the twenty-first century: "I propose that we should adopt the plant as the organizational model for life in the 21st century, just as the computer seems to be the dominant mental/social model of the late 20th Century, and the steam engine was the guiding image of the 19th Century" (1). McKenna concludes by articulating some of the lessons, both metaphysical and physical, of vegetal life, including inwardness, connectedness, symbiosis, detoxification, whole system fine-tuning, recycling, photovoltaic power, a global atmosphere-based energy economy, nanotechnology, and the maintenance of biological diversity as a repository of plant heritage.

Before returning to the vegetal future of Aldiss' *Hothouse*, it is worth considering what critics have said of the connections between science fiction and environmental sustainability. Scholarly studies of the ecological implications of sci-fi appear relatively plentiful in the fields of ecocriticism and environmental design. IgeaTroiani (2012) examined the potential of post-apocalyptic ecological science fiction novels and films to inspire sustainable architectural design. She

concludes that, rather than an impractical, fanciful or outlandish genre, sci-fi can reveal ecological architecture pathways for future energy use through its appeal to the imagination. Eric Otto and Andrew Wilkinson describe the emphasis within green discourse on technological rationality. In their study of time-travel narratives, the authors argue that sci-fi allows the reader to call into question the mechanistic worldview of technological utopianism and encourages sociocultural transformation of the kind that environmental sustainability requires today. Sci-fi narratives encourage discussion of environmental crises not only in terms of technical solutions but also through human behaviors and societal norms. Ecocritic Patrick Murphy (2009, 89–118)characterises the genre as nature-oriented literature that enables critical thinking necessary to link present actions and decisions to the future. Few studies, however, examine potential contribution of sci-fi to understanding human relations to the vegetal realm, including matters of ethics, conservation, species loss, and botanical futures.

Hothouse as a Critical Plant Studies Text

In *Hothouse*, the tribes people Gren, Poyly, Veggy, May and others take refuge in the canopy of an gargantuan immortal banyan tree blanketing the illuminated side of the earth. On first impression, the banyan mothership evokes the Yggdrasil of the thirteenth-century *Poetic Edda*, the immense tree that bridges

the nine worlds of Norse cosmology. A highly adaptive and intelligent plant system, the banyan is "the longest lived organism ever to flourish on this little world" (Aldiss 1962, 31). Aldiss goes on to describe the evolutionary means by which the banyan achieved supremacy:

> On this continent, the banyan, thriving in the heat and using its complex system of self-rooting branches, gradually established ascendancy over the other species. Under pressure, it evolved and adapted. Each banyan spread out farther and farther, sometimes doubling back on itself for safety. Always it grew higher and crept wider, protecting its parent stem as its rivals multiplied, dropping down trunk after trunk, throwing out branch after branch, until at last it learnt the trick of growing into its neighbour banyan, forming a thicket against which no other tree could strive. Their complexity became unrivalled, their immortality established. (31)

Aldiss' reference to the banyan's "complex system of self-rooting branches" and the ensuing description of the tree's intentionality, behavior, and learning echoes Charles Darwin's theory of plant-root intelligence. At the end of *The Power of Movement in Plants* from 1880, Darwin invokes the similarities between plant and animal movements and postulates that the plant brain lies in the root tip, or radicle, the part of a plant embryo that becomes the primary root: "[…] it is hardly an

exaggeration to say that the tip of the radicle […] acts like the brain of one of the lower animals; the brain being seated within the anterior end of the body, receiving impressions from the sense-organs, and directing the several movements" (419).Darwin placed this contention at the end of the treatise, aware that the statement would garner negative responses from biologists, such as Julius von Sachs, committed to a zoological paradigm of intelligence. Darwin figured the plant as an upside-down human, with its brain in the soil and its reproductive organs and waste disposal mechanisms in the air. His prescient intimations have markedly influenced the development of new understandings of plant capacities. Recent empirical research indicates that plant cells and human neurons share more characteristics in common than scientists previously recognized. Anthony Trewavas (2002) uses the clever term "mindless mastery" to signify the specific intelligence of plants despite their lack of brains and neurons.

In *Hothouse*, the root-brain hypothesis surfaces in the description of burnurn plants, translucent seed casings who exploit fire as a method of self-defense in the perilous high strata of the banyan canopy: "Here in the Tips, relying on that sun for its strange method of defence, the burnurn ruled among stationary plants. Already its sensitive roots told it that intruders were near" (33). Lily-yo, the leader of the tribe, disarms the burnurn by casting a shadow on their fire-brewing urns. In response, the plants demonstrate affective states: "As if realizing

that this ruined its method of defence, the plant drooped in the shade, a picture of vegetable dejection with its flowers and its urns hanging limply" (34). However, Aldiss does not so whole-heartedly bestow intelligence to the plants of this perpetually illuminated world. Many of his vegetal creatures, despite exhibiting behavior, learning, emotions, sentience, and so forth, are depicted as automatons who voraciously accrete biomass. For instance, there is the suckerbird: "being of vegetable origin, it had little intelligence and only a rudimentary nervous system. What it lacked in this respect, it made up for in bulk and longevity" (72). Whereas the plants of *Hothouse* cannot speak, the sentient morel is a charismatic talkative fungus who colonises the male tribesman Gren's brain, directing and at times manipulating him through the course of the narrative's second half.

Conclusion: Botanical Futures

Returning to the idea of plants in the world of 2050, this section will reflect briefly on the vegetal lessons of *Hothouse* grounded in the qualities articulated by Marder and McKenna: autopoiesis, inwardness, brainlessness, freedom from constructs of past, present, and future (although research does indicate that plants can remember events and adapt their behaviors accordingly). It is the prominence of the intelligent morel in *Hothouse* that problematises our assignation of intelligence to certain

categories of life over others. At the risk of upending its own argument, this articlesuggests that to privilege a plant-like future is to swing the pendulum of speciesism towards the vegetal and away from the myriad other biological forms that make life on earth possible. To this effect, at the end of the novel, an integrated posthuman vision of the future emerges in which the former distinctions between life disintegrate in the new world: "Were the tummy-bellies vegetable or human? Are the sharp-furs human or animal? And the creatures of the hothouse world, these traversers, the killer-willows in Nomansland, the stalkers that seed like plants and migrate like birds—how do they stand under the old classifications?" (1962, 306). Aldiss suggests that a plant-like future will also be fungi-like, bacteria-like and, to be certain, mammal, bird and human-like. This is a future in which nature in its wholeness, rather than in its particular forms, is recognised for its intelligence and sentience.

Embracing an integrated vision of life is not to dismiss the lessons presented to us through close attention to and conscientious participation in the botanical world. To receive the knowledge of plants requires a kind of openness to vegetal being intimated but not fully actualised in *Hothouse*. The dystopian vegetal future of the novelis plagued by war-like defensiveness against plant-animal hybrids, rather than the harmonious states of dynamic exchange possible on the planey today. What is more, despite their dominance and sentience, the vegetal

creatures are rendered as mindless, though not in Darwin or Trewavas' root-brain terms. In the novel, plant life is invariably unthinking, mechanistic, menacing, and consumed with growth.As ecocritics point out, the value of sci-fi for sustainability lies in its facilitation of critical thinking and prompting of the imagination towards new possibilities. *Hothouse* leads us back to a future in the extraordinary flora—and fauna, fungi, and micro-organismic life—in which we are immersed on an everyday basis and which occupies our bodies, as posthumanist scholars such as Donna Haraway (2008) have emphasised. The vegetal creatures of *Hothouse* remind us that plants already dominate the world, accounting for ninety-nine percent of the Earth's biomass. And rather than expelling us to the margins of existence, plants lovingly provide everything we need to survive.

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Creative Visualisation and Visualising Creativity:

An investigation of the relationship between creativity and visualisation

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Abstract

The paper presents an interdisciplinary analysis of the relationship between creativity and visualisation. It explores the potential for new visualisation technologies to represent, communicate or interactively engage with theories of creativity

to extend our understanding of creativity and its application across differing domains.

By giving an overview on the definitions of creativity, it demonstrates that the understanding of creativity is a continuous process of interpretation. Such an understanding involves many personal and environmental elements such as social and cultural context - culture as well as different perspectives on the relationship between "old" and "new" technologies, paradigms and artistic forms. Analyses of artistic creativity engaging with computer technologies in the form of case studies raise questions on how to understand the "machine's creativity" and what is the role of the "machine as creator", or in other words, the potential of the machine to participate as a non-human agent in creative practice to new knowledge of creativity.

The analysis indicates that there is a gap in a creative technology-based approach to creativity. The result of the study also suggests some future directions for research in this emerging interdisciplinary field.

Keywords: Creativity, Data Visualisation, Art Practice

Introduction

Creativity is understood here as a concept fundamental to all people and cultures that involves a mental process of producing new ideas and products. Since there is a wide range of different disciplinary perspectives on creativity and different understandings of creativity through historical periods and over time, there are thus many different concepts on creativity. For example, in many arts related fields, creativity is often regarded as mysterious; or learned or developed tacitly and evaluated through interpretive methods such as reviewing and critique. In more technical fields such as engineering and robotics, however, creativity is often regarded as akin to problem solving and capable of being subjected to well-defined methods for development and quantitative evaluation. In psychology, creativity refers to "solving problems, communicating with others, and entertaining ourselves and others" in order to generate ideas, alternatives, or possibilities (Franken 2001, p.394). In the field of cognitive science, research on creativity has been related to brain function and the development of computational models. In addition, different cultures have exhibited diverse understandings of the concept of creativity. From a Western perspective, creativity can be defined as the capacity to produce work that must be novel and appropriate (Barron 1988). However, in Eastern cultures, the concept of creativity emphasizes personal attachment to a primordial realm or a personal expression of an inner essence (Kuo 1996).

Nevertheless, in many fields, any understanding of creativity remains limited.

In recent years, research has explored how new visualisation technologies represent, communicate or interactively engage with theories of creativity. This paper aims to extend the understanding of creativity and its potential application across differing domains. Visualisation has been proved as an effective process of the transformation, translation or interpretation of certain forms of information into another (visual) form. For the scientist, visualisation is an important tool for observing, understanding or representing complex scientific data. During these interactive processes, visualisation techniques and data manipulations play a key role in discovering and communicating knowledge or findings. However, the translation and interpretation of complex mathematical data into visual media is often limited by both technical and perceptual issues. For example, many scientists may have a limited engagement with visual communication techniques and conversely, designers often lack understanding of scientific forms of information. Scientific visualisation, which emphasises quantitative interpretations of data, can be monotonous and unsatisfactory to post-industrial society. Therefore, how to effectively represent data or information in clearly understandable visual form has become an important issue for both scientists and designers.

The paper introduces the different definitions and criteria for creativity and examines how those different concepts contribute to the understanding of the topic. It provides an overview on the definitions of creativity that attempts to explore a range of possible explanations of creativity from many different angles. The limitation of such different definitions of creativity will be investigated in order to explore new approaches to the understanding of creativity.

The paper focuses on examining the relationship between artistic creativity and technologies. In this study, art refers to visual art such as paintings, sculptures and media art, but not music or writing. It argues that artistic creativity often engages with new technologies through - or frequently as - new media. Hence, there is a focus in this discussion on artists' engagement with emerging computing technologies in the processes of modern art. This creative engagement with computing techniques is divided into three parts: computer as a tool, computer as a creator and other computing applications. This paper emphasises the computer as a creator, as some artists have been interested in designing and developing machines for visualisation, in which machine can make a drawing or painting with or without human instructions. Here the paper raises the question of what role "machine as creator" plays in the process of creativity? In addition, the paper also discusses artistic data visualisation, which might not accurately represent scientific data and might not be a tool to translate or communicate data in any scientifically meaningful

sense. Some artistic representations of data to communicate, but may not necessarily be able to communicate, - nor are tightly connected to - scientific data.

This study addresses a gap research into the kinds of practices of creativity that engage with computing techniques and a deficiency in theoretical explanations of the role of technology in the mental activity of creativity. This paper examines this gap in terms of what role we can say the machine's "creativity" plays and whether that may also be indicative of a new concept of "creator"? It is predicted that the study on "machine creativity" indicates a new approach of creativity. The paper aims to explore how to broaden and link differing understandings of creativity and how technology may contribute to applications of creativity across differing fields.

The Definitions of Creativity

What indeed is creativity? How can we identify a product that is creative? To be certain, most researchers believe that defining creativity is difficult, because creativity has been "changing throughout history and creative ideas usually appear unexpectedly, with little conscious awareness of how they arose on the part of the people who have the ideas" (Niu and Sternberg 2001). While some scientists and researchers have attempted to seek a definition, which can cover all expressions of creativity,

there are multiple ways to define creativity and many versions of creativity have been proposed and discussed.

Creativity is not exclusively a modern concern. In ancient Greece, Plato discussed society's need for creative people and suggested ways of fostering their development (Cropley 1999). From ancient Greece until the Renaissance, it was widely believed that all desirable innovations were inspired by divinity. Since the Renaissance, this viewpoint began to give way to the idea that creativity is a "matter of genetic inheritance" (Dacey 1999, p.310). In 19th century, there was a theory widely accepted that creativity was closely aligned to madness (Cropley 1999). At the beginning of 20th century, the debate "turned to an argument over the relative contributions of nature versus nurture" (Dacey 1999, p.310). However, shortly after the Second World War, researchers began to explore creativity in mathematics, the natural sciences and in professions such as architecture in which creativity has "strong aesthetic connotations, and was largely seen as a medium for beautifying the environment, a form of self-expression and communication, or a way of understanding, opening up or coping with the previously unknown" (Cropley 1999, p.512). Furthermore, in recent years, there has been growing acceptance of biopsycho social theories, that is, the belief that all creative acts are "born of a complex interaction of biological, psychological, and social forces" (Dacey 1999, p.310).

Guilford (1956, 1986) believes that creativity is kind of divergent thinking, in which "the quantity (fluency) and quality (flexibility and originality) of information people generated from given information has been used to represent people's divergent thinking" (Niu and Sternberg 2001). However, researchers such as Amabile (1996), Sternberg and Lubard (1995) argue that the actual processes of creativity are much more complex than the processes of just generating information. For them, the more important consideration is that people must accept the products of creativity as valuable or useful.

According to the research by Cropley (1999), creativity is defined as "a social phenomenon that is facilitated by some social factors, and inhibited by others" (p.511). He points out that a work place is an important social background in which "an interaction between the person and the environment affects the process of innovation" (p.511). Franken (2001) defines creativity as "the tendency to generate or recognize ideas, alternatives, or possibilities that may be useful in solving problems, communicating with others, and entertaining ourselves and others" (p.394). He believes that the reasons people become motivated to be creative is out of the need for new, different and complex stimulation, communication of ideas, value, and problem solving (Franken 2001). Meanwhile, Weisberg (1993) argues that the term "'creative' refers to novel products of value, as in 'The airplane was a creative invention.' Creative also refers to the 'person who produces the work, as in,

Picasso was creative.' 'Creativity,' then refers both to the capacity to produce such works, as in 'How can we foster our employees' creativity?' and to the activity of generating such products, as in 'Creativity requires hard work'" (p.4). Sternberg and Lubart (1999) define creativity as "the ability to produce work that is both novel (i.e. original, unexpected) and appropriate (i.e. useful, adaptive concerning task constraints)" (p.3). By considering the personal elements of creativity, the term can be defined as "an aspect of thinking, as a personality constellation, and as an interaction between thinking, personal properties, and motivation" and that "contradictory elements have to coexist for creativity to emerge" (Cropley 1999, p.511).

Different cultures have different definitions of the creativity. For example, a Western viewpoint on creativity for the most part is very different from the one held by an Eastern culture. From a Western viewpoint, creativity can be defined as the ability to produce works that are novel and appropriate (Pope 2005). The conceptions of Eastern creativity believe that "re-creation" of the "the old" is valued or "novel" and must be based on "previous one/the old" (Pope 2005), which may be similar to "neo-Classicism" or other kinds of traditionalism in the West (Pope 2005). In other words, neo-Classical creativity depends on the old for the new. In addition, Boden (1996) argues that "novelty may be defined with reference either to the individual concerned or to the whole of human history" (p.351). Boden's principles of P-creativity and H-creativity are two sensors of

creativity which P-creativity is that which makes a discovery or experiences a personal break-through and H-creativity is what is known already or had been known before (Pope 2005). Furthermore, based on Pope's "original and fitting" terms, a conception of creativity may be formulated as following:

> *Creativity may be 'original' in the sense both of drawing on ancient origins and of originating something in its own right; either way, the overall aim or end is a 'fitting' – an active exploration of the changing proportions, measure, ratios- between older modes of understanding and newer ones (Pope 2005, p.59)*

Instead of presenting a standard definition of creativity, Pope (2005) introduces a conception called *"re…creation"*. He believes that *re…creation* is "the ongoing of making afresh" (p.84). The prefix *"re…"* can mean "afresh" as well as "again", and denotes repetition with variation, not just duplication. The concept of "*…creation*" is considered to comprise many different meanings of the "creativity" including God as Creator, "'the creative artist' and the various 'creatures' of the imagination, along with such processes as 'creative evolution' and 'heterogenesis' …" (Pope 2005, p.84). This conception shows people to "see through the exiting possibilities to words beyond as well as between; and it encourage a view of

'difference' that is genuinely otherwise… it is an invitation to keep on jumping or bridging the gap…" (Pope 2005, p.88). The new concept leaves more room for "conserving and sustaining as well as recasting and refreshment, while resisting conservative, reactionary impulses of an unthinking and merely reflexive kind" (Pope 2005, p.88).

At last, the concept of creativity needs continual reinterpretation and rewriting in current terms because creativity will always be "something more and something different" (Pope 2005, p.88). As technology has been widely used in contemporary society, how creativity could be interpreted in the context of technology is a key. The next section will discuss the relationship between creativity and computer-based visualisation technology.

Visualisation Technology

In the global information society of today, people are often required to comprehend or understand the meaning or implications of data or information. How to efficiently present data or information has become a key issue in achieving this comprehension. The basic function of visualisation is transforming data or information into "a visual model capable of revealing its essence", which people can easily understand, such as maps, paintings, movies, photos, charts and diagrams (Wildbur and Burke 1998). The result of the visualisation itself

may cause scientific findings. Hamming (1973) believes that the purpose of visualisation is "insight" and not simply "pictures". The main goals of this insight are discovery, decision making, and explanation.

Visualisation technology as artistic creativity

Technology plays a most important role in the process of visualisation, and determines whether data can be successfully transformed into certain visual forms that reflect the designer's purpose. Before the invention of computing technology, most visualisation works were completed by hands the most common technique is illustration or drawing by using traditional tools such as paper, ink, pen and brush. However, since the application of computing technologies, visualisation has largely relied on computer technologies that can facilitate the comprehension of large and complex data in two, three, or even more dimensions.

A computer hardware system needs software to support the process of visualisation. In this study, software refers to computer software achieved through different programming platforms. Computer software receives commands from computer operators and passes these instructions to the hardware to executive certain tasks. Compared to hardware, software is intangible, invisible and it includes application software, programming languages and operating systems. An operating system is basic software for the hardware, such as Microsoft

Windows, Linux and DOS. Programming languages defines the syntax and semantics of the programs, such as C/C++, BASIC, Java and Processing. Application software is software that the computer users to communicate to the computer to achieve certain tasks. For example, these include word processors, games, online chat tools and browsers such as Internet Explorer.

The design and development of computing software is the most important part of visualisation that directly impacts the effects of a visualisation. The process of designing computer software usually involves designing, writing, implementing, testing, debugging and maintaining the source code of the programming. Algorithm are key steps in the process of software design. The implementation of the most efficient algorithm is a major concern in academic computer programming.

Scientists seek patterns and trends from complex data through efficiently visualisation processes. Not only does it allow scientists to recognise the information or pattern behind the data, but the process also contributes to a better understanding of the data itself. Scientists may wish to "engage the reader or spectator in a wonderful journey of imaginative visualisation", and, after analysis, they wish to "communicate an interpretation that embodies testable content in an unambiguous way" (Valle 2008). However, artistic visualisation tends to employ ambiguous interpretational methods that facilitate the expression of hidden information behind the data patterns (Figure 1).
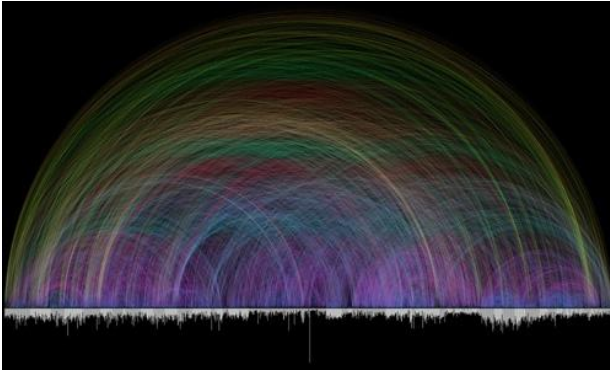
Figure 1: Bible Visualisation by Chris Harrison

Artistic Based Studies on Creativity and Technology

What we understand as "modern technology" has been applied to the creation of art works at least since the Industrial Revolution. Between the late-nineteenth century and the early-twenty centuries, the modern art movement pushed traditional art to its limits through probing the whole concept of what constitutes "art," through engagement with new electronic technologies and, later, new digital media. During this time, art also addressed and absorbed developments in modern science and related social changes. Since then, the understanding of art has been continually shifting and has produced many art movements. A key change in understanding artistic creativity involved bringing new technologies into artists' processes of creation. For example, artist Eadweard Muybridge used

photographic techniques to capture the actual sequence of movement on animal locomotion.

In the postmodern period, artistic creativity largely has involved artists using new computing technologies - including computing software and hardware systems, internet, video, photography, and multimedia technologies – in the creation of art works. For example, art based in notions of interaction allows audiences participating in the communication between art works and audiences themselves. The open-ended art works evolve through this form of audience participation. This points to "a process that becomes possible only through the new technological devices that create a situation in which questions by the user/spectator are effectively answered by the art work itself" (Popper 1993, p.8). In such art works, technique plays a key role in the process of artistic creativity. It focuses on the different scientific and computing techniques and analyses the relationship between technology and aesthetics under different technologies. Such "technological art" has been "the most important source … related to the new interpretation and use of light and motion …" (Popper 1993, p.12).

In general, there are three main categories of art-based creativity engaging computer technologies. One is computer as tool, one is computer as creator and the third might be defined as any other areas of art creativity using computer techniques but not included in first or second categories.

Computer as An Agent in Artistic Creativity

Using the computer as a creator means that artists develop a computer controlled visualisation machine -Artificial Intelligence-based technique. The special drawing machine can create an art work such as a painting or drawing, without any human interruption or ideas. The use of the computer technology "changes the strategy of image-making" and raises questions concerning whether "the computer actually creates art itself" (Popper 1993, p.80). Therefore, we really cannot just classify computers as a tool but something like "a creator" or "a simulator of memory, of reasoning and of the brain itself" (Popper 1993).

The first artist who explored this area was Harold Cohen who developed an Artificial Intelligence program called AARON, a computer system that can make a drawing. In fact, it took Cohen more than 30 years to develop the drawing system in which the computer becomes a "creator" of art. From the early 1970s to now, AARON has been refined from simple shapes and curves to colored abstract forms to realistic figurers with its robotic arm. The art works created by AARON more and more resemble paintings drawn by humans. How the AARON system makes a painting is decided by computer program implemented in its "brain."

AARON has been programmed with two types of knowledge. The first type of knowledge encodes all kinds of different shapes

into its programming, such as the human body and a simple tree. The programming of the knowledge about the world parallels human memory in which information is stored. This part of the programming is called "declarative knowledge". The second type of knowledge is called "procedural knowledge" that allows the robot to move from a start to an end through a series of inter-connected steps during the process of making a painting. Those two types of knowledge in AARON programming comprise the soul of the computer as an artistic creator. The artistic aim of AARON is "shaped by the historically long-standing dream of a 'thinking machine' and he looks forward to a time when computers will be able to surprise him, not only by drawing something he did not anticipate but by producing a drawing only possible through the computer's own modification of the programme" (Popper 1993, p.80). However, there are still many limitations in the AARON system. It is believed that AARON's creativity is not enough to the machine cannot examine the process of understanding creativity in abstract terms, although computing technology brings a new platform for artists to understand creativity. This example clearly shows that technologies adopted in the various modes of creativity are best described under the banner of "visualising creativity." The following section discusses the notion of creative visualisation, which emphasises aesthetic approaches to visualisation and new visualisation techniques.

Artistic Data Visualisation

Creative visualisation models novel, varied and complex stimulations, to communicate ideas and values and solve problems, leading to knowledge acquisition. Creative visualisatioon includes the aesthetics of visualisation, the invention of new visualisation techniques, and the artistic representation of data.

Artistic data visualisation can be defined as "visualisations of data done by artists with the intent of making art" (Viegas and Wattenberg 2007). Actual data provides to basis for the works that include "the metaphors or surface appearance of visualisation" (Viegas and Wattenberg 2007). The works might not be as beautiful as people's expectation but aesthetics is not only about beautiful art works visually presented. For example, microscope photography obviously is not artistic visualisation, insofar as scientific images merely present quantitative findings. Although some scientific visualisation is presented as beautiful images, they lack the creative intent of artists. The difference between both artistic visualisation and scientific visualisation largely focuses on how to explain or explore the data in certain ways. In other words, the way of see the data distinguishes between artistic and scientific visualisation. Scientific visualisation presents a highly data-accurate picture whereas artistic visualisation needs free creativity with less of a view towards representing data (Lau and Moere 2007).

An Example of Artistic Data Visualisation

Jason Salavon is an artists working in data visualisation based artistic practice. His work "*The Class of 1988*" (Figure 2) was created through computing techniques that take the mean average color of every photo, pixel by pixel, and then represent those photos as totally different new images. He attempts to express "the collective aggregation of human experience" through the process of blue-coloured individuals (Viegas and Wattenberg 2007).

Figure 2: The class of 1988 by John Salavon

Discussion and Conclusion

The purpose of this paper has been to develop an analysis of the relationship between creativity and visualisation through a discussion in the seemingly disparate domains of creativity and the technologies of visualisation. It is clear that the understanding of creativity depends on two basic key points: novelty and value. Typically, the concept of "novelty" is described by contrast to the "old". The "value" of creativity is usually interpreted as useful or defined as appropriate in relation to some domain-specific goals. However, in practice, what we recognise as creativity has been found to emerge as the result of a much more complex process of interaction between psychological, environmental, social and biological actions and other criteria. Instead of proposing a standard definition of creativity, Pope's (2005) new concept of creativity, "re…creation", indicates an ongoing understanding of creativity as a quality that develops, emerges and changes in relation to the evolution of societies or fields.

The results of this study indicate an insufficiency in the study of creativity; specifically, in its engagement with technologies. While most understanding of creativity focuses on human perceptive, psychological, cultural, social and neuro-scientific domains, there are few approaches to theorising creativity through technology, partly because technology itself is often

considered a product of creativity rather than an agent of creativity.

This paper also has demonstrated that visualisation software plays a key role mediating between users and hardware devices. Software receives commands from the user and then interprets human instructions and passes the instructions to the hardware to execute tasks. In different software, algorithms are the most important factors. Different algorithms generate different effects to represent data or information. Most visualisation integrates many different techniques, both in terms of hardware and software. Virtual Reality is a typical application using different techniques to creative immersive and embodies environments.

In relation to computer-based art, there are two key questions: is the computer-based art work, in itself a "new" form of creativity? How can we evaluate the novel role or value of the "autonomous mechanism" or "thinking machine" model of production offered by computing technology, in terms of creativity? This paper has suggested that computer-generated art work is a "new" form of creativity because those "assisted" or "created" paintings or drawings have an obviously autonomous or automatic character that distinguishes them from the traditional hand-on works. In addition, artists in traditional forms of practice often directly participate in art works and determine, rather than pre-determine, each step throughout the whole process of creativity.

However, it is also evident that the role of the computer as a machine in the process of creativity has been largely expanded beyond the role as tool or medium to a new concept of "creator". This agentic view the machine suggests a new approach to the creativity of the future. To evaluate the autonomous quality or contribution of technology, we need to set up a theoretical model based on an understanding of the human relationship to these "creative technologies".

The problems of how to understand the concepts and manifestations of creativity are of critical importance in many fields. One of the key functions of visualisation is effective and efficient transformation, translation or interpretation of data into a visual medium. This paper on theoretical models of creativity and their application contributes knowledge about the relationship between and effect of expression on visualisation. It has been shown that the model of an approach to creative expression involving new technology is effective in discovering, understanding and representing the value of ideas and data across scientific and artistic fields. Creative visualisation has significance for scientists, as it seeks new creative models of expression and uses creative technologies to translate and interpret data into visual form in order to facilitate understanding of often complex concepts. On the other hand, this paper has contributed to the evaluation of creativity or creative practices. For example, artistic data-based visualisation has been defined as an example of the relationship between creativity and

visualisation. First, artistic data visualisation emphasises "artistic" concepts other than conventional visualisation models that attempt to represent data with limited, unchanged, unambiguous techniques and methods. In contrast, data-based art works represent data in ambiguous, different and intentional visual forms open to multiple interpretations. Second, this new "creative" (artistic) concept of the machine as a creative agent rather than a technological medium not only can improve the effect of visualisation but also lead to new creative practices to explore the understanding of creativity.

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TROPICAL FREE ENTERPRISE

(*for Dominique, "Ne me quitte pas", Jacques Brel*)

GLEN PHILLIPS

School of Arts and Humanities
Edith Cowan University
2 Bradford Street
Mount Lawley WA 6050
Australia

The tropics called certainly in the days

when rattan ceiling fans span slowly

day and night. Conference days wholly

given to charge or discharge of ways

of knowing or unknowing learned themes:

the strut of emissaries of new theory

or benign breath of poets in beery

elocutions in the bars of their dreams.

But late at night when jungle steamed

its spicy scents and hidden creatures stirred,

the urge to plunge in fresh water spurred

some to go out where solitary there gleamed

a concrete campus swimming pool, fit

for midnight frolic beneath the moon.

A crevice in the fence gave hope and soon

splashing under dim lighting signaled it.

Later the watchman came in surprise

to find foreign devils dripping emerge,

damp and triumphant with their surge

of defiance, claiming their freedom prize.

FOR WHAT WE RECEIVE

GLEN PHILLIPS

School of Arts and Humanities
Edith Cowan University
2 Bradford Street
Mount Lawley WA 6050
Australia

Take note please—It's not the sun

comes over the east horizon each day

to us. It's we who come boldly riding

over the hump of the world to the sun.

Just like the cheek of a woman loved

who turns her face to take the kiss

with startled heart she won't refuse.

And believes she didn't ask for it,

as we do not ask for each new dawn

to present to us the sun. Also when

eyes peer through lenses in the last

minutes as the sun sets. That's when

rose-gold foil spreads thin on tree limbs,

on paddock grass or hill-slope, like

glow of lamplight on human skin. Again

you take from setting suns maybe what

you do not wholly ask to receive.

So, whether to gaze out over the rim

of a ruined turning world at dusk

or dawn, or simply assume the rise

or set of any sun, we ought be aware

of affirmation in that brief ascent or fall.

ROCK ORCHID HYPHAE

JOHN CHARLES RYAN

University of New England
Armidale NSW 2351
Australia

Cutlass-shaped
leaf, rigid sandpaper sheet
smoothed from use,

but with gritty aftertouch.
Margin and midrib
surprisingly resistant when

strummed between
thumb, index and middle
finger. From tip

to base, faintly traceable
veins break out
in browning blemishes.

Profound gouges

found on hide-leather edge
where beetle mandibles

chewed abscesses—
charred blotches with rimes
of ash, like cigarette

burns on old mattresses.
Fitful wind shakes
organs of rock orchid—

whole stiff gorgon quakes,
transmitting shivers
along ridges of stretched

stems, those pseudobulbs,
half-clothed in membrane,
feeling of filthy paper

lantern material left outside
over many winters,
disintegrating and peeling

back. Bulbs, at distance,
reminiscent of plump
asparagus spears—squashy

rotten, half-heartedly eaten,
forgotten in refrigerator
bottoms but, to touch them:

sensation speaks truth,
upends expectation—fleshy
antennae of lithophyte,

as dense as antique wooden
umbrella handles,
fists clenched around them

on some squally amble.
Between stalky assemblage,
shaking slightly on verge,

and lichen-splotched rock
surface—rootlets
sprawl in air, their merest

earthly medium there,
extract what nutriment they
can from odds and ends,

aggregated miscellany
of gum trees—lumpen, dry,
wavy, uncooked noodles,

springy to phalanx pressure,
sachet ripped open.
Another dendrobium holds

vigil overhead, suctioned
firmly to sharp pitch
of granite—miniature grove

of yellow palms leans to old
medusa below, getting
closer yearly by millimetres.
Things live by touch, live by
being touched—
thrive in becoming touched.

False lily, soilless at gulch
brink, miraculously, yes,
but savvily too—how things

must reach out continually,
across yawning hugeness,
wayfaring by yank of feeling

like hyphal filaments,
unseen, spindling through
inner orchid circuitry.

At Paradise Rock Lookout,
fringes of ecosystems
interbreed in ravine creases,

stone anatomies at horizon
are femoral heads
articulated with acetabular

rims, waiting, for millennia,
to stand upright,
stride off into opaque light,

across terrains of glacial
reminiscence—
landscapes echoed within

bodies roused by
feltness. Termite moundup,
conical adobe oven,

concrete-tough from sweat
and spittle epoxy
of billions of wood ants in

holy clearing of burnt
eucalypts, acrid with scent
of carbonised stumps

growing potent with sun,
ripening among young
sheoaks and mossy pendula

which insinuate rainforest.
Whiff of fire incites memory
incised in Apsley gorges,

limbic impressions of being
in touch, of beings
in touch—bunches of herbs

with downy peach fuzz
fragrant horehound, palmar
arches open in welcome.

Other shrubs bring to mind
rosemary but with-
out woody camphor aroma,

hemlock-like evergreen
needles pliable and yielding,
to wit, neither briery nor

wielding ordnance of any
kind. Jurisdiction
of king orchid, outstanding

dendrobium, imperfect
rock lily, not-yet in blossom
but soon-to-be, creamy

flowers about to awaken
synchronously,
scent glands over perianth

poised to perfuse stingless
bee-dazing
polyphony of boulder ledge

attar but, for now, there is
touch—most profound
and immediate of senses,

for Diderot. A skin-
knowing not always in flesh,
but of cuticles of beings

in communion nonetheless,
to stretch filaments
in airy possibility, to breach

chasmic spaces between—
threads of hyphae,
unseen reach to deep green.