

**SCIENCE: dynamic, pattern-based,  
knowledge stories ...**  
*an integrative framework  
with emphasis on “role of the knower”*

presentation for: ABS350Y Aboriginal Health Systems



## **Aboriginal Studies**

University of Toronto (Distinguished Lecturer Series)  
5 November 2007

**Cheryl Bartlett, PhD**  
Canada Research Chair  
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



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

Mi'kmaq College Institute / Mi'kmaq Espi Kina'matno'kuom



IWK Health Centre Foundation

IAPH

ATLANTIC ABORIGINAL Health Research Program

Mi'kmaq Elders

NOVA SCOTIA Health Research FOUNDATION

SABLE OFFSHORE ENERGY INCORPORATED

UNAMA'KI INSTITUTE OF NATURAL RESOURCES

KECCA Knowledge: Education and Cultural Consultant Associates

NSERC CRSNG

Mi'kmawey Debert

Eskasoni Detachment Royal Canadian Mounted Police / Gendarmerie royale du Canada

**10+ years: where our journey  
has been and continues to be ...**

## **Integrative Science**

**bringing together Indigenous and Western  
scientific knowledges and ways of knowing**

**Indigenous**

**Western**

# Why our journey started ...

1 2 3 reasons

Indigenous

Western



# Why?

# 1



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



**Why?**

**1**

**mid 1990's**

# CAPE BRETON UNIVERSITY

**no Mi'kmaq students in science**

**MI'KMA'KI**

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



**Why?**

**1**

**mid 1990's & now**

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

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

**MI'KMA'KI**

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



**Why?**

1

mid 1990's & now



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



# Why?

# 2



... and many, many youth



**Why?**

**3**

**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**



# Integrative Science



Artist Basma Kavanagh

# Integrative Science

## SCIENCE

education, research, applications,  
youth and community outreach

Indigenous

our sciences  
our stories

Western

“bringing our knowledges together”  
our worldviews



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**





**Science: dynamic, pattern-based,  
knowledge stories**

## **THIS PRESENTATION:**

1. outline our *integrative framework*
2. emphasize, from this framework, the “role of the knower” ... via
  - exploration of *patterns*, and
  - use of *visuals*

# Integrative Framework

## **both Indigenous and Western, plus:**

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

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



# “Two-Eyed Seeing”

learning to see with the strengths of each & together



Indigenous



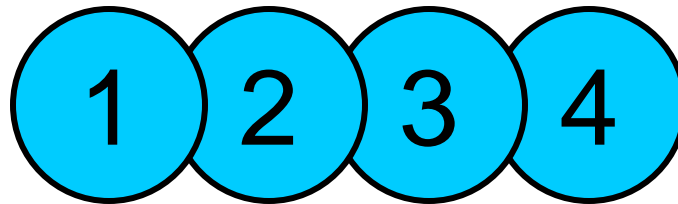
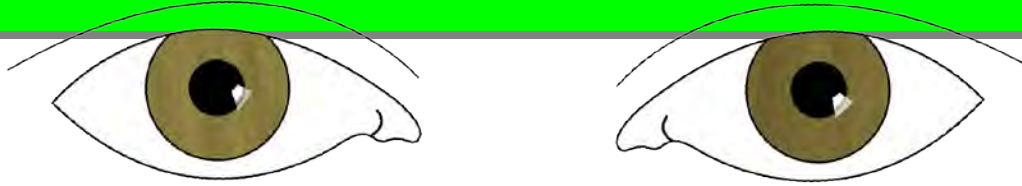
Western



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

# Two-Eyed Seeing

## FOUR BIG KNOWLEDGE PATTERNS





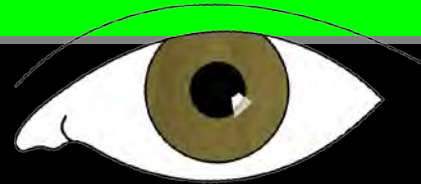
1

# Two-Eyed Seeing

our key concepts & actions



- respect
- relationship
- reverence
- reciprocity
- ritual (ceremony)
- repetition
- responsibility



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

2

# Two-Eyed Seeing our language & methodology



**vigour**

**WEAVING**



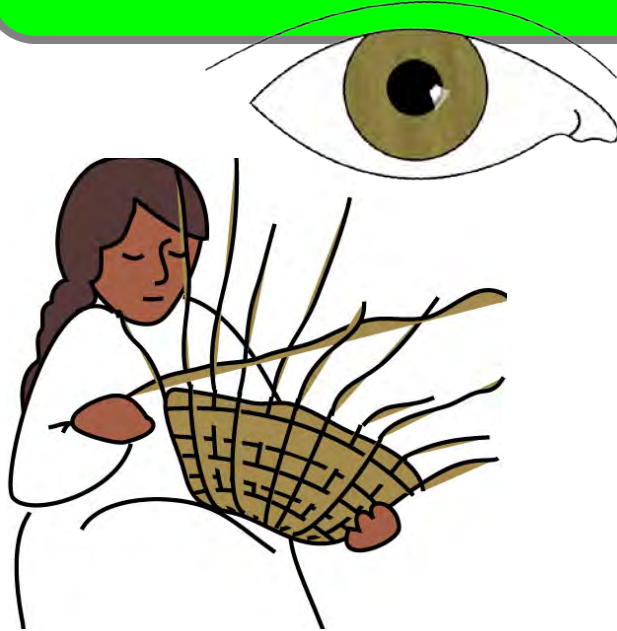
**rigour**

**UN-WEAVING**

3

# Two-Eyed Seeing

our overall knowledge objective



towards resonance  
of understanding  
within environment



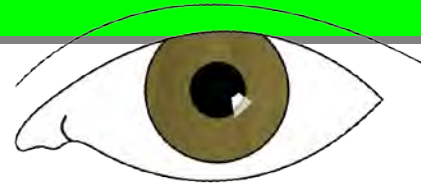
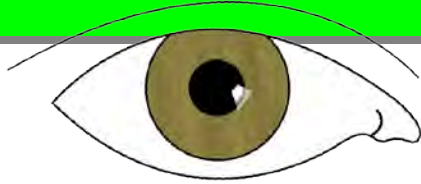
towards construction  
of understanding  
of environment



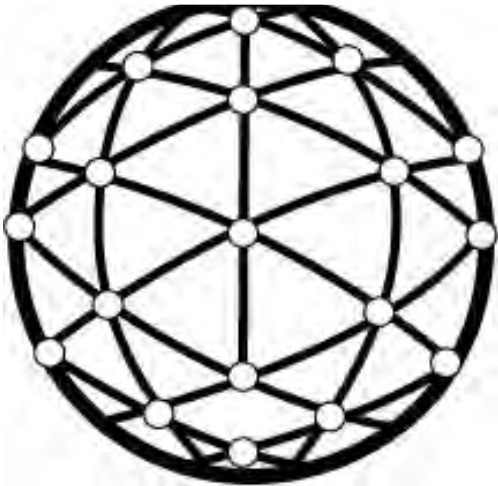
4

# Two-Eyed Seeing

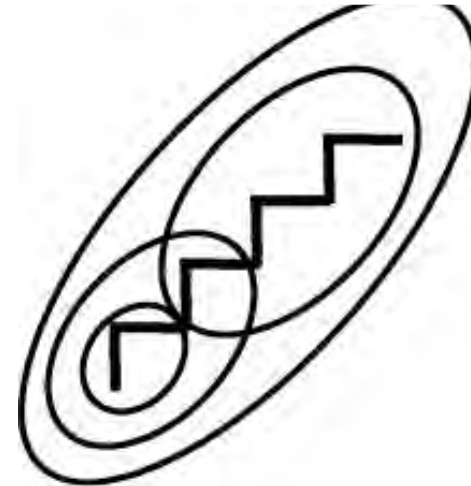
how our world is



**interconnective**



**parts & wholes**



**Mrs. Murdena Marshall** BEd, MEd  
Elder and Spiritual Leader, Mi'kmaq Nation  
Eskasoni First Nation, Nova Scotia  
Associate Professor (retired), Mi'kmaq Studies, CBU



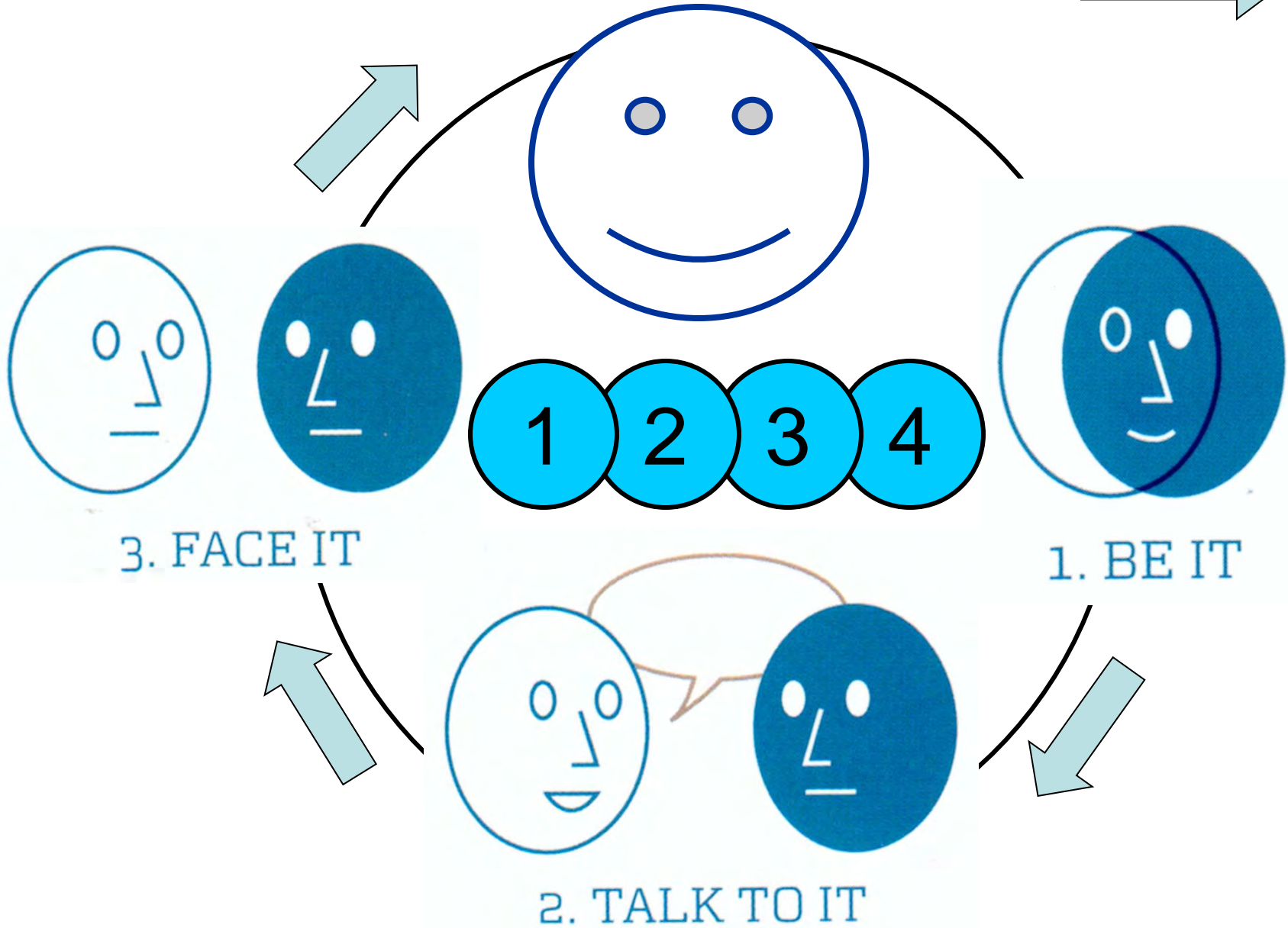
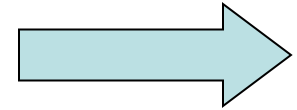


We must become able to put the “know, do, value” aspects of our worldviews in front of us ... like an object ... and then we must develop the abilities to walk around them ... to acknowledge them, take ownership of them, understand them, and put them beside those of another worldview ... to see our mutual strengths and to begin working together in a reciprocally respectful manner.

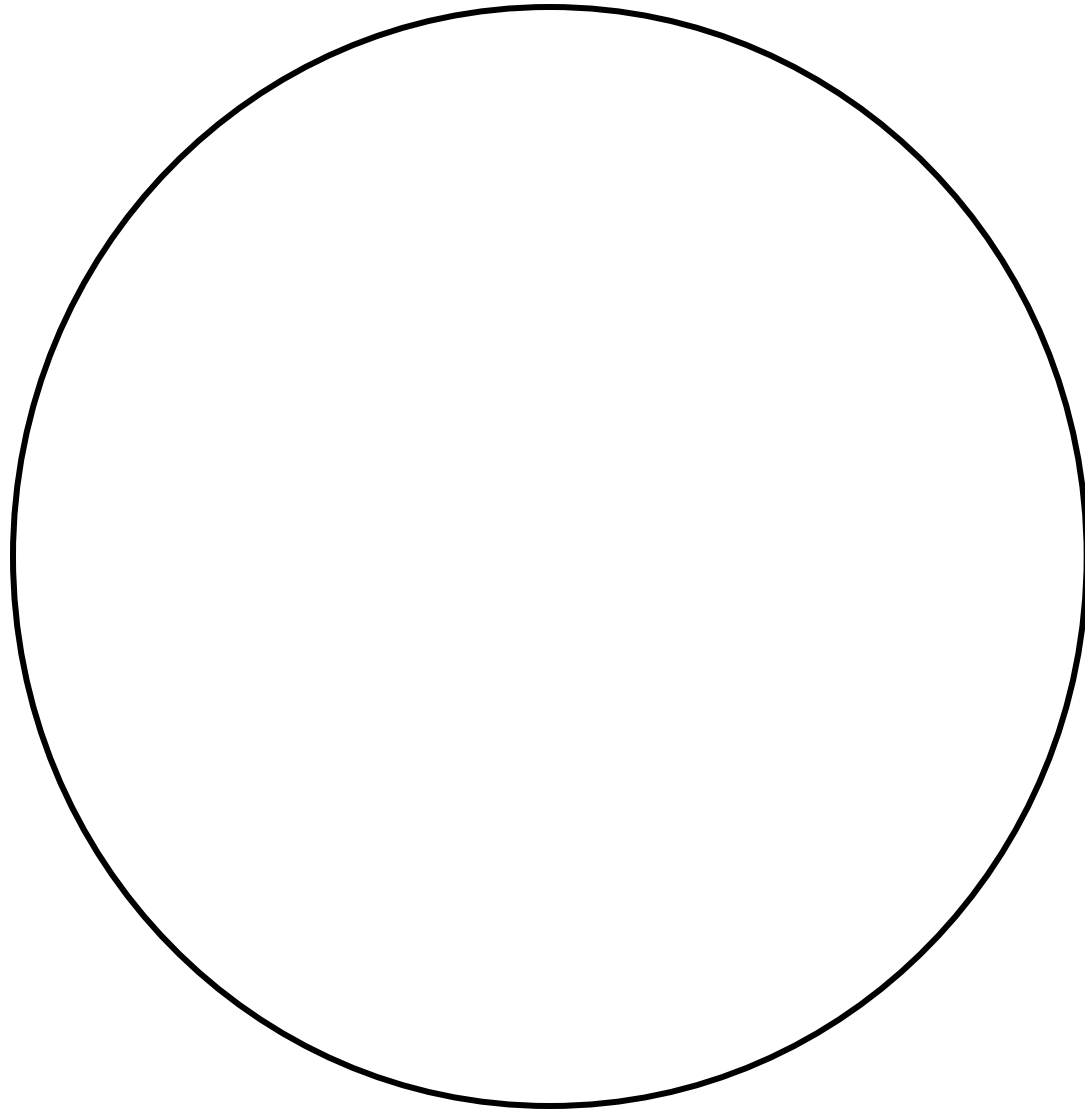




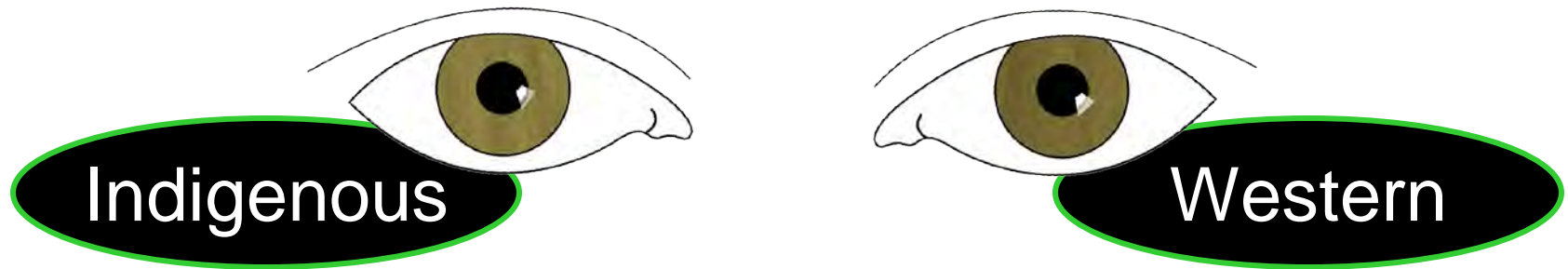
4. "KNOW, VALUE, and DO" IT ... SHARE IT ... and GROW IT



role of the knower in the knowing



role of the knower in the knowing



Science



# role of the knower in the knowing

## common ground

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



role of the knower in the knowing

## PATTERN RECOGNITION

common ground

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

order

= **PATTERN-BASED STORIES**





stories of our interactions with and within nature

Science

Science is  
dynamic,  
pattern-based  
knowledge.

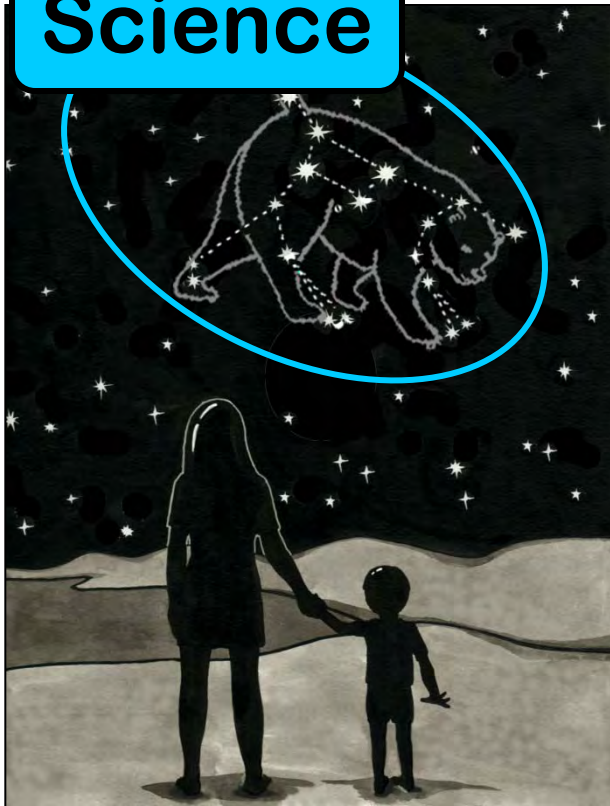
= PATTERN-BASED  
STORIES





# stories of our interactions with and within nature

## Science



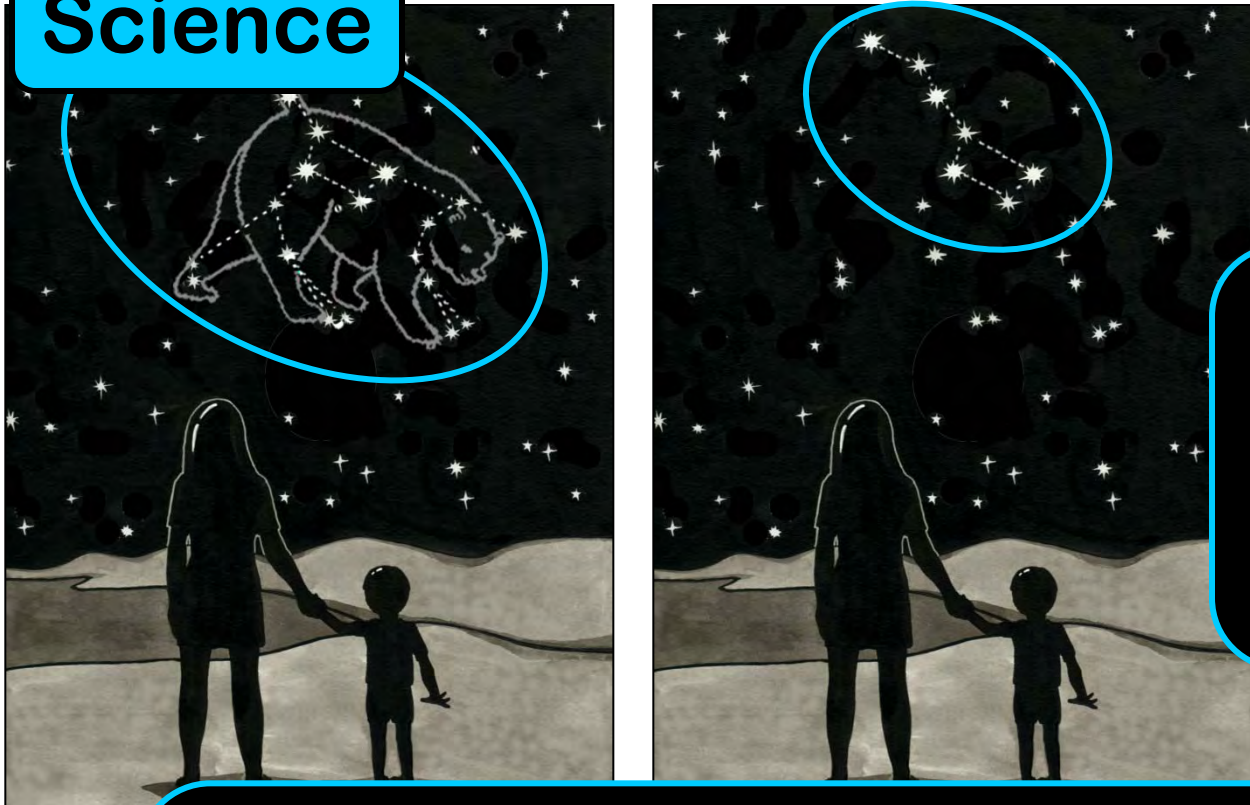
## PATTERN

- recognition
- transformation
- expression

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

# stories of our interactions with and within nature

## Science



the patterns  
that we see  
within nature  
reflect our ...

**SANCTIONED  
PERSPECTIVES & INTELLIGENCES:**  
who we are; where we are; where we were;  
what we know, do and value

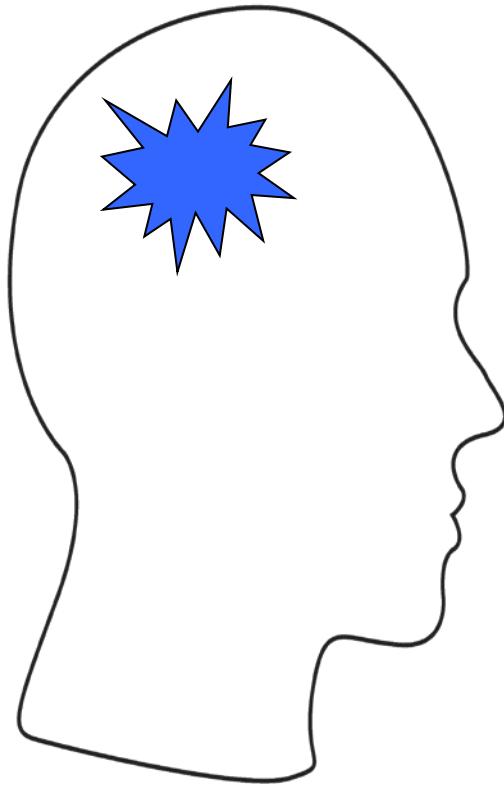
# “pattern smarts”

multiple intelligences theory

(H. Gardner, Harvard Univ.)

sanctioned  
world view or methodology

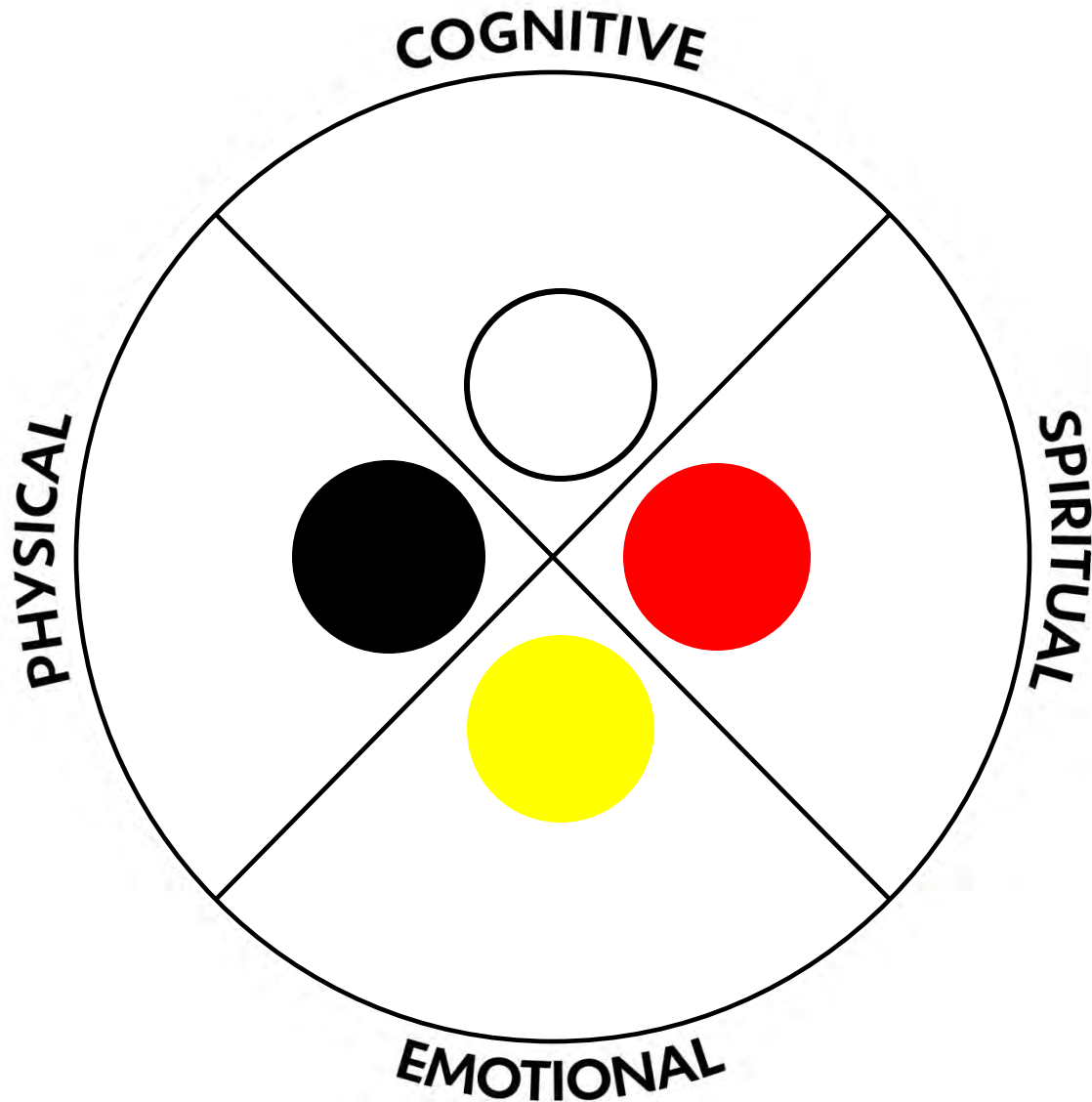
“VALUE”



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



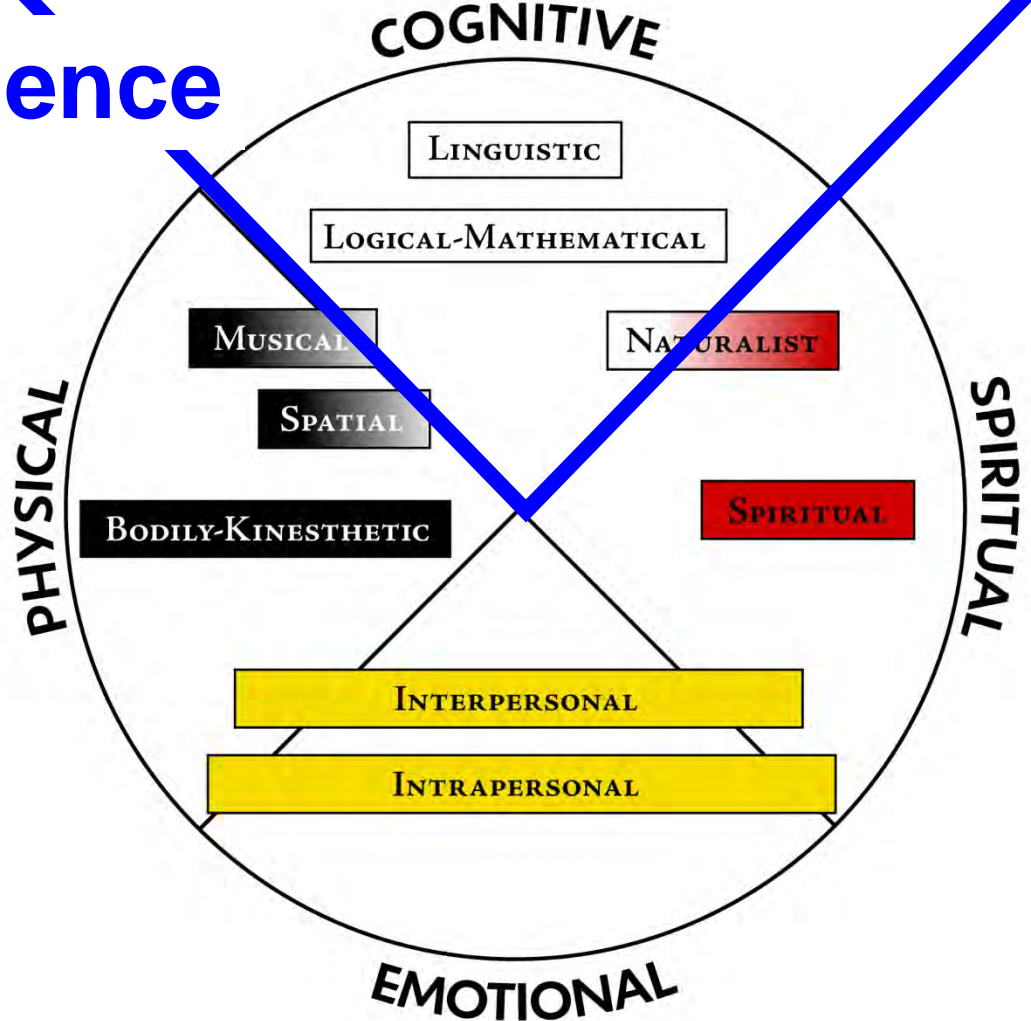
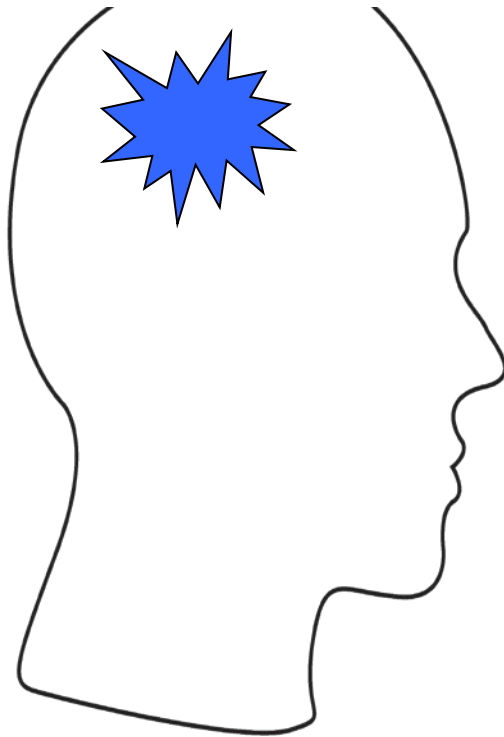
# Circle Teachings: lived relationships



“pattern smarts”

# Circle Teachings: lived relationships

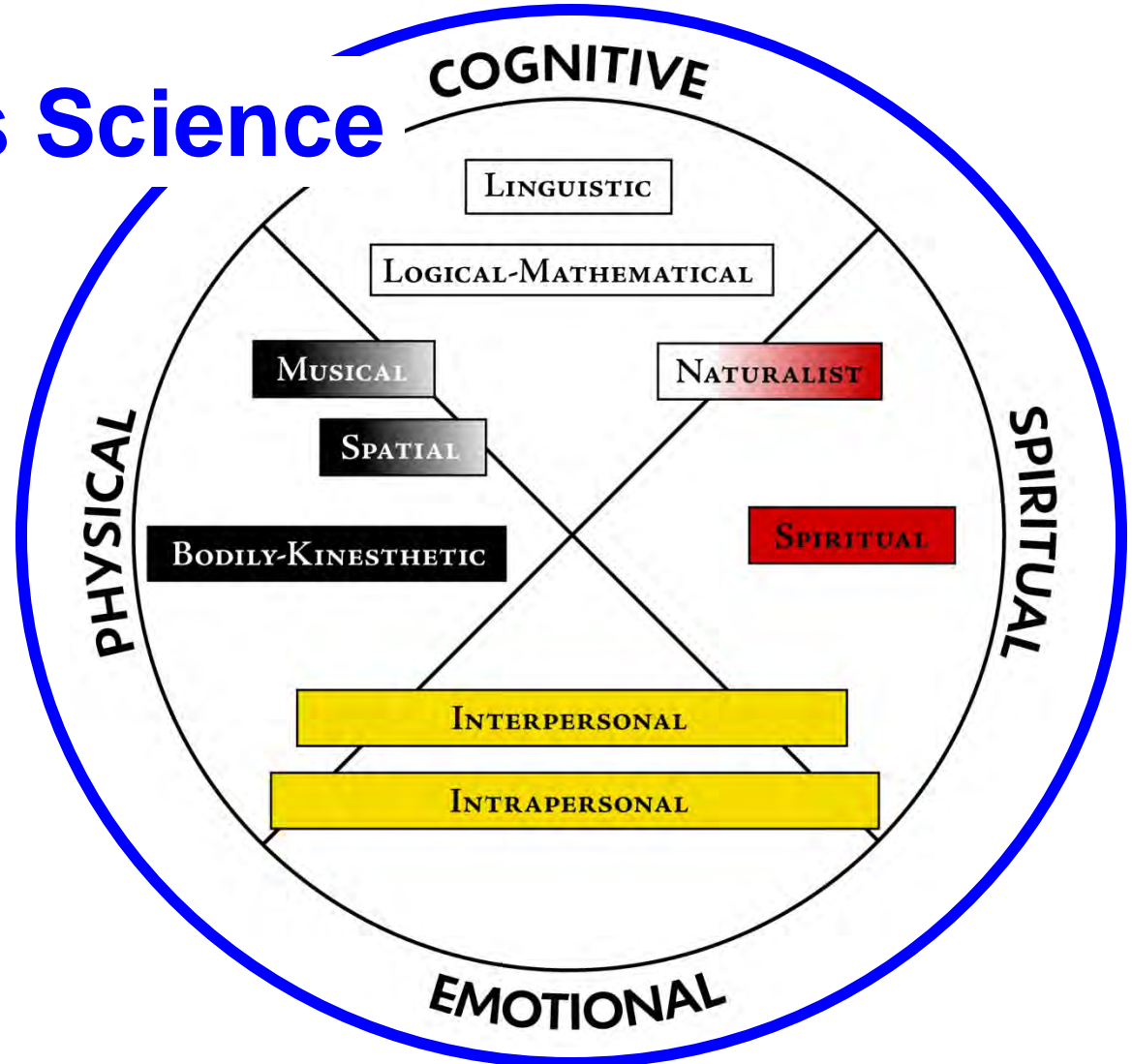
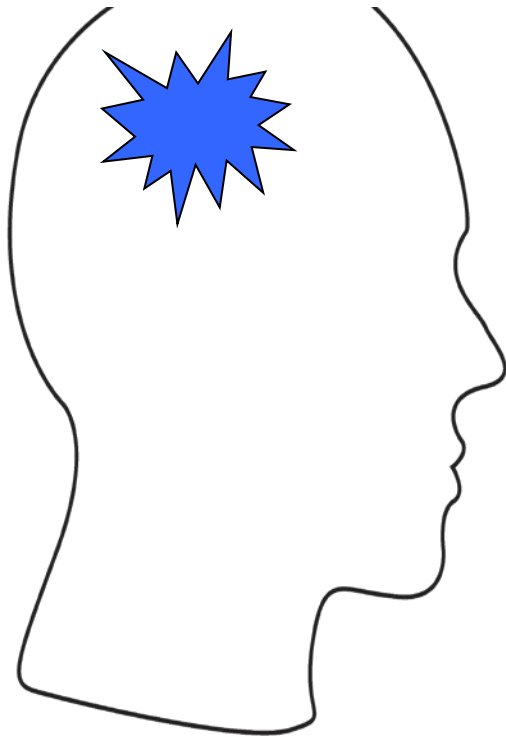
Western Science



“pattern smarts”

Circle Teachings: lived relationships

## Indigenous Science



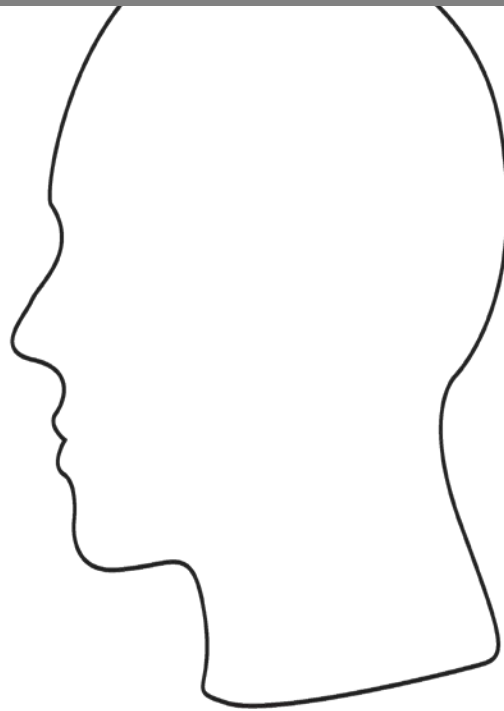


# PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

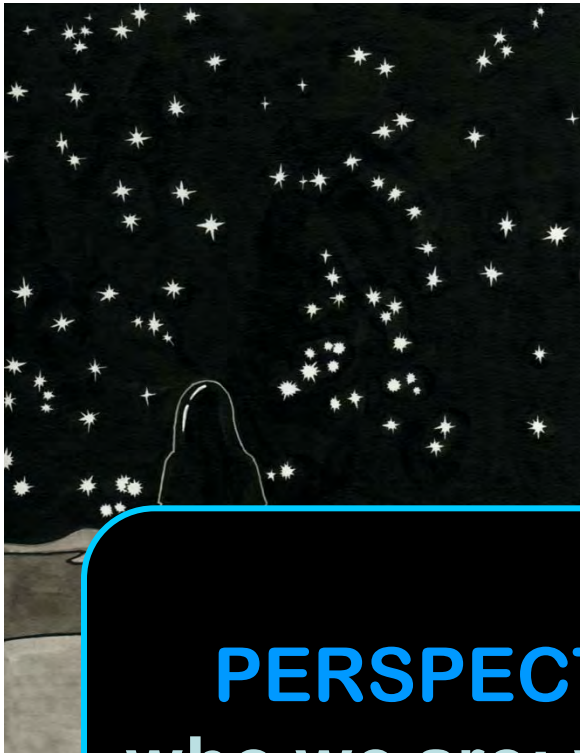


# PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer



muisca / Ursa major



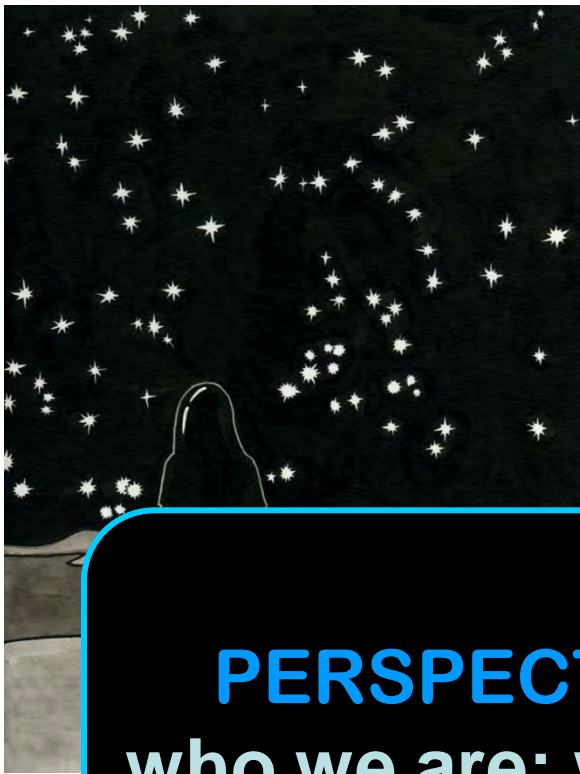
**SANCTIONED  
PERSPECTIVES & INTELLIGENCES:**  
who we are; where we are; where we were;  
what we know, do and value

# PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer



Big  
Dipper

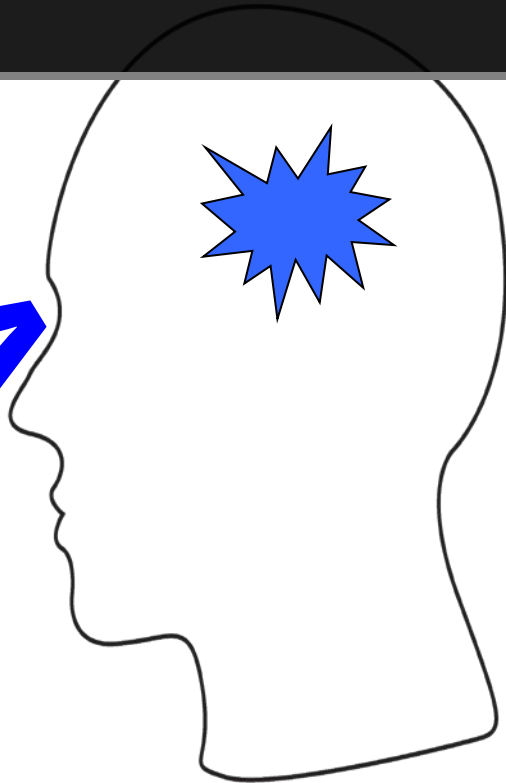


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# PATTERN CONCEPTUAL FRAMEWORK

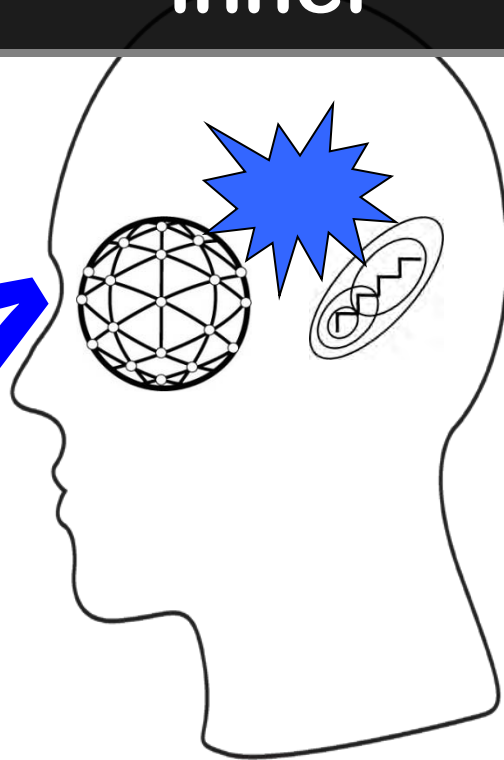
outer



# PATTERN CONCEPTUAL FRAMEWORK

outer

inner







**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.

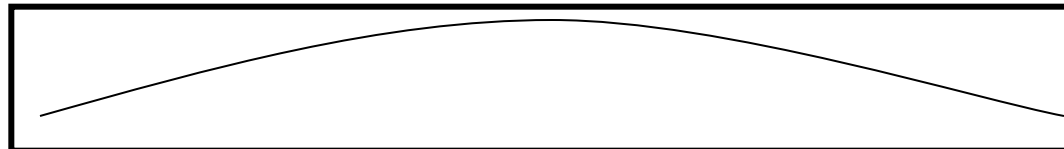
SYDNEY, NS  
Rise and Set for the Sun for 2004

Location: W060 11, N46 09      Zone: 4h West of Greenwich

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

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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X



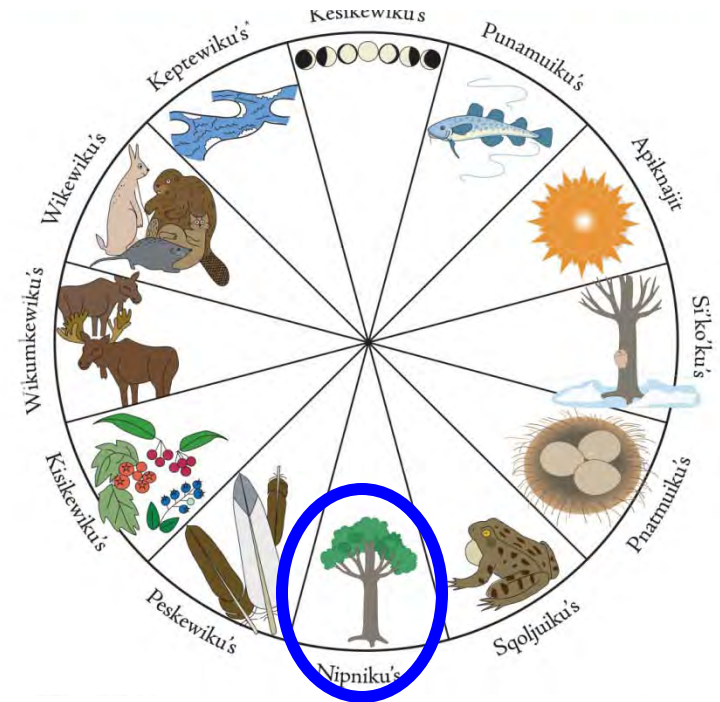
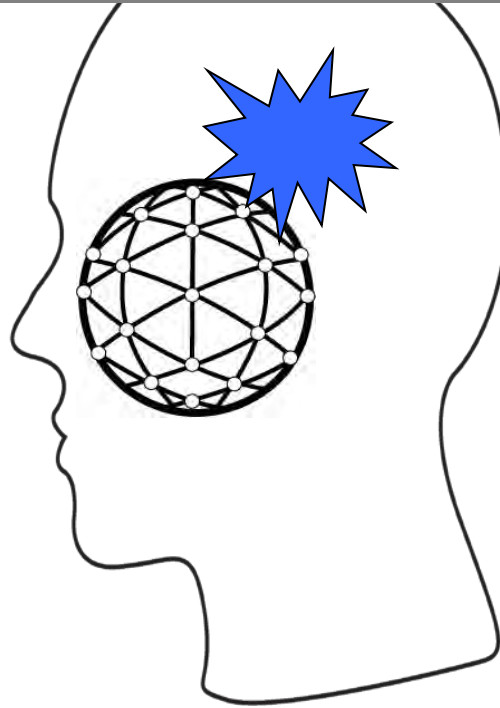
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# PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer





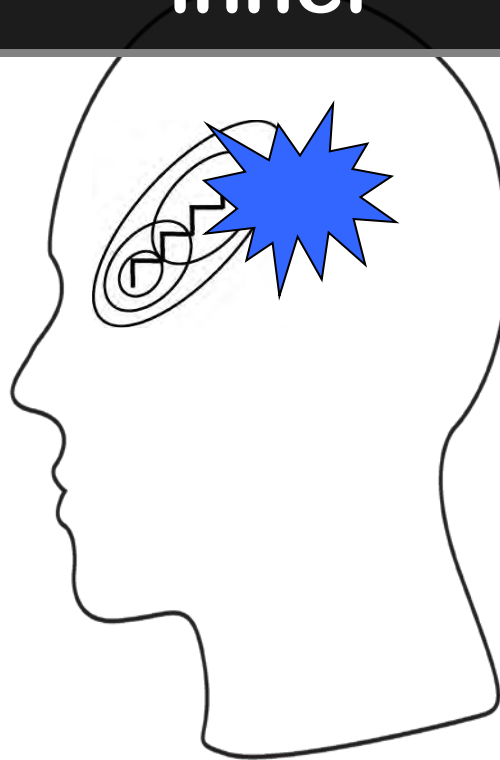
# PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

**X**



**June**

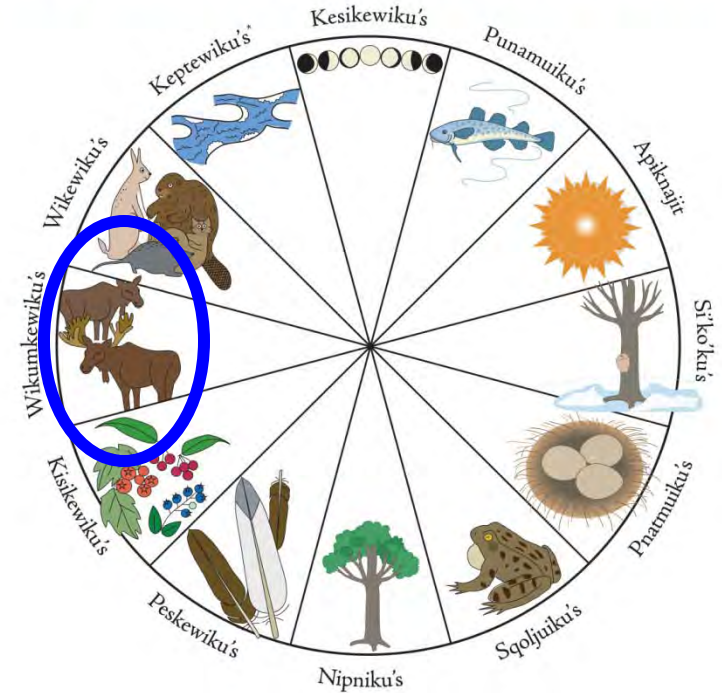
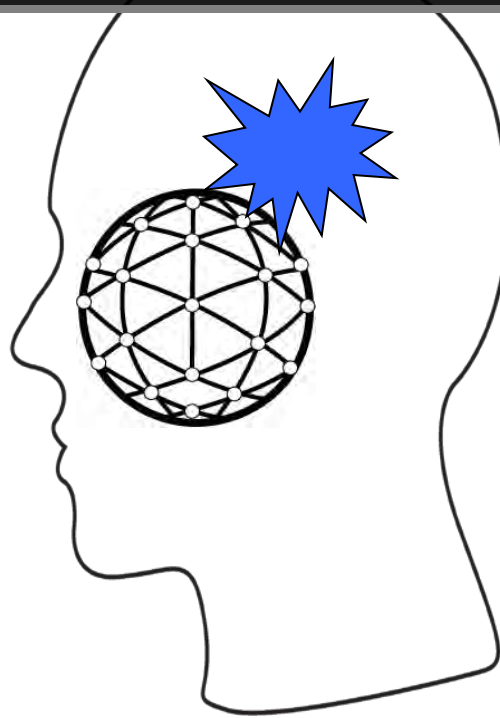
... in honour of  
“Juno”, the  
Roman’s Queen  
of the Gods

# PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer



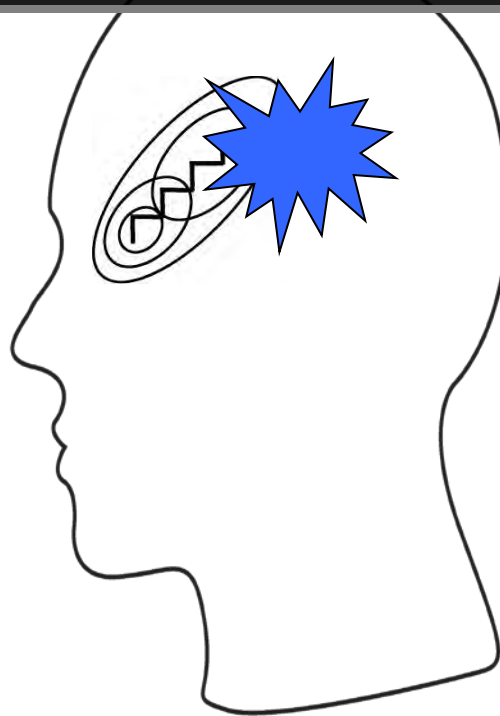
# PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer

**X**



**September**

*“sept” = 7 in Latin  
... was 7<sup>th</sup> month in  
a 10 month year  
... now is 9<sup>th</sup> month in  
a 12 month year*

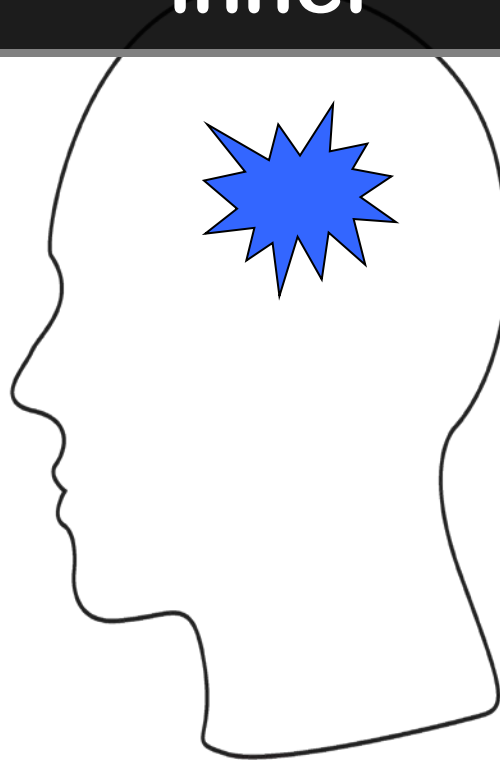


# PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer



Attu'tuejualu



*millefolium*

1000



Yarrow

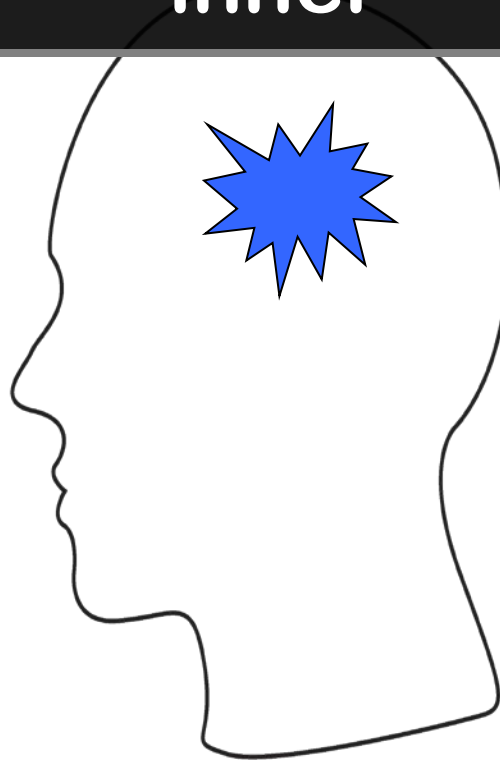


# PATTERN CONCEPTUAL FRAMEWORK

outer

inner

outer



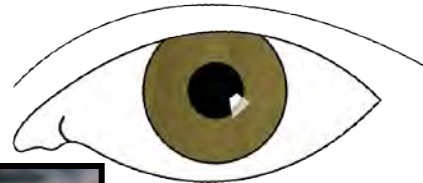
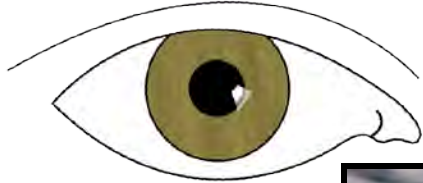
Mtèskmwaqsil



Fiddlehead  
fern

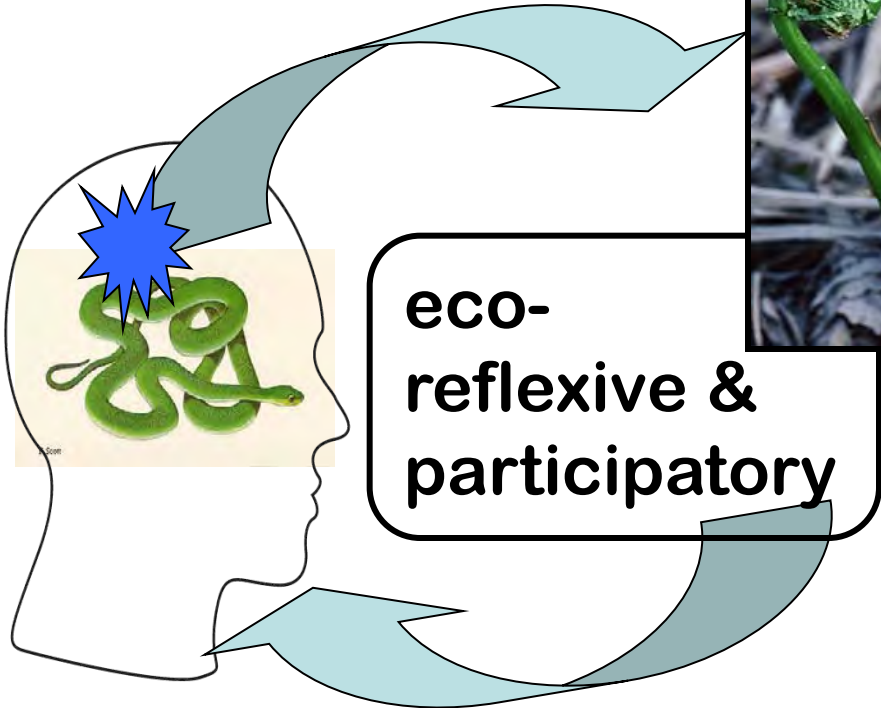


# what our "pattern seeing" (re)generates



**subject-subject**

**subject - object**



**eco-reflexive & participatory**



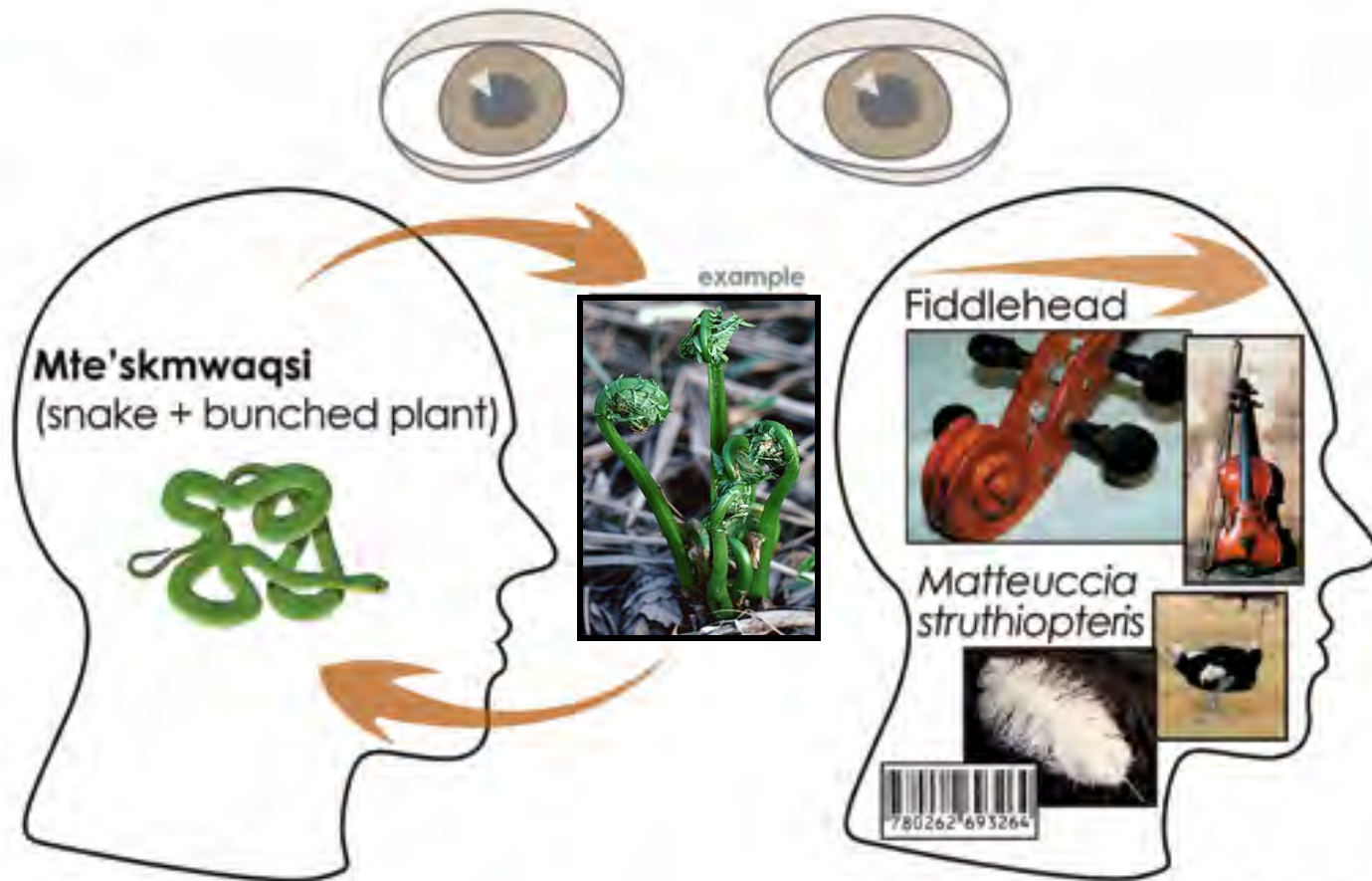
**cogno-centric & detached**

connectedness

disconnectedness



# Seeing relationships: plant names and my environment



The eco-reflective Mi'kmaq plant name describes the fern in terms of the relationship between it and another living being present in the same local environment, a snake.

The cogno-centric Western plant names describe the fern in terms of symbolic objects, organisms, and even numbers that might reflect the patterns of the plants but that are not related to the local environment. The barcode exemplifies extreme detachment from environment.

stories of our interactions with and within nature

“Two-Eyed Seeing”



Indigenous



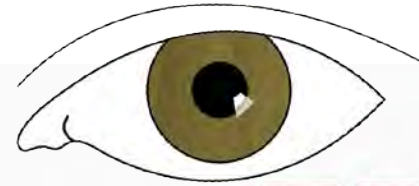
Western

Science

**DYNAMIC, PATTERN-BASED KNOWLEDGE**  
PATTERN: recognition, transformation, expression

# stories of our interactions with and within nature

# Science



1 H Hydrogen																	2 He Helium
3 Li Lithium	4 Be Beryllium															10 Ne Neon	
11 Na Sodium	12 Mg Magnesium															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							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							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							86 Rn Radon		
87 Fr Francium	88 Ra Radium	89-103 Actinides	104 Unq Unnilquadium	105 Unp Unnilpentium	106 Unh Unnilhexium	107 Uns Unnilseptium	108 Uno Unniloctium	109 Une Unnilennium									
			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									

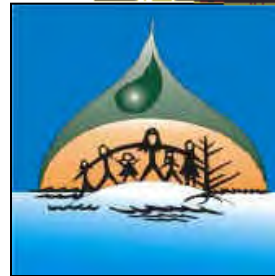
																3 B Boron	4 C Carbon	5 N Nitrogen	6 O Oxygen	7 F Fluorine	8 Ne Neon										
																13 Al Aluminum	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon										
28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton																							
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																							
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																							
																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



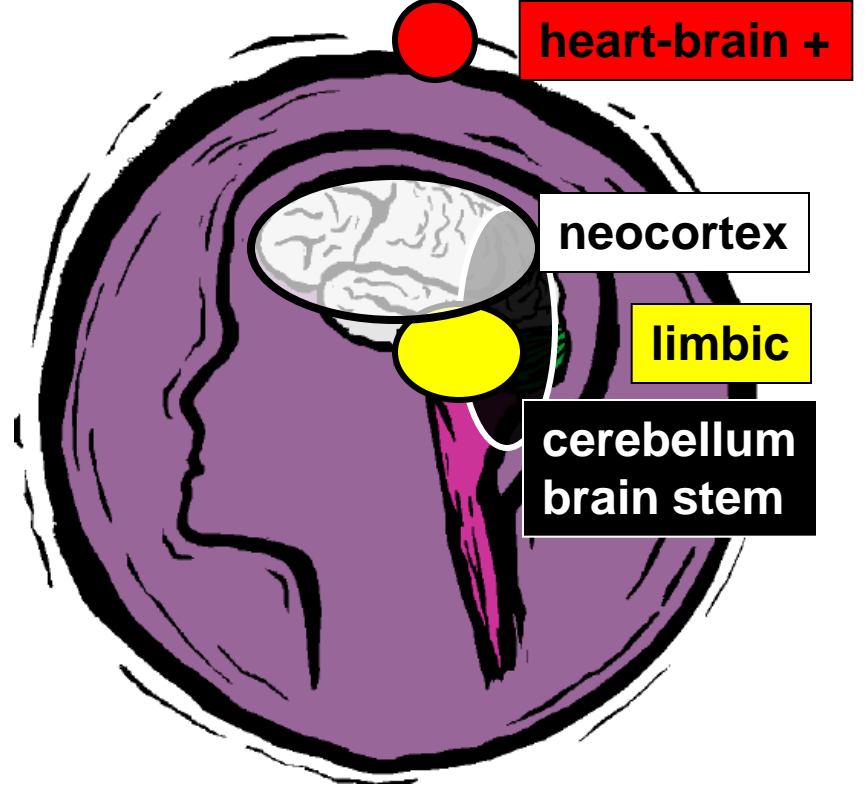
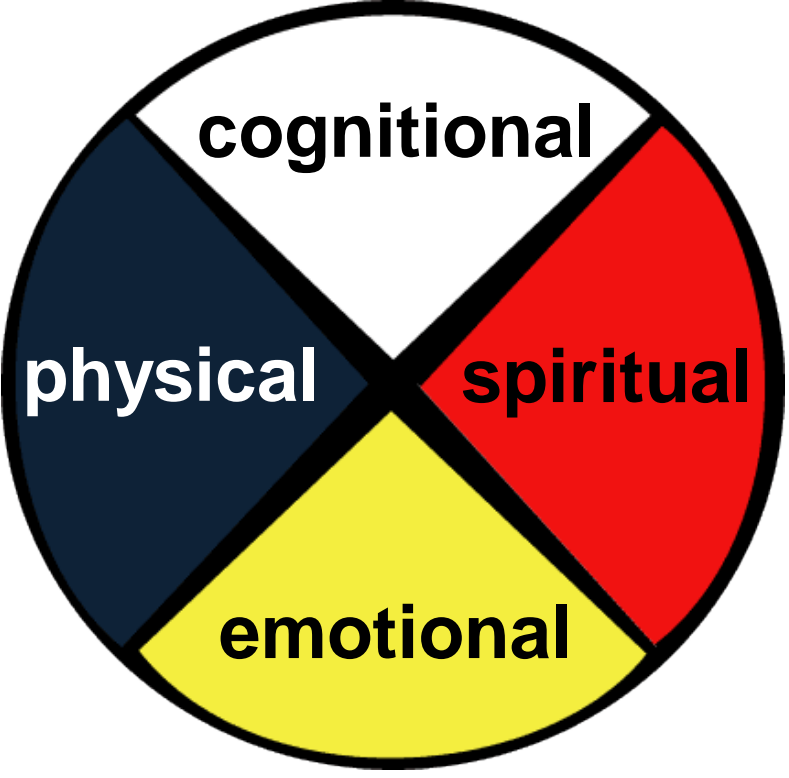
# stories of our interactions with and within nature

## Science

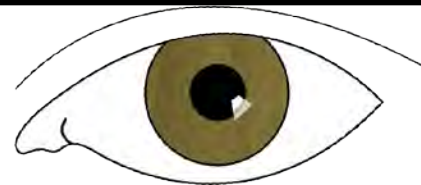




what we "see" as: HUMAN



# what we "see" as: MOTHER-CHILD

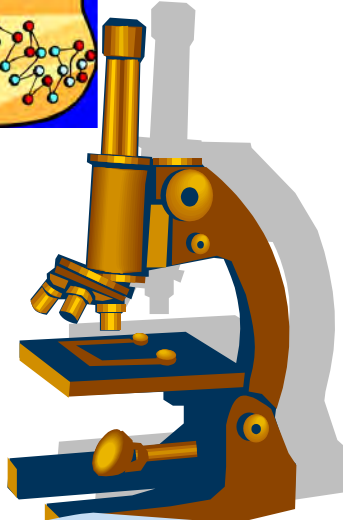
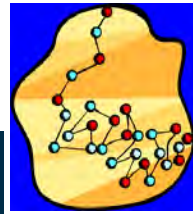


from:  
Mi'kmaq Family  
& Children's  
Services



from:  
Society of  
Obstetricians and  
Gynecologists of  
Canada

# what we "see" as: HUMAN HEALTH



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

# PATTERN-BASED KNOWLEDGE

## Sherman's Lagoon

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

PATIENCE.  
PATIENCE.

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.

<http://www.shermanslagoon.com>

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# Integrative Science



Indigenous

Western

“bringing our sciences together”

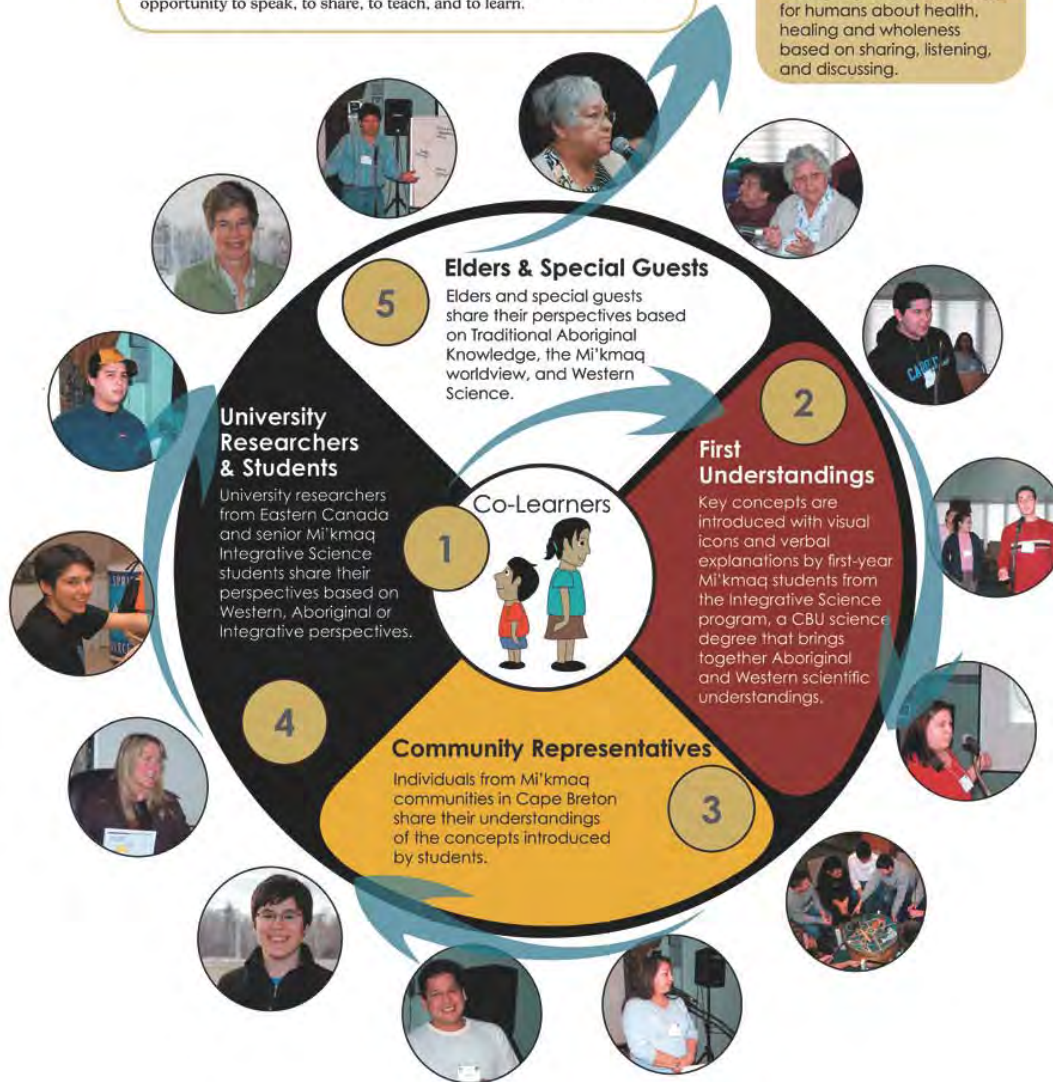
# Co-Learning Journey

A shared understanding of how to talk together

This visual is based on the Medicine Wheel (or Circle of Learning) which is a commonly used Aboriginal teaching tool. The visual shows that within the discussion, all have a role to play. Each person has an opportunity to speak, to share, to teach, and to learn.



Each participant gains some new understandings of Mother Earth and her lessons for humans about health, healing and wholeness based on sharing, listening, and discussing.





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



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

Mi'kmaq College Institute / Mi'kmaq Espi Kina'matno'kuom



IWK Health Centre Foundation

IAPH

ATLANTIC ABORIGINAL Health Research Program

Mi'kmaq Elders

NOVA SCOTIA Health Research FOUNDATION

SABLE OFFSHORE ENERGY INCORPORATED

UNAMA'KI INSTITUTE OF NATURAL RESOURCES

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Mi'kmawey Debert

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