Science and/in Literature: A Californian Perspective

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Abstract

This essay explores the intersection of science and literary expression in Californian literature. It aims to analyze a current in said literature characterized by the convergence of literature and science. In so doing, the essay probes four thematic layers that play a prominent role in Californian environmental literature: 1) ecology and Darwinian science, 2) the holistic approach to science, 3) the geological imagination, 4) and imagined worlds in ecological science fiction. Investigating literary works spanning from the late 19th century to the early 21st century, the essay addresses authors such as John Muir, Mary Austin, Robinson Jeffers and John Steinbeck, each of whom incorporated science into their imaginative writing. In addition to these quintessential Californian authors, the essay also probes texts by writers who experienced the dramatic degradation of the California environment in the 1960s and was further aggravated by climate change at the turn of the century. These writers include Gary Snyder, Ernest Callenbach, Ursula Le Guin and Kim Stanley Robinson. The essay identifies a distinctive and coherent thread that runs through the texts under scrutiny, one characterized by a critical and skeptical attitude to fragmented science and its ambition to control rather than apprehend the natural world. In contrast, the writers draw from the inclusive and holistic approach applied by Charles Darwin.

Keywords

American literature, California, environment, ecocriticism, science, John Muir, Mary Austin, Robinson Jeffers, John Steinbeck, Gary Snyder, Ernest Callenbach, Ursula K. Le Guin, Kim Stanley Robinson

Introduction

The decline of California's environment has been studied by scientists and imaginatively portrayed by a host of Californian writers. This intersection of science and creative expression is the focus of the present study, which aims to analyze a current in Californian literature that is marked by the convergence of science and literature – a trend that would seem to contradict Charles Percy Snow's mid-20th century lament concerning the growing abyss between the sciences and humanities described in his "The Two Cultures and the Scientific Revolution" (1959). This essay examines the ways in which science has informed the works of quintessential Californian authors, identifying tendencies that prevailed in various periods between the late 19th and early 21st centuries.

The role of science in the brief history of American California can hardly be overestimated. This Pacific state once represented the ultimate frontier, a place where the process of "civilizing the wild continent" culminated in the latter half of the 19th century. At the same time, California was a territory that aroused curiosity in both scientific and artistic circles since it had been largely unexplored by Euro-Americans. Following California's statehood in 1850, some of the best natural scientists were sent there to survey the newly acquired land and its potential. Given the fact that the incorporation of California into the Union was accelerated by the Gold Rush, it was geologists that formed the most important segment of the initial scientific investigations. California's geology mattered in terms of economic development, but it also stirred the imagination of writers, although right at the outset it should be emphasized there was no clear dividing line between groups of empirical researchers and creative artists. The work of many of these individuals flows among

various categories. Two acclaimed figures of early American California history, William Henry Brewer and Clarence King, were both distinguished geologists and authors of some of the first noteworthy pieces of Californian literature, namely King's *Mountaineering in the Sierra Nevada* (1872) and Brewer's *Up and Down California in 1860–1864* (1930).

Even in the late 20th century, a nonfiction geological tour of the state titled *Assembling California* (1993), a remarkable project by writer John McPhee and world-renowned geologist Eldridge Moores, garnered favorable reception among readers as well as critics.[1]

Subversive Science in the Religious Union

As Charles Darwin's groundbreaking *On the Origin of Species* caused religious controversy in Britain upon its publication in 1859, the implications of evolution in general were hard to accept in deeply Christian America. While scholarly disputes were mostly restricted to professional journals, it was often creative writers who mediated the new theories and ideas to the general public. One of the first to do so was John Muir, the founder and first president of the San Francisco-based Sierra Club, which has since grown into the largest environmental organization in the country. Muir was also a prolific writer who had familiarized himself with the theory of evolution as early as 1867, fully embracing Darwin's ideas and propagating them enthusiastically. In a journal entry, Muir remarked that Darwin's "noble character has suffered from silly, ignorant, and unbelieving men who say much about Darwinism without really knowing anything about it. A more devout and indefatigable seeker after truth than Darwin never lived."[2] It is important to point out that words such as "unbelieving" and "devout" are not used by chance. In Muir's eyes, evolution did not contradict the idea of a Deity. His evolutionist views were often veiled in religious vocabularies. He was able to reconcile divine Intelligence and the Christian outlook with the concept of an ever-evolving natural world governed by the cycle of inseparable life and death:

> It is eternally flowing from use to use, beauty to yet higher beauty; and we soon cease to lament waste and death, and rather rejoice and exult in the imperishable, unspendable wealth of the universe, and faithfully watch and wait the reappearance of everything that melts and fades and dies about us, feeling sure that its next appearance will be better and more beautiful than the last.[3]

However, it is the frequently cited passage from *My First Summer in the Sierra* (1911), based on the author's Yosemite journal, that encapsulates the fundamental ecological principle

1 As a University of California Davis (UCD) professor, Moores also taught classes in the groundbreaking bachelor's program Nature and Culture cofounded by Gary Snyder in 1993. Both Snyder and Moores were instrumental in inaugurating this interdisciplinary program, the first of its kind in the country, and promoting collaboration between the natural sciences and the arts, primarily literature. A member university of the world-renowned California state system, UCD has a notable record of being the in the vanguard of crosspollination among the sciences, arts and humanities. In June 2019, UCD hosted a major conference of the Association for the Study of Literature and Environment (ASLE), one of the largest professional organizations in the field of environmental humanities. The theme of the conference, Paradise on Fire, referred to the putative effects of anthropogenic climate change in California.

2 Quoted in Stephen Fox, *John Muir and His Legacy: The American Conservation Movement* (Madison: The University of Wisconsin Press, 1981), 82.

3 John Muir, *The Wilderness World of John Muir*, ed. Edwin Way Teale (Boston: Houghton Mifflin Company, 1954), 320.

of interdependence among all species that Muir shared with Darwin: "When we try to pick out anything by itself, we find it hitched to everything else in the universe."[4]

In his fiction, Jack London also drew inspiration from Darwin, though in his case Darwin's influence was mediated by Herbert Spencer and his theory of Social Darwinism. In novels like *Burning Daylight* (1910) and *The Valley of the Moon* (1913), the motifs of natural selection and struggle for survival recur in various forms and contexts. In the former, Daylight and Dede Mason plant cattails "along the meadow stream, where they were left to fight it out with the water-cress." They "made no effort to introduce a flower or shrub that did not of its own right belong. Nor did they protect them from their enemies."[5] In his "Darwin and Ecology in Novels by Jack London and Barbara Kingsolver" (2011), Bert Bender documents the growth in London's views on ecology between the years 1910 and 1914 in which the novelist spent ranching in Sonoma County, California.[6] However, it should be noted that London's reading of Darwin was somewhat selective, as it emphasized struggle and competition while largely ignoring the benefits of cooperation and community as important elements of Darwin's theory and, even more so, in ecological thought generally.

The eminent writer and activist Mary Austin incorporated a Darwinian hypotheses, including the struggle for survival and adaptation, into her texts more profoundly than London. She was able to convey the themes in a comprehensible manner, as the following lines from her classic *The Land of Little Rain* (1903) demonstrate: "The real struggle for existence, the real brain of the plant, is underground; above there is room for a rounded perfect growth. In Death Valley, reputed the very core of desolation, are nearly two hundred identified species . . . The desert floras shame us with their cheerful adaptations to the seasonal limitations."[7] Given the author's well-documented break with dogmas of institutional Christianity, the quoted extract can be also interpreted as a challenge to the Christian view of the desert, which evokes a Godless and God-forsaken territory. The writer confronts this mythology with a scientific perspective that helps unearth and grasp natural processes and basic ecological principles. Austin also opposes a burgeoning tendency in American nature writing of the early 20th century marked by excessive sentimentality.[8] She objected to "the silly pastoral gentleness that glozes over an elemental violence."[9]

In her journal article "Science for the Unscientific" (1922), Austin reflects on the idea of the two separate cultures of science and art, a binary notably scrutinized by Charles Percy Snow in the 1960s. Austin argues that "a new type of writer will have to be evolved, writers whose approach is purely literary but who are capable of immersing themselves in the data of science to the point

4 John Muir, *My First Summer in the Sierra,* in *The Eight Wilderness-Discovery Books* (Seattle: Diadem Books, 1992), 248.

5 Jack London, *Burning Daylight* (New York: Macmillan, 1913), 344.

6 It should be noted that Bohemian Grove in Sonoma County represents the location where gatherings of the Bohemian Club have taken place since 1872. At Bohemian Grove London would meet with Muir on a regular basis.

7 Mary Austin,*The Land of Little Rain* (New York: Penguin Books, 1997), 4 and 2. In the notably eclectic community of Carmel-by-the-Sea, California, London came to know Mary Hunter Austin.

8 The best known manifestation of this tendency was the so called "nature fakers" controversy (1903–1907). Prominent writers such as John Burroughs and even President Roosevelt ranked among the major voices in the dispute. The commentators chastised the "nature fakers" for overly sentimentalizing and fictionalizing the nonhuman world. These critics called rather for scientific accuracy and a more responsible approach in the depiction of the natural world.

9 Austin, *The Land of Little Rain*, 40.

of saturation."[10] This passage echoes sentiments expressed by Theodore Roosevelt on his visit to California in 1911. Roosevelt hailed Muir as an author with scientific imagination and poetic expression. The former US President articulated the need for more writers who could "take the facts of science and write of them with fidelity, yet with such an interpretive and poetic spirit to make them into literature."[11]

Fragmented vs. Holistic Science

Mary Austin found this new type of writer in both Robinson Jeffers, who was her neighbor during Austin's Carmel years, and in John Steinbeck, who lived in Pacific Grove and Monterey, only a few miles north of Carmel. Arguably, Jeffers and Steinbeck rank among the most scientifically erudite American authors of the first half of the 20th century. Yet, their stances on contemporary science were ambivalent, they questioned the excessively analytical character of scientific pursuits. And the unceasing discovery of the hitherto unknown particles of life accelerated the atomization of science, both literally and metaphorically. In "Themes in My Poems" (1941), Robinson Jeffers eloquently describes this process and asserts the redemptive power of poetry: "Science usually takes things to pieces in order to discover them; it dissects and analyzes; poetry puts things together; producing equally valid discovery, and actual creation. Something new is found out, something that the author himself did not know before he wrote it; and something new is made."[12] The significance of Darwin's non-anthropocentric thought is explicitly underscored in the frequently cited poem "The Inhumanist"; which also contains the following verses: "Science is not to serve but to know. Science is for itself its own value, it is/ not for man."[13]

John Steinbeck took much inspiration from Jeffers's work in his early career. He also echoed some of the poet's views regarding science. In *The Log from the Sea of Cortez* (1941), he acknowledges that "the impulse that drives a man to poetry will send another man to the tide pools and force him to try to report what he finds there."[14] And in the same book, a joint project by Steinbeck and his closest friend, pioneering biologist Ed Ricketts, he provides a response that combines the poetic with the scientific outlook:

> Man is related to the whole thing, related inextricably to all reality, known as unknowable. This is a simple thing to say, but the profound feeling of it made a Jesus, a St. Augustine, a St. Francis, a Roger Bacon, a Charles Darwin, and an Einstein. Each of them in his own tempo and with his own voice discovered and reaffirmed with astonishment the knowledge that all things are one thing and that one thing is all things – plankton, a shimmering phosphorescence on the sea and the spinning planets and an expanding universe, all bound together by the elastic string of time. It is advisable to look from the tide pool to the stars and then back to the tide pool again.[15]

10 Mary Austin, "Science for the Unscientific," *The Bookman* 55, no. 6 (1922), 565.

11 Quoted in Paul Brooks, *Speaking for Nature: How Literary Naturalists from Henry Thoreau to Rachel Carson Have Shaped America* (Boston: Houghton Mifflin Company,1980), 3.

12 Robinson Jeffers, *The Collected Poetry of Robinson Jeffers*, vol. 4, ed. Tim Hunt (Stanford: Stanford University Press, 2000), 416.

13 Robinson Jeffers, *The Collected Poetry of Robinson Jeffers*, vol. 3, ed. Tim Hunt (Stanford: Stanford University Press, 1991), 291.

14 John Steinbeck, *The Log from the Sea of Cortez* (New York: Penguin Books, 1986), 1.

15 Steinbeck, *The Log from the Sea of Cortez*, 257.

In *The Log from the Sea of Cortez*, Steinbeck also challenges the rigorous divisions of life into different biological species, families and phyla. He rejects the fragmentation of life by means of taxonomic categories that go hand in hand with the overspecialization of narrowly defined scientific disciplines. He writes in favorable terms about holistic science and repeatedly invokes Darwin: "And the modern process—that of looking quickly at the whole field and then diving down to a particular—was reversed by Darwin. Out of long long (*sic*) consideration of the parts he emerged with a sense of the whole."[16] While working on the draft of the log, Steinbeck wrote a letter to his editor describing the design of the book. The letter includes a passage which illustrates the author's indulgence in scientifically informed writing imbued with a poetic spirit: "I told you once that I found a great poetry in scientific thinking. Perhaps I haven't done it but I've tried and it's there to be done."[17]

Jeffers and Steinbeck also share and imaginatively express the idea of the interdependence of all life forms. In this respect, Jeffers in particular was able to harmonize ontological and biological holism. One of his many articulations of this insight reads as follows: "Universe is one being, all its parts are different expressions of the same energy . . . Parts of the organic whole."[18] Likewise, Steinbeck perceived the biosphere as a superorganism. While taking a course in marine biology at Stanford University in 1923, Steinbeck was intrigued by the William Emerson Ritter's theory of the superorganism, which exhibits almost identical characteristics as an ecosystem. Steinbeck later applied this concept in his novels *Tortilla Flat* (1935) and *In Dubious Battle* (1936). Even the structure of *The Grapes of Wrath* (1939) is inspired by this biological notion. Steinbeck intercalates chapters featuring the Joad family with chapters portraying migration as a whole. From a detached perspective, these intercalary chapters depict the community of migrants as a superorganism.

Geological Layers

In his dissertation on the symbiotic relationship between19th-century poetry and early geology, John Robert Higgins asserts that "[p]oetry and geology continually intersected throughout the infancy of the science, with geologists admiring the power and importance of poetic truth and perception, and poetry responding to the challenges posed by geologists to the human relation to nature."[19] But while this mutually beneficial relationship can be observed in the Romantic writing of the 19th century, later on, the increasing exactitude of modern science could not be reconciled with poetic expression any more. Still, according to the renowned American nature writer and ecologist Aldo Leopold, geology (along with Darwinian theory) was one of the two greatest "cultural advances" of the 19th century.[20]

16 Steinbeck, *The Log from the Sea of Cortez*, 70.

17 John Steinbeck, *Steinbeck: A Life in Letters*, edited by Elaine Steinbeck and Robert Wallsten (New York: Penguin Books, 1976), 232.

18 Robinson Jeffers, *The Selected Letters of Robinson Jeffers*, edited by Ann N. Ridgeway (Baltimore: The John Hopkins Press, 1968), 221.

19 John Robert Higgins, *Fossil Poetry, the Birth of Geology, and the Romantic Imagination, 1790–1860.* (Doctoral dissertation), 2011, unpaged.

20 Quoted in Roderick Nash, *Wilderness and the American Mind* (New Haven and London: Yale University Press, 1982), 193.

It is not by accident that the two aforementioned geologists, Brewer and King, rank among the first well-known literary figures from California. As a land where otherwise buried geological layers are often exposed on the surface, California represents an ideal outdoor laboratory for geologists. And after all, etymologically, "geology" (from the Greek *geo* + *logos*) is associated with the word or language of the Earth.[21] No wonder scientifically erudite literati were perhaps the best interpreters of this language. In the context of Californian writing, the interpreters such as Muir, Robinson Jeffers and Gary Snyder rank among the most articulate.

Despite the fact that Muir was not a geologist by profession, he proved wrong Clarence King and Josiah Whitney, the most distinguished geologists of his time. Muir's theory regarding the glacial origin of the Yosemite Valley was supported by mounting evidence, and from a "ignoramus" ridiculed by the experts, Muir became a respected figure in the scholarly community. Although he lacked theoretical background, his intimate knowledge of Yosemite's landscape taught him to read the marks carved on the rocks by the sluggishly moving ice. He noted in his journal that the most effective method of glacial study was "patient observation and constant brooding above the rocks, lying upon them for years as the ice did."[22] In his first book, *The Mountains of California* (1894), he writes about the interplay between granite and ice: "Nature's poems carved on tables of stone—the simplest the most emphatic of her glacial compositions."[23] Even though the passage uses the then popular image of nature as a (sacred) book, Muir conceives of it as an incomplete text that is in the making.

Rocks and stones are central to the imagery in the poetry of Robinson Jeffers. As his wife Una observed, it was the kinship with stone which the poet experienced while building his own house that lie behind the "awakening" that turned an average artist to a leading American poet (Ridgeway, 213). Obviously, Jeffers is one of many creative writers who used rock-related imagery and symbolism widely, but very few can match his ability to poetically capture complex geological processes and phenomena. He does this in the most condensed form in the narrative poem "The Women at Point Sur" (1927):

> Not for repose; [the mountains] are more strained than
> the mind of a man; tortured and twisted
> Layer under layer like tetanus, like the muscles of a mountain bear that has
> gorged the strychnine
> With the meat bait: but under their dead agonies, under the nightmare
> pressure, the living mountain
> Dreams exaltation; in the scoriac shell, granites and basalts, the reptile force
> in the continent of rock
> Pushing against the pit of the ocean, unbearable strains and weights,
> inveterate resistances, dreams westward
> The continent, skyward the mountain . . . The old fault
> In the steep scarp under the waves

21 Steven P. Schneider, *Complexities of Motion: New Essays on A. R. Ammons's Long Poems* (London: Associated University Presses, 1999), 139.

22 Quoted in Michael P. Cohen, *The Pathless Way: John Muir and the American Wilderness* (Madison: The University of Wisconsin Press, 1984), 43.

23 John Muir,*The Mountains of California*, in *The Eight Wilderness-Discovery Books* (Seattle: Diadem Books, 1992), 324.

Melted at the deep edge, the teeth of the fracture
Gnashed together, snapping on each other; the powers of the earth drank
Their pang of unendurable release and the old resistances
Locked. The long coast was shaken like a leaf.[24]

For Aaron Yoshinobu, professor of structural geology and current president of the Robinson Jeffers Association, Jeffers had a discerning and even prophetic imagination. Jeffers was thus able to imagine plate tectonics in "The Women at Point Sur" forty years before the theory was developed.[25] Besides plate tectonics, the poem imaginatively depicts many other geological theories and processes, such as continental drift and seismicity. In fact, Yoshinobu has detected many other geological motifs in the poet's verse that paralleled or predated the contemporary scientific findings (see e.g. "Robinson Jeffers: Poet, Stone Mason and Earth Sciences").

It has been well documented that Jeffers inspired Gary Snyder. As a matter of fact, Snyder apparently responds to Jeffers' geological imagination in his early work, namely in poems "Out of the soil and rock" and "Geological Meditation." However, it was the unmediated contact with granite which Snyder experienced in the 1950s while building trails in Yosemite National Park that made his poetry more immediate and authentic. He admits this experience came to be a solid bedrock on which his creative career was to be built. Its first poetic rendering can be found in the poem "Piute Creek":

Hill beyond hill, folded and twisted
Tough trees crammed
In thin stone fractures
A huge moon on it all, is too much.
The mind wanders. A million
Summers, night air still and the rocks
Warm. Sky over endless mountains.
All the junk that goes with being human
Drops away. . . .[26]

Commenting on the formal properties of his poetry in *The Real Work: Interviews & Talks 1964–1979* (1980), he acknowledges the significance of geological processes: "The rhythm I am drawing on most now is the whole of the landscape of the Sierra Nevada, to feel it all moving underneath. There is the periodicity of ridge, gorge, ridge, gorge, ridge, gorge at the spur ridge and tributary gorges that makes an interlacing network of, oh, 115-million-year-old geological formation rhythms."[27] This is one of a number of passages in which the poet, on the one hand, illustrates the dynamic nature of the seemingly static earth and, on the other, applies a geological time scale in which the human presence on the planet represents just a brief moment. The notion of a geological time scale, sometimes associated with the so-called deep time, is difficult to grasp

24 Robinson Jeffers, *The Collected Poetry of Robinson Jeffers,* vol. 1, ed. Tim Hunt (Stanford: Stanford University Press, 1988), 308–309.

25 Aaron Yoshinobu, "Robinson Jeffers: Poet and Earth Scientist," Jeffers, Science & the Natural & Cultural History of the Big Sur Region (10th Annual Robinson Jeffers Association Conference. Sunset Center, Carmel. 15 February 2004).

26 Gary Snyder, *Turtle Island* (New York: New Directions, 1974), 8.

27 Gary Snyder, *The Real Work: Interviews & Talks 1964–1979*, ed. Scott McLean (New York: New Directions, 1980), 48.

and ultimately accept, because it subverts the anthropocentric thought that has defined much of the cultural history of the modern era in the Western world. Snyder conveys the idea via simple juxtapositions, for instance in his Pulitzer Prize winning poetry collection *Turtle Island* (1974): "To be in / to the land / where croppt-out rock / can hardly see / the swiftly passing trees."[28] Variations on the same theme, including explicit references to human ontological insignificance, are found in other texts by Snyder, for instance in *Axe Handles* (1983): "As the crickets' soft autumn hum / is to us, / so are we to the trees / as are they / to the rocks and the hills."[29]

In the past few decades, as the debates regarding the Anthropocene have been gaining momentum, geological imagination has expressed itself in diverse ways. The Anthropocene is defined as a geological epoch in which humans have had and used the capacity to alter their environment on a planetary scale. While the current US presidential administration systematically denies man-made climate change, a growing number of California-related futuristic and post-apocalyptic works of fiction have been published based on overwhelming scientific evidence documenting human-induced environmental change. Some of the most acclaimed titles representing this burgeoning genre are Dale Pendell's *The Great Bay: Chronicles of the Collapse* (2010) and *Gold Fame Citrus* (2015) by Claire Vaye Watkins.

Science (in) Fiction

Pendell's *The Great Bay: Chronicles of the Collapse*, set in the flooded Central Valley of California of the future, may also be described as an example of science fiction, another genre flourishing in the California context. Given the limited scope of the present study, attention will be devoted primarily to ecology-oriented science fiction. In his *Ecological Literature and the Critique of Anthropocentrism* (2017), Bryan L. Moore claims that ecological science fiction literature peaked in the 1970s, partially in response to heavily publicized disasters, most notably the massive oil spill in the coastal city of Santa Barbara, California in 1969. It is thus not surprising that some of the best-known authors of ecological science fiction have set their stories in California, the environment of which has been great peril owing to the rapid growth of population.[30]

Ecological science fiction prospered in California even before the 1970s, with George Rippey Stewart's classic text *Earth Abides* (1949) defining the genre in the years that followed. The novel's central character Isherwood Williams is a graduate student of ecology at UC Berkeley who happens to be one of the few survivors of a major measles pandemic. He witnesses the gradual return of both the flora and fauna to a wild condition, which is the result of the abruptly ended human interventions in the environment. With his trained scientific eye, he observes and comments on the manner in which the biological laws of natural selection operate: "As for man, there is little reason to think that he can in the long run escape the fate of other creatures, and if there is a biological

28 Snyder, *Turtle Island*, 26.

29 Gary Snyder, *Axe Handles* (San Francisco: North Point Press, 1983), 51.

30 This growth and its ramifications are discussed by Stanford University professor Paul Ehrlich in his aptly titled book *The Population Bomb* (1968).

law of flux and reflux, his situation is now a highly perilous one."[31] Isherwood recognizes the beneficial effects of spontaneous rewilding on the natural environment. It is important to note in this connection that the protagonist's nickname Ish is a deliberate reference to Ishi, commonly known as the last "California Indian," who epitomizes both intimate knowledge of the natural world and environmental sensitivity in the American imagination. The values and attitudes held by Ishi became known to the world thanks to the leading anthropologist of the early 20th century, Alfred Kroeber, a UC Berkeley professor and father of the accomplished science fiction author Ursula Kroeber Le Guin.

Le Guin's *The Dispossessed: An Ambiguous Utopia* (1974) has received several distinguished awards (Hugo, Locus, Nebula). Based on the critical reception of the book, it can be argued that the recognition came partly due to the number of socially relevant themes Le Guin covers in the novel, one of which is the position of science in the modern world. Shevek, the main character of the novel, is an innovative physicist who is effectively excommunicated from a circle of fellow scientists. His General Temporal Theory is too radical, and as such is flatly dismissed by his colleagues. His theory of time goes well beyond the limits of physics, drawing on ethics and history, among others. Its rejection can thus be interpreted as a critique of the overspecialized science that rigidly defends the disciplinary boundaries and ultimately loses contact with society and its trust. Shevek's lover and biologist, Takver, epitomizes the kind of science that maintains such contact and does not embrace the typical detached point of view: "It was strange to see Takver take a leaf into her hand, or even a rock. She became an extension of it, it of her."[32] Throughout her work, Le Guin stresses interdependence, the fundamental principle of ecology, as a motif that manifests itself in different images and words: "If the human creatures will not understand Relativity, very well; but they must understand Relatedness."[33]

Set in the Napa Valley of California, Le Guin's masterpiece *Always Coming Home* (1985) is imbued with ideas and motifs associated with the indigenous people of the region. The future-primitive[34] Kesh people live communally and in harmony with the bioregion in which they dwell. But as Michael Ziser aptly suggests, the one "major legacy that the Kesh preserve from our present civilization . . . is a computer network that archives and serves all recorded knowledge to researchers."[35] The key character of Pandora, who is erudite in archeology and anthropology, appears to embody Le Guin's ambivalent attitude to science, namely the positivist version of modern science whose belief in the capacity to grasp all the natural phenomena is self-deceptive. The crucial but somewhat subtle distinction between science as a means of control of nature as opposed to understanding its complexities comes to mind as one attempts to analyze this intriguing character. In her eyes, science is not a vehicle driving material progress. Le Guin's perspective on

31 George R. Stewart, *Earth Abides* (Boston: Houghton Mifflin, 1969), 8.

32 Ursula Le Guin, *The Dispossessed: An Ambiguous Utopia* (New York: Harper and Row,1974), 185.

33 Ursula Le Guin, "Direction of the Road," in *Buffalo Gals and Other Animal Presences* (New York: Penguin, 1990), 107.

34 The expression "future primitive" was coined by Californian ecologist Raymond Dasmann. In his 1976 article "Future Primitive: Ecosystem People versus Biosphere People," he calls for the restoration of the sense of place that characterized primordial societies.

35 Michael Ziser, "Home Again: Peak Oil, Climate Change, and the Aesthetics of Transition," in *The Environmental Criticism for the 21st Century*, ed. Stephanie LeMenager, Teresa Shewry, and Ken Hiltner (New York and London: Routledge, 2011), 192.

science bears similarities with the approach postulated by Fritjof Capra in his *The Tao of Physics* (1975) which integrates modern science and spirituality.

Ernest Callenbach's *Ecotopia* (1975) represents another classic of ecological science fiction. As the author has admitted, in considering the setting for a fictional account of an "ecologically sane society, it seemed inevitable to situate Ecotopia in this territory [California], and to think of San Francisco as its heart."[36] Callenbach's fantasy society is indeed dependent on ecological literacy. The science of ecology is central to the system of education. It also generates the knowledge and principles around which Ecotopia is designed as a sustainable society, such as ecological food production including organic waste treatment and the use of renewable energy.

Kim Stanley Robinson, a major literary voice in contemporary science fiction, prefers to be classified as a Californian first, and only then a science fiction author (qtd. in Abbot 2009, 68). He also acknowledges the influence of other California writers on his writing, most importantly that of John Muir, Gary Snyder and Ursula Le Guin.[37] In the so called Capital Trilogy, which includes *Forty Signs of Rain* (2004), *Fifty Degrees Below* (2005) and *Sixty Days and Counting* (2007), the chief character Frank Vanderwal, a professor of sociobiology at UC San Diego, becomes increasingly frustrated with the current state of science, which "wants to make assertions from a position that is not any particular subject's position . . . Complete agreement; the world put under a description."[38] He resents the sterility and atomization of science, and advocates a more integrated and holistic approach. He keeps believing that "science [is] the solution, not the problem."[39] Echoing Bruno Latour's ideas concerning the growing abyss between science and society, Frank avidly defends "passionate" science, a method centered around multiplicity and experimentation.[40] It is perhaps worth pointing out that multiplicity and experimentation are qualities oftentimes linked with the Californian experience in many spheres of life,[41] research included. Further, another noteworthy character in the trilogy President Chase (a former California senator) who promotes permaculture and sustainability pleads for a progressive environmental agenda. Chase's science-backed appeal to his fellow countrymen acknowledges the need to adapt to the changing environment rather than continue transforming it thoughtlessly,[42] a practice that has generated an array of problems in the Golden State.

36 Ernest Callenbach, *Ecotopia* (Berkeley: Banyan Tree Books, 1975), 209.

37 Istvan Csicsery-Ronay, "Pacific Overture: An Interview with Kim Stanley Robinson," *Los Angeles Review of Books* (Jan. 9, 2012), 156.

38 Kim Stanley Robinson, *Forty Signs of Rain* (London: HarperCollins, 2004), 78.

39 Robinson, *Forty Signs of Rain*, 292.

40 Andrew Rose, "The Unknowable Now: Passionate Science and Transformative Politics in Kim Stanley Robinson's Science in the Capital Trilogy," *Science Fiction Studies* 43, no. 2 (2016), 266.

41 These words, along with their near-synonyms such as diversity, abundance, cutting edge, and innovation recur in a host of publications on California history and society. See for instance Kevin Starr's *California: A History* (2005), *The Elusive Eden: A New History of California* (2012) by R. Rice, W, Bullough, R. Orsi and M. Irwin, and *California Dreams and Realities* (2005) by Sonia Maasik and Jack Solomon.

42 Kim Stanley Robinson, *Sixty Days and Counting* (London: HarperCollins, 2007), 516.

Conclusion

It is safe to state that in tracing the scientific dimension of these chosen classics of the literature of California, one can detect a distinctive and coherent thread that runs through the texts. It is characterized by a somewhat skeptical attitude to scientific work that emphasizes analysis and maintains a very narrow focus or complete detachment. The authors invoke the Darwinian scientific approach marked by synthesis and holism, which surprisingly applies more to those among the literati discussed whose work predates the rediscovery of Darwin as an ecologist and patron of holistic science in the 20th century in the context of ecocritical studies. They do not entirely distance themselves from and objectify the phenomena they investigate. Whether called participatory or passionate, the authors adhere to an integral and organic conception of science. It is no surprise that the scientific disciplines of ecology and geology serve this purpose well. And ecology in particular ranks among the most inclusive scientific disciplines. While ecology is more horizontal in its ability to apprehend the interconnected nature of life on Earth, geology's inherent verticality has the ability to unearth a time frame and layers that put humanity's position into perspective. The findings and insights both sciences provide also have the capacity to arouse wonder and sublimity—something of which these writers and poets seem to be well aware. To different degrees, all the authors inspire a sense of wonder and even sacredness related to the natural world by combining science and indigenous spiritualities. However, the interplay between these two is beyond the scope of this essay. What is beyond doubt, however, is that all the writers share the insight eloquently expressed by Rachel Carson, writer and biologist, whose *Silent Spring* (1962) first ignited environmental consciousness in America: "The aim of science is to discover and illuminate truth. And that, I take it, is the aim of literature, whether biography or history or fiction. It seems to me, then, that there can be no separate literature of science."[43]

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