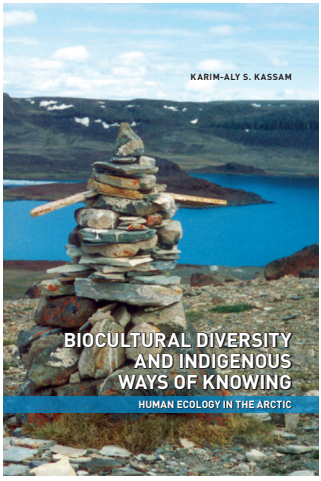

BIOCULTURAL DIVERSITY AND INDIGENOUS WAYS OF KNOWING: HUMAN ECOLOGY IN THE ARCTIC

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CHAPTER 2

Relations between Culture and Nature: A Critical Consideration

And God created great whales, and every living creature that moveth, which the waters brought forth abundantly, after their kind, and every winged fowl after his kind (Bible 1989 Genesis 1:21)

And God made the beast of the earth after his kind, and cattle after their kind, and everything that creepeth upon the earth after his kind (Bible 1989 Genesis 1:25)

So God created man in his own image, in the image of God created he him; male and female he created them (Bible 1989 Genesis 1:27)

2.1. Introduction

Culture and nature are not separate binaries because culture is an aspect of nature. It is an error of logical type to assign culture and nature equal

weight as distinct categories. What we need to explore is the relationship between the biological and cultural and how diversity and variation are expressed in those relationships. Nature is a foundation from which possibilities of culture emerge. Simultaneously, culture bridges human experience and meaning upon this foundation. Culture encompasses human activities that range from a way of life like hunting and gathering to the workings of the human mind.

In recent decades it has become obvious that the impact of the human species is global even in seemingly remote regions of the earth such as the circumpolar Arctic and sub-Arctic. This recognition of the human footprint is being gradually acknowledged in the industrialized world. As images of the earth as seen from the moon have caused a paradigm shift in consciousness, humans in industrial societies have begun to conceive of themselves as beings living with other diverse and complex organisms within the protective skin of the earth. Indigenous peoples of the Arctic and sub-Arctic have conceived of themselves along such lines for thousands of years. For them culture and nature are a seamless reality, not division.

In this chapter, we will explore the concept of human ecology and briefly tracing its roots in the social sciences and then connect it to recent literature. We will discuss the relations between biological and cultural diversity.

1. Human ecology, as espoused by its proponents, will be defined via the concepts of ecology and ecosystem. We will also provide a summary of the attributes and propositions of human ecology. References will be made to specific contexts; namely, to examples from the circumpolar north (sections 2.2–2.4).

2. Specifically, the works by scholars committed to this relatively new interdisciplinary area of study will be summarized and analyzed (section 2.5).

3. The current literature on the relationship between biological and cultural diversity will be examined (section 2.6).

4. The human ecology approach to the connectivity between biological and cultural diversity will be critically considered in relationship to northern indigenous circumpolar communities (section 2.7).

Critical consideration is part and parcel of scholarship. Criticism for the sake of academic elegance is of little value to applied research addressing societal aims such as conservation of diversity or sustainable livelihoods. Examination of current conceptualizations of the relationship between biological and cultural diversity is informed by these pragmatic objectives. Critical consideration in this chapter is undertaken not to diminish the contributions of other scholars but to propose alternative methods based on the body of their work. In other words, engagement with ideas through interrogation, clarification, and suggestion of different approaches is only possible because of a continuing conversation between scholars committed to the conservation of biological and cultural diversity.

2.2. Ecology: The Founding Science

Study of human ecology draws its inspiration primarily from the field science of ecology. Derived from the Greek word *oikos*, meaning household, *ecology* is the study of the house and is extended to a study of human interactions. The same Greek word is also the root for the branch of social science called economics. Ecology views the earth as a household or a whole system. As early as 1870, Ernst Haeckel explained that: "By ecology we mean the body of knowledge concerning the economy of nature – the investigation of the total relations of the animal both to its inorganic and to its organic environment" (Kormondy and Brown 1998: 29). Early English phrases such as "the economy of nature" and "the balance of nature" convey a sense in which nature is perceived as a mechanistic system consisting of a well-oiled machine and functioning in an orderly manner (Molnar and Molnar 2000; Nepstad and Nielsen 1993). This mechanistic world-view, influenced by then-current ideas of Newtonian mechanics, gave way to a

more comprehensive perspective with the creation of the British Ecological Society in 1913 and the Ecological Society of America in 1915.

In 1905 Frederick Clements, American plant ecologist (botanist), defined *ecology* as "the science of community" (Kormondy and Brown 1998: 29). From the beginning ecologists have sought to express the science of ecology in lyrical terms, using metaphors to convey its meaning. Twentieth-century ecological thinking viewed nature holistically as an organism. This concept of holism maintains that all things are connected and that these connections form a wider whole. By the 1920s ecology became increasingly recognized as a science (Nepstad and Nielsen 1993). However, it was not until the 1960s that ecology drew wide interest from both scientists and the average citizen. Viewing the earth from the moon shifted humanity's perspective. Metaphors of the Earth as an island with finite resources worthy of wise stewardship, as expressed by astronaut Neil Armstrong, or Earth as a spaceship requiring careful utilization of life support systems, as expressed by writer and economic thinker Kenneth Boulding, galvanized the public imagination (Juzek and Mehrtens 1974). Eugene Odum, an American ecologist, defined *ecology* as "the study of the structure and function of nature" and "the study of the structure and function of ecosystems" (Kormondy and Brown 1998: 29). This latter definition continues to be the standard. Odum (1989) argues that the role of the ecologist in the future will be to promote a holistic approach. "Ecology is now" he maintains "more and more a discipline that emphasizes a holistic study of both parts and wholes. While the concept of the whole being greater than the sum of the parts is widely recognized, it tends to be overlooked by modern science and technology, which emphasize the detailed study of smaller and smaller units on the theory that specialization is the way to deal with complex matters" (Odum 1997: 34).

2.3. Ecosystems

In 1935 Arthur J. Tansley, a British ecologist, expanded the concept of holism by bringing together ecology and systems science. He coined the term *ecosystem* for the natural environment as an interacting whole. *Ecosystem* is

a contraction of 'ecological system.' Tansley defined an *ecosystem* as "an organisational unit consisting of both living (biotic) and non-living (abiotic) things that occur in a particular place" (Kormondy and Brown 1998: 30). Article 2 of the Convention on Biological Diversity defines ecosystem as "a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit" (Secretariat of the Convention on Biological Diversity 2001: 3). Therefore, the assemblage of plant and animal communities within a common habitat form an organized body, or *ecosystem*.

Ecosystems can vary in size. For instance, they may be very large, like the boreal (northern) forest or Arctic tundra, or much more confined, as in an aquarium or test tube. While delimiting an ecosystem is somewhat subjective, it is not without an internal logic. Creating and defining boundaries may be problematic for the ecosystem approach, but the idea that the system is open to inputs and outputs does not weaken the holistic theme of ecology (Nepstad and Nielsen 1993).

Because human beings occupy a dominant position within the ecosystem, it offers them a wide variety of resources. As omnivores, humans feed at different levels of the food chain. This complicates the task of placing us in an ecosystem. For example, Dene communities in the Canadian sub-Arctic consume terrestrial mammals, fish, and plants found within the boreal forest. Similarly, Sami, Iñupiat, and Inuvialuit communities in the Russian, Alaskan, and Canadian Arctic, respectively, consume marine and terrestrial mammals, salt and fresh water fish, and tundra plants. Analysis of an ecosystem illustrates that different species are components of an interdependent community whose activities have feedback linkages to other organisms within the system. Populations of *Homo sapiens*, like other species, are able to adapt through biological, behavioural, or both types of adjustments to meet the demands of their environment. By virtue of their adaptations, species occupy an ecological niche. Odum (1989) described an organism's niche as its "profession" and its habitat as its "address." Some of these "professions" for *Homo sapiens* include forager, fisher, cultivator, hunter, or intense agriculturist and industrialist within an ecosystem. The survival and flourishing of pre-modern and modern *Homo sapiens* under varying ecosystems has depended upon cultural adaptations that include

the interplay of technology and social institutions (Molnar and Molnar 2000: 23–50). In the Arctic and sub-Arctic, the persistence of hunting and gathering culture in addition to an industrial social complex is an adaptive response to given environmental factors and dramatic social change.

The concept of ecosystems is now the predominant model for our discussion of nature. The idea has been institutionalized in our national and international environmental frameworks so that it is the dominant scientific paradigm or world-view supported by industrial society. As a strategy for integrated management land, water, and living resources, the Convention on Biological Diversity (Secretariat of the Convention on Biological Diversity 2001) proposes the ecosystem approach as the primary framework for action. The ecosystem approach seeks to achieve three objectives: (1) conservation; (2) sustainable use; and (3) fair and equitable sharing of benefits from utilization of natural resources. Such a system recognizes that humans with their cultural diversity are integral components of many ecosystems. This approach focuses on the structure, processes, functions, and interactions among organisms and their environment. As ecosystem processes are non-linear, this approach promotes an adaptive 'learning-by-doing' approach to ecological management based on direct research. The convention outlines several principles that stress a decentralized democratic decision-making process involving local communities so as to promote local participation, responsibility, and accountability. The principles emphasize a practical approach with various scientific disciplines that work in tandem with indigenous knowledge and expertise. They also insist that private users should pay the costs associated with the benefits of utilization of an ecosystem and society should not be encumbered with mitigative, reclamation, and clean-up costs. Finally, the principles display a conservation ethic with a long-term, intergenerational perspective that emphasizes the sustainability of a biologically diverse system.

2.4. Human Ecology and its Propositions

Ecology is the science of the relations of organisms to their environment, and therefore, human ecology is the science of human community and

its dynamic interdependence with the environment (Bruhn 1974; Hawley 1950). Like ecology, which embraces life as a whole as well as particular populations of living organisms, human ecology examines human life as an aggregate phenomena. Therefore, human ecology views a 'community' as a pattern of relations that responds collectively to the environment enabling the organism to adjust. In the 1950s, Amos Hawley articulated the notion of human ecology as a field of sociology. He maintained that with community as the unit of observation, human ecology studies the static and dynamic morphology of collective life in its habitat. His perspective focused on how the environment fostered change and community development. In short, human ecology is "the study of form and the development of the community in human population" (Hawley 1950: 68). The unit of analysis for Hawley is the 'community.' The evolution of population in relationship to its environment is an expression of either dependent or independent variables (Micklin 1984). The variables that mould a social system give human beings tremendous potential for adjustment as a result of flexibility and refinement of behaviour. Human ecology is thus concerned with the functional and relational aspects of this behaviour. According to Hawley, although the human community is more than functional behaviour and the relationships that arise from it, the scope of human ecology is restricted to this sphere (Hawley 1950).

Hawley (1984: 1–15; 1986: 7–9) describes rudimentary propositions that form the human ecology paradigm.[1] Below we will examine these propositions and subject them to comprehensive critical considerations in section 2.7.

(1) As social phenomena occur in both space and time, human ecology is territorially based (1984). This proposition raises important questions relating to the context in which human beings dwell vis-à-vis the proximate and the global.

(2) As a community or population adapts to its environment, human ecology's central area of concern is this system of interaction (1984). The adaptation is based on interdependencies among members of a population (1986). This

proposition is informed by the notion of ecological systems and implies a cultural materialist view of adaptation.

(3) In human ecology, adaptation is an irreversible process of cumulative change of an organizational system moving from simple to complex forms (1984). All things being equal, the size and complexity of the development of a system is determined by the technologies of transportation and communication of a population (1986). The capacity of a system is enlarged by the acquisition of new information (1986). This proposition raises the question: can irreversibility of adaptation within a biological system also be extended to a complex social system, or in other words, do human beings have agency?

(4) The environmental relationship forms the organizing principle of a system and sub-system (1984). The axiomatic articulation of this proposition is clearly deterministic, tending to cultural materialism. Cultural materialism, a term coined by Marvin Harris (1968), seeks to explain behaviour, including ideological and symbolic aspects of human society, on the basis of biological needs.

(5) As adaptation takes place in the aggregate, human ecology is committed to a holistic and macro-level mode of analysis (1984). Hawley remains staunchly committed to the idea that adaptation takes place at the level of groups. According to Hawley: "Regrettably there are always miscreants who dwell on the tails of distributions. But we try not to let our affection for the aggregate, and for all individuals with traits that fall on the respective means, be dimmed by such deviants" (1998: 346). This sociological bias is a parametric proposition, which denies the value of diversity, a fundamental value of ecology.

According to Hawley (1984; 1986), these elements of the paradigm collectively provide a theory of change as well as a theory of organization with a forceful explanatory power. Human ecology provides a bridge across different disciplines, thereby treating problems or issues not manageable in other disciplines and elucidating independent variables to study individual behaviour.

In the inaugural issue of *Human Ecology* (Editors 1972: 1), the editors define human ecology as "the complex and varied systems of interaction between man and his living and non-living environment." From the succinct and terse introductory statement four attributes of the field of human ecology can be discerned that were intended to guide the articles in the journal: (1) is strictly interdisciplinary in approach; (2) deals with complex and interacting systems; (3) is based on applied research; and (4) is devoted to a wide variety of cross-cutting social issues of relevance. These attributes are echoed by a number of human ecologists (Borden 1988; 1990; Bruhn 1974; Micklin 1984; Pratt 1990; Straus 1990; Young 1991).

Atlantic College in Bar Harbour, Maine, was the first in the United States to offer an interdisciplinary degree in human ecology in 1969. In 1979 an interdisciplinary group met and by 1981 the Society for Human Ecology (SHE) was established. Within the first decade it had published several significant volumes of collected papers and international directories of human ecologists. SHE organized thematic meetings between interdisciplinary professionals with ecologically based interests, developed publications to unify a nucleus of people, and established a network between individuals and institutions (Borden 1988; 1990).

It was at a meeting of SHE in 1988 that the study of human ecology was defined as: "The discipline [that] seeks to understand and manage wisely the complex problems of the planet of which humans are a part. It integrates the old disciplines of highly specialized scientific investigation with the new discipline of seeing things, and acting upon them, as generalists" (Straus 1990: 22).[2]

In a subsequent meeting of SHE, Gerald Young (1991), in a tongue-in-cheek piece intended to challenge orthodox disciplinary sciences, listed eighteen heresies upheld by human ecology. These heresies are essentially statements that suggest what human ecology 'ought' to be rather than 'is'

as claimed by Young. While these statements were unsubstantiated by examples of applied activities of human ecologists, they nevertheless represent aspirations of the Society of Human Ecology. Listed below are these eighteen propositions.

- Human ecology is interdisciplinary,
- Human ecology is connective,
- Human ecology is committed to synthesis,
- Human ecology is transcendental (goes beyond one interpretation),
- Human ecology eschews chauvinism,
- Human ecology is holistic,
- Human ecology is humanistic,
- Human ecology is, by definition, anthropocentric,
- Human ecology concedes to subjective reality,
- Human ecology is process-oriented,
- Human ecology does not deny teleology,
- Human ecology acknowledges the mystical or spiritual,
- Human ecology denies determinism,
- Human ecology seeks to understand community,
- Human ecology recognizes some form of 'family' as a fundamental ecological unit,
- Human ecology recognizes the wisdom of the vernacular,
- Human ecology includes a normative vision, and
- Human ecology is subversive.

These propositions reveal, at best, the optimism characteristic of a new organization and, at worst, naïveté about the disciplinary calcification and defensiveness characteristic of academics. Nonetheless, they represent the aspirations of a group of scholars who are struggling to formulate and practise human ecology. At the Third International Conference of the Society

for Human Ecology (1988) entitled *Human Ecology: Steps to the Future*, the working group on applied human ecology viewed human ecologists as problem solvers and recommended that participatory processes be considered in dealing with human ecology applications (Pratt 1990). The decade of the 1990s saw an explosion in interest in environmental social science (Scoones 1999).

2.5. Human Ecology among the Social Sciences

Human ecology did not gain a foothold in the science of ecology. Ecology may be divided roughly into more or less three distinct branches – plant, animal, and human. According to Hawley (1950), the notion of subdivision of ecology into smaller units to facilitate observation, experimentation, and understanding is a normal process of analysis by science. However, compartmentalization and poor communication across disciplines of study related to ecology is a cause for dismay because it is an impediment to synthesis. When the Ecological Society of America (ESA) was formed (1915), its members were keen to include the study of human ecology; however, as soon as it was proposed that humans as a dominant species should be the focus of the ESA, enthusiasm waned (Bruhn 1974). Therefore, human ecology mainly developed in the social sciences rather than in the biological sciences.

Currently, the ESA has no option but to address issues of human relations with the environment as stated it concerns itself with the following cross-disciplinary issues: biotechnology, natural resource management, ecological restoration, ozone depletion and global climate change, ecosystem management, species extinction and loss of biological diversity, habitat alteration and destruction, and sustainable ecological systems (Ecological Society of America 2004). However, in 2005, as it marked its ninetieth anniversary, the ESA could not ignore the human dimension. Eugene Odum's (1997: xiii–xiv) comments are apropos. Citing C.P. Snow's *The Two Cultures*, which refers to the dismal communication between the sciences and humanities in academe, Odum calls for a "third culture" that links the sciences and social sciences broadly through human ecology.

2.5.1. Economics

While economics and ecology derive from the same term *oikos*, economics examines relations derived by exchange value and is limited to concerns for efficiency, maximization, and the price system. Human ecology, on the other hand, seeks to examine collective life and relations (Hawley 1950). Aristotle distinguished between *chrematistics* and *oikonomia*. *Chrematistics* is "defined as the branch of political economy relating to the manipulation of property and wealth so as to maximize short-term monetary exchange value to the owner," whereas *oikonomia* "is the management of the household (or community) so as to increase its use value to all members of the household (or community) over the long run" (Daly and Cobb 1990: 138). *Chrematistics* is short-term oriented, focuses on individuals, maximizes exchange or market value, and seeks unlimited accumulation. *Oikonomia* is long-term oriented, considers the whole community, focuses on use value, and seeks to meet concrete needs. Neo-liberal economics bears a startling resemblance to *chrematistics*. Modern economics in particular has veered away from its early biological thinking characterized by the Physiocrats, for whom economic activity could be likened to the circulatory system, to a more mechanistic perspective (Fusfeld 1982; Spiegel 1983). In environmental economics, natural resource issues are discussed in terms of market failure resulting from externalities. In ecological economics, a co-evolutionary systems approach conflating ecological and economic systems has been adopted. In institutional economics, concern is devoted to management of common pool resources. Unfortunately these areas of economic concern employ a static view of the environment and natural resources (Scoones 1999).

2.5.2. Political Science

In political science, the human ecological perspective is relatively recent compared to other disciplines. The ecological crisis characterized by an imbalance of natural and social processes informs the ecological perspective in political science in the context of international or foreign, national or regional, and local or civic politics. A political scientist tends to concentrate on a specific organizational response such as the governmental role in policy formulation, regulation, and implementation (Micklin 1984).

Political ecology has been concerned with balanced and harmonious traditional systems that have been disrupted by forces of modern change. In political ecology structural relations of power have been seen as critical in understanding social, political, and environmental relationships. Therefore, the notion of politically and socially constructed resources is important to gauging environmental change from the perspective of different actors (Scoones 1999). In short, political science views the environment as a field of competing stakeholder interests.

2.5.3. Geography

In geography the recognition of human behaviour and its impact led to consideration of linking organism to place. From the seventeenth to the nineteenth centuries, early geographers debated whether to study the influences of the physical environment on humans or explain human relations in terms of the natural environment. In either case, it was recognized that human occupancy was connected to social phenomena. In 1903, when the Department of Geography was established at the University of Chicago, its aim was to dwell in an intermediate position between the natural and social sciences. Population geography became the most closely aligned to the notion of human ecology although geographers continued to debate nature and culture as separate entities. Furthermore, human geography in contrast to human ecology tends to proceed by way of the environment instead of by way of organism. As a result, adaptation as a means of change is not well developed in a geographical conception of human ecology. Nonetheless, geography as a field of study provides a significant link between the biological, physical, and social sciences (Bruhn 1974; Hawley 1950; Micklin 1984).

2.5.4. Sociology

Sociology has sought to include human ecology in studies of social organization. Historically sociologists have also used mapping of spatial distribution of social phenomena. Amos Hawley, in his influential work *Human Ecology: A Theory of Community Structure*, describes human ecology as "primarily a sociological concern" (1950: 73; 1984; 1986). At the University of Chicago in 1915, Robert Park devised an area of ecological studies in sociology where human relationships are affected by the surrounding

environment. The term human ecology first appeared in 1921 in a volume entitled *An Introduction to the Science of Sociology* by Park and Burgess (1969). It is noteworthy that in sociology, the study of human ecological phenomena was primarily based in cities. Park described human ecology as "an attempt to investigate the process by which the biotic balance and the social equilibrium (1) are maintained once they are achieved and (2) the process by which, when the biotic balance and social equilibrium are disturbed, the transition is made from one relatively stable order to another" (Park 1952: 158). In addition to the Chicago school in the United States, human ecology gained prominence in Chile and India (Bruhn 1974). Sociologists tend to be limited to a populations-organizational response to environmental conditions. Conceptual orientations to human ecology in sociology are at a macro-level, avoid subjective factors such as values and motives, and give lip service to the influence of culture on ecological organization (Micklin 1984).

2.5.5. Psychology

In psychology, unlike sociology, human ecology did not develop as a specific area of study. However, with the notion of 'life space' or the 'psychological environment,' developed by Kurt Lewin (1948), the individual and the environment are regarded as a single constellation of mutually dependent factors. It is, therefore, not surprising that while he concerned himself with practical social issues, Lewin was devoted to integration among the social sciences. By the 1950s and 1960s, the fields of psychological ecology and later the field of environmental psychology gained a foothold due to the recognition of the need to understand a person in his or her environment. The milieu is part of the total culture and affects behaviour (Bruhn 1974).

2.5.6. Anthropology

Early anthropologists acknowledged that habitat influenced the diversity and geographic distribution of cultures. Kroeber (1965) urged anthropologists to consider the 'whole' culture within its environmental setting. Unlike geographers, anthropologists perceived cultures not as mere reflexive responses to their habitat, but as a force that also influenced it. Anthropologists have studied how cultural behaviour affects environmental

phenomena and how the experience of the habitat affects cultural conduct (Bruhn 1974). Unlike sociologists, they include wider substantive phenomena within their purview of human environmental relations. Human ecological perspectives in anthropology are divided into cultural ecology, ethnoecology, and systemic ecology. Cultural ecology examines the processes that enable a society to adapt to its environment. Ethnoecology concerns itself with culturally based perceptions of the human habitat and is taxonomic in nature. Systemic ecology is deterministic and characterized by cultural materialism. It focuses on causal relationships between the physical environment from which human cultures extract resources to produce and transform energy. While these three approaches to human ecology are diverse, all make explicit that the ecology of human social systems cannot be understood without consideration of cultural meanings (Micklin 1984). Ecological thinking in anthropology maintains that just as natural environments are homeostatically regulated, so are societies that rely on nature. This type of thinking fails to engage complexities associated with ecological and social dynamics despite ample evidence from ethnographic cases to the contrary (Scoones 1999).

This review of human ecological perspectives among the disciplines indicates that together these views can be complementary, each providing a window into a wider understanding of human environmental relations. Bruhn (1974) concludes that in order for human ecology to be a unifying science it needs to be interdisciplinary and collaborative with different disciplines. However, trapped by the paradigm of disciplinary self-interest, human ecology remains a fragmented science and so its understanding of human relations with the environment continues to be disjointed.

2.6. Relations between Biological and Cultural Diversity

The fledgling field of human ecology, while being cognizant of the link between ecology and culture, has been associated primarily with the social sciences. Of late, proponents of the biological sciences have been knocking at the gates of the social sciences demanding to enter. They contend that as the twentieth century belonged to physics, the twenty-first century will

belong to the biological sciences because this is where fundamental issues reside that face human civilization. Despite fundamental weaknesses,[3] E. O. Wilson's *Sociobiology* (1975) has been the boldest attempt so far to transcend the disciplinary boundaries of biological and social sciences seeking a *Consilience* (Wilson 1999a) or unity of knowledge much like Odum's "third culture." The discussion has taken an urgent tone as cultural diversity as well as ecological diversity faces the grave prospect of extinction. Because of these concerns, literature on the relationship between diverse cultures and their varied ecological contexts is appearing with even greater frequency. In the next section, the nature of the relationship between biological and cultural diversity will be examined. Specifically, the works by scholars committed to this relatively new interdisciplinary area of study will be summarized and analyzed. The proposed approach to establishing the connectivity between biological and cultural diversity will be critically considered with a view to applicability in northern indigenous circumpolar communities.

2.6.1. Diversity: A curse or blessing?

The word diversity implies a condition or quality of difference, variety or unlikeness. In the fifteenth century, diversity was considered contrary to what is right, agreeable, or good. It was associated with evil, mischief, and perversity. Starting in the early twentieth century, diversity has been applied to technical contexts such as operations of electrical systems and reception of radio signals. The ability to handle various power demands and receive multiple radio signals at different frequencies connotes a positive application of the word diversity (OED 2003). The contradictory meanings connected to the word diversity illustrate the two ends of a continuum in which diversity has been understood and tolerated.[4]

In the creation narrative of Judeo-Christian societies, linguistic diversity, and by implication cultural diversity, may be interpreted as undesirable. The descendants of Noah were punished by being given the curse of multiple languages for attempting to reach heaven by building the Tower of Babel (Bible 1989 Genesis 10:11; Muhlhausler 1994; Nettle and Romaine 2000). Furthermore, standardization or monism was a goal pursued by philosophers of the European Enlightenment – the idea of a common language to bind the nation-state (Brody 2000; Harmon 2002; Lovejoy 1936).

For instance, linguists in the 1970s believed that diversity and economic development were at odds. Economic development could be only achieved by a modernized and centralized nation-state which had a single language (Nettle and Romaine 2000). Given the mechanistic mindset of the industrial revolution, with assembly line production and task-simplifying division of labour, it is understandable how such a socio-economic system could feel threatened by diversity. Arguably, this is also true of contemporary thinking in the global marketplace through the enforcement of harmonized regulations in free trade agreements or economic unions. Even the desire by large corporations for a single operating system in the computer industry may be construed as examples of a continued effort to undo the curse of Babel.

However, Judeo-Christian creation narratives are not decisive in their characterization of diversity as undesirable. The Old Testament shared by Judaism and Christianity begins with acknowledgment of difference and the glories in the biological diversity of creation. Yet with respect to cultures, linguistic diversity is presented as a curse. Notwithstanding this seeming contradiction, the first chapter of Genesis starts with: "In the beginning God created the heaven and the earth. And the earth was without form and void; and the darkness was upon the face of the deep. And the Spirit of God moved upon the face of the waters. And God said let there be light: and there was light." Genesis implies that the perception of difference is achieved through light. Light is a metaphor for the ability to discern. The remaining verses in this chapter make reference to the diversity of life (Bible 1989 Genesis 1: 3–27). Along the same lines, another Abrahamic tradition,[5] Islam, also views human diversity as worthy of reflection. "O humankind! We created you from a single pair of a male and a female, and made you into nations and tribes, so that you may *know* each other"[6] (Quran 1975 49:13) – the implication being that direct experience of diversity is a source of knowledge.

2.6.2. Adaptation and variation: Unforeseen possibilities

The arrival and prominence of conservation biology made scientific research the handmaid of environmental advocacy and spurred the growth of the idea of biodiversity (Harmon 2002). Biodiversity, a term coined by Arthur G. Rosen in 1985, refers to biological diversity. The recognition of

biological diversity, however, is not new. Charles Darwin gloried in the diversity of life.

> It is interesting to contemplate an entangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent on each other in so complex a manner, have all been produced by laws acting around us. These laws, taken in the largest sense, being Growth with Reproduction; Inheritance, which is almost implied by reproduction; Variability, from the indirect and direct action of the external conditions of life, and from use and disuse; a Ratio of Increase so high as to lead to a Struggle for Life, and as a consequence to Natural Selection, entailing Divergence of Character and the Extinction of less-improved forms. Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved (Darwin 1996: 398).

Similarly, Alfred Russel Wallace reiterated this diversity and articulated the evolutionary basis of life. "Every species has come into existence coincident both in space and time with a pre-existing closely allied species" (quoted in Quammen 1997: 41).

Francois Jacob, a molecular biologist, simultaneously articulates the idea of origin in biological diversity and opens it to future paths or possibilities. In *The Possible and the Actual*, Jacob (1982) emphasizes that complex and unforeseen possibilities emerge from adaptation and variation. He explains that while Western science is founded on a monastic conception of

an orderly universe created by God, and while science attempts to confront the possible with the actual:

> The Darwinian view has … an inescapable conclusion: the actual living world, as we see it today, is just one among many possible ones. Its present structure results from the history of the earth. It might well have been very different; and it might even not have existed at all! (Jacob 1982: 15).

Adaptation is at the centre of evolutionary thinking because it is linked to the theory of the origin of the world. Adaptation took place at the initial stage of 'primordial soup' and then natural selection did its work. At the heart of evolutionary thinking is a stochastic range of possibilities (pluralism). In other words, science cannot bridge the possible with the actual or, to state it even more tersely, "the difference between 'is' and 'ought' cannot be bridged by science" (Greenwood 1984: 23). Science probes, but it does not prove (Bateson 2002: 27). Variation is the prime mover of evolution.

> Diversity is one of the great rules in the biological game. All along generations, the genes that constitute the inheritance of the species unite and dissociate to produce those fleeting and ever different combinations: the individuals. And this endless combinatorial system which generates diversity and makes each of us unique cannot be overestimated. It gives a species all its versatility, all its possibilities.… Diversity is a way of coping with the possible. It acts as a kind of insurance for the future. And one of the deepest, one of the most general functions of living organisms is to look ahead, to produce future.… In humans, natural diversity is further strengthened by cultural diversity, which allows mankind to better adapt to variety of life conditions and to better use resources of the world (Jacob 1982: 66–67).

In this sense of the word, biodiversity is first a restatement of the great issue of concern to Wallace and Darwin – that is, the origins of diversity. Second,

biodiversity also reflects the future possibilities inherent in it as described by Jacob. The notion of diversity is imbued with the idea of origin and possibilities. It simultaneously bridges the present with the past and opens up to the future. It carries with it a constant sense of becoming.

2.6.3. Defining biodiversity: Keeping all the parts

The notion of biodiversity is conflated with the current ecological crisis facing the planet, including the potential of a sixth major extinction in geological time. The planet has not faced the prospect of such a mass extinction in sixty-five million years. The word biodiversity simultaneously creates both a sense of deep wonder for diversity and an alarming anxiety at its potential loss, thereby stirring an individual out of self-indulgence and sheer apathy (Harmon 2002). When describing biological diversity, Edward O. Wilson combines the notion of diversity and its origins in a complex ecological system, starting with the genetic and linking it to the global. Biodiversity is: "The variety of organisms considered at all levels, from genetic variants belonging to the same species through arrays of species to arrays of genera, families, and still higher taxonomic levels; includes the variety of ecosystems, which comprise both the communities of organisms within particular habitats and the physical conditions under which they live" (Wilson 1999b: 393). In this definition ecological diversity is an aspect of biological diversity. The Convention on Biodiversity restates it without overt references to evolutionary biology and defines biodiversity as "the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (Secretariat of the Convention on Biological Diversity 2001: 5).

Conservation biologists argue that the world's biological diversity is being homogenized at an ascending rate, thereby engendering the death of birth, that is, at a rate that outstrips the pace of evolution (one hundred million years) to replace diversity with new species. This loss of diversity jeopardizes the ability of an ecosystem to withstand environmental stress. Diversity is fundamental to the effective functioning of the biosphere. Furthermore, damage to biological diversity limits sources of food, new medicines, and other essential products of use to humans and their societies

(Dasmann 1991; Wilson 1999b). Jacob explains that: "Evolution does not produce innovation from scratch. It works on what already exists, either transforming a system to give it a new function or combining several systems to produce a more complex one" (1982: 34). He refers to this as tinkering. "What characterizes the living world is the basic unity that underlies its tremendous diversity" (Jacob 1982: 37). Tinkering creates diversity by endlessly combining bits and pieces. We need to keep all of the parts in order to tinker (Leopold 1949). Thus, the present connotation to the term biodiversity provokes a sense of urgency due to human avarice and the short-sightedness in the operations the global market system.

Wilson (1999b) argues that preservation of biodiversity is outside the ambit of the market system. We should not look to the marketplace (or neo-liberal economics) for solutions.[7] He makes a case for preserving the "hotspots" – that is, regions with the highest density of biological diversity. These "hotspots" must be turned into nature reserves or protected areas (Dasmann 1991; McNeely 1997). Besides the obvious difficulties in determining and building consensus on what constitutes a biodiversity "hotspot" as well as quantifying diversity, focus on particular species such as mega-fauna as flagship species and restricted regions of conservation may miss the point of overall sustainability. "Coldspots," which may be ignored, are equally valuable in providing benefit to the planet's ecological systems as a whole (Bridgewater 2002; Kareiva and Marvier 2003; Myers et al. 2000). In the context of the Arctic, the proportion of endemic species is lower than the tropics, but this misses the point of conservation of biodiversity because conservation becomes species-focused rather than based on variation or, more specifically, the role of diversity itself. It also ignores the overall importance of relations between biological and cultural diversity in one region and its application to other parts of the globe. Furthermore, the drawing of boundaries in terms of reserves despite their obvious success in certain regions (Bruner et al. 2001; Nabhan, Pynes, and Joe 2002) is antithetical to indigenous conceptions of their relationship to the environment in the Arctic and sub-Arctic. The very notion of reserves in North America carries a tragic historical memory. These approaches are appropriate to cultures and economic systems that presume "dominion"[8] over nature.

2.6.4. Cultural Diversity

Culture is one of the most complicated words in the English language because of its varied uses in different systems of thought. Culture carries both the idea of tending to natural growth (such as *cultivation*) and of a sense of honour along with worship forming a group identity (such as *cult*). Since the seventeenth century, the agricultural meaning of culture has been extended by metaphor to the process of human development – that is *cultivation* of the human mind. There are three distinct, but not mutually exclusive uses of the word culture (Williams 1989). One use of the word culture relates to spiritual and aesthetic growth. This resonates with its root meaning of honour and worship. Another application of the word culture indicates a particular way of life. This extends the metaphor of cultivation to day-to-day living of a particular group or people. Inherent in this sense of culture is the idea of plurality – that there are diverse manifestations of everyday living among different human communities. This means that cultural diversity may be expressed over time in the same community or across various communities in the same time period. A third use of the word culture is to describe a variety of artistic and intellectual practices – that is, music, song, dance, literature, painting, sculpture, theatre, or film.

David Harmon, in his work *In Light of Our Differences*, defines cultural diversity as the "variety of human expression and organization, including that of interactions among groups of people and between these groups and the environment" (2002: 40). This definition includes the three associated meanings of the word culture in a wide range of spatial boundaries, that is between contemporaneous cultures as well as across temporal domains, and that changes over time in the same culture. Harmon identifies three indicators of cultural diversity: (1) subsistence and livelihood, (2) creative activities, and (3) group identification (2002). These coincide with the uses of the word culture as subsistence and livelihood in a particular way of life; creative activity as artistic and intellectual practices related to human development; and group identification, which is suggestive of values that uphold time-honoured traditions in the context of worship and identity.

Language is used both as a proxy and a benchmark for shrinking cultural diversity (Harmon 2002; Maffi 2002; Nettle and Romaine 2000). Luisa Maffi, a linguist, ethnobiologist, and anthropologist, estimates a potential

loss of 50–90 per cent of the world's 6,800 languages in the next 100 years (Graddol 2004; Maffi 2002: 386). It took 100,000 years to build linguistic diversity. The diversity of languages that exists today reflects the adaptation to natural and social conditions (Muhlhausler 1994). For 85 per cent of the world's languages there are fewer than a 100,000 speakers. The small languages are unevenly shared across both continents and cultures (Nettle and Romaine 2000: 32). While the loss in biological and cultural diversity is a historic phenomenon, the current pace of damage is accelerating and is both indirectly or directly due to human action. Maffi (2001) maintains that a loss of 90 per cent of the world's languages in the twenty-first century may be a greater threat than loss of biodiversity. Furthermore, Maffi (2001) argues that both the loss of the world's languages and bio-species represents a total and irretrievable loss because this information is not documented. A similar argument is made by Wilson (1999b). He suggests that productive research needs to fill in the blanks on the biodiversity map, an inventory of species, as there are many species we know nothing about.[9]

There is a nuance worthy of reflection in this convergence between advocates of conservation of cultural diversity and advocates of biological diversity. References to diversity by Darwin, Wallace, and Jacob have been related to evolution and adaptation through variance. In short, variance is the focus. On the other hand, documentation or mapping in a taxonomic sense as suggested by Wilson and Maffi reflects a shift where the idea of species becomes more significant to conservation. Clearly the one best able to identify a particular species of plant, animal, or bird is the 'expert.' This Linnaean tendency is noteworthy and we will return to it in the next section. However, the taxonomic impulse raises the question: mapping and documenting according to whose criteria? Are indigenous ways of categorizing considered as worthy as those of Carl Von Liné?[10]

2.6.5. Implications of loss of linguistic diversity

The implications of a drastic decrease in linguistic diversity include the loss of understanding carried in diverse human languages. Furthermore, the loss of speakers of those languages is linked to issues of human rights, ethics, social justice, and retention of cultural identity. Finally, language and environment creates knowledge that mediates cultural-environmental

relations. Especially at risk is the loss of indigenous knowledge. Humans have developed many different ways to talk about their relationship with their environment. Each of these languages encodes and transmits knowledge differently. Language itself in this sense contains and conveys the human ecology of indigenous communities (Maffi 2001). Nettle and Romaine (2000) echo this concern in *Vanishing Voices*. They suggest that biological terms such as death and extinction apply to the life of languages. "A community of people can exist only where there is a viable environment for them to live in, and a means of making a living. Where communities cannot thrive, their languages are in danger. When languages lose their speakers, they die" (2000: 3). Therefore, losing one's language implies losing the knowledge, beliefs, values, and practices that language encodes. It is really a loss of identity, of a sense of self (Maffi 2002; Nettle and Romaine 2000). Furthermore, much of the knowledge in one language cannot be imparted in another foreign language (Bridgewater 2002) because such knowledge is associated with a particular way of life, a specific context and circumstance (Brody 2000).

Maffi maintains that languages are dynamic – they generally do not die, but get transformed. The death of a language occurs when (1) speakers shift to another more dominant language and do not transfer it to the next generation, and (2) communication or transmission is broken down due to decimation through disease, natural disaster, war, or genocide (2002: 385). Nettle and Romaine add that people stop speaking a language as a self-defence strategy (2000: 6). They also explain how languages die. Their analysis is essentially similar to that of Maffi but more nuanced. According to Nettle and Romaine languages die when (1) the speakers cease to exist (genocide, disease), (2) the speakers are forced to shift to another language, and (3) the speakers voluntarily shift to another language (2000: 90–91). The distinction between voluntary and forced shift is not as precise, and in fact it is difficult to distinguish "coercion from choice" (2000: 93–97). It helps to speak of voluntary shift as top-down or bottom-up. In top-down death, the language retreats from the official domain of use. Bottom-up occurs when language is no longer in everyday use and is mainly for ceremonial or formal use (2000: 91–92). In the context of the Arctic, language use must be related to functionality, use in day-to-day subsistence activities.

2.6.6. Language as culture

Hugh Brody argues that each language provides a particular outlook. He uses the example of the origin myth of Judeo-Christian society to explain the outlook of that particular society. "On the one hand, a passion to settle, on the other, a fierce restlessness; a need to find and have and hold an Eden, alongside a preparedness to go out and roam the world; an attachment to all that is meant by home, and an overriding commitment to a socio-economic system, to some form of profit rather than to a place" (Brody 2000: 87).

There is a particular kind of instrumentalism associated with this outlook; everything, including the environment is seen as a means to an end. "Hunters and gatherers constitute a profound challenge to the underlying messages that emerge from the stories of Genesis. They do not make any intensive efforts to reshape their environment. They rely, instead, on knowing *how*[11] to find, use and sustain that which is already there.… Everything about the hunter-gatherer system is founded on the conviction that home is already Eden, and exile must be avoided" (2000: 89–90). Brody's fundamental insight is that hunter-gatherers, with their reliance on a single region, are profoundly settled. As a system, over time, it is farming, not hunting that generates 'nomadism.' "Agriculture evokes the curses of genesis" (2000: 90). In essence the objective of a farming culture over time is the creation or manufacture of Eden, and profit from domination of land. Since this is not sustainable over time, it creates hierarchies, lack of sufficient land, and so agriculturalists need to move to 'new lands.' It is the farmers who are in fact nomadic. The objective of a hunter culture is not change, but conservation. The restlessness is not with the land and its transformation; the place where they live is already ideal; it is Eden.

The agro-industrialist culture is more readily dismissive of diversity whilst the hunter-gatherer culture is more accepting. Brody explains that hunter-gatherers needed at least 100,000 years and possibly 250,000 years for a geographic diaspora, whereas farmers needed only one-tenth the time for a geographic diaspora. Hunter-gatherer societies are currently at the environmental margins because they are displaced by farmers and because of their world-view of the environment. They live on *The Other Side of Eden* (i.e., the title of his book).

According to Nettle and Romaine (2000), the grammatically most complicated languages are spoken by tribes in remote areas where they have had no contact with related languages and whose way of life is currently under threat. In addition, the world's major languages are becoming more streamlined as a result of intertranslation and cultural contact. Many of the world's languages are dying due to the spread of a few languages such as English, French, Chinese, Hindi, and so on. They argue that the curse of Babel is false: monolingualism is not a means of preventing war and differences. Language disputes are not about languages, but about perceived inequalities among people who speak different languages. Language is preserved when a people's way of life continues (Nettle and Romaine 2000).

2.6.7. Language as ecology

Diverse environments support linguistic diversity while political, geographic, and economic factors influence the level of diversity. Nettle and Romaine contend that: "A large language could be endangered if the external pressures on it were great, while a very small language could be perfectly safe as long as the community was functional and the environment stable" (2000: 41). This is relevant to the Arctic because functionality refers to the maintenance of a subsistence hunting culture and its relation to human ecology. They make a connection between biological and cultural diversity in the form of niches. They argue:

> If a habitat is drastically altered or destroyed, the organisms that once inhabited it will be wiped out. Just as languages claim territories of various sizes, every species has a niche. Niches, in turn, have various widths or limits to their distribution.… The higher the latitude, the greater the average area and latitudinal extent of a species range. This is known as Rapoport's Rule. Thus, the relatively fewer species in the northern latitudes have much more extensive ranges than do the more numerous species inhabiting the tropics.… One reason the tropics have more species of organisms is the availability of relatively constant amounts of energy, in particular from the sun. ...Niche widths can change, however, and disrupt a relatively stable ecosystem.… We have

> become the first species in 3.5 billion year history of life to live outside the confines of our local ecosystem. Now all but a handful of hunter-gatherer societies live outside their local ecosystems (Nettle and Romaine 2000: 43–46).

Like conservation biologists who speak of "hotspots" of species diversity, Nettle and Romaine talk of "hotbeds" of languages. The authors suggest that "there are remarkable overlaps between the areas of greatest biological diversity around the world and greatest linguistic/cultural diversity around the world, allowing us to speak of a common repository of biolinguistic diversity" (Nettle and Romaine 2000: 27). They argue that there is high linguistic density in the tropics which then declines as "one moves towards the poles" (Nettle and Romaine 2000: 32). Yet the authors quote a study (Nichols 1992) that indicates that the greatest structural diversity of languages is found in the Americas and the Pacific basin, despite excluding the Eskimo-Aleut languages (Nettle and Romaine 2000: 36–38). Furthermore, they conclude that these languages are primordial; that is, the languages are close to their natural state (2000: 39). Again they shift their reasoning and argue that "we see that those areas which are rich in languages also tend to be rich in biodiversity value. Biodiversity is concentrated through the tropics and tails off towards the poles, just as linguistic diversity does" (2000: 43).

Finally the authors argue that they have presented evidence that indicates "why the same amount of habitat destruction in the tropics would lead to many more biolinguistic extinctions than would occur in the higher latitudes" (Nettle and Romaine 2000: 46). Yet they use the example of the Sami, an indigenous community living in the northern regions of Fino-Scandinavia and Russia, whose livelihoods are threatened (Nettle and Romaine 2000: 47). In short, adherence to reasoning based on "hotspots" or "hotbeds" is flawed because it misses cultural diversity in the Arctic and sub-Arctic.

So far the discussion of the loss of cultural diversity bears a marked resemblance to the discussion on loss of biodiversity, because they are fundamentally linked.

2.6.8. Species-language model

Maffi (2001) suggests that literature in the 1990s provided increasing recognition of the connection between biological and cultural diversity. This connection was made by Western anthropologists in the Arctic at least some fifty to a hundred years earlier (Boas 1998; Nelson 1969). Furthermore, in the case of indigenous cultures in the Arctic, this realization is not the real issue. The real source of concern is the desire by southern peoples to exploit the natural resources in the Arctic and sub-Arctic and their lack of understanding of its implications for biological and cultural diversity. Maffi further argues the connection of language to cultural and biological diversity was not made until more recently; again, in the Arctic this was noted much earlier. Indigenous communities have achieved stability with their ecological surroundings by becoming the efficient users of a given region and understanding its potentialities. Consequently, viable cultural traditions of indigenous communities are a key factor in maintaining biologically rich environments.

Maffi makes a link between language and species respectively as a way of illustrating the relationship between biological and cultural diversity.

> Biological evolution is a process of learning – the cell learns, the genes encode the learning of the species. Cultural evolution is also a process of learning and of memory encoding, largely occurring through language. Now economic globalization processes are being touted as the ultimate, inevitable step in human evolution. If so, one should expect them to enhance human memory correspondingly. But quite to the contrary, they are crucially based on effacing, the annihilation of memory: biological memory, by wiping out species and environments; cultural memory, by wiping out, either physically or through assimilation, whole distinct human groups, with their diverse stores of knowledge, beliefs and practices and the languages in which the latter are encoded and by which they are transmitted; and even individual memory, as everything we know is at constant risk of being washed out by the rising tide of homogenization by which the forces of economic globalization are fostering shorter

and shorter memory spans and more and more mindless living (Maffi 2001: 39).

Below (Figure 2.1) is a summary of the model for the relationship between biological and cultural diversity as put forward by two prominent writers in this field, Luisa Maffi (2001; 2002) and David Harmon (2001; 2002). Species is identified as a marker for biological diversity and language is identified as an indicator for cultural diversity. The process of speciation is heredity and the process of language transmission is memory. These processes are stochastic because one can talk about the probable, but never the actual.

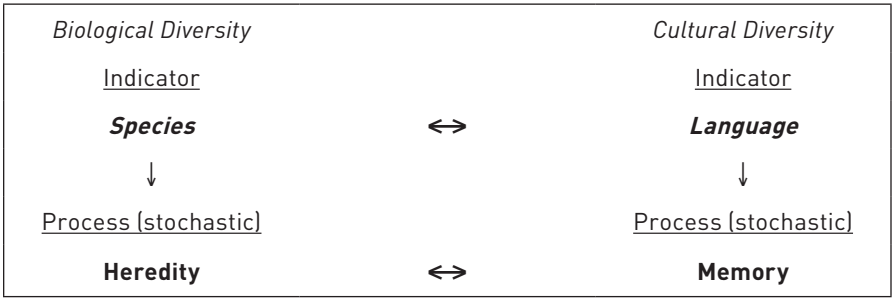

Figure 2.1: Model for Link between Biological and Cultural Diversity

2.7. Critique

There are various flaws in the propositions of human ecology and the language species model used to explain the relationship between biological and cultural diversity. The failings of both human ecology and the species-language model are stunningly similar and reflect a weakness in the fundamental premises when addressing the relationship between nature and culture. If the relationship between the biological and cultural is to be understood, then the basic assumptions in the literature need to be exposed and examined so that the notion of human ecology may be effectively re-articulated. Foremost among these underlying premises are (1) the nature-culture dichotomy, (2) determinism in the form of cultural materialism,

(3) the denial of human agency and its influence on culture, and (4) dependence on static and taxonomic conceptions of the aggregate that depend on the law of averages at the expense of genuine holism. These problematic assumptions seek to standardize diversity, which is a contradiction.

2.7.1. Nature-culture dichotomy

Greenwood (1984) explains that non-evolutionary thought expresses a radical dichotomy between nature and culture – a struggle between natural laws and human will. These naturalistic arguments set ethical standards. Natural laws must be obeyed unless we wish to destroy our relationship with nature. The rise of evolutionary thinking has been significantly jarring to the historically well-developed and firmly established paradigms of human understanding based on non-evolutionary modes of thought. Evolutionary thinking challenges fixed standards of what is natural and desirable, whereas the persistence of non-evolutionary thinking sustains a dichotomy between nature and culture. The problem is not the complexity of the evolutionary view, but the implications that arise from it. Evolutionary theory has challenged us to reconceptualize nature and natural processes, but it does not radically divide cultural and natural processes. Instead, it suggests that justification for our moral and ethical beliefs should be found in other places.

Two factors are involved in evolutionary processes that produce complex organisms such as humans: (1) constraints like the genetic mechanisms that specify the rules of the game within an organic system; and (2) historical circumstances that determine the interactions between systems and the actual course of events. While simpler objects are dependent on the constraints, complex objects are increasingly also dependent on historical circumstances (Jacob 1982). For humans, biological evolution did not occur independent of cultural evolution; the two operated in tandem. Culture has been central to the production of the human animal. In other words, nature in the form of human evolutionary biology is not independent of culture. For instance, proto humans became *homo sapiens* as a result of perfection of tools, development of hunting and gathering practices, organized family units, and reliance on systems of symbols such as language and ritual as forms of communication. Step-by-step cultural and biological evolution worked together to give proto humans selective advantage to adapt and

evolve into *homo sapiens*. In short, "without man, no culture certainly; but equally and more significantly, without culture no men" (Geertz 2000: 49).

The balance of nature perspective is yet another permutation of the nature-culture dichotomy. Scoones (1999) argues that human ecology tends to take a static and equilibrium view of ecosystems based on a premise of balance of nature. This point of view ignores issues of dynamics and variability (diversity), which results in a partial and limited analysis.

Despite arguments in the ecological sciences since the 1930s that the balance of nature does not exist and has never existed, notions built on homeostatic regulation and stable equilibrium conceptions have continued to dominate the fundamental assumptions of models, thereby affecting policy recommendations and management of rangelands or forests. The idea of harmony with nature, rather than being seen as a human desire, is expressed as a nature-imposed necessity and used to justify moral and ethical positions and policy actions. The balance of nature view has persisted and resisted change due to poor communications between disciplines, conceptual framing of the various disciplines based on equilibrium modes of thought, and reinforcement by policy prescriptions. The way the natural world is then classified, viewed, and interpreted is embedded in management decisions, policy recommendations, and actions that may have negative consequences on indigenous populations. For instance, the drive to return to pristine nature reserves, displacing local populations, is often informed by such sentiments.

Ethnographic work continues to indicate that such a view is untenable and that nature and culture must be viewed as co-created. Cultural materialist characterization of human ecology is deterministic because it views human existence in terms of energy flows from material surroundings, and the meanings people derive are external to the major cause of their existence. Nature in this world-view is real, material, and mundane, whereas culture is unreal, unnatural, and vague. Such perspectives maintain that cultures are not competent to see the consequences of their own behaviour and require the outside 'objective' scientist to see the real consequences of people's behaviour (Greenwood 1984). The species-language model, with its tendency towards static and taxonomic abstraction by experts, is an example *par excellence* of the nature-culture dichotomy. In short, the divide is

a cultural phenomenon itself. A view of nature deeply entangled with social practices and modes of cultural representations is essential. However, one must guard against universalist determinism or cultural relativism when adopting such a view (Scoones 1999).

2.7.2. Determinism versus agency: A case for social change

In many respects the cultural materialist is not unlike Dostoevsky's Grand Inquisitor with respect to his assumptions about human nature as a static category.[12] The cultural materialist rejects human agency just as the Grand Inquisitor rejects Christ's assertion in favour of free choice that "Man does not live by bread alone."[13] If human nature is constant and only its expression varies with the situation, then there is no hope for change for humanity in the future. The idea that human nature is static and human culture evolves is a reflection of the nature-culture dichotomy.

The cultural materialist point of view tends to be macro-oriented and pays little attention to micro-level diversity. As a result, it does not deal well with change and does not answer questions like: What causes transitions in human societies? What is adaptation? How do we distinguish between maladaptive and adaptive systems? Cultural materialism lacks the force of operationalization. As Greenwood succinctly states, the principle of parsimony in science does not call "for the simplest explanation but the simplest *possible* explanation" (1984: 194).

The species-language typology for cultural and biological diversity is a simple explanation. It does not address the role of social change, an objective that one would expect to be foremost for conservationists.

The role of cultural and social processes as conceptually independent, but mutually interdependent, yields interesting insights into the complex connectivity that comprise relations with biological foundations. To deny the interplay between the roles of culture and social structure is to ignore the potential impact of social change.

The impact of the two world wars and the Russian Revolution compelled Pitrim Sorokin (1962) to write a four-volume work on social conflict titled *Social and Cultural Dynamics*. At a time in history when the promise of humanitarianism and democracy seemed strong, the seemingly impossible outcome occurred of dictatorship, human suffering, and mass

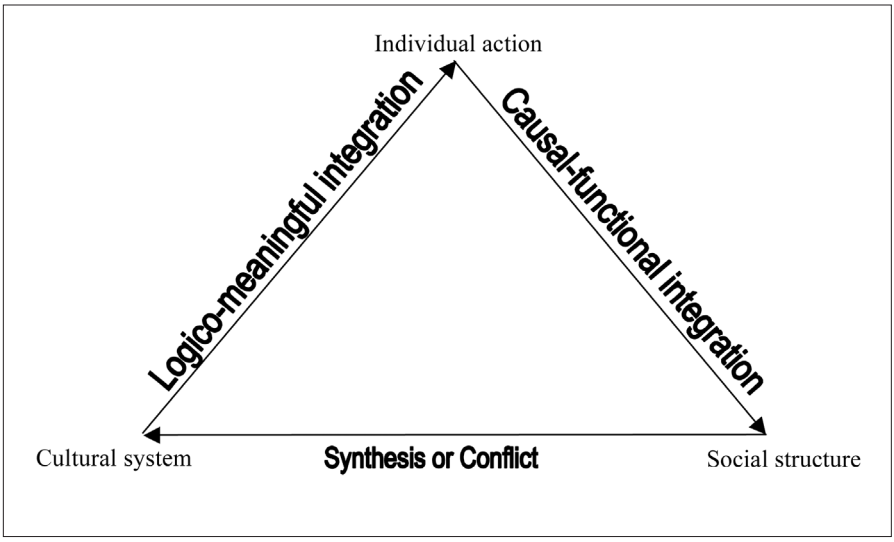

Figure 2.2: Interplay of Cultural System, Social Structure, and Individual Action.

murder. These events drove Sorokin to develop a system to examine social change.

Using Sorokin's ideas as a basis, Clifford Geertz (2000) developed the two levels of analysis. Culture is an ordered system of meanings and symbols upon which social interaction takes place. The social system is the pattern of interaction itself. At the level of culture, there is a framework of meaningful and communicative symbols, values, and beliefs. In this system, human beings define their world, express their feelings and make their judgments. The cultural level is where individuals draw meaning, interpret their experience of the world, and guide their actions. On the social level, the continuous process of interactive behaviour forms a social structure. It is within this structure that individual or group action takes place in the context of a network of social relations (see figure 2.2). At the level of culture, there is "logico-meaningful integration" and at the social level, there is "causal-functional integration"[14] (Geertz 2000: 142–69; Sorokin 1962).

An excellent example of social change that did not result in conflict between the interplay of social structure and cultural system is the relationship of the bowhead whale Iñupiaq human ecology. Sharing is a fundamental cultural value among the Iñupiaq of Wainwright, Alaska. The *Nalukataq* festival is the social context where this value with its concomitant beliefs is manifested after a successful whale hunt. The introduction of the wage economy and capitalist emphasis on individual profit, the growing power of the International Whaling Commission, and mechanization of hunting techniques have put considerable stress upon the social structure of Iñupiaq communities, but has not displaced its cultural system of ordered meanings, upon which the social interaction takes place. Almost forty years ago, Richard K. Nelson characterized whale hunting in the community of Wainwright as a "lost art" and predicted its demise (1969: 213). He said: "How significant whaling is or has been in the total economic picture is open to question, especially in modern times when it is degenerating even in its greatest stronghold at Point Hope. Whaling involves hard work and long cold nights for the crews, expense and effort with the hope of prestige for the *umailik*, or crew captain" (Nelson 1969: 214). Some twenty years later Nelson had to revise his predictions of not only the demise of whale hunting but the subsistence economy as a whole. He admitted his error with honesty worthy of a true scholar:

> When I lived in Wainwright during the 1960's, I believed that growing contact with the outside world would soon eliminate subsistence as the basis of village economy and culture.… It is so instructive to look at these predictions now, almost 20 years later: the material aspects of life in Wainwright have undergone a steady and progressive change, resulting in far greater modernity than I could have foreseen.… Wainwright's recent history shows that change is not a constant, universal, or one-directional process. Nor can it be accurately predicted. Subsistence has persisted here for a number of reasons, most of them related to its prominent position in Iñupiat culture, social organization, and value system (Nelson 1982: 111).

Subsistence hunting continues to thrive in Wainwright, Alaska, as the Iñupiat navigate their cultural and ecological heritage in the twenty-first century (Kassam and the Wainwright Traditional Council 2001).

Andrew P. Vayda (1988) is equally critical of tendencies in human ecology to concentrate on behaviour affected by environmental factors while paying little attention to the environmental consequences of human actions. There is a need, he argues, to include individual intentions, goals, beliefs, knowledge resources, and situation in an explanation of human ecology. Goals constantly inform human action and should be the source of empirical information for the human ecologist. He warns against convenience at the expense of veracity in the situation. It is important to be cautious in attributing consequences of actions to adaptation or strategies or problem solving. It is important to discern that the response is a product of design and not just coincidence. Generalizations of behaviour by human ecologists need to take into account contextual factors; namely, the validity of a generalization depends upon the situation in which the behaviour occurs and the intentions that informed it. Attention to context does not mean following a predefined cultural or ecological 'whole.' Contexts are loose, contingent interactions, influenced by movements of peoples, resources, and ideas across the boundaries of ecosystems, societies, and cultures (Vayda 1988).

A striking example of context where design informs action and action bears a marked consequence on human ecology is co-management of Arctic Char in the small Inuvialuit community of Ulukhaktok (formerly Holman), Northwest Territories, in the Canadian western Arctic. In the summer of 1998, while undertaking research in this hamlet, I had the opportunity to attend a meeting of the Char Working Group, which consisted of Canadian federal government scientists, leaders of the Inuvialuit, and representatives of local hunters, fishers, and trappers who 'co-managed' the stock of Arctic Char. This meeting was devoted specifically to fish stocks in Char Lake. After five years of conservation measures by community members, such as reduced catch and use of larger mesh nets, the stocks of this landlocked species of Arctic Char rose enough to sustain a higher catch. When the scientists raised the prospect of increasing the catch beyond the agreed twenty-five char per household from this lake as targets had been met, the fishers refused, preferring to continue conservation measures. However, in

one household, the fisher distributed his char to a greater number of people in the community, namely his children and grandchildren. The quota for all households was adjusted so that this individual could get enough Arctic char and the overall catch remain low at level of conservation measures agreed upon. Inuvialuit behaviour, based on local knowledge and cultural values, was designed to sustain both the char and the needs of community members with tangible consequences for the human ecology of the region.

The interwoven nature of biological and cultural evolution in humans suggests agency. Culture has a changeability which solely biological processes do not have. Whilst paths of biological evolution cannot be reversed, cultures can visit unexplored paths, by re-examination of values and beliefs to make changes and adapt. Chemical and biological time binding is different from time binding in culture. This is a hopeful note for humanity only if understood and acted upon.

2.7.3. A fetish for averages: The standardization of diversity

Throughout his articulation of the human ecology paradigm, from the beginning till his last "confessions," Amos Hawley (1998) emphasized that it is a concept about the aggregate. As is characteristic of many social scientists, Hawley fetishized the average and the mean. This parametric weakness is obvious in the species-language dichotomy. In addition to suggesting the nature-culture dichotomy, effectively this approach specifies that the relationships between biological and cultural diversity that constitute species (or a population of species) and languages (or a family of languages) follow a normal distribution (bell curve). In essence, diversity becomes standardized because it reflects averages rather than variance (see figure 2.3).

Bateson (2002) explains that number (an organism or individual) is different from quantity (species or community). "*Numbers* are the product of counting. Quantities are the product of measurement" (2002: 45). This means that numbers can be conceivably accurate because they have discontinuity between each integer. However, quantity is always approximate, it can never be exact. "In other words, number is of the world of pattern, gestalt, and digital computation; quantity is of the world of analogic and probabilistic computation" (Bateson 2002: 46). Quantity does not determine a pattern. "It is impossible, in principle, to explain any pattern by invoking

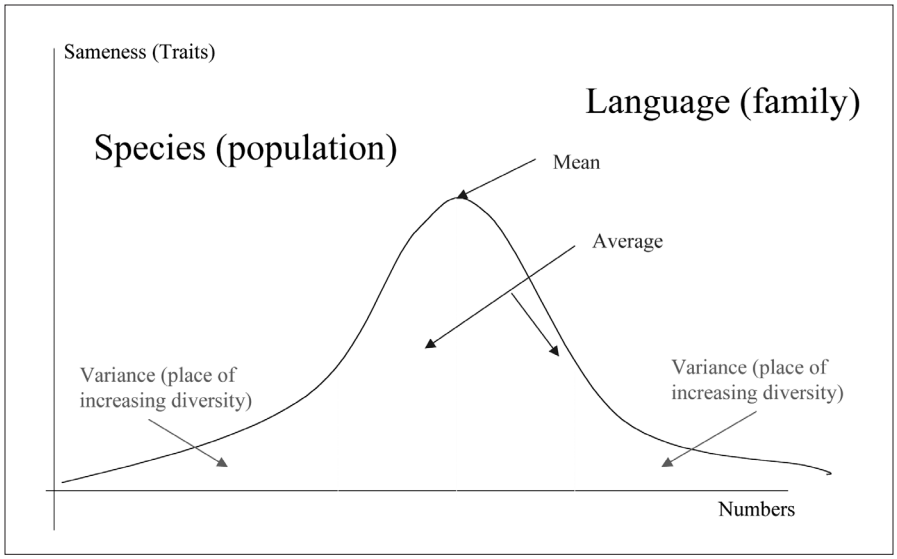

Figure 2.3: Standardization of Diversity.

a single quantity. But note that a ratio between two quantities is already the beginning of a pattern. In other words, quantity and pattern are of different logical type and do not readily fit together in the same thinking" (Bateson 2002: 49). Averages are approximates; comparing language and species is comparing approximates, and tells us little about how to conserve diversity. Relationships form with discrete events, not averages.

David Harmon (2001; 2002) draws on the work of Theodosius Dobzhansky (1961) to respond to the problem of "species" in nature. He points out that variation in nature is discontinuous. The idea of organic discontinuity is essential for Harmon because this is how he justifies the taxonomic classification of species. He argues: "that there is a basically accurate correspondence between what we perceive to be separate groups of fundamentally similar organisms and the actual existence in nature of such separate groups.[15] The exceptions to the rule do not disprove it; they merely illustrate the higher-order difficulty intrinsic to any analysis of diversity versus identity" (Harmon 2001: 58). Invocation of the idea of identity by Harmon implies classification. Classification does not address diversity,

or specifically, observations of interconnectivity between culture and diversity. In this context, the invocation of identity merely serves to standardize diversity through a taxonomic analysis that privileges a category of classification found only in one culture.

For instance, research among diverse cultures in the Arctic illustrates the complexities involved in classification. The naming of the Arctic fox varies between Western science (Linnaean taxonomy) and Iñupiat perceptions of their environment. To the ecologist the Arctic fox is *Alopex lagopus*. To the Iñupiat of Wainwright, Alaska it is two beings, *Tigiganniaq* or *Qiangaqtuluk*, depending upon the phase variance of blue or white based on their experience of the fox (Kassam and the Wainwright Traditional Council 2001). Which classification is *real*? Is the Western 'expert' best suited to decide? The fact is that a typological view of species, especially when trying to meet conservation objectives, may not really protect diversity (Rojas 1992). The idea of species is limiting.

Harmon similarly privileges Western taxonomic structure with respect to culture in his section "the species problem in culture." "Like species, like religions, here again the problem is how to distinguish what is happening at the margins" (Harmon 2001: 60). He acknowledges that the word *culture*, like *species*, is resistant to easy definition. He offers Tylor's "complex whole," Sapir's "assemblage," and Geertz's "pattern of meaning" by way of definitions for culture. He concludes: "Again, it is evident that some defining set of characteristics is at the centre of these complex unities" (Harmon 2001: 61). He chooses the mean or average rather than the variance. However, interconnectivity is not between averages, but between the discrete elements within the continuum of variance among different organisms.

Harmon then proceeds to argue that cultural diversity is in peril and makes a case for languages as "the most accessible indicator of global cultural diversity" (Harmon 2001: 63). There are an estimated 249 families or stocks of languages. A stock is the degree of divergence found among Indo-European languages. There are also *isolates*, languages that do not have any discernible relations with other languages (Nettle and Romaine 2000: 36). This raises the point that the species-language equation is not easily made. Just like we cannot draw a boundary with species easily, we cannot draw similar boundaries with languages. In effect we would be engaging in the

standardization of linguistic diversity if we did. Genetic and language evolution do not follow the same processes even though in the process of evolution they interact (Pennisi 2004a). Recent evidence not only indicates that there is diversity among the click languages of Africa, said to be the original languages of humanity, but their classification into one Khoisan language family has been called into question (Pennisi 2004b).

Besides being simply incorrect, there is a more profound weakness in privileging the notion of species or language as a typology. It is reminiscent of the Aristotelian mode of thought in physics, where frequency determines lawfulness and the essential nature of events. Aristotelian physics depended on regularity of occurrence for classifications to determine whether an object is natural or not natural. Yet diversity takes place in a specific circumstance; it is the individual event that makes it significant. Galilean physics did not assign a value to an object; rather, the substantial is replaced by the functional. It does not operate in binary, but in a continuum. This does not mean that Galilean modes of thought, by concentrating on the particular, ignore the greater or whole. Rather, rigid and abstractly defined classes that determine the physical nature of things were simply not relevant according to Galileo (Lewin 1935). The typological approach taken by the proponents of the species-language model is akin to the notion of special creation, which Wallace and Darwin effectively debunked. The idea that an understanding of the greater or whole can be approached by recognizing diversity is both a characteristic of Galilean thinking and of evolutionary thought as described by Darwin, Wallace, and Jacob. In these modes of thought, the exception cannot be ignored because it is relevant – it is the basis of diversity and the stepping stone to discovering unity from the particular. The species-language link lacks the forcefulness of a specific context and is therefore vacant due to excessive generalization.

Describing diversity by means of a category such as species is to standardize diversity. Diversity is dynamic, not static. There are multiple layers of interaction between culture and its ecological environment. These are best described by 'relationship' rather than 'causality,' by 'meaning' rather than 'mean.' David Turnbull is scathing in his criticism:

> To coordinate commensurability, to order according to a common standard or measure, to make uniform, is to deny, suppress, and stifle diversity. It sublimates difference into identity. Assemblage and diversity are in contradiction with one another, yet we have little alternative except to find ways of working with incommensurability and contradiction. Hence there is an attached conundrum; if we are attempting the assemblage of knowledge of complex, multiplicitous, interactive, phenomena we need a complete rethink of all the components and ontologies involved. We need to rethink the very ideas of assemblage and of diversity, which implies rethinking our understanding of science and knowledge and of the enlightenment project itself (2003: 3).

The key point here is that the preservation of diversity leads to the preservation of species, but the reverse does not hold true. The notion of fragmentation in island biogeography illustrates this: once ecosystem decay has set in, no amount of species preservation will help (Quammen 1997). Turnbull (2003) makes a case for examining the linkages and interactions between plants, animals, insects, environments, and humans. He argues that easy identification of cultural diversity with language is just as flawed as that which equates biodiversity with species.

The failure of applicability of the species-language model is revealed by Smith, ironically, in Maffi's edited volume (2001), Smith begins his case study of Native North America by a qualification that an empirical analysis of the relationship between biological, cultural, and linguistic diversity is still in its infancy. He chooses to compare biological diversity to cultural and linguistic diversity. His point of entry is entirely taxonomic, defined by "cultural areas," "ethnolinguistic groups," and "species richness." He does not examine the multidimensional connectivity between biological and cultural diversity (Smith 2001: 98–99) and he finds the correlation between linguistic, cultural, and biological diversity problematic. He argues that some Native North American groups are culturally diverse and linguistically similar, whereas other societies are linguistically similar and culturally diverse. There was strong correlation between cultural and linguistic

diversity and tree species, but low correlation between various mammal species. The policy outcome of the language-species model is conservation of "hotspots" and "hotbeds" of diversity. Based on linguistic atlases, the essentialist categorization of culture as language in comparison to species has been replicated several times (Collard and Foley 2002; Moore et al. 2002; Pagel and Mace 2004). These studies have resulted in a strong correlation of lower latitudes to species and language richness. As noted, these categorizations miss the so-called "coldspots" where historically cultural diversity has been present but not viewed through the proxy of language.

For example, up to the mid-1800s cultural diversity was supported by rich biological diversity of the sea and land in northwest Alaska. In a region of 40,000 square miles (104,000 square kilometres), slightly larger than South Korea, ten different Iñupiaq nations engaged in trade, warfare, and peace. Their cultural diversity is not identifiable at the level of language. There would be no correlation between species and language based on linguistic atlases. Societal boundaries and territorial borders were determined by culture and ecological resources that defined their relationship to the land and sea. One of the elements from which these Arctic communities derived their identity was at the level of speech (subdialect). The contours of intonation, rhythm, and speed of speech were the basis of striking differences (Burch 2005). The point is that this taxonomic approach does not yield helpful insights and is problematic, as the author is forced to rely on questionable categorizations and unreliable approximations. It is preferable to explore connectivity.

Instrumental connectivity (language and species as indicators) is a standardized approach that emerges from a scientific culture based on taxonomic categorizations and tends to be global in perspective and detached from context. Then there is connectivity within localities; that is, at the level of local life. This is a type of complex connectivity that confounds taxonomy because it is multidimensional. In this sense instrumental connectivity is impoverished of dimension, of insights, because it is a one-dimensional account of the relationship between diversity at the ecological and cultural level. Unlike instrumental connectivity, complex connectivity does not give conceptual privilege to the indicators such as language and species. Complex connectivity is empirically demanding as well as rich. This type

of connectivity has a strong sense of consequentiality, that is, consequences arising from actions (Tomlinson 1999). This type of connectivity recognizes agency and steers clear of the nature-culture dichotomy.

2.7.4. Need to reconceptualize human ecology

Scoones argues that three themes are central to ecological thinking in the social sciences:

- Detailed and situated analyses of peoples in places based on spatial and temporal dynamics;
- Growing understanding of environment as both product and setting for human interactions, taking into account structural analyses environmental processes as well as human agency in producing environmental transformation; and
- Appreciation of complexity and uncertainty in social-ecological systems, with the recognition that prediction, management, and control are unlikely if not impossible (1999: 490).

Detailed, dynamic, temporally and spatially situated analyses should encompass a historical perspective utilizing a range of qualitative, quantitative, and textual methods from both the natural and social sciences. Such eclectically combined methods emphasize diversity and complexity in nonlinear social-ecological relations.

Structure, agency, and scale in environmental change are dynamically and recursively created in a nonlinear, nondeterministic, and contingent fashion. Dialectical and co-evolutionary conceptions provide room for difference, complexity, and unexpected contingency. Environments are both a template and product of human action. Complexity and uncertainty raise important implications for perceptions, policy, and practice because the science will always be incomplete and the system a moving target.

These three themes need to be broadly engaged by various disciplines for a new ecological thinking to be realized. The nature-culture dichotomy, much like the indigenous versus scientific knowledge dichotomy, is unhelpful. Enquiry based on interdisciplinarity, hybridity, and innovative eclecticism involving historical analysis, qualitative and interpretive approaches

as a part of multi-sited and multi-actor processes is the methodological way to proceed.

Gunderson and Holling (2002) engage in a "quest" for a theory to find unity between social, cultural, and natural systems in *Panarchy: Understanding Transformations in Human and Natural Systems*. The "quest" for a unifying theory guided by the principle of simplicity seeks to integrate economic, ecological, and institutional systems on the one hand, and to encompass space from local to regional to global and time from months to millennia on the other. Drawing their inspiration from the Greek god Pan, they describe interplay of the three interacting systems as *panarchy*. This theory of *panarchy* contains the notions of dynamic systems with unpredictable change, cross-scale hierarchies of structures that enable adaptive responses, and of interdisciplinarity. The theory views nature as an adaptive and evolving complex system (Gunderson and Holling 2002: 3–22). The idea of *panarchy* provides the basis for some valuable case studies which reiterate the idea that theories are grounded in specific contexts, as discussed by Bateson (2002), Geertz (2000), Jacob (1982), and Sorokin (1962). *Panarchy* differs from these previous works in its emphasis on economics as a separate system. The concept of adaptive cycles is valuable and noteworthy. Within an adaptive cycle three properties – potential, connectedness, and resilience – determine the dynamics of change. "*Potential* sets the limits to what is possible – it determines the number of options for the future. *Connectedness* determines the degree to which a system can control its own destiny, as distinct from being caught by the whims of external variability. *Resilience* determines how vulnerable a system is to unexpected disturbances and surprises that can exceed or break that control" (Gunderson and Holling 2002: 62). Novelty in adaptive capacity is related to building on and re-integrating existing components to provide new paths and opportunities.

2.8. Summation

The objective of this chapter has been to discuss recent literature about the relationship between biological and cultural diversity that falls within a

larger framework of the study of human ecology. We have discussed the following key ideas:

- Human ecology draws its inspiration and defining characteristics from ecology.
- Like ecology, human ecology is a science of community utilizing the concept of holism – where all things are connected to a greater 'whole.'
- The ecosystem forms the organizing unit of that 'whole' connecting the biotic as well as the abiotic.
- As ecology is the science of relations between organisms and their environment, human ecology makes the human community the central focus of these dynamic and complex interconnectivities.
- Human ecology aspires to be interdisciplinary, to examine complex and interacting systems, to respond to a wide variety of cross-cutting issues of societal relevance, and to be applied to nature.
- Historically, human ecology gained a foothold in the disciplines of the social sciences rather than the biological sciences.
- Ecology, when it commemorated the ninetieth year of its founding in 2005, could no longer ignore human dimensions of environmental relations.
- In the new millennium, human ecology promises to be the 'third culture' linking the sciences and social sciences.
- The main obstacles to the development of this third culture are disciplinary self-interest and a fragmented understanding of human relations with the environment.
- Recent literature on the relationship between biological and cultural diversity illustrates yet another attempt to underscore the need and significance of human ecological perspective.
- It seeks to bring about a 'consilience' between the biological and social sciences and driven by the concept of diversity.
- Diversity is employed to make a case for conservation of biological life and cultures in the face of mass extinction.

- Historically the concept of diversity is associated with both positive and negative qualities.
- These varying perspectives are informed by Judeo-Christian creation narratives.
- The core of biological diversity is adaptation and variance which open up to unforeseen possibilities.
- The word 'biodiversity' carries with it a wonder at the variety of life and a concern for its extinction.
- In order to tinker, evolution needs all the parts.
- Cultural diversity is equally magnificent and threatened.
- Evolution of complex beings like humans is informed by both biological as well as cultural factors.
- Language may be a proxy for culture and expresses an ecological outlook.
- The loss of linguistic diversity is at least as dramatic as the loss of biological diversity.
- The link between biological and cultural diversity lacks the force of context specificness and is vacant of meaningful interconnectivity, which is essential to maintaining overall diversity.
- Social change is an important ingredient in the discussion of biological and cultural diversity.

While human ecological thinking seeks to unify and transcend disciplinary boundaries, it suffers from fundamental weaknesses. Primary among these is the nature-culture divide. This conceptual failing gives rise to additional flaws such as the balance of nature or equilibrium perspective, determinism in the form of cultural materialism, and the fetish for averages at the expense of variance. The flaws are mirrored in the language-species model which has been used to illustrate the relationship between biological and cultural diversity.

The species and language binary is an error in logical typing. Biology and culture are not equal types. Culture emerges from a biological basis – it is an aspect of nature. Cultural diversity emerges from biological diversity.

The species and language binary is a critical error because it reveals a separation between culture and nature in the minds of the proponents of the species language-link, the very gap they seek to close. The objective is to study nature-culture relations so as to conserve both, not to equate them. The species-language model is parametric and does not reveal a relationship between biological and cultural diversity. Relationships form between discrete events, not averages.

There is a gap in understanding the relationship between cultural and biological diversity. Some scholars have asserted that there is such a relationship and offer examples to illustrate its nature. They have not developed an approach to illustrate the relationship that can withstand basic scrutiny. This gap in understanding is largely due to three factors: (1) scholars feel pressured to illustrate this relationship in order to preserve biological and cultural diversity, and therefore, they take intellectual shortcuts due to the sense that time is running out; (2) this is a relatively new area of transdisciplinary (interdisciplinary) research, so it takes time to develop a systematic body of ideas; and (3) it is one thing to promote multidimensional analysis in theory and quite another to actually deal with the cumbersome nature of such an analysis and meaningfully undertake it in the field. In spite of its good intentions the species-language model is seriously flawed.