

Indigenous and Western Sciences

Presentation for students in Bachelor of Social Work

- Sackville, New Brunswick
- 15 Sept 2006

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in Integrative Science

CAPE BRETON
UNIVERSITY



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

CAPE BRETON UNIVERSITY



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IAPH

SABLE OFFSHORE ENERGY INCORPORATED



IWK Health Centre Foundation

Mi'kmaq Elders

NOVA SCOTIA Health Research FOUNDATION

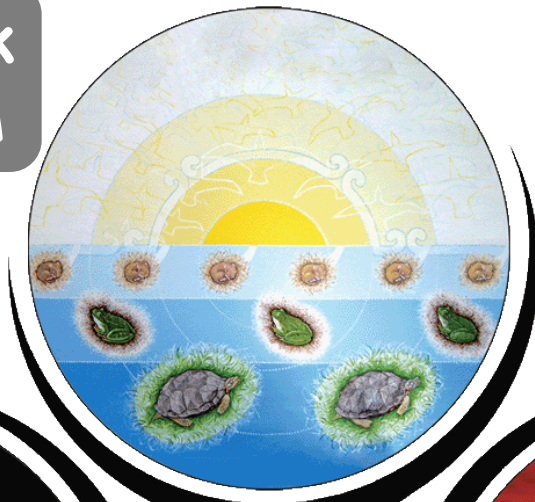
UNAMA'KI INSTITUTE OF NATURAL RESOURCES

NSERC CRSNG

Mi'kmawey Debort

Royal Canadian Mounted Police / Gendarmerie royale du Canada

Oqwatnuk
... wisdom



Wjipnuk
... newness



Tkisnuk
... unknown



Pkite'snuk
... fullness

... consider:

FEAR

domain of the
unknown

Land of Eagle



ONE WHO SEES BIG PATTERNS

domain of the
known



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

PATTERN

Sherman's Lagoon

OKAY, WE'RE HERE AT THE MALL. WHERE'S THIS WATCH YOU WANT TO BUY?

PATIENCE. PATIENCE.

<http://www.shermanslagoon.com>

ONE DOESN'T JUST RUSH INTO THE MALL FOR A QUICK ITEM AND LEAVE. IT'S NOT A CONVENIENCE STORE.

ONE MUST TAKE IT ALL IN. MEASURE THE VIBE. SOAK UP THE AMBIENCE. FIND PATTERNS AND IDENTIFY THE DISTURBANCES.

TRANSLATION?

YOU'RE HERE ALL DAY, PAL.

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Where our journey started ...

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, scientist & educator, Univ. of New Mexico

Indigenous



Western



Where our journey has taken us ...

11 LESSONS LEARNED: We need to learn to ...

1. acknowledge we need each other
2. acknowledge we are on a learning journey
3. learn to “co-learn”

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)



Where our co-learning journey has taken us ...

11 LESSONS LEARNED:

We need to learn to ...

1. acknowledge we need each other
2. acknowledge we are on a learning journey
3. learn to “co-learn”:
 - simple **Integrative Framework**

Integrative Framework

both Indigenous and Western, plus:

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

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

Where our co-learning journey has taken us ...

11 LESSONS LEARNED:

We need to learn to ...

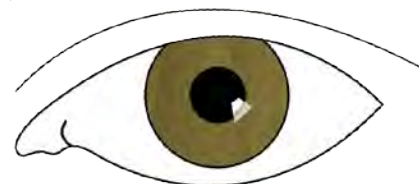
1. acknowledge we need each other
2. acknowledge we are on a learning journey
3. learn to “co-learn”:
 - simple **Integrative Framework**
4. help institutions to help us “legitimize” TK in the minds of youth (and many others)
5. work with “living agendas”
6. use other “organic language”
7. do ... in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

Where our co-learning journey has taken us ...

11 LESSONS LEARNED:

We need to learn to ...

8. think “knowledge gardening” more than knowledge translation or knowledge transfer
9. weave back and forth between our knowledges, our world views, our stories
10. navigate our weaving via awareness of **BIG PATTERNS** (knowledge orientations or maps)
11. make our knowledges, i.e. our stories, **visual**



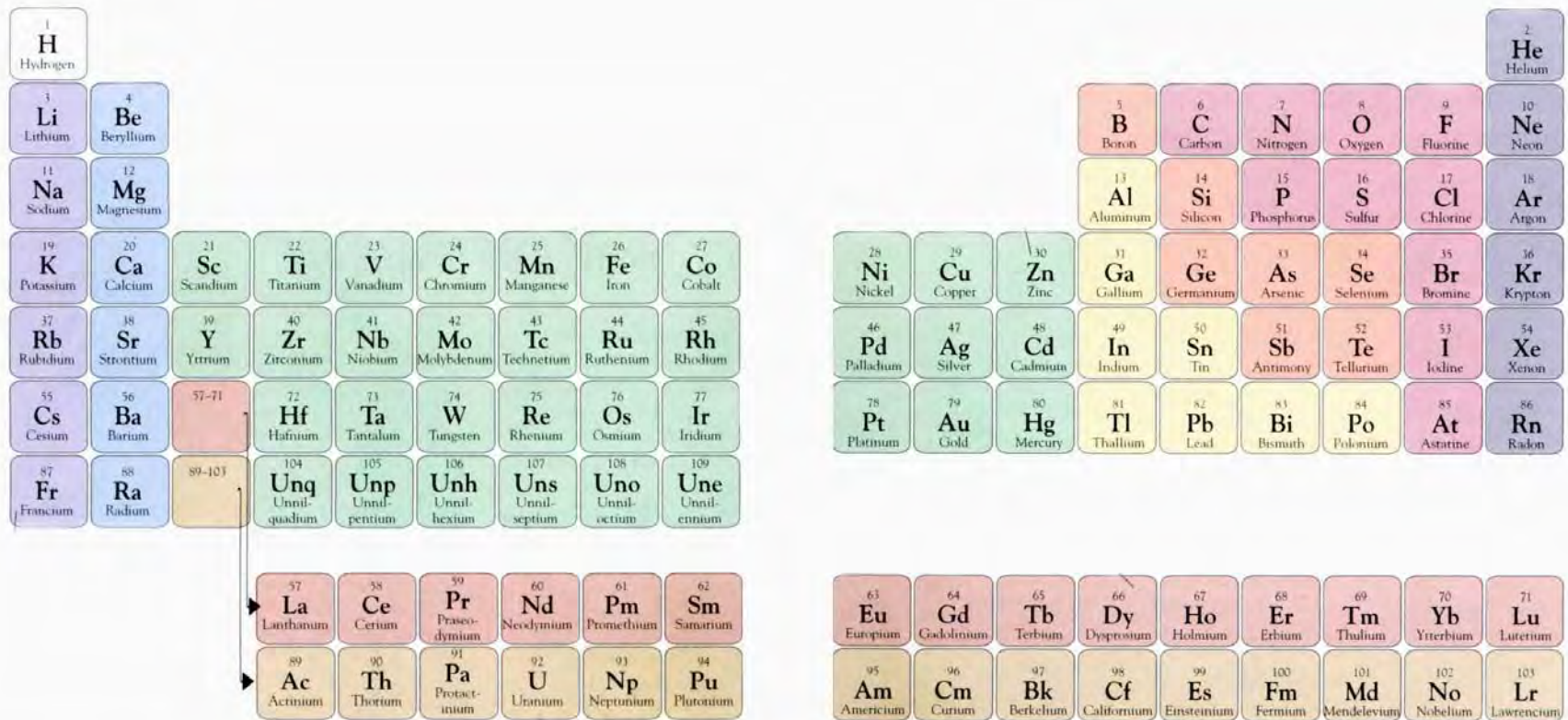
stories of our interactions with and within nature

Science

Western

stories of our interactions with and within nature

Science



The image displays a periodic table of elements, color-coded by groups. The table is organized into several rows and columns. The first row contains Hydrogen (H) and Helium (He). The second row contains Lithium (Li), Beryllium (Be), Boron (B), Carbon (C), Nitrogen (N), Oxygen (O), Fluorine (F), and Neon (Ne). The third row contains Sodium (Na), Magnesium (Mg), Aluminum (Al), Silicon (Si), Phosphorus (P), Sulfur (S), Chlorine (Cl), and Argon (Ar). The fourth row contains Potassium (K), Calcium (Ca), Scandium (Sc), Titanium (Ti), Vanadium (V), Chromium (Cr), Manganese (Mn), Iron (Fe), Cobalt (Co), Nickel (Ni), Copper (Cu), Zinc (Zn), Gallium (Ga), Germanium (Ge), Arsenic (As), Selenium (Se), Bromine (Br), and Krypton (Kr). The fifth row contains Rubidium (Rb), Strontium (Sr), Yttrium (Y), Zirconium (Zr), Niobium (Nb), Molybdenum (Mo), Technetium (Tc), Ruthenium (Ru), Rhodium (Rh), Palladium (Pd), Silver (Ag), Cadmium (Cd), Indium (In), Tin (Sn), Antimony (Sb), Tellurium (Te), Iodine (I), and Xenon (Xe). The sixth row contains Cesium (Cs), Barium (Ba), Lanthanum (La), Hafnium (Hf), Tantalum (Ta), Tungsten (W), Rhenium (Re), Osmium (Os), Iridium (Ir), Platinum (Pt), Gold (Au), Mercury (Hg), Thallium (Tl), Lead (Pb), Bismuth (Bi), Polonium (Po), Astatine (At), and Radon (Rn). The seventh row contains Francium (Fr), Radium (Ra), Actinium (Ac), Thorium (Th), Protactinium (Pa), Uranium (U), Neptunium (Np), and Plutonium (Pu). The eighth row contains Europium (Eu), Gadolinium (Gd), Terbium (Tb), Dysprosium (Dy), Holmium (Ho), Erbium (Er), Thulium (Tm), Ytterbium (Yb), and Lutetium (Lu). The ninth row contains Americium (Am), Curium (Cm), Berkelium (Bk), Californium (Cf), Einsteinium (Es), Fermium (Fm), Mendelevium (Md), Nobelium (No), and Lawrencium (Lr). The table also includes several unclassified elements: Ununquadium (Unq), Ununpentium (Unp), Ununhexium (Unh), Ununseptium (Uns), Ununoctium (Uno), and Ununennium (Une) in the sixth row; and Unseptium (Unq), Unoctium (Unp), Unnonium (Unh), Undecium (Uns), and Untrium (Uno) in the seventh row. The table is color-coded by groups: Group 1 (blue), Group 2 (light blue), Groups 3-10 (green), Groups 11-12 (yellow), Groups 13-18 (orange), and Groups 19-20 (purple).

1 H Hydrogen																	2 He Helium	
3 Li Lithium	4 Be Beryllium											5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon	
11 Na Sodium	12 Mg Magnesium											13 Al Aluminum	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon	
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton	
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon	
55 Cs Cesium	56 Ba Barium	57-71 Lanthanides	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon	
87 Fr Francium	88 Ra Radium	89-103 Actinides	104 Unq Ununquadium	105 Unp Ununpentium	106 Unh Ununhexium	107 Uns Ununseptium	108 Uno Ununoctium	109 Une Ununennium										
			57 La Lanthanum	58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium										
			89 Ac Actinium	90 Th Thorium	91 Pa Protactinium	92 U Uranium	93 Np Neptunium	94 Pu Plutonium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium	
								95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium		

Periodic Table of the Elements

stories of our interactions with and within nature

Science

Indigenous

stories of our interactions with and within nature

Science



Land
Language
Life



stories of our interactions with and within nature

Science: Integrative Science

Artist
Basma
Kavanagh



stories of our interactions with and within nature

Science: Integrative Science

Artist
Basma
Kavanagh



Indigenous our knowledges Western

our world views

bringing our stories together

stories of our interactions with and within nature

Science: Integrative Science



Indigenous

Western

bringing our stories together

“Two-Eyed Seeing”

learning to see with the strengths of each & together



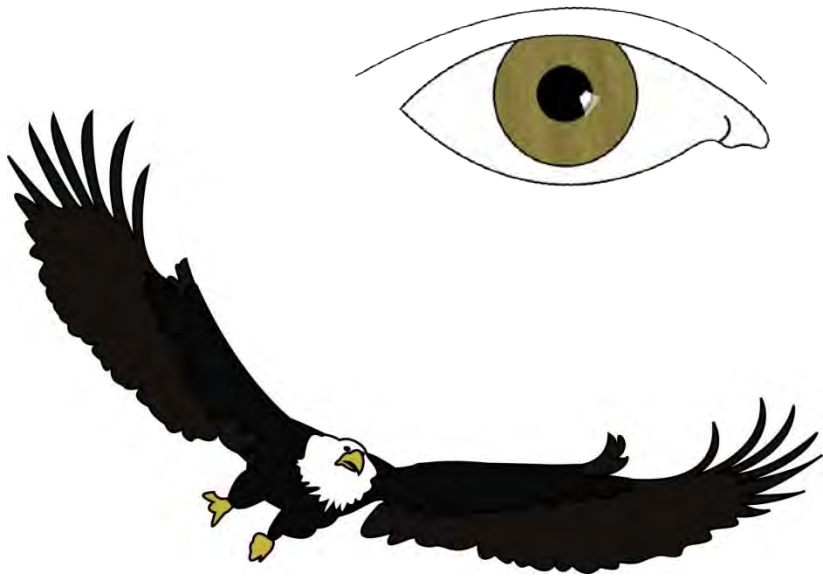
Indigenous



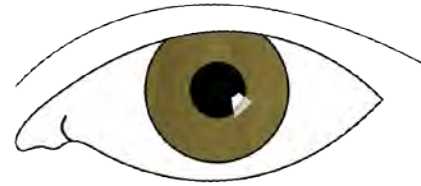
Western



Mr. Albert Marshall, Mi'kmaq Elder
Eskasoni First Nation



Eagle

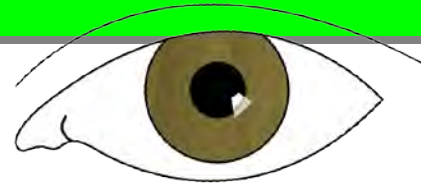
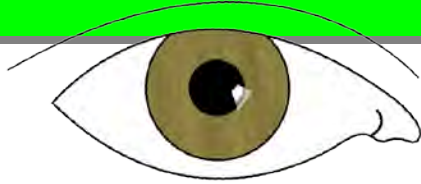


Hawk

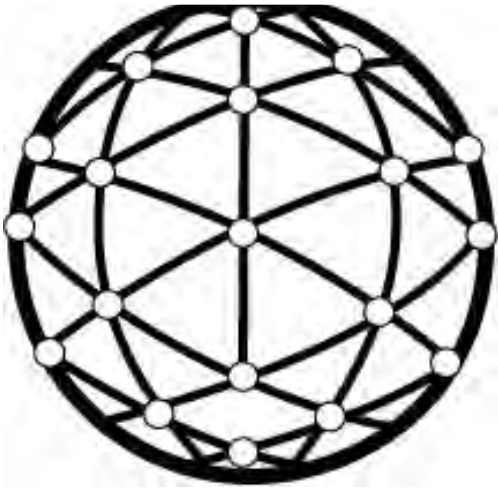
see Paula Underwood Spencer's article: *Hawk and Eagle, Both are Singing*
http://www.ratical.org/many_worlds/NAworldview.html

Two-Eyed Seeing

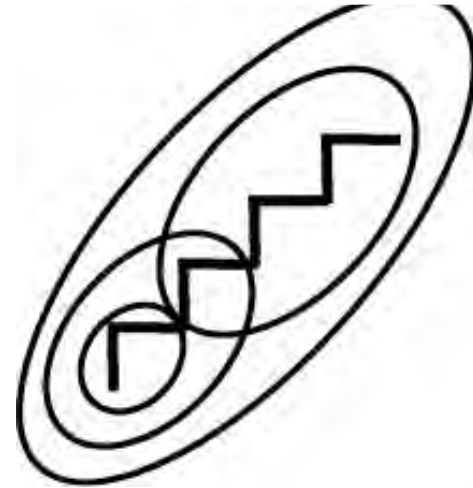
our world is



interconnective



parts & wholes

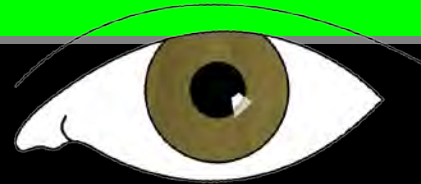


Two-Eyed Seeing

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

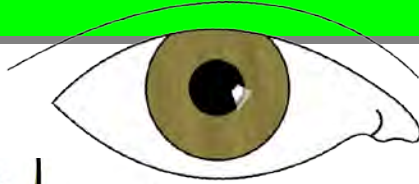


rigour

UN-WEAVING

Two-Eyed Seeing

our overall knowledge objective



towards resonance
of understanding
within environment



towards construction
of understanding
of environment

Co-Learning

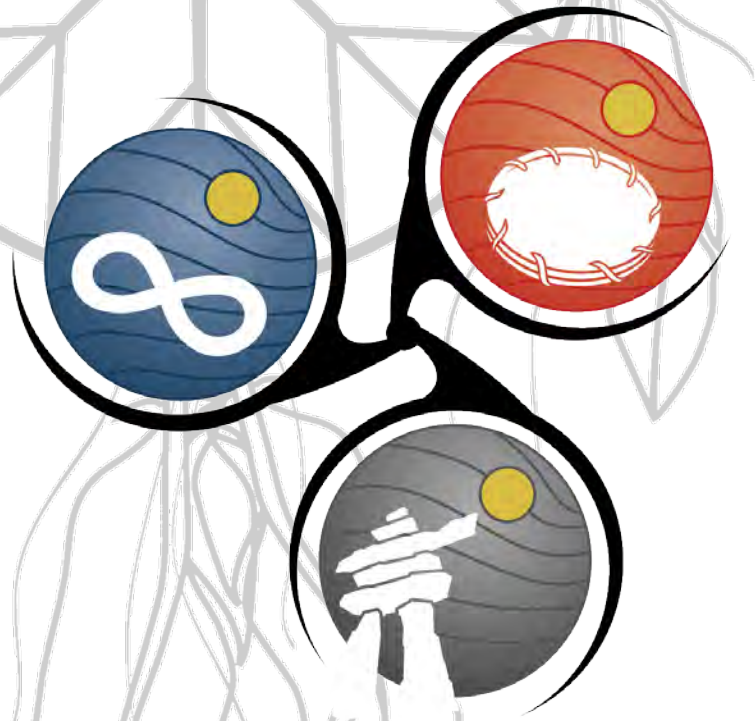
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Look underground and all those trees are holding hands. We as people must do the same.

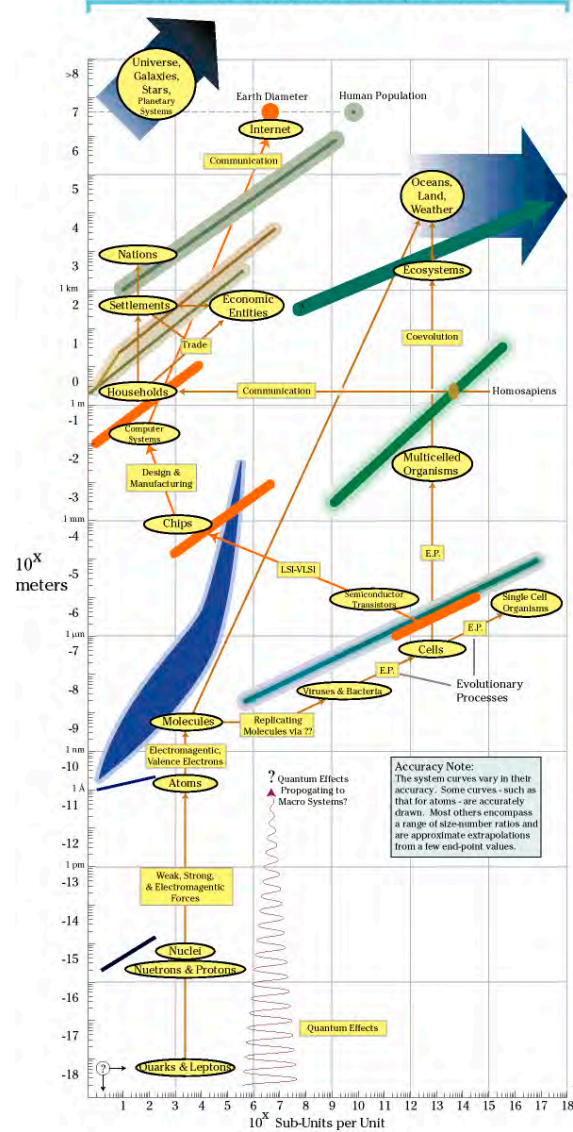
(late Mi'kmaq Chief, Spiritual Elder, and Healer Charlie Labrador)



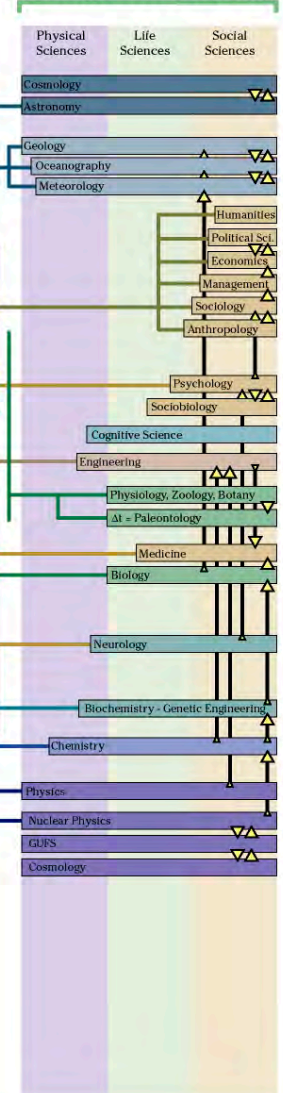
Co-Learning



Some Physical Systems



Some Systems of Human Knowledge



Co-Learning

It is not enough to just value the links between the experiences, disciplines, creativity, and ideas (as in inter & multi disciplinarity) ...

... in trans - disciplinary work ...

... in trans - cultural work ...



... one has to develop methods, strategies, and practices that will transform those links to the real connections.

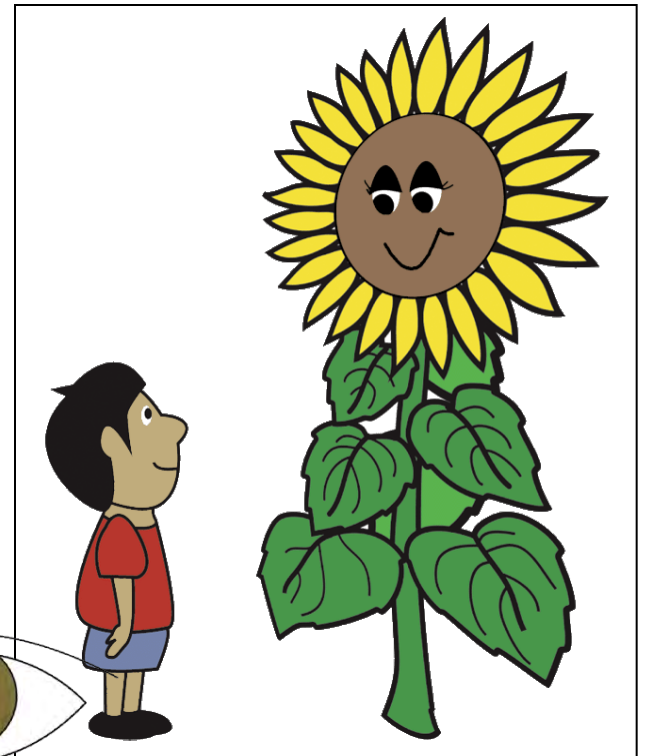
[adapted from Ron Burnett at http://www.chocuk.net/troupe/isin_onol1.html]

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[adapted from Ron Burnett at http://www.chocuk.net/troupe/isin_onol1.html]

Co-Learning

**Science: stories ...
... humans with and within Nature**

Science education

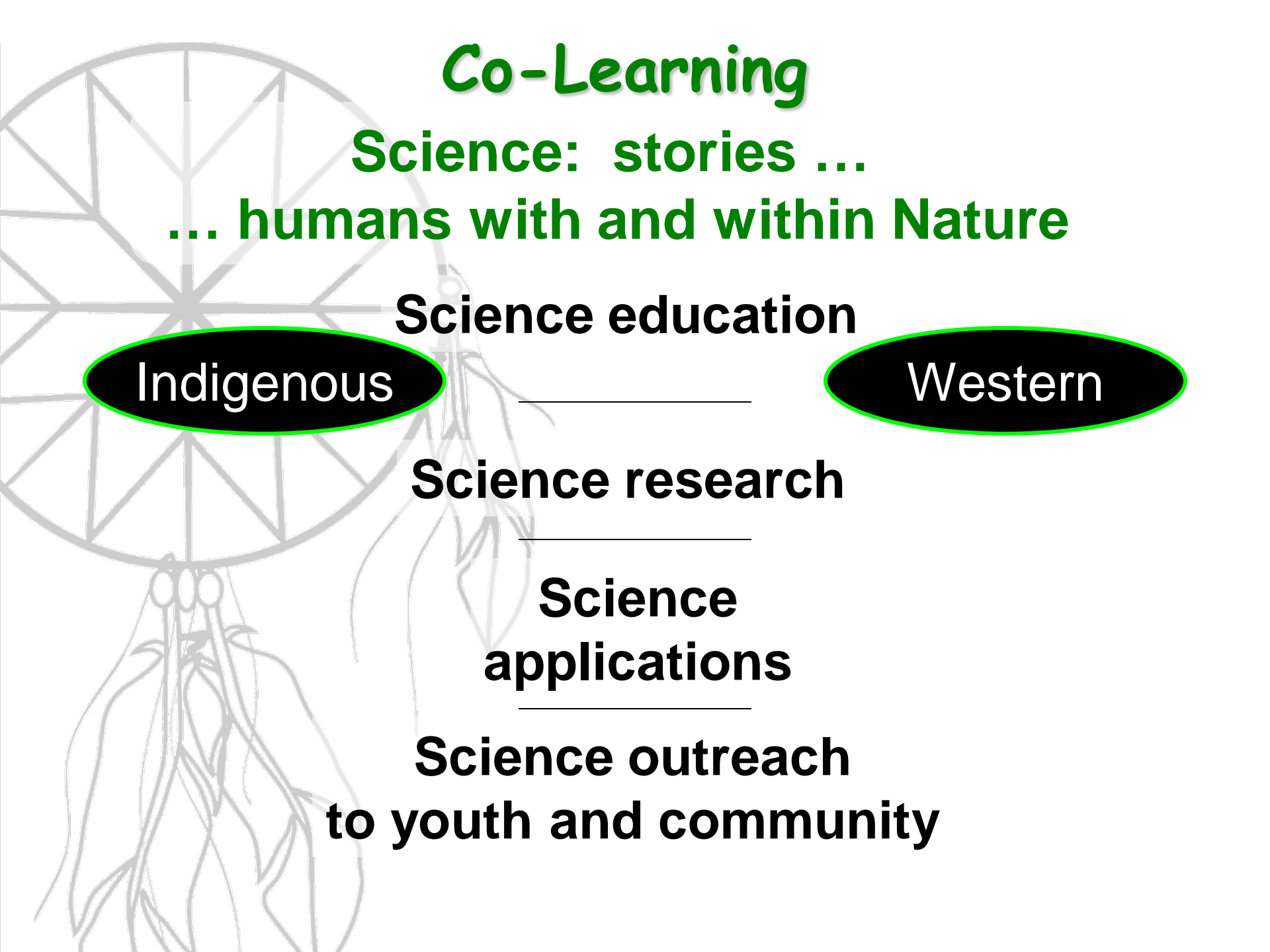
Indigenous

Western

Science research

**Science
applications**

**Science outreach
to youth and community**







SYDNEY, NS
Rise and Set for the Sun for 2004

Zone: 4h West of Greenwich

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

	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.	
Day	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
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31	0725	1703			0542	1829			0413	1944			0442	1931	0520	1840			0641	1647			0743	1625



**participatory &
creative choice**



**Wjipenuk Etek
Lnuimlkikno'ti
- Spirit of the East -**

East (sunrise)

**... a place of
beginnings and
enlightenment**

**... where new
knowledge can be
created or received
to bring about
harmony or right
relations.**

Physical Direction

detached & instrumental



East (sunrise)

... measurement of
the time of sunrise

... for each new day
over the course of
one full year.

		SYDNEY, NS												Astronomical Applications Dept.										
Location: W060 11, N46 09		Rise and Set for the Sun for 2004												U. S. Naval Observatory										
		Zone: 4h West of Greenwich												Washington, DC 20392-5420										
Day	Rise	Set	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Rise	Set								
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m								
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10	0742	1635	0712	1718	0622	1800	0523	1842	0434	1921	0409	1952	0420	1952	0454	1917	0533	1821	0611	1723	0655	1634	0733	1615
11	0742	1636	0711	1720	0620	1802	0521	1843	0433	1922	0409	1952	0421	1951	0455	1915	0534	1819	0613	1721	0657	1633	0734	1615
12	0741	1637	0709	1721	0619	1803	0519	1845	0431	1924	0409	1953	0422	1951	0457	1914	0535	1817	0614	1719	0658	1631	0734	1615
13	0741	1638	0708	1723	0617	1804	0517	1846	0430	1925	0409	1953	0423	1950	0458	1912	0537	1815	0616	1717	0659	1630	0735	1615
14	0740	1640	0706	1724	0615	1806	0515	1847	0429	1926	0409	1954	0424	1949	0459	1911	0538	1813	0617	1716	0701	1629	0736	1615
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24	0733	1653	0650	1739	0555	1819	0458	1900	0418	1937	0410	1956	0434	1940	0512	1853	0551	1754	0631	1658	0714	1620	0742	1619
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30	0727	1702			0544	1827	0448	1908	0414	1943	0413	1956	0441	1933	0519	1842	0558	1742	0639	1649	0722	1617	0743	1624
31	0725	1703			0542	1829			0413	1944			0442	1931	0520	1840			0641	1647			0743	1625

PATTERN CONCEPTUAL FRAMEWORK

outer

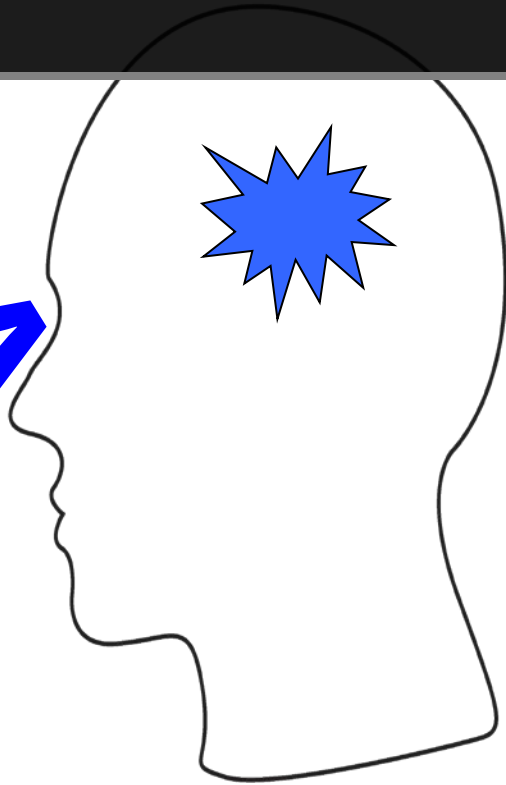
inner

outer



PATTERN CONCEPTUAL FRAMEWORK

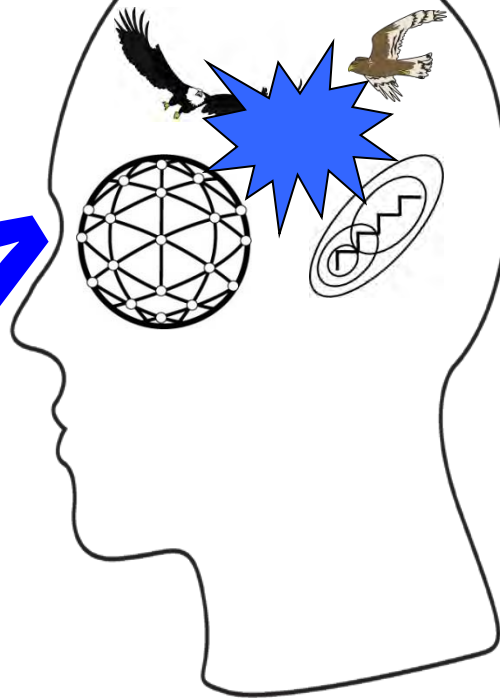
outer



PATTERN CONCEPTUAL FRAMEWORK

outer

inner

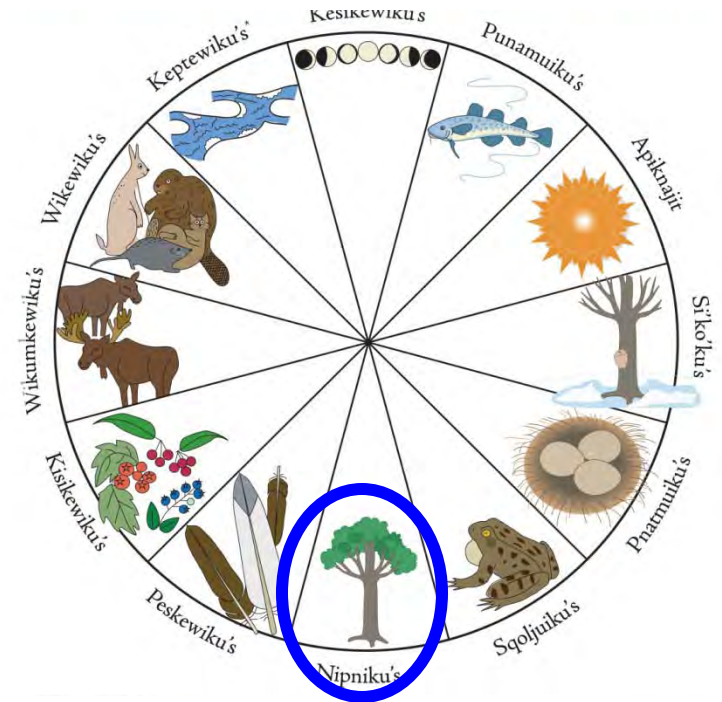
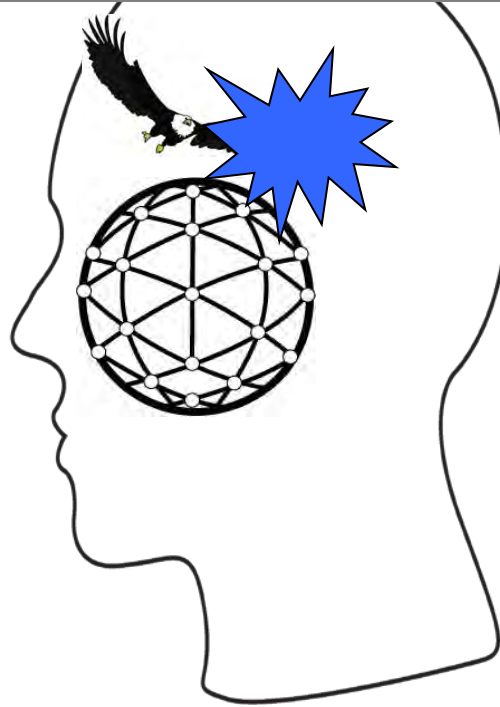


PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer



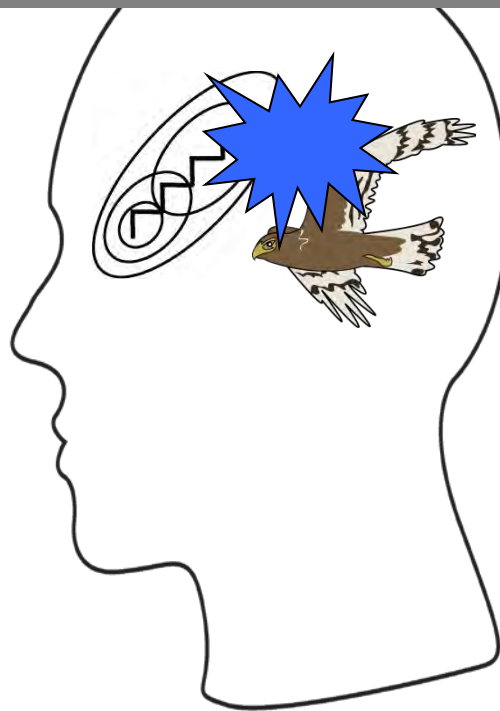
PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

X



June

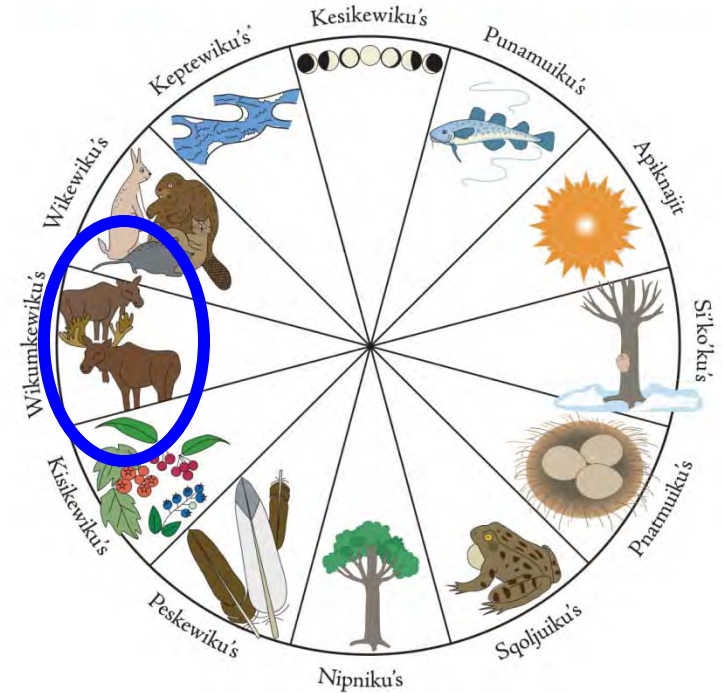
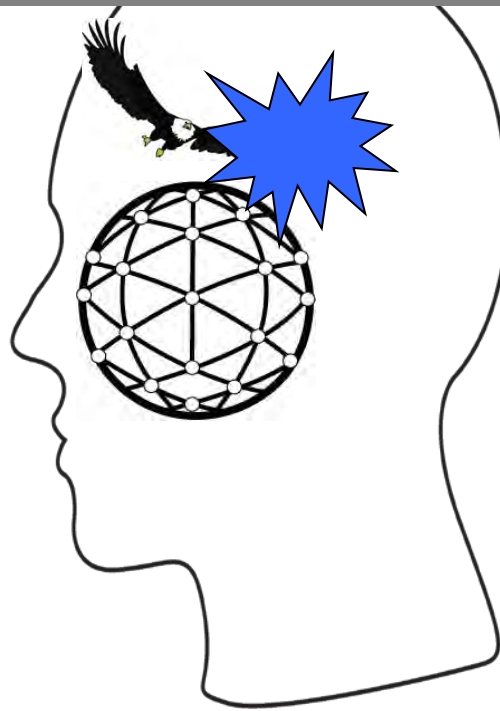
... in honour of
“Juno”, the
Roman’s Queen
of the Gods

PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer



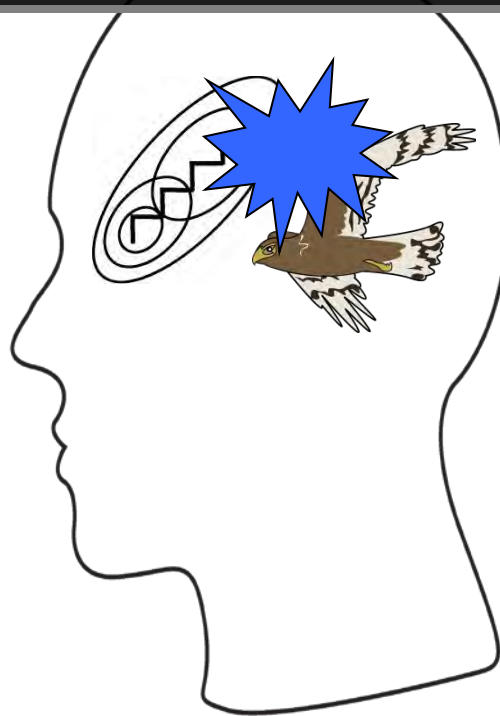
PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

X



September

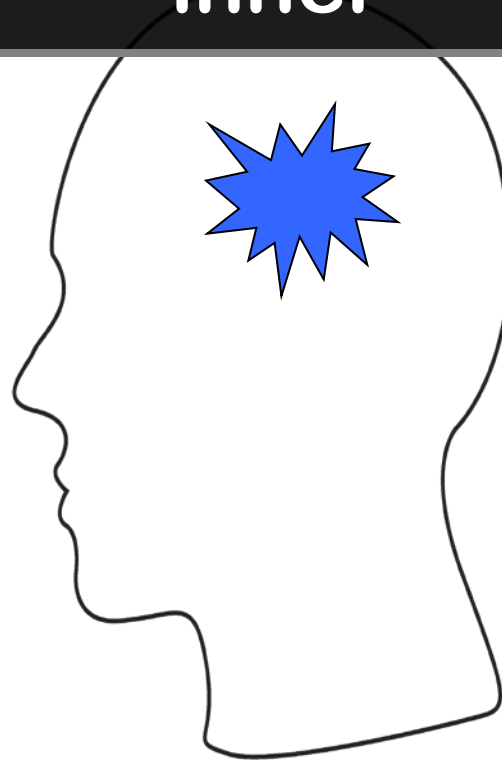
“sept” = 7 in Latin
... was 7th month when
a 10 month year was
used ... although now
is 9th month in a 12
month year

PATTERN CONCEPTUAL FRAMEWORK

outer

inner

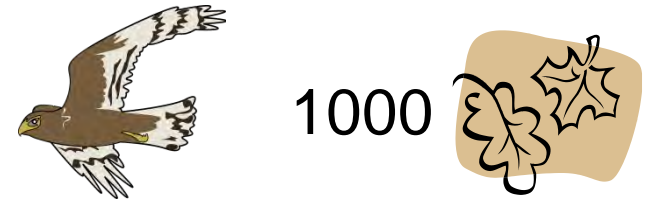
outer



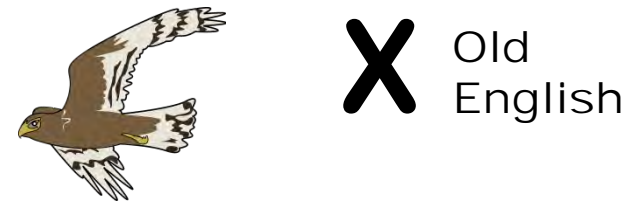
Attu'tuejualu



millefolium



Yarrow

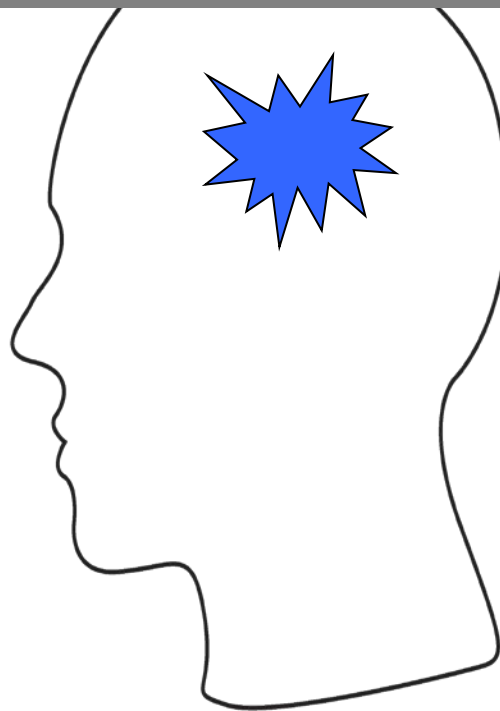


PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer



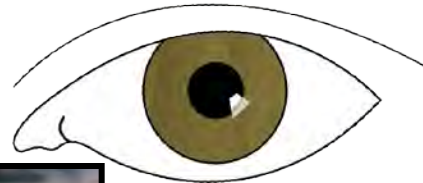
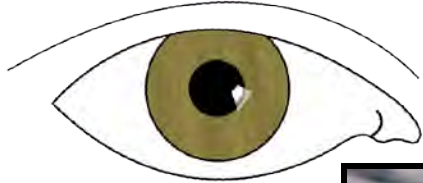
Mtèskmwaqsil



Fiddlehead
fern

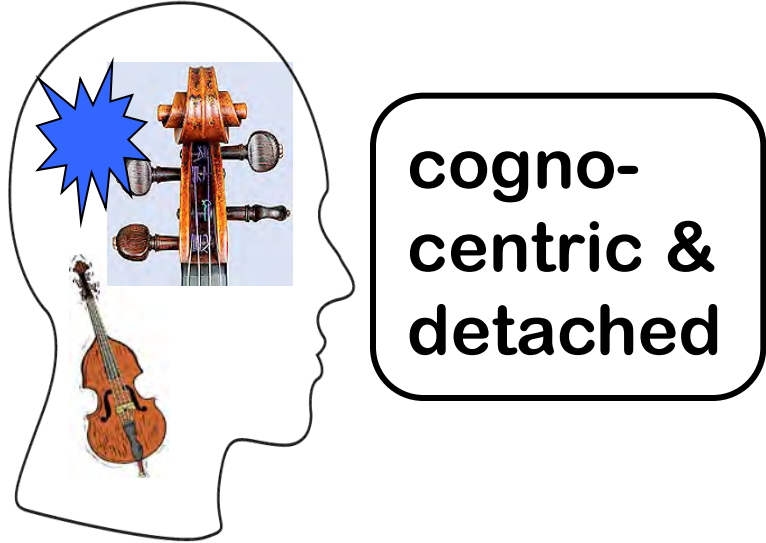
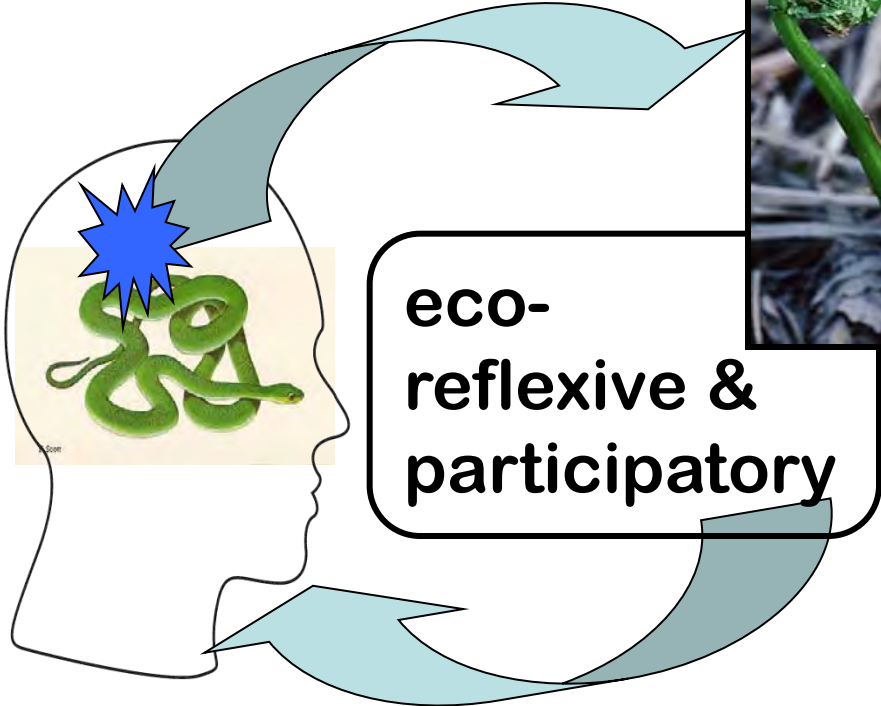


what our "pattern seeing" (re)generates



subject-subject

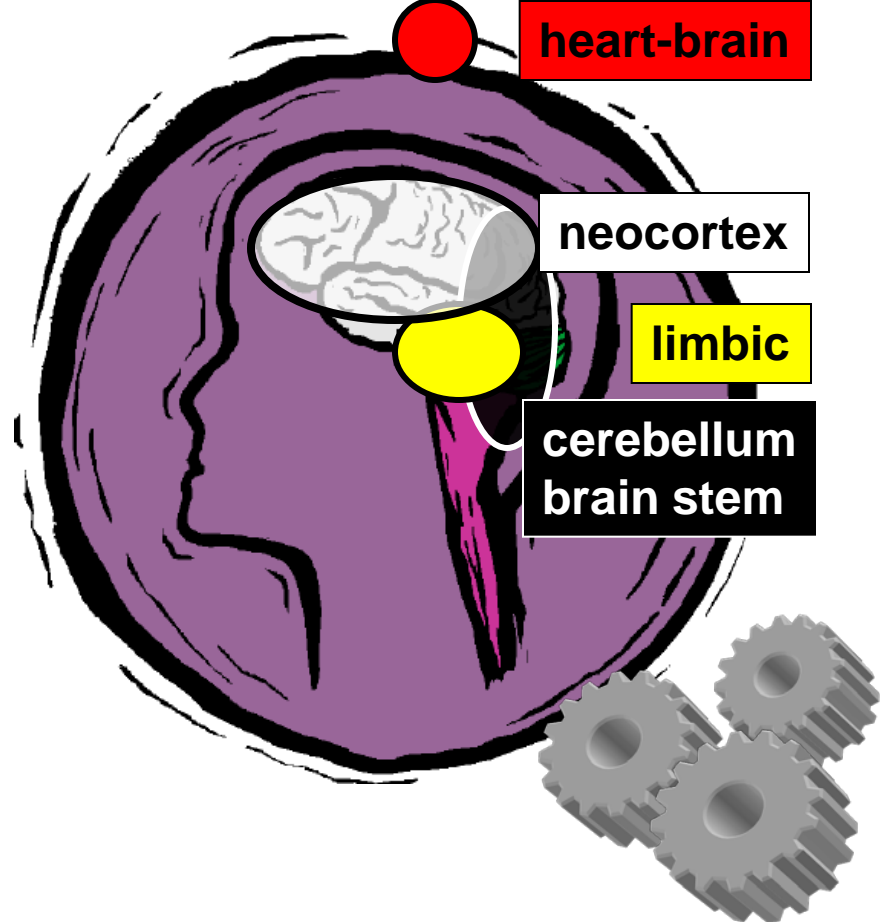
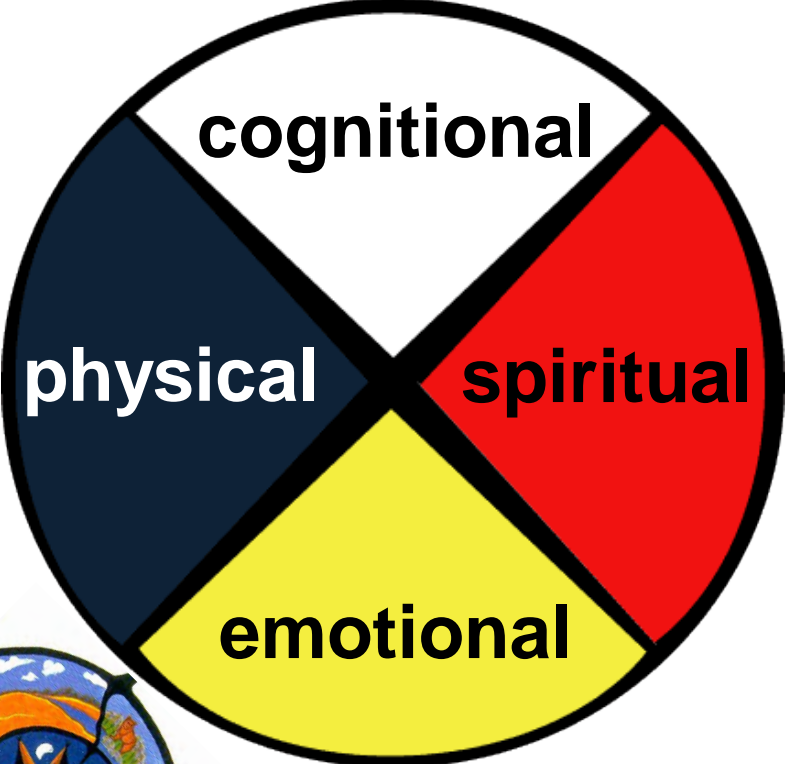
subject - object



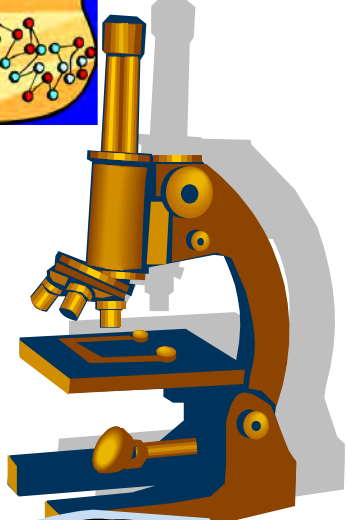
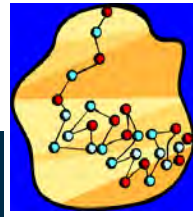
connectedness

disconnectedness

what we "see" as: HUMAN



what we "see" as: HUMAN HEALTH



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

what we "see" as: MOTHER-CHILD



from:
Mi'kmaq Family
& Children's
Services

Land of Eagle



ONE WHO SEES BIG PATTERNS
or "WHOLENESS"

domain of the
unknown

FEAR

domain of the
known



**"must become
PATTERN-able"**
(Douglas J. Cardinal)
world renown architect

common ground

Both Indigenous and Western scientific knowledges are based on observations of the environment.



PATTERN RECOGNITION

common ground

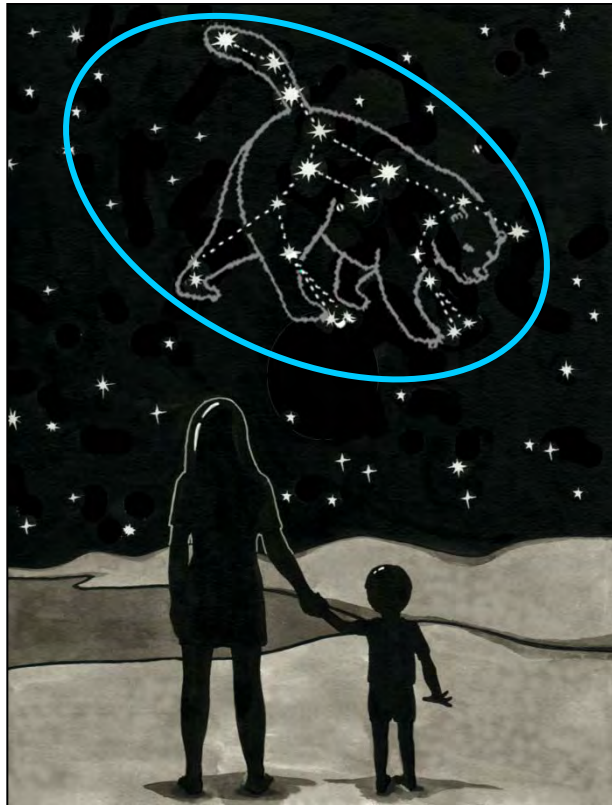
Both Indigenous and Western scientific knowledges result from the same intellectual process of creating order out of disorder.

order

= **PATTERN**



stories of our interactions with and within nature



PATTERN

- recognition
- transformation
- expression

- various **pattern smarts**
 - various ways to connect the dots
 - variety in our stories

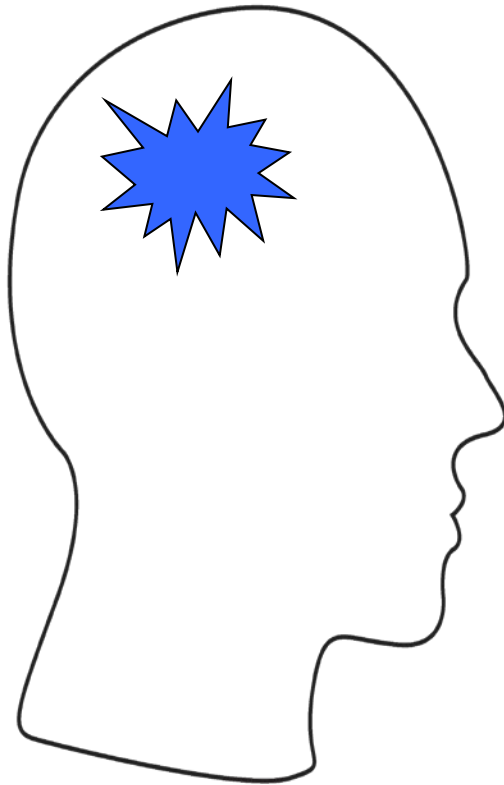
“pattern smarts”

multiple intelligences theory

(H. Gardner, Harvard Univ.)

sanctioned
world view or methodology

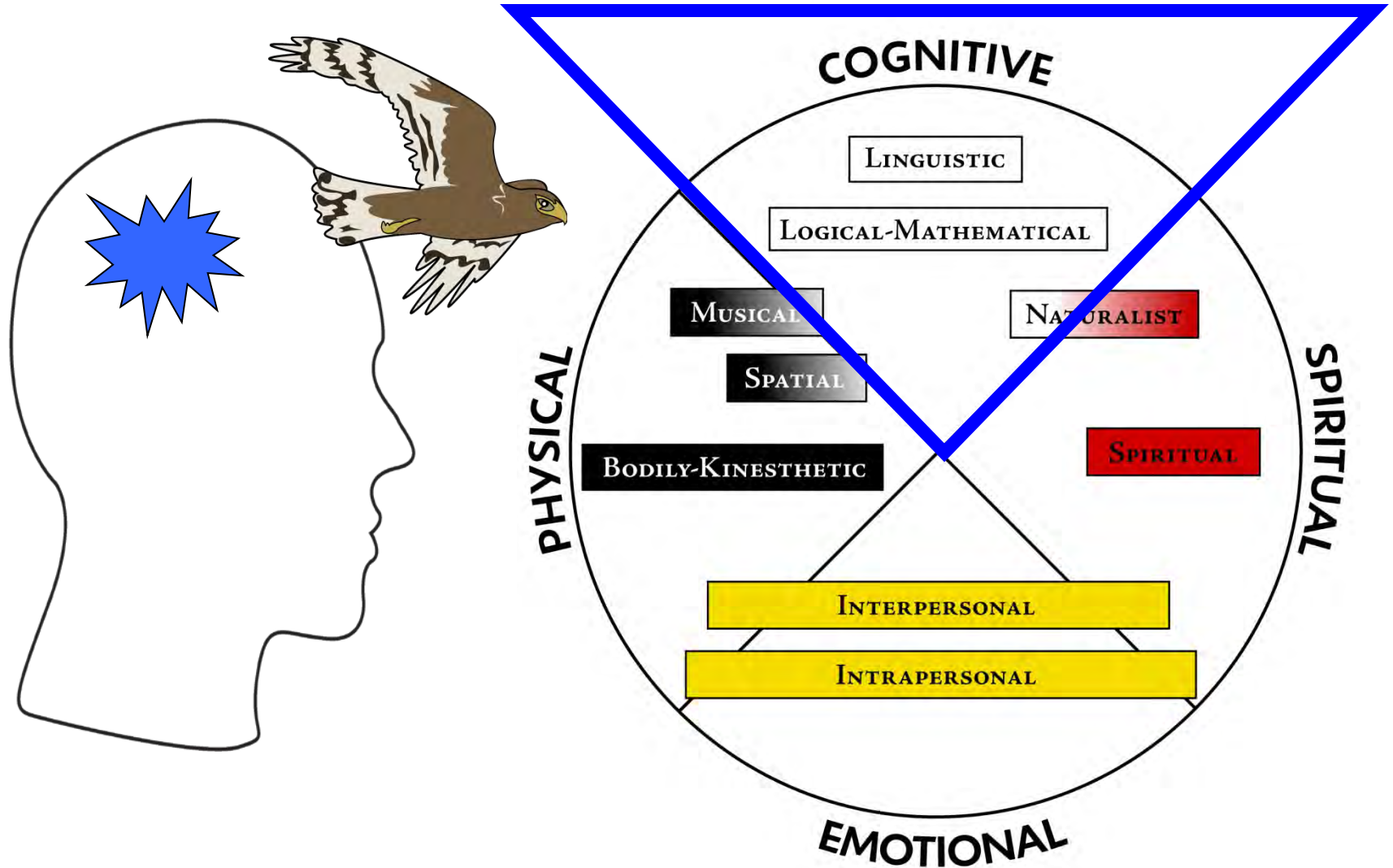
“VALUE”



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

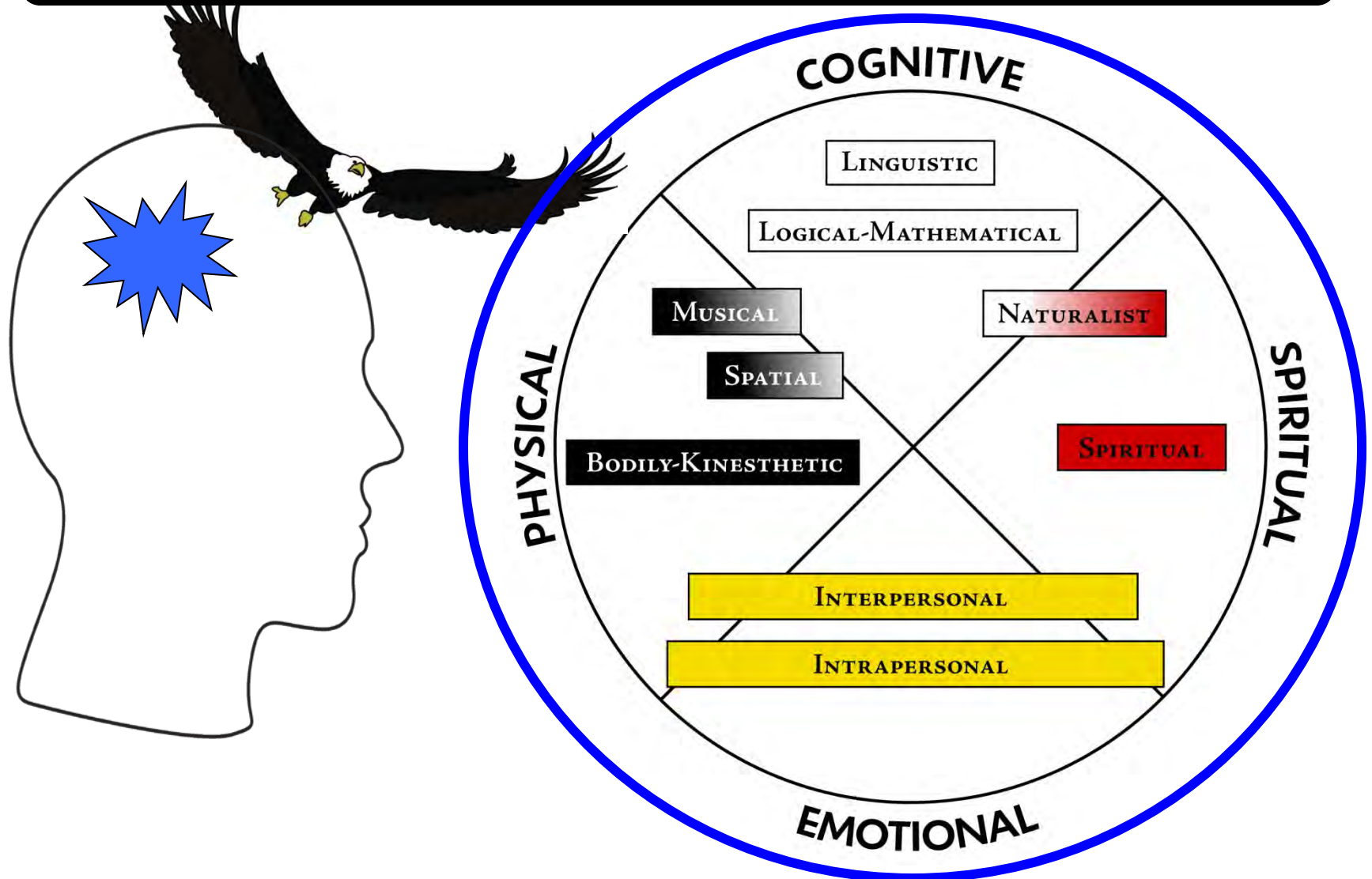
“pattern smarts”

Medicine Wheel: lived relationships



“pattern smarts”

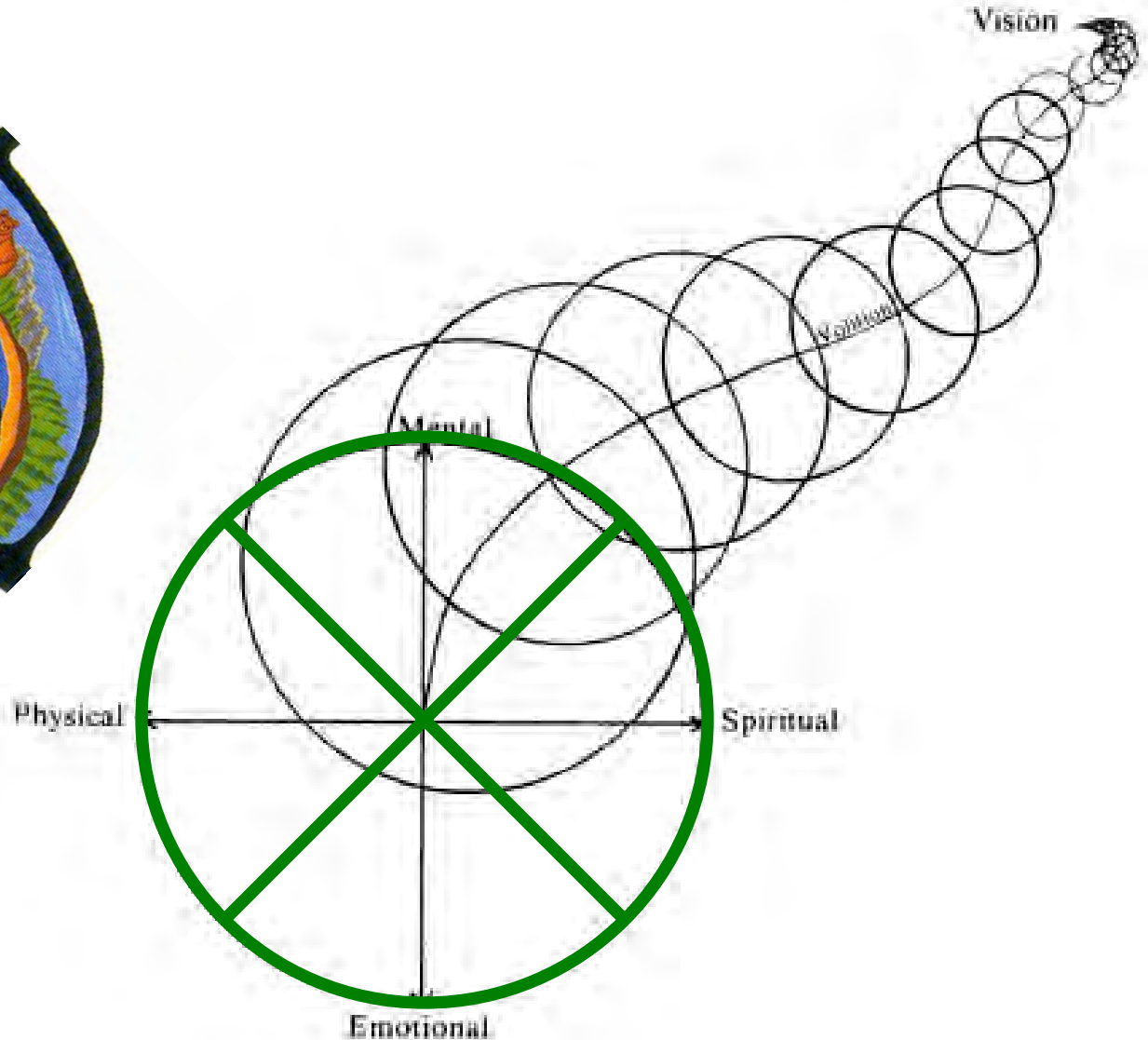
Medicine Wheel: lived relationships



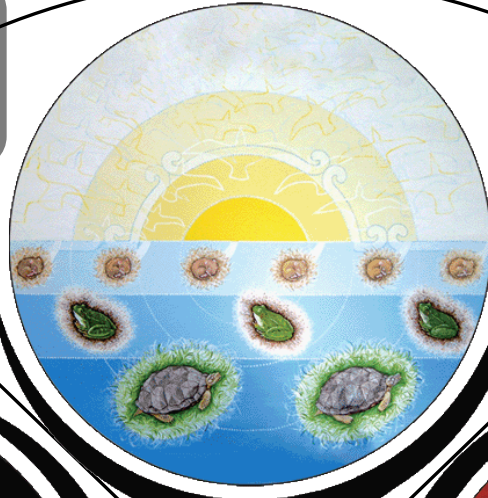
co-learning our way to expanding wholeness through restoration of relationships with the land



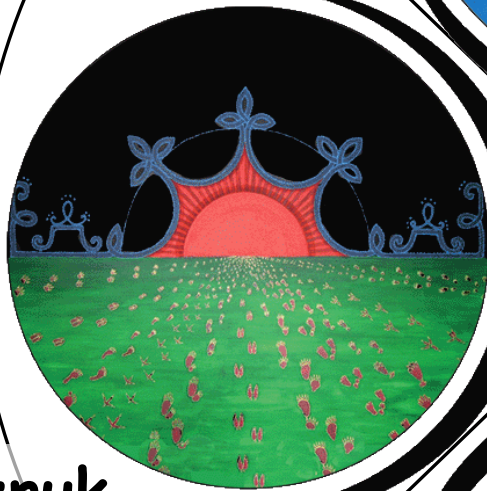
Artist: Rod Restoule
from: Into the Daylight;
C. Morrisseau, 1998



Oqwatnuk
... wisdom



Wjipnuk
... newness



Tkisnuk
... unknown

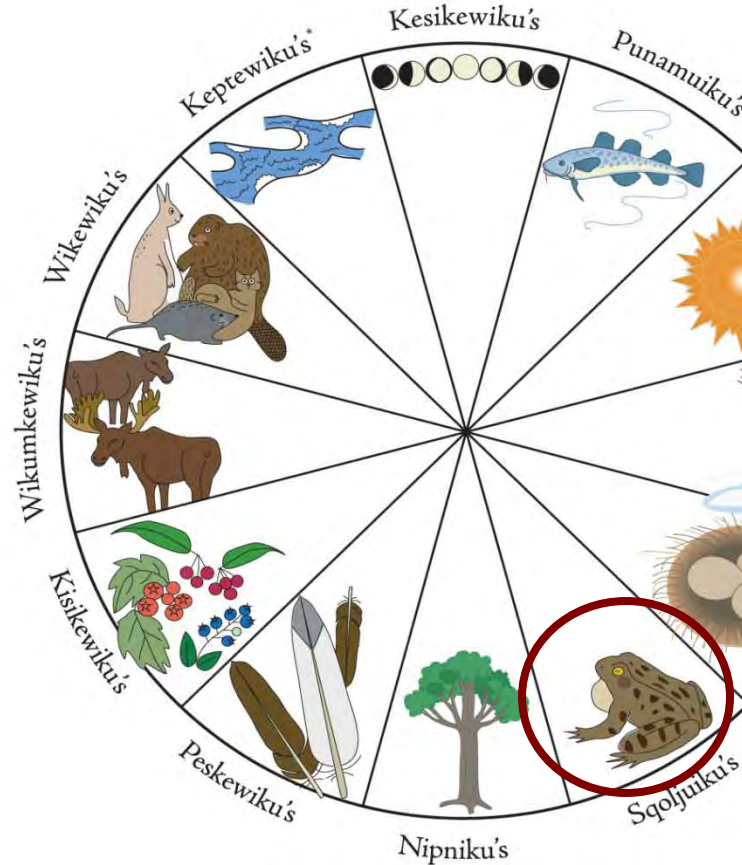


Pkite'snuk
... fullness

Artist
Basma
Kavanagh



Mi'kmawe'k Tepknusetk



*Alternative – Kepti'kewiku's

Earth speaks

ECOSYSTEM HEALTH CONSCIOUSNESS Difference, Pattern, Variation

TOQWA'TU'KL KJIJITAQNN • INTEGRATIVE SCIENCE

Frogs of Unama'ki



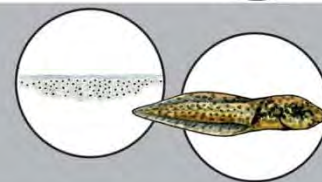
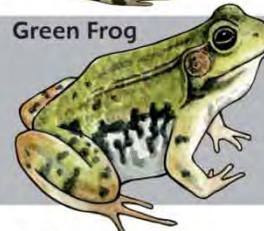
Mink Frog



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

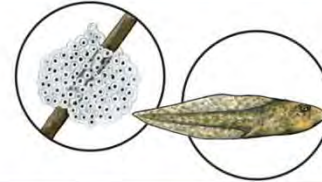
Green Frog



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, slugs, waterbugs, butterflies and moths, and sometimes other small frogs.

GREEN FROG

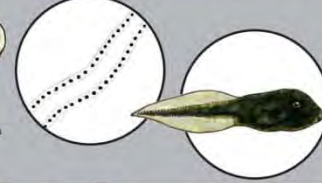
Pickerel Frog



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, snails, slugs, 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 at a time in two long strings near the bottom of the pond or puddle. Toad eats many kinds of insects like caterpillars, earwigs, saw 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

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.

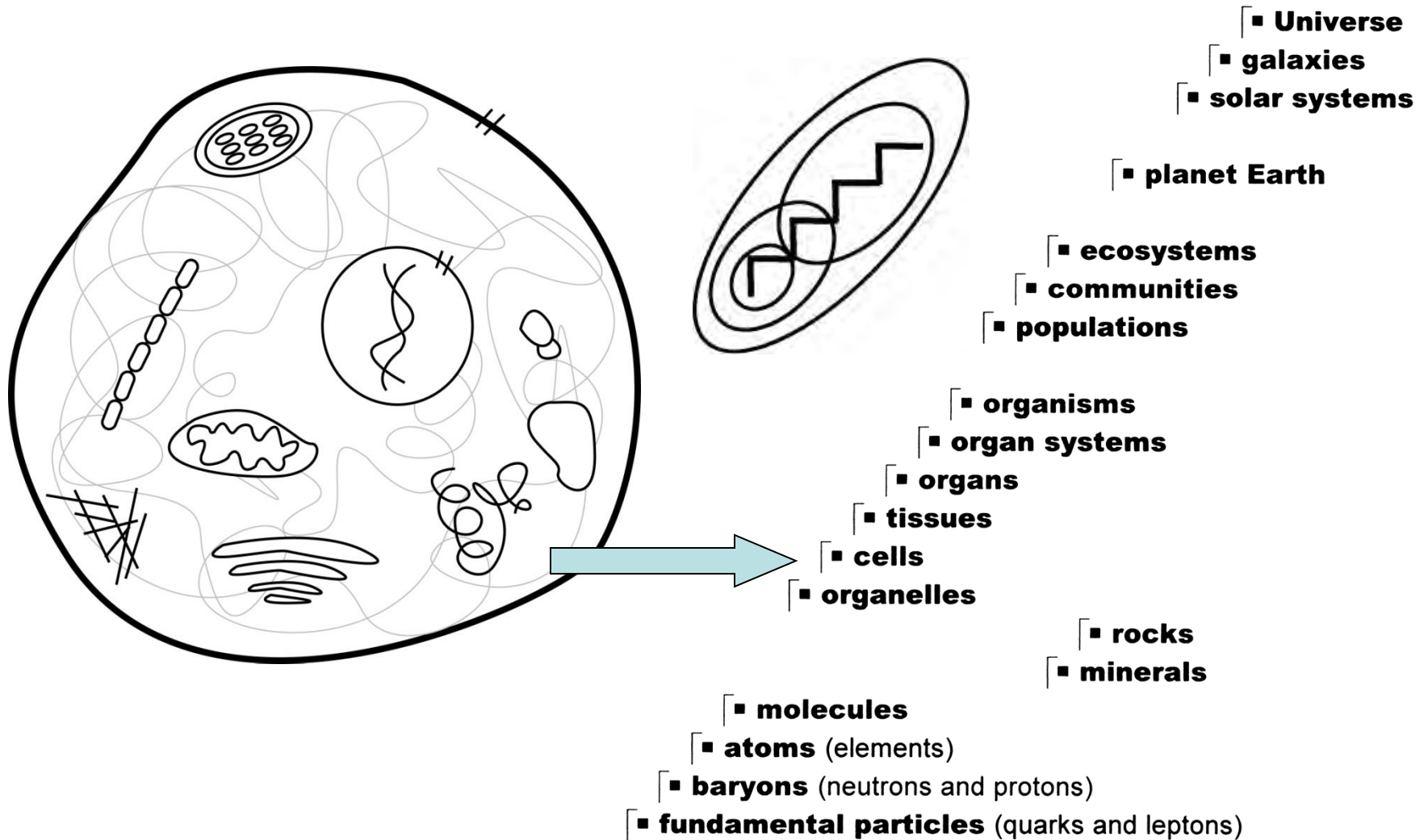
(late Mi'kmaq Chief, Spiritual Elder, and Healer Charlie Labrador)



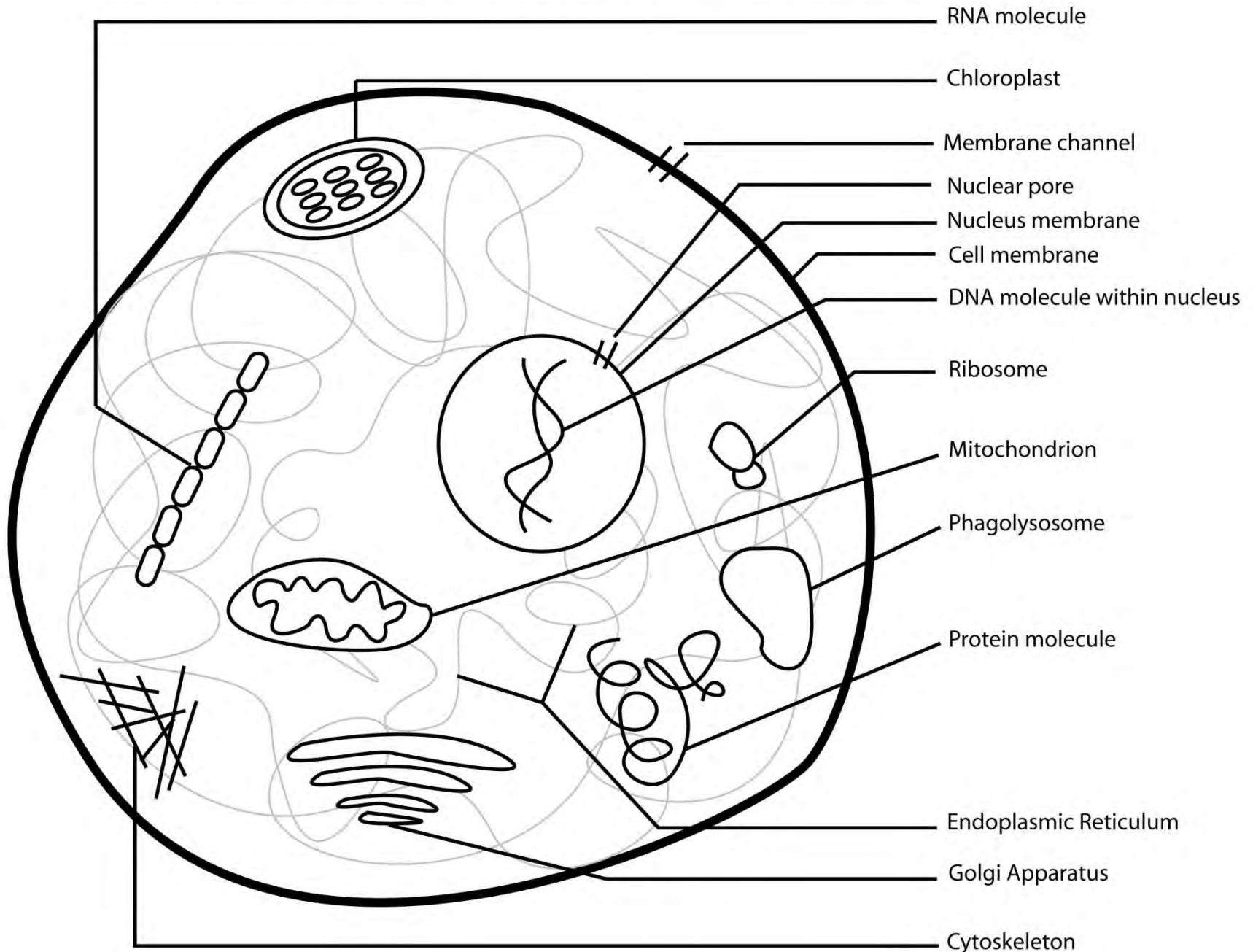


HOLARCHY

- VISIBLE MATTER IN THE UNIVERSE -

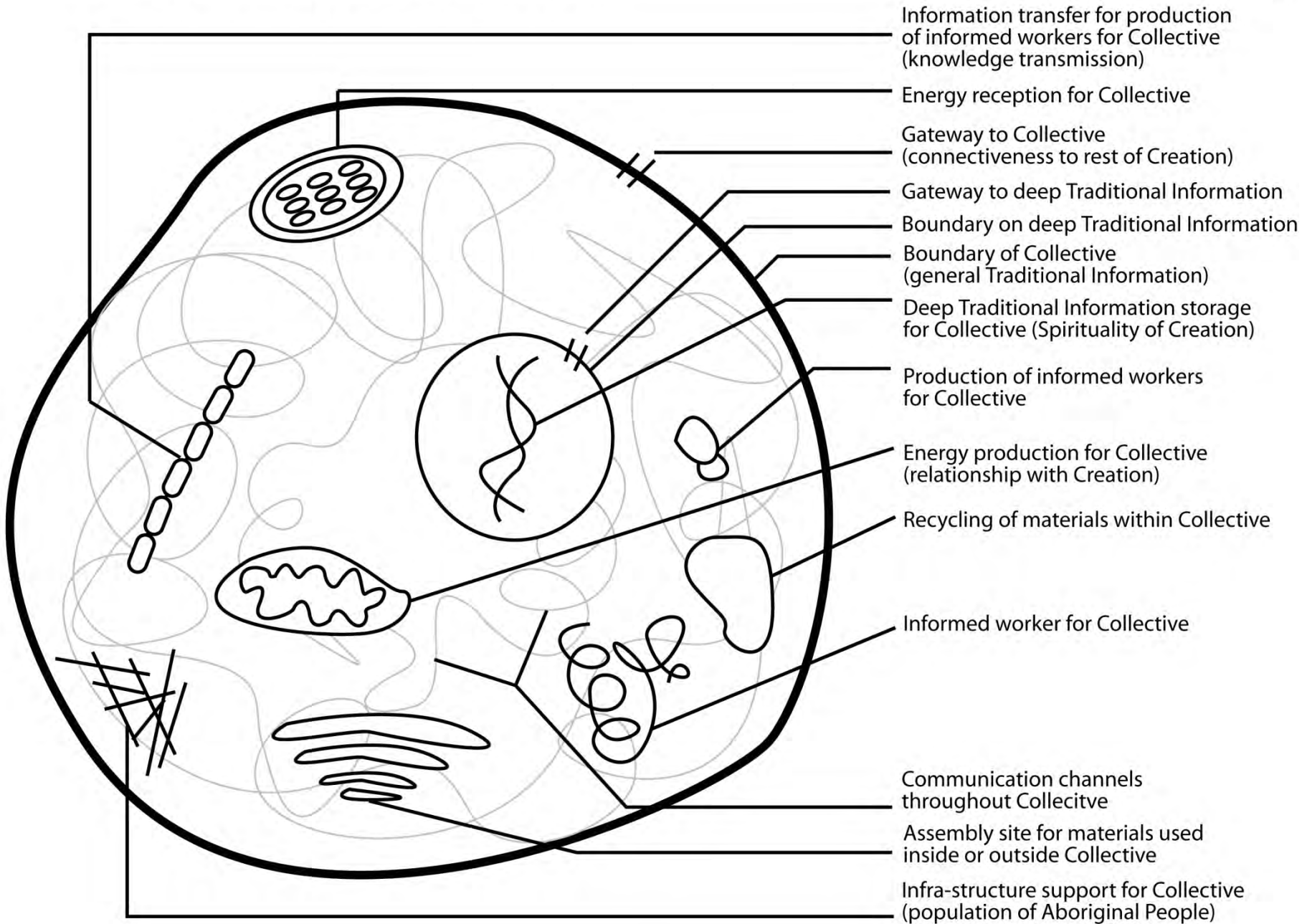


The Collective: Its Parts (example = the living cell)



The Collective: Its Functions

Murdena Marshall's TK metaphor





Wela'lioq

Thank you