

CAPE BRETON
UNIVERSITY

Cheryl Bartlett, PhD

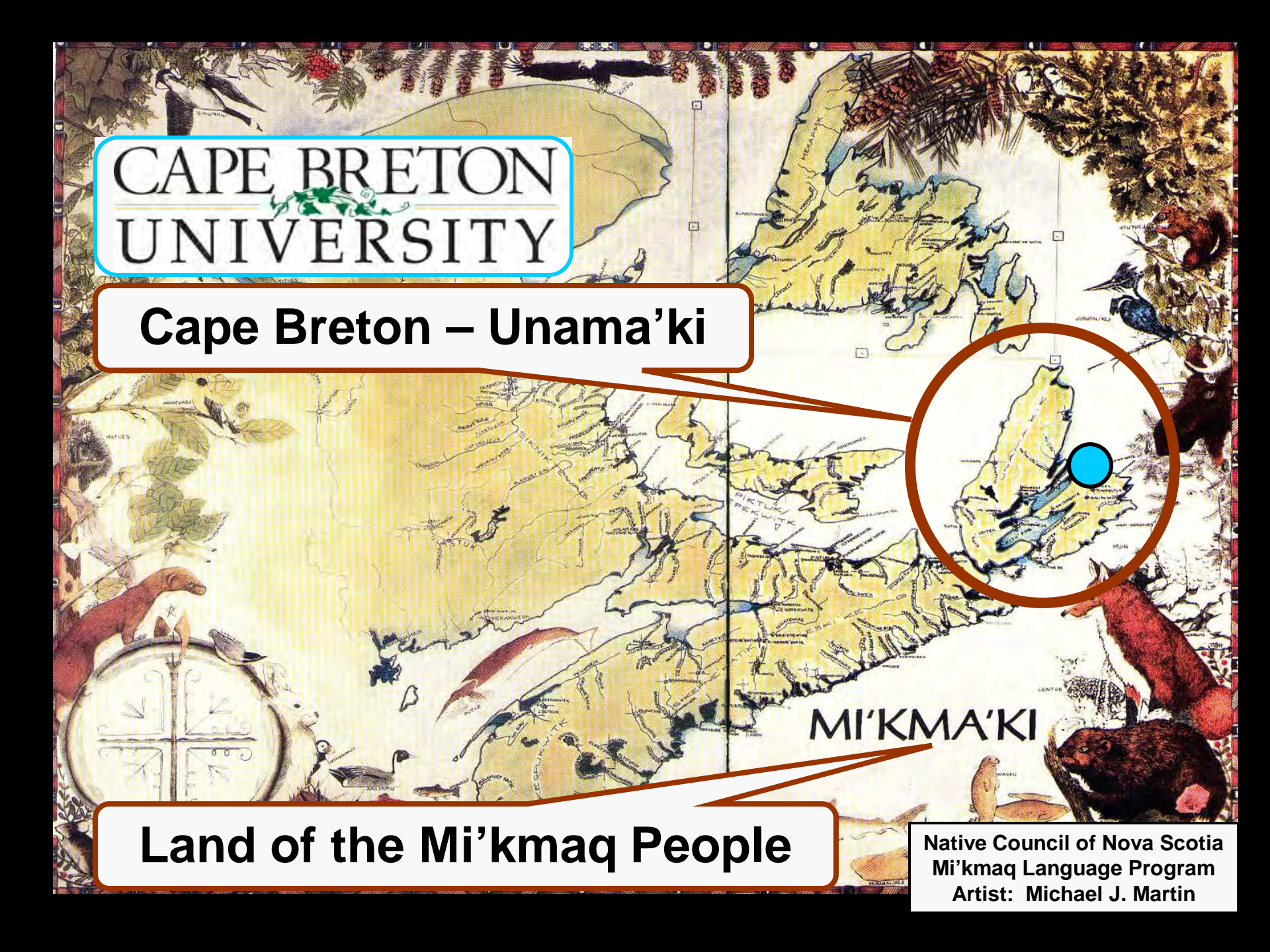
Institute for Integrative Science
& Health

Knowledges Working Together: Integrative Science



“Two-Eyed Seeing”

Adult Learning Association of Cape Breton County; 18 April 2006

A detailed map of Cape Breton Island, Nova Scotia, Canada, set against a background of various animals and plants. The map is yellow and shows the island's coastline, rivers, and towns. A blue dot is placed on the map, and a circular callout provides a magnified view of that area. The text 'CAPE BRETON UNIVERSITY' is in a blue-bordered box at the top left. 'Cape Breton – Unama'ki' is in a white-bordered box below it. 'MI'KMA'KI' is written in large letters at the bottom right. A white-bordered box at the bottom left contains the text 'Land of the Mi'kmaq People'. A white-bordered box at the bottom right contains the text 'Native Council of Nova Scotia Mi'kmaq Language Program Artist: Michael J. Martin'.

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Cape Breton – Unama'ki

MI'KMA'KI

Land of the Mi'kmaq People

Native Council of Nova Scotia
Mi'kmaq Language Program
Artist: Michael J. Martin

Integrative Science

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mid 1990's

no Mi'kmaq students in science

1999 - 2006

many Mi'kmaq students in science

Land of the Mi'kmaq People

Native Council of Nova Scotia
Mi'kmaq Language Program
Artist: Michael J. Martin

A map of the Mi'kma'ki region in Nova Scotia, Canada, is the central focus. The map is overlaid with a grid and various geographical labels. Surrounding the map are numerous detailed illustrations of local wildlife, including various birds, a moose, a fox, a bear, and a rabbit. In the bottom left corner, there is a circular emblem with a cross and other symbols. The text 'MI'KMA'KI' is written in large, bold, black letters across the bottom right of the map.

mid 1990's & now

**other universities in
traditional territory of Mi'kma'ki**

**... almost
no Mi'kmaq students in science**

Land of the Mi'kmaq People

**Native Council of Nova Scotia
Mi'kmaq Language Program
Artist: Michael J. Martin**

mid 1990's & now



Mi'kma'ki

same picture other Aboriginal students
... universities across Canada
and throughout North America

Indigenous

Western

The central dilemma of science education today is the teaching of science from only one cultural perspective, and in an incomplete and non-connected manner.

Gregory Cajete, PhD, Univ. of New Mexico



Artist Basma Kavanagh

Toqwa'tu'kl Kjjitaqnn Integrative Science

Science: stories of our interactions with and within Nature



Indigenous

Western

“bringing our knowledges together”

collaborative initiatives

Mi'kmaq
Elders



**UNAMA'KI
INSTITUTE OF
NATURAL
RESOURCES**



CAPE BRETON UNIVERSITY

Canada Foundation for Innovation / Fondation canadienne pour l'innovation



CIHR IRSC / Canadian Institutes of Health Research / Instituts de recherche en santé du Canada

IWK Health Centre Foundation

IAPH

NOVA SCOTIA Health Research FOUNDATION

UNAMA'KI INSTITUTE OF NATURAL RESOURCES



Mi'kmaq Elders

NSERC CRSNG

Mi'kmawey Debert



Royal Canadian Mounted Police / Gendarmerie royale du Canada

collaborative initiatives

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post-secondary
science
education

collaborative initiatives

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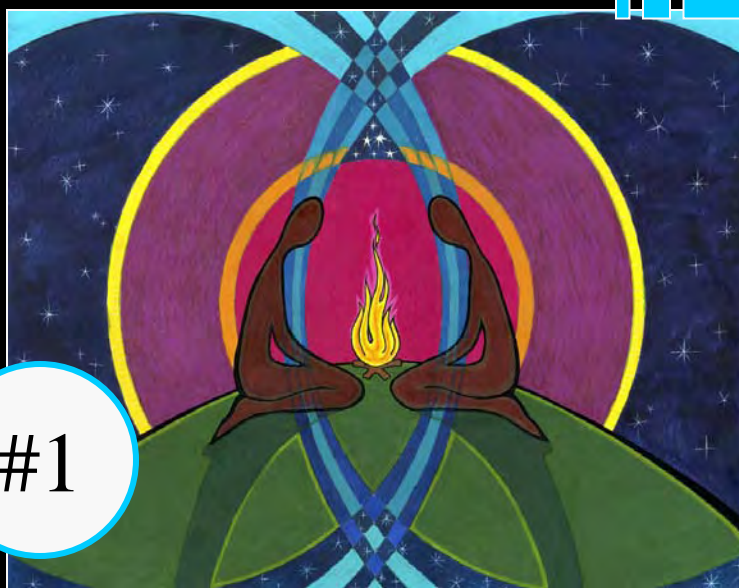
#2



CIHR IRSC

health research

#1



post-secondary
science
education

collaborative initiatives

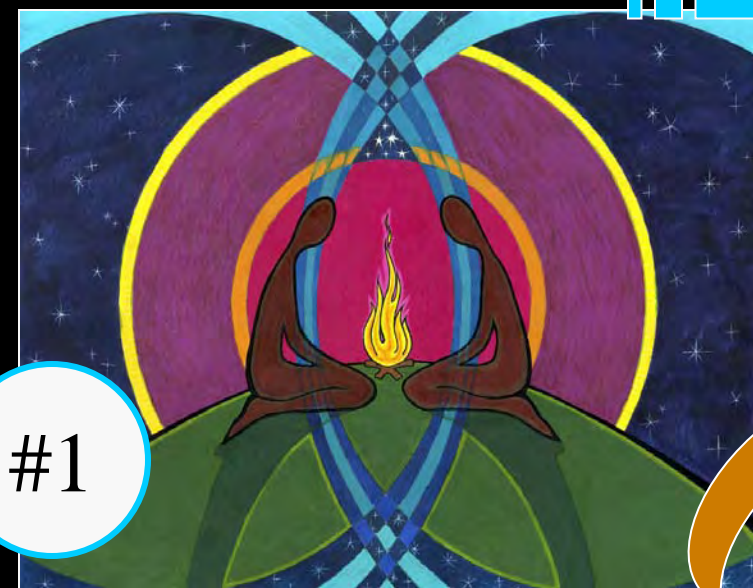
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#2



CIHR IRSC

health research



#1

post-secondary
science
education



Bras d'Or Lake

CEPI

#3

environmental
planning

collaborative initiatives

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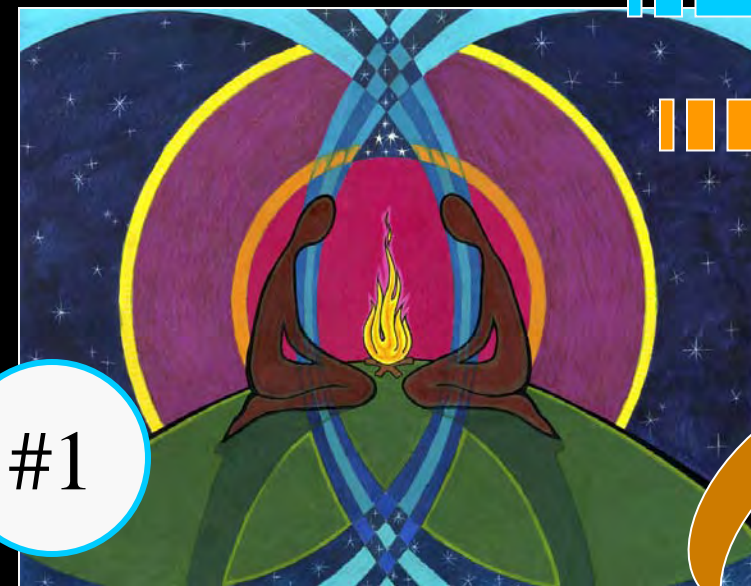
#2



CIHR IRSC

health research

#4
archaeological
interpretation



#1

post-secondary
science
education



Bras d'Or Lake

CEPI

#3

environmental
planning



Mi'kmawey Debert



Toqwa'tu'kl Kjjitaqnn Integrative Science

Science: stories ... humans with and within Nature

Indigenous

Western

Science education

Science research

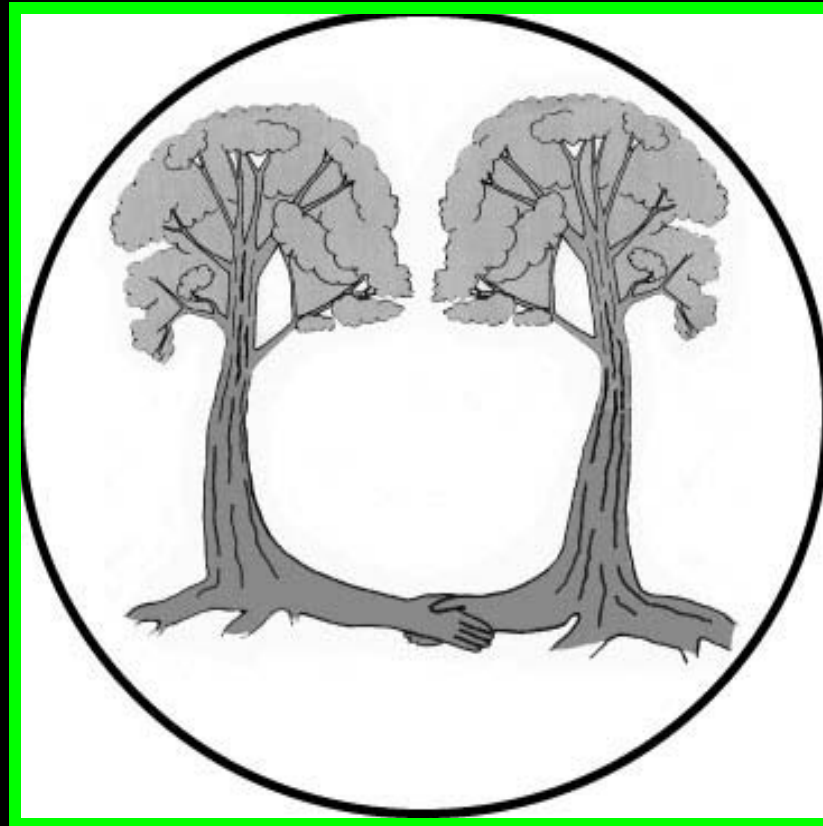
**Science
applications**

**Science outreach
to youth and
community**

Co-Learning

**Go into a forest, you see the birch, maple, pine.
Look underground and all those trees are
holding hands. We as people must do the same.**

(late Mi'kmaq Chief, Spiritual Elder, and Healer Charlie Labrador)



Co-Learning

**Go into a forest, you see the birch, maple, pine.
Look underground and all those trees are
holding hands. We as people must do the same.**

(late Mi'kmaq Chief, Spiritual Elder, and Healer Charlie Labrador)



real connections

11 LESSONS LEARNED:

We need to learn to ...

- acknowledge we need each other
- acknowledge we are on a learning journey
- learn to “co-learn”:
 - simple **integrative framework**
- help institutions to help us “legitimize” TK in the minds of youth (and many others)
- work with “living agendas”
- use other “organic language”
- do ... in a creative “grow forward” manner

11 LESSONS LEARNED: (cont'd)

We need to learn to ...

- think “knowledge gardening” more than knowledge translation or knowledge transfer
- weave back and forth between our knowledges, our world views, our stories
- navigate our weaving via awareness of “big patterns” (knowledge orientations or maps)
- make our knowledges, i.e. our stories, visual



“Two-Eyed Seeing”

Indigenous



Western



**Albert Marshall, Mi'kmaq Elder
Eskasoni First Nation**

integrative framework



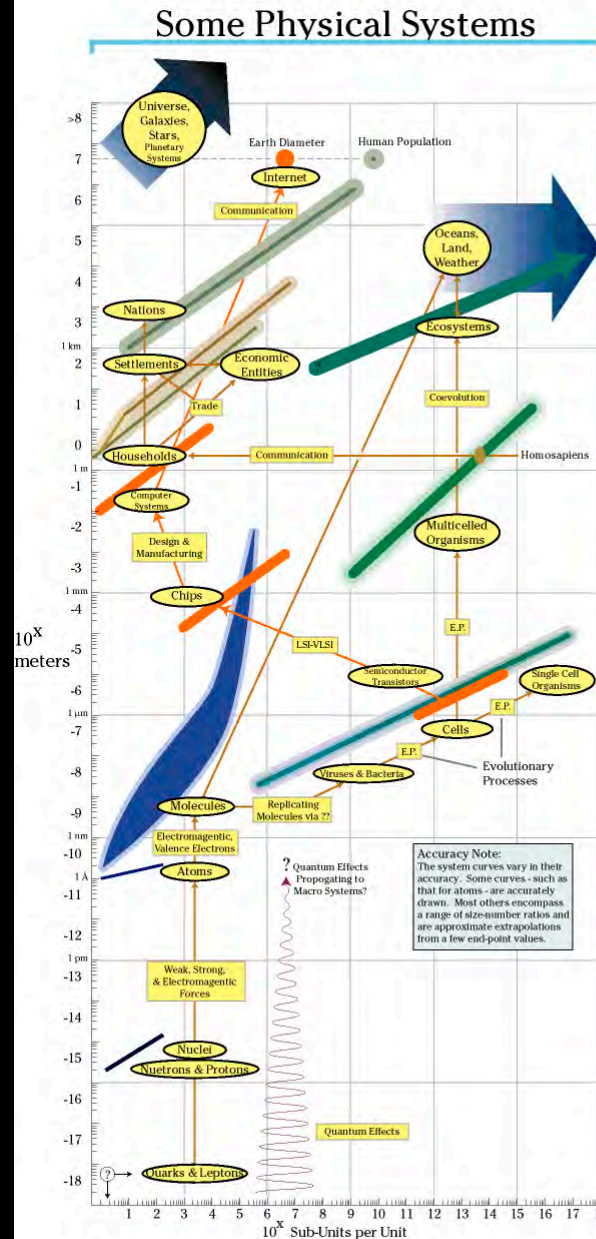
both Indigenous and Western, plus:

- role of me and you in “the knowing”
 - e.g. patterns: recognition & transformation
- our common ground
- our differences (and respect them)
- our journey ... forward & together

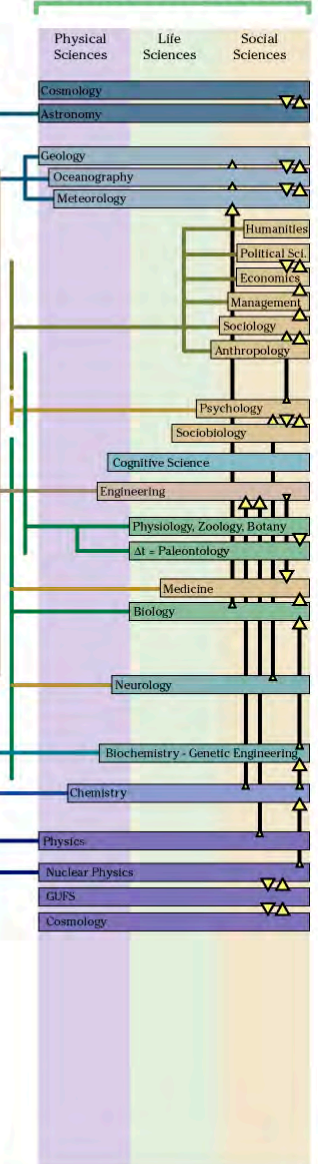
AVOID ... simply Western plus
bits and pieces of Indigenous

Transdisciplinary & Transcultural

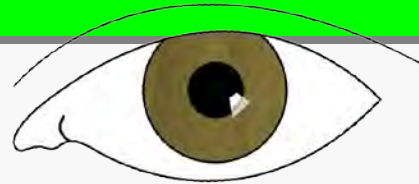
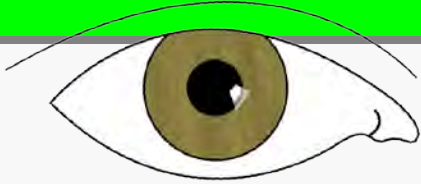
- multi-referential
- multi-dimensional
- trans-historical



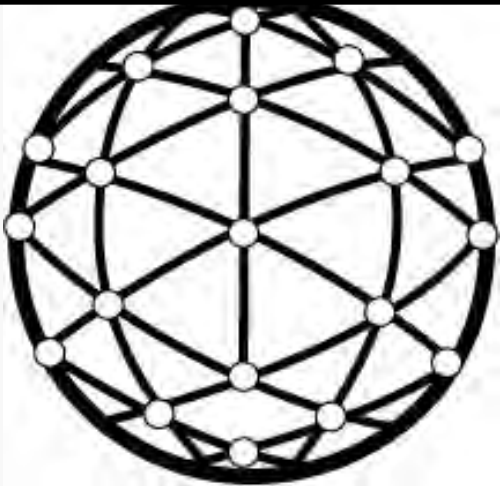
Some Systems of Human Knowledge



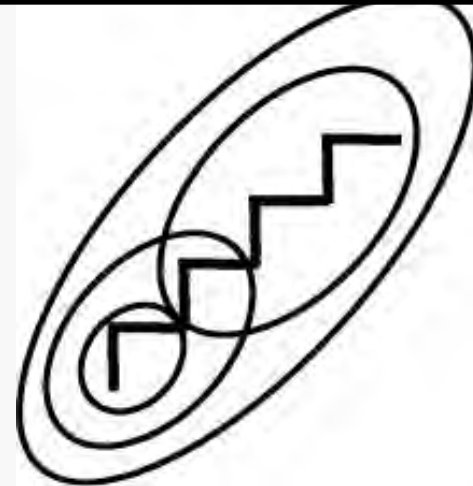
**“two-eyed seeing”
how our world is**



interconnected



parts & wholes

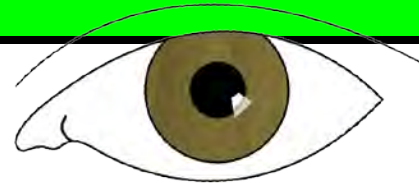


“two-eyed seeing”

our key concepts & actions

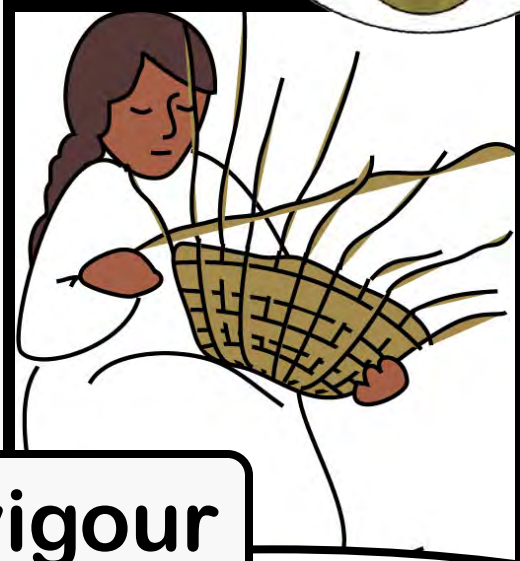


- **respect**
- **relationship**
- **reverence**
- **reciprocity**
- **ritual**
- **repetition**
- **responsibility**



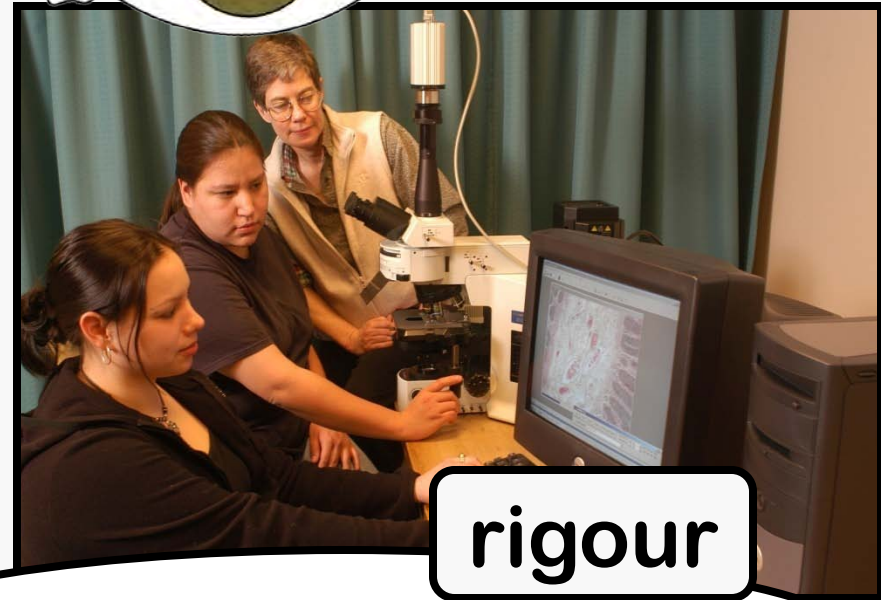
- **hypothesis**
(making & testing)
- **data collection**
- **data analysis**
- **model & theory
construction**

**“two-eyed seeing”
our language & methodology**



vigour

WEAVING



rigour

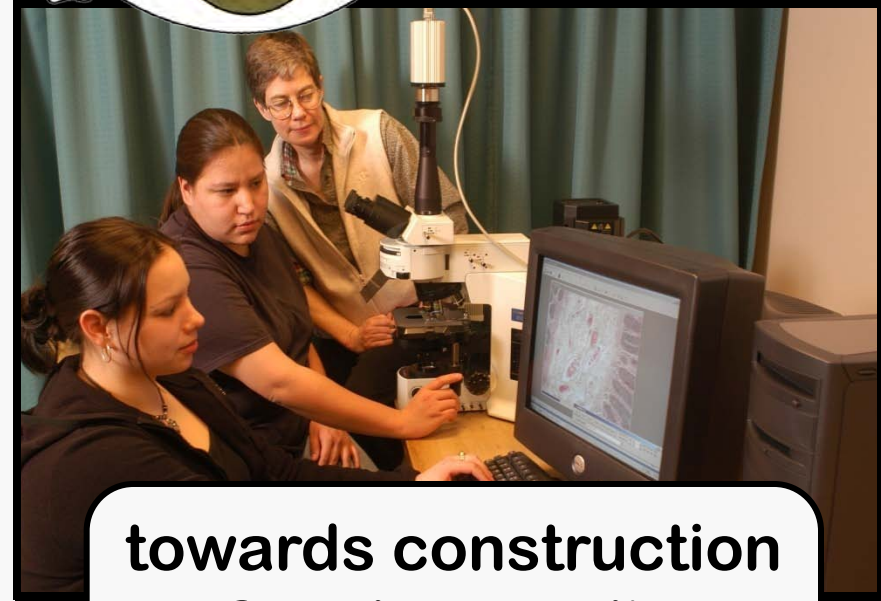
UN-WEAVING

“two-eyed seeing”

our overall knowledge objectives

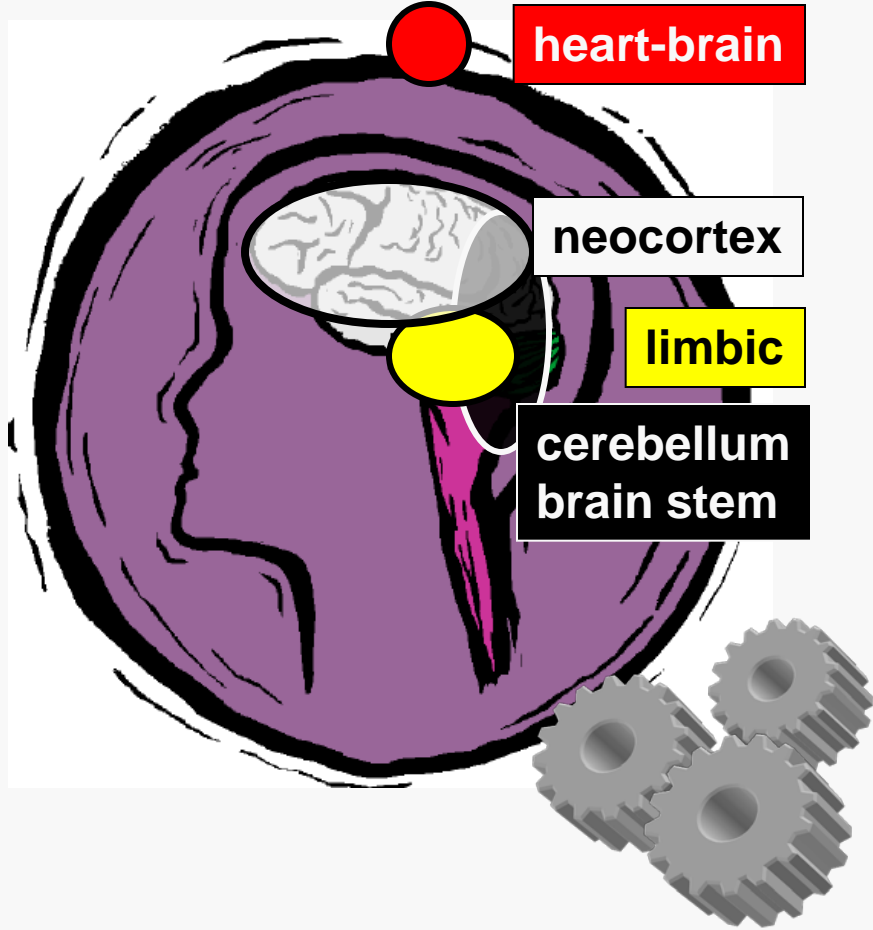
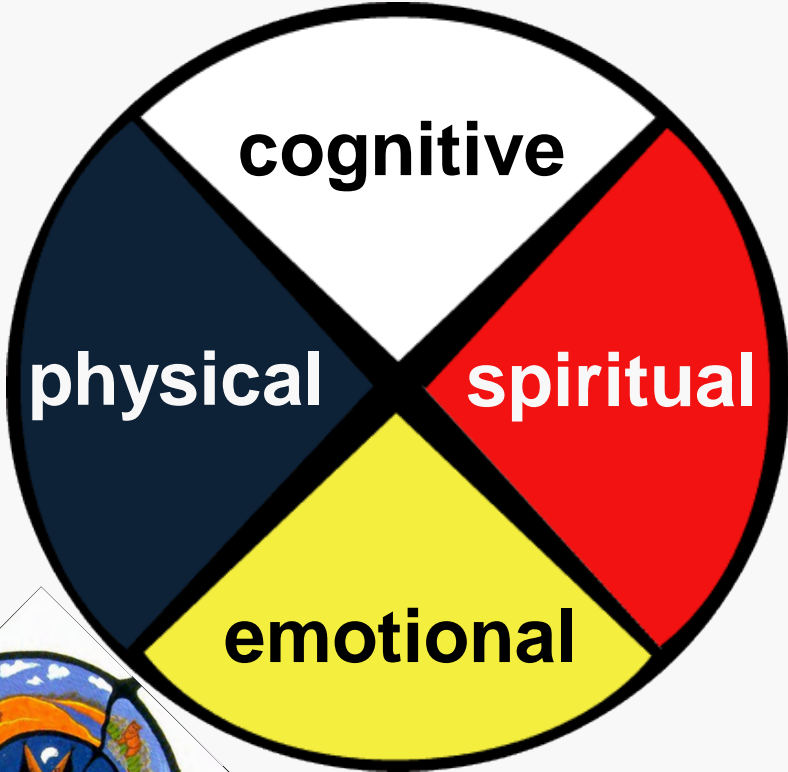
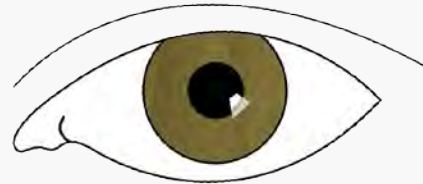
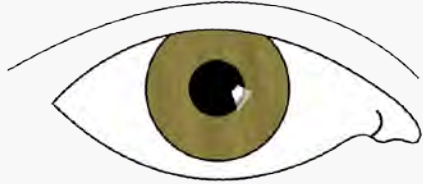


**towards resonance
of understanding
within environment**



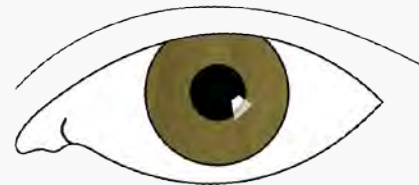
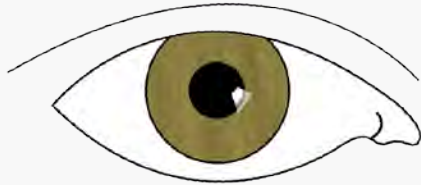
**towards construction
of understanding
of environment**

Human



Artist: Rod Restoule
from: Into the Daylight;
C. Morrisseau, 1998

Family

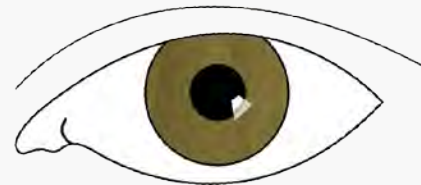


from:
Mi'kmaq Family
& Children's
Services

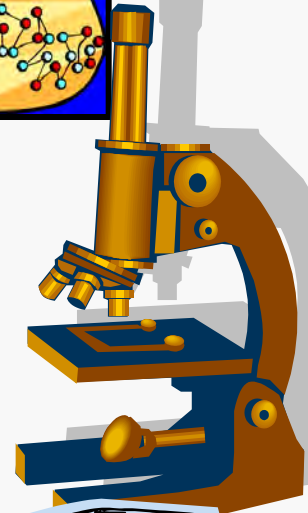
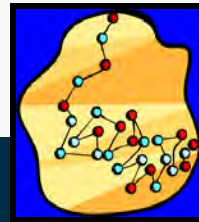


from:
The Society of
Obstetricians and
Gynaecologists of Canada

Health



Artist: Rod Restoule
from: Into the Daylight;
C. Morrisseau, 1998



Earth



Artist Basma Kavanagh



Location: W060 11, N46 09

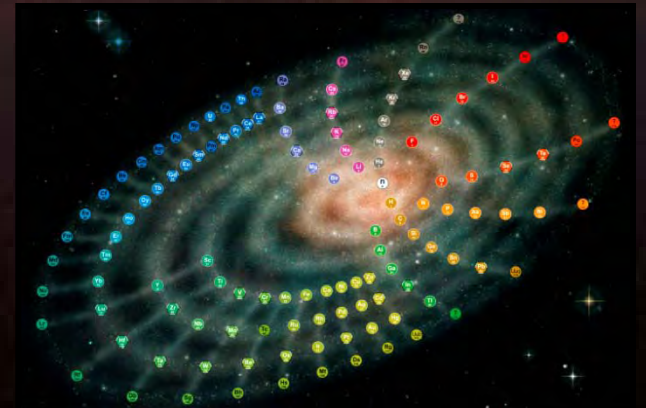
SYDNEY, NS
Rise and Set for the Sun for 2004

Astronomical Applications Dept.
U. S. Naval Observatory
Washington, DC 20392-5420

Zone: 4h West of Greenwich

Day	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
01	0743	1625	0724	1705	0639	1748	0540	1830	0447	1910	0413	1945	0413	1956	0443	1930	0522	1839	0600	1740	0642	1646	0723	1617
02	0743	1626	0723	1706	0637	1749	0538	1831	0445	1911	0412	1946	0414	1955	0444	1929	0523	1837	0601	1738	0644	1644	0724	1616
03	0743	1627	0722	1708	0635	1750	0536	1833	0444	1912	0412	1947	0415	1955	0446	1927	0524	1835	0602	1736	0645	1643	0725	1616
04	0743	1628	0720	1709	0634	1752	0534	1834	0442	1913	0411	1947	0415	1955	0447	1926	0525	1833	0604	1734	0646	1642	0727	1616
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06	0743	1630	0718	1712	0630	1755	0530	1837	0439	1916	0410	1949	0417	1954	0449	1923	0528	1829	0606	1730	0649	1639	0729	1615
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31	0725	1703			0542	1829			0413	1944			0442	1931	0520	1840			0641	1647			0743	1625

Sun





Grandfather Sun

image from
Aboriginal Policy Research Conference
Ottawa, March 2006

The voices of our ancestors are in the land

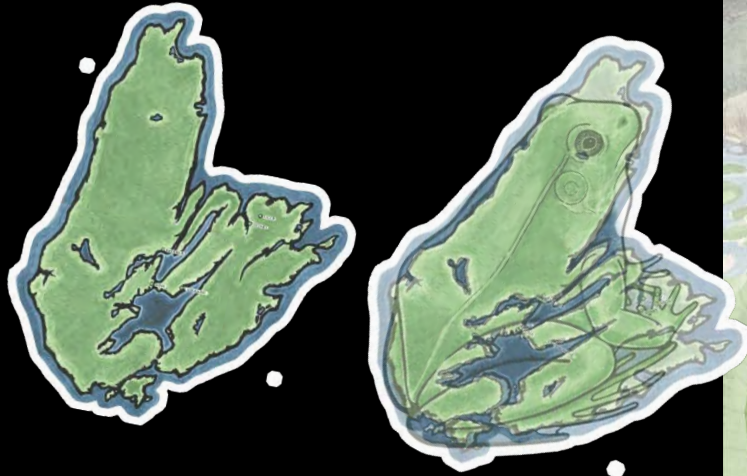


**Life
Language
Land**



Science: stories of our interactions with the land

... consider:



Spirit of the East

**gift of
newness
(of transformation)**

As a scientist, I want my imagination rekindled. I want to be shown how to look at things in new ways; I believe my capacity for innovation and creativity in my own discipline will grow as a result.

(Arthur J. Carty, then President NRC, now National Science Advisor to PM)

(2000 Conference on Creativity in the Arts and Sciences)

... consider:

conceptual space shifting



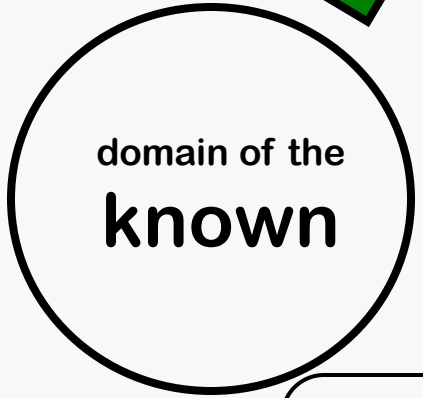
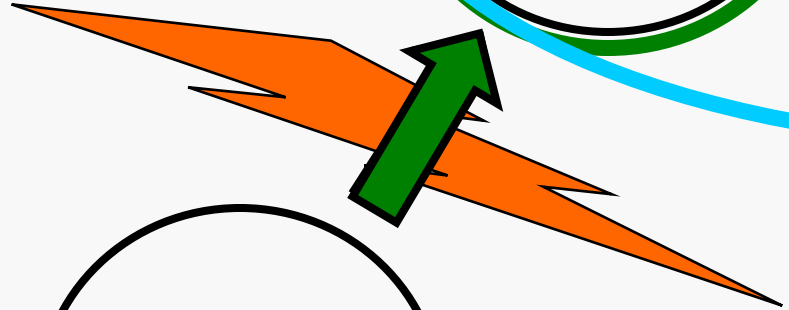
KNOW

VALUE

DO

... consider:

FEAR

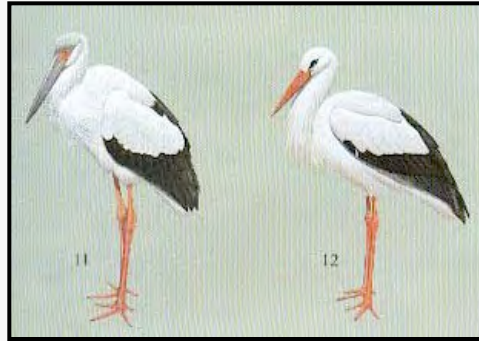


human consciousness
**“must become
 PATTERN-able”**
 (Douglas J. Cardinal)
 world renown architect

must learn:
**“conceptual
 space shifting”**

(2000 Conference on Creativity in the Arts and Sciences)

PATTERN RECOGNITION & TRANSFORMATION



human
consciousness



“pattern smarts”

multiple intelligences theory

(H. Gardner, Harvard Univ.)

sanctioned
world view or methodology

KNOW

VALUE

DO



- ◇ numbers (logical-mathematical)
- ◇ language (linguistic)
- ◇ music (musical)
- ◇ body (body-kinesthetic)
- ◇ spatial (spatial)
- ◇ other people (interpersonal)
- ◇ self (intrapersonal)
- ◇ naturalist (naturalist)
- ◇ spiritual / existential *



PATTERN RECOGNITION & TRANSFORMATION

three piece iterative approach
for Integrative Science-implicated research

natural

ideal

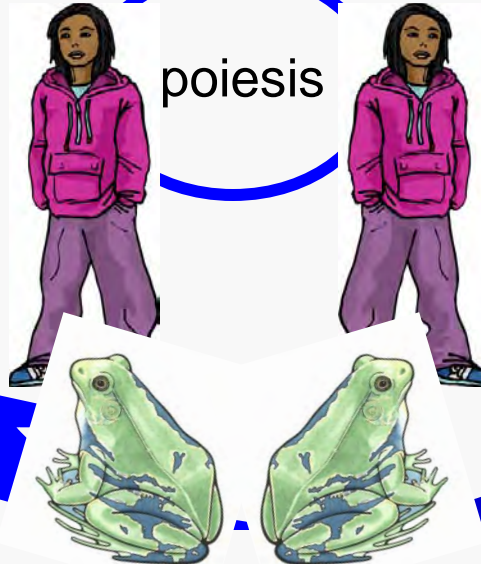
abstract

mimesis

alterity

poiesis

kinesis



Co-learning our way to expanding wholeness through restoration of relationships with the land



1. Key phrases & words

2. Biodiversity literacy



4. Mi'kmaq biocultural expression

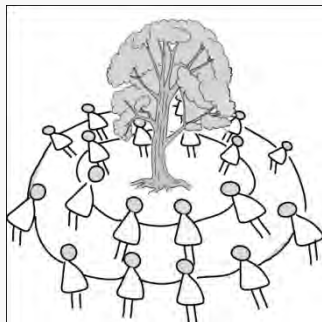
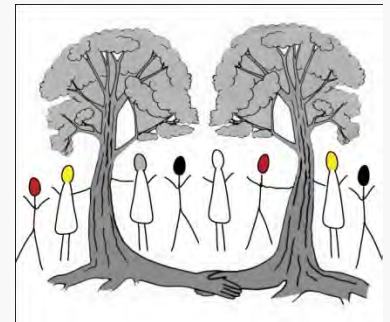


5. Spiritual connectedness with the land

3. Ecosystem health literacy

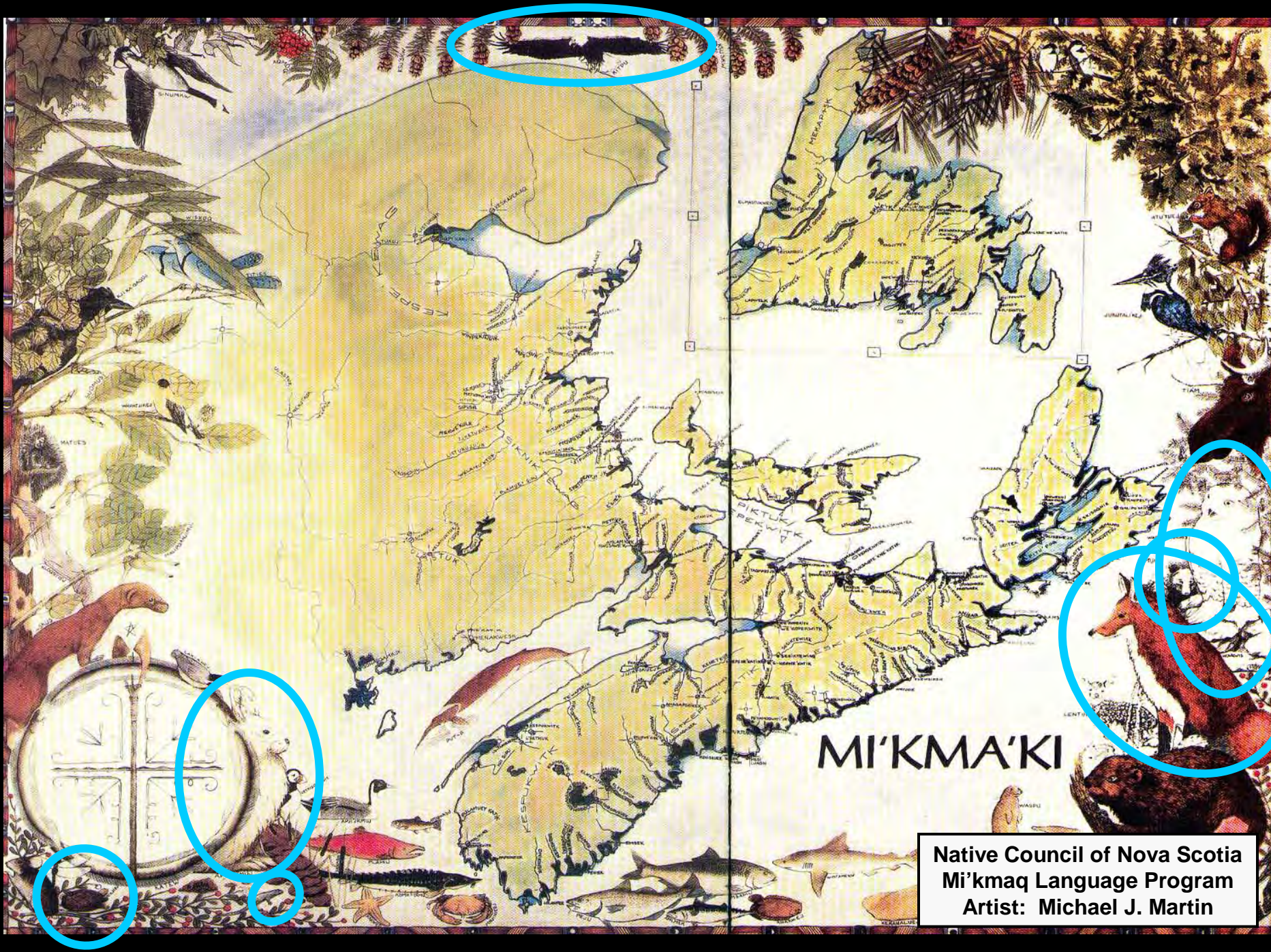


6. Integration of co-learnings into health care delivery systems



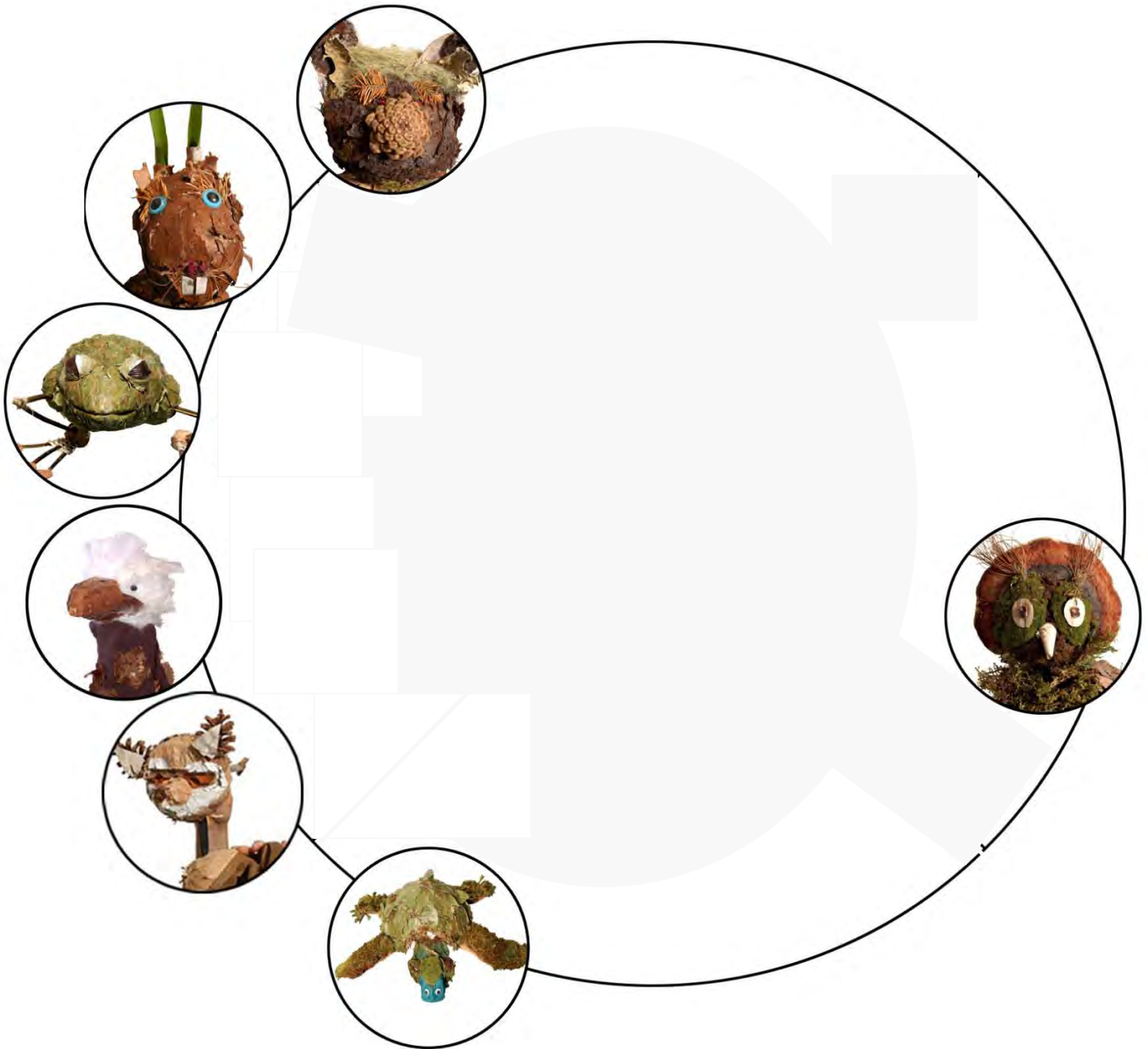
7. Extension of co-learnings into sustainable ventures

Themes



MI'KMA'KI


**Native Council of Nova Scotia
Mi'kmaq Language Program
Artist: Michael J. Martin**



puppets made from the Earth

TOQWA'TU'KL KIJJITAQNN
Integrative Science

Nipuktuk Wejiaql A'tukuaqnn
FROM THE FOREST COMES OUR STORY



Apl'kmuj
Lepus americanus
SNOWSHOE HARE

Kaqajulman
Clintonia borealis
BLUE BEAD LILY

Pukusp
DECAYING WOOD

Kawatk
Picea sp.
SPRUCE CONE

Stoqn
Abies balsamea
DWARF FIR


Wso'qmanaqsil
Cornus canadensis
BOWENBERRY

Qqnn
TWIGS

Kuow
Pinus strobus
PINE NEEDLES

A small multicultural group of young people worked at the University College of Cape Breton during the summer of 2004 to make puppets for the characters in two Mi'kmaq legends: *Haw Rabbit Goo Ho Long Ears* and *Haw Bollyng Waa Conqwaerud*. All puppets were made from natural materials easily collected in the forests of Nova Scotia - Cape Breton. The puppets are part of a larger research effort to help preserve and revitalize Mi'kmaq and modern scientific understanding of our forests and ecosystems without commercial interests, especially as the timber industry faces an uncertain future. This was the first time that a Canadian Indigenous and Scientific Institute of Biological Resources.

For Mi'kmaq language information contact: **Medowk Mawlaq** 902-739-2200
For additional information contact: **Integrative Science Program** University College of Cape Breton • PO Box 17000 • Sydney • Nova Scotia • B1P 6L2 • Or visit our website: www.uccb.ca



TOQWA'TU'KL KIJJITAQNN
Integrative Science

Nipuktuk Wejiaql A'tukuaqnn
FROM THE FOREST COMES OUR STORY



T'i'tikli
Bubo virginianus
GREAT HORNED OWL

Jikoqs
Fomes fomentarius
BRACKET FUNGUS

Kuow
Pinus strobus
PINE NEEDLES

Maskwi
Betula papyrifera
BIRCH BARK

Wisqasaw
Pinus strobus
PINE CONE

Pukusip
Dicranum sp.
Moss

Qqnn
TWIGS

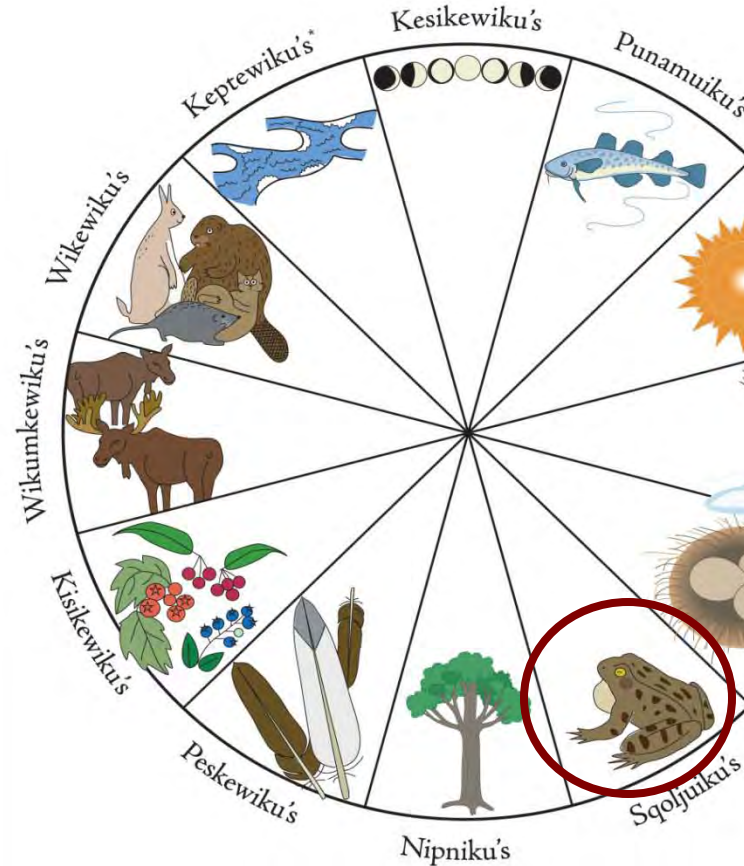
Ulnetkul
Moss

Jikoqs – BRACKET FUNGUS: This hard, woody, slow growing bracket fungus once had a very special role to play in the life of the Mi'kmaq Nation. Jikoqs, Keeper of the Sacred Flame, was used to ensure that embers of the fire remained alive when the people moved to a new camp. The fungus was set on fire and then placed in a clamshell for protection. Jikoqs would burn slowly and thus keep the fire alive. At the new campsite, Jikoqs would be used to start a new campfire – this was in the time before we had modern matches. Similarly, to ensure that the fire could be restarted every morning at the same campsite, Jikoqs and a clamshell were used to safeguard an ember each night. The species of fungus used was possibly *Fomes fomentarius*, which is known in English as *tinder many tiny holes* (tinder polypore).

A small multicultural group of young people worked at the University College of Cape Breton during the summer of 2004 to make puppets for the characters in two Mi'kmaq legends: *Haw Rabbit Goo Ho Long Ears* and *Haw Bollyng Waa Conqwaerud*. All puppets were made from natural materials easily collected



Mi'kmawe'k Tepknusetk



*Alternative – Kepti'kewiku's



Earth speaks: health indicators

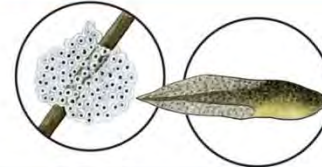
ECOSYSTEM HEALTH CONSCIOUSNESS Difference, Pattern, Variation

TOQWA'TU'KL KJIJITAQNN • INTEGRATIVE SCIENCE

Frogs of Unama'ki



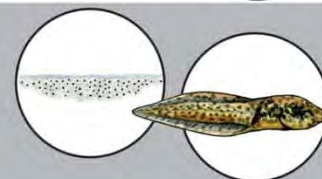
Mink Frog



Mink Frog • *Rana septentrionalis*
 Mink Frog is green with many dark markings and is 4 – 7 cm long. He gets his common name from his musky odour; he smells like a mink. Mink Frog's song sounds like pieces of wood being rapped together ... TAP TAP! While other frogs live on both land and water, Mink Frog spends most of his life in the water. He prefers permanent bodies of water like ponds and lakes. Female Mink Frog lays 2000 to 4000 eggs in a round jelly mass. This jelly mass is attached to an underwater plant stem or submerged twig. Mink Frog eats dragonflies, damselflies, water beetles, aphids, minnows, leeches, snails, millipedes, and spiders.

MINK FROG

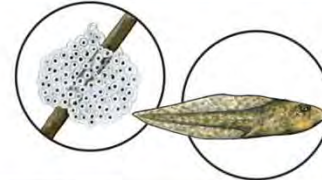
Green Frog



Green Frog • *Rana clamitans*
 Green Frog is green with gray or brown markings on her back and legs, and has a pale belly marked with dark streaks. Male Green Frog has a bright yellow throat and is 6 – 10 cm long. Green Frog's song sounds like a loose banjo string being plucked, or like a small pebble dropped into water ... LINGKI! Green Frog prefers to be close to water, and tends to live at the edge of rivers, ponds, lakes or streams. Female Green Frog lays 1000 to 4000 eggs in a loose jelly mass that floats on the surface of the water like a raft. Green Frog eats beetles, flies, caterpillars, grasshoppers, spiders, snails, algae, waterbugs, butterflies and moths, and sometimes other small frogs.

GREEN FROG

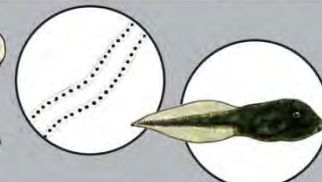
Pickerel Frog



Pickerel Frog • *Rana palustris*
 Pickerel Frog is light brown with many dark blotches on his back and legs. He is 4 – 7 cm long. Pickerel Frog's song sounds like somebody snoring, or like the sound of someone slowly pushing open a creaky door ... ARREP ARREP! Pickerel Frog lives on the shores of ponds or lakes, or on the banks of streams, often staying near permanent bodies of water at breeding time. However, he will also live in moist fields, bogs, or damp woods. Female Pickerel Frog lays her eggs in a round jelly mass attached to a plant or stick below the surface of the water. She can lay as many as 800 to 1800 eggs at a time. Pickerel Frog eats beetles, ants, spiders, caterpillars, sow bugs, mites, snails, true bugs, and many small water creatures.

PICKEREL FROG

Eastern American Toad



Eastern American Toad • *Bufo americanus*
 Toad is a plump creature with stubby toes and rough warty skin. He is usually brownish, with darker brown or black markings. Toad has a pale belly with dark spots that become more distinct at night. Toad can grow to be 5 – 11 cm long. Toad lives in many different places, for example, in the woods, near a swamp or lake, in a field, or even in your backyard! His song sounds like a long, high trilling sound ... THRRR! Female Toad prefers temporary ponds for breeding. She lays 8000 to 80000 eggs in a time in two long strings near the bottom of the pond or puddle. Toad eats many kinds of insects like caterpillars, earwigs, sow bugs, as well as slugs, earthworms, and millipedes.

AMERICAN TOAD

Northern Spring Peeper

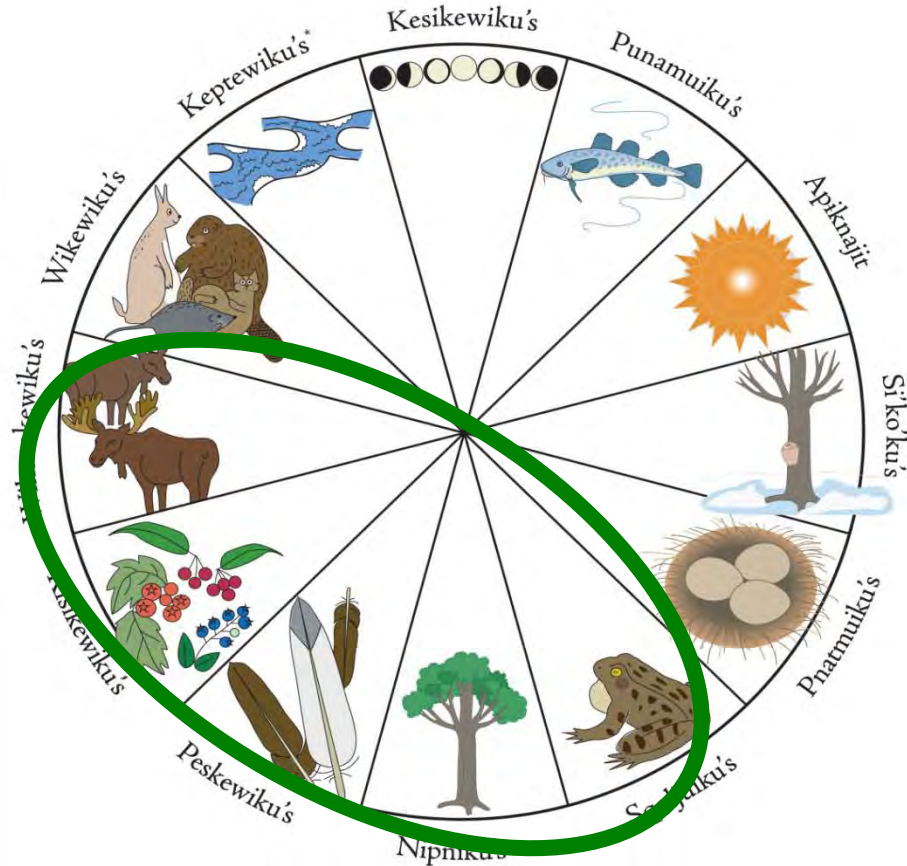


Northern Spring Peeper • *Pseudacris crucifer*
 Spring Peeper is our smallest frog; he grows to 2 – 4 cm long. We know that spring has arrived when we hear Spring Peeper singing at night. His song sounds like a high PEEP! Spring Peeper lives in the woods near ponds, marshes or swamps. He is our only tree frog and can change the colour of his skin to blend in with his

SPRING

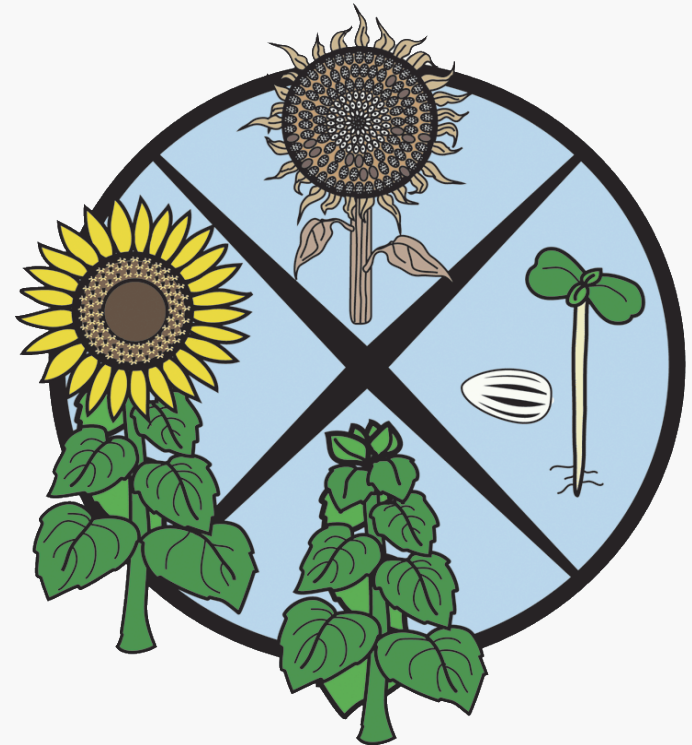


Mi'kmawe'k Tepknusetk

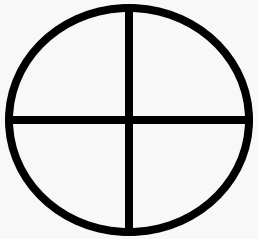
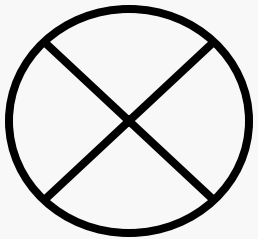


*Alternative - Kepti'kewiku's

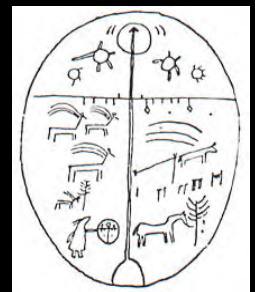
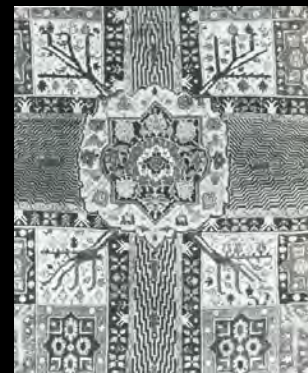
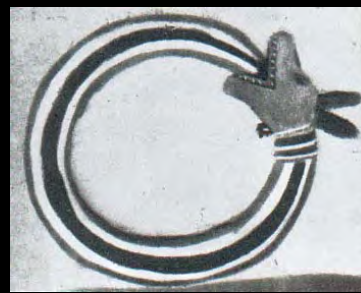
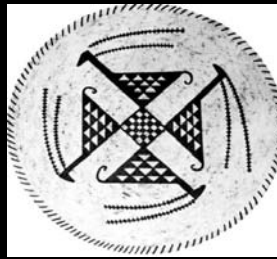
Earth speaks: voices of health in the land



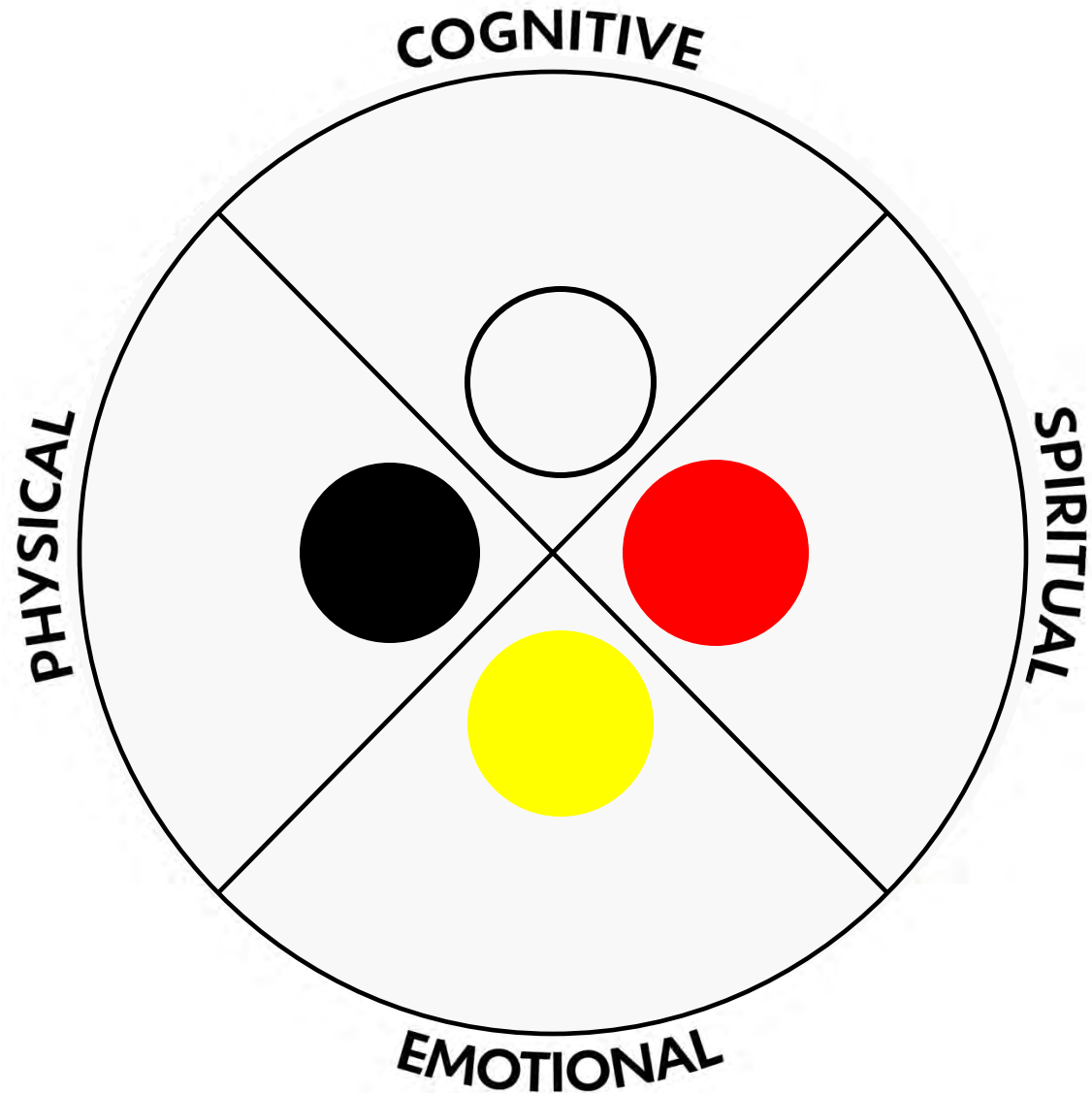
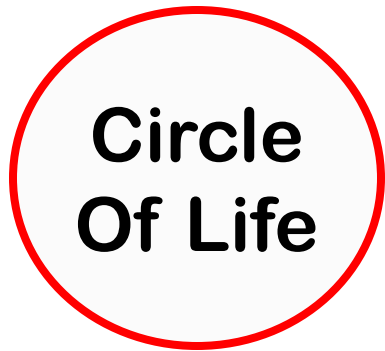
Medicine ... in many, many cultures: "that which heals, that which helps"



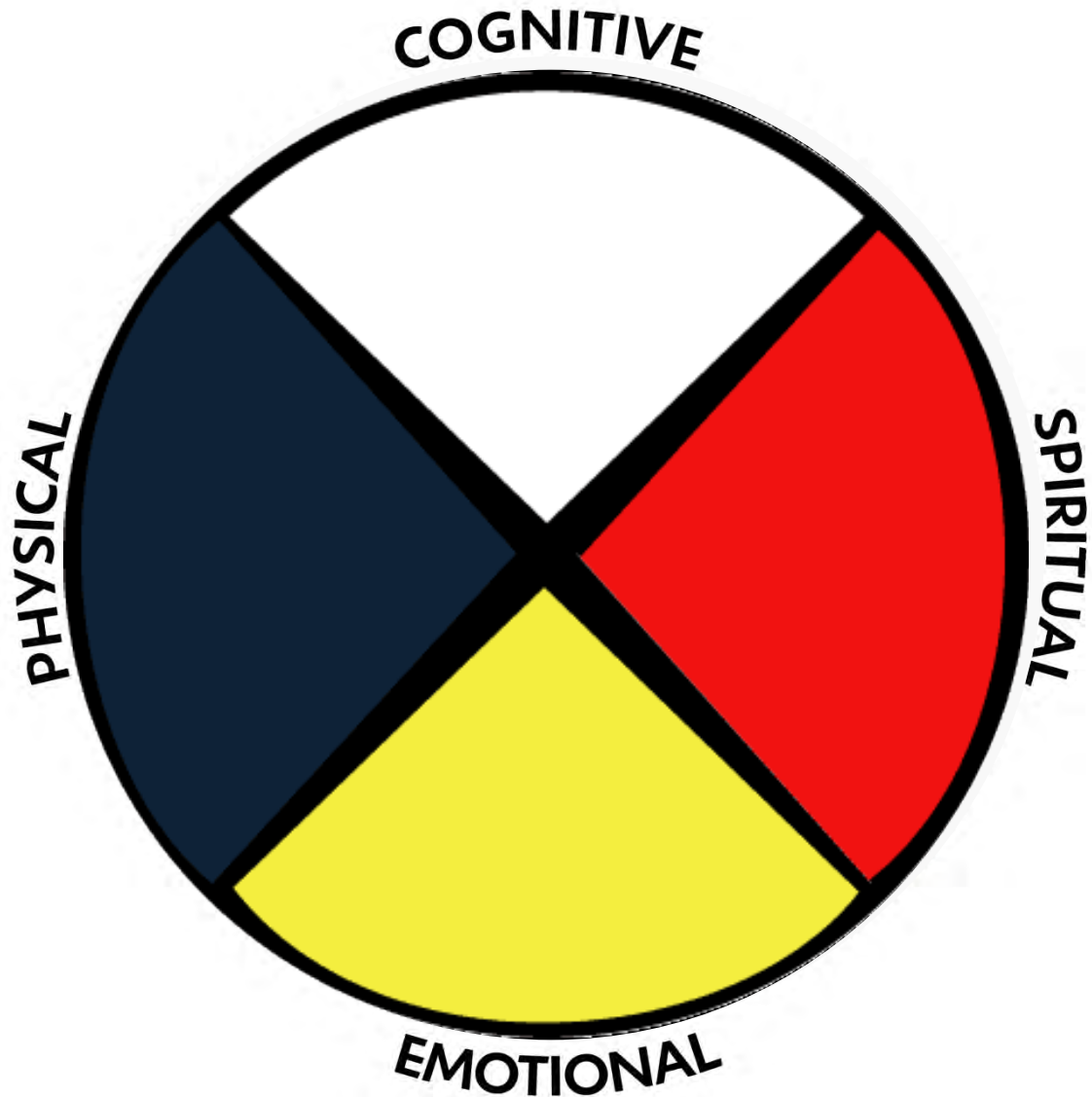
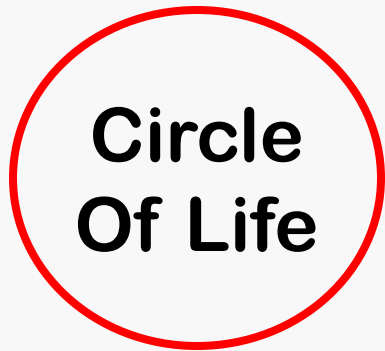
**Medicine
Wheels**



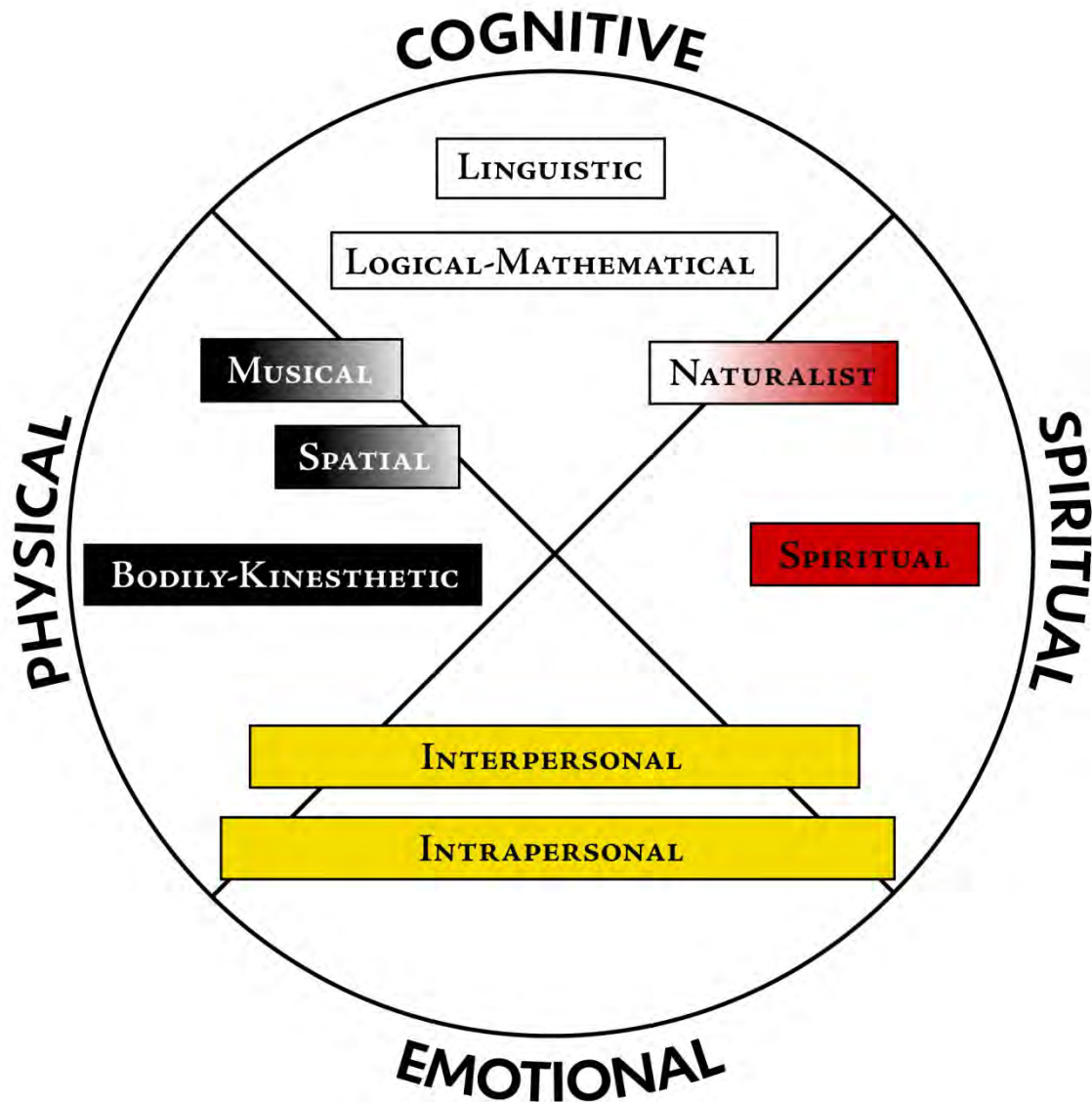
Medicine Wheel: lived relationships



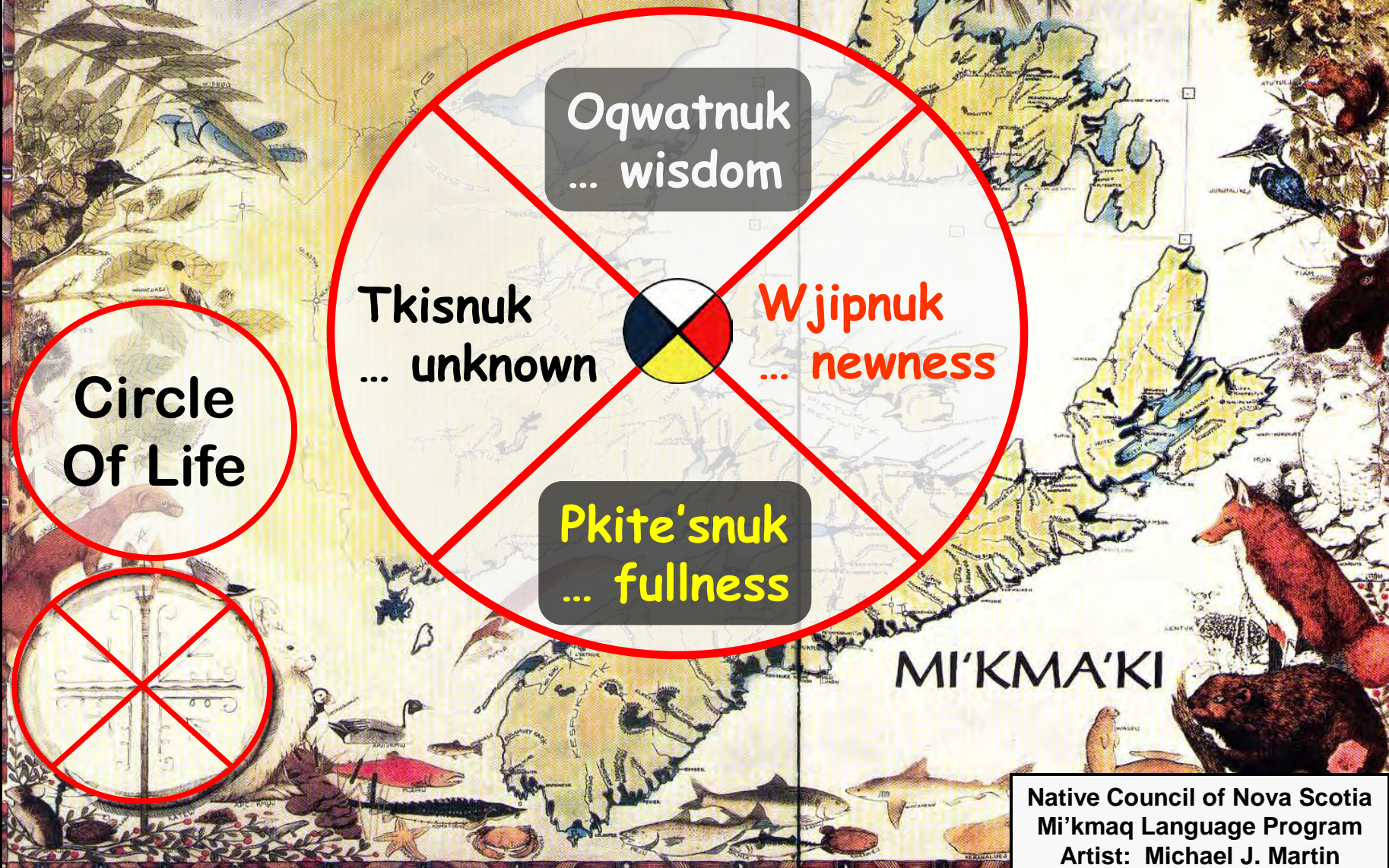
Medicine Wheel: lived relationships



Medicine Wheel: lived relationships



Medicine Wheel: lived relationships

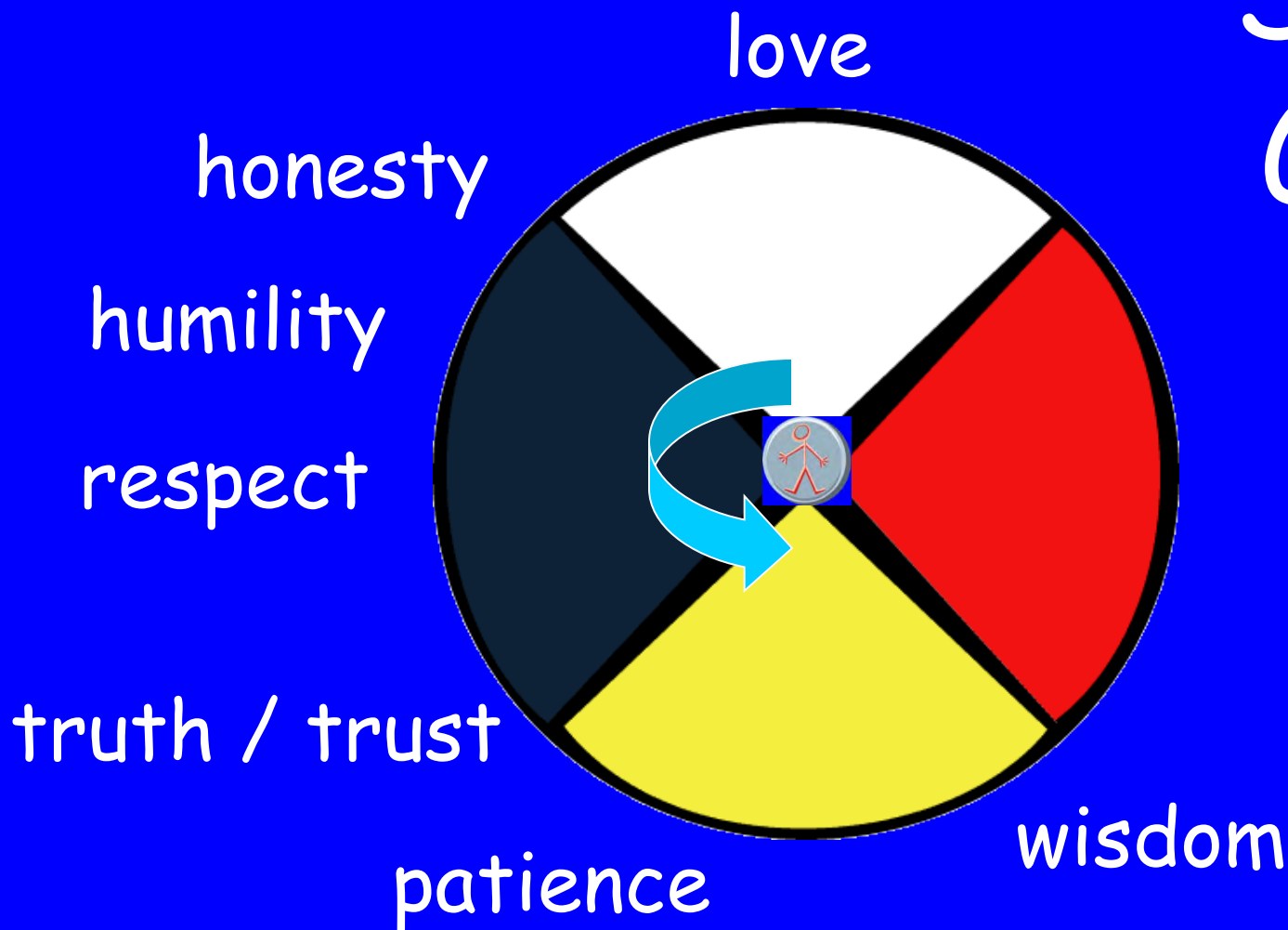


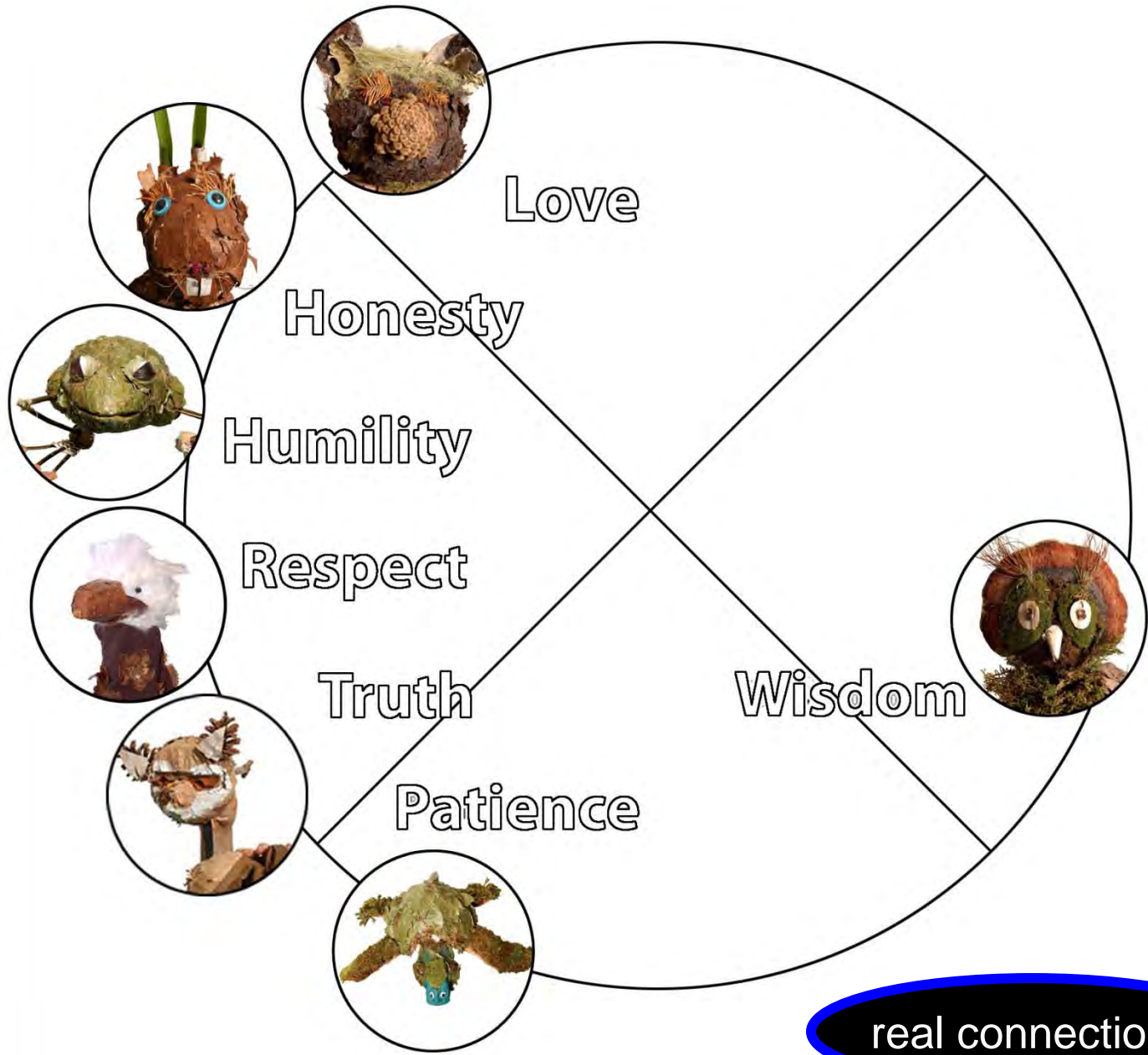
Native Council of Nova Scotia
Mi'kmaq Language Program
Artist: Michael J. Martin



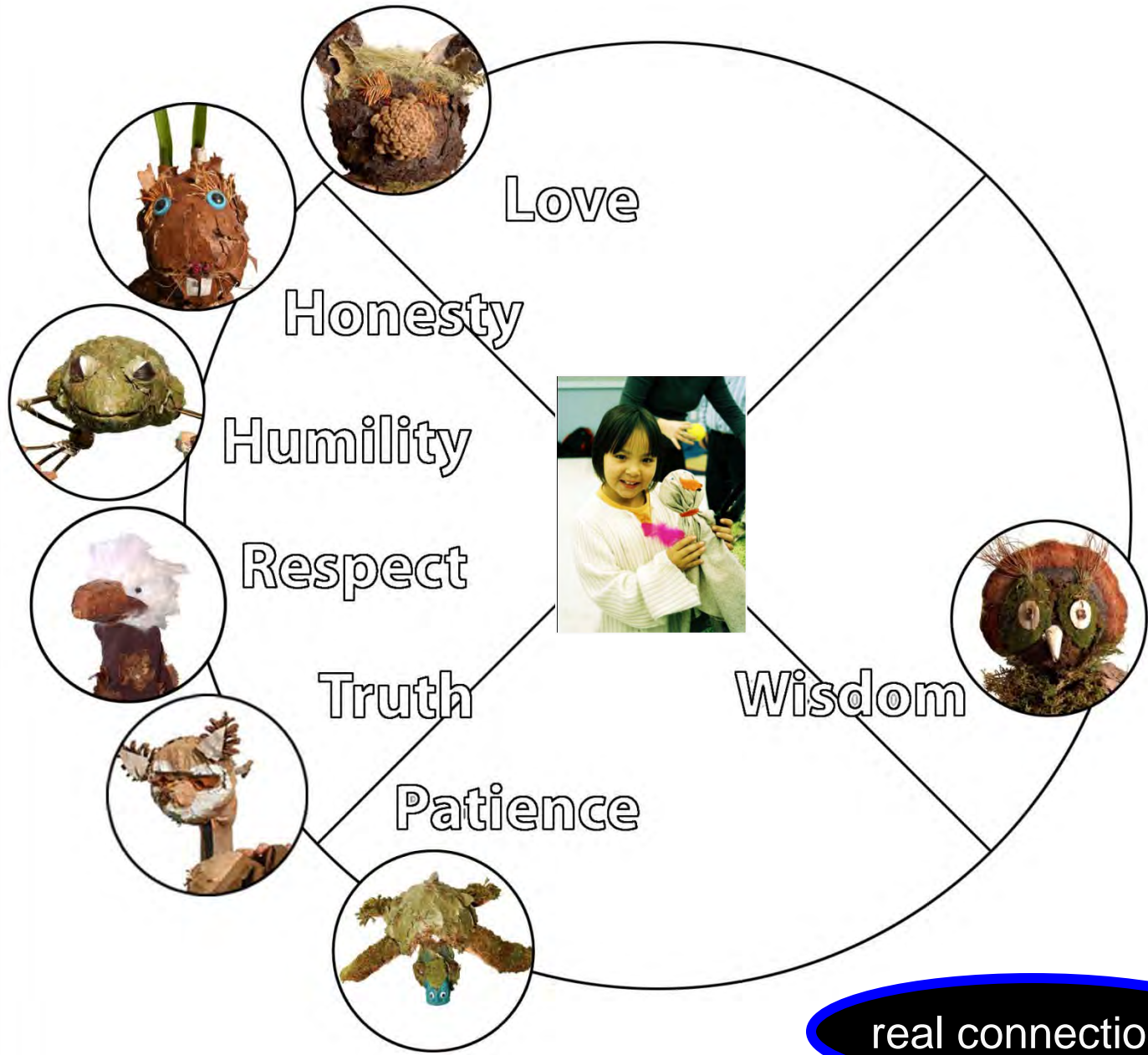
Medicine Wheel: lived relationships

Seven Gifts Of Life





real connections



real connections

The Elders say:

Many of our Mi'kmaq youth seem lost.

- There's everything in the language that you want to know about yourself.
- *There's something called the healing tense.*

Verb Conjugation

"to be drunk"

- ketkiay (present)
- ketkiayop (simple past)
- ketkiayasa*nek* (healing)

THE HEALING TENSE ... an example

Mi'kmaq

English

Ketkiayop

I was drunk

Keskiayasa*nek*

I was drunk

How Bullfrog was Conquered



How Bullfrog Learns His Lesson

Epilogue

Bullfrog: I know now that I was selfish and caused much suffering. I was wrong.



The Healing Tense Heals

"[Bullfrog] has taken his misdeeds and placed them in front of him and walked around them, and said yes, I was there."

(Murdena Marshall, in conversation with Ivar Mendez)

How Bullfrog Learns His Lesson

Epilogue

Bullfrog: Meskey keskna oqmeyas*nek*



We Heal Together

*"... when he goes into this healing tense,
then my attitude has to change ...
everybody in the household ...
everybody ... has to abide with him."*

(Murdena Marshall, in conversation with Ivar Mendez)



Time:

- now then
- now now
- now future

“Love is the main ingredient of wellness.”

- *Murdena Marshall*

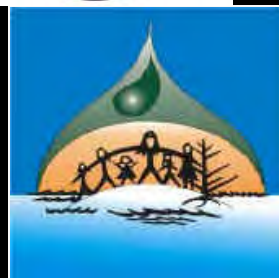
“The voice of our language is in the land.”

- *Albert Marshall*



Time:

- now then
- now now
- now future



expanding wholeness

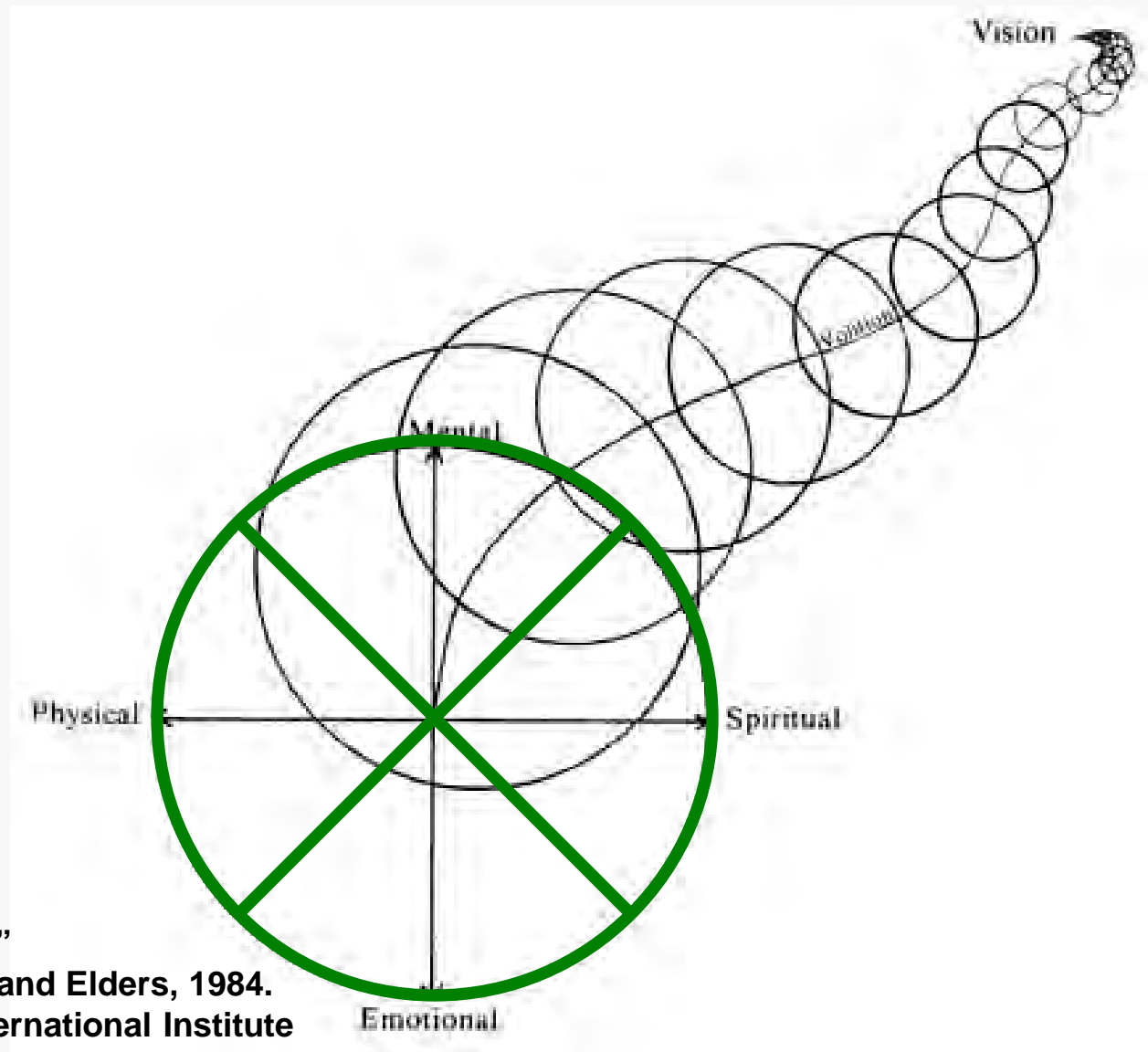


image from: "The Sacred Tree"
by: Lane, Bopp, Bopp, Brown and Elders, 1984.
published by: Four Worlds International Institute

expanding wholeness through restoration of relationships with the land

Artist: Rod Restoule
from: Into the Daylight;
C. Morrisseau, 1998

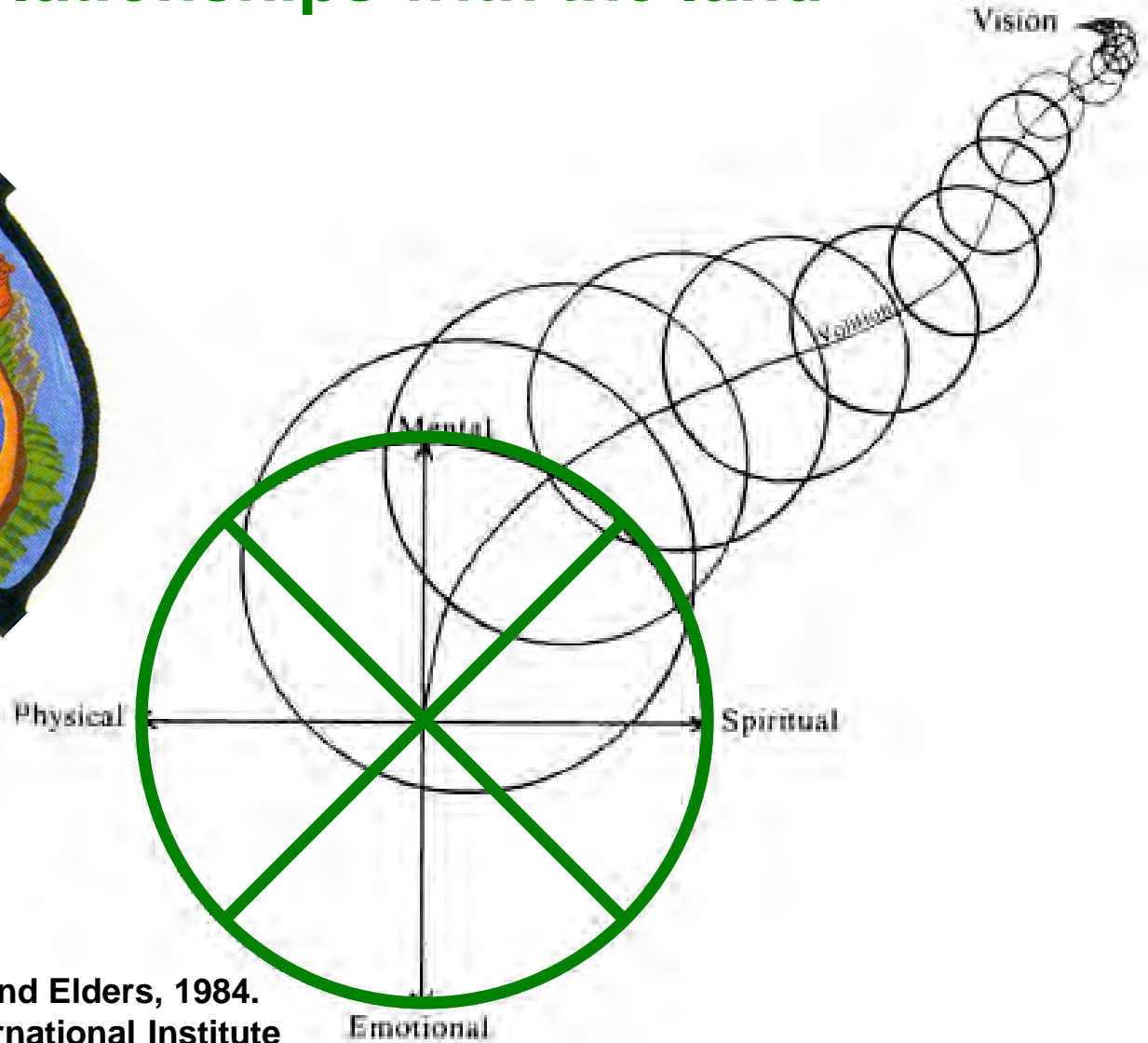


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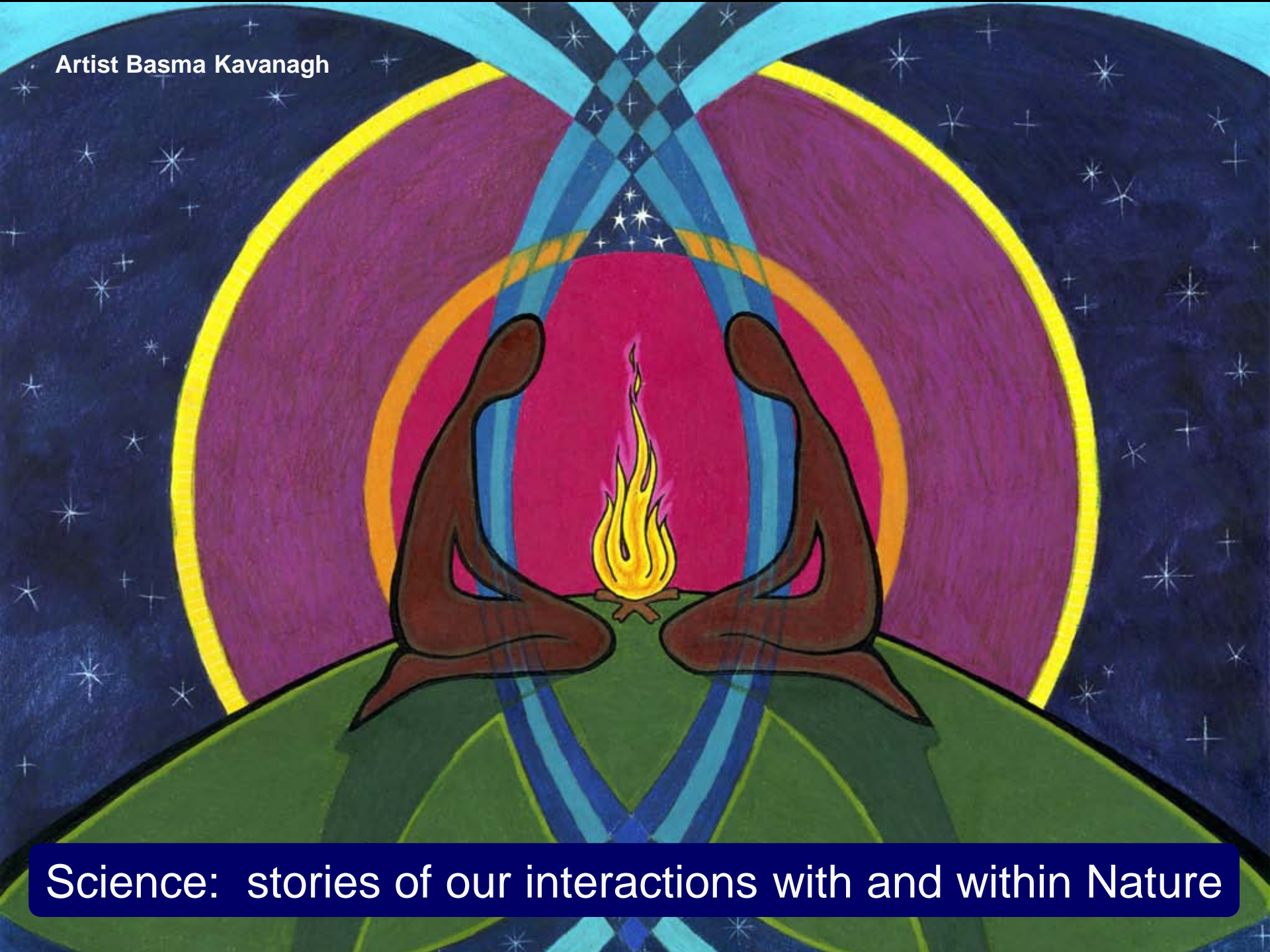


Science: stories of our interactions with and within Nature



Science: stories of our interactions with and within Nature

Artist Basma Kavanagh



Science: stories of our interactions with and within Nature

Canada Research Chairs / Chaires de recherche du Canada / Canada

Social Sciences and Humanities Research Council of Canada / Conseil de recherches en sciences humaines du Canada

Canada Foundation for Innovation / Fondation canadienne pour l'innovation

CIHR IRSC / Canadian Institutes of Health Research / Instituts de recherche en santé du Canada

IAPH

SABLE OFFSHORE ENERGY INCORPORATED

UNAMA'KI INSTITUTE OF NATURAL RESOURCES

Mi'kmawey Debert

Royal Canadian Mounted Police / Gendarmerie royale du Canada



IWK Health Centre Foundation

NOVA SCOTIA Health Research FOUNDATION

NSERC CRSNG



Thank you

Mi'kmaq Elders

CAPE BRETON UNIVERSITY