

Honouring Indigenous Science as a
Means of Ensuring Scientific Responsibility

By Priscilla Settee

A Thesis Submitted to the
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A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University

of Manitoba in partial fulfillment of the requirements of the degree

of

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Abstract

This research actually began many years ago before it was foreseen that it would end up as a research thesis. It has been a culmination of work to date about topics that are near to my heart, the work around Indigenous sovereignty and preservation of the natural world. Through a process of personal contacts with Latin American Indigenous groups in the early 1970's and more recently work with the Indigenous Women's Network, the Indigenous Environmental Network and others, my knowledge about the state of environment and Indigenous peoples has increased. This thesis documents this knowledge. My work with many fine insightful leaders from our various Indigenous nations, as well as other colleagues exercising their solidarity with Indigenous peoples, has been a very rewarding and inspirational experience. Long travels to the far reaches of the earth have permitted me to witness first hand the ravages left behind by western development, and has permitted me to learn how people organize to respond to those ravages. A most inspirational part of my education has been my contacts and conversations with elders from various communities. Their unending optimism, humour and great strategic insights into important world matters have been a deep source of inspiration and motivation through difficult times. I believe that as educators and citizens we have a responsibility for the protection of our Earth Mother for future generations. This thesis will serve, I hope, as an inspiration to how people can overcome their sense of isolation and work towards building a better world for those who will come after us.

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A special thanks to my family Len and Mika who are always part of my journey, either through participation or tending to the homefront while this work goes on. This work is in honour of not only them but also my extended family of the Indigenous Women's Network, the Indigenous Environmental Network/First Nations Environmental Network and all the warriors who work towards preserving our Earth Mother. I also wish to acknowledge the leadership of many organizations and particularly the Pacific Concerns Resource Centre in Fiji. I am always grateful to our elders who are the carriers of Indigenous wisdom.

This thesis is dedicated to our three friends and colleagues, Ingrid Washinawatok, Menominee Nation, Terence Freites and Lahe'ena'e Gay who were tragically killed on March 4, 1999 in Colombia, South America in the defense of the homelands of the U'wa Indians. Our work is nowhere finished.

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Chapter 1

Introduction

Aboriginal* peoples in the world currently number in the range of 500 million. They comprise eight percent of the global population living in over 100 countries (Burger, 1996). They represent thousands of language groups and have developed varied existences based on their natural surroundings. They are as diverse as the lands they live on. Throughout time tribal groups have developed a unique and harmonious relationship with their natural surroundings. This harmonious existence has developed from a respect, a dependence, and a spiritual relationship with nature.

Like my people the Cree, *Nahiyawak* "or the exact speaking people", Aboriginal peoples in all parts of the world learned to sustain themselves skillfully under very rigorous climate conditions. *Nahiw*, in the Cree language, means one who is skilled in her/his particular performance, whether it be in battle, in hunting, in practising spirituality, or in speaking. *Wiyaw* means body in the sense of having a human body. When put together the word becomes *Nahiyew*. A Cree person is therefore a person who is skilled or careful in her/ his movements and speech. By living in harmony and developing a respect of all living things, Indigenous peoples developed a symbiotic relationship with nature.

Through my various work and visits throughout the world I have noticed a commonalty which exists among Indigenous peoples with reference to plants, food production, and relationship to natural surroundings. Their knowledge of nature is skillful and precise.

*Throughout this paper I will use the term Aboriginal and Indigenous to describe my people as well as those people with whom I have come to identify and who are indigenous to the land. It is important to note that in all First Peoples languages each have their own terminology.

While Aboriginal people did not refer to their knowledge as "science," they knew the requirements for existence with scientific precision often in harsh climates. People still know which season and what time of the day that animals and plants are to be harvested as well as which plants are used in healing illness. People know that each plant and animal has a use as well as a purpose in the natural order of existence. This knowledge of natural surroundings and biodiversity has been developed over millennia and through a careful process of observation, listening, experimentation, and adaptation.

A common North American Aboriginal belief is that both animate and inanimate objects have a spirit and a life, and that this life must be honoured and protected. (Colorado, Indigenous peoples believe that one does not harm one part of the web of life without having a reaction to that chain. The famous Chief Sealth said, "Whatever befalls the earth befalls the sons of the earth. Man did not weave the web of life, he is merely a strand in it. Whatever he does to the web, he does to himself"(Chief Sealth's Speech 1854).

Life continues to be lived according to that principle. Indigenous science knowledge was not limited to plants and weather, but transcended the heavens. Many tribal peoples have amassed knowledge about the constellations and have applied this knowledge when growing food, navigating, predicting weather, and situating sacred sites.

Now in the twentieth century the rest of humankind is beginning to value and exploit the wealth of knowledge which continues to exist within the Aboriginal world. Unfortunately that motivation is not for reasons which support Indigenous peoples and strikes at the heart of the sovereignty issue, as Simpson (1997) claims:

Proven by their survival to be both socially and ecologically sustainable, indigenous cultural and intellectual property are of increasing economic value to non-indigenous peoples. They represent the key to the development of the vast and largely untapped resources of tropical rain forests

and the germplasm of traditional farmers. Indigenous knowledge of biodiversity and sustainable environmental management practices could also provide important directions for natural resource use and conservation that are urgently required to achieve ecological sustainability. (p.48)

This interest in Indigenous knowledge has mushroomed recently with a devastating impact on Indigenous peoples. Front and centre to environmental problems is a very important fundamental difference in attitude towards nature. This fundamental difference separates how Indigenous peoples and Western development view nature and all her gifts. The Western approach assumes the natural world should be exploited and conquered.(Ermine, 1995) The Indigenous world view sees all of nature as equal, to be respected and given a place of honor. This thesis describes these two world views in some detail and explains how the two are incompatible.(Chapter 3)

As a Cree person I recognize that a wealth of knowledge exists within my culture. There is a need for this knowledge to be honoured and represented within educational institutions. Whether it has been acknowledged or not, many of the Western scientific discoveries have their roots in Indigenous practices and knowledge. Credit must be given to the originators of this knowledge. Lastly, I believe the principles which have sustained Indigenous peoples through extreme and difficult times are based on principles of balance. These principles of balance are very much required at this time in history.

I come from a community in northern Saskatchewan, Cumberland House, whose traditional livelihood was all but wiped out because of the development of a hydroelectric dam. In the mid 1940's the provincial government built a hydroelectric dam about an hour and a half upstream from Cumberland House on the North Saskatchewan River. Within a few short years the community of Cumberland House went from a prosperous traditionally economic based community to one of upheaval, and eventual poverty. Having witnessed the socioeconomic and cultural impact on my community and its

natural surroundings, I feel a passion and urgency for the preservation of the natural world as well as for ensuring that development and scientific research/projects benefit the community. This passion has become a lifelong journey, one which developed over the years through a process of self education, experience, and activity. This informal education is rarely recognized by formal educational institutions. This lack of support is an issue which concerns me deeply both as a parent and an educator.

I have long been a follower of international issues and Indigenous peoples. Back in 1978-79, while working for the Saskatchewan Indian Federated College, I contacted a number of Indigenous organizations in Mexico and Latin America with the purposes of learning information from them. It was to be one of those rare events which changes one's life completely. For six months, I travelled from Mexico to Ecuador, with a faltering understanding of Spanish, and learned about Indigenous struggles around land and life. The beauty of the land and people, the cultural richness, the foods, the personalities, were like nothing I had ever experienced. Unfortunately, so too were the political realities of all of those Indigenous peoples with whom I spent time. Throughout Mexico, Central America, and the northern part of South America, the stories were similar-- repression, genocide, poverty, and stolen land. My strongest and most vivid memories are from the tiny country of El Salvador, as well as Guatemala, in Central America and Colombia, in South America. Back in the 1940's, thousands of Indigenous peoples were slaughtered while defending their lands in El Salvador, in an historic event referred to as La Matanza, the massacre. I was a guest of Adrian Lizco and ANIS, (Asociacion National Indigena de El Salvador). There in Santa Ana I witnessed the machete slashes to the doors of buildings which still stand as a silent testimony to the slaughter of a people. It was a powerful and sad event for me. Since those years Adrian Lizco, a Nahuatl/Pipil Indian, and President for ANIS has spent much of his life in exile in both Guatemala and neighbouring Mexico as a political refugee. Occasionally on the internet I catch glimpses of news of tiny El Salvador and watch for news of my friend

Adrian Lizco. In Colombia the events were are very similar. High up in the Sierra Madre Mountains I met with leaders from Consejo Indigena de Colombia. Two days prior to my arriving, leaders from the National Indigenous Council had been marched off and shot dead, simply for standing up for land rights for their people. It was a frightening event, which both politicised and angered me. I recall one of our community meetings with leaders which was abruptly interrupted and ended by a surprise visit by the ejercito (army). Over the couple of decades since I was there violence against Indigenous people has escalated particularly in the fight against land grabs. At times I feel a sense of powerlessness when I turn on the radio and hear of Zapatistas being massacred even as recently as a month ago. My hope is that this thesis will serve as an education, but also as a call for international solidarity, for those people unaware of the extent of repression felt by Indigenous communities.

In addition to these interesting and awareness-raising experiences, I have been afforded the good fortune of other career/life opportunities. My interest in the research topic of Indigenous environmental issues and the notion of Indigenous science was piqued when I had the opportunity to work as Director of the Engineering Access Program (ENGAP) at the University of Manitoba which trains Aboriginal students in engineering. I discovered that none of the curriculum included information from the Aboriginal perspective. Soon I developed a course called *Aboriginal Peoples, Sciences, and the Environment*. This course explored the relationship of Aboriginal science knowledge and the impact of Western development on Indigenous lands. This exercise in developing curriculum around the environment and its Indigenous peoples helped to raise an awareness about these issues within the engineering student community. I believe it sensitized at least part of the student body.

Around that time, I became active in the Canadian Aboriginal Science and Technology Society (CASTS) with other Aboriginal academics who had organized themselves at a national level to establish CASTS. Today CASTS strives to not only

attract Aboriginal youth into the sciences, but it strives to make science more relevant for Aboriginal learners by including Aboriginal perspectives within the sciences and by honouring that community knowledge. During that time I had the opportunity to chair the third annual CASTS conference. This conference provided the ENGAP and others with an opportunity to hear first hand from people like Dr. Oscar Kawagley and his recognition of Indigenous science principles and their practical application in the classroom.

When I first started inquiring into scientific knowledge within the Aboriginal world and within the Canadian context, I found a lack of written information. I have since found that most of the written information exists primarily in the form of Ph.D. dissertations, such as Oscar Kawagley's (1993) *The Yupiaq World View: Implications for Cultural Educational and Technological Adaptation in a Contemporary World*. Another useful resource was Dr. Greg Cajete, a Tewa Indian educator from Santa Clara Pueblo, New Mexico, whose dissertation inspired a book entitled *Look to the Mountain, An Ecology of Indigenous Education* (1994). Another early pioneer author of Indigenous science knowledge is Dr. Pam Colorado now from Hawaii. Almost all of the written information about Indigenous science happens to be American. I believe a great need exists to research and document Canadian Indigenous science knowledge. There is a small but growing body of literature within the Canadian context. There exists, particularly in Saskatchewan, numerous projects which promote the recognition of Indigenous science contributions. My thesis reflects my own personal growth in uncovering/discovering and working with these projects. I have interviewed people to expand this existing knowledge pool and to document some of that knowledge in written form.

As environmental conditions on earth worsen, due to exploitation of the earth's resources and internationally financed megadevelopment projects much of the plant life which was traditionally used for medicines is now disappearing. My thesis addresses the

deteriorating state of the environment, the cause of that deterioration, and how that deterioration affects the use of plants and all life on earth (Chapters 3,4, and 5). It is my hope that this thesis will be a warning cry to those who read it. Our plant relatives are in danger of disappearing, due largely to human's greed, disrespect, and the method of industrial development currently practised particularly on Indigenous lands.

In North America alone, there are no less than 200 environmental catastrophes in Indigenous communities (Indigenous Women's Network Magazine,1996). Many more ecological crises exist in other parts of the world, virtually all on Indigenous lands. I have been deeply touched by my contacts with Indigenous peoples throughout the world whose land is being sacrificed in the name of scientific advancement and technological progress. A recent trip to the South Pacific to hear the people's stories about the impact of the nuclear bombs on their lives has remained a deeply moving event for me. In my thesis, I write about these issues and the Indigenous response to them to illustrate the hopefulness which still exists among my people. My information comes from many years as an active environmentalist, learner, and reader.

When we examine the lack of representation faced by Aboriginal people in the science professions, when we notice the negative impact that much of science has had on Indigenous people's land and life, and finally, when we note the rejection of Indigenous knowledge within scientific knowledge, we can describe science as having a racist manifestation. This systemic racism needs to be acknowledged and addressed before Aboriginal peoples can influence the values that guide science.

Throughout my years of environmental activity I have been introduced to many people, campaigns, and organizations who work towards the preservation of the natural world. My thesis documents some of the efforts of such groups as the Indigenous Environmental Network, the Indigenous Women's Network, First Nations Environmental Network, Union of Concerned Scientists, and others who are promoting scientific responsibility and the preservation of the natural world. I write about the international

mining campaign and the Honour the Earth campaign as examples of organizations and individuals working together to create global change. My thesis will also document some projects initiated by Indigenous political organizations such as the Saskatoon Tribal Council, some of which enjoy support from non-Indigenous learning institutes.

Indigenous peoples are not willing victims to incursions on their lands and their resistance is phenomenal, not only locally but internationally. Since first storming the United Nations assembly in Geneva, Switzerland, in the 1970's, Indigenous peoples have been using the international arena to redress the wrongs endured in their home communities. The past three decades have seen the organization of international lobbying groups networking and strategizing for the world's Indigenous peoples. Many documents have been developed which purport to strengthen the voice of Indigenous peoples. I document some of the lobbying activities and I evaluate the effectiveness of some of these activities and documents.

In her keynote address to the Fourth World Conference on Women in Beijing, China Winona LaDuke, co-chair of the Indigenous Women's Network stated:

On a worldwide scale and in North America, Indigenous societies remain in a predatory/prey relationship with industrial society. We are the peoples with the land-land and natural resources required for someone else's development program and amassing of wealth. The wealth of the United States, the nation which today determines much of world policy, was illegally expropriated from our lands. Similarly the wealth of Indigenous peoples of South Africa, Central and South American countries, and Asia was taken for the industrial development of Europe and later for settler states which came to occupy those lands. That relationship between development and under development adversely affected the status of our Indigenous societies and the status of Indigenous women. (Indigenous Women's Network Magazine, 1996, p.34)

I write about the impact that development has had particularly on Indigenous women's lives. In the case of hunting and gathering peoples, women's work is comprised of gathering foodstuffs from a rapidly diminishing source, as their land is mined, deforested, flooded, and leveled all in the name of development. In many traditional Indigenous societies women are the carriers of knowledge about plants. As societies deteriorate, so does the special status of women as keepers of knowledge of life and sustenance. If medicines are disappearing so does the role of the keepers of that medicine knowledge -- the women.

Industrialized society has had a particularly negative impact on women and their health. Reproductive technologies have targeted women in the scientist's solution to the overpopulation problem. Persistent organic pollutants, science's deadliest legacy, has contaminated the breast milk of all women. But the contamination of breast milk in Indigenous women is twelve times higher than that of other women (Indigenous Women's Network Magazine, 1996, p.34). For Indigenous women, the inability to breast feed babies is a final blow in a long list of assaults against them.

While they are not always recognized in the contemporary sense, Indigenous women are in the forefront of creative and direct action in the preservation of Indigenous lands. I document throughout my thesis some of the activities which are making a difference in the lives of people in our communities.

The issue of scientific responsibility and technological development are becoming more evident as the earth's natural resources continue to disappear and as natural disasters are predicted. Feminists have argued that the destructive forces of Western male science is a blow to all people but especially to women. More women are speaking out against destructive male forces which are antithetical to the female psyche and female life forces. Rachel Carson (1962) was a pioneer female voice to the savaging of nature. Since then Sandra Harding (1991), Vandana Shiva (1997), Ruth Hubbard (1998), among others, have contributed to a critique of Western science as being something largely developed from a

Western male paradigm. Part of my thesis includes women's thoughts and actions around ensuring scientific responsibility. The thesis documents women's concerns around science research and public input.

Finally I address the protection of biodiversity and the Indigenous struggle with intellectual property rights. "Biodiversity" is a word used by Western scientists to describe the vast array of plant growth in the world. For Indigenous peoples this word has become maligned because it represents the last vestige of colonialism for them (explained just below). The phrase "intellectual property rights" has also become a negative term for Indigenous peoples. I describe the impact that the loss of those rights is having on Indigenous populations in different parts of the world. Currently many pharmaceutical companies and Western scientists are acting rapidly to document and patent much of our Indigenous plant knowledge. Scientists, often employed by large transnational pharmaceutical companies, want to become sole owners of this knowledge in order to make huge financial profits through patents. Particularly since the Earth Summit in Rio de Janeiro, but even before then, the issue of biodiversity has become an important issue with significant colonizing impact on Indigenous communities. Many communities are fighting to preserve their biodiverse knowledge, but many are in the process of losing it, sometimes unknowingly or through misrepresentation. Aboriginal communities must not only be warned about the loss of ownership of knowledge through patents by transnational corporations, they must also understand the eventual legal implications that the loss of knowledge will bring.

Many communities and organizations have begun establishing declarations which reflect their concern around the threat to biodiversity. Sometimes these documents are antithetical to Indigenous world views. These are all issues that must be communicated and discussed at the community level to promote understanding and to educate the people. The North American Indigenous Peoples Summit on Biological Diversity and Biological Ethics met in August 1997 in Montana and addressed the concerns of over 60 organizations

and hundreds of individuals and communities. As a result of my participation in many of these activities, my thesis describes the establishment of these type of documents and examines their effectiveness.

Activities supplemental to these declarations include the preservation and amassing of Native seeds, and the establishment of seed "banks" and projects preserving Indigenous knowledge. Some communities, for example in India, have taken to nonviolent action and have removed large conglomerates such as Cargill and Kentucky Fried Chicken. Other communities have established projects which operate on Indigenous principles of sustainability and which restore and revive plant knowledge and usage. Much of this information has been either unrecorded or not accessible without a lot of probing. My thesis documents this valuable information.

Communities must be informed so they can make decisions about the knowledge that they may want to share. In the creation of documents which protect Indigenous rights, a challenge today is ensuring that they reflect the spirit of collectivity that remains central to community values.

A classic case of expropriation of intellectual property rights is the Human Genome Diversity Project (HGDP), a project seen by Indigenous peoples as the final act of colonialism. The Human Genome Diversity Project is an international consortium of scientists and scholars whose work it will be to collect blood, hair, and skin samples from over 500 Indigenous tribes. HGDP scientists are attempting to map the estimated three billion bases in human DNA for the purpose of determining human variation and diversity among the earth's population. The dogma of DNA, as the storehouse of genetic information, pervades the ideology of the HGDP (Lewontin, 1991). One of the consequence of the HGDP is to define which DNA base sequences are normal and which are inferior. The scientists want to sample "pure" Indigenous populations to use in comparisons. The HGDP will have the power to define humanness in mechanistic forms embodied in base sequences of human DNA.

In response to the HGDP Indigenous peoples are creating history by organizing many interesting and timely events in opposition to it. This thesis documents this history (Chapter 5).

It is my hope that this thesis will educate both the Aboriginal community and broader society, including the university scholarly community and educators at all levels.

I believe that problems within the Aboriginal communities reflect the lack of care that dominant society has shown us as Indigenous peoples. I believe that the very real apathy, internal violence, and sense of loss shared by our communities is a direct reflection of, and has developed parallel to, the type of exploitation exercised by outside interests. It would be wrong to say that anger and frustration is not a real part of the personal motivation behind this thesis. I am a product of Indigenous and Western world conflict/creations. In a real sense my natural family was virtually destroyed, first by the wars of the Western world and then later by laws which broke up not only my natural family but whole communities. It is said that change has two sisters: anger at the way things are and courage to change those things. Writing this thesis is my contribution to putting my anger to work, as well as making the world a safer place for future generations. Those future generations include my daughter, Mika, who through her participation in my work and her questioning the archaic systems which neither make sense nor contribute to life on earth, has been a major part of that environmental journey.

Purpose of the Research

Since the mid 1970's I have had the unique opportunity to travel to many Indigenous communities in various parts of the world. Without exception I have found that Indigenous communities suffer from the incursions of dominant societies and that suffering represents loss of life, language, culture and homelands. Whether those losses are through the exploitation/destruction of the natural environment to create wealth in some other community or through the purposeful genocide of peoples, the impact is the same: the marginalization and destruction of Indigenous life. As an educator within a mainstream

institution, I face frustrations over the fact that the Indigenous reality is not honoured or understood by those institutions, nor by the ones attended by my daughter. By researching the issues of Indigenous knowledge in the sciences, I am addressing many vital problems which include biodiversity, the Human Genome Diversity Project, the preservation of the natural environment, and the examination of the role of citizens groups. I am helping to fill a vacuum which exists within a dominant academic community.

Through my research and writing I seek to document how Indigenous peoples are addressing the situations they face. This documentation will include the actions of other individuals and organizations which assist Indigenous groups. I describe and analyze documents that have been developed particularly over the past decade to protect Indigenous Intellectual Property Rights, including the Convention on Biological Diversity, Agenda 21, the Draft Declaration of Indigenous Rights, and others. I discuss their purposes and their limitations.

The exercise of research and writing enables me to reach more people through education and communication. I believe that as citizens of the world and as earth stewards, we have a responsibility to challenge the scientific community and other institutions which condone, encourage, and lead much of the destruction of the earth. I believe that if the current model and rate of "development" is not turned around, we are all eventual losers in the bigger picture.

I also believe that the world needs Indigenous knowledge as a directive and as a source of hope. I believe that many individuals are beginning to recognize that need and are ready for instructions and in many cases have taken action.

Research Statement

Coming from a Cree cultural background, I have learned to view all things in life from a holistic perspective. A Cree cultural world view sees all of life as interconnected. Animate as well as inanimate objects have a spirit and are worthy of respect. One does not purposefully harm animals or the natural environment because we are related and we

interdependent. Having had many opportunities to spend time with other Indigenous peoples from various parts of the world I have learned that we share many similar world views particularly in respect to the natural world. Another commonality shared by Indigenous peoples is our reliance on our plant relatives for healing and sustenance. As a Cree environmentalist and woman, I am deeply concerned about the impact of Western development on Indigenous lands, both locally and globally. Some of my information comes from my activity with the Indigenous Women's Network, a group which works for sustainable and holistic development as well as for sovereignty rights. I am also actively involved with the Indigenous Environmental Network Board and with the Nuclear Free and Independent Pacific Board. Even in my work with the Canadian Aboriginal Science and Technology Society I run into attitudes with fellow board members who believe it is enough just for Indigenous people to aspire to scientific professions, without taking a critical look at what happens with science. In almost all cases I have found Western development has meant the abrogation of sovereignty rights and death of Indigenous communities as we have known them. It is not to deny that some Indigenous peoples have benefited from Western development. But if we examine the majority of Indigenous reality, development has meant destruction of natural environment and lives which depend on that environment.

Indigenous peoples now have a new frontier of colonialism to be concerned about. My people who have been informed about genetic research have become very concerned about it. Our people believe that the new genetic research transcends ethical and moral boundaries. Indigenous peoples believe that we must never allow others access to body parts such as hair and finger nail samples. The new genetic research (which requires sampling of blood, hair, and skin) represents a personal and spiritual infringement and intrusion of the worst kind. The procurement by others of body parts is antithetical to the Indigenous way of life. It is for all of these reasons that the Human Genome Diversity Project takes up an important part of this thesis.

I have identified the following key issues for my thesis research:

- Identification and differentiation of Indigenous and Western world views.
- Documentation of my personal and educational/political involvement as a means of personal understanding and growth.
- Documentation of some causes and impact of the earth's deterioration with special focus on four case studies (Lubicon Cree, Innu and others affected by military practises, Indigenous peoples effected by the nuclear cycle.)
- Impact of scientific/technological development on women's lives and actions taken by women to halt destructive activities.
- Efforts by some organizations to address and reverse the destructive trend of Western development.
- Documentation and assessment of Indigenous lobbying efforts.
- Biodiversity and the Human Genome Diversity Project versus Indigenous peoples.
- Establishment and assessment of documents that aim to preserve the world's biodiversity.

Research Methodology

In addition to descriptive writing and interviews, I have used the participant observer method of research. Much of my research material has been gathered over a number of years of activity as both a participant and an observer involved with a number of key organizations, as well as participation at meetings and conferences. My activity on various Indigenous boards and committees has spanned twenty-five years. While active on these boards I have gathered much information which I feel compelled to document and record. Initially I was an observer but eventually I became a participant. From the beginning it was not my intention to record any of these activities in a Masters Thesis, but I have grown to see the need for the documentation of this unwritten history and my life's work. My thesis records the issues which have been central to these various boards, committees, and events. In addition I have written a number of articles which have been published, in the hope of spreading understanding to a wider audience. I will draw on some

of my own more recently produced documents. I have had the good fortune of listening to, taking notes on, and interchanging with, some of the world's best environmental speakers and Indigenous sovereignty rights people. I include some of their spoken words. I have found that the more I participated the more informed that I became (Glesne & Peskin, 1992). My people the Cree have a wealth of knowledge about the natural environment which for the most part remains untapped. I have chosen one or two individuals to interview during the preparation of this thesis. I used an interview format to learn elders' information. In some Cree and Saulteaux communities it is customary to first present tobacco to the person you want to learn from. Like mainstream research, participants' customs among Aboriginal peoples are not standard, and so variations in some data will exist. For example, in many communities women are the keepers of knowledge around plants. However, due to colonization and the impact by EuroCanadian culture, many aspects of Indigenous culture have changed. I am also aware that some information will not be given for public communication because of the mistrust that Aboriginal people have developed towards non-Aboriginals based on historical exploitation. This not-for-public-information issue will pose an interesting challenge in dealing with thesis requirements. Some of my research was primary and included documentation of historical events through interviews with individuals. In a very real sense, I have written previously unrecorded Aboriginal history.

Chapter 2

A Critique of Western Science

While it is recognized that the world of modern Western science (MWS) has been responsible for many advances over the last few hundreds of years, Indigenous Peoples particularly are uncomfortable with attributing all scientific principles for cures and discoveries to one particular group -- Western scientists. Western science always credits Galileo, Descartes, and others with the origins of scientific principles. With very rare exceptions, such as Jack Weatherford's *Indian Givers*, and F. David Peat's *Lighting the Seventh Fire*, virtually no credit is given to Indigenous contributions or Indigenous knowledge of scientific principles. I am astounded at the range of attitudes which Western scientists generally bestow upon Indigenous knowledge. On the one hand attitudes show scorn and denial that Indigenous peoples actually have a knowledge base. On the other hand, attitudes encourage rampant theft, expropriation, and a disregard for intellectual property rights. I had the recent experience of attending the American Association for the Advancement of Science annual conference. According to one presenter, Indigenous people in a region of the Brazilian rainforest were portrayed as somewhat less than human, existing in very poor condition and incapable of using any of the local plants to improve their condition. I was annoyed and dismayed at being told that the rainforest's baboons taught the research team more about plants than the Indigenous people who survived on those lands for thousands of years. I don't believe that this incident is an unusual case but may represent the thoughts of the average scientist. It seems to me, judging from the conference program which featured virtually no Indigenous presenters, that there is a great need for open discussion, integration of ideas, and mutual learning and understanding.

Feminist, Environmental, and Indigenous critiques of MWS

Rachel Carson was a pioneer in the early 1960's to voice concerns about the state of the environment. In 1962, when commenting on human's impact on the environment, she wrote:

The most alarming of all man's assaults upon the environment is the contamination of air, earth, rivers, and sea with dangerous and even lethal materials. This pollution is for the most part irrecoverable; the chain of evil it initiates not only in the world that must support life but in living tissues is for the most part irreversible. (p.18)

Carson warned of the impact of 200 plus basic chemicals used in killing insects, rodents, weeds. A woman before her time, she told that these chemicals had the power to still the song of birds, to coat the leaves with a deadly film, to linger on in soil, and to stop the leaping fish in the streams, even though the target was a few weeds or insects. Carson also understood, as a biologist, the lethal impact that chemicals would have on human genes.

Along with the possibility of the extinction of mankind by nuclear war, the central problem of our age has therefore become the contamination of man's total environment with such substances of incredible potential for harm-substances that accumulate in the tissue of plants and animals and even penetrate the germ cells to shatter or alter the very material of heredity upon which the shape of the future depends. (p. 21)

While she did not refer to her work in the environment as feminism, her voice was a powerful female force which effectively terminated the use of the deadly chemical DDT. While Carson's voice referred to nature, later feminist writers would write about the negative impact that science held upon female scientists.

Domination by Western white upper-class males is one reason for the one-sidedness and narrow vision of science, a vision labeled by more recent feminist critics and others. Distinguished Harvard scholar and biologist Ruth Hubbard, claims that who

ever gets into the study of science and whose research receives funding has a lot to do with public accountability and agendas. Hubbard (1988) expressed the issue this way:

Until the last decade or two, mainly upper-middle and upper class youngsters, most of them male and white, have had access to that kind of education. Lately, more white women and people of color (women and men) have been able to get it, but the class origins of scientists have not changed appreciably. The scientific professions still draw their members overwhelmingly from the upper-middle and upper classes. (p. 120)

During the 1970's, the idea of a feminist science grew out of women's frustration from discrimination within the scientific community, as well as from the negative impact of some science research on the lives of women and other disenfranchised groups. In many ways women were feeling frustration with their lowly positions within academia and science and were challenging the patriarchy of science. Those early feminist scientists (Harding 1991) drew parallels between the canons of science and the values that guided those canons.

The conceptual schemes in these fields and the dominant notions of objectivity, rationality, and scientific method were too weak, or too distorted in some way or another to be competent even for identifying-let alone eliminating sexist and androcentric assumption and beliefs. (p. 105)

Science is, Ruth Hubbard claims, made by largely self-perpetuating, self-reflexive groups; by the chosen for the chosen. Peer review is important to this select group (Hubbard, 1988).

What this means is that small groups of people with similar personal and academic backgrounds decide whether a particular fact-making proposal has enough merit to be financed. Scientists who work in the same, or related, fields mutually sit on each other's decision making panels and whereas criteria for access are supposedly objective and meritocratic, orthodoxy and conformity

count for a lot. Someone whose ideas and/or personality are out of line is less likely to succeed than "one of the boys"- and these days some of us girls are allowed to join the boys, particularly if we play by their rules (p. 120)

Hubbard is dismayed that the old boys network allows no public accountability into the system. She believes this is wrong and that science needs to be more open *to* the people and *for* the people. The new biotechnology, for example, estows public participation with what could its devastating impacts. Tuana (1988) argued:

Discussions of critical social, technical, and ethical aspects of these technologies are currently suppressed by the view that science and technology are beyond the boundaries of conventional political discourse. Nonetheless, choices are being made concerning the new biotechnology's -- choices that will determine the kind of society we get. (P.)

According to the author, scientific decision making supports commercial interests over societal and environmental concerns.

Within industrial capitalism, biotechnology is tied to private profit, short-term control over nature, and neglect of short and long-term social and environmental consequences. (p.)

In *Whose Science Whose Knowledge*, Harding states that it is clear that science and technology today, as in the past, provide benefits disproportionately to members of the dominant races, classes, and gender. Not only are resources used for the benefit of just a few, but she claims science is responsible for the direct oppression and exploitation of the many. She cites the reproductive technologies and policies as an example. When describing the issues of the medicalization of birth, reproductive technologies unbeneficial to women, sterilization and abortion policies, unsafe contraceptives, prenatalism, and unnecessary gynecological surgery Harding states:

It is clear that the dominant culture has been willing to take far greater risks with women's reproductive systems than it would

ever countenance for those of men-or,
rather, for those of men in the dominant
classes and races. (p. 34)

These sentiments are echoed by Winona LaDuke when speaking about the impact of Western civilization on Indigenous peoples. In her keynote address at the United Nations Fourth World Conference on Women in Beijing, China in 1995, LaDuke called for challenges to the status quo.

If we can no longer nurse our children, if we can no longer bear children and if our bodies are wracked with poisons, we will have accomplished little in the way of determining our destiny or improving our conditions. These problems, reflected in our health and well-being, are the result of historical processes and are inherently resulting in a decline of the status of women. We need to challenge these processes if we want to be ultimately in charge of our own destinies, our own self-determination and the future of our Earth, our Mother. (p. 8)

Harding's (1991) work includes not only a gender issue but a social class issue as well. Harding claims that affirmative action is a scientific and epistemological issue as well as a moral and political one, yet affirmative action programs have not worked in the science area. Harding looks at sciences treatment of women, the African American community, including the specific case of Black women. While she limits herself to African American examples, Native American peoples in the United States have experienced similar treatment. Harding states that one must view science within a larger soicopolitical reality. For example, she states that it is difficult to imagine advancing democratic tendencies without the participation of people of colour in directing scientific and technological policy.

On the topic of race and African American women's role, Harding claims that those women who are already in the sciences are frequently members of an economic and political elite. Consequently, they are far less likely to challenge how science conducts

its business, despite the fact that many of the women who have striven for change have come from the upper classes.

As in the case of Native Americans, the sciences have not in general had beneficial effects on African American lives partly because of racist policies and practises, and partly because African American youth have not been encouraged to pursue science careers until recently . Finally Harding (1991) states that patterns of race relations in the larger society have to be understood to appreciate the consequences of African Americans' interaction and experiences with the sciences.

As part of its racist practices, science has transferred dangerous, inappropriate and exploitative technology to communities of colour (Harding, 1991). This has resulted in human rights abuses in regards to female sterilization and hazardous exploitative working conditions.

In the First World as well, science's assistance in rationalizing labor processes has succeeded in deskilling labor in many occupations, with the consequence that those who are least powerful in the labor market are moved into whatever work is most degraded and least rewarded. (p. 206)

So we see a phenomenon of factories locating to places where African American, Hispanic, and Native American workers live in order to exploit cheap, abundant and compliant labor. This points to the fact that the sciences support technologies and applications that are not morally and politically neutral.

Harding refers to African American scholars when describing African contributions to the field of science and the fact that racism precludes their contribution. She refers to the contributions to medicine, architecture, engineering, mathematics, transportation, agriculture, and academia which the African community has given to the world. Further she claims that Europe stole from Africa, taking their brightest scholars and thereby reducing its intellectual and technological resources. She quotes such scholars as Walter Rodney, Joseph Needham, and Van Sertima, who all stated that the

North Atlantic nations depended on African economic and political resources but have always claimed those resources as their own, thereby denying African contributions to the development of Europe. Rodney asks for us to consider history had the situation of the British and the African peoples had been reversed.

If millions of Britons had been put to work as slaves outside their homelands over a period of four centuries, and if continental Europe had also been enslaved, the level of scientific and technological development in England would have been low indeed. (Harding, p.230)

Perhaps Africans would be wondering whether it was because of either pale skin and biological inferiority, or inadequate cultural response to an unfriendly social and natural environment, that the British were languishing developmentally and economically.

The Union of Concerned Scientists was established in 1969 and has created alliances between committed citizens and the nations leading scientists. It works to encourage responsible stewardship of the environmental and its natural resources. It promotes energy technologies which are renewable, cost effective, and safe. UCS works to reform transportation policy and to curtail weapons proliferation. It seeks to influence governmental policy at the local, state, federal and international levels. Signatories include such international recognized scientists as Carl Sagan and Stephen Hawking.

In order to create change it is important for people to come together to discuss concerns and strategize. The Union of Concerned Scientists has done just that. It represents a voice of concern as well as an organization of action. The Union has developed its "Warning to Humanity" document which has been signed by over 1670 scientists, including 104 Nobel laureates. This organization represents 71 countries, including all of the 19 largest economic powers, all of the 12 most populated nations, 12 countries in Africa, 14 in Asia, 19 in Europe, and 12 in Latin America.

Human beings and the natural world are on a collision course. Human activities inflict harsh and often irreversible damage on the environment and on critical resources. If not

checked, many of our current practices put at serious risk the future that we wish for human society and the plant and animal kingdoms, and may so alter the living world that it will be unable to sustain life in the manner that we know. Fundamental changes are urgent if we are to avoid the collision our present course will bring about. (p. 1)

The Union stresses that the environment is suffering critical stress, including the atmosphere, water resources, oceans, soil, forests and all living species. Currently some 80 countries which contain 40 percent of the world's population suffer from serious water shortages. Pollution of lakes, rivers and ground water further limits water supplies. Rivers which carry eroded soil to the seas also carry municipal, agricultural, industrial, and livestock waste. Forests are being destroyed rapidly through clear cutting. Most of the tropical rain forest will vanish before the end of the next century, including large numbers of plant and animal life.

Although forests still cover one-fifth of the earth's land surface, fifty acres are destroyed every minute. An area one-fifth the size of Saskatchewan. (International Women's Network, 1994 p.4)

Oceans are being destructively pressured particularly in coastal regions. Marine catch is sometimes above the maximum sustainable yield. Since 1945, 11 percent of the earth's vegetated surface has been negatively impacted which has hampered food production, according to the UCS (199) . .

The irreversible loss of species which by 2100 may reach one-third of all species now living, is especially serious. We are losing the potential they hold for providing medicinal and other benefits and the contribution that genetic diversity of life forms gives to the robustness of the world's biological systems and to the astonishing beauty of the earth itself. (p. 1)

The Union is telling us that much of the damage is irreversible and permanent. Increased levels of gases in the atmosphere may alter climate on a global scale. Global

warming is a scientific reality which has impacted several countries. Scientists are telling us that we are approaching many of the earth's limits in regard to food, productive energy, and ability to absorb wastes and destructive effluents. Global systems will be damaged beyond repair they warn.

The union suggests five inextricably linked areas which must be addressed at the same time:

1. We must bring environmentally damaging activities under control to restore and protect the integrity of the earth's systems we depend. This includes moving away from fossil fuels, halting deforestation, obliteration of terrestrial and marine plants.
2. We must manage resources crucial to human welfare more effectively. We must make more efficient use of energy, water and other materials.
3. Population must be stabilized, recognizing that this will require improved social and economic conditions.
4. We must eventually eliminate poverty.
5. We must ensure sexual equality and women must have control over their reproductive decisions.

The developed nations are the largest polluters in the world today. They must greatly reduce their over consumption, if we are to reduce pressures on resources and the global environment. The developed nations have the obligation to provide aid and support to developing nations, because only the developed nations have the financial resources and the technical skills for these tasks. (p. 2)

The union stresses a reduction in violence and war stating that over one trillion dollars annually are spent on the preparation and conduct of war.

A new ethic is required-a new attitude towards discharging our responsibility for caring for ourselves and for the earth. We must recognize the earth's limited capacity to provide for us. We must recognize its fragility. We must no longer allow it to be

ravaged. This ethic must motivate a great movement, convincing reluctant leaders and reluctant governments and reluctant peoples themselves to effect the needed changes.
(p.2)

Similar to Aboriginal concerns, the Union believes that we are all on one lifeboat and none can escape when global biological systems are destroyed. In many ways we see today the union's predictions of environmental decline, poverty, unrest, and social, economic and environmental collapse.

Finally the Union calls on not only scientists, but the world's business, industrial leaders, and religious leaders along with the world peoples to join in this task to save the world.

Another voice for the environment has been Jerry Mander, author of *In the Absence of the Sacred, The failure of Technology and the Survival of the Indian Nations*. When speaking about some of the irresponsible advances in science and technology, Mander (1991) describes autonomous science/technology -- just because something can be done then it is done regardless of the consequences for the environment.

If it can be done, do it. There are no boundaries, no rules, no sets of standards by which to moderate these activities. No sense of right or wrong, no taboos; there's only what will succeed in the marketplace.
(p.226)

Mander states that many of the large prestigious universities such as Harvard, Stanford, MIT, Berkely, and Princeton financially support with multimillion-dollar grants socially irresponsible research, with no public debate.

Technology continues to be introduced and described by the people who stand to benefit most from its acceptance, and who deliver their visions in utopian form. The public is uninvolved; there are no forums for argument. No pros and cons. No referenda.
(p. 228)

Further, Mander points out that major publishers produce books singing the praises of these ideas. Highly recognized journals, newspapers, and magazines glowingly review

and report on all of these developments. Meanwhile, all of these developments, claims Mander, have not brought us closer to peace, security, sanity, fulfillment, happiness, and public and planetary health. If anything the planet has been sacrificed to satisfy the desires of the technological mania through oil spills, ozone depletion, global warming, deforestation, and toxic pollution, affecting all life on the planet.

Finally Mander quotes an excerpt from a speech delivered at the 1977 UN conference on Indigenous Peoples from the Hau de no sau nee(Iroquois), called "A Basic Call to Consciousness."

We must all consciously and continuously challenge every model, every program and every process that the West tries to force upon us. The people who are living on this planet need to break with the narrow concept of human liberation, and begin to see liberation as something that needs to be extended to the whole of the Natural World. What is needed is the liberation of all things that support Life-the air, the waters, the trees-all the things which support the sacred web of Life. (p. 192)

Indigenous Environmental Network

While the people in the Indigenous Environmental Network (IEN) did not start out seeing themselves as a critique of science, the Network has more and more taken on that role.

The goals are as follows:

- Educate and empower Indigenous grassroots people to address and develop strategies for the protection of our environment.
- Re-affirm our traditional and natural laws as Indigenous Peoples.
- Recognize, support, and promote environmentally sound lifestyles and economic livelihoods.
- Commitment to influence all policies that effect our People on a local, regional, national, and international level.
- Protect youth and elders in all levels of IEN activities.
- Protect our rights to practice our spiritual beliefs.

The national office of the IEN serves both United States and Canada with the following:

1. Provide a national clearinghouse of information through fax, e-mail, mail, web page, and telephone communication on environmental issues affecting Indigenous Peoples.

2. Resource and referral network for technical information, resource persons, and fact sheets.

3. Provide national/regional/local advocacy on Indigenous grassroots and tribal issues concerning environmental protection, natural resource management, and environmental health issues.

4. Provide resource, referral and support to Native grassroots on organizing, training, and strategy development.

4. Provide annual outdoor Native environmental conference gatherings.

6. Information and referral on Native grassroots and tribal environmental programs, national Native and non-Native environmental organizations, environmental justice initiatives, and federal agency programs.

While all of the aforementioned writers and groups recognize that science needs checks and balances, IEN provides some ideas on how to educate the broader public with solutions. The IEN provides many resources and inspiration for individuals and groups to draw upon. Some of the reasons that the IEN takes action are described in the next section.

Global Deterioration Case Studies of Environmental Destruction of the Earth's Environment

Many of the world's leading scientists, including such notables as Dr. Vandana Shiva and Dr. David Suzuki, have warned us about global destruction, that certainly will occur unless humans reverse destructive living habits. The world's forests are disappearing at a rapid rate. Studies have predicted that fresh water will be in short supply in about 50 years. Indeed some parts of the world such as Africa are currently

facing water scarcity, drought, and starvation due to water shortage. It is a well documented fact that much of the environmental destruction is taking place on Indigenous lands. Human Rights groups such as the International Work Group for Indigenous Affairs in Copenhagen, Denmark, make it their life work to address Indigenous human rights and land issues. As the value of land increases due to the discovery of minerals or because of logging or huge mega dams many Indigenous groups are displaced and relegated to less productive and less commercially valuable land. Life in these new quarters has proven to be very difficult and in some cases fatal for newcomers. The 1996-97 Indigenous World Yearbook identified the following issues which are urgently needing to be addressed:

1. *Militarisation and violation of human rights.* Chittagong Hill Tracts, East Timor and much of West Papua and Burma are virtually under siege or occupied militarily and extreme human rights abuses are reported. The Indigenous peoples of Colombia suffer from continued paramilitary presence, and massacres in Chiapas, Mexico, continue to this day.
2. *Harassment of Indigenous leaders and members of communities.* Indigenous leaders in Sarawak(Malaysia) are still being imprisoned because of their opposition to logging in their homelands.
3. *Colonization.* East Timor still suffers from the occupation of Indonesia. Ghana, Niger and Bougainville suffer from internal colonization. West Kalimantan continues to suffer from continuing encroachment which has led to a massive uprising resulting in heavy casualties.
4. *Encroachment on Indigenous territories by national and multinational companies.* Mining, logging, oil exploration, and drilling continues by government backed national and multinational companies on Indigenous territories in Ghana, Indonesia, Malaysia, the Pacific, Peru, and the Philippines.

5. *Lack of land rights.* While improvement have been made in South America, South Africa, the Philippines and Alaska, they represent isolated cases and do not justify optimism. In some instances countries like India and Peru have faced set-backs.

6. *Forced relocation and settlement .* Large infrastructure projects like dams in Malaysia, the Philippines, and West Papua cause major disruptions. Severe land use restrictions and forced relocation, which are imposed by environmental conservation projects such as forestry laws, establishment of national parks, and games reserves, cause suffering in Indian Botswana, Indonesia, and Thailand. (The Indigenous World Yearbook 1996-97, p. 9).

Sadly many of the groups and individuals who are calling for more public accountability in the management of environment and the earth's natural resources are not predominantly groups of scientists, but instead, groups of ordinary citizens.

The prospect of documenting Indigenous environmental struggles was a very difficult decision for me, given my variety of contacts, my library of information, and my personal contacts with the global Indigenous peoples. To try to prioritize in order to write about the land struggles faced by Indigenous peoples is very difficult, given the numbers of examples to choose from. It is no exaggeration to say that an undeclared war is currently taking place on Indigenous lands globally. Some struggles consist of the appropriation of land forcing the inhabitants to languish in poverty and/or on welfare. Some take on more severe genocidal proportions as in the case of people of East Timor, the Ogoni in Nigeria, and the Indigenous people of West Papua. A host of others can be identified. None is more important or more dire than the other. All have tragic human consequences and most are hidden from the eyes of mainstream society. I finally selected topics/communities which I am most familiar with. In order to assist the reader to learn more, I have included a reading list and a list of contacts.

Lubicon Cree

The Lubicon in Northern Alberta are a small community of Cree whose population is approximately 2000 members. Since the early 1980's when oil was discovered and deforestation began, the Lubicon have gone from a hunting and gathering existence to one of virtual dependence on welfare. This dependence on welfare has resulted in the deterioration of health due to a disruption in their diet of natural foods. This case is particularly disturbing as the Lubicon Cree have never ceded their land or signed a Treaty. All of their land entitlement is outstanding but the province of Alberta has given rights to pulp and paper and oil companies. The destruction of Lubicon's natural habitat through deforestation and the building of a sour gas plant has impacted the health of children and old people particularly. Tuberculosis has now made a comeback in the community of Little Buffalo. In addition children and old people are developing lung diseases from the sour gas which looms over the community. The Lubicon and their supporters have taken their issues to the courts and lost. This loss led to a successful international boycott against Daishowa-Marubeni International Ltd. (DMI), a Japanese pulp and paper company. The latest verdict is that the Friends of Lubicon who had been sued by DMI were within their rights to plan the boycott against DMI. The judge in the case refused to grant Daishowa a permanent injunction restraining picketing activities at the stores of the companies customers. The boycott resulted in the loss of millions of dollars of profit by DMI.

Grassy Narrows Objive First Nations

In the early 1970's, pulp mills in Dryden, Ontario, polluted the water supply of the community of Grassy Narrows. The people of Grassy Narrows were awarded 33 million dollars but to any observer the benefit of that settlement appears to be remote or nonexistent; because the traditional economy of Grassy Narrows was destroyed. The people of Grassy Narrows can no longer eat the fish in the lakes that surround the community and one main lake is still completely contaminated posing serious health

problems. The pulp and paper industry produces dioxins, organochlorides, and polychlorinated biphenols. These toxins are having a devastating impact on Indigenous people and especially any women in the area. Each year according to the Environmental Protection Agency figures:(Indigenous Women's Network Magazine, 1995)

the world's paper industry discharges from 600 to 3,200 grams of dioxin equivalents in water, sludge and paper products. This quantity is equal to the amount which would cause 58,000 to 292,000 cases of cancer every year. According to a number of recent studies, this has significantly increased the risk of breast cancer in women. Similarly, heavy metals and PCB contamination of Inuit women of the Hudson Bay region of the Arctic indicates that they have the highest levels of breast milk contamination in the world -- 28 times higher than the average woman in Quebec and ten times higher than that considered "safe" by the government. (p. 7).

Added to this devastation is the clearcutting and deforestation by Abitibi which threatens to wipe out all trapping and large animals as a food staple. According to the local people, community members suffer from diabetes at a rate of 8 out of 10, and cancer has increased significantly among the people in recent years. As if these problems were not enough, the Grassy Narrows people are now anticipating the building of a nuclear dump site on the lands north of their reserve land. This brings new threats to their community. Very recently the Grassy Narrows community has posted signs warning intruders to leave their land.

Indigenous People and the Nuclear Issue

Indigenous peoples the world over are significantly impacted by the nuclear industry, from the mining process, to the nuclear bomb detonations, to storage of nuclear waste. The first uranium mine in Canada was established in northern Saskatchewan in the 1940's. Close to fifteen million tonnes of radioactive tailings still remain at the original mine site. These tailing piles from Uranium City which remain radioactive for up to 250,000 years have never been decommissioned and they pose health risks. Over

two hundred million tons of radioactive tailings exist in Canada, mostly on or adjacent to Indigenous lands.

For over 60 years the Dene people of Deline, North West Territories, were exposed to radiation through uranium mining. Between 1942 and 1960 uranium mining at Port Radium, across Great Bear Lake, exposed workers to high levels of radiation. For \$3.00 a day, Dene men hauled and ferried burlap sacks at what was the world's first uranium mine. At least 14 workers have since died of lung, colon, and kidney cancers, according to documents obtained through the NWT Cancer Registry. The Canadian government ran the uranium mine "Eldorado Mining and Refining" as a Crown corporation. Today the tiny community of 600 is left with millions of tons of radioactive waste in the Great Bear Lake area and with a series of premature deaths.

We the Dene have been subjected to over 60 years of horrible injustice because of apparent national interests. Our people have paid for this with our lives and the health of community, lands and waters. We have set out a Plan for Essential Responses and Necessary Redress. It is a constructive and minimum response to the ongoing impacts of uranium mining on the Dene people and lands (Northern News Service)

A 1991 federal Aboriginal health survey found twice as many illnesses in Deline than in other Canadian and Aboriginal community. The NWT chief medical officer, Andre Corriveau, blamed deaths and health problems on smoking. The advice that the community has received has been to abandon their ancestral home which is on the world's fourth largest in-land lake.

Of the twenty-one proposed nuclear dump sites in the United States, seventeen are designated for Indian lands. This phenomenon of disposing dangerous substances on or near communities of color has been referred to as "environmental racism".

Indigenous people are the most bombed nations in the world. Since the 1940's the Western Shoshone have been bombed over 1054 times by above ground nuclear weapons tests which sent radioactive particles over all their lands. In 1863 the U.S. government

and Western Shoshone entered into a relationship of peace and friendship secured by the Treaty of Ruby Valley. This Treaty granted specific rights to the U.S. at that time. The Western Shoshone has made continuous effort to resolve grievance with the United States to no avail.

Yucca Mountain was slated as the U.S. national high-level nuclear dump in 1987. Yucca Mountain, located within the south central region of Western Shoshone homelands, is also within the Nevada nuclear test site which already contains over 1000 contaminated sites. The Western Shoshone and other Indigenous people of the Great Basin oppose the proposed nuclear dump. Congress is considering two bills. Their House subcommittee has approved the creation of an interim storage site by 1998. Hearings on Yucca Mountain are underway for the environmental impact statement. Issues of concern include transportation, accidents, radiological and non-radiological release environmental justice, the likelihood of a nuclear chain-reaction, and impact on biological, cultural, soil, water and air resources. When commenting on Clinton's recent visit to China and his comments on the abuse of human rights in China, the Western Shoshone state (IEN Network News, 1998):

The Western Shoshone National Council cannot ignore the fact that the United States lacks the moral high ground to lecture the rest of the world on human rights while it continues to victimize the Western Shoshone Nations. 1054 U.S. nuclear weapons tests have been conducted within our territory in violation of the Treaty of Ruby Valley. We are the most bombed nation in the world.
(p.11)

In addition to having taken their grievances to the United Nations, the Western Shoshone have a case in the U.S. courts to maintain title to the proposed nuclear waste repository at Yucca Mountain and ten million acres of land which includes the Nevada nuclear test site.

The Indigenous people from the South Pacific have been bombed over 200 times since 1945 by colonial governments of the United States (100), France (75) and England

(10) both above ground and below ground. As recently as 1996, subterranean blasts washed gigantic dead sea turtles to the shores of the beautiful islands of the South Pacific. On the island of Bikini whole populations have been forced to leave their ancestral homes, islands have been absolutely destroyed. Included in the destruction has been the traditional, economic, and political autonomy of the people. In all cases no consultation took place and people to this day are forced to live with the aftermath of nuclear problems, including ongoing cancers and radiation poisoning. Even more devastating are the birth of live jelly fish babies. (Those babies born with no limbs and/or head etc.) which women still give birth to presently.

In 1977 the Nuclear Free and Independent Pacific (NFIP) movement was established to address the devastation brought to the South Pacific region. The NFIP is a pan-Pacific network that unites village-based organizations, provincial governments, newly independent nations, and supporters, in the common goal of reasserting the inalienable rights of Indigenous peoples to their lands, cultures, languages, religions, and the protection of their heritage. Women's involvement has been a central tenet in pressuring for a nuclear free and independent Pacific. From the island linkages and their relationships to colonial governments, women understood the inseparability between political status and the nuclear issues (De Ishtar, 1994).

In our first conference women came just wanting to discuss "women's issues" separately. But we learnt to see the connection between nuclear testing and colonialism and discussed economic exploitation and financial and other dependence of Pacific countries on the first world. (p. 221)

Today twenty years later, the NFIP has gained much international exposure which was responsible for shutting down nuclear blasts by France last year. A powerful education and lobbying campaign and international networking was responsible. According to Hilda Halkyard-Harawira (De Ishtar, 1994) their impact and influence is global.

Our movement encompasses many issues. We are united by the threats to the well-being of the Pacific. For me the NFIP movement is a liberation movement, a survival movement. It is a people's struggle, a grassroots movement. It encompasses all social, political, cultural, and economic consideration for Pacific peoples. It is each country working on its own issues in their regions and networking with each other. That is the NFIP movement. The NFIP movement will go where we take it. It will be what we make it. We can make NFIP go forward into new, uncharted areas. (p. 231)

Recently the devastation faced by workers in the military industry in Moruroa has been documented in a book called *Moruroa Revisited* (McLennan, Chesneux, 1998).

Indigenous peoples have not been willing victims when it involves the nuclear issue. In January of 1998 the people of Ward Valley Southern California made their voice heard by establishing a permanent encampment on the proposed nuclear dump site in the desert home of the giant tortoise. Today over 500 Indigenous people and their supporters remain on the land in a deadlock against the state of California and the U.S. federal government. Their claim is simple: they will not allow the government of California to use their traditional homelands and that of the desert tortoise as a dumping ground for the nuclear industry.

The Innu of Labrador are semi-nomadic people who rely heavily on the migrating caribou for food. Since the 1960's their lands have been barraged by NATO low-level flights engaged in war exercises. The results of these low-level flights, jets cruising 30 feet above the ground, has been devastating. Sound barriers booms by these jets literally appear out of nowhere with no advanced warning. They have caused old people to go deaf, have startled nursing babies to rigidity and have sent the caribou running in confusion in circles. The result of the caribou disorientation has meant a loss in food supply as the caribou no longer migrate but rather walk in circles until they collapse and die. The Canadian government allowed North Atlantic Treaty Organization(NATO) jets to disrupt the Innu homelands after European governments disallowed them to disrupt

European lives. The Canadian governments attitude toward Innu homeland is that it is just barren wasteland. Many of the Innu leadership have been jailed for disrupting the jets before they take off from the tarmac. Many of those jailed have been the elder women, such as Elizabeth Penashue, Innu elder from Sheshashit, Labrador(Indigenous Women's Network Magazine 1996)

I know what Nitassinan was like before the military testing began, and I've seen what the practice bombing runs have done to it. I've gone twice myself to inspect the damage done in the company of women and children..I am very proud that it is the women who are there to defend the land, that they are standing up to do something, and I hope that all women will stand together to continue the fight to defend the territory. (p. 6)

Indigenous peoples' communities are the most dammed, deforested, mined, and flooded in the world. Amassing all the examples of destruction throughout the world we see a trend that Indigenous peoples are simply in the way of Western development. Indigenous homelands are considered there for the taking and Indigenous lives are considered expendable. The International Work Group for Indigenous Affairs based in Denmark works to document cases of abuses of human rights and destruction of Indigenous homelands.

Of particular concern to Indigenous peoples is the attack on sacred lands. Sacred lands are those places which have historical and contemporary spiritual significance for Indigenous peoples. For example according to the Association on American Indian Affairs, forty-four sacred sites have been scheduled for destruction either by the mining, damming, communication, oil/gas exploration, railway, tourist, and logging industry. Some are destroyed simply through vandalism.

Persistent Organic Pollutants (POPS)

POPS are industrial chemicals produced by industry that have been found in virtually all the world's people. POPS include dioxins, polychlorinated biphenyls

(PCBs), Mirex, dieldrin, hexachlorobenzene and dichlorodiphenyldichloroethylene (DDE). Dioxins are accidental by-products which are created during the manufacture, use, and combustion of chemicals such as solvents, pesticides, and polyvinyl chlorides. They are among the most toxic chemicals known to science. Mirex and dieldrin, used in the agriculture industry, are still produced and used in some countries but have been banned by other countries. Hexachlorobenzene is used as a pesticide. DDE is the most persistent of the degradation products of DDT which is still used. POPS find their way into the far north, and into the arctic circle. They come from southern industrialized communities and those third world communities who are still unfortunate enough to be forced to use DDT to combat malaria. Through a process called global distillation, POPS are carried by wind and water and eventually reach the oceans, accumulating in the fish flesh and marine animals. Global distillation is a factor in the higher concentrations of POPs that have been found in the air, seawater, precipitation, wild animals, plankton, and people of the Arctic regions. People who ingest the meat of these animals and fish are then contaminated. The Inuit, like many Indigenous people, depend on the ocean and these animals for sustenance. Despite their distance from industrial activities, Inuit accumulate many POPS in their tissue and, for women, in their breast milk. Inuit women carry in their breast milk some of the highest levels of POPS ever found in people (Indigenous Women's Network Magazine, 1996).

The PCB concentrations in the breast milk of the Inuit women are similar to those in the blubber of beluga whales. These levels are seven times less than PCB levels in the fat of polar bears and seven times greater than PCB levels in the breast milk of non-Inuit women. The dioxin concentrations in Inuit breast milk are 1.4 times greater than those in the breast milk of non-Inuit women. (p. 7)

When a woman becomes pregnant, her POPS are transmitted through her breast milk to the new born baby. Fetuses and nursing infants are therefore subjected to even

higher doses of POPS than their mothers. Infants can suffer from impaired brain development (IEN, 1998).

However, the higher incidence among the Inuit infants of infectious disease, including otitis media(chronic ear infections) and meningitis, suggests that their immune systems are suppressed by prenatal and postnatal POPs exposure. Also, the infants of Inuit mothers with higher PCB and dioxin concentrations show more pronounced reductions in height among the males and larger increases in height among the females. (p.)

POPS have been blamed for birth defects and infertility (IEN, 1998).

A growing body of evidence suggested that some POPs interfere with the actions of hormones that regulate critical body functions. They can cause birth defects and infertility and impair mental function in children. Also they can cause cancer, and decrease resistance to diseases by suppressing the immune system. When chemical pollutants interfere with such basic functions, their continued production undermines the biological foundations of many species, including humans(IEN pamphlet).

Because of the impact of POPs on circumpolar peoples, the Inuit Tapirisat Council have lent a strong voice to ridding the world of POPS.

Globalization and the Indigenous Response

It is important and necessary to review the problems of Indigenous peoples within a process called globalization, a process which has been steadily growing for over 500 years. Cultural and environmental destruction and theft of Indigenous lands throughout the world have been the direct result of devastating global economic policies (IAITPTF, 1997).

The reformulation of the world economy according to the globalization of capital has not been translated into benefits for indigenous communities. Rather, it is precisely this globalization that has sharpened their problems. Part of this

continuing movement for economic appropriation is the increasing attempt to collect and commercialise the Indigenous Peoples' knowledge, biodiversity and natural resources in general. (p. 7).

In September 1977, one hundred Indigenous delegates from fifteen countries crossed the threshold of the United Nations in Geneva to claim their rights. In some respects this was an historic moment marking the first entry of Aboriginal peoples into the processes of international decision making. The event was called the international NGO Conference on Indigenous Peoples of the Americas. Since that time Indigenous peoples have used the international arena to bring attention to their concerns and to call for international solidarity. In 1982 the Working group on Indigenous Populations met for the first time. Since then they have drafted the Declaration on the Rights of Indigenous Peoples. (Appendix C) The working group, consisting of five experts, has a mandate to study the problems confronting Indigenous peoples and to elaborate on international standards for Indigenous rights. At every Working group session, hundreds of Indigenous representatives participate in drafting these standards. The working group focuses on Indigenous intellectual property rights and on a comprehensive investigation of treaties that exist between Indigenous peoples and states. The forum is a good opportunity for multilateral discussions and exchanges between Indigenous peoples, NGO's, specialized UN agencies, and governments. The Draft Declaration document receives the support of practically all Indigenous peoples active in the international human rights arena.

In 1993 the Working Group on Indigenous Populations adopted the completed draft of the Declaration which was approved by the Subcommission on Human Rights. While the final document is not as strong as the one drafted solely by Indigenous participants, it establishes standards of rights (including control over resources and land rights) and political autonomy. However as a declaration, it will never have binding status as in the case of a Treaty. The presence of the working group

has forced the general assembly of the UN to work towards a deadline for adopting the Declaration, and to take more operational measures and to show stronger commitment towards a permanent forum for Indigenous peoples at the UN. A copy of the document is contained in Appendix 2.

The fact still remains that the working group is at the bottom of the United Nations' power hierarchy. Governments still decide issues. This forces Indigenous peoples to struggle for access to the UN fora. While great strides in the area of recognition and challenges to derogatory procedures have been made, it is still necessary to create a permanent forum at the UN in order to have influence over powerful decision-making bodies (Abya Yala News, 1998):

Over the past thirty years, Indigenous peoples have successfully challenged the derogatory procedures that have characterized the past, and have made great strides in having their existence, as distinct, independent cultures with special concerns, acknowledged by the world's most powerful international bodies. Their mobilization and dedication has led to significant changes in the way their issues are addressed and acted upon, but there is still a lot to be done before Indigenous people hold real positions of power at the higher levels of the UN system.
(p. 35)

When we consider what Western development has meant for some Indigenous communities and I have just touched on a few examples, this fact speaks for the need to consider another paradigm or other forms of knowledge. Indigenous knowledge can fill a void and provide some information which is long overdue. This information can ensure the survival of Indigenous Peoples globally. Chapter 3 will examine the topic of indigenous knowledge.

Chapter 3

The Case for Indigenous Knowledge

Several articles, research papers and books, have been written by Indigenous scholars about the Indigenous science knowledge base of Indigenous peoples. While the knowledge base is growing, more research is urgently required, especially to help future students and youth get a sense of the wealth of knowledge which exists within their communities. This chapter reviews some of those books and then describes current projects that attempt to overcome the problems identified.

Indigenous Knowledge

A Yupiaq World View: Implications for Cultural, Educational and Technological Adaptation in a Contemporary World by Angayuqaq Oscar Kawagley examines some of the cultural and educational implications when two cultures meet. This study takes place in a remote Yupiaq village in southwestern Alaska. More specifically the study is of the Yupiit Nation and its school system. Kawagley, a Yupiaq, documents Yupiaq practices in a traditional fish camp and how those practices relate to science education in Yupiaq schools. Kawagley utilizes participant-observer research methods, a common method for data gathering. Kawagley describes the Yupiaq World view as a cognitive map for making sense of our world where care is given for maintaining balance between the human, natural, and spiritual realms, thereby creating a sense of harmony.

Kawagley uses a tetrahedral metaphor to represent the interrelationship among humans, nature, and the supernatural in the Yupiaq world view. A delicate balance is maintained through constant communication between the three realms. Kawagley chose as his research setting the Yupiaq fish camp, community and school. He calls the fish camp a cornucopia of traditional and modern technologies. Kawagley feels that it is a mistake to exclude ordinary people whose experience comes from common sense, casual empiricism, or thoughtful speculation. Through his study Kawagley shows the process his people used in order to make a good life for themselves and their community.

Kawagley examines all aspects of production within the research setting. How weather is predicted how fish is obtained, prepared, and stored are considered. The Native diet and plants which are used for medicine and healing are also considered. Kawagley examines old and modern technology such as transportation and aids for food production. All are considered applications of Indigenous science and technology. He concludes that Yupiaq people survived by asking questions, observing, experimenting, memorizing, applying data, and using available resources to develop their technology.

Look to the Mountain: An Ecology of Indigenous Education by Greg Cajete is a book about Indigenous perspectives in education. In the chapter "Indigenous Science: Seven Orientations of Environmental Knowledge," Cajete explains that ethnosience is a Western terminology useful for describing some of the key elements of Indigenous science. The separation between science and ethnosience represents a dilemma that has been associated with the orienting, teaching, and learning of science by primarily non-Western learners. In most Western cultures, ethnosience is seen as cultural while science is seen as acultural, an idea which has alienated many Indigenous learners from science. Because many Indigenous students have been alienated from learning Western science and because Indigenous science is neither acknowledged or validated, students have been excluded from science type professions. Cajete presents a remarkable model for curriculum development which is reflective of Aboriginal philosophy and which is based on seven orientations (organized around: a Center, the four directions, Below and Above. Students begin with the Center place of creation and learning through self. Students learn the nature of creativity by learning to be creative through journal writing, making art, creative encounters with Nature and researching creative expression in Indigenous cultures. Through this process students find their own Center and form the foundation for the process of learning and creation. The four directions provide a framework for researching other forms of knowledge. The East orients the student to the natural philosophy which guides them to Indigenous knowledge. The East is where

students prepare for their personal journey of learning. The West represents sustenance, social well-being, and community. Through the West students understand the human community and its reflection in themselves. The South is the world of plants, fertility, healing, and wholeness. Here students understand their relationship and dependence on the plants and the natural world. The North is associated with animals and human relationships. Here students are introduced to concepts from wildlife biology, ecology, mythology, and theology. Students establish a direct personal relationship with the animal world through the form of making animal masks, drawing animals, and working with animals. Myth and art bring to life the relationship between people and animals. The Below is the domain of the Earth Mother and the elements of earth, wind, fire, water, and air. Students are introduced to natural phenomena such as the winds, mountains, seas, forests, lakes, rivers, plains, and deserts. The seventh orientation is the Above and the domain of the Celestial Father, the Great Mystery, the Sun, Moon, and Stars. The Cosmos is the grand expression of the creative centre that is within each of us. Students see themselves as part of a greater story of creation.

"The Foundational Values of Cultural Learning" by Kallen M. Martin describes the Ahkwesahsne Science and Math Pilot Project which is under the auspices of the Mohawk Board of Education. The reserve of Ahkwesahsne is split among the provinces of Ontario and Quebec and the state of New York. Ahkwesahsne has developed a curriculum which relies on the principles of three foundational aspects of Iroquoian culture, the Great Law of Peace, the Iroquoian Creation Story, and the Thanksgiving Address. The curriculum was created as a response to the high failure rate of Iroquoian students and is based on values which honour Mohawk culture and science. It teaches students who they are as a people. The co-ordinator of the project, Brenda LaFrance defines science as a way of coming to knowing. LaFrance says that it was important to look at dreams, visions, and the prophecies and information that they have come to know as being Mohawk. The information is then compared to Western science. Creation

stories were incorporated into the math, science, and language arts components of the curriculum. The curriculum begins at the ground level and then goes up to the sky world. Circles and lines, earth, water, trees, animals and birds, agriculture and food, medicine, the cosmos, and energy, constitute the unit theme.

The Tree of Peace is discussed in the unit on trees. The symbolism of the great white pine in Iroquoian stories is discussed. Principles of peace, honor, and a good mind, are instilled in students. The project ensures use of Elders and spiritual leaders in the classroom. Camping trips enable students to track animals and to identify them by their droppings. Students also find out about Indian medicines, herbs, and edible plants. The water unit enables students to look at history, geography, and language arts, as well as the impact of industrial pollutions and its impact on the seventh generation. Bird studies include local birds habitat, coloring, breeding, wingspan, and plumage. No other textbook provides the information on the alteration of the environment along the St. Lawrence River.

The mathematics curriculum includes Aboriginal number systems, origin of number words, limits of counting, mathematics thought of the Iroquoian agricultural and hunting society, Mesoamerican geometry, the Mayan concept of zero, Incan and Mayan calendrics, computational techniques, and notation devices. The use of Indigenous cultural values and concepts has shown an amazing increase in student self-esteem and it makes students better prepared for higher education.

In *Lighting the Seventh Fire*, F. David Peat (a brilliant physicist) writes about the spiritual ways, healing, and science of the Native American. Peat has written thirteen other books about science. This book was written after Peat's illustrious career in science, and after he had spent much time with Aboriginal philosophers, teachers, and elders. After many years as a scientist engaged in theoretical research, Peat began thinking about new ways and new ideas when he was struck by the way society had become separated from nature. Peat recalls looking at *Touch the Earth* by T.C.

McLuhan and being struck by the images of Indigenous faces which spoke to him in a hauntingly beckoning manner. Shortly after, he was called by a man who was to become a lifelong friend and teacher, Leroy Littlebear, inviting him to an Aboriginal ceremony. That began Peat's journey to the richness, power, and subtlety of the Indigenous approach to knowing and being.

Lighting the Seventh Fire chronicles Peat's journey to the world of Indigenous science and knowledge. Peat claims that it is not so much an attempt to explain traditional knowledge in the light of Western science so much as it is an acknowledgment of another way of knowing and his attempt to dialogue with another world view. Peat relates his experience at a Sun Dance, acknowledging first and foremost the womens' important role in bringing together the conditions and energy for the Sun Dance to begin. For Peat, the Sundance experience is an example of two cultures clashing -- the Western and the Aboriginal. Western scientists do not accept Aboriginal science world views as authentic and valid, but measure them through a Western world view. Western paradigms, through their positions of power, deny any authenticity to Indigenous knowledge. Aboriginal knowledge becomes labelled as myths, legends, superstitions, and fairy stories. In Western science almost all knowledge is learned out of books however in the Indigenous coming to knowing, everything is learned through listening and experiencing as well as relating and respecting other living entities, including natural resources such as rocks, water, trees, and the land. Peat talks about the quality of silence and role of Elders, dreams, visions, and clowns.

Stories of creation are central to all Indigenous peoples and are at the centre of their being. This fact presents a clash of values when compared to the stories of conquest, that Western falsification and projection history teaches. Peat finds error in many of the historical projections such as the Bering Strait theory, wherein Indigenous people supposedly crossed into the new world through the Bering Strait. Western science/history does not teach about the Indigenous holocaust wherein millions have died

since contact with Europeans. Peat states that 90 to 95 percent of the people perished. Nor does Western Science teach about Indigenous knowledge of plants and their contributions to Western medicines. Western knowledge fails to teach about the sacredness of all life forms. It fails to teach the facts that plants are important not only because of their medicinal qualities, but because of their important relationship to Indigenous peoples. Peat believes that much of Western illness is a product of the philosophy of disrespect for the natural world, something that Indigenous people neither experienced nor practised. Peat uses the metaphor of bacteria and viruses as not only causing sickness but also permeating ideas, values and ways of thinking.

Aboriginal knowledge in the sciences includes mathematics. Peat explains the importance of mathematics concepts, including geometry, surveying, computation and number representation. Early application of these principles by Indigenous people, helped them in the building of their early temples and earth works. As an example, Peat explains that the buildings of the Anasazi people of the Chaco Canyon were aligned astronomically. Balls of string kept by women of the northwest were knotted at periodic intervals. This method was used to keep accurate monthly times. To enter the world of numbers is a sacred act. For Indigenous people the number four represents the four directions, the four seasons, and the four cycles of human life (birth, childhood, adulthood, and old age). The number four also represents balance and harmony as seen in the Medicine Wheel.

Mayan people wrote vast numbers of books about religion, mathematics, and daily life. These books were destroyed by the early Spaniards on the grounds that the writings were pagan. Mayan astronomy, science, history, literature, ceremonies, cosmology and philosophy will never be known except for that knowledge which has been passed down orally from generation to generation. Peat feels that the highest mathematics is identical for Europeans, Mayans, Arabs, Chinese and Indians. Therefore mathematics should translate across cultures, as it is the study of basic logical

relationships of the world. For Peat, mathematics begins with the structure of the cosmos and of sacred sites. Peat states that the Mayan number system is superior to all others because the Mayans invented the number zero. The concept of zero made it possible to represent astronomically large numbers which was necessary when the Mayans figured out the great cycles of the solar system and the universe.

Within Indigenous science, language has a power all its own, it is not simply a matter of translating Western concepts into Indigenous languages. Speaking can evoke powers and energies. Thus people must be careful when choosing their words.

Peat states that Indigenous science conforms to the definition of Western science. But it is not possible to separate Indigenous science from ethics, spirituality, metaphysics, ceremony, and social order.

On the other hand, it is not possible to separate Indigenous science from other areas of life such as ethics, spirituality, metaphysics, social order, ceremony, and a variety of other aspects of daily existence. (p. 242)

Indigenous science is a way of being. In comparing Western and Aboriginal science, Peat examines how true Western science is to its principles and what makes Aboriginal science sound. He feels that Westerners need to drop their obsession with ideals and accept Indigenous science as a valid understanding of nature. Both Western and Indigenous cultures have much to gain by listening and dialoguing. They need to envision new and harmonious relationships for all of life. Particularly because physics has had a profound effect upon the world population, it is important that a bridge be established between Western physics and Indigenous science and metaphysics.

Red Earth White Lies, Native Americans and the Myth of Scientific Fact by Vine Deloria, Jr., is another critical look at the field of Western science. Deloria begins by giving some history to the American Indian situation and how this history sets the stage for the public to view Indians as child-like with no history and no sense of nationhood. Deloria goes on to say how this frame of mind sets the stage to acknowledge only one

form of scientific knowledge, the Western form. Deloria (1995) presents his information in such a way as to belittle Western knowledge and by stating that science is fueled by racism which acknowledges only its own knowledge.

Unfortunately, the discussion of the age of the Earth and the nature of past events was conducted wholly within the confines of Western civilization. Consequently, the traditions of all other peoples were shunted aside. (p. 38)

Deloria states that scientists spend time proving they are right, rather than bothering to consider any other world views.

Deloria criticizes the Bering Strait theory as a way of denying Indigenous peoples' claim to the Americas. He also calls into question Western scientists information on human origins and states that many inconsistencies and inaccuracies exist in contemporary interpretations.

Like any other group of priests and politicians, however, scientists lie and fudge their conclusions as much as the most distrusted professions in our society-lawyers and car dealers (p. 41).

Deloria refers to science as a very powerful religion. Deloria states that many of Western scientists' theories and postulations go unchallenged because it is an old boys network of gentlemanly agreements.

Scientists and scholars are notoriously obedient to the consensus opinions of their profession, which usually means they pay homage to the opinions of scholars and scientists who occupy the prestige chairs on Ivy League and large research universities or even dead personalities of the past (p. 43).

Scholars who question commonly held beliefs are often pay personally. If they question issues such as the often touted overkill of the mammoth, mastodon, and other prehistoric animals by Paleo-Indians, scholars are squeezed out of the scholarly world.

Racism plays a large part in Western science thereby disregarding any non-Western contributions.

In methodological terms there is a major problem in bringing non-Western traditions within the scope of serious scientific perspective, and that is the inherent racism in academia and in scientific circles. Some of the racism is doctrinaire and unforgiving- for instance, the belief that, for a person or community possessing any knowledge that is not white/Western in origin, verification and articulation are unreliable (p. 49).

This attribute of Western science is echoed by Gill and Levidow (1987) and by Harding (1993).

In "Redefining science Education for Aboriginal students" Madeleine MacIvor (1995) gives statistics to show that much needs to be accomplished in the teaching and learning of science by Aboriginals. It is essential that Indigenous people take their place in the development of their own community, and science is an important component of that development. But Western science needs to be reconstructed to meet the needs of the Aboriginal community. MacIvor uses Eber Hampton's twelve standards of education as a framework for science curriculum development for Aboriginal people. Those twelve standards are: spirituality, service, diversity, culture, tradition, respect, history, relentlessness, vitality, conflict, place, and transformation. MacIvor makes a case for the inclusion of Aboriginal knowledge, culture, ways of knowing and material and social reality when developing science curriculum. She states that Indigenous people must be fully engaged when learning science. An example would be the involvement of Aboriginal students in mapping out traditional territories in documenting resource use and traditional sustainable methods. MacIvor cites several examples of environmental disasters on Indigenous lands. They illustrate science gone bad and they give one more reason for the redrafting of a new scientific paradigm. According to MacIvor, the use of the twelve standards will ensure that science curriculum requires Indigenous peoples not to assimilate but will instead honour and respect them.

In "Bridging Native and Western Science", Pam Colorado describes Native science through the metaphor of a tree. The tree is the precursor to human existence and is likened to a respected elder. According to Colorado, Native science has a sacred basis, its teachings are grounded in the natural world. All of life can be understood from the tree. A law of Native science requires that we look ahead seven generations when we make decisions. Laws and standards govern Native science. The goal of Native science is the search for balance, harmony, and peace with all living relations.

Colorado writes about four dynamics that drive Native science: feelings, the historical now, a quiet still place, and relations. Because elders are the purveyors of Native science, a potential barrier exists: today many youths do not know how to ask for knowledge. Qualities which allow a person to become a Native scientist include self-discipline, patience, sharing, faith experience, information, and prayer. Native language is the key to all.

Colorado states that it is necessary to strengthen Native science to block penetration by Western science. The annihilation of 25 million Indigenous peoples was a direct result of the birth and evolution of Western science. We Indigenous people have become dependent on a foreign system of knowledge to understand our own destruction. We try to find solutions through someone else's eyes rather than through our own means, our own knowledge. How we came to that destructive point has historical roots. Events such as the burning of the Mayan libraries and the murder of elders were two ways that the destruction of the Indigenous knowledge base came about. More recently Colorado states that Indigenous Elders, Shamans, and ceremonial events are trivialized and undermined by outsiders. All of these symptoms Colorado claims reflect a European colonial structure or intellectual imperialism. Our survival relies on the ability of our youth to develop a critical consciousness about their world and an understanding of Indigenous science. Native science will protect and nurture the natural environment which is in dire need of protection (Chapter 1).

Colorado states that the survival of the planet is dependent on Western science's ability to acknowledge and utilize the principles of Indigenous science. One way to ensure this bridging is to take advantage of cross-cultural scientific exchange and collaboration. Participatory research can serve as a tool towards change. In order to avoid pitfalls in the relationship, Indigenous science must be recognized as standing on its own right as a knowledge base.

Indigenous people acquire much knowledge through listening. I recall a story told by Danny Musqua, Saulteaux elder at the University of Saskatchewan, in which he relayed an incident with his 86 year old grandmother. One day Danny greeted her only to be told to be quiet. Every time he would try to greet her she would tell him to be quiet. Finally she said, "I'm listening for the sounds that these tiny bugs make and if you talk I will not be able to hear their voices." It was after they both heard the sharp highpitched tiny screech, did the old woman tell Danny the significance of the bug's voice. Her knowledge goes something like this: In the spring the tiny insects lay their eggs on the shaft of a special plant which at this time of the year is underground. If we hear the bugs before they actually lay their eggs we will be able to identify the spot where the plant will grow. I gathered from this that the plant may be dug up accidentally or damaged if we don't walk carefully-- hence the bug listening ritual. The plant leaves will be used as a medicine, and later in the season the flowers and the roots will all be used for medicinal purposes. All because of the sound of a bug.

Jack Weatherford is a non-Indigenous scholar who has spent a lot of time learning and writing about Indigenous contributions to science. Prior to writing his book *Indian Givers*, Weatherford spent considerable time in South America and other parts of the world learning about Indigenous knowledge, particularly in reference to food contributions. He claims that without the experimental and trial and error methods of early Indian farmer,

modern science would have lacked the resources with which to start. The limited agricultural background of the Old World

would have been far too meager and would have required centuries more of research before science reached its present level. (p. 82)

According to Weatherford, Indigenous peoples in South America were the first to develop the "planting" method (as opposed to the Old World "broadcasting" method) of planting seeds. Corn was adapted to grow with an protective husk which saved the corn seeds from both drought and insects. Prior to their adaptation away from wheat-based foods to potato diets, many Old World people died from famine when wheat was wiped out with more ease than underground potato crops. Weatherford states that without potato crops many populations (including the Irish and Russians) would not have survived. Indigenous peoples of South America were the first to freeze-dry potatoes for storage, and to use after the growing season had come and gone.

In the tiny jungle community of Genaro Herrera, the South American Indians are teaching scientists how to cultivate a wide variety of yams, potatoes, and tubers. These Western trained scientists have no understanding, knowledge, or language for many of these plants. Weatherford (1988) stated:

The American crops required new ways of farming that appeared bizarre to Old World farmers and violated all past agricultural principles of good farming. The scientist working at Ganaro Herrera strive to unravel the complex technology of native agriculture and food processing as much as they strive to understand more about the biology of the plants themselves. (p. 82)

Weatherford talks about the general superiority of Indian medical knowledge and pharmacology. It is common knowledge that Indigenous peoples saved the lives of many men who came with Jacques Cartier during the early voyages. Today the Incas still prevent goiter with seaweed (high iodine content) and kelp is harvested by large commercial ships from California to Peru for a variety of pharmaceuticals, foods, and toiletries (Weatherford, 1988). Other Indigenous medicines are petroleum jelly, oil of

wintergreen, aspirin, quinine, and muscle relaxants from curare. Brain surgery was practised by Andean Indians to relieve concussions suffered from severe blows to the head during combat. The Aztec precision surgery surpassed the European centralization of medicine at that time.

Even today no steel scalpel has ever been made that cuts sharper than the obsidian implements of the Aztec surgeons. Only the laser beam can cut a finer incision with less bleeding and less scarification than the Aztec surgeons. The fine Aztec scalpels allowed the doctors to cut with minimum blood loss, and the wound healed with fewer scars. (p. 188)

Similarly Sandra Harding in *Whose Science Whose Knowledge*, credits the knowledge of Indigenous African cultures. According to her sources, agricultural sciences developed in Africa at least seven millennia before appearing on any other continent.

Barley and wheat were cultivated and harvested near the Nile and farther south in Nubia more than 10,000 years before the Egyptian dynasties. Cattle were domesticated in the Kenya highlands more than 15,999 years ago. It now appears that the Euphrates River Valley, familiar to North Atlantic schoolchildren as the cradle of civilization was developed through the diffusion from Africa of information, ideas, and technologies. (p. 225)

In the field of medicine, Africans used many of the components of some modern drugs, including, antibacterial agents, Kaopectate, aspirin, and reserpine. African societies had treatments for malaria fever, snakebite, neurotoxic venoms, intestinal parasites, catarrh, tumors, skin ulcers, venereal disease, conjunctivitis, bronchitis, urethral stricture, and others. Mathematics was highly developed in ancient Africa as evidenced by records of an 8,000 year old numerization system which was found in Zaire.

While it is indisputable that Indigenous knowledge in the sciences predates much of Western science, and forms the basis for many contemporary scientific wonders,

recognition for these contributions is not evident. The following section describes projects which honour Indigenous science knowledge.

Indigenous Knowledge Base, Models of Communities/Projects

Dene Cultural Institute

The mandate of the Dene Cultural Institute in Hay River, North West Territories, is to preserve and promote Dene culture through the coordination of educational and research activities. The Institute began with a pilot project in 1989 whose mandate was (1) to document traditional knowledge and to (2) gain an understanding of Dene environmental knowledge and how this knowledge is used to govern Dene land and resources. One of the tasks of the Institute is to integrate traditional knowledge with Western science in order to aid in future resource management. Research was begun with the ecology of four important community species: barren-ground caribou, beaver, marten, and moose. Moose and caribou have been major food sources and marten while beaver are the most economically important fur-bearing animals. Taxonomic information was sought to gain insight into how Dene perceive and use taxonomic relationships and associated nomenclature and how this compares with Western science. Other information included, interspecies relationships, habitat and habitat relationship, life cycles and reproduction, migration and movements of caribou and moose, population dynamics, traditional and modern management, and parasites and diseases is also studied. Also considered were traditional hunting and trapping rules, including the unique Dene ways of showing respect towards the animals.

The project has had successes and some trials. Some of the trials initially related to interviewing methodologies and communication. Initially the community was not entirely engaged or interested. It took a few tries before an advisory committee became effective. The project concluded that it is unclear to what extent Western science and Dene ideas about general ecosystems correspond, even though many Dene understand complex ecological linkages. Those Dene who have spent most of their life on the land

have as much understanding of some fisheries, ecology, and wildlife, as many non-Dene scientists. Where Dene knowledge and Western science differ is in their explanations of concepts of environmental management and ecological processes (Johnson, 1992).

For the traditional Dene, ideology is a fundamental element of subsistence, as important as practical empirical knowledge and appropriate technology. Traditional Dene ideology consists of a spiritually based moral code or ethic that governs the interaction between the human, natural, and spiritual worlds. It encompasses a number of general principles and specific rules that regulate human behavior toward nature. (p. 59)

Finally like other Indigenous peoples the world over, the Dene consider the land and its resources to belong to future generations. The Dene view the world as a living organism. All its elements have a reason for being. The elements represent an intricate balance which is necessary to ensure continued life on the earth (Johnson, 1992).

Specific rules that govern human behavior toward natural entities include avoidance of waste (taking only what one needs), avoidance of live capture and captivity of animals, humane treatment of animals, use and respect for all parts of an animal, and respect for hunting and trapping equipment. (p.60)

Similar to other Indigenous groups, the Dene refer to a higher power or creator who oversees all. They feel that humans do not have special authority over the natural world.

Super Saturday: A Program in Action

This year the Saskatoon Tribal Council and the University of Saskatchewan have embarked on an activity which will incorporate Indigenous knowledge with Western science in the context of teaching children. The Project called "Super Saturday", is based after a Hawaiian model from the Na Pua No'eau Center for Gifted and Talented Native Hawaiian Children in Hilo, Hawaii.

Na Pua No'eau

The Center for Gifted and Talented Native Hawaiian Children was established for the purpose of increasing educational enrichment opportunities for Native Hawaiian children from grades k to 12 at the University of Hawaii. There are four elements incorporated into the Na Pua No'eau program development. These elements are, talent enhancement, self-esteem development, integration of Hawaiian culture and values, and student and parent support services. The Na Pua No'eau centre serves as a resource for educational institutions and teachers. It provides state of the art research, materials and knowledgeable personnel. Workshops are offered to classroom teachers to enable them to understand the needs of Native Hawaiian gifted and talented youth.

The Student and Parent Support Services is an integral part of the centre. The support services provide students and their families with information and activities that will help the students to succeed. Students and parents receive staff support, information, and enrichment activities to use at home. These activities permit parents to be positive advocates in the students success.

Within the Na Pua No'eau program, the Keala Lapa'au program develops an interest in medical careers. The program facilitates activities which enhance the number of students in medicine. It provides hands-on practice with day to day contact and other activities with medical doctors. It also includes career shadowing and internships, as well as an undergraduate pre-medicine program at the university.

An important part of the programming is the integration of Western knowledge with Native Hawaiian values and culture, as an effort to meet the needs of parents. Language, culture, handicrafts, and history is an integral part of the programming. The Hokule'a utilizes the outdoors and the wa'a kaulua (double hulled canoe) to gain knowledge in celestial navigation, astronomy, meteorology, and physics of wave action.

Students use their creativity and thinking skills as they re-live the survival of their Kupuna(ancestors) who crossed the Pacific Ocean on the double-hulled canoe, Hokule'a.

A thorough process of solving a series of everyday problems encountered while at sea is an every day challenge for student sailors. Psychomotor skills also come into play as students learn to construct tools for gathering food and water and learn to construct protective shelters while at sail. More psychomotor skills become important to master as students learn to paddle, navigate, sail, maintain and repair a Hawaiian sailing vessel (Na Pua No'eau Booklet)

Like the Hawaiian model, the Super Saturday program reflects Indigenous culture and incorporates Western science knowledge. The organizing team, which is made up of faculty members from the University of Saskatchewan, employees from the Saskatoon Tribal Council, and First Nations Elders and community people, met over the past year, identifying topics, resource people, curriculum ideas, and funding proposals. The pilot year, which began in July 1998, sponsored two groups of children in Grades 4-6 to study at the University of Saskatchewan campus, and to take part in some field work in their home communities during the months of July and August. The second intake of 1998 took place in August.

An essential component of the Super Saturday program includes themes that will incorporate cultural/traditional teachings. This particular aspect prevents the loss of knowledge of ancestral accomplishments. Therefore, serving as an anchor for students maintaining cultural identity in the mix of learning other world view perspectives. (SuperSaturday brochure)

In preparation for their studies, science faculty members (from engineering, mathematics, chemistry and biology) met with community people knowledgeable in their Aboriginal traditions. Together they developed curriculum which appeal to young Aboriginal students and draw comparisons between Indigenous knowledge and Western science. The Engineering faculty along with teepee and sweatlodge builders, have

incorporated the Aboriginal and Western design forms as examples of structurally sound building practices. The program expanded to include Grades 7-9 in the fall of 1998.

Women's Association for Natural Medicinal Therapy

Indigenous communities are organizing projects which promote, conserve and protect traditional medicine knowledge and medicinal plant resources. The Women's Association for Natural Medicinal Therapy (WAINIMATE) is an example of such a project. Established in Fiji in the South Pacific in 1993, WAINIMATE goals are to save the plants that save lives and to ensure Affordable Health for All. It promotes the use of safe and effective traditional medicines and encourages the conservation of medicinal plants. In addition WAINIMATE works to ensure that Indigenous knowledge and traditional medicine practices are respected and protected in Fiji and other Pacific Island countries.

Forests are our pharmacy. They provide us with natural medicines that are inexpensive and effective. But we must use the forests wisely without completely destroying them. There is an increasing and unacceptable loss of medicinal plants due to habitat destruction and unsustainable harvesting practices. Unless we act now, thousands of years of knowledge accumulated by traditional medicine practitioners, about how to use rainforest plants, may disappear forever. (WAINIMATE poster)

Presently WAINIMATE is carrying out a survey to identify all traditional healers and inform them about intellectual property rights as well as hear other concerns. They encourage the Ministry of Health to recognize the value of traditional medicines and they promote the utilization of them. It establishes demonstration gardens to identify medicinal plants. It organises community workshops to promote the use of safe traditional medicines. It encourages people to grow medicinal plants in home and community gardens so they are readily available. WAINIMATE provides resource people who are available to do workshops and training sessions, and who develop learning materials on medicinal plants.

Women are central to the values and principles of WAINIMATE.

In Fiji as in other parts of the South Pacific and around the world, women play a major role in the provision of health care within their families and communities. As such they have a respect for the forest resources that are frequently used to make traditional medicines. Women are dependent upon forests for many other items required for daily living, including many wild foods and craft materials that they routinely obtain from their forests. (WAINIMATE booklet)

Women who used to see themselves as only housewives now refer to themselves as healers and community workers. These women have prepared *Nai Vola Ni Wai Vakaviti* a traditional medicine handbook. Local groups provide opportunities for more women and their families to identify medicinal plants by establishing demonstration gardens.

Future plans for WAINIMATE include: continued documentation of traditional medicine through ongoing ethnobotanical surveys, documentation of healer profiles, as well future workshops and public awareness campaigns, and traditional medicine usages for common ailments such as skin diseases, children's ailments, and women's ailments. WAINIMATE will continue networking not only in their South Pacific region but around the world with other organization working on similar issues and concerns.

PRATEC (Proyecto Andino de Tecnologías Campesinas)

PRATEC, which translates into English as the Andean Project of Technological Peasants or Farmers, was established in Peru, South America, in 1987. Core members include academics and ex-government bureaucrats who left positions to form a non-governmental organization. This organization researches and writes about traditional Andean technologies, knowledge and world view. PRATEC teaches a course which represents the Andean worldview and assesses modern Western knowledge. PRATEC addresses officialdom as a colonizing entity. Andean worldviews are always contrasted with Western worldviews. The project assesses Western knowledge from an indigenous

Andean point of view and not from a Western unsituated objective perspective. It rejects claims to universality and absolute truth. (Apffel-Marglin, 1997)

PRATEC sees the Andean cosmovision as emerging from the very soil and air of the Andes, inseparable from its landscape and its history. Indeed, the very process of assessing modern knowledge from an Andean point of view has the powerful effect of revealing the historic-cultural particularity of modern Western knowledge, by which PRATEC refers to the globalization of what originated in western Europe and which continues to be imported and channelled to the rural areas through all manner of development endeavors. To look at this hegemonic knowledge system from such a light robs it immediately of its claims to universality, and places it within the context of a particular cosmology rooted in western European culture and history (p. 221).

Acknowledgment is given to the fact that the Andean peasants have existed for over 10,000 years and have the potential and resources to regenerate themselves without breaking from their history. PRATEC has a viable role to play in the current global crises.

They argue that with the collapse of the formal economy of Peru, the spectacular failure of most development projects, the rapidly deteriorating environment and the chaotic political situation in the country, the only vibrant, non-destructive and dynamic sector of the country is the Andean peasantry (p.222)

The Andean region has been identified by Western science as one of the eight centres of origin of cultivated plants. The variety of cultivated plant species is legion. The Indigenous peoples grow some 1,500 varieties of quinoa, 330 of kaniwa, 228 of tarwi, 3,500 of potatoes and 610 of oca, another tuber. (Apffel-Marglin, 1997) With this amount of knowledge, PRATEC is a timely project the the rest of the World can use as a model.

Native Seeds/SEARCH

Native Seeds/SEARCH was established in 1986. Their "Cultural Memory Bank" is designed to collect, record, and organize cultural and historic data about each crop variety in their seed banks. Currently they have 1777 collections in the database. Included in their on-going projects is the seed distribution to farmers and gardeners throughout the world. Native Americans are given seeds for free. The Desert Food for Diabetes project works to encourage the production and consumption of traditional desert foods to combat diabetes among Native American people. In the future they plan to develop a wild chile botanical area in collaboration with the United States Forest Service. In the summer of 1998, they sponsored a two-week, institute which focused on desert plant knowledge.

Zuni Pueblo Conservation Project

Today more than ever it is important for Aboriginal communities to revitalize themselves and one way to do that is to call on the elders' knowledge of building sustainable communities. It is this knowledge which has sustained communities long before contact with Western society. Zuni, Arizona is revitalizing and rebuilding its community by combining traditional knowledge and practices with modern technology. In 1992 the Zuni community settled two land claims which gave them a base of capital to begin developing the Zuni Conservation Project. The Zuni Land Conservation Act of 1990 facilitates the Zuni's efforts to combine traditional and mainstream resource management practises. The project's efficiency lies in the harmonious integration of the past, present and future. The project used a model from developing countries such as Ghana, Nepal, Bolivia, and Mexico. Aboriginal values and knowledge are an important part of the project development. From the very start it was important for the community people to be active participants. In the words of project co-ordinator Jim Enote (Thorpe, 1996):

We were going to assess what people know.
We were going to communicate in our own
language as much as possible. We were
going to have the farmers, land users,

religious hunters, sports hunters, youth and others tell us what they thought the priorities were. We were going to spend a lot of time and resources understanding the cultural values that affect land use. Values would be the foundation of our program. (p. 204)

In 1994 the Zuni Conservation Project began implementing the Zuni Resource Development Plan focusing upon six areas: community inclusivity, sustainable environment, combining community and ecology in an interdisciplinary project, monitoring and mapping, human resource development, and collaborative efforts. Zuni religion and customs provide the guiding principles for the project's approach to work. The project addresses such concerns as sustainable agriculture, forestry, hydrology and freshwater resources, fish and wildlife, range conservation, and watershed restoration. The project works with an advisory team made up of respected Elders, who are consulted regarding the use of plants, animals or locations that may be affected by resource development. The Project has surveyed tribal members, conducted interviews, involved schools and local organizations. They have given training sessions to help in making informed decision (Indigenous Case Study Profiles, no date)

The Project integrates concepts of ecological economics, land tenure, common properties, water rights, intellectual property rights, and intergenerational equity in its work with the Zuni community and in reorientation of policy that will benefit the community. (p. 42)

Zuni based programming requires an adequate training or capacity building of human resources. This is critical to sustainable development of Zuni natural resources.

The big job of rehabilitating damaged lands and implementing mechanisms to sustain natural resources is paying off. In just two years the project has grown from its original two workers to over sixty-five people. All but one are Zuni tribal members. They include hunters, farmers, youth, elders, ranchers, and religious liaisons. They are working on water grazing, range conservation, wildlife and fisheries, and sustainable agriculture. In addition they have a Geographic Information System office and a youth

group, and they are conducting a cultural values study. As a result of their successes, they attract attention from all over the world and are seen as a model to be duplicated. Since 1992, over 40 nations have visited the site. The Zuni Conservation Project was cited as a model project in the 1995 edition of State of the Earth.

Canadian Aboriginal Science & Technology Society

The Canadian Aboriginal Science and Technology Society (CASTS) was first established in the early 1990's, in the Treaty Seven Area (in Alberta) by Albertan Aboriginal educators and scientists. CASTS is a non-profit national organization which works to increase the number of Aboriginal scientists and technologists who share their expertise within Aboriginal communities and who provide role models. CASTS begins working with Canadian Aboriginal students as early as elementary school, to strengthen mathematics and science areas and to prepare them for academic studies. CASTS members from the Treaty 7 Tribal Council have developed a Health Careers CD-Rom . This CD-ROM encourages hands-on participation in information technology. Workshops trained students to use information technology to create an interactive CD-ROM. With the help of technical experts, ten Treaty 7 students within eight schools took part in the production of the CD. The students interviewed health professionals working within their communities. The Health Careers CD is the first one produced by First Nations people in Canada. Other CASTS work has included documenting the ethnobotany and phytochemistry of Northern Ontario Ojibway. CASTS board member Neil Jones (1996) reminds us that each plants species has fought and won a never ending battle against, viruses, diseases, bacteria, and anti herberbivores.

As humans, we have a lot to learn from plants about what we are battling against. Intensive research is an expensive way to unlock the powers that plants have, but First Nations have broad knowledge of these phytochemical aids. The challenge for First Nations is sharing their knowledge whilst at the same time ensuring that people understand that plants are sacred, to be

respected, and that the compounds they contain do become increasingly resistant to bacteria. (p. 30)

More recently CASTS has worked to ensure scientific responsibility on Indigenous lands and worked for the recognition of Indigenous science knowledge (sometimes referred to as traditional ecological knowledge). To date CASTS has held five conferences in Vancouver, Winnipeg, and Edmonton. In September 1998 CASTS 5th Conference theme was "Honouring Aboriginal Science". The 1998 conference was hosted by the Indigenous Peoples Program and the Aboriginal Caucus at the University of Saskatchewan and featured presentations on Indigenous seed projects, the preservation of biodiversity, scientific responsibility on Indigenous lands, and environmental issues. The conference showcased a number of initiatives by First Nations and Aboriginal communities including the Super Saturday Project. The conference featured Indigenous academics recognized for their Indigenous plant knowledge and who combine Western agriculture knowledge and Indigenous plant knowledge to establish agrarian projects in an effort to preserve Indigenous knowledge.

Honor the Earth Campaign

Since 1995, the Honor the Earth Campaign has been spear headed by the Indigenous Women's Network, the Indigenous Environmental Network, the Seventh Generation Fund, as well as the Indigo Girls and other musicians. They have been raising public awareness and financial support for Indigenous, grassroots, environmental initiatives through concerts and speaking tours. Included as part of the public education campaign was the distribution and collection of postcards to key politicians and decision makers on specific Indigenous environmental issues. All of these events were broadcast on the Honor the Earth's website. The first event raised a quarter of a million dollars and helped finance 38 community-based projects working on environmental issues.

Some of their beneficiaries include the Innu of Labrador who are fighting over 600 NATO low level flights annually, the Ka Lahui Hawai'i who are fighting for

sovereignty rights in Hawaii, the Citizen Alert Native American program in Nevada who are fighting a nuclear storage dump since 1987, and the Prairie Island Coalition who are opposing plans to store high-level radioactive waste on Prairie Island in Minnesota. Other 1996 beneficiaries include the Kokaogon Chippewa community who are opposing the proposed Exon-Rio Algom copper-zinc mine; the National Center-Democracy, Liberty and Justice which is rebuilding Zapatista communities which have been devastated in the conflict zone in Mexico; and the Dine Alliance who are opposing the Peabody Coal Company's Kayenta mine permit.

The 1997 and third Honor the Earth Campaign focused on the nuclear issue. It financed those Indigenous communities fighting nuclear waste storage sites. This campaign addressed the Nuclear Waste Policy Act, which authorizes the transportation of high level radioactive waste from nuclear reactors. This bill will allow casks of waste, each carrying the radiological equivalent of 200 Hiroshima bombs, to travel by highway and railroad within a half a mile of the front lawns of 50 million Americans. Western Shoshone Nations who have suffered from over 1000 nuclear explosions on their land and who are fighting a high level nuclear waste storage dump, were one of the 1997 beneficiaries. The Mohawks at Alwesahsne were another beneficiary of the 1997 tour. The Mohawks want General Motors to clean up an industrial mess on Mohawk land. The site has 823,000 cubic yards of highly toxic Polychlorinated Biphenyls (PCBs), one of the most toxic and cancer-causing substances, (adjacent to the reservation community). Those PCBs are in the soil, the fish, and the people. The Penobscots of Maine, another beneficiary, have been asking the Environmental Protection Agency for years to stop a local pulp and paper mill from dumping 40 million gallons of dioxin-laden water annually into their rivers.

Although the Honor the Earth Campaign is only five years old, its organizing bodies have been around for several decades. The Indigenous Women's Network (IWN) was established in the late 1980's to bring awareness to Indigenous women's issues. The

Network has expanded to include global issues and now works closely with women of the South Pacific and Asia, as well as Central and South America. The IWN hosts international women's and young girls' conferences every two years. Board members are involved in local community development projects such as the White Earth Land Council and the Alma de Mujer Retreat Center. Both projects work on sustainable land issues. The White Earth Land Council operates a wild rice operation, a maple sugar business, and a berry farm in rural Minnesota on the White Earth Reservation. The Alma de Mujer Retreat Center, located on a acreage, just outside the Austin, Texas city limits, provides training for Austin, inner city girls. Alma de Mujer also operates an organic herb and vegetable garden and conducts leadership training and arts programs. Leaders from the IWN have been invited to speak at many global events including the United Nations Fourth World Conference in Beijing China and the 21st anniversary of the Nuclear Free and Independent Pacific in Suva, Fiji.

The Seventh Generation Fund, another Honor the Earth Campaign partner, is a small intermediary Native American foundation and advocacy group dedicated to promoting the uniqueness of Indigenous peoples. The Fund facilitates the self-help effort of Indigenous communities by providing advocacy, grants, training, management support, and technical assistance throughout United States, Canada, and South and Central America.

The Indigenous Environmental Network is an alliance of grassroots Indigenous peoples whose mission is to protect the sacredness of Mother Earth from contamination and exploitation by strengthening, maintaining, and respecting the traditional teachings and the natural laws. IEN has been in existence for almost a decade and celebrated it's 9th Annual Protecting Mother Earth Conference in the fall of 1998. The conference took place in northern California and to support members of the Pitt River, Modoc, Shasta, and Wintu Tribes in their fight to preserve Mount Shasta and against geothermal development at Medicine Lake. Conference workshops will include information on sacred sites,

nuclear, toxic waste, forestry, fishing rights, mining impact, pollutants, sustainable communities, and biodiversity.

The First Nations Environmental Network

Established in the 1990's, FNEN works at addressing environmental issues facing First Nations and Aboriginal communities. First Nations Environmental Network is an affiliate of the Indigenous Environmental Network from south of the forty-ninth parallel. The issues that First Nations Environmental Network has worked on issues related to dams, clear-cut, fishing rights, mining, low level flights, and water pollution. The FNEN is an affiliate of the Indigenous Environmental Network in the United States.

I have reviewed several books written by Aboriginal scholars and others which outline the knowledge base of Aboriginals. There are increasing numbers of projects based on Aboriginal knowledge which have been established especially in this decade. Indigenous peoples feel an urgency for the natural environment. Through the establishment of environmental organizations, traditional knowledge projects they are making efforts to communicate this information to the wider public. The establishment of sources of informal education can help formal educational institutions in the development of relevant and timely curriculum.

Chapter 4

The Issue of Biodiversity, Intellectual Property Rights and Indigenous Rights

Indigenous peoples communities are currently besieged by a relatively new problem. Their natural surroundings are being sought as a new form of wealth for outsiders. Increasingly scientists have come to recognize the plant wealth which exists largely within Indigenous natural habitats and homelands. Indigenous peoples are becoming more concerned and vigilant about the disappearance of the natural plant life and about the destruction in the natural environment. Referred to as "biodiversity" by some scientists, but as "life" by Indigenous peoples, the search for rights to the plants has created tremendous strains and tensions within communities. Added to these incursions is the concern of patenting plant biodiversity. In this chapter, I describe some of the complex problems related to the issues of Indigenous rights and biodiversity. I document the Indigenous political response mounted to save Indigenous knowledge. I write about some issues related to biotechnology and the support which Indigenous peoples have received from outside groups.

There have been a few responses to the fact that outsiders wanting to exercise control over Indigenous plants and knowledge. The one I describe is the one I am most familiar with. It ensures respect for Indigenous peoples' knowledge and rights to the land. This response is all about Indigenous rights to self-determination.

Dr. Vandana Shiva (1997) has been a outspoken advocate and leader in the preservation of biodiversity within Indigenous communities. Dr. Shiva, a leading scholar of ecology, is director of the Research Foundation for Science, Technology and Natural Resource Policy in India. Shiva has coined the term "biopiracy" when referring to the situation faced by Indigenous peoples and the loss of their community's plant life. Biopiracy is simply the theft of intellectual property/biodiverse knowledge from Indigenous peoples. Shiva refers to this brand of piracy, as the new conquistadore, to draw a parallel between the early Spanish invaders who colonized Latin America in

search of gold and other sources of wealth. According to Shiva, one reason for the world's biodiversity being destroyed is the internationally financed megaprojects such as the building of mines, dams, highways and aquaculture. This thesis has described a number of those communities which have been negatively impacted by mining and other forms of industrial activity (Chapter 2).

Another reason the world's biodiversity is being destroyed is what Shiva describes as the "Blue Revolution" -- exploitation of ocean waters, which affects coastal areas rich in marine diversity. These rich areas are being destroyed through intensive fish farming. Here in Canada fish farming is destroying natural shellfish beds. Droppings from the confined areas where fish are farmed poison the natural shell fish beds below.

The global push for homogeneity in forestry, agriculture, animal husbandry, and fisheries is yet another reason for the destruction of biodiversity. The so called Green Revolution deliberately replaces biological diversity with biological monocultures and uniformity. Because most of the world's biodiversity exists in the tropical rainforests and the coral reefs in the southern hemisphere where Indigenous peoples predominantly reside, these people are severely impacted. In contrast, studies reveal that the northern hemisphere is comparatively poor in terms of biodiversity and crop germplasm (Simpson, 1997). The erosion of biodiversity causes a chain reaction that destroys many species along the way. Shiva (1997) concludes:

Biodiversity erosion starts a chain reaction. The disappearance of one species is related to the extinction of innumerable other species, with which it is interrelated through food webs and food chains. The crisis of biodiversity, however, is not just a crisis of the disappearance of species, which serve as industrial raw material and have the potential of spinning dollars for corporate enterprises. It is, more basically, a crisis that threatens the life-support systems and livelihoods of millions of people in Third World countries. (p. 66)

The concept of intellectual property rights (IPR) is central to the discussion of biodiversity. IPR is a Western concept which sees natural resources as valuable only because of their commercial worth. Intellectual property rights spans many areas and includes such things as indigenous art, biological and medical knowledge, literature, songs, poetry, environmental management practices, ecological knowledge, as well as other aspects of Indigenous cultural heritage (Simpson, 1997).

For lack of better terms, biodiversity has been the term used to refer to an array of plants and resources which are valuable to Indigenous communities because of their intrinsic worth to community and what is held as common property. It must be noted that the term "biodiversity" is problematic for Indigenous peoples because of the narrow concepts it embodies. The concept of private property is foreign to Indigenous communities because of the communal nature of their communities. Shiva (1997) relates biodiversity to economic capital this way:

Biodiversity carries the intelligence of three and half billion years of experimentation by life-forms. Human production is viewed as coproduction and cocreativity with nature. IPR regimes, in contrast, are based on the denial of creativity in nature. Yet, they usurp the creativity of emerging indigenous knowledge and the intellectual commons. Further, since IPRs are more a protection of capital investment than a recognition of creativity per se, there is a tendency for ownership of knowledge, and the products and processes emerging from it, to move toward areas of capital concentration and away from poor people without capital. (p. 67)

The privatization of plant knowledge is a serious matter for people who rely on their back yards for cures and foods. Indigenous healing practitioners most times give their knowledge as gifts. In India this practise is referred to as *gyan daan* , the gifting of knowledge. In contrast to Western medical practices which exercise a commercial monopoly, Indigenous practices do not use their knowledge to amass private wealth. The West's monopolistic right is achieved though the system of intellectual property rights.

Anyone who has visited a health food store and paid for the products of tea tree oil, feverfew, and a host of other commodities will clearly see the monetary benefits accrued by companies involved in the plant industry.

According to Shiva, at the root of biodiversity exploitation is an economic system which reduces all value to market prices and all human activity to commercial transactions. This causes a serious clash of values between cultures.

While it is difficult to put a dollar figure to the diversity in the back yards of Indigenous peoples, some have estimated in the billions of dollars (Posey, 1996).

It is probably impossible to estimate the full market value of traditional knowledge, but it is certainly enormous and may increase as advances in biotechnology broaden the range of life forms containing attributes with commercial applications. by one estimate the market value of plant-based medicines alone(many of which were used first by indigenous peoples) sold in developed countries amounted to \$43 billion in 1985.
(p. 34)

Posey (1996) and Simpson (1997) state that much less than 1% is ever returned to the source community.

Attached to the issue of ownership of plant knowledge is (1) compensation for ancestral Indigenous knowledge, and (2) how to recognize the contributions of ancestors in building the foundations of modern scientific knowledge and advances. A starting point according to Patel (199)is a review and recognition of Indigenous contributions to world development. Such contributions would include: pottery, weaving, fire, the domestication of animals, agriculture, irrigation, selection and conservation of seeds, metals, the wheel, roads, carriage, rudder, compass, arithmetic, astronomy, compass, geometry, city planning, architecture, paper, water supply and drainage, printing, glass, gears, systems of state and administration. Consideration of these contributions puts the development of science into a proper perspective(Brush & Stabinsky, 1996).

Such a recognition immediately raises the question of the relation between the

contributions of indigenous people and their rightful share in the much enlarged output of goods and services which, building upon these foundations, modern science and technology have made possible. (p. 307).

The Western practice of patenting ensures that communal access to healing plants is destroyed. This undermines a central Indigenous community value. The patent is a tool used to protect the intellectual property rights of monopolistic exploiters. A patent is granted by a government to the person who made the innovation or invention (Brush & Stabinsky, 1996).

This right is really granted not to promote any noble cause—for example, promotion of inventiveness, as has so often been argued by the advocate of the system. It is a monopolistic right to prevent, to restrain, to limit others from imitating, adapting, improving, producing, or using, even for public welfare and development, the patented produce or process, or both. (p. 310)

Industrially advanced countries (e.g. Britain, France, Belgium, the Netherlands, Portugal, Spain, Italy, and Germany) have been the strongest advocates of the IPR system. They have imposed this system on their southern colonies. Patents translate into wealth and power for foreign transnational companies and have a tremendous negative impact in the biodiverse southern countries. There are about four million patents in the world, which provide a source of wealth for foreigners from Third World markets.

In the comity of nations, the Third World accounts for 75 percent of world population, 20 percent of world income, 25 percent of world trade, and about 45 percent of world enrollment in higher education. But it owns less than even 1 percent of world patent grants. The patent system is quite clearly the most unequal and the most unjust of all the relationships between the developed and developing countries. (p.310)

According to Patel less than 5 percent of the foreign-held patents are actually used in southern countries.

In order to understand whose interests are protected by patents, it is important to know a bit of the background to patents. The patent law has a history which goes back to 1883, when the Paris Convention for the Protection of Industrial Property was established to serve as the international guardian of the patent system. The Paris convention, which still exists, has been referred to as a country club serving the interests of the rich and powerful countries at the expense of the poorer ones. The Convention has been revised six times, each time strengthening the monopolistic rights of patent holders.

Seeing the unfairness of the patent system, many of the developing countries altered the colonial imposition of the patent system during the 1970's. Those countries were: Iraq, Sri Lanka, Thailand, and South Korea in Asia; Egypt, Nigeria, and Algeria in Africa; and Chile, Peru, Colombia, Ecuador, Bolivia, Venezuela, and Mexico in Latin America.

According to Patel (19), India has led the movement to challenge the patent laws by producing the Indian Patents Act of 1970. This act serves as a model for other developing countries. Its main features are to reduce the scope, degree, coverage, and duration of the patent monopolies. The Indian Patent Act's central objective is to bend the Intellectual Property Rights system to make the development needs of the Third World more front and centre.

Realizing that they were losing power to the Third World, the First World launched a new offensive called the Uruguay Round. This Round reflected the serious universal economic, social, political, and environmental crisis humanity is facing. Even the First World is now facing severe political and economic power and domestic disarray with rising unemployment, prolonged recession, falling rates of growth, and social chaos. The Uruguay Round, completed in 1993, was a last-ditch effort to maintain fledgling control. Intellectual Property Rights was an important subject covered by the Uruguay document and sought to force the Third World to its knees (Brush & Stabinsky, 1996).

Instead of promoting self-reliance, these provisions open the way for control by

transnational corporations of the Third World's domestic markets. Instead of giving developing countries freedom and flexibility to exclude sectors of strategic importance for national development from patentability, they force them to patent everything, including agricultural and biogenetic innovation. (p. 315)

The Uruguay Agreement obliges developing countries to extend patent protection to products as well as processes. Patents were extended to 20 years. Compulsory licensing was practically abolished. Import monopolies were preferred over home patents. Third World autonomy was quashed and First World control is intensified (Brush & Stabinsky, 1996).

Instead of promoting self-reliant national development, they [patents] serve private interests of foreign corporations. In short, they universalize the U.S. system of intellectual property rights, thereby constraining the national interests of the developing countries to decommercialize progressively the IPR system in order to accelerate their development. (p. 315)

Before the Uruguay round was completed, and recognizing that the world's biodiversity is vital to humanity's economic and social development, the United Nations Environment Program (UNEP) convened an ad hoc working group of experts on biological diversity in 1988 to explore the need for an international convention on biological diversity. At the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, the Convention of Biological Diversity (CBD) was adopted. The objectives of the Convention were set out in article 1 of the document:

1. conservation of biodiversity
2. the sustainable use of its components
3. fair and equitable sharing of benefits arising from genetic resources
4. appropriate access to genetic resources
5. transfer of technology
6. taking into account rights over genetic resources and technologies

7. appropriate funding.

The CBD represents a partial victory for Indigenous peoples. On one hand, it represents an historic milestone which explores the possibilities of compensating Indigenous communities for their pre-industrial knowledges. It is also a historical first step in the conservation of biological diversity by a promise in the resources to Southern peoples. (Convention of Biological Diversity, 1994).

The Convention on Biological Diversity was inspired by the world community's growing commitment to sustainable development. It represents a dramatic step forward in the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from the use of genetic resources, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources. (p. 1)

However, on the other hand, the final draft of the CBD reflects compromises by each side, and it is those compromises which continue to concern Indigenous peoples. To the uncritical eye the CBD seems like a good idea, but Indigenous peoples continue to raise voices of concern. At the International Alliance of Indigenous Tribal Peoples of the Tropical Rainforest (representing 31 Indigenous organizations in Latin America, Africa, Asia, and the Pacific), several concerns were expressed. First and foremost, it is recognized that the CBD is a tool of governments that was designed with little input by Indigenous peoples. Further, it was felt that the Convention increases the power of states to control Indigenous lands and resources. The term "indigenous" is limited to local settlements living in isolated conditions. The CBD promotes development of protected areas. The peoples affected are not consented. Another point concerns how the Convention promotes and facilitates agreements between governments and bioprospecting companies in order to gain access to the genetic resources on Indigenous territories. And lastly, the Convention opens up the possibility of top-down projects that support biodiversity in less than desirable conditions, that is local settlements. In

addition to the United Nations, efforts Indigenous peoples have been mobilizing to protect their community's knowledge and land (Biodiversity Bulletin, 1996).

The CBD reaffirms a unilateral state sovereignty, which could easily be used by states to deny indigenous sovereign rights to our territories, lands and resources. (p. 12)

Indigenous peoples have been meeting regularly at international forums to ensure the full recognition of their rights. These key issues have been identified: (1) collective ownership of territories; (2) self-determination to the exercise of customary law according to social and cultural practices, including legal and political representation through Indigenous institutions; and (3) control of Indigenous knowledge. Access to Indigenous knowledge, innovation or practices should not take place without prior and informed consent of those Indigenous people affected. Indigenous people must not be on the lower end of benefit sharing. Sharing must be equal.

A number of declarations, treaties, and agreements (Appendices A,B) have been drafted which address Indigenous peoples, biological diversity, intellectual property rights and access to genetic resources. However, many of these documents fail to address rights and may even set down laws that greatly affect Indigenous peoples. The agreements fall into three categories: legally binding agreements, soft law, and Indigenous peoples declarations. It is important to note that even with international binding agreements, no international law can rule supreme over a national law. Indigenous peoples, therefore, cannot make a legal claim against a government based on those agreements (Rothschild, 1997).

One document, which is currently being worked on and has been offered as a model for Indigenous rights, is the Draft Declaration on the Rights of Indigenous Peoples. The Declaration was established by the Working Group on Indigenous Populations. The Working group, was established in 1982, is comprised of indigenous peoples, experts, governments, and intergovernmental institutions (although participation is open to any Indigenous people). According to Simpson (1997) it is a document drafted

by the Indigenous peoples that eloquently expresses the spectrum of rights of Indigenous peoples. It gives attention to the importance of self determination for Indigenous peoples. It stresses individual and collective rights of Indigenous peoples to the ownership, use, and control of the homelands, territories, and natural resources.

It is therefore important to locate the discussion of the recognition and protection of indigenous peoples' cultural and intellectual property in the context of formulated, identified, inherent rights as expressed in the Draft Declaration of the Rights of Indigenous Peoples. This reflects the fact that the protection of the cultural and intellectual property of Indigenous Peoples is connected fundamentally with the realization of their territorial rights and right of self-determination. (p. 49)

In regards to property and territorial rights, the Declaration emphasizes the requirements of participation, consultation, and prior informed consent to activities that will have an impact on Indigenous peoples and their lands. It addresses the issue of just and fair compensation to address violation of human rights. The draft Declaration has not been fully endorsed by various governments or by the United Nations.

All documents need to be understood within the context of international trade agreements, such as the General Agreement on Tariffs and Trade (GATT), the North American Free Trade Agreement, and others. While the CBD can potentially benefit Indigenous peoples, the GATT threatens Indigenous peoples' rights to their own resources (Rothschild, 1997).

The GATT is a multilateral binding treaty that creates a free market trade system throughout the world, to be enforced by the World Trade Organization(WTO). GATT's main objective is to establish free trade by dismantling trade barriers. (p. 60)

The GATT allows transnational corporations to compete with local markets worldwide and to price products under local prices thereby driving traditional farmers and local industries out of business. The Trade Related Intellectual Property Rights (TRIPS)

obliges countries to pass intellectual property legislation. TRIPS requires signatory countries to establish patent protection for biotechnological innovation (Rothschild, 1997).

This threatens to commercialize Indigenous knowledge and genetic resources worldwide. For example, medicines derived from Indigenous medicinal plants will be patentable in all GATT signatory countries. Most southern countries have been given until the year 2000 to pass the new required IPR legislation. The "least developed countries" have until 2004. (p. 60)

The United States, which is home to many of the world's transnational and biotechnology corporation, has forcefully pressured countries, through trade sanctions, to create laws that cover biotechnological innovation in accordance with the TRIPS. India, China, and others have been forced to produce patent compliance laws.

Still another concern for Indigenous peoples is the exploitation of knowledge for financial gain, or when Indigenous knowledge is taken out of context from culturally appropriate rewards to market-driven approaches. For many reasons, the current legal and ethical ways of dealing with questions of economics and ownership have been inadequate in sharing benefits with the users and keepers of plants and local knowledge. Of utmost importance to the traditional plant users is the assurance that ethical practices go beyond just the letter of the law to embody the spirit of traditional values and ethical exchange. Some feel that fundamental principles ensuring the protection of Indigenous cultural heritage are not able to be reconciled with those of intellectual property law (Simpson, 1997).

In contrast to Western legal systems, indigenous cultural heritage cannot be owned or monopolized by an individual, just as it cannot be alienated, surrendered or sold on an unconditional basis. Rather, the cultural heritage of indigenous peoples is a collective right, and as such the responsibility for its use and management in accordance with indigenous laws and

traditions is born by the community as a whole. (p. 54)

It is not sufficient to view biodiversity as the only issue. Biodiversity is a rather Western legal concept that is not founded on respect for the rights of Indigenous peoples. According to Simpson(1997) the fact that a disproportionate focus at both domestic and international levels reflects the financial interests of businesses and governments.

This emphasis on biological information partly reflects the large financial investments now being made by governments, and the pharmaceutical, agricultural, and cosmetic industries in biodiversity prospecting. Other contributing factors include the resources of environment organizations which have been directed at the conservation of biodiversity (and not always in a manner that respects the rights of indigenous peoples), the effects of the specialty area of study known as ethnobotany, the international demand for the products produced from biological resources which transfers enormous economic power to corporations dealing in these products, and the specialized structure of the law that protects ownership rights to biological and biochemical materials. (p.56)

The assurances that biodiversity will be protected must be critically examined for whose interests are being served. The cultural aspect inherent in community must also be protected.

Ultimately it is not possible to separate exercising cultural rights from rights to self-determination on lands and territories. This land issue is at the heart of the struggle of the world's Indigenous peoples.

Related to Indigenous peoples' concerns regarding the use of their knowledge, there is the problem of the biotechnology industry and its impact on Indigenous farmers. A recent innovation, something called the "new terminator technology", is an example. In March 1998, the United States Department of Agriculture and the Delta and Pine Land Company (an American cotton seed company) received a U.S. patent on a technique that

genetically alters seeds. This seed is genetically altered so that it will not germinate, unless a agricultural chemical is applied (RAFI Communique, 1998).

The seed-sterilizing technology threatens to eliminate the age-old rights of farmers to save seed from their harvest and it jeopardizes the food security of 1.4 billion people -- resource poor farmers in the South -- who depend on farm-saved seed. (p. 1)

To its critiques this lethal technology has been called the terminator technology and is a threat to farmers, food security and biodiversity.

The technology will be used primarily in the South as a means of preventing peasants from saving seeds which are sold by American seed corporations. Patents on the terminator technology have been applied for in close to 80 countries. Should this new technology be used, ultimately the multinational seed and agrochemical industry will have an unprecedented and dangerous capacity to control the global food supply.

In addition to genetically altered seeds, farmers have a concern about the issue of seed saving. Monsanto, a huge chemical conglomerate worth in the hundreds of billions of dollars, has recently taken legal action against more than 100 soybean growers who have violated a licensing agreement on transgenic soybean seeds. Monsanto has hired Pinkerton private police to identify unauthorized seed-saving in the United States.

Small and local plant breeders have a lot to lose. According to the RAFI Communique(1998), the terminator technology could drive millions of farmers out of agriculture altogether and threaten to world food security. These small farmers grow 15 to 20 percent of the world food and directly feed 100 million people in Latin America, 300 million in Africa, and 1 billion in Asia.

Rural Advancement Foundation International is calling for a global ban on the terminator technology on the basis of public morality. Nongovernmental organizations will urge the Convention on Biological Diversity to condemn the new technology as a threat to world food security and farmer's rights.

The issue of biotechnology touches all of the world's people. Many scientists have raised concerns around food biotechnology and genetic engineering. Currently Canadian supermarkets have over 30 genetically engineered foods on store shelves that have been approved by Health Canada. It is not a requirement that these same foods are labelled warning potential buyers that foods are genetically engineered (B.C. Biotechnology Circle Fact Sheet, no date). Tomatoes have been engineered for longer shelf life or for delayed ripening. Lettuces have been engineered to fit the cooler compartment of refrigerators. Soy beans have been genetically altered to prevent them from becoming damaged from herbicide use(RAFI Communique, 1998).

Soy is one of the key genetically engineered crops, and soy products are found in almost 60% of the processed foods on the market.
(p.3)

It is now up to the consumer to figure out which food has been genetically engineered so the consumer can avoid such products if they so choose. While the biotechnology industry and food production are reason for concern, Indigenous people are launching many fight back strategies.

There is room for hope, however, thanks to the Satyagraha Principle of tribal people of India.

The Karnataka State Farmers Association (KSFA), an organization which represents 10 million Indigenous peasants represents a ray of hope in a sometimes depressing global picture. Driven by the Satyagraha principle of standing up to injustices the KSFA puts into practice principles of freedom by their daring acts of defiance. The KFA successfully removed both Kentucky Fried Chicken (KFC) and Cargill Seed Company from India because they were a threat to Indian small scale farming autonomy as well as a threat the biodiversity in the whole of India. After numerous warnings to the managers of KFC and Cargill, the KFA torched the offices of KFC and Cargill, after employees left work.

I have listed a number of concerns which Indigenous peoples have in regards to the protection of their knowledge regarding intellectual property rights. I have described this struggle within a global context in order to describe the extent of the concerns. Indigenous peoples around the world are becoming more vigilant about ensuring their rights are protected. Indigenous peoples are in a race against time to ensure that their rights to sovereignty are protected. They are establishing their rights by organizing through international forums.

Chapter 5

The Human Genome Project and the Issue of Biodiversity

Seeds are not the only item of curiosity for the scientific community. Human DNA is at the centre of an international consortium of scientists, universities, governments, and other interests in North America and Europe. (Indigenous Women's Network Magazine)

Over 700 Indigenous groups world wide have been identified to have samples collected from them. Indigenous communities targeted for DNA collection include Africa(165), Asia(212), South America (114), Oceania (101) North America (107 tribes) and Europe (23) (p.68).

Established in 1992, the Human Genome Diversity Project (HGDP) will take blood, tissue samples (cheek scrapings or saliva), and hair roots from hundreds of Indigenous communities throughout the world. Through the Human Genome Organization (HUGO) the project is mandated to map the entire genetic structure of the human race (Indigenous Women's Network Magazine, 1996).

It seeks to sequence the DNA information in all 100,000 genes in the human body and is expected to cost 3 billion dollars over the span of the fifteen year project. While HUGO intends to uncover the norm of the human genome as a composite model the Human Genome Diversity Project seeks to map and sequence genetic diversity. The project is specifically mandated to take blood, tissue, and hair samples from "endangered" indigenous communities around the world. (p. 67)

The HGD project was formally adopted in 1994 by the Human Genome Organization (HUGO) and now enjoys massive funding. It is a multi-billion dollar initiative by scientists and has plans to sequence the DNA in the entire human genetic structure. The HGDP seeks to map the genetic difference of groups from the monotype genome that will be identified by the HUGO effort.

Scientists believe that many of the world's Indigenous people are endangered of becoming extinct and refer to them as isolates of historic interest. Scientists hope to gather DNA samples from the living before they disappear forever, and so avoid the irreversible loss of precious genetic information. Indigenous peoples find it reprehensible that scientists' interest is purely to document scientific genetic information rather than to preserve tribal groups. In effect, the scientists are asking endangered tribal groups to submit personal samples before their group disappears. The scientists' action revive out-dated and oppressive attitudes, and their actions instill self-fulfilling pessimism. Such actions are simply unethical.

Blood samples taken from Indigenous peoples will become immortalized for future study. A technique called "cell conservation" will keep certain cells of an organism alive and capable of multiplying. Unlimited amounts of the organism's DNA will be stored at various gene banks, mostly in the United States.

Indigenous peoples have many concerns with the HGDP. One is the issue of informed consent. Although the HDGP claims that it will seek the consent of the individuals and populations, many people doubt as whether this is in fact happening. Some questions that remain unanswered are as follows: Can tribal leaders give consent for the whole tribe? Can one person give consent while others don't? How can some of these consents be explained in ways and languages which have no concept or words for these confusing terms? What are the benefits for the local communities? Will decisions not to consent be fully respected?

The HGDP North American Committee has secured a grant to develop a model protocol or rules for the collection of samples from Indigenous groups. It is felt by Indigenous people that this protocol will primarily be used to seek project co-operation (Dukepoo & Harry, 1998).

The HGDP states that the research will help reconstruct the history of the world's populations, address questions about the history of human evolution and migration

patterns, and identify the origins of existing populations. While the HGDP is looking for answers about human evolution, Indigenous peoples already possess strong beliefs and knowledge regarding their creation and histories. (p. 1).

Danny Billie, traditional spokesman for the Independent Seminole Nation of Florida, states in the 1997 *Indigenous Environmental Network News*:

The white people are trying to play God. If they continue to do what they are doing the impact to the human species, insects, plant and animal life is going to be devastating. They think that they can get away with, but they'll also suffer the consequences. (p.).

In response to the HGDP research Indigenous peoples from various parts of the world have mobilized against the project. Documents such as the Ukupseni Declaration from Panama and the National Congress of American Indians Resolution No. 93-118 have been signed. These documents represent hundreds of communities that declare opposition to the HGDP.

In the early 1980's, the Karioca Declaration was signed by a group of Indigenous people who were opposed to the HGDP and who met prior to the 1993 United Nations Conference at the Earth Summit in Rio de Janeiro. The Karioca Declaration was followed ten years later by the Mataatua Declaration and signed by over 150 participants from 14 United Nations countries. The Declaration calls for an immediate halt to the ongoing HGDP until all aspects of it could be understood by Indigenous peoples. In 1994 The United Nations' working group on Indigenous populations, along with the Sub-Commission on the Prevention of Discrimination and Protection of Minorities approved Article 29 of the the Declaration of the Rights of Indigenous Peoples which stated (Western Shoshone Defense Project Newsletter, 1997):

Indigenous Peoples are entitled to the recognition of the full ownership, control and protection of their cultural and intellectual property. They have the rights to special measures to control, develop and

protect their sciences, technologies and cultural manifestations including human and other genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, and visual and performing arts. (p. 7)

In 1993 an assembly of representatives of the tribes from the North and South Islands of Aotearoa (New Zealand) passed resolutions condemning the HGDP and the patenting of life-forms. In that same year the National Congress of American Indians (the oldest and largest national organization, comprised of representatives from 671 American Indian tribal governments in the United States) passed a resolution condemning the HGDP and called upon all related activities to cease immediately.

Coined as the "Vampire Project" by the World Congress of Indigenous Peoples, the Central Australian Aboriginal Congress Position Paper stated in 1993 (Western Shoshone Defense Project, 1997):

The Vampire Project is legalized theft. The Vampire scientists are planning to take and to own what belongs to Indigenous People. We must make sure that our people are not exploited once more by corporations, governments, and their scientists. (p. 7)

In 1994 at the Maori Congress Indigenous Peoples Roundtable, Indigenous participants from the World Council of Indigenous Peoples, Greenland Home Rule Government, COICA (Peru), Treaty Six Chiefs of Alberta, and governmental representatives from Vanuatu, Papua New Guinea, and Fiji declared that (Western Shoshone Defense Project, 1997)

The collection of genetic samples from Indigenous peoples such as the Human Genome Diversity Project, is unethical and immoral and must be brought to an immediate halt. (p.7)

Also in 1994 in Panama, the Guaymi Indians, along with citizens of Papua New Guinea and the Solomon Islands, discovered that the United States government had taken

patent claims out on the cell lines from some of their people. Through effective campaigning they were able to have the patent claim abandoned.

In August 1994, the International Academy of the Environment, along with the World Wildlife Federation and the United Nations Centre for Human Rights, organized an information workshop on "Intellectual Property Rights and Indigenous Peoples" stating:

The issue of HUGO, and others related to human genes, is a serious violation of our peoples' rights. Without consultation with the indigenous communities, several projects are now taking blood, hair, tissue and other samples for purposes that are not clear. This practice of collecting samples without our approval is very dangerous because in this way our genetic material can be patented or used for other purposes. Such practices not only violate ethics and human rights, but also violate nature, our spirituality, and our knowledge of creation that connects us with all forms of life. (p. 7)

In Bolivia in September 1994, the Latin and South American Consultation on Indigenous Peoples Knowledge rejected the HGDP and human genetic research. Similarly in Malaysia in 1995, the Asian consultation on the Protection and Conservation of Indigenous Peoples Knowledge rejected the HGDP. In Arizona February, at the same time, Indigenous leaders from US, Canada, Panama, Ecuador, Peru, Bolivia, and Argentina, formulated a Declaration of Indigenous Organizations of the Western Hemisphere. It considered the responsibility to future generations (Western Shoshone Defense Project, 1997):

We have a responsibility to speak for all life forms and to defend the integrity of the natural order. We particularly oppose the HGP which intends to collect, and make available our genetic materials which may be used for commercial, scientific and military purposes. We oppose the patenting of all natural genetic materials. We hold that life cannot be bought, owned, sold, discovered or patented, even in its smallest forms. (p. 7)

In April 1995 the Pan-American Health organization passed a resolution opposing the HGDP, and stated:

This type of research will have a negative impact on future health programmes and projects in indigenous communities, by undermining indigenous peoples' trust in the medical and health professions. (p. 7)

The Pacific Consultation on the Protection and Conservation of Indigenous Peoples Knowledge developed a Treaty declaring a Life-Forms Patent Free Pacific, with specific objections directed to the HGDP.

In August of 1997, several hundred Indigenous peoples representing many tribes and over 60 organizations met to discuss the impact of the new biotechnology on their homelands and their people. This meeting called "the North American Indigenous Peoples Summit on Biological Diversity and Biological Ethics" It established the Heart of the People Declaration. Its preamble "expresses our profound concern for the well being of our Mother Earth and the Indigenous circle of Life known as 'biological diversity' ". The Declaration further states(Indigenous Environmental Network News, 1997):

We wish to add our voices to ongoing global discussions regarding the protection of biological diversity, the safeguarding of traditional knowledge and sustainable development practices, and the ethical use and treatment of all forms of life on harmony, respect and the spiritual interconnectedness of the natural world. (p. 8)

In November of 1997, Indigenous people representing 25 organizations from 15 countries met in Panama to discuss the Human Genome Diversity Project and the issue of human genetic piracy. This meeting was one the first opportunities for Indigenous people from Latin America to meet with North American Indigenous people who were working on the HGDP issue. The Ukupseni Declaration on the Human Genome Diversity Project was established as a result of the two-day meeting. The Declaration condemns the HGDP and (Indigenous Women's Network Magazine, 1998):

It calls for a moratorium on the collection of genetic samples from indigenous peoples, and demands the repatriation of genetic samples and data already obtained by unethical measures. It opposes the application of intellectual property law, and patents, to human genes. It calls upon scientists to denounce any research conducted in a manner that violates the protocols that protect the human rights of human subjects. Finally it calls upon allies to work with Indigenous Peoples to demand protection for the human and collective rights of Indigenous Peoples. (p. 38)

The Indigenous Peoples Coalition on Biopiracy was established in 1998 to address the theft of Indigenous blood, hair, and skin sampling. This was a more concerted response to the Human Genome Diversity Project. Coalition participants worked on strategies to protect their communities from exploitation. Members disseminated information to the local grass-roots levels. They built alliances for sharing current information as well as for implementing collaborative action and support among the participating organizations and individuals. An extensive list of key points has been developed by this coalition, the direct quotation from the document is as follows:

After careful review of HGDP and other independent investigations on the genome of indigenous peoples, (Indigenous Women's Network Magazine):

- a. We declare absolute opposition to the Human Genome Diversity Project, and demand the immediate suspension of any activities to collect genetic samples, cell lines, or genetic data from indigenous peoples, including our deceased ancestors.
- b. We demand the fullest cooperation of any government agency or independent research institute in the return of all genetic materials, cell lines, and data they may have in their possession to the appropriate governing authorities of the tribal group.
- c. We oppose any attempt to monopolize or commercialize the genetic samples, cell lines, or data derived from the cell lines of Indigenous peoples through the application of intellectual property law and patent systems.

d. We oppose the genetic engineering of Indigenous peoples genes and cloning. This includes cloning indigenous peoples genes or gene fragments into bacterial, viral, mammalian cell lines, or other vectors. We demand the immediate suspension of activities that are currently using any Indigenous peoples' DNA, genes or fragments in any cloning experimentation.

e. We demand the international scientific community condemn any research that has been carried out contrary to recognized human values and moral principles, and that violates the international codes of ethics described in the Nuremberg code and the World Medical Association Declaration of Helsinki.

f. We reaffirm the governing entities of Indigenous tribal peoples/nations have the primary authority to deny access to, refuse to participate in, or to authorize any removal of genetic materials from our peoples or territories. The ethical principle of "individual informed consent" is also applicable, and is secondary to tribal governmental consent.

g. We demand that scientific endeavors and resources be prioritized to support and improve social, economic and environmental conditions of Indigenous peoples in their environments, thereby directly improving health conditions and raising the overall quality of life.

h. We demand an immediate moratorium on collections and/or patenting of genetic materials from Indigenous persons and communities by any scientific project, health organization, governments, independent agencies, or individual researchers.

i. We demand that the US government and any governing agencies, to not participate, fund or provide any assistance to the HGDP, or any related research projects which seek to research the genome of indigenous peoples.

j. We denounce the integrity of the report by the Committee on Human Genome Diversity of the National Research Council which gives unethical endorsement to the Human Genome Diversity Project while acknowledging the "lack of a sharply defined proposal that it could evaluate." (p. 38)

Indigenous peoples continue to organize worldwide to stop further colonization through scientific measures. In the fall of 1998 the Confederated Salish and Kootenai Tribes and the Montana/Wyoming Area Indian Health Board cohosted a conference on North American Genetic Research and Indigenous peoples called "Colonialism through Biopiracy." The conference addressed the underlying threat of genetic research and the potential impact on tribal sovereignty. The Human Genome Diversity Project was on the agenda of the 1998 CASTS conference in Saskatoon.

Indigenous peoples enjoy the support of a number of organizations which work towards ensuring that principles of morality are not abrogated in gene research. The Council for Responsible Genetics (CRG) based in Cambridge, Massachusetts, creates a forum for discussing, evaluating, and distributing information about the social impacts of genetic engineering. The CRG's Board of Directors includes some internationally recognized scholars such as Ruth Hubbard, from Harvard University, and Doreen Stabinsky from California State University and editor of *Valuing Local Knowledge, Indigenous People and Intellectual Property Rights*. The Council initiates events on the social, ethical (GeneWATCH, 1997) and legal concerns about the patenting of genes and life forms:

The CRG was the first organization in the nation to call attention to the growing threat of genetic discrimination and continues to lead the fight in this area. Today, we are at the hub of a growing network of individuals, organizations, and legislators working to protect vulnerable individuals from discrimination based on their genetic characteristics. (p. 8)

To counter the economic and political power of the HGDP, the CRG has been steadily building support with food and agriculture organizations, indigenous peoples' organizations, health care rights groups, students groups, and labor unions in opposing patents on living organisms. The CRG also opposes the commercialization of living creatures and of human genes. CRG's work includes (1) producing consumer information to help buyers know what they are purchasing and consuming, (2) engaging in public

education, and (3) lobbying governments and leaders to ensure that genetic privacy is protected. The Council produces a monthly magazine called GeneWATCH which monitors the social impact of biotechnology.

The Rural Advancement Foundation International (RAFI) is an international non-governmental organization with headquarters in Canada and an affiliate office in North Carolina, U.S. RAFI is dedicated to the conservation and sustainable improvement of agricultural biodiversity and to the socially responsible development of technologies useful to rural society. RAFI's concerns include: the loss of diversity especially in agriculture, the loss of intellectual property rights, precision farming, erosion of farmers rights, bioserfdom, genetic piracy, and world food scarcity.

RAFI supports the principle of Farmers' Rights, as endorsed by the United Nations Food and Agriculture organization in 1989. This principle recognizes the fact that the world's farmers, particularly those rural and Indigenous farmers have contributed immensely to the creation, exchange, conservation, and knowledge of genetic resources. The principle affirms that farmers should be rewarded and recognized for their past and ongoing contributions. Farmers' Rights farmers, are those who for example, in South America who have selected and improved crop genetic resources. They should be rewarded as much as the plant breeders who benefit from patent-like monopolies such as Breeders' Rights. Civil societies and governments have supported the principle of Farmers' Rights as a recognition of the role that farmers and rural communities play in genetic resources. They should benefit from those roles. For Indigenous peoples, the Farmers' Rights concept is critical because it includes not only the issue of compensation for farmers and their communities, it also includes rights to land. More specifically, it refers to the farmer's fundamental right to save seed and exchange germplasm, secure land tenure, and to choose or not to choose to make their knowledge and germplasm available. Farmer's Rights are essentially about human rights.

RAFI has been active in surveilling the activities of the industrial agriculture complex. The agro-chemical multinational Monsanto has been under the watchful eye of RAFI. Monsanto has created a gene-altered soybean which will withstand spraying of Roundup, the worlds' top selling herbicide. Roundup will kill weeds without harming the genetically engineered soybean plant. Many consumer and environmental groups have reacted strongly to the Monsanto claims that Roundup is environmentally safe and harmless. What is not known is that soybean oil ends up in thousands of consumer food products such as infant formula, salad dressing, and chocolate bars. Many Non-Governmental Organizations (NGOs) in Europe and North America believe that genetically engineered soybeans may not be safe for human consumption and that the long term health effects are not known as this time. Because current health regulations do not require genetically engineered foods to be labelled, consumers have no way of knowing whether they are purchasing such products.

The gene-altered soybean is an issue of monopoly control, morality, and social justice for farmers groups and rural Indigenous communities. Through a close examination of Monsanto's "1996 Roundup Ready Gene Agreement", RAFI has discovered some disturbing information. Not only does the farmer pay \$5.00 technology fee per 50 lb bag of seed, but the farmer also gives Monsanto the right to inspect the farm for up to three years to ensure that the farmer has kept within the terms of the agreement. All farmers' right to save or replant the patented seed or seed derivations from it have been relinquished. Any kind of breeding research is strictly forbidden (RAFI Communique, 1997):

Grower may not: resell or supply any seed purchased under this Agreement to any other person or entity; use or sell to anyone the purchased seed or any of the soybean material derived therefrom for breeding, research, seed production, reverse engineering or analysis of the genetic makeup thereof, save any of the seed produced from the purchased seed for the purpose of using it for planting seed; save

any of the seed produced from the purchased seed for the purpose of selling it to anyone who would use it to plant a soybean crop.
(p. 3)

Stiff penalties await the farmer who violates the agreement. The agreement states that nothing contained in the agreement can limit the amount of damages that Monsanto might recover for violations to the agreement.

Monsanto has issued a similar gene licensing agreement for its genetically engineered Bollgard cotton and will introduce similar agreements including Roundup Ready canola, maize, sugarbeets, and others. Because Monsanto is one of the world's major players in plant biotechnology and seeds, this monopoly has disturbing and far reaching consequences for the world's Indigenous farmers (as well as all farmers). While other commercial seed corporations have restricted the rights of farmers in replanting and reselling, farmers have never been required to sign away their rights nor have been legally obliged to use a brand name chemical on a specific variety. The new gene licensing agreement clearly diminishes the farmers' role in decision making, and it gives greater control to seed and agrochemical corporations.

Other trends in industrial agriculture includes the transformation of farm commodities to proprietary products. Some critics say that soon, virtually all crops will be designed for a specific use, such as the high protein, low-fat soybean for human consumption.

Precision Farming has other names such as "site-specific farming" and "prescription farming". All terms refer to new information technologies in the management of commercial and large scale agriculture, mostly in the industrialized world. Precision farming technologies include: personal computer, satellite positioning system, automated machine guidance, geographic information systems, telecommunications, and remote sensing devices. With these tools, site specific information can be used to tailor the application of fertilizers, pesticides, seed spacing, and irrigation to precise levels needed for specific crops. Technology that is being

introduced to industrial agriculture has been developed by military contractors (such as Lockheed Martin and Rockwell International) for the Department of Defense in the United States (RAFI Communique, 1997).

Lockheed Martin, the world's largest arms-producing company(1996 sales of \$27,000 million), proudly advertised, Perhaps nowhere is the principle of pounding swords in plowshares being carried out more literally than with precision farming. (p. 6)

Precision farming may be thought of as an industrializing technology which builds links of dependency between the farmer, the off-farm information providers, and the agrochemical industry. It reinforces the chemical-intensive requirements and uniformity of industrial agriculture. It diminishes the the age-old , local knowledge of farmers, and substitutes capital and technology for the traditional role of farmers.

Precision farming is also an information-based industry. This information was obtained from public sector resources such as government extension services and agricultural experiments. However precision farming is increasingly privately held, and is a marketable product as well as a source of strategic competition. Donald Senechal, Chairman of a management consulting firm that specializes in precision farming, is quoted in RAFI Communique (1997) as saying:

We expect in 15 years to have one-half of all major field crops being grown under some system of precision farming. In some cases especially for high-value crops such as cotton, potato and sugarbeets , that level will approach 100%. (p. 7)

Although all of these scientific/technological realities are facing farmers large and small, RAFI contends not all farmers are victims of what has been referred to as "biosefdom." Many people inside and outside the farming community are working to build an alternative food and farming system based on principles of social justice and environmental sustainability. The farmers' fundamental right to save seed and exchange germplasm in central to achieving these goals.

It is clear that Farmers' Rights is central to the wider issue of the right to food and biodiversity. It has related to scientific accountability which I refer to in Chapter 2. It will be debated within this broader context by intergovernmental bodies. For instance, the 1996 World Food Summit, made up of civil society organizations, developed four central elements concerning the right to food and biodiversity (RAFI Communique, 1997):

- the right of all people to have adequate, affordable, and culturally appropriate food;
 - the right of all people to have access to food, even in times of political unrest and natural disaster;
 - the right to fair marketing of food;
 - farmers' rights -- the right to produce food under equitable and sustainable conditions.
- (p. 8)

RAFI states that these issues must go before the United Nations Human Rights Commission where a legally enforceable agreement on the right to food could be formed. However, the United Nations forums have not always dealt fairly with Indigenous peoples, and some South Asian communities (for example, the Philippines) have simply chosen to defy unfair laws and carry on with their Indigenous rights to biodiversity.

The 20th Century has brought Indigenous peoples to the highest level of exploitation. Whereas before land was the ultimate resource to be expropriated, now Indigenous intellectual property rights and even human genome is a source to be exploited. Because the issue of expropriation connects the Indigenous struggle to the rights of all citizens, there are possibilities for common grounds for making important strategies for solutions. Indigenous view of sanctity of life for all living matter requires that we challenge the efforts of transnational companies whose only interest in plants and food is to make profit. When it comes to the issue of food, seeds and power relationships Indigenous rights have become ordinary citizens rights.

Chapter 6

A Synthesis

Serving a dual role as an activist and scholar I felt a tremendous need to share some of the experiences and knowledge which I have learned from many inspiring leaders and educators over several decades. Writing this thesis has meant that the information would be available to educators and others who otherwise may not have an opportunity to learn about it. I believe that much of this information is not available within most mainstream learning institutions. This thesis has documented work done largely by people who may not be considered scholars. Whether it is within the North American or beautiful South Pacific Island community there is a world which for the most part remains uncommunicated to a broader population. This information includes principles of Aboriginal knowledge which is beneficial to other communities. If this information, which includes the Indigenous way principles of sustainability, is not recognized, some scientists and Indigenous peoples have predicted that the impact on human life will be devastating. The challenge which lies before us as educators and others is how to communicate this information. This thesis is a reminder that informal methods of learning can be used as inspiration for curriculum development.

This thesis has shown that despite the wealth of knowledge which exists within Indigenous communities globally, the current global environmental crises is taking its toll on the lives of Indigenous peoples. Many contemporary Indigenous health problems are attributable to the disappearance of our natural resources. Destruction of Indigenous homelands and disappearance of the world's natural resources are issues that we all need to pay attention to. The issue of Indigenous sovereignty is very much connected to the preservation of our community's natural environment and development for the people. As an example of what others can do, this thesis has documented efforts of non-Indigenous groups who are working to preserve the world's resources. Throughout this thesis I have shown that western science has received criticism for some of the negative

impact it has had on the world. This criticism has come from within its scholarly midst as well as outside.

The sharing of Indigenous knowledge has had predictable repercussions. Knowledge which was freely gifted within an Indigenous community is increasingly becoming attractive to non-Indigenous people. Westerners have discovered the value of Indigenous knowledge and have begun exploiting this knowledge through research, the development of patents, and the invasion and exploitation of land for the benefit of outside interests. While the development of the concept of patents has been around for over a century, the impact of these documents is becoming increasingly more problematic in terms of land rights usage and quality of life for Indigenous peoples. Scholars like Vandana Shiva have shown that much of the world's biodiversity is being controlled by the northern, developed and primarily European countries at the expense of the southern and largely Indigenous countries. Most of the world's biodiversity exists in the ravaged south. Indigenous groups continue to mobilize against what has been referred to as biopiracy and the last colonial frontier, the theft of the Indigenous intellect and knowledge base.

This thesis has shown that Indigenous peoples are not silent recipients of exploitation but have waged a battle of resistance since contact with the invaders. Indigenous peoples have taken their battles to many levels and many places. Efforts such as the establishment of the Convention on Biological Diversity has shown us that the path towards sovereignty will be one of give and take and possible compromise. Through the establishment of their own learning institutes, and through the honouring and preservation of their Indigenous knowledge and languages, Indigenous peoples have created models of learning and pathways to sovereignty. The incorporation of Indigenous thought and practices has proven viable through projects like the SuperSaturday program of the Saskatoon Tribal Council in partnership with the University of Saskatchewan and the University of Hawaii. These partnerships can do much to address the situation of

environment preservation, culture and language retention, curriculum change and paradigm shift.

As a means of expanding their network and gaining support Indigenous peoples have taken their struggle to the national and international arena. Indigenous peoples have drafted statements and declarations which address human rights issues and which also establish principles of conduct for outsiders. At the United Nations and other international venues, Indigenous scholars, community leaders, NGO's and ordinary people have established the Draft Declaration on the Rights of Indigenous peoples. This has been a slow process largely because of the bureaucracy which exists and because of governments not exercising the powers they possess to support Indigenous peoples. Some of these documents described in this thesis establish fundamental principles of governance which all communities can learn from. Indigenous peoples are currently in the situation where solidarity with the broader global community is required in order to address the plethora of human rights concerns. This thesis has only touched on a few of those issues. Many more exist within the far reaches of the world. Our task as Indigenous peoples is to educate the broader public. Hope comes from the fact that a significant network of other agencies such as the International Working Group on Indigenous Affairs, exist and work towards communicating the need to address Indigenous human rights. These groups and other and have done a fairly good job of documenting these issues. I have had the interesting experience of working with organizations such as the Dag Hammarskjold Foundation, the International Research Development Centre, the Pacific Concerns Research Centre, and a host of others and I can attest to the fact that non-Indigenous agencies can lend help, both human and financial, in the support of Indigenous issues.

Working at a complex place like the University, I also recognize the opportunity and obligation for support that such an institute can give. We have ample opportunity to allow and encourage support for the teaching of Indigenous history, values and

contemporary political movements. University scholars have opportunities and resources to establish learning environments in other parts of the world that can teach us and our students about Indigenous conditions and struggles. By consulting with Indigenous peoples, we can use international centres to establish programs for good governance and democracy, based on Indigenous values. Now more than ever in this time of environmental destruction, we need Indigenous values. We have power that we need to exercise. Much more work lies before us. It has been stated that humans are three minutes to midnite on the environmental clock. Most Indigenous peoples have realized and vocalized the urgency of the situation. Indigenous peoples have attributed their rights to sovereignty as the rights to healthy, biodiverse, holistic and intact communities with development for human needs. We welcome the expansion of more allies in the preservation of our Earth mother.

Chapter 7

Keeping Science Accountable

While it is true that science has brought a level of advancement which society has benefitted from, it is clear that some scientific research and practise have had negative impact particularly on Indigenous communities. This, coupled with the fact that knowledge which can be attributed to Indigenous peoples has not been adequately acknowledged, requires that Indigenous peoples be more involved and active in science education. Involvement in science education could be a means of giving the Aboriginal community a vehicle to bring its concerns forward. In most countries science is taught in a moral and social vacuum unrelated to the outside world (Solomon & Aikenhead, 1994). Current science education and science needs to be evaluated with input from a broader public. Science needs to be evaluated as to how it can serve the people.

Implications For Curriculum Development

There would appear to be a great desire by Indigenous peoples to have influence on curriculum development as it refers to land, life, and liberty. In my experience within the classroom and at the university, I have not seen evidence that the natural environment and those people who depend on that environment are dealt with in a realistic or representative manner. For example, while there are educational programs in social work, education, and more recently the sciences, most do not include Indigenous science knowledge and most do not look critically at the impact of science on local and global Indigenous communities. For educators and administrators, school boards and departments of education, I believe there are moral and ethical issues that need to be addressed. All prospective teachers are not receiving environmental curriculum in their teacher training. This is a concern. Quite a bit has been written about the need for curriculum to address local conditions as a means of empowerment (Freire, Settee, Maliyamkono). What is clear from the information contained within this thesis, and

based on years of activity and networking with Indigenous peoples throughout the world, there exists an environmental crisis on Indigenous land which constitutes human rights violations. Understandably the United States has more environmental concerns than Canada. The U.S. has a longer history of industrialization. But we are destined to walk down the same path unless future generations are educated about the dangers. This can and should happen in a classroom setting. It will require that teachers and educators are first made aware of the many issues which impact people globally. Clearly what is needed is for information of this nature to be taught within higher learning institutions and classrooms of the nation's schools. Indigenous people have referred to exploitation and destruction of land as environmental racism, a condition of exploitation and suffering experienced by people solely because of the color of their skin.

In some Canadian communities, efforts are underway to make links between Western science and Indigenous knowledge. The two I am most familiar with is the recently established Super Saturday program with the Saskatoon Tribal Council and the University of Saskatchewan and the Canadian Aboriginal Science and Technology Society (Chapter 3). While it is too soon to determine the effectiveness of Super Saturday, the process leading up to the actual creation of the curriculum (coming to know each other's reality) has been an interesting one, and certainly one that other groups could learn from. This thesis has merely looked at some of the problems and has only slightly touched on solutions. It has called for more efforts in understanding the extent of the problems, and in drafting curriculums which respond to the needs of people. As is clearly voiced by the Dene Cultural Institute and others, Indigenous people need to be front and centre in developing curriculum, as it is their knowledge which is desperately needed at this time in history.

Throughout these pages are examples of Indigenous communities designing their own curriculum, using local knowledge, making practical applications, and responding to community needs. Indigenous people feel that it is not possible to separate Indigenous

science from ethics, spirituality, metaphysics, ceremony and social order. For Indigenous people life is sacred and that includes all living things. An Indigenous world view includes animals and the natural world of water, fire, air, and earth as having a spirit and deserving of respect and reverence. The natural world gives us life and in turn we must honor that life. Indigenous science is a way of being.

According to F. David Peat's (1994) statement it is possible and necessary that Westerners drop their obsession with ideals and accept Indigenous science as a valid understanding of nature. Both Western and Indigenous cultures have much to gain by listening and dialoguing and envisioning new and harmonious relationships for all of life. Many outstanding Western scientists have concurred with this view, as this thesis has documented. In the case of physics, which has had a profound effect upon the world's peoples and how they behave toward the world, it is important that a bridge be established between Western physics and Indigenous science and metaphysics. As a person who spent several years in the engineering world, I believe that science and engineering has much to gain from the Aboriginal world view and Indigenous science experience. Indigenous science principles are sound. If they weren't people would not have survived in such challenging climates and without the predecessors and wonders of Western medicines. Indigenous peoples the world over have evolved healthy and wholistic lives based on experimentation with plants as healer, and on the night and day skies as forecasters. This knowledge needs to be taught in school science.

The Ahkwesahsne model, provides many successful outcomes which can be used as a model. Quality student science projects have become a regular feature of the Ahkwesahsne Mohawk School. The mathematics curriculum includes Aboriginal number systems, origin of number worlds, limits of counting, mathematic principles of the Iroquoian agricultural and hunting society, Mesoamerican geometry, the Mayan concept of zero, Incan and Mayan calendrics, computational techniques, and notation devices. This type of curriculum can be used in other schools. The use of Indigenous cultural

values and concepts have shown an amazing increase in student self-esteem. Teaching values makes students better prepared for higher education. The Ahkwesahsne project is an excellent model for Indigenous learners and teachers in many communities. It is an example of learning which has transcended jurisdictional boundaries into the international arena. Many Western or non-Indigenous learners have difficulty integrating public, private, and separate systems. The Ahkwesashne model begins unit plans from the ground to the heavens, rather than just separating learning into discrete subject disciplines. This approach is in keeping with the wholistic nature of world views and experiences. While other communities may not have the Great Law of Peace, most have similar values which can be acknowledged.

F. David Peat (1994) argued that a bridge must be established between Indigenous science and Western science as a way of correcting what is wrong in society. This world view will help to establish harmony and balance.

Indigenous metaphysics offers us an alternative approach, a way of being within the world that does not analyze and categorize, control, and intervene, but rather admits the openness of the circle, accepts the unexpected, acknowledges obligations, and seeks harmony, balance, and equilibrium.
(p. 306)

Like other colleagues in the science field, Peat is calling for a reconsideration of fundamental attitudes towards life, land, and integrity. He is urging us to translate those concerns into a *modus operandi*.

Having been involved with what has been termed "informal education activities," I know that there are volumes of writing that have not been adapted to fit curriculum standards. Indigenous peoples and others must look to this literature and adapt it for use in the curriculum. As we approach the 21st century the myriad of issues which impact on Indigenous communities and all communities are immense and require immediate attention. As well, we as Indigenous peoples could influence the citizen's input in keeping science accountable. Such groups as Science for the People, feminist scientists,

the Union of Concerned Scientists, and more recently, the Circles of Wisdom Native Peoples/Native Homeland Climate Change, groups have made some inroads in mobilizing citizens concerns around science issues.

Finally, when developing curriculum, the Aboriginal condition has to be situated within a broader global context. The environmental holocaust which is currently taking place the world over on Indigenous lands must be aggressively addressed. In a world mainly divided between the haves and the have-nots, what is needed is a sound political understanding of the causes of inequality and a solid understanding of the power relationships, namely, who exercises power and who is prevented from exercising power. This, coupled with a solid understanding of one's own community's science knowledge can then provide a more wholistic solution. Included in this understanding needs to be a solid analysis of the dynamics of racism and its impact on Indigenous communities and the rest of society. A thorough understanding of the issue of globalization and it's impact on Indigenous communities is also needed.

In an effort to combine forces to stop some of the destructive events in the global community, extensive communication, education and action needs to take place. There are some opportunity to learn of Indigenous peoples global struggles but most take place outside of mainstream schools and educational institutions. Cultural Indigenous youth exchanges, such as the one that is being organized by the Maori youth in Aoteroa/New Zealand, should be encouraged and supported by mainstream education institutions. Indigenous youth internship programs such as the one organized in 1998 by the Indigenous Women's Network, is worthy of mainstream educational support. Right now these types of efforts are financially supported by benevolent and usually private donors rather than by publicly funded educational institutions. Other education exchanges permit only the children of the rich to take part. As an educator who has taken her child out of formal school to learn by travelling and meeting with people from other parts of the world, I know international exchanges are possible and are vital in promoting

understanding. I believe that drastic action is needed to awaken student/teacher apathy. Action that is desperately required is action based on mutual respect and not just on curiosity of what some might see as quaint cultures standing in the way of progress and development.

Clearly Indigenous peoples are fighting for survival beyond all odds and with few resources. They are challenging colonial governments and colonial attitudes in order to save their communities and to save the world. Their efforts need to be acknowledged. Their actions need to be commended. Their knowledge needs to be protected and honored if the rest of humanity is to survive.

BIBLIOGRAPHY

- Abya Yala News, Oakland, California, Vol.10, No. 4, 1997
- Apffel-Marglin, Frederique, Counter-Development in the Andes, The Ecologist, Vol.27, No.6, 1997
- Arditti, Rita; Brennan, Pat; & Cavrak, Steve, Science and Liberation, Black Rose Books, Montreal, Quebec, Canada, 1980
- Biodiversity Bulletin, International Alliance of Indigenous-Tribal Peoples of the Tropical Rain forest, London, England, August, 1996
- Brush, Stephen B., Valuing Local Knowledge, Indigenous People and Intellectual Property Rights, Island Press, Washington, DC, 1996
- Burger, Julian, The GAIA Atlas of First Peoples, Gaia Books Ltd., London, 1990
- Cajete, Greg, Look to the Mountain, An Ecology of Indigenous Education, Kivaki Press, Durango, Colorado, 1994
- Chief Seattle's Speech 1854, Seattle Washington Territory, Suquamish, WA
- Colorado, Pam, Bridging Native and Western Science, in Convergence, Vol. 21, No. 2/3, 1988
- Convention on Biological Diversity, Text and Annexes, The Interim Secretariat for the Convention on Biological Diversity, Geneva, Switzerland, November, 1994
- De Ishtar, Zohl, Daughters of the Pacific, Spinifex Press, North Melbourne, Vic. Australia, 1994
- Deloria, Vine, Red Earth White Lies, Native Americans and the Myth of Scientific Fact, Scribner, New York, 1995
- Dukepoo, F., & Harry, D. Indigenous Peoples Coalition on Biopiracy, 1998
- Gall, M., Borg, W., & Gall, J. Educational Research, An Introduction, Longman Publishers, White Plains, NY, 1996

GeneWATCH, Monitoring the Social Impact of Biotechnology, Cambridge, MA , Vol. 10, No.6, 1997

GeneWATCH, Monitoring the Social Impact of Biotechnology, Cambridge, MA, Vol. 11, Nos.1-2, 1998

Gill, D., & Levidow, L., Anti-Racist Science Teaching, Free Association Books, London, 1987

Glesne, G. & Peshkin, A., Becoming Qualitative Researchers, An Introduction, Longman, N.Y., U.S.A. 1992

Hampton, E., Towards a Redefinition of Indian Education, in M. Battiste & J. Barnman (Eds.), First Nations Education in Canada: The Circle Unfolds, University of British Columbia Press, Vancouver, B.C. 1995

Harding, Sandra, The Science Question in Feminism, Cornell University Press, Ithaca, New York, 1986

Harding, Sandra, Whose Science? Whose Knowledge?, Cornell University Press, Ithaca, New York, 1991

Harding, S. The 'Racial' Economy of Science, Indian University Press, Bloomington, 1993.

International Alliance of Indigenous-Tribal Peoples of the Tropical Forest, London, Indigenous Peoples Participation in Global Environmental Negotiations, An Evaluation of Indigenous Peoples' participation in and Impact on the UN Conference on Environment and Development and Its Follow-Up Mechanisms, England, September 1997

Indigenous Case Study Profiles (U.S.A.) no date

Indigenous Environmental Network News, Voice of Native Grassroots for Environmental Justice. Vol.3 No. 2, 1997

Indigenous Woman Magazine, Indigenous Women Address the World, Special Beijing Edition, Rapid City, South Dakota, U.S.A. 1996

- Indigenous Women Magazine, Rapid City, South Dakota, U.S.A., Vol, 2, No. 3, 1996
- Johnson, Martha, Lore, Capturing Traditional Environmental Knowledge, Dene Cultural Institute, International Development Research Centre, Hay River, NWT, Canada, 1992
- Kawagley, Oscar Angayuqaq, A Yupiaq World View: Implication for Cultural, Educational and Technological Adaptation in a Contemporary World, Cross-Cultural Education Development Program University of Alaska Fairbanks, Fairbanks, Alaska, 1993
- Lewontin, R.C., Biology as Ideology: The Doctrine of DNA, Amansi Press, Concord, On., Canada, 1991
- Maliyamkono, T.L. The School as a Force for Community Change in Tanzania, in International Review of Education, Martinus Nijhof Publishers, The Netherlands, 1980
- Mander, Jerry, In the Absence of the Sacred, The Failure of Technology and the Survival of the Indian Nations, Sierra Club Books, San Francisco, 1991
- Martin, Kallen M. The Foundational Values of Cultural Learning, The Ahkwesahsne Science and Math Pilot Project, Winds of Change, American Indian Science and Engineering Society, Boulder, Colorado, Autumn, 1995
- MacIvor, Madeleine, Redefining Science Education for Aboriginal Students, in M. Battiste & J. Barmnan (Eds.), First Nations Education in Canada: The Circle Unfolds, University of British Columbia Press, Vancouver, B.C., 1995
- McLuhan, T.C. Touch the Earth, New Press, Toronto, Canada, 1971
- Na Pua No'eau Handbooklet, University of Hawai'i, Hilo, Hawai'i, 1997/98
- Peat, F. David, Lighting the Seventh Fire, the Spiritual Ways, Healing, and Science of the Native American, Birch Lane Press Book, Carol Publishing Group, New York, 1994

- Posey, Darrell A. Beyond Intellectual Property, Toward Traditional Resource Rights For Indigenous Peoples and Local Communities, International Development Research Centre, Ottawa, Canada 1996
- RAFI Communique, March/April 1997
- RAFI Communique, March/April 1998
- Rothschild, David, Protecting What's Ours, Indigenous Peoples and Biodiversity, South and Meso American Indian Rights Center, Oakland, CA, 1997
- Settee, Priscilla, Prince Albert Drop out Report, 1981
- Shiva, Vandana, Biopiracy the Plunder of Nature and Knowledge, South End Press, Boston, MA, 1997
- Simpson, Tony, Indigenous Heritage and Self-determination, International Work Group and Indigenous Affairs, Copenhagen, Denmark, 1997
- Solomon, J., & Aikenhead STS Education: An International Perspective, Teachers College Press, New York, 1994
- Suzuki, D., & McConnell, A., The Sacred Balance, GreyStone Books, Toronto, 1997
- The Heart of the People Declaration, 1997
- Thornthwaite, Jane, Food Biotechnology and Genetic Engineering: Do You Know Where Your Food Comes From?, 1997
- Thorpe, Dagmar, People of the Seventh Fire, Returning Lifeways of Native America, Akwekon Press, Cornell University American Indian Program, Ithaca, New York, 1996
- Tuana, Nancy, Feminism and Science, Indiana University Press, Bloomington and Indianapolis, 1989
- Weatherford, Jack, Indian Givers, How the Indians of the Americas Transformed the World, Crown Publishers, Inc., New York, 1988

Honouring Indigenous Science Knowledge as a
Means of Ensuring Scientific Responsibility

A Thesis

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by

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Saskatoon, Saskatchewan

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APPENDIX A

The Mataatua Declaration on Cultural and Intellectual Property Rights of Indigenous Peoples

The Mataatua Declaration on Cultural and Intellectual Property Rights of Indigenous Peoples

In recognition that 1993 is the United Nations International Year for the World's Indigenous Peoples, the Nine Tribes of Mataatua, in the Bay of Plenty Region of Aotearoa New Zealand, convened the First International Conference on the Cultural and Intellectual Property Rights of Indigenous Peoples (12-18 June 1993, Whakatane).

Over 150 delegates from 14 countries attended, including indigenous representatives from Ainu (Japan), Australia, Cook Islands, Fiji, India, Panama, Peru, the Philippines, Surinam, USA, and Aotearoa.

The Conference met over 6 days to consider a range of significant issues, including the value of indigenous knowledge, biodiversity and biotechnology, customary environmental management, arts, music, language, and other physical and spiritual cultural forms. On the final day, the following Declaration was passed by the Plenary.

Preamble

Recognizing that 1993 is the United Nations International Year for the World's Indigenous Peoples;

Reaffirming the undertaking of United Nations Member States to:

“Adopt or strengthen appropriate policies and/or legal instruments that will protect indigenous intellectual and cultural property and the right to preserve customary and administrative systems and practices.” —*Agenda 21*, United Nations Conference on Environment and Development (UNCED), (26:4b);

Endorsing the recommendations on Culture and Science from the World Conference of Indigenous Peoples on Territory, Environment, and Development, Kari-Oca, Brazil, 25-30 May 1992;

We

Declare that Indigenous Peoples of the world have the right to self determination, and in exercising that right must be recognized as the exclusive owners of their cultural and intellectual property;

Acknowledge that Indigenous Peoples have a commonality of experiences relating to the exploitation of their cultural and intellectual property;

Affirm that the knowledge of the Indigenous Peoples of the world is of benefit to all humanity;

Recognize that Indigenous Peoples are capable of managing their traditional knowledge themselves, but are willing to offer it to all humanity provided their fundamental rights to define and control this knowledge are protected by the international community;

Insist that the first beneficiaries of indigenous knowledge (cultural and intellectual property rights) must be the direct indigenous descendants of such knowledge; and

Declare that all forms of discrimination and exploitation of Indigenous Peoples, indigenous knowledge, and indigenous cultural and intellectual property rights must cease.

1. Recommendations to Indigenous Peoples

In the development of policies and practices, Indigenous Peoples should:

- 1.1 Define for themselves their own intellectual and cultural property.
- 1.2 Note that existing protection mechanisms are insufficient for the protection of Indigenous Peoples' intellectual and cultural property rights.
- 1.3 Develop a code of ethics which external users must observe when recording (visual, audio, written) their traditional and customary knowledge.
- 1.4 Prioritize the establishment of indigenous education, research, and training centers to promote their knowledge of customary environmental and cultural practices.
- 1.5 Reacquire traditional indigenous lands for the purpose of promoting customary agricultural production.
- 1.6 Develop and maintain their traditional practices and sanctions for the protection, preservation, and revitalization of their traditional intellectual and cultural properties.
- 1.7 Assess existing legislation with respect to the protection of antiquities.
- 1.8 Establish an appropriate body with appropriate mechanisms to:
 - (a) Preserve and monitor the commercialism or otherwise of indigenous cultural properties in the public domain;
 - (b) Generally advise and encourage Indigenous Peoples to take steps to protect their cultural heritage; and
 - (c) Allow a mandatory consultative process with respect to any new legislation affecting Indigenous Peoples' cultural and intellectual property rights.
- 1.9 Establish international indigenous information centres and networks.
- 1.10 Convene a Second International Conference (Hui) on the Cultural and Intellectual Property Rights of Indigenous Peoples to be hosted by the Coordinating Body for the Indigenous Peoples Organizations of the Amazon Basin (COICA).

2. Recommendations to states, and national and international agencies

In the development of policies and practices, states, and national and international agencies must:

- 2.1 Recognize that Indigenous Peoples are the guardians of their customary knowledge and have the right to protect and control dissemination of that knowledge.
- 2.2 Recognize that Indigenous Peoples also have the right to create new knowledge based on cultural traditions.
- 2.3 Note that existing protection mechanisms are insufficient for the protection of Indigenous Peoples cultural and intellectual property rights.
- 2.4 Accept that the cultural and intellectual property rights of Indigenous Peoples are vested with those who created them.
- 2.5 Develop in full cooperation with Indigenous Peoples an additional cultural and intellectual property rights regime incorporating the following:
 - (a) Collective (as well as individual ownership and origin-retroactive coverage of historical as well as contemporary works;
 - (b) Protection against debasement of culturally significant items;
 - (c) Cooperative rather than competitive framework;
 - (d) First beneficiaries to be the direct descendants of the traditional guardians of that knowledge; and
 - (e) coverage span.

Biodiversity and customary environmental management

- 2.6 Indigenous flora and fauna are inextricably bound to the territories of indigenous communities and any property right claims must recognize their traditional guardianship.
- 2.7 Commercialization of any traditional plants and medicines of Indigenous Peoples, must be managed by the Indigenous Peoples who have inherited such knowledge.
- 2.8 A moratorium on any further commercialization of indigenous medicinal plants and human genetic materials must be declared until indigenous communities have developed appropriate protection mechanisms.
- 2.9 Companies and institutions, both governmental and private, must not undertake experiments or commercialization of any biogenetic resources without the consent of the appropriate Indigenous Peoples.
- 2.10 Prioritize settlement of any outstanding land and natural resources claims of Indigenous Peoples for the purpose of promoting customary, agricultural, and marine production.

- 2.11 Ensure current scientific environmental research is strengthened by increasing the involvement of indigenous communities and of customary environmental knowledge.

Cultural objects

- 2.12 All human remains and burial objects of Indigenous Peoples held by museums and other institutions must be returned to their traditional areas in a culturally appropriate manner.
- 2.13 Museums and other institutions must provide, to the country and Indigenous Peoples concerned, an inventory of any indigenous cultural objects still held in their possession.
- 2.14 Indigenous cultural objects held in museums and other institutions must be offered back to their traditional owners.

3. Recommendations to the United Nations

In respect for the rights of Indigenous Peoples, the United Nations should:

- 3.1 Ensure that the process of participation of Indigenous Peoples in United Nations fora is strengthened so their views are fairly represented.
- 3.2 Incorporate the Mataatua Declaration in its entirety in the United Nations Study on Cultural and Intellectual Property of Indigenous Peoples.
- 3.3 Monitor and take action against any states whose persistent policies and activities damage the cultural and intellectual property rights of Indigenous Peoples.
- 3.4 Ensure that Indigenous Peoples actively contribute to the way in which indigenous cultures are incorporated into the 1995 United Nations International Year of Culture.
- 3.5 Call for an immediate halt to the ongoing Human Genome Diversity Project (HUGO) until its moral, ethical, socioeconomic, physical, and political implications have been thoroughly discussed, understood, and approved by Indigenous Peoples.

4. Conclusion

The United Nations, international and national agencies, and states must provide additional funding to indigenous communities in order to implement these recommendations.

June 1993

APPENDIX B

Kari-Oca Declaration and the Indigenous Peoples' Earth Charter

Kari-Oca Declaration and the Indigenous Peoples' Earth Charter

Kari-Oca Declaration

Preamble

The world Conference of Indigenous Peoples on Territory, Environment and Development (25-30 May 1992)

The Indigenous Peoples of the Americas, Asia, Africa, Australia, Europe, and the Pacific, united in one voice at Kari-Oca Villages, express our collective gratitude to the indigenous peoples of Brazil. Inspired by this historical meeting, we celebrate the spiritual unity of the indigenous peoples with the land and ourselves. We continue building and formulating our united commitment to save our Mother the Earth. We, the indigenous peoples, endorse the following declaration as our collective responsibility to carry our indigenous minds and voices into the future.

Declaration

We, the Indigenous Peoples, walk to the future in the footprints of our ancestors.

From the smallest to the largest living being, from the four directions, from the air, the land, and the mountains, the Creator has placed us, the Indigenous Peoples, upon our Mother the Earth.

The footprints of our ancestors are permanently etched upon the land of our peoples.

We, the Indigenous Peoples, maintain our inherent rights to self-determination.

We have always had the right to decide our own forms of government, to use our own laws to raise and educate our children, to our own cultural identity without interference.

We continue to maintain our rights as peoples despite centuries of deprivation, assimilation, and genocide.

We maintain our inalienable rights to our lands and territories, to all our resources — above and below — and to our waters. We assert our ongoing responsibility to pass these on to the future generations.

We cannot be removed from our lands. We, the Indigenous Peoples, are connected by the circle of life to our land and environments.

We, the Indigenous Peoples, walk to the future in the footprints of our ancestors.

Signed at Kari-Oca, Brazil, on the 30th day of May, 1992

Indigenous Peoples' Earth Charter

(Please note, for the purposes of the Declaration, and this statement, any use of the term "indigenous peoples" also includes tribal peoples.)

Human rights and international law

1. We demand the right to life.
2. International law must deal with the collective human rights of indigenous peoples.
3. There are many international instruments which deal with the rights of individuals, but there are no declarations to recognize collective human rights. Therefore, we urge governments to support the United Nations Working Group on Indigenous Peoples' (UNWGIP) Universal Declaration of Indigenous Rights, which is presently in draft form.
4. There exists many examples of genocide against indigenous peoples. Therefore, the convention against genocide must be changed to include the genocide of indigenous peoples.
5. The United Nations should be able to send indigenous peoples' representatives in a peace-keeping capacity, into indigenous territories where conflicts arise. This would be done at the request and consent of the indigenous peoples concerned.
6. The concept of Terra Nullius must be eliminated from international law usage. Many state governments have used internal domestic laws to deny us ownership of our own lands. These illegal acts should be condemned by the world.
7. Where small numbers of indigenous peoples are residing within state boundaries, so-called democratic countries have denied indigenous peoples the right of consent about their future, using the notion of majority rules to decide the future of indigenous peoples. Indigenous peoples' right of consent to projects in their areas must be recognized.
8. We must promote the term "indigenous peoples" at all fora. The use of the term "indigenous peoples" must be without qualifications.
9. We urge governments to ratify International Labour Organisation (ILO) Convention 169 to guarantee an international legal instrument for indigenous peoples (Group 2 only).
10. Indigenous peoples' distinct and separate rights within their own territories must be recognized.
11. We assert our rights to free passage through state-imposed political boundaries dividing our traditional territories. Adequate mechanisms must be established to secure this right.
12. The colonial systems have tried to dominate and assimilate our peoples. However, our peoples remain distinct despite these pressures.

13. Our indigenous governments and legal systems must be recognized by the United Nations, state governments, and international legal instruments.
14. Our right to self-determination must be recognized.
15. We must be free from population transfer.
16. We maintain our right to our traditional way of life.
17. We maintain our right to our spiritual way of life.
18. We maintain the right to be free from pressures from multinational (transnational) corporations upon lives and lands. All multinational (transnational) corporations which are encroaching upon indigenous lands should be reported to the United Nations Transnational Office.
19. We must be free from racism.
20. We maintain the right to decide the direction of our communities.
21. The United Nations should have a special procedure to deal with issues arising from violations of indigenous treaties.
22. Treaties signed between indigenous peoples and nonindigenous peoples must be accepted as treaties under international law.
23. The United Nations must exercise the right to impose sanctions against governments that violate the rights of indigenous peoples.
24. We urge the United Nations to include the issue of indigenous peoples in the agenda of the World Conference of Human Rights to be held in 1993. The work done so far by the United Nations Inter-American Commission of Human Rights should be taken into consideration.
25. Indigenous peoples should have the right to their own knowledge, language, and culturally appropriate education, including bicultural and bilingual education. Through recognizing both formal and informal ways, the participation of family and community is guaranteed.
26. Our health rights must include the recognition and respect of traditional knowledge held by indigenous healers. This knowledge, including our traditional medicines and their preventive and spiritual healing power, must be recognized and protected against exploitation.
27. The World Court must extend its powers to include complaints by indigenous peoples.
28. There must be a monitoring system from this conference to oversee the return of delegates to their territories. The delegates should be free to attend and participate in international indigenous conferences.
29. Indigenous women's rights must be respected. Women must be included in all local, national, regional, and international organizations.

30. The above-mentioned historical rights of indigenous peoples must be guaranteed in national legislation.

Land and territories

31. Indigenous peoples were placed upon our Mother the Earth by the Creator. We belong to the land. We cannot be separated from our lands and territories.
32. Our territories are living totalities in permanent vital relation between human beings and nature. Their possession produces the development of our culture. Our territorial property should be inalienable, unceasable, and not denied title. Legal, economic, and technical back-up are needed to guarantee this.
33. Indigenous peoples' inalienable right to land and resources confirm that we have always had ownership and stewardship over our traditional territories. We demand that these be respected.
34. We assert our rights to demarcate our traditional territories. The definition of territory includes space (air), land, and sea. We must promote a traditional analysis of traditional land rights in all our territories.
35. Where indigenous territories have been degraded, resources must be made available to restore them. The recuperation of those affected territories is the duty of the respective jurisdiction in all nation states, which cannot be delayed. Within this process of recuperation the compensation for the historical ecological debt must be taken into account. Nation states must revise in depth the agrarian, mining, and forestry policies.
36. Indigenous peoples reject the assertion of nonindigenous laws onto our lands; states cannot unilaterally extend their jurisdiction over our lands and territories. The concept of Terra Nullius should be forever erased from the law books of states.
37. We, as indigenous peoples, must never alienate our lands. We must always maintain control over the land for future generations.
38. If a nonindigenous government, individual, or corporation wants to use our lands, then there must be a formal agreement which sets out the terms and conditions. Indigenous peoples maintain the right to be compensated for the use of their lands and resources.
39. Traditional indigenous territorial boundaries, including the waters, must be respected.
40. There must be some control placed upon environmental groups who are lobbying to protect our territories and the species within those territories. In many instances, environmental groups are more concerned about animals than human beings. We call for indigenous peoples to determine guidelines prior to allowing environmental groups into their territories.

41. Parks must not be created at the expense of indigenous peoples. There is no way to separate indigenous peoples from their lands.
42. Indigenous peoples must not be removed from their lands in order to make it available to settlers or other forms of economic activity on their lands.
43. In many instances, the numbers of indigenous peoples have been decreasing because of encroachment by nonindigenous peoples.
44. Indigenous peoples should encourage their peoples to cultivate their own traditional forms of products rather than to use imported exotic crops which do not benefit local peoples.
45. Toxic wastes must not be deposited in our areas. Indigenous peoples must realize that chemicals, pesticides, and hazardous wastes do not benefit the peoples.
46. Traditional areas must be protected against present and future forms of environmental degradation.
47. There must be a cessation of all uses of nuclear material.
48. Mining of products for nuclear production must cease.
49. Indigenous lands must not be used for the testing or dumping of nuclear products.
50. Population transfer policies by state governments in our territories are causing hardship. Traditional lands are lost and traditional livelihoods are being destroyed.
51. Our lands are being used by state governments to obtain funds from the World Bank, the International Monetary Fund, the Asian Pacific Development Bank, and other institutions, which has led to a loss of our lands and territories.
52. In many countries, our lands are being used for military purposes. This is an unacceptable use of the lands.
53. The colonizer governments have changed the names of our traditional and sacred areas. Our children learn these foreign names and start to lose their identity. In addition, the changing of the name of a place diminishes respect for the spirits which reside in those areas.
54. Our forests are not being used for their intended purposes. The forests are being used to make money.
55. Traditional activities, such as making pottery, are being destroyed by the importation of industrial goods. This impoverishes the local peoples.

Biodiversity and conservation

56. The Vital Circles are in a continuous interrelation in such a way that the change of one of its elements affects the whole.

57. Climatic changes affect indigenous peoples and all humanity. In addition, ecological systems and their rhythms are affected, which contributes to the deterioration of our quality of life and increases our dependency.
58. The forests are being destroyed in the name of development and economic gains without considering the destruction of ecological balance. These activities do not benefit human beings, animals, birds, and fish. The logging concessions and incentives to the timber, cattle, and mining industries affecting the ecosystems and the natural resources should be cancelled.
59. We value the efforts of protection of the Biodiversity but we reject being included as part of an inert diversity which pretends to be maintained for scientific and folkloric purposes.
60. The indigenous peoples' strategies should be kept in a reference framework for the formulation and application of national policies on environment and biodiversity.

Development strategies

61. Indigenous peoples must consent to all projects in our territories. Prior to consent being obtained the peoples must be fully and entirely involved in any decisions. They must be given all the information about the project and its effects. Failure to do so should be considered a crime against the indigenous peoples. The person or persons who violate this should be tried in a world tribunal within the control of indigenous peoples set for such a purpose. This could be similar to the trials held after World War II.
62. We have the right to our own development strategies based on our cultural practices and with a transparent, efficient, and viable management and with economical and ecological viability.
63. Our development and life strategies are obstructed by the interests of the government and big companies and by the neoliberal policies. Our strategies have, as a fundamental condition, the existence of international relationships based on justice, equity, and solidarity between the human beings and the nations.
64. Any development strategy should prioritize the elimination of poverty, the climatic guarantee, the sustainable manageability of natural resources, the continuity of democratic societies, and the respect of cultural differences.
65. The Global Environmental Facility should assign at best 20 percent for indigenous peoples' strategies and programs of environmental emergency, improvement of life quality, protection of natural resources, and rehabilitation of ecosystems. This proposal in the case of South America and the Caribbean should be concrete in the indigenous development fund as a pilot experience in order to be extended to the indigenous peoples of other regions and continents.
66. The concept of development has meant the destruction of our lands. We reject the current definition of development as being useful to our peoples.

Our cultures are not static and we keep our identity through a permanent recreation of our life conditions; but all of this is obstructed in the name of so-called developments.

67. Recognizing indigenous peoples' harmonious relationship with Nature, indigenous sustainable development strategies and cultural values must be respected as distinct and vital sources of knowledge.
68. Indigenous peoples have been here since the time before time began. We have come directly from the Creator. We have lived and kept the Earth as it was on the First Day. Peoples who do not belong to the land must go out from the lands because those things (so called "development" on the land) are against the laws of the Creator.
69.
 - (a) In order for indigenous peoples to assume control, management and administration of their resources and territories, development projects must be based on the principles of self-determination and self-management.
 - (b) Indigenous peoples must be self-reliant.
70. If we are going to grow crops, we must feed the peoples. It is not appropriate that the lands be used to grow crops which do not benefit the local peoples.
 - (a) Regarding indigenous policies, state government must cease attempts of assimilation and integration.
 - (b) Indigenous peoples must consent to all projects in their territories. Prior to consent being obtained, the peoples must be fully and entirely involved in any decisions. They must be given all the information about the project and its effects. Failure to do so should be considered a crime against indigenous peoples. The person or persons responsible should be tried before a world tribunal, with a balance of indigenous peoples set up for such a purpose. This could be similar to the trials held after the World War II.
71. We must never use the term "Land claims." It is the nonindigenous peoples which do not have any land. All the land is our land. It is nonindigenous peoples who are making claims to our lands. We are not making claims to our lands.
72. There should be a monitoring body within the United Nations to monitor all the land disputes around the world prior to development.
73. There should be a United Nations conference on the topic of "Indigenous Lands and Development."
74. Nonindigenous peoples have come to our lands for the purpose of exploiting these lands and resources to benefit themselves, and to the impoverishment of our peoples. Indigenous peoples are victims of development. In many cases, indigenous peoples are exterminated in the name of a development program. There are numerous examples of such occurrences.
75. Development that occurs on indigenous lands, without the consent of indigenous peoples, must be stopped.

76. Development which is occurring on indigenous lands is usually decided without local consultation by those who are unfamiliar with local conditions and needs.
77. The Eurocentric notion of ownership is destroying our peoples. We must return to our own view of the world, of the land, and of development. The issue cannot be separated from indigenous peoples' rights.
78. There are many different types of so-called development: road construction, communication facilities such as electricity, telephones. These allow developers easier access to the areas, but the effects of such industrialization destroy the lands.
79. There is a world-wide move to remove indigenous peoples from their lands and place them in villages. The relocation from the traditional territories is done to facilitate development.
80. It is not appropriate for governments or agencies to move into our territories and to tell our peoples what is needed.
81. In many instances, the state governments have created artificial entities such as "district council" in the name of the state government in order to deceive the international community. These artificial entities then are consulted about development in the area. The state government, then, claims that indigenous peoples were consulted about the project. These lies must be exposed to the international community.
82. There must be an effective network to disseminate material and information between indigenous peoples. This is necessary in order to keep informed about the problems of other indigenous peoples.
83. Indigenous peoples should form and direct their own environmental network.

Culture, science, and intellectual property

84. We feel the Earth as if we are within our mother. When the Earth is sick and polluted, human health is impossible. To heal ourselves, we must heal the Planet, and to heal the Planet, we must heal ourselves.
85. We must begin to heal from the grassroots level and work towards the international level.
86. The destruction of the culture has always been considered an internal, domestic problem within national states. The United Nation must set up a tribunal to review the cultural destruction of the indigenous peoples.
87. We need to have foreign observers come into our indigenous territories to oversee national state elections to prevent corruption.
88. The human remains and artifacts of indigenous peoples must be returned to their original peoples.

89. Our sacred and ceremonial sites should be protected and considered as the patrimony of indigenous peoples and humanity. The establishment of a set of legal and operational instruments at both national and international levels would guarantee this.
90. The use of existing indigenous languages is our right. These languages must be protected.
91. States that have outlawed indigenous languages and their alphabets should be censured by United Nations.
92. We must not allow tourism to be used to diminish our culture. Tourists come into the communities and view the people as if indigenous peoples were part of a zoo. Indigenous peoples have the right to allow or to disallow tourism within their areas.
93. Indigenous peoples must have the necessary resources and control over their own education systems.
94. Elders must be recognized and respected as teachers of the young people.
95. Indigenous wisdom must be recognized and encouraged.
96. The traditional knowledge of herbs and plants must be protected and passed onto future generations.
97. Traditions cannot be separated from land, territory, or science.
98. Traditional knowledge has enabled indigenous peoples to survive.
99. The usurping of traditional medicines and knowledge from indigenous peoples should be considered a crime against peoples.
100. Material culture is being used by the nonindigenous to gain access to our lands and resources, thus destroying our cultures.
101. Most of the media at this conference were only interested in the pictures which will be sold for profit. This is another case of exploitation of indigenous peoples. This does not advance the cause of indigenous peoples.
102. As creators and carriers of civilizations which have given and continue to share knowledge, experience, and values with humanity, we require that our right to intellectual and cultural properties be guaranteed and that the mechanism for each implementation be in favour of our peoples and studied in depth and implemented. This respect must include the right over genetic resources, genebanks, biotechnology, and knowledge of biodiversity programs.
103. We should list the suspect museums and institutions that have misused our cultural and intellectual properties.

104. The protection, norms, and mechanisms of artistic and artisan creation of our peoples must be established and implemented in order to avoid plunder, plagiarism, undue exposure, and use.
105. When indigenous peoples leave their communities, they should make every effort to return to the community.
106. In many instances, our songs, dances, and ceremonies have been viewed as the only aspects of our lives. In some instances, we have been asked to change a ceremony or a song to suit the occasion. This is racism.
107. At local, national, and international levels, governments must commit funds to new and existing resources to education and training for indigenous peoples, to achieve their sustainable development, to contribute and to participate in sustainable and equitable development at all levels. Particular attention should be given to indigenous women, children, and youth.
108. All kinds of folkloric discrimination must be stopped and forbidden.
109. The United Nations should promote research into indigenous knowledge and develop a network of indigenous sciences.

APPENDIX C

The Draft Declaration on the Rights of Indigenous Peoples

UN Draft Declaration on the Rights of Indigenous Peoples

Affirming that indigenous peoples are equal in dignity and rights to all other peoples, while recognizing the right of all peoples to be different, to consider themselves different, and to be respected as such,

Affirming also that all peoples contribute to the diversity and richness of civilizations and cultures, which constitute the common heritage of humankind,

Affirming further that all doctrines, policies, and practices based on or advocating superiority of peoples or individuals on the basis of national origin, racial, religious, ethnic, or cultural differences are racist, scientifically false, legally invalid, morally condemnable, and socially unjust,

Reaffirming also that indigenous peoples, in the exercise of their right, should be free from the discrimination of any kind,

Concerned that indigenous peoples have been deprived of their human rights and fundamental freedoms, resulting, inter alia, in their colonization and dispossession of their lands, territories, and resources, thus preventing them from exercising, in particular, their right to development in accordance with their own needs and interests,

Recognizing the urgent need to respect and promote the inherent rights and characteristics of indigenous peoples, especially their rights to their lands, territories, and resources, which derive from their political, economic, and social structures, and from their cultures, spiritual traditions, histories, and philosophies,

Welcoming the fact that indigenous peoples are organizing themselves for political, economic, social, and cultural enhancement and in order to bring an end to all forms of discrimination and oppression wherever they occur,

Convinced that control by indigenous peoples over developments affecting them and their lands, territories, and resources will enable them to maintain and strengthen their institutions, cultures and traditions, and to promote their development in accordance with their institutions, cultures, and traditions, and to promote their development in accordance with their aspirations,

Recognizing also that respect for indigenous knowledge, cultures, and traditional practices contributes to sustainable and equitable development and proper management of the environment,

Emphasizing the need for demilitarization of the lands and territories of indigenous peoples, which will contribute to peace, economic, and social progress and development, understanding, and friendly relations among the nations and peoples of the world,

Recognizing in particular the right of indigenous families and communities to retain shared responsibility for the upbringing, training, education, and well-being of their children,

Recognizing also that indigenous peoples have the right freely to determine their relationships with States in a spirit of coexistence, mutual benefit, and full respect,

Considering that treaties, agreements, and other arrangements between States and indigenous peoples are properly matters of international concern and responsibility,

Acknowledging that the Charter of the United Nations, the International Covenant on Economic, Social and Cultural Rights, and the International Covenant on Civil and Political Rights affirm the fundamental importance of the right of self-determination of all peoples, by virtue of which they freely determine their political status and freely pursue their economic, social, and cultural development,

Bearing in mind that nothing in this Declaration may be used to deny any peoples their right of self-determination,

Encouraging States to comply with and effectively implement all international instruments, in particular those related to human rights, as they apply to indigenous peoples, in consultation and cooperation with the peoples concerned,

Emphasizing that the United Nations has an important and continuing role to play in promoting and protecting the rights of indigenous peoples,

Believing that this Declaration is a further important step forward for the recognition, promotion, and protection of the rights and freedoms of indigenous peoples and in the development of relevant activities of the United Nations system in this field.

Solemnly proclaims the following United Nations Declaration on the Rights of Indigenous Peoples:

Articles

Part I

1. Indigenous peoples have the right to the full and effective enjoyment of all human rights and fundamental freedoms recognize in the Charter of the United Nations, the Universal Declaration of Human Rights, and international human rights law.
2. Indigenous individuals and peoples are free and equal to other individuals and peoples in dignity and rights, and have the right to be free from any kind of adverse discrimination, in particular that based on their indigenous origin or identity.
3. Indigenous peoples have the right of self-determination. By virtue of that right they freely determine their political status and freely pursue their economic, social, and cultural development.
4. Indigenous peoples have the right to maintain and strengthen their distinct political, economic, social, and cultural characteristics, as well as their

legal systems, while retaining their rights to participate fully, if they so choose, in the political, economic, social, and cultural life of the State.

5. Every indigenous individual has the right to a nationality.

Part II

6. Indigenous peoples have the collective right to live in freedom, peace, and security as distinct peoples and to full guarantees against genocide or any other act of violence, including the removal of indigenous children from their families and communities under any pretext. In addition, they have the individual rights to life, physical and mental integrity, liberty and security of person.
7. Indigenous peoples have the collective and individual right not to be subjected to ethnocide and cultural genocide, including prevention of and redress for:
 - (a) Any action which has the aim or effect of depriving them of their integrity as distinct peoples, or of their cultural values or ethnic identities;
 - (b) Any action which has the aim or effect of dispossessing them of their lands, territories, or resources;
 - (c) Any form of population transfer which has the aim or effect of violating or undermining any of their rights;
 - (d) Any form of assimilation or integration by other cultures or ways of life imposed on them by legislative, administrative or other measures;
 - (e) Any form of propaganda directed against them.
8. Indigenous peoples have the collective and individual right to maintain and develop their distinctive identities and characteristics, including the right to identify themselves as indigenous and to be recognized as such.
9. Indigenous peoples and individuals have the right to belong to an indigenous community or nation, in accordance with the traditions and customs of the community or nation concerned. No disadvantage of any kind may arise from the exercise of such a right.
10. Indigenous peoples shall not be forcibly removed from their lands or territories. No relocation shall take place without the free and informed consent of the indigenous peoples concerned and after agreement on just and fair compensation and, where possible, with the option of return.
11. Indigenous peoples have the right to special protection and security in periods of armed conflict. States shall observe international standards, in particular the Fourth Geneva Convention of 1949, for the protection of civilian populations in circumstances of emergency and armed conflict, and shall not:
 - (a) Recruit indigenous individuals against their will into the armed forces and, in particular, for use against other indigenous peoples;
 - (b) Recruit indigenous children into the armed forces under any circumstances;

- (c) Force indigenous individuals to abandon their lands, territories or means of subsistence, or relocate them in special centres for military purposes;
- (d) Force indigenous individuals to work for military purposes under any discriminatory purposes.

Part III

12. Indigenous peoples have the right to practice and revitalize their cultural traditions and customs. This includes the right to maintain, protect, and develop the past, present, and future manifestations of their cultures, such as archaeological and historical sites, artifacts, designs, ceremonies, technologies, and visual and performing arts and literature, as well as the right to the restitution of cultural, intellectual, religious, and spiritual property taken without their free and informed consent or in violation of their laws, traditions, and customs.
13. Indigenous peoples have the right to manifest, practice, develop, and teach their spiritual and religious traditions, customs, and ceremonies; the right to maintain, protect, and have access in privacy to their religious and cultural sites; the right to the use and control of ceremonial objects; and the right to the repatriation of human remains. States shall take effective measures, in the conjunction with the indigenous peoples concerned, to ensure that indigenous sacred places, including burial sites, be preserved, respected, and protected.
14. Indigenous peoples have the right to revitalize, use, develop, and transmit to future generations their histories, languages, oral traditions, philosophies, writing systems, and literatures, and to designate and retain their own names for communities, places and persons. States shall take effective measures, whenever any right of indigenous peoples may be threatened, to ensure this right is protected and also to ensure that they can understand and be understood in political, legal, and administrative proceedings, where necessary through the provision of interpretation or by any other appropriate means.

Part IV

15. Indigenous children have the right to all levels and forms of education of the State. All indigenous peoples also have this right and the right to establish and control their educational systems and institutions providing education in their own languages, in a manner appropriate to their cultural methods of teaching and learning. Indigenous children living outside their communities have the right to be provided access to education in their own culture and language. States shall take effective measures to provide appropriate resources for these purposes.
16. Indigenous peoples have the right to have the dignity and diversity of their cultures, traditions, histories, and aspirations appropriately reflected in all forms of education and public information. States shall take effective measure, in consultation with the indigenous peoples concerned, to eliminate prejudice and discrimination and to promote tolerance, understanding, and good relations among indigenous peoples and all segments of society.

17. Indigenous peoples have the right to establish their own media in their own languages. They also have the right to equal access to all forms of nonindigenous media. States shall take effective measures to ensure that State-owned media duly reflect indigenous cultural diversity.
18. Indigenous peoples have the right to enjoy fully all rights established under international labour law and national labour legislation. Indigenous peoples have the right not to be subjected to any discriminatory conditions of labour, employment, or salary.

Part V

19. Indigenous peoples have the right to participate fully, if they so choose, at all levels of decision-making in matters which may affect their rights, lives, and destinies through representatives chosen by themselves in accordance with their own procedures, as well as to maintain and develop their own indigenous decision-making institutions.
20. Indigenous peoples have the right to participate fully, if they so choose, through procedures determined by them, in devising legislative or administrative measures that may affect them. States shall obtain the free and informed consent of the peoples concerned before adopting and implementing such measures.
21. Indigenous peoples have the right to maintain and develop their political, economic, and social systems, to be secure in the enjoyment of their own means of subsistence and development, and to engage freely in all their traditional and other economic activities. Indigenous peoples who have been deprived of their means of subsistence and development are entitled to just and fair compensation.
22. Indigenous peoples have the right to special measures for the immediate, effective, and continuing improvement of their economic and social conditions, including in the areas of employment, vocational training and retraining, housing, sanitation, health, and social security. Particular attention shall be paid to the rights and special needs of indigenous elders, women, youth, children, and disabled persons.
23. Indigenous peoples have the right to determine and develop priorities and strategies for exercising their right to development. In particular, indigenous peoples have the right to determine and develop all health, housing, and other economic and social programs affecting them and, as far as possible, to administer such programs through their own institutions.
24. Indigenous peoples have the right to their traditional medicines and health practices, including the right to the protection of vital medicinal plants, animals and minerals. They also have the right to access, without any discrimination, to all medicinal institutions, health services, and medical care.

Part VI

25. Indigenous peoples have the right to maintain and strengthen their distinctive spiritual and material relationships with the lands, territories, waters, and coastal seas and other resources which they have traditionally owned or otherwise occupied or used, and to uphold their responsibilities to future generations in this regard.
26. Indigenous peoples have the right to own, develop, control, and use the lands and territories, including the total environment of the lands, air waters, coastal seas, sea-ice, flora and fauna, and other resources which they have traditionally owned or otherwise occupied or used. This includes the right to the full recognition of their laws, traditions and customs, land-tenure systems, and institutions for the development and management of resources, and the right to effective measures by States to prevent any interference with, alienation of, or encroachment upon these rights.
27. Indigenous peoples have the right to the restitution of the lands, territories, and resources which they have traditionally owned or otherwise occupied or used; and which have been confiscated, occupied, used, or damaged without their free and informed consent. Where this is not possible, they have the right to just and fair compensation. Unless otherwise freely agreed upon by the peoples concerned, compensation shall take the form of lands, territories, and resources equal in quality, size, and legal status.
28. Indigenous peoples have the right to the conservation, restoration, and protection of the total environment and the productive capacity of their lands, territories, and resources, as well as to assistance for this purpose from States and through international cooperation. Military activities shall not take place in the lands and territories of indigenous peoples, unless otherwise freely agreed upon by the peoples concerned. States shall take effective measures to ensure that no storage of hazardous materials shall take place in the lands and territories of indigenous peoples. States shall also take effective measures to ensure, as needed, that programs for monitoring, maintaining, and restoring the health of indigenous peoples, as developed and implemented by the peoples affected by such materials, are duly implemented.
29. Indigenous peoples are entitled to the recognition of the full ownership, control, and protection of their cultural and intellectual property. They have the right to special measures to control, develop, and protect their sciences, technologies, and cultural manifestations, including human and other genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, and visual and performing arts.
30. Indigenous peoples have the right to determine and develop priorities and strategies for the development or use of their lands, territories, and other resources, including the right to require that States obtain their free and informed consent prior to the approval of any project affecting their lands, territories, and other resources, particularly in connection with the development, utilization, or exploitation of mineral, water, or other resources. Pursuant to agreement with the indigenous peoples concerned,

just and fair compensation shall be provided for any such activities and measures taken to mitigate adverse environmental, economic, social, cultural, or spiritual impact.

Part VII

31. Indigenous peoples, as a specific form of exercising their right to self-determination, have the right to autonomy or self-government in matters relating to their internal and local affairs, including cultural, religion, education, information, media, health, housing, employment, social welfare, economic activities, land and resources management, environment, and entry by nonmembers, as well as ways and means for financing these autonomous functions.
32. Indigenous peoples have the collective right to determine their own citizenship in accordance with their customs and traditions. Indigenous citizenship does not impair the right of indigenous individuals to obtain citizenship of the States in which they live. Indigenous peoples have the right to determine the structures and to select the membership of their institutions in accordance with their own procedures.
33. Indigenous peoples have the right to promote, develop, and maintain their institutional structures and their distinctive juridical customs, traditions, procedures, and practices, in accordance with internationally recognized human rights standards.
34. Indigenous peoples have the collective right to determine the responsibilities of individuals to their communities.
35. Indigenous peoples, in particular those divided by international borders, have the right to maintain and develop contacts, relations, and cooperation, including activities for spiritual, cultural, political, economic, and social purposes, with other peoples across borders. States shall take effective measures to ensure the exercise and implementation of this right.
36. Indigenous peoples have the right to the recognition, observance, and enforcement of treaties, agreements, and other constructive arrangements concluded with States or their successors, according to their original spirit and intent, and to have States honour and respect such treaties, agreements, and other constructive arrangements. Conflicts and disputes which cannot otherwise be settled should be submitted to competent international bodies agreed to by all parties concerned.

Part VIII

37. States shall take effective and appropriate measures, in consultation with the indigenous peoples concerned, to give full effect to the provisions of this Declaration. The rights recognized herein shall be adopted and included in national legislation in such a manner that indigenous peoples can avail themselves of such rights in practice.
38. Indigenous peoples have the right to have access to adequate financial and technical assistance, from States and through international cooperation, to pursue freely their political, economic, social, cultural, and spiritual

development and for the enjoyment of the rights and freedoms recognized in this Declaration.

39. Indigenous peoples have the right to have access to and prompt decision through mutually acceptable and fair procedures for the resolution of conflicts and disputes with States, as well as to effective remedies for all infringements of their individual and collective rights. Such a decision shall take into consideration the customs, traditions, rules, and legal systems of the indigenous peoples concerned.
40. The organs and specialized agencies of the United Nations system and other inter-governmental organizations shall contribute to the full realization of the provisions of this Declaration through the mobilization, inter alia, of financial cooperation and technical assistance. Ways and means of ensuring participation of indigenous peoples in issues affecting them shall be established.
41. The United Nations shall take the necessary steps to ensure the implementation of this Declaration including the creation of a body at the highest level with special competence in this field and with the direct participation of indigenous peoples. All United Nations bodies shall promote respect for and full application of the provisions of this Declaration.

Part IX

42. The rights recognized herein constitute the minimum standards for the survival, dignity, and well-being of the indigenous peoples of the world.
43. All the rights and freedoms recognized herein are equally guaranteed to male and female indigenous individuals.
44. Nothing in this Declaration may be construed as diminishing or extinguishing existing or future rights indigenous peoples may have or acquire.
45. Nothing in this Declaration may be interpreted as implying for any State, group, or person any right to engage in any activity or to perform any act contrary to the Charter of the United Nations.

As agreed upon by the members of the Working Group on Indigenous Populations at its 11th session, 1993.