

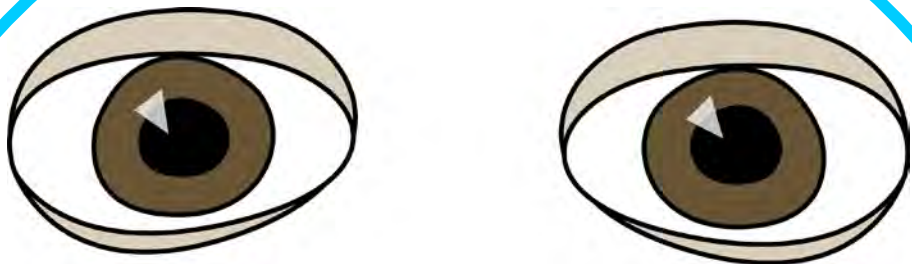


Cheryl Bartlett, PhD, Canada Research Chair
in Integrative Science & Professor of Biology,
Cape Breton University

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



Two-Eyed Seeing

science education for
children & youth

Workshop
24 May 2007



CAPE BRETON UNIVERSITY



NSERC
CRSNG



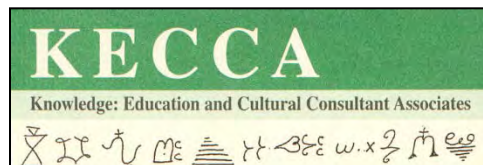
Social Sciences and Humanities
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Canada



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



UNAMA'KI
INSTITUTE OF
NATURAL
RESOURCES



Membertou
Elementary



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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

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



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

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

Native American Scientist & Educator, Univ. of New Mexico

The centr
education t
science f
perspectiv
and non

Native American S

Indigenous

Why & How



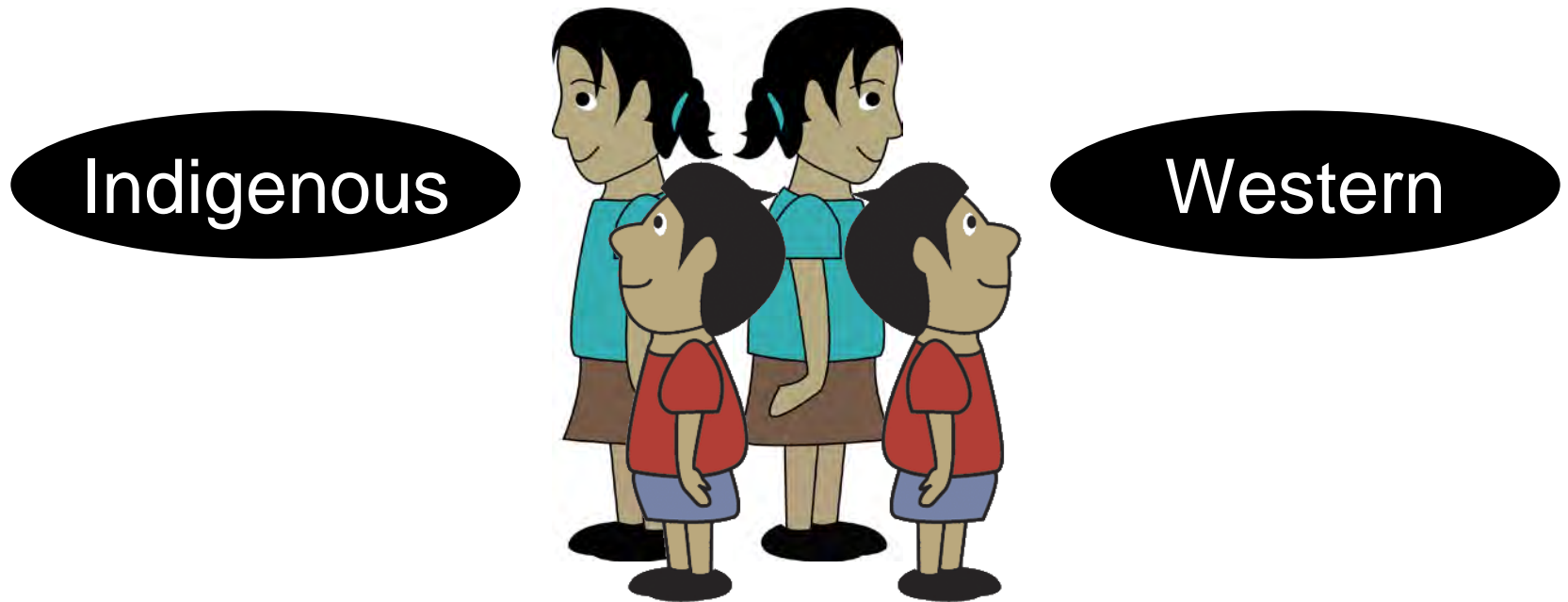
of science
teaching of
e cultural
incomplete
manner.

Univ. of New Mexico

Western

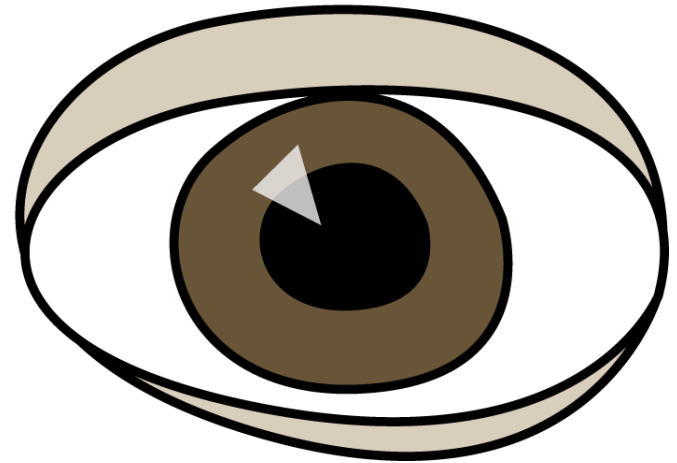
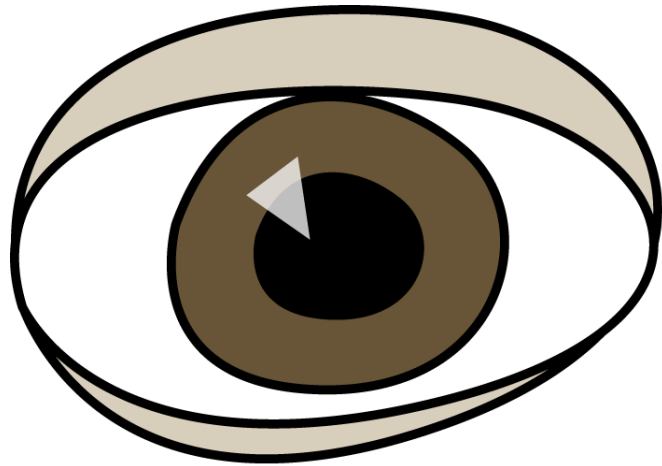
WHY???? Because today ...

Mi'kmaq and other Aboriginal young people are poised on the edge of two worlds.



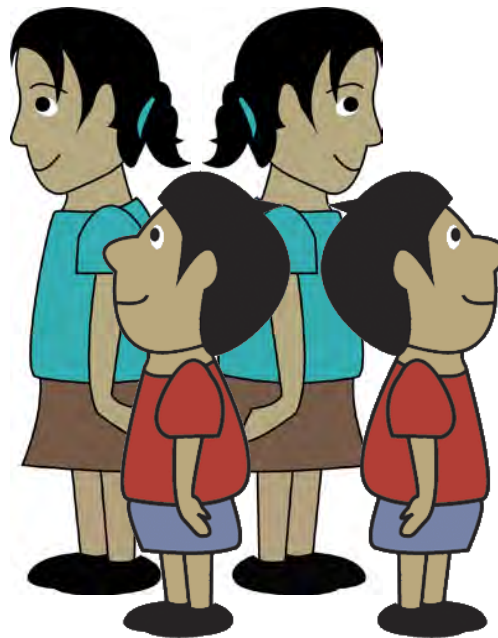
TWO-EYED SEEING

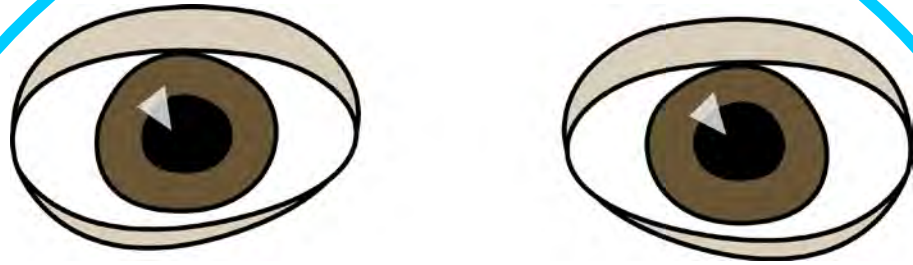
can help young people learn to be solidly in two worlds.



Indigenous

Western





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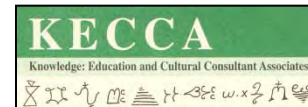
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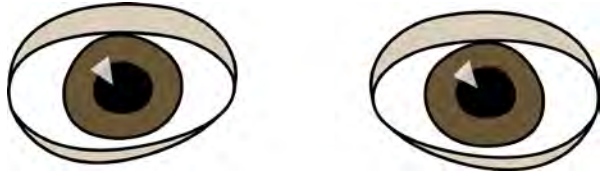
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Indigenous and Western scientific knowledges are based in observations of the natural world.

Both result from the same intellectual process of creating “order”, i.e. pattern stories.

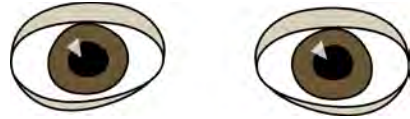


Artist Basma Kavanagh

Science is pattern-based knowledge.

stories of our interactions with and within nature

Science



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

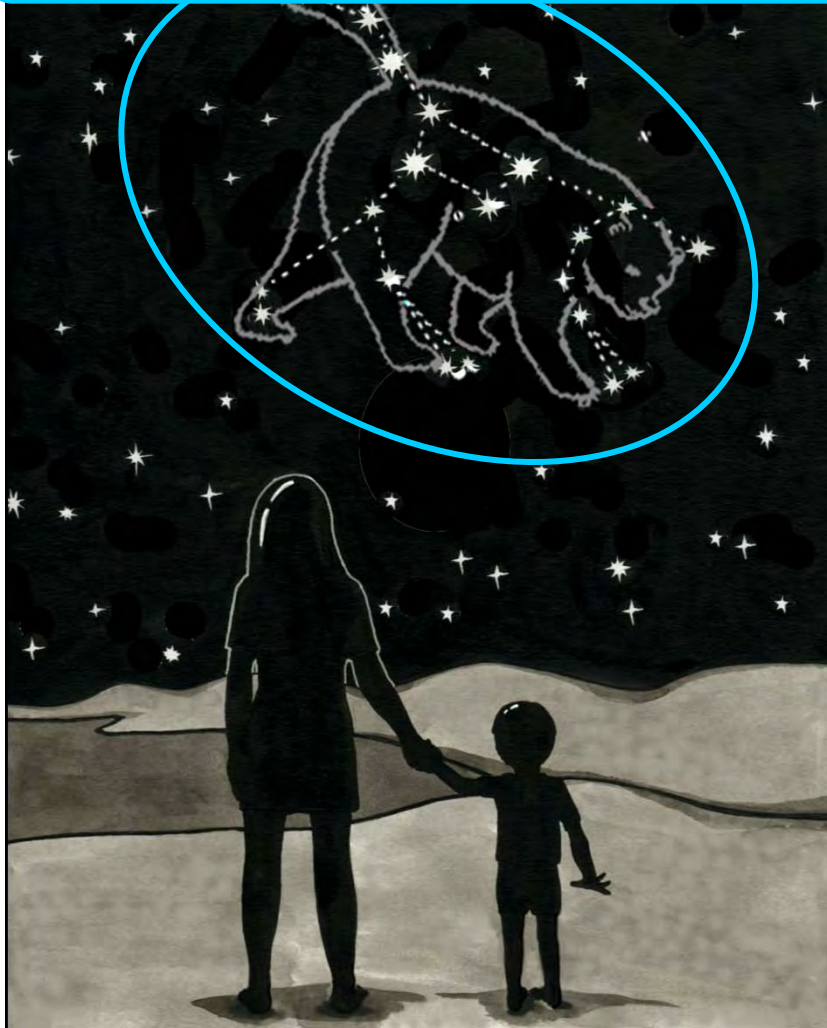
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Artist Basma Kavanagh

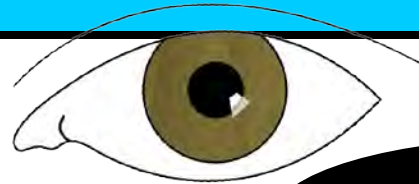
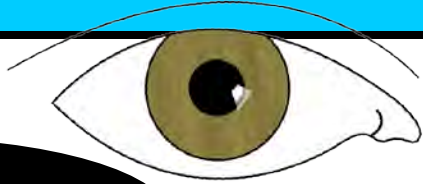
Science is pattern-based knowledge.

stories of our interactions with and within nature



DYNAMIC, PATTERN-BASED KNOWLEDGE

Two-Eyed Seeing how our world is

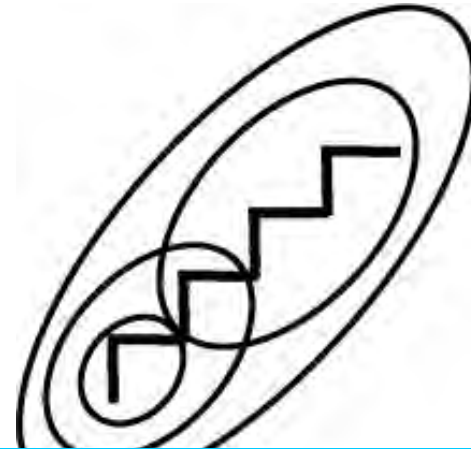
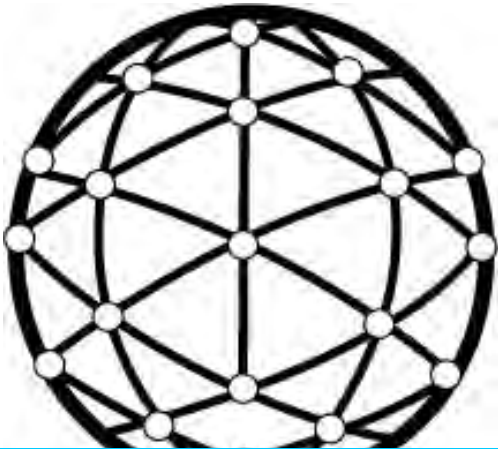


Indigenous

interconnective

Western

parts & wholes



DYNAMIC, PATTERN-BASED KNOWLEDGE

stories of our interactions with and within nature

Science

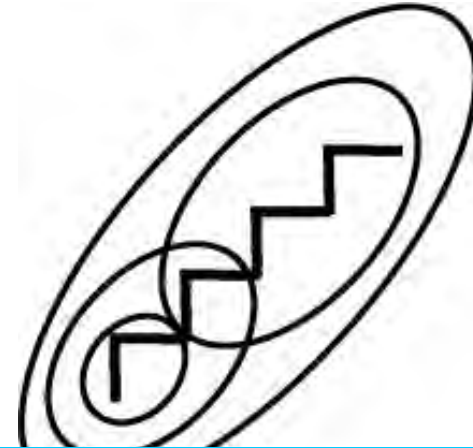
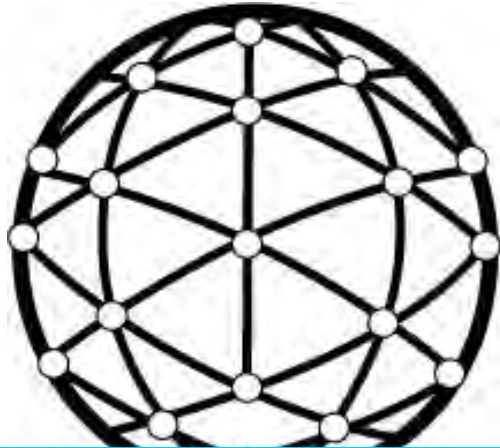


stories of our interactions with and within nature

Science

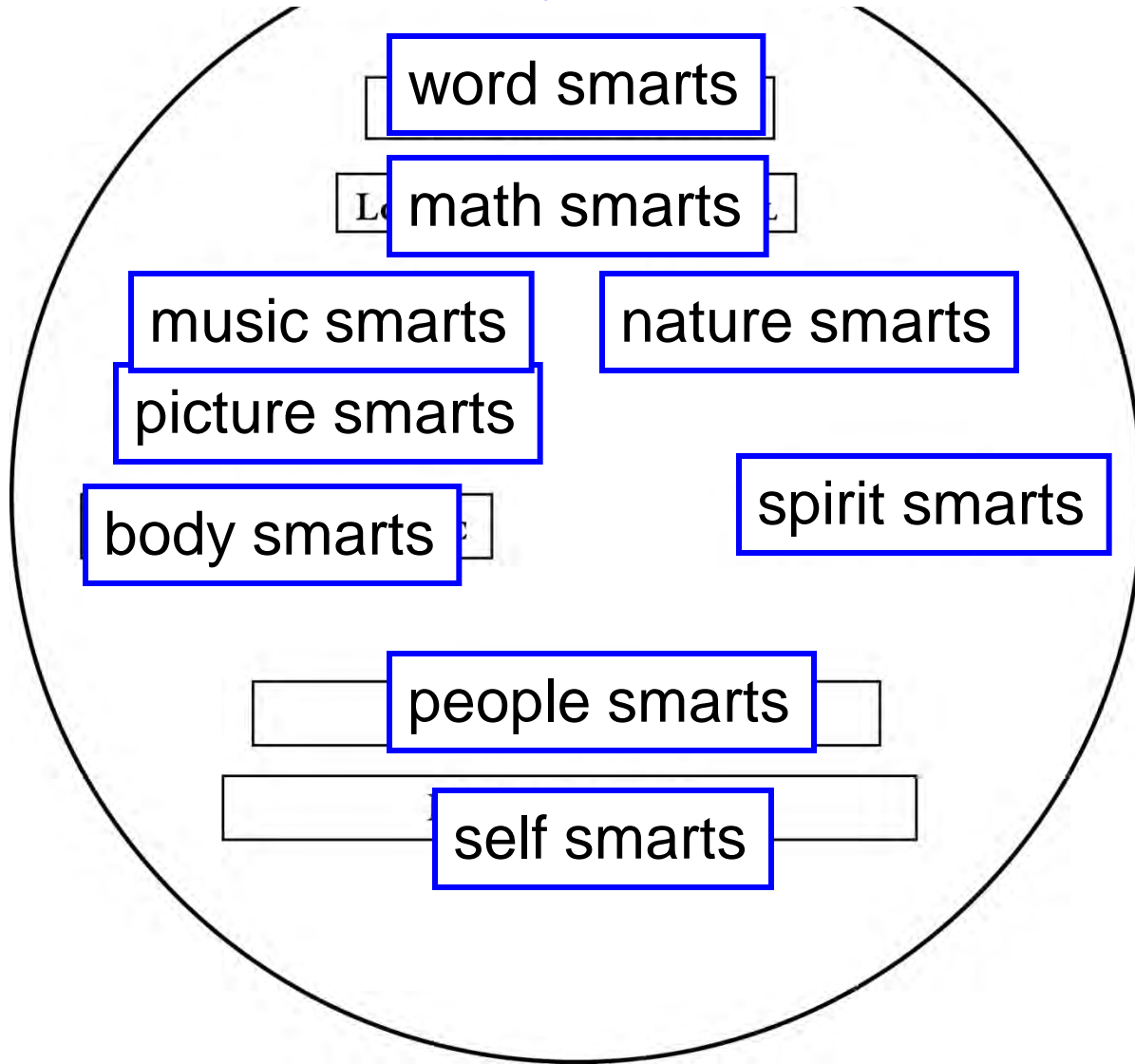
A periodic table of elements with color-coded groups. The groups are color-coded as follows: Group 1 (purple), Group 2 (blue), Groups 3-10 (green), Group 11 (yellow), Group 12 (orange), Groups 13-18 (pink), and the f-block (red).

Periodic Table of the Elements

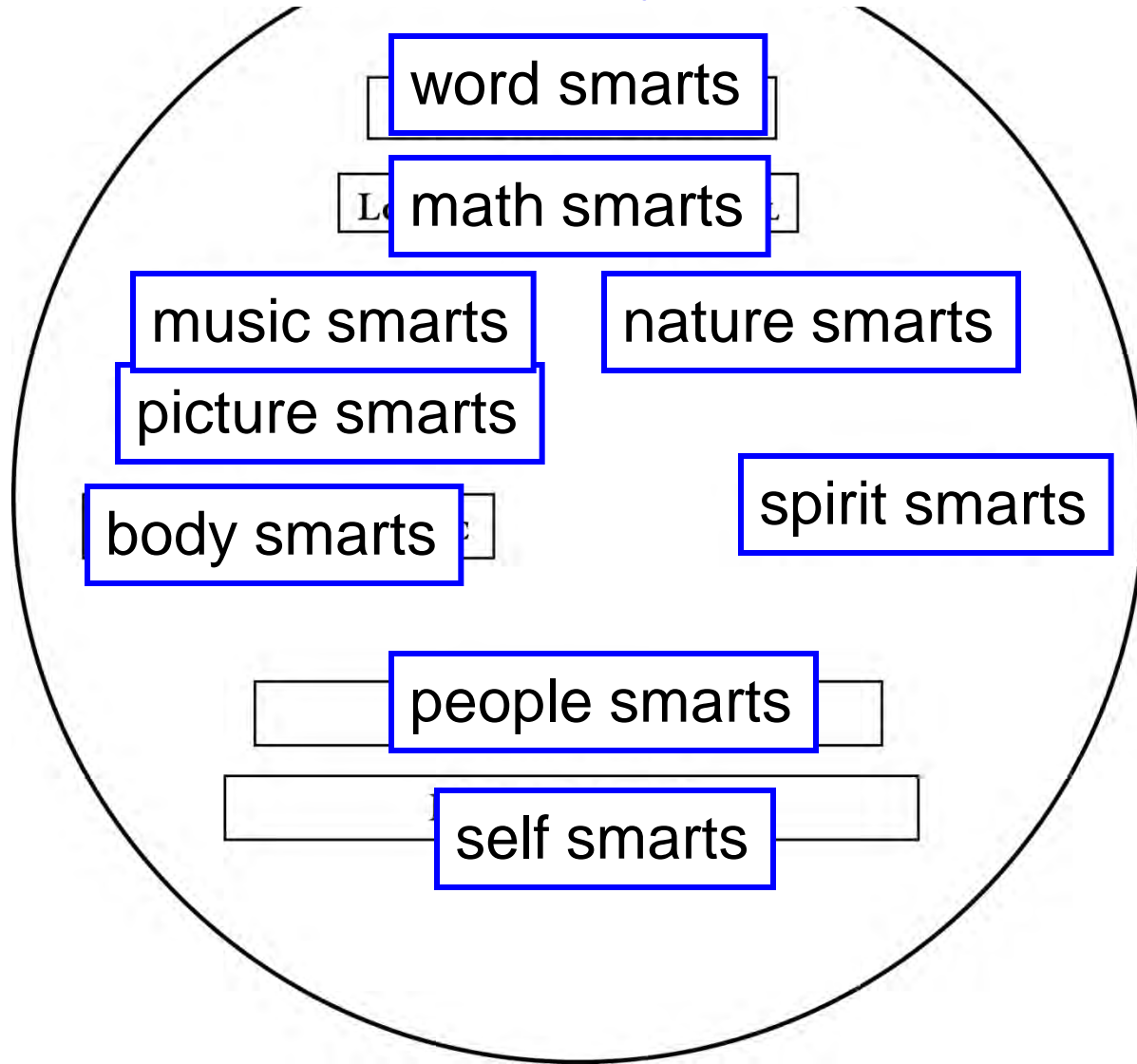


DYNAMIC, PATTERN-BASED KNOWLEDGE

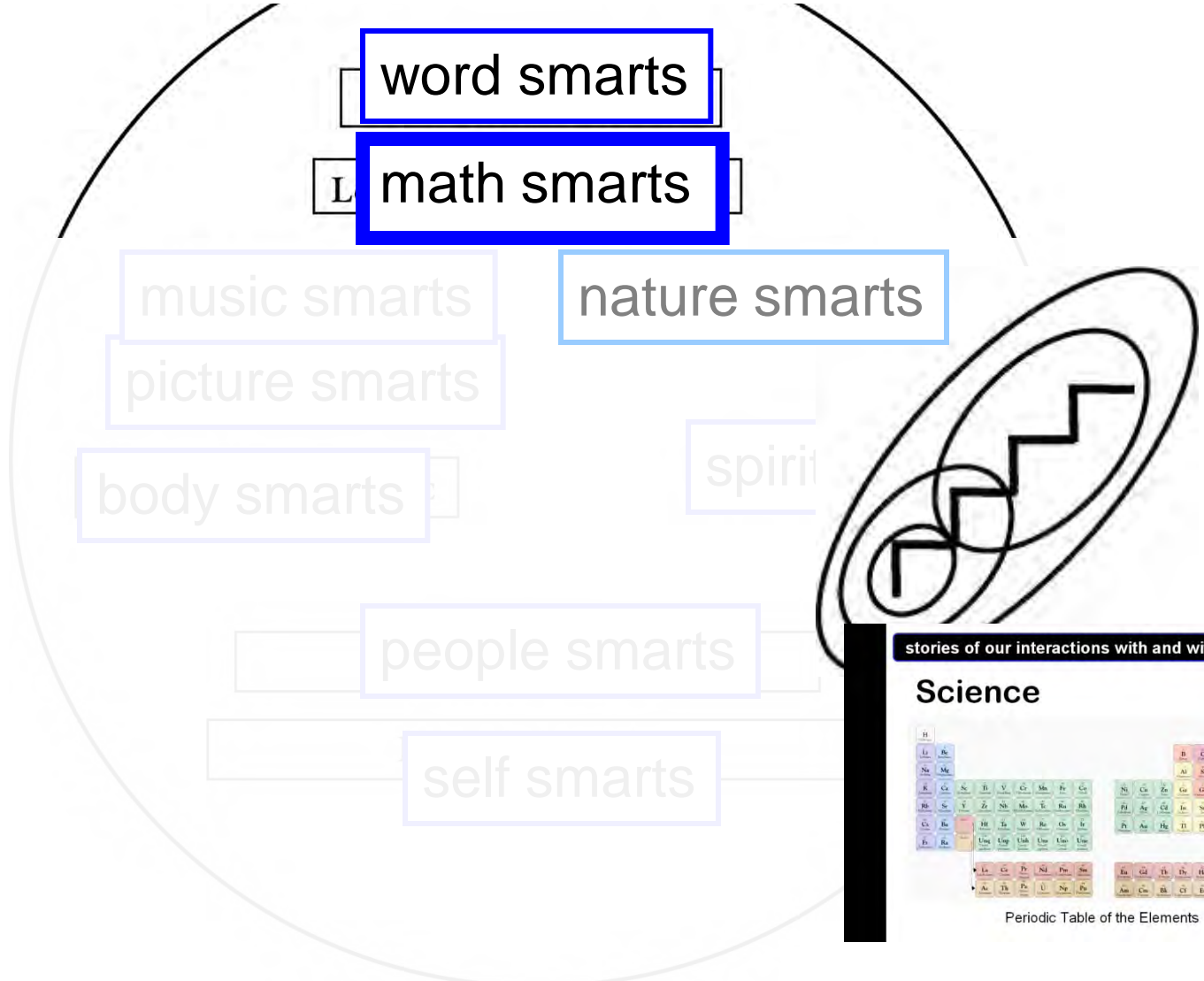
our science stories ...
draw upon our “**pattern smarts**”



our different science stories ...
privilege different "pattern smarts"



our different science stories ... privilege different "pattern smarts"



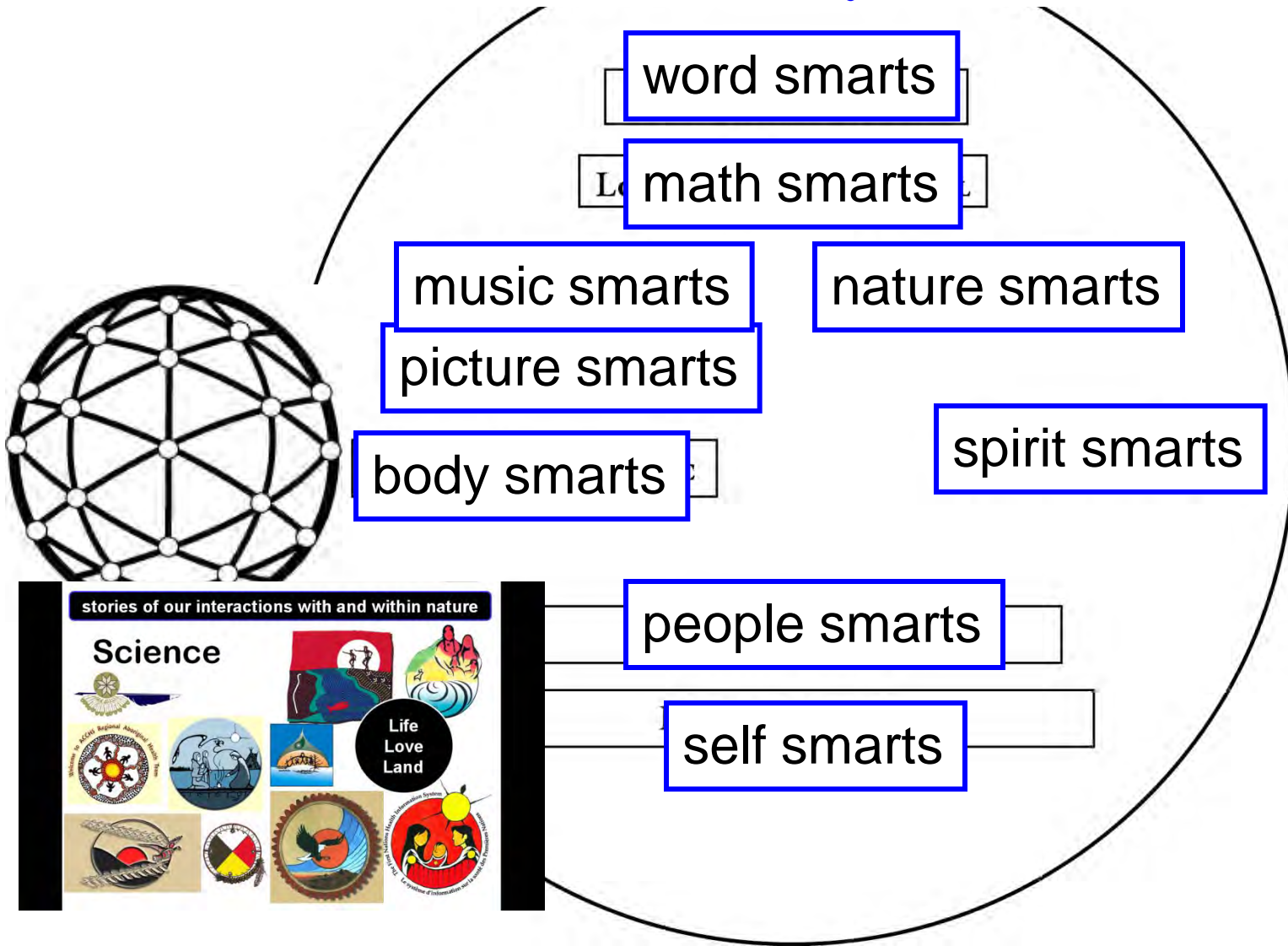
stories of our interactions with and within nature

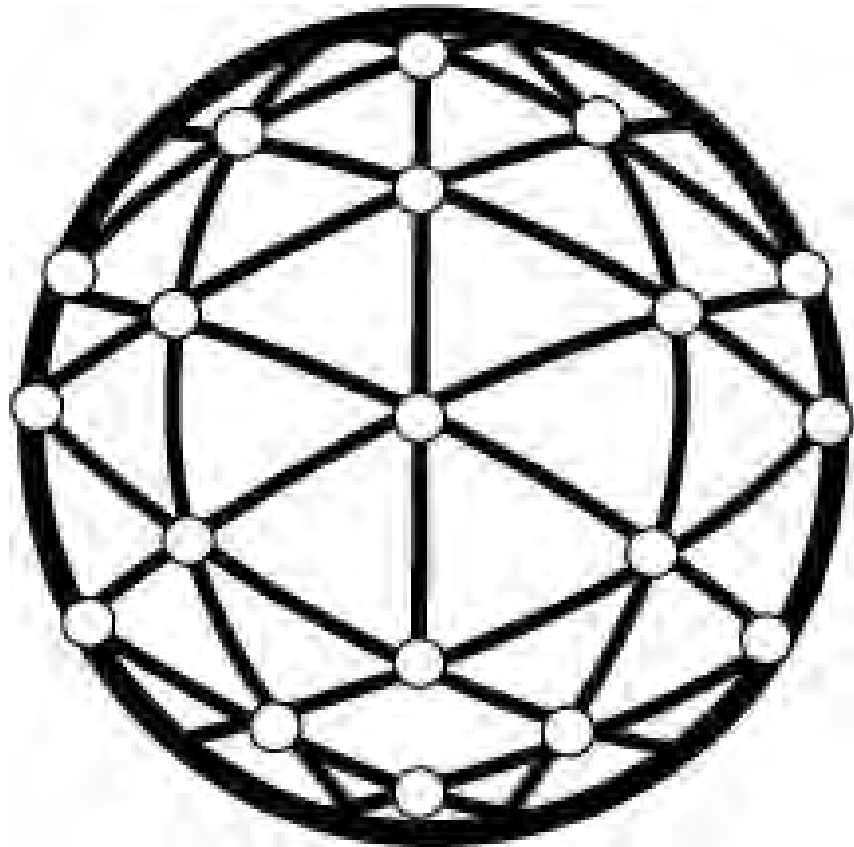
Science

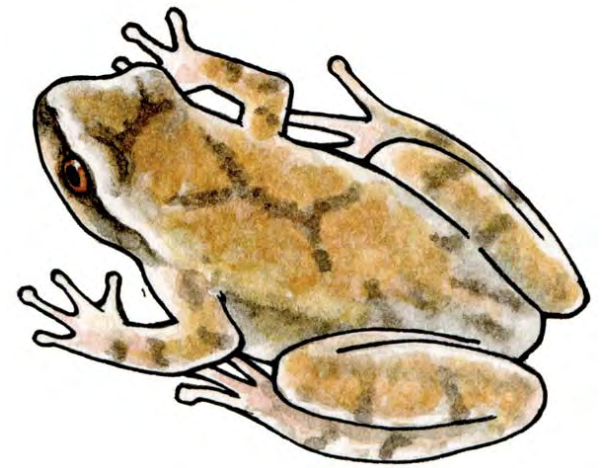
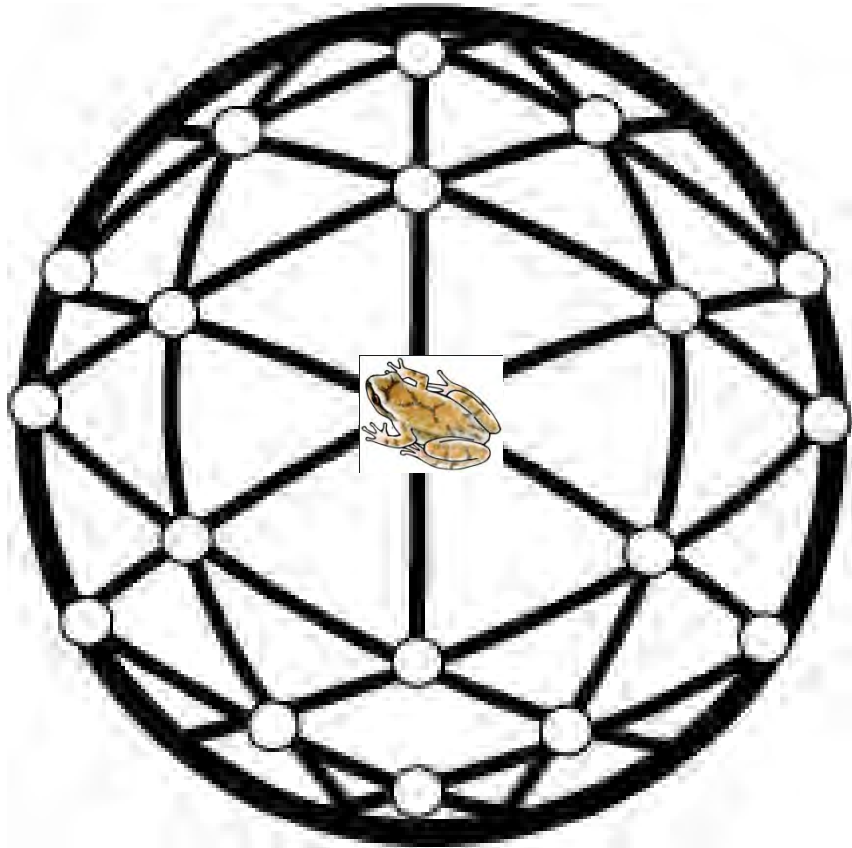
A color-coded periodic table of elements, showing the arrangement of chemical elements. The elements are grouped into different colors, likely representing different categories or groups.

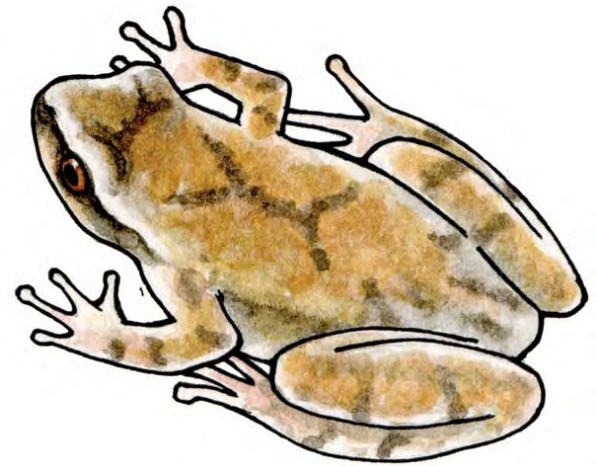
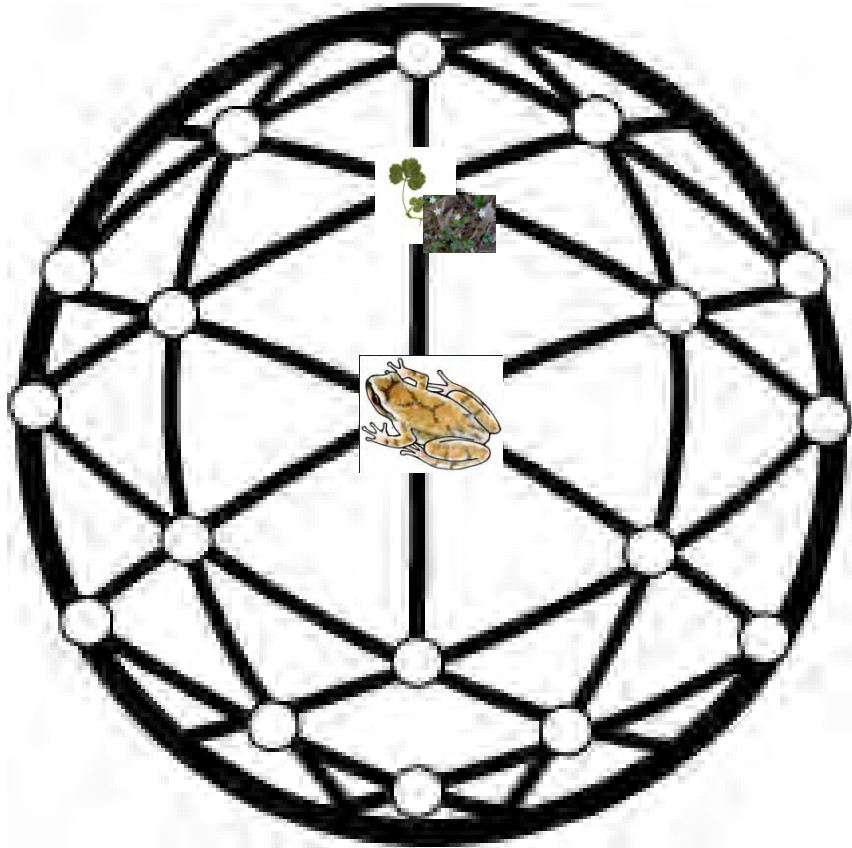
Periodic Table of the Elements

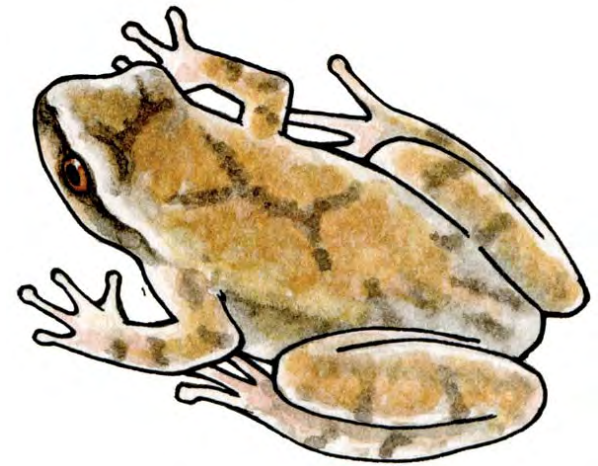
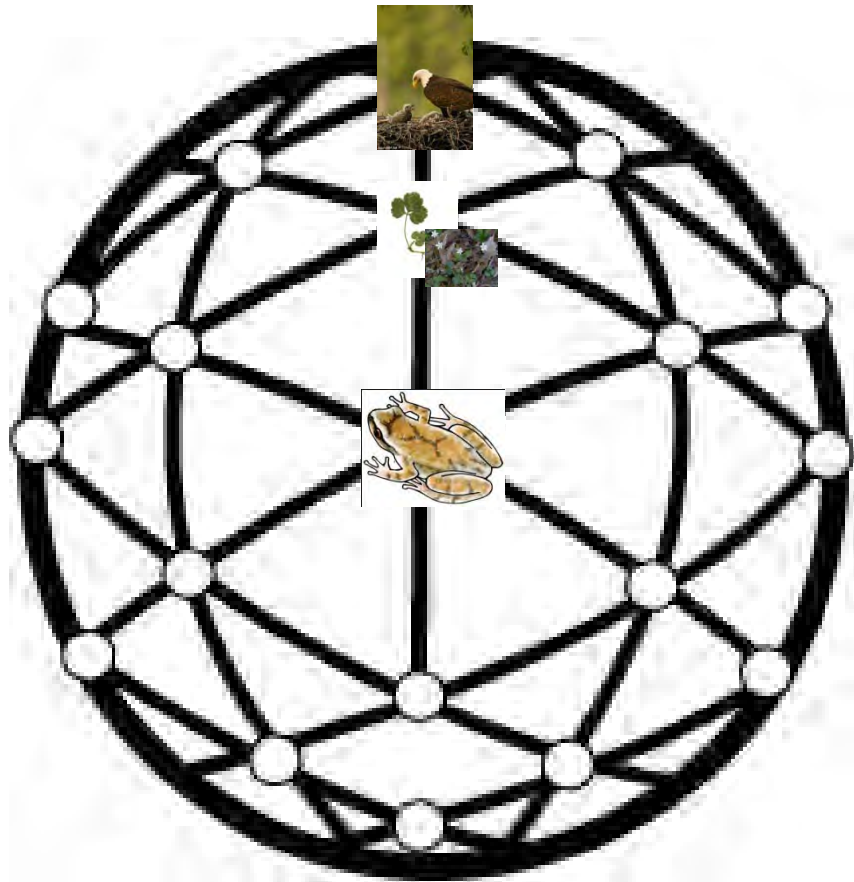
our different science stories ... privilege different "pattern smarts"

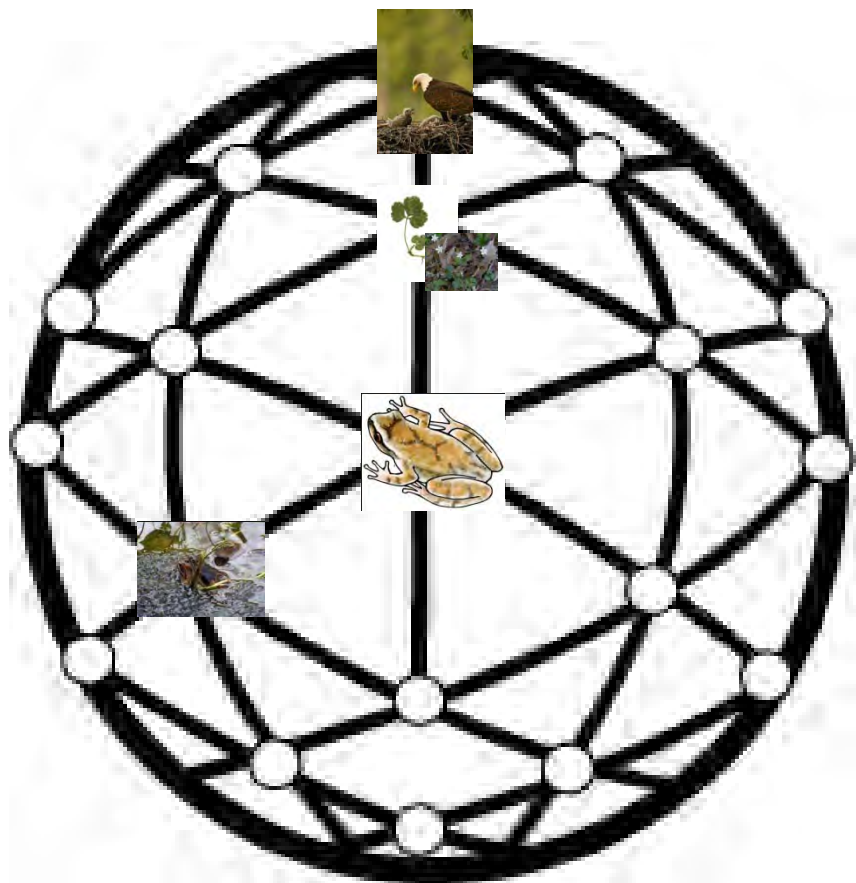
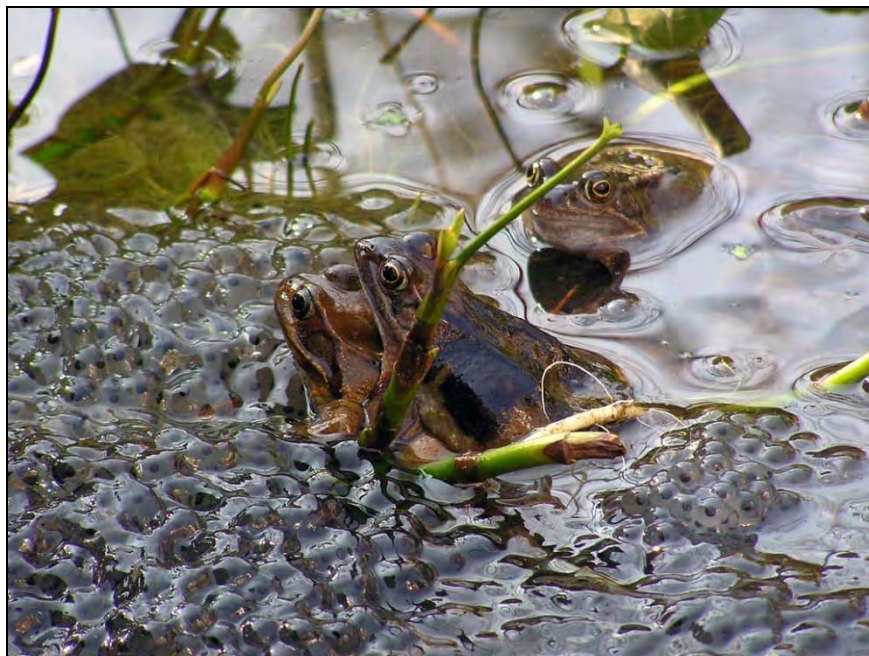


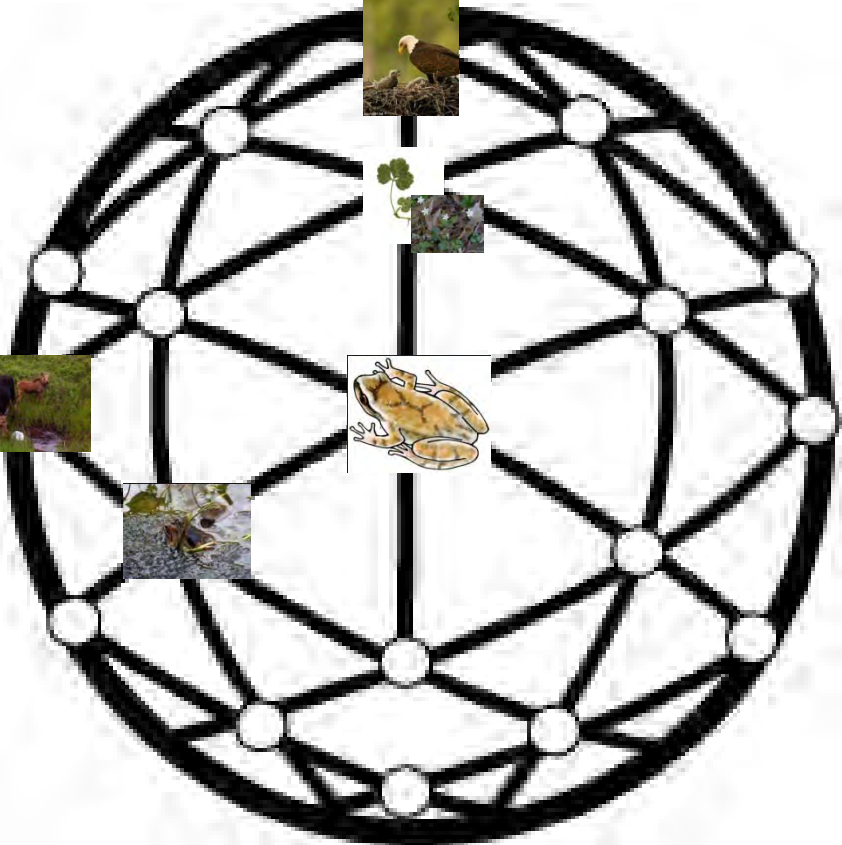
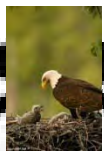
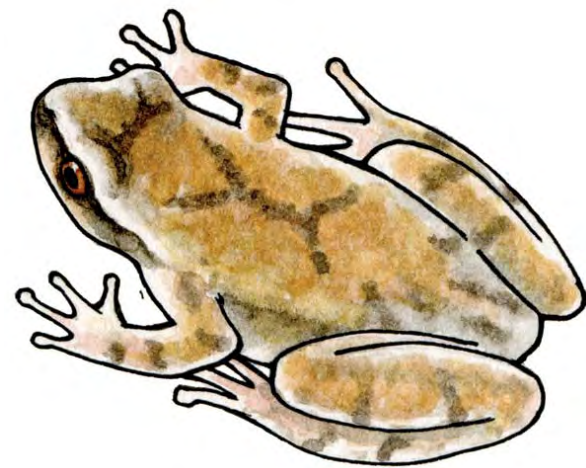


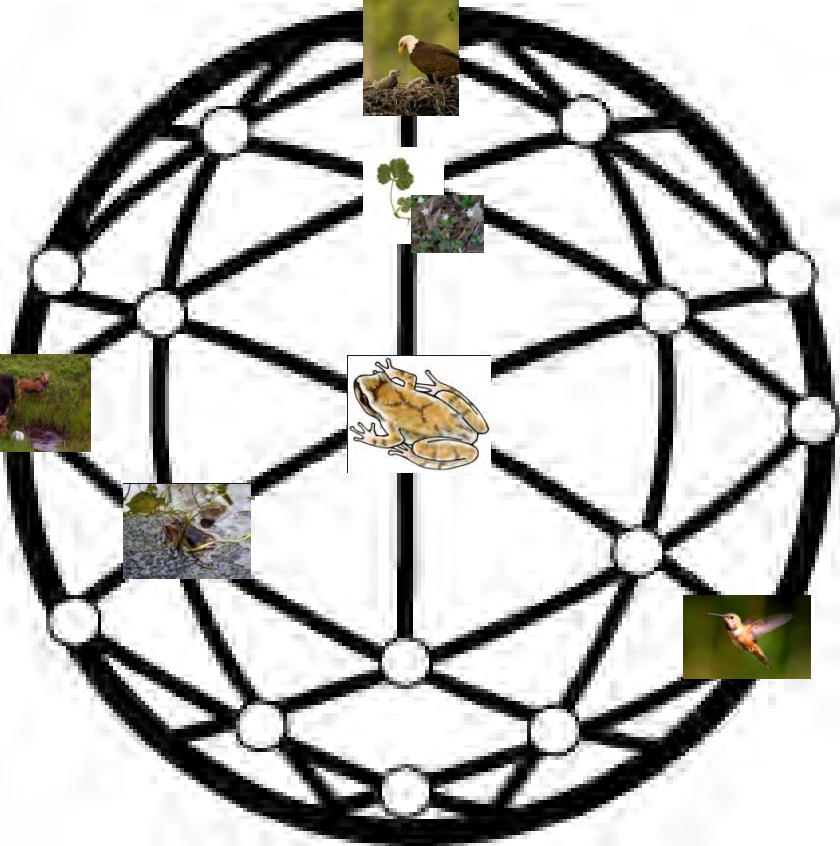
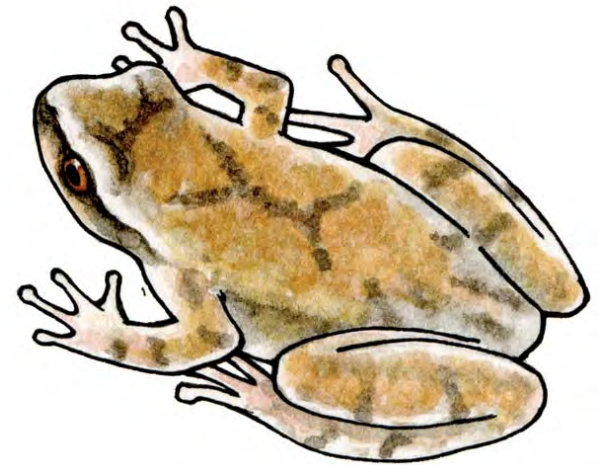


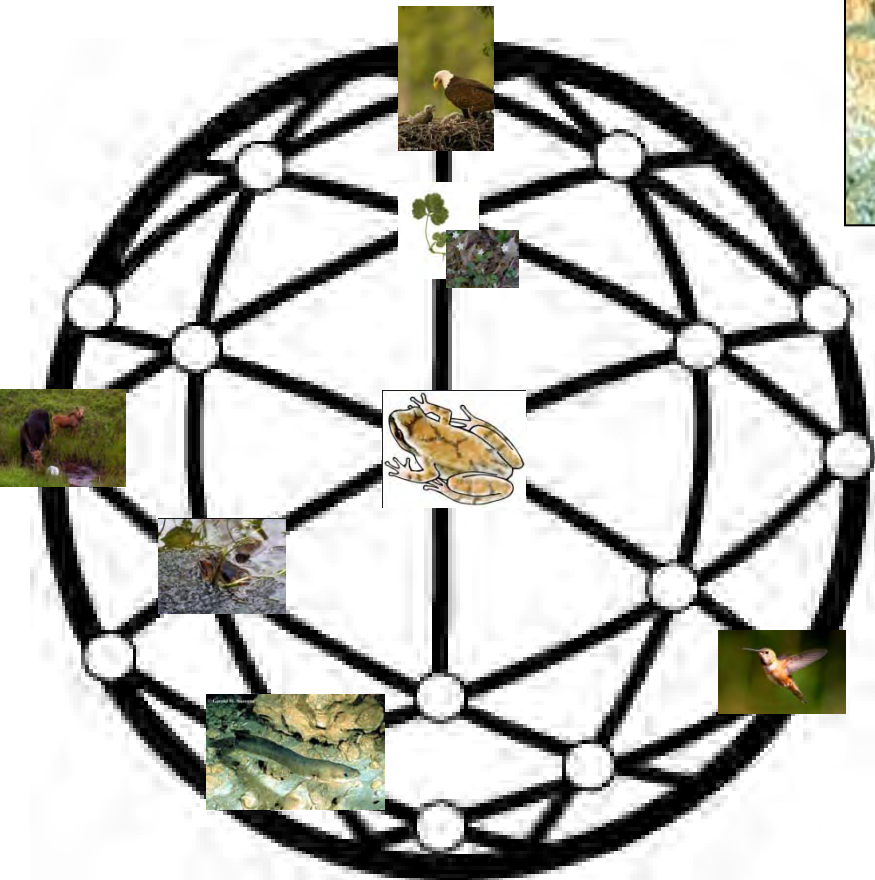
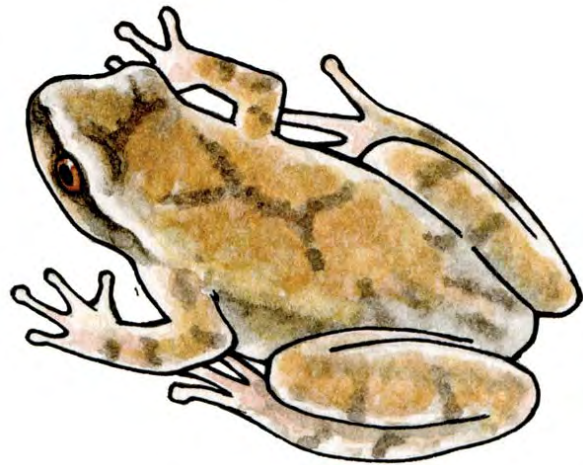


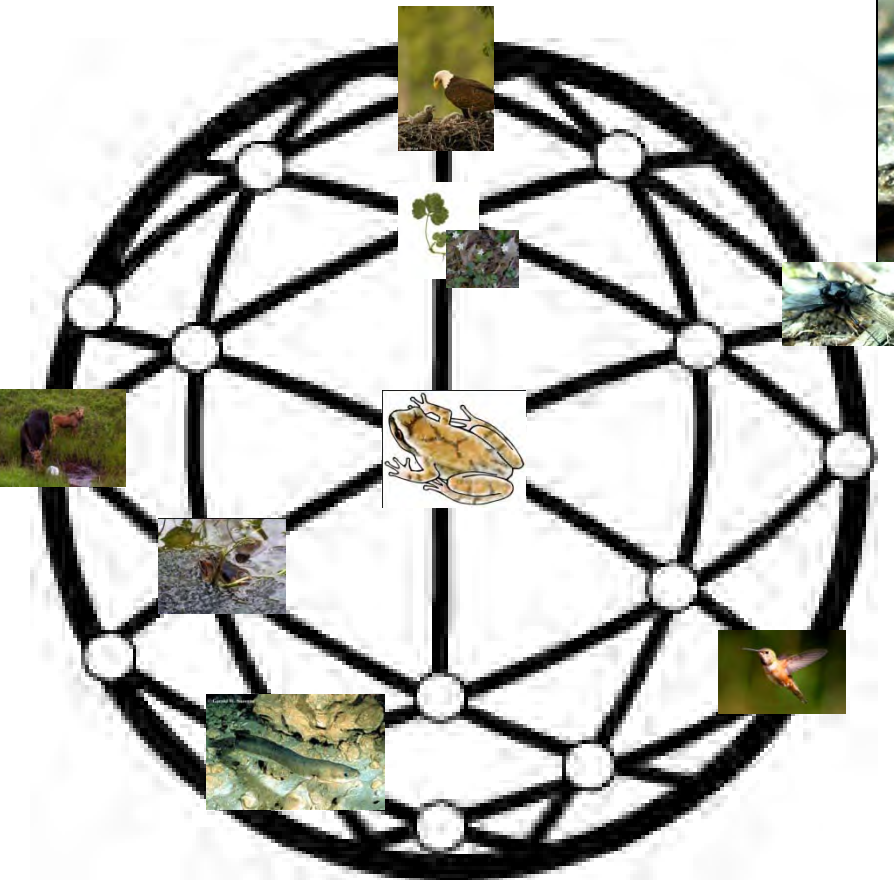
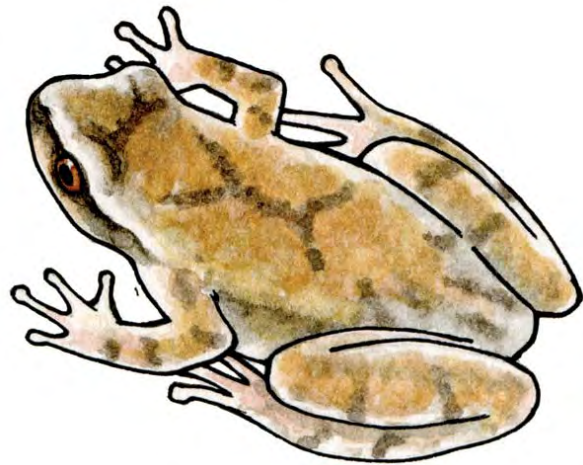


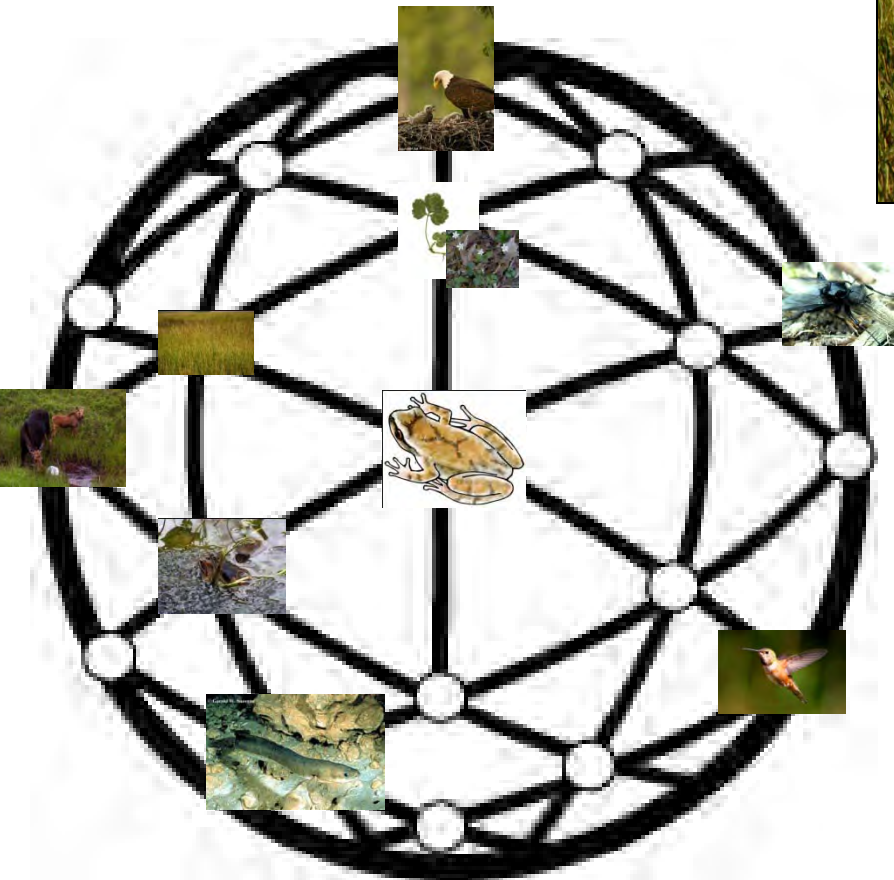
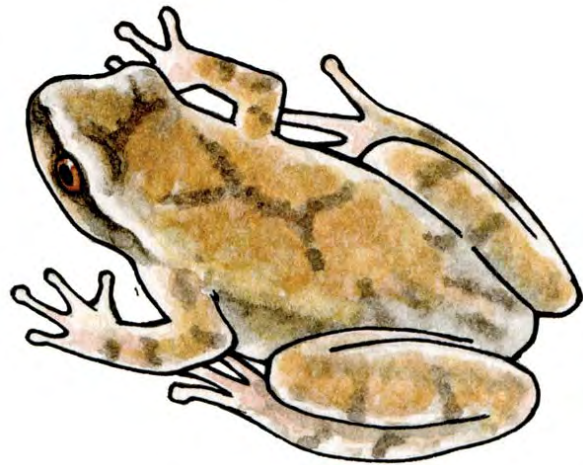


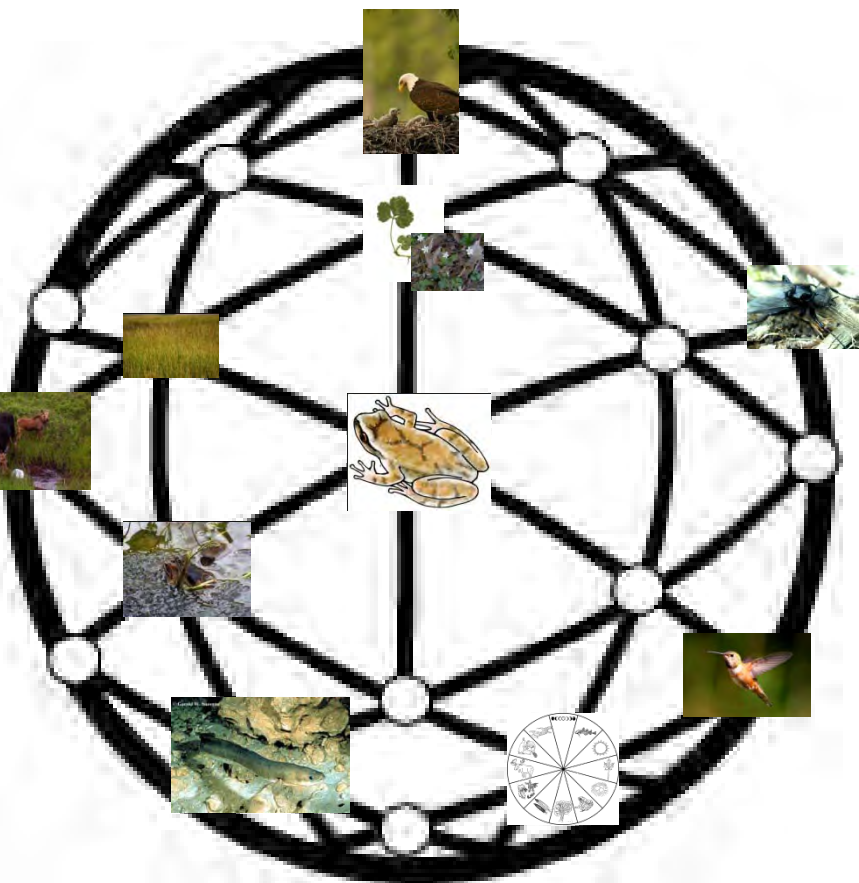
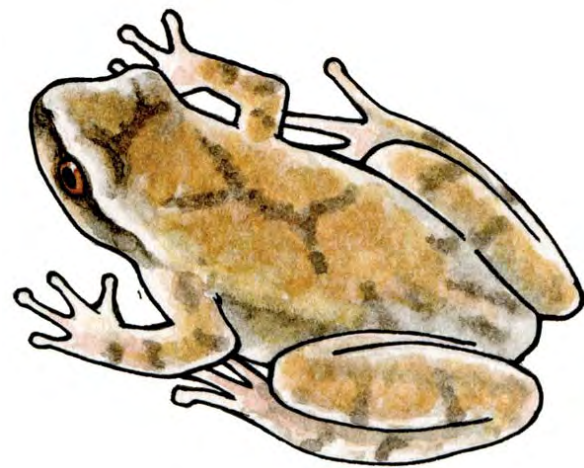
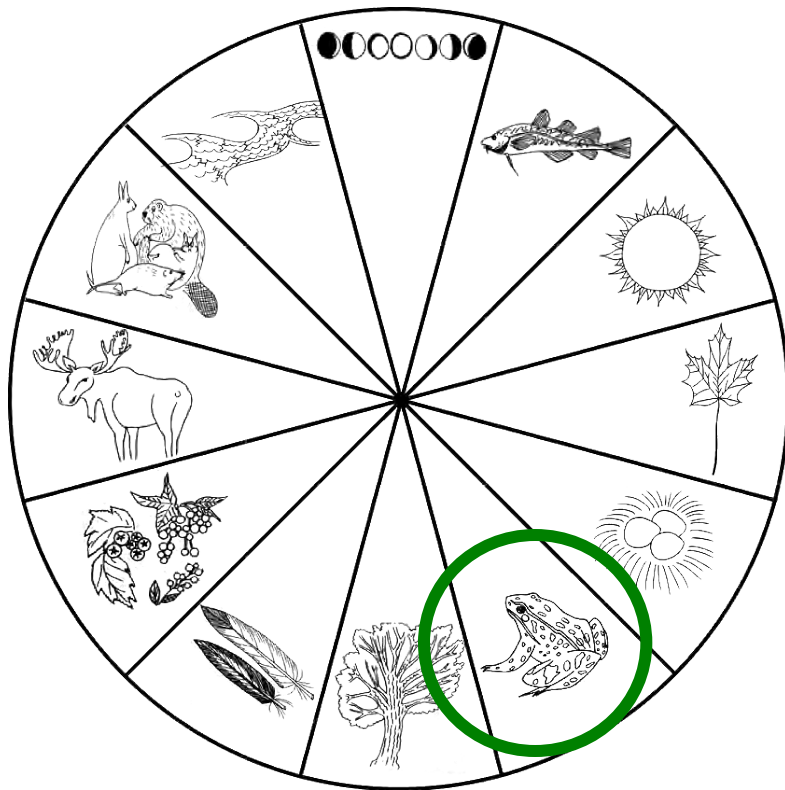


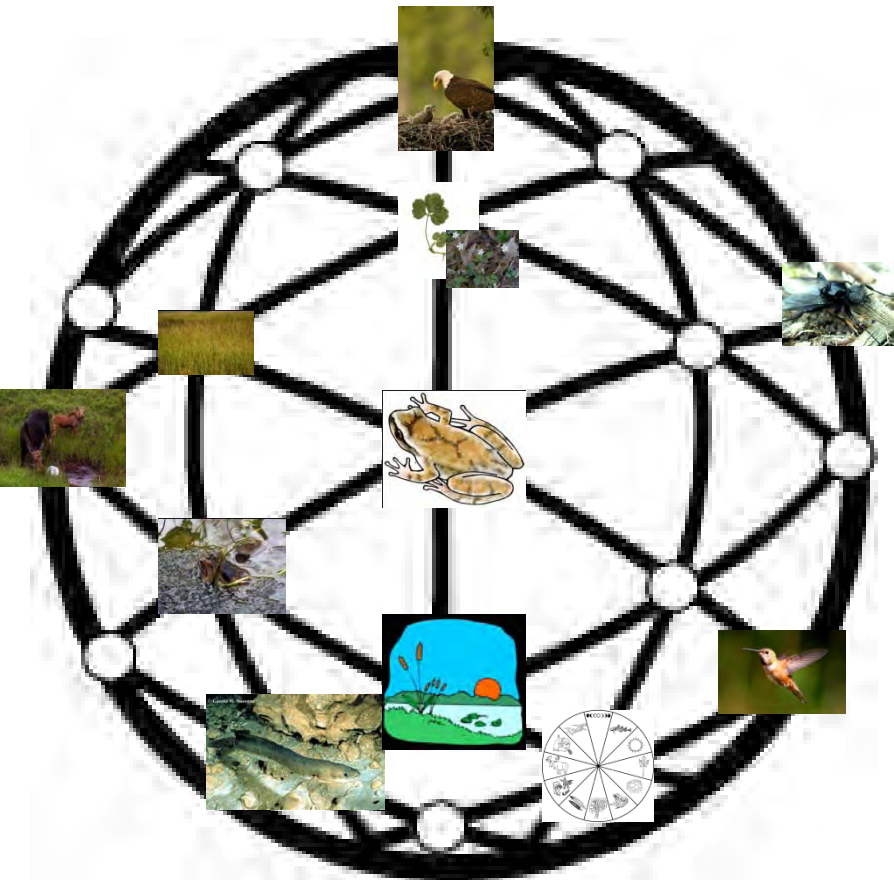
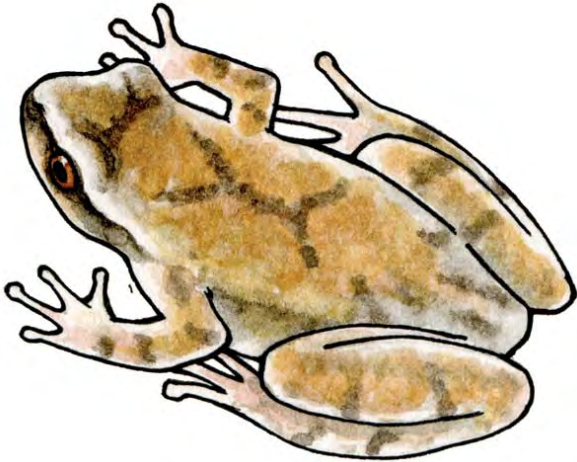
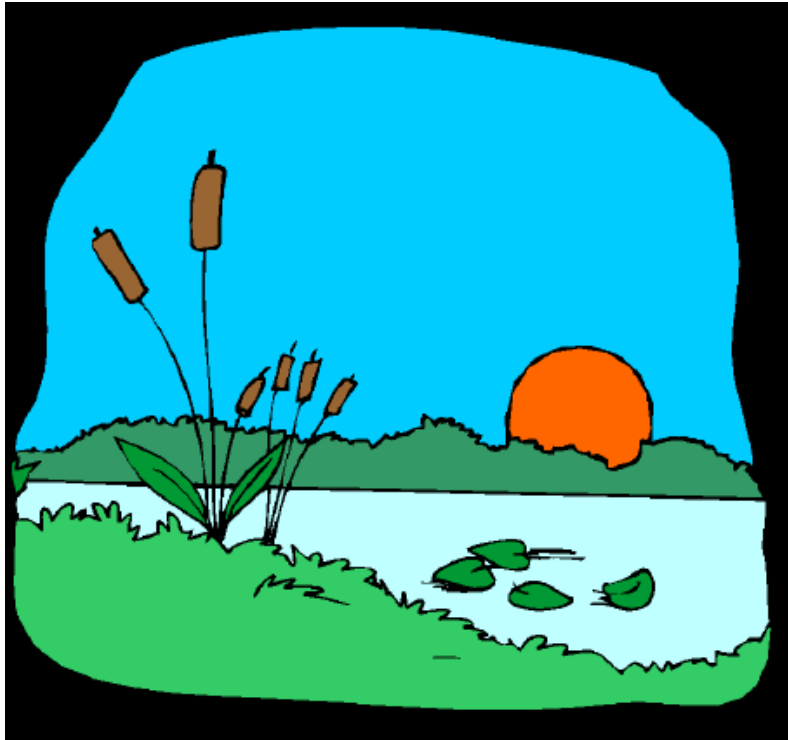


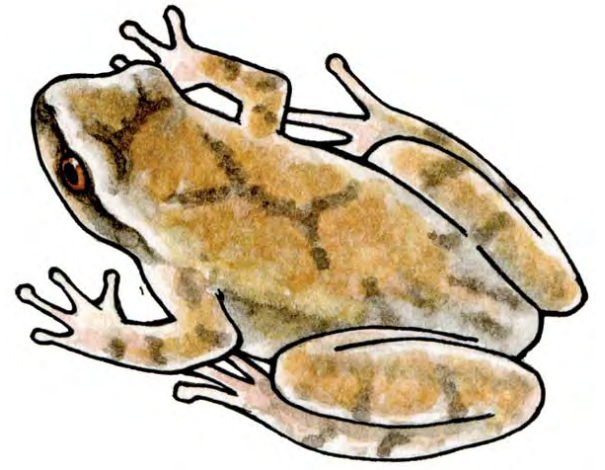
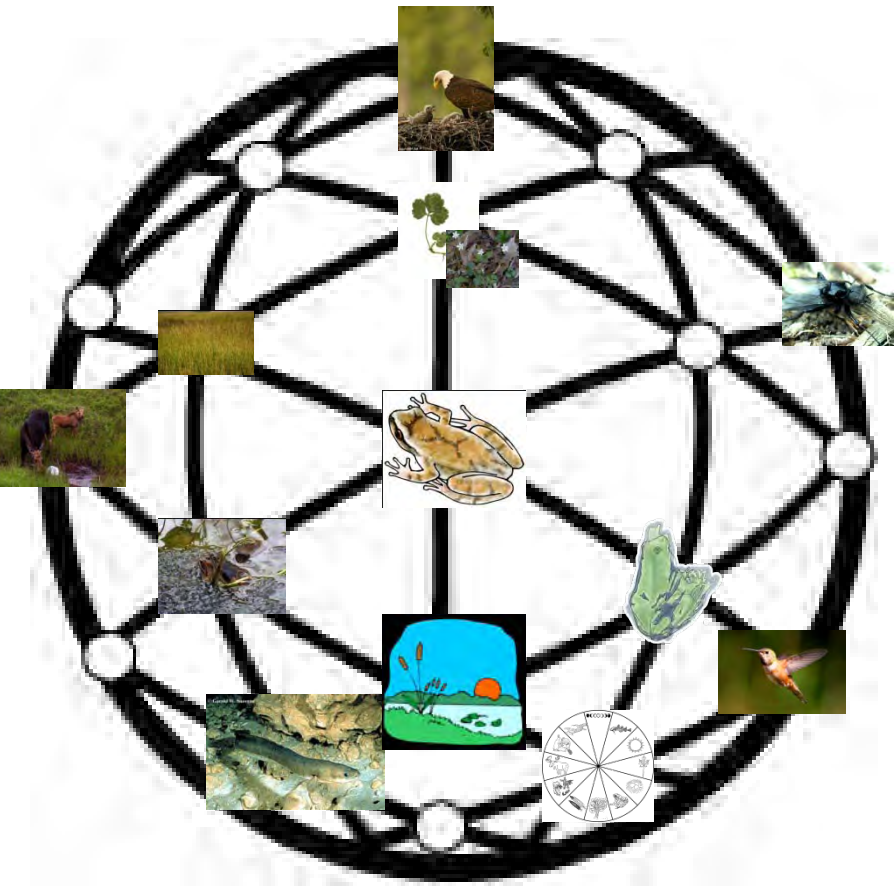


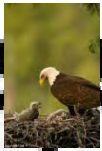
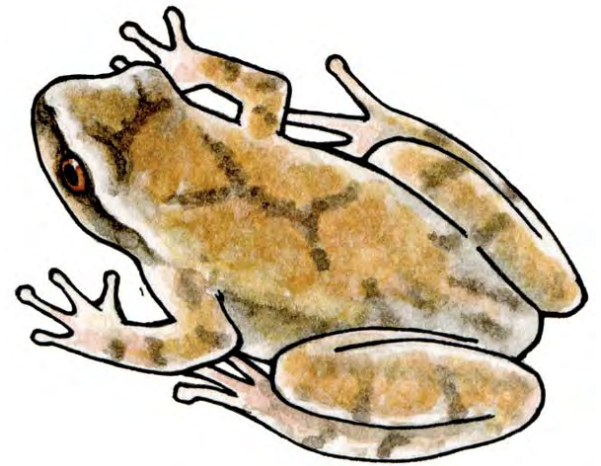


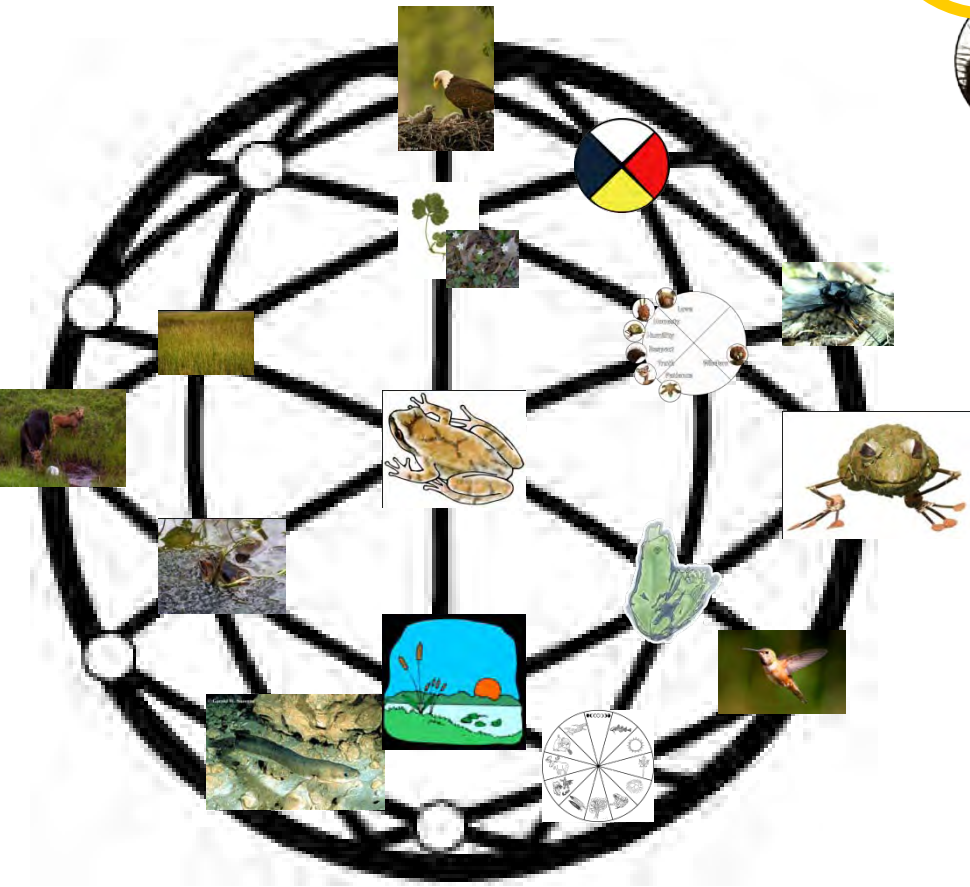
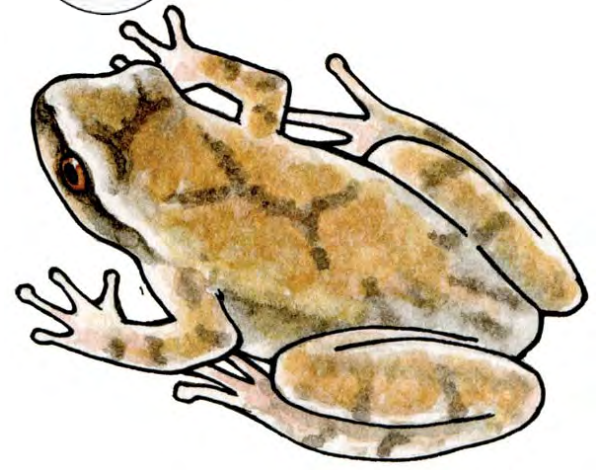
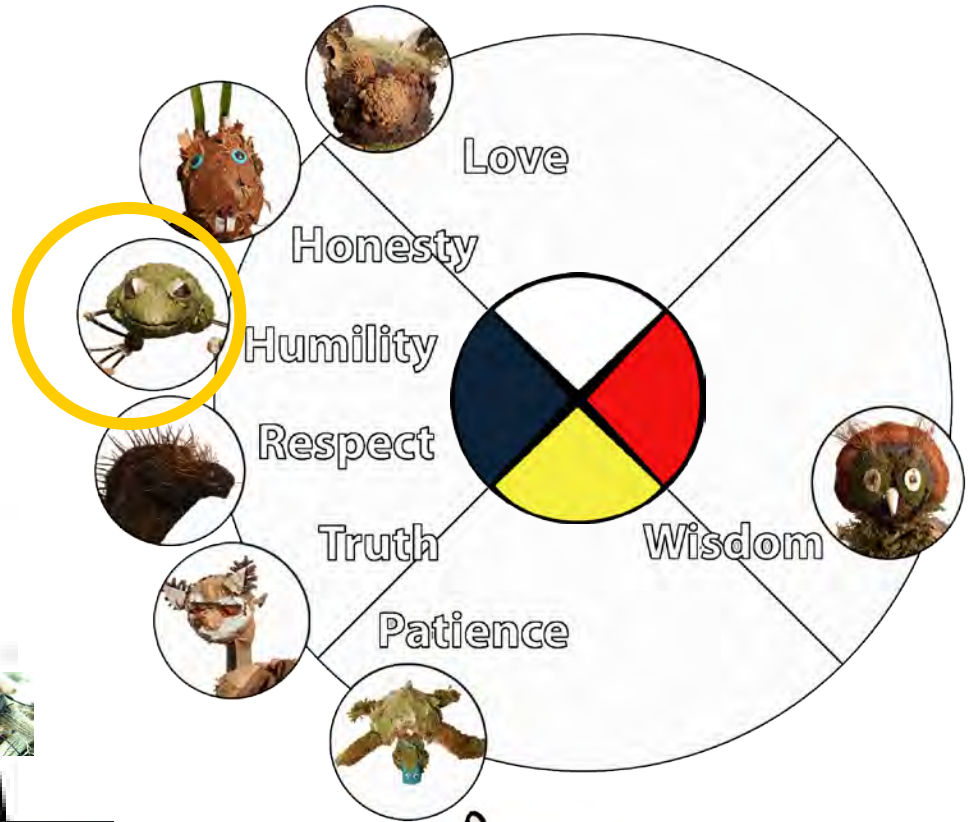


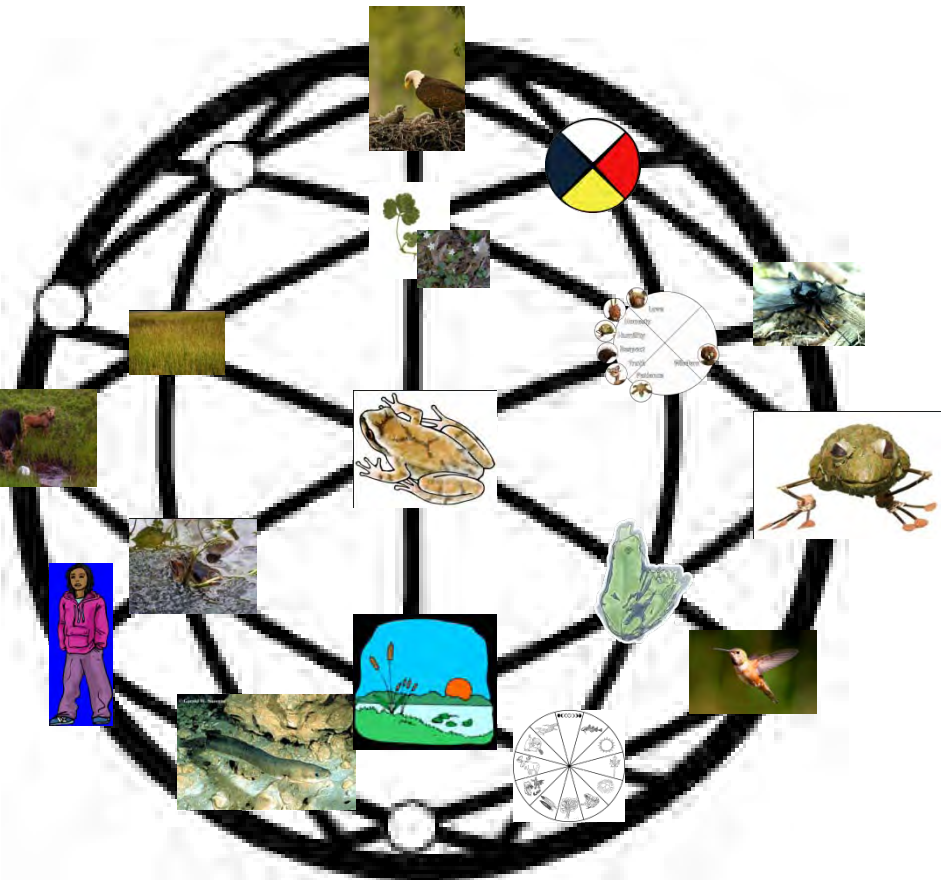
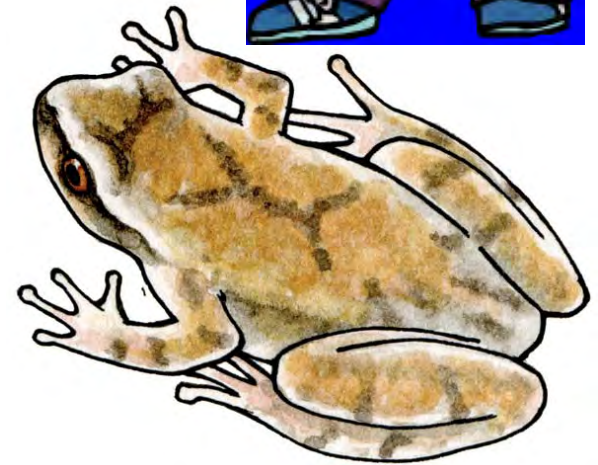


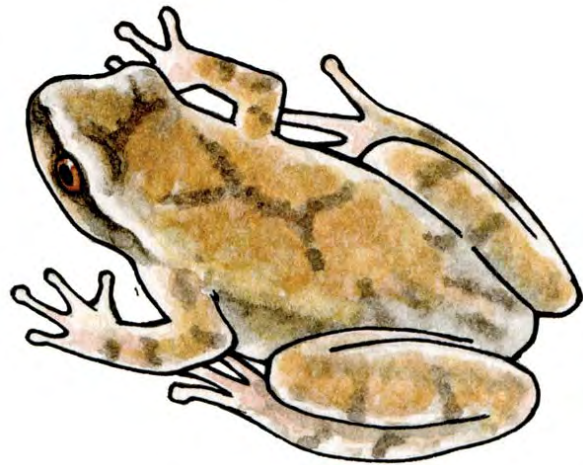




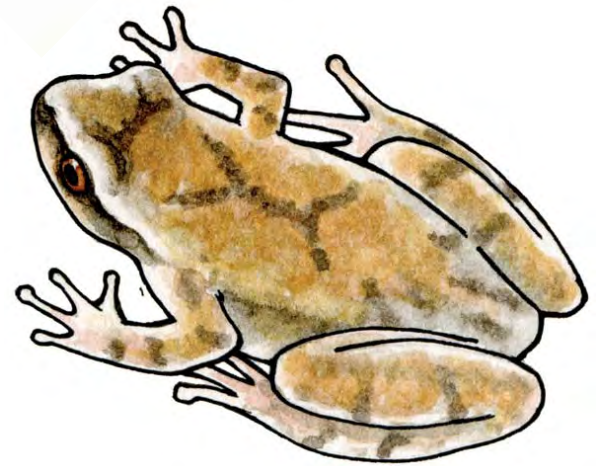




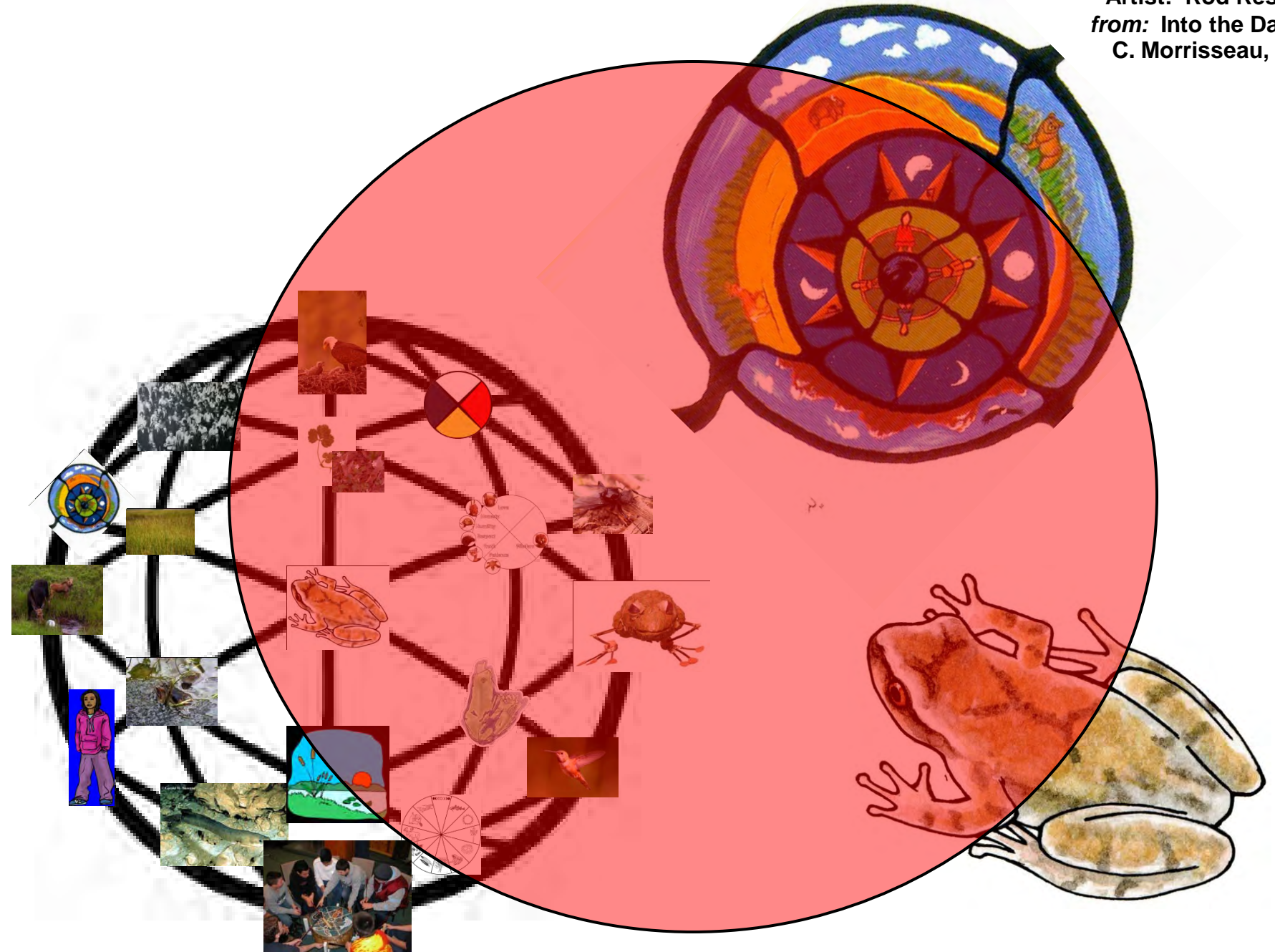




Artist: Rod Restoule
from: Into the Daylight;
C. Morrisseau, 1998

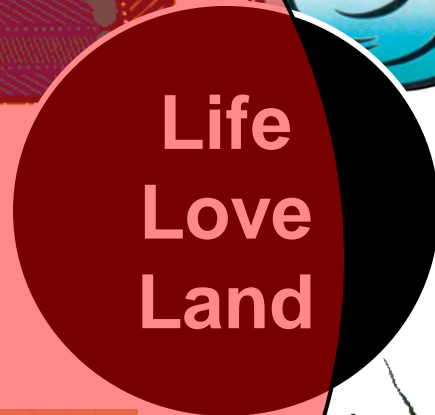
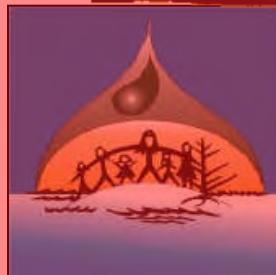


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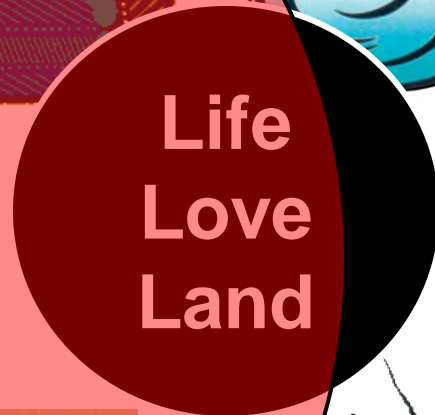
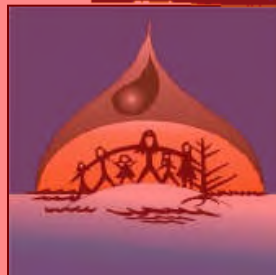
stories of our interactions with and within nature

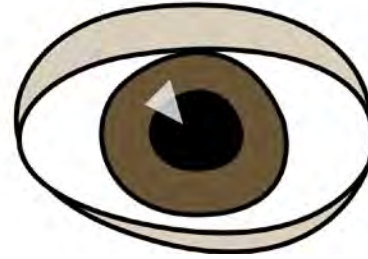
Science



stories of our interactions with and within nature

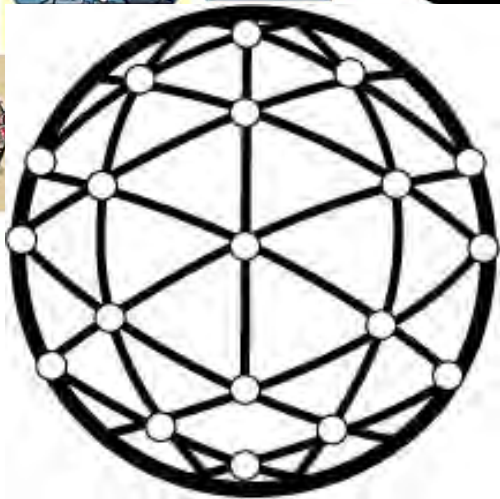
Science

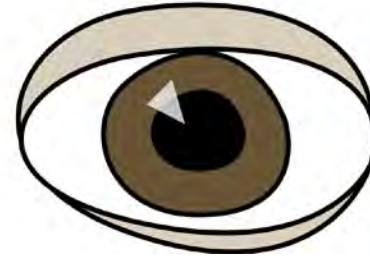




stories of our interactions with and within nature

Science



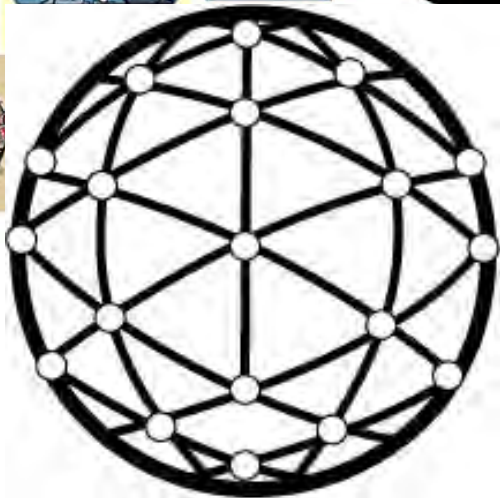


stories of our interactions with and within nature

Science



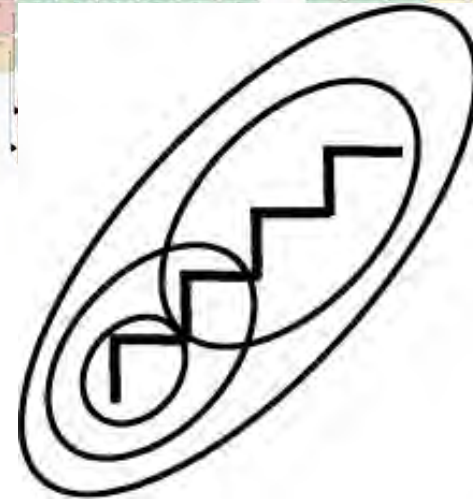
Life
Love
Land

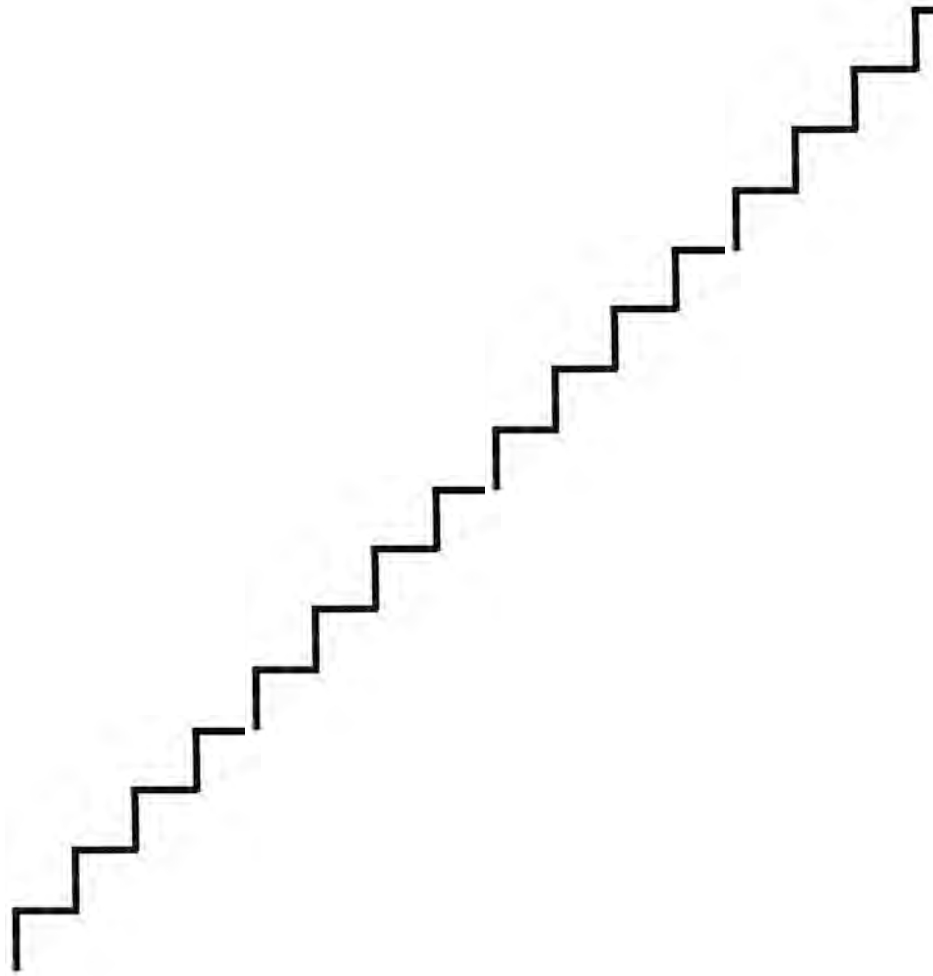


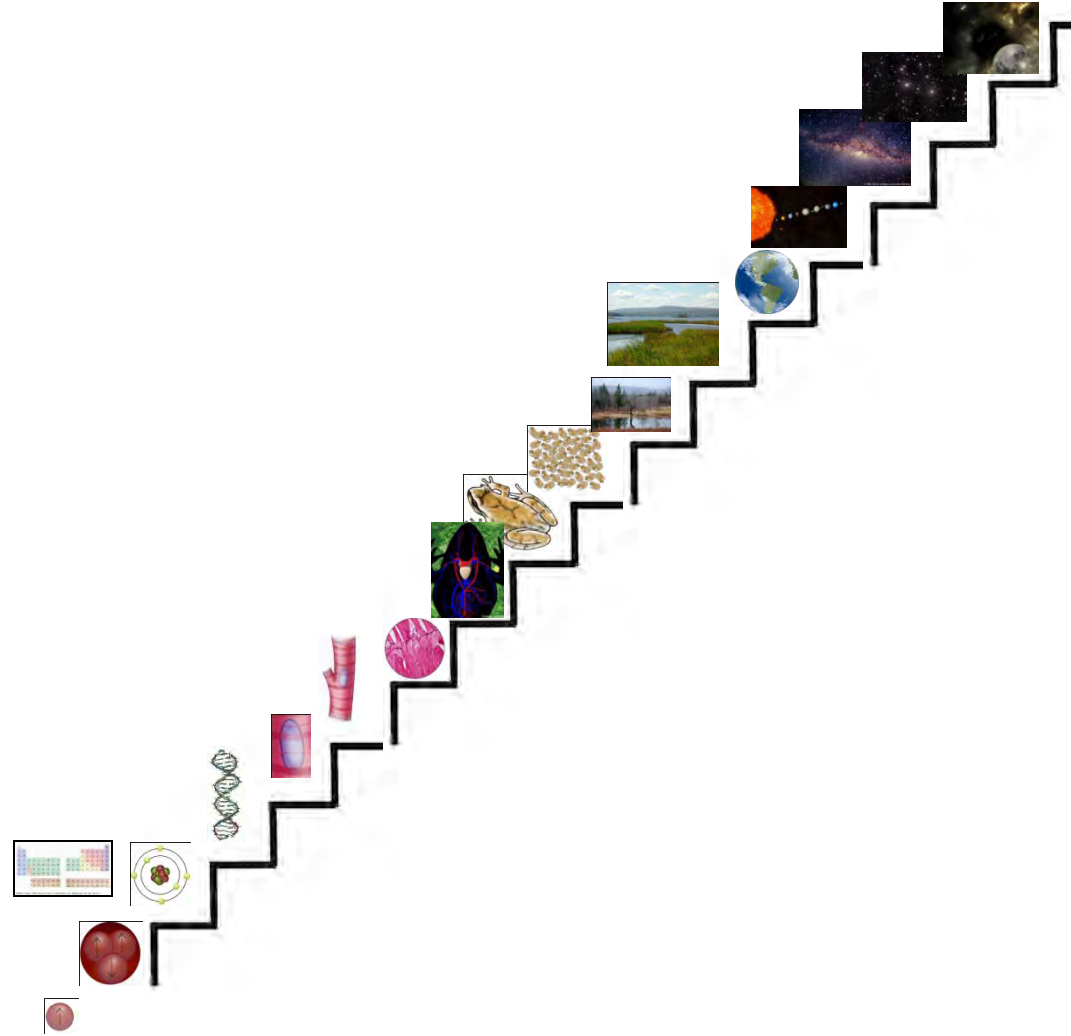
stories of our interactions with and within nature

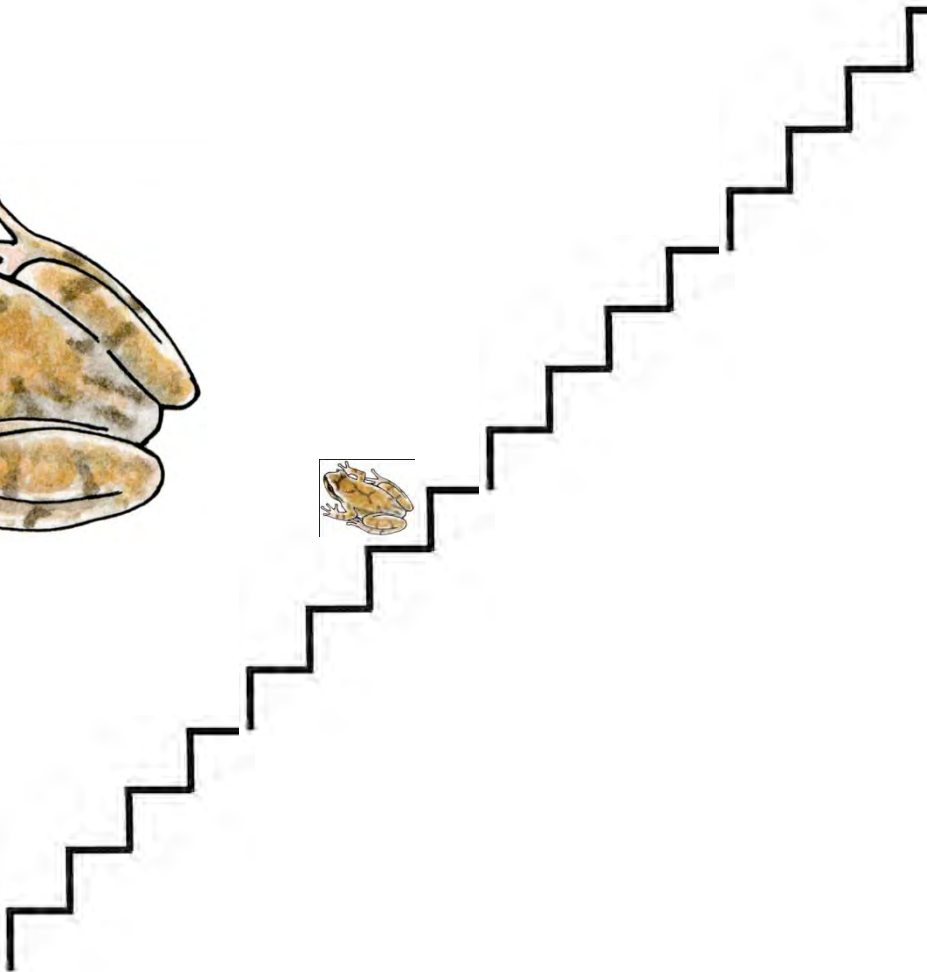
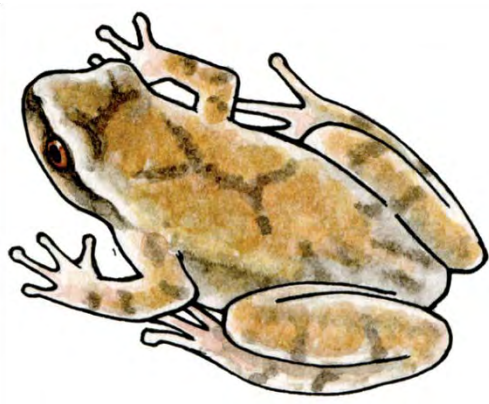
Science

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Li	Be											B	C	N	O	F	Ne						
Na	Mg											Al	Si	P	S	Cl	Ar						
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Cu							Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh							Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba											Pb	Bi	Po	At	Rn							
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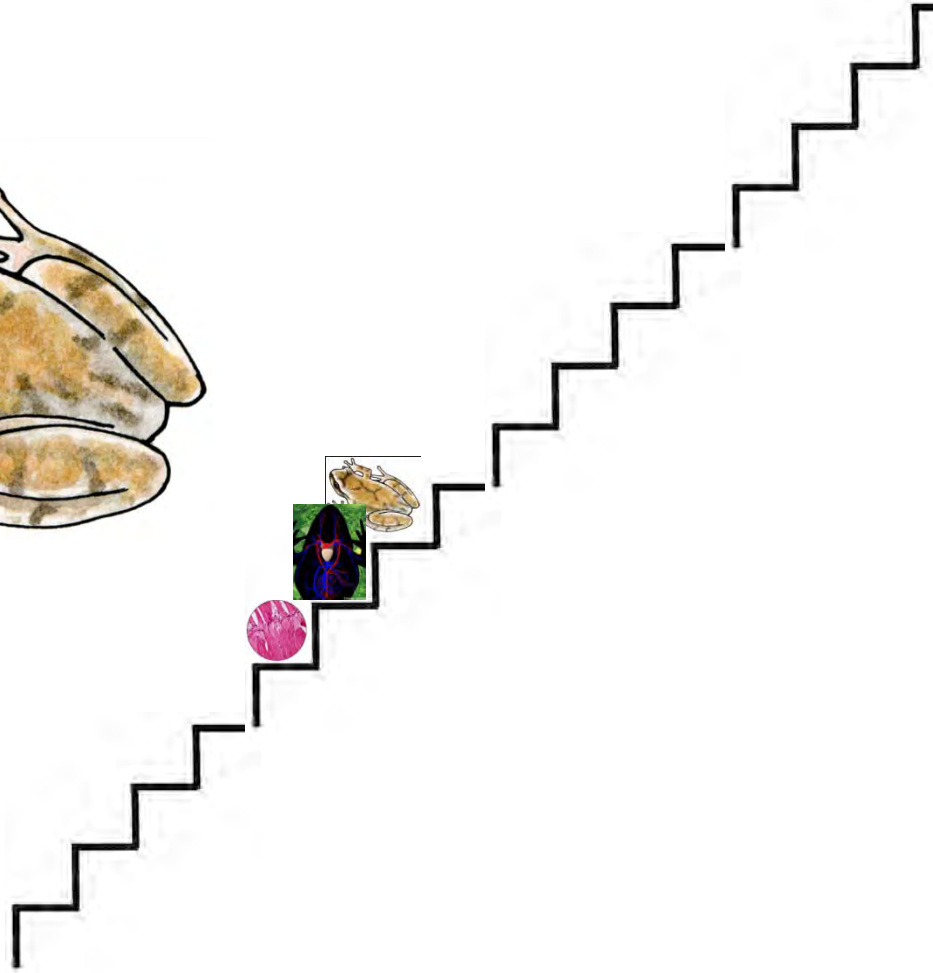
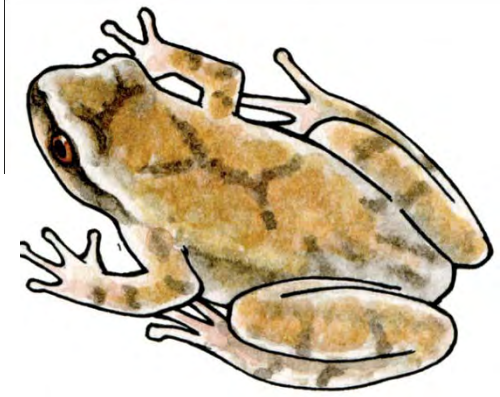
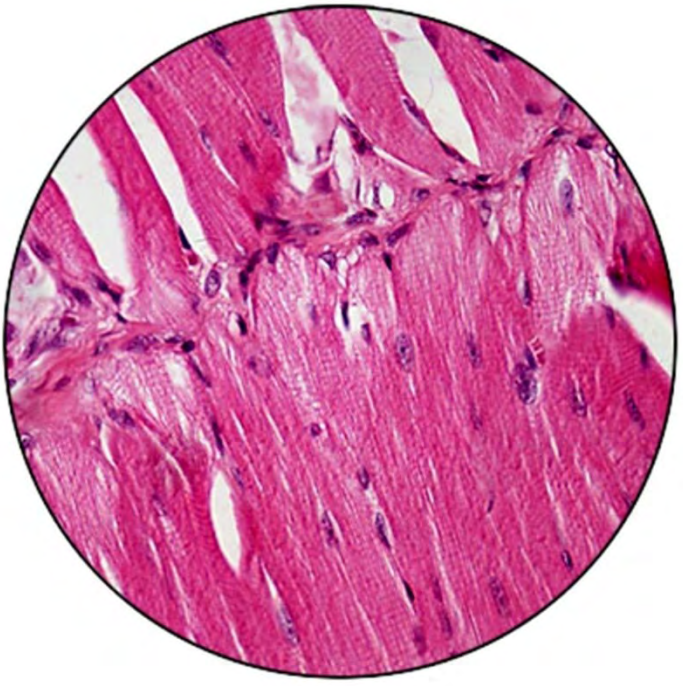


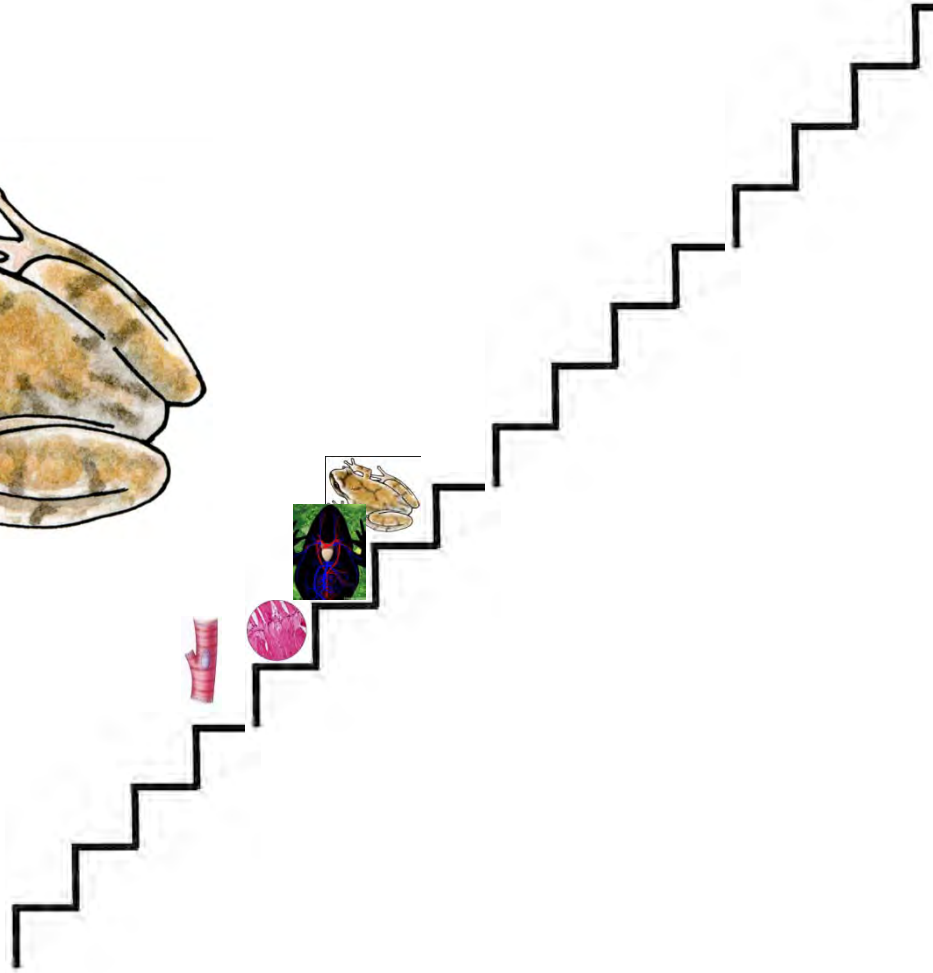
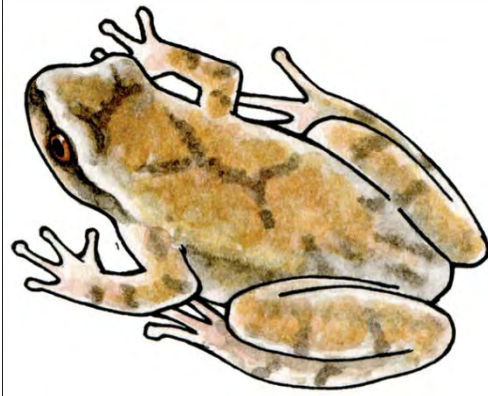
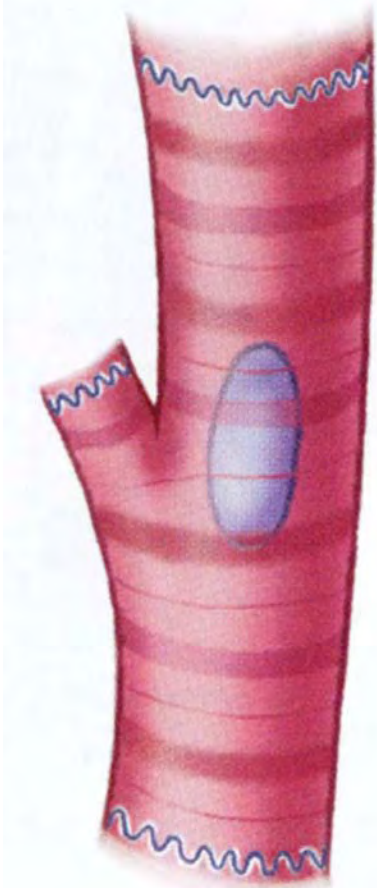


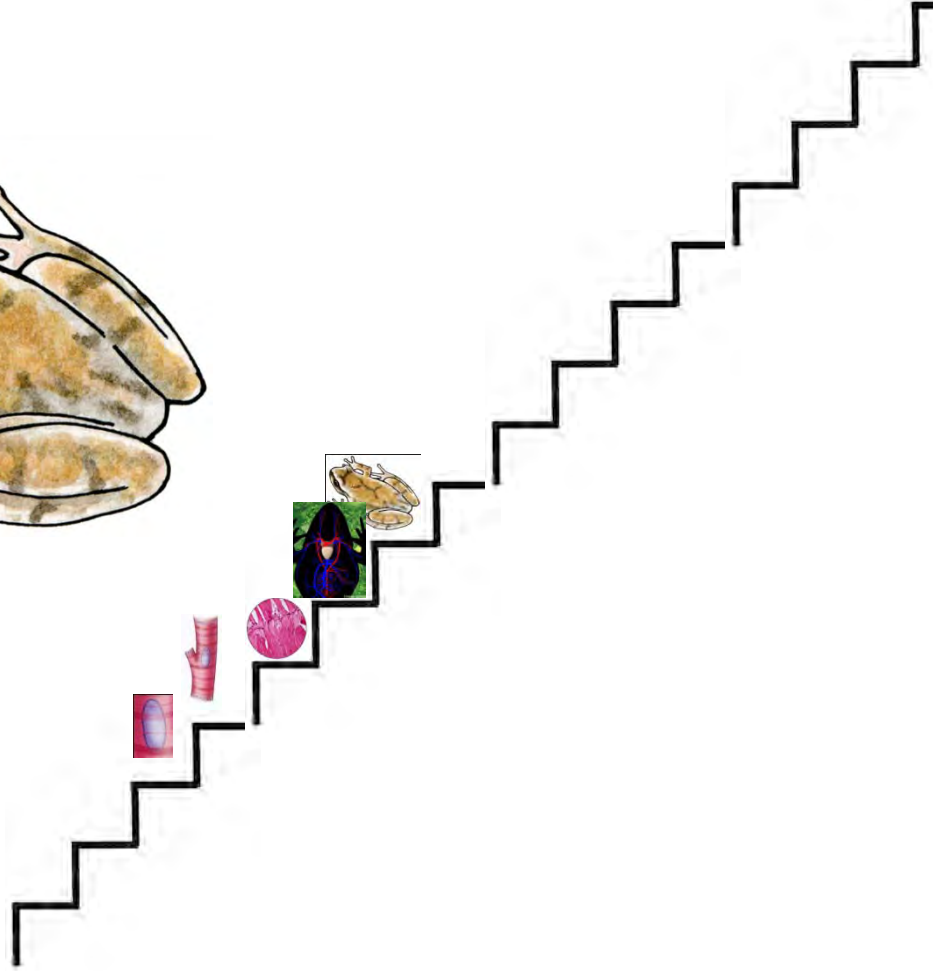
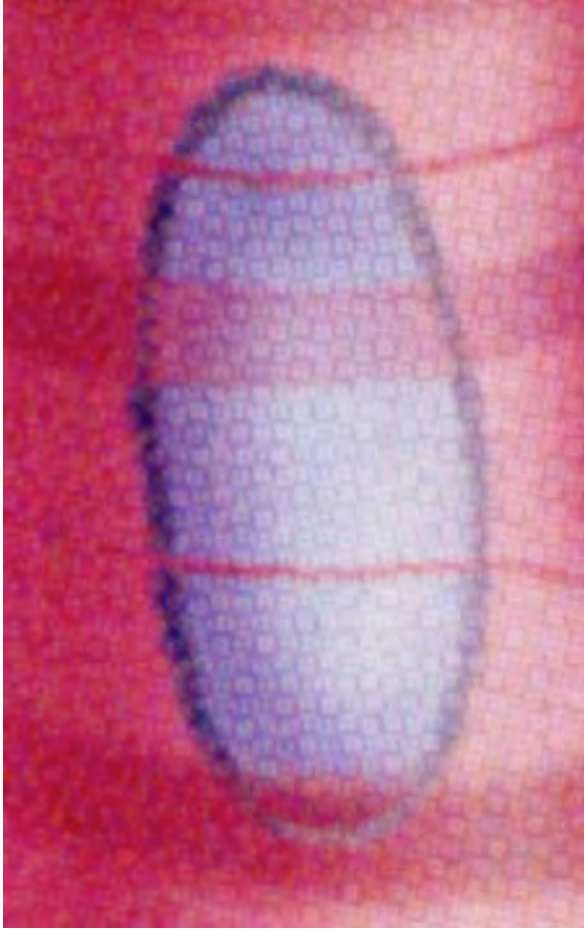


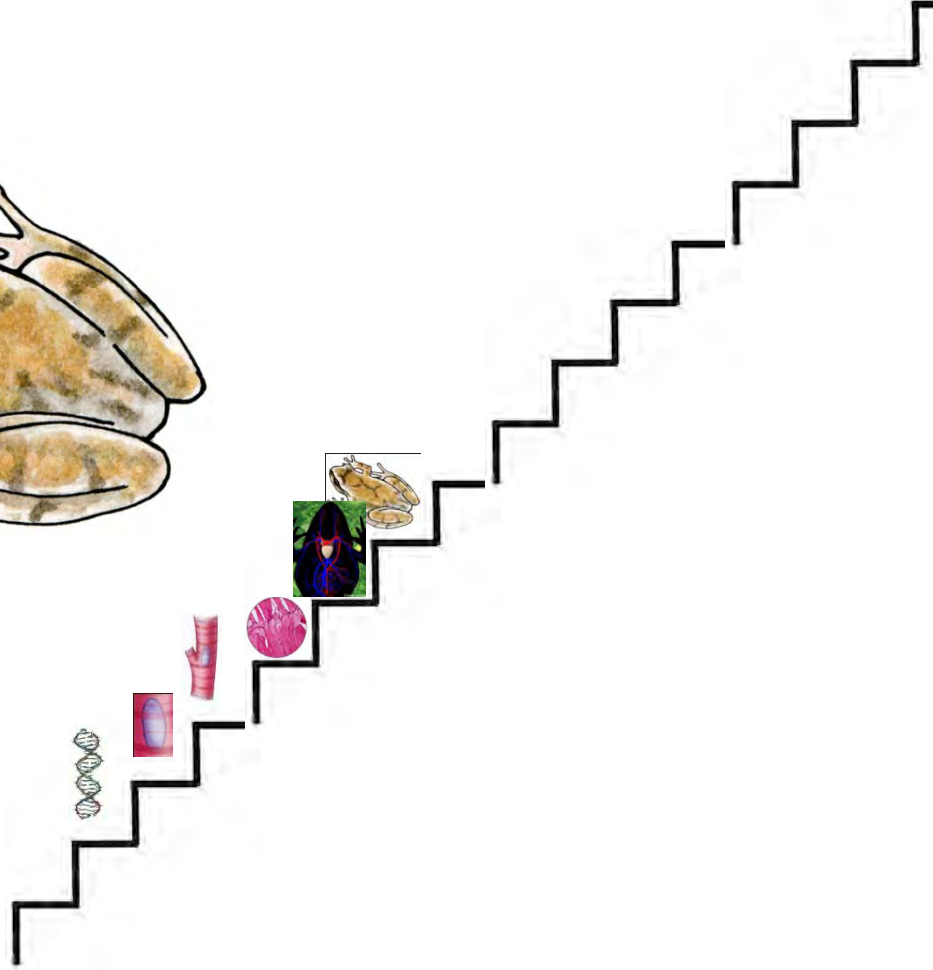
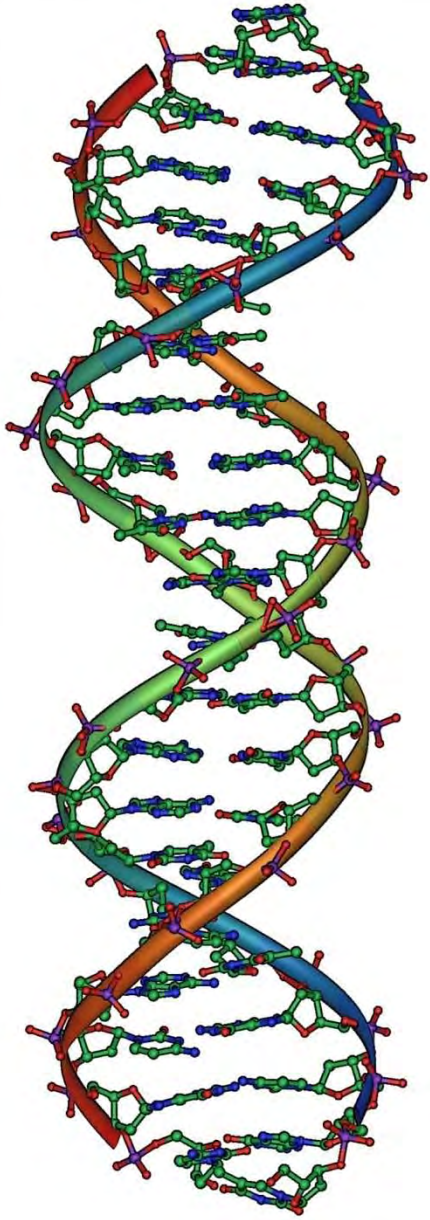






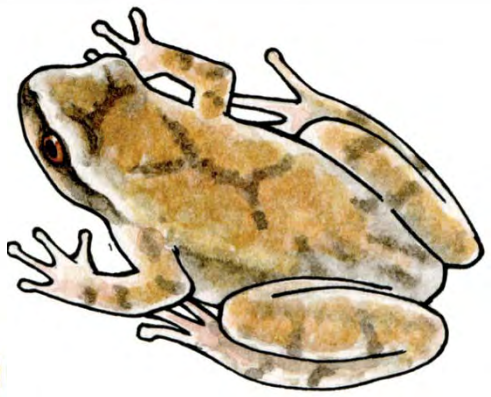
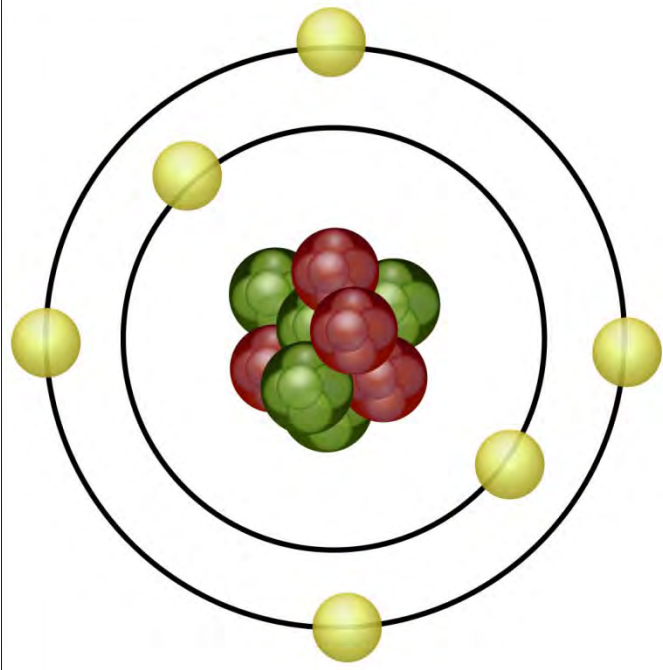


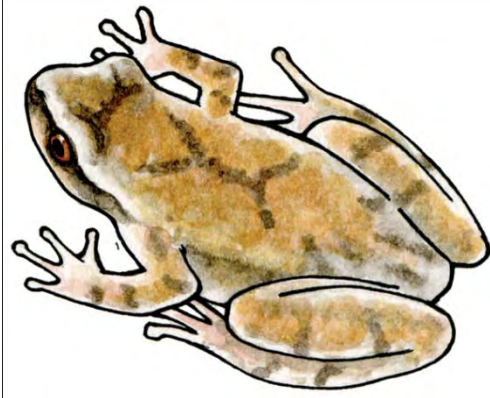
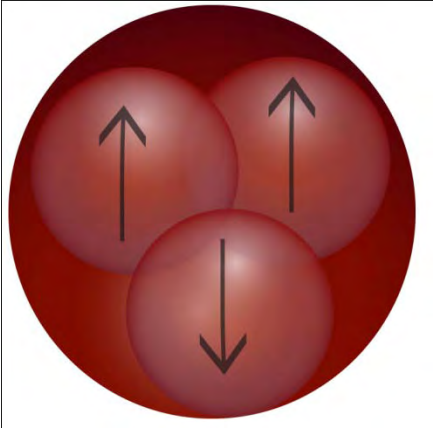


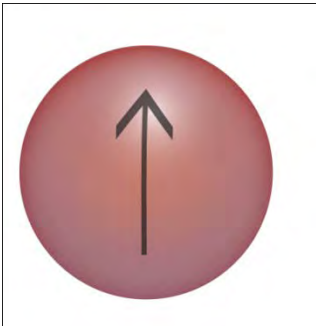


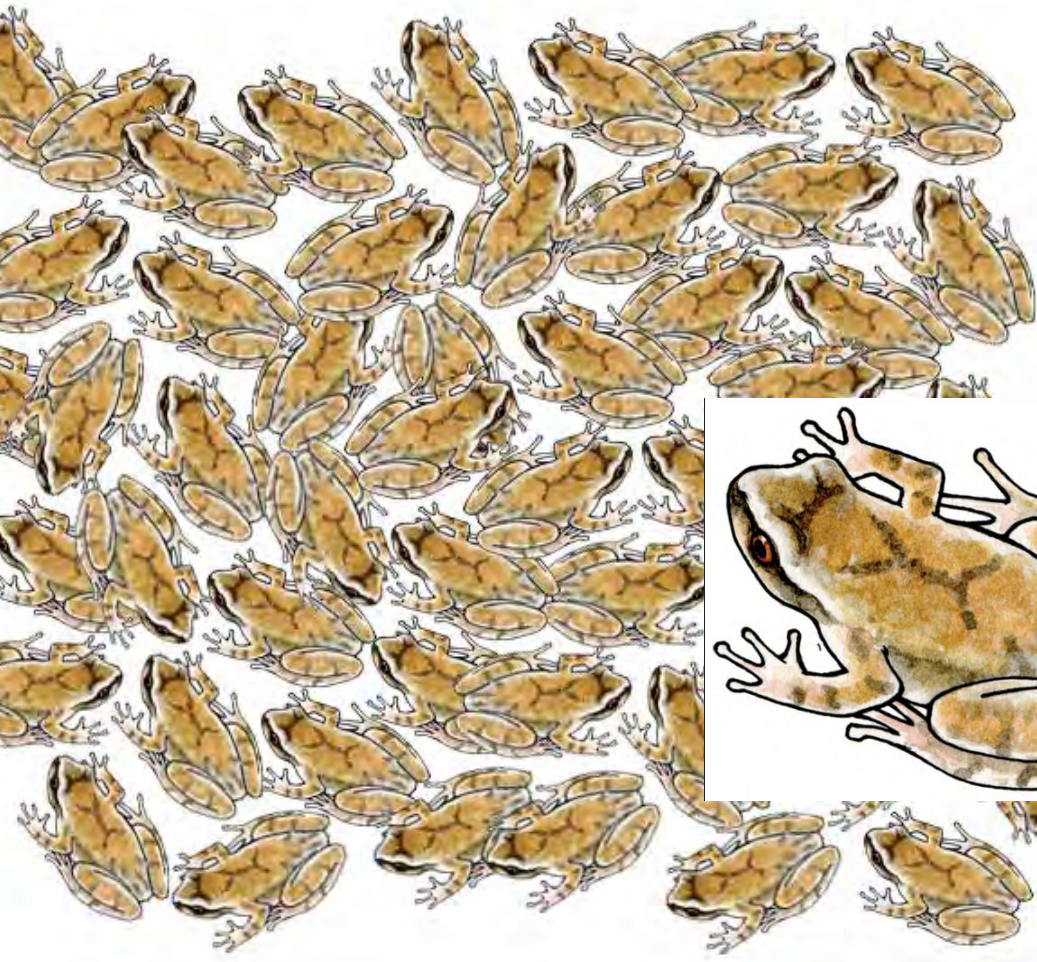
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Li	Be											B	C	N	O	F	Ne									
Na	Mg											Al	Si	P	S	Cl	Ar									
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr									
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe									
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn									
Fr	Ra	Unq	Unp	Unh	Uns	Unl	Uur	Uus	Uuq	Uub	Uut	Uuq	Uuh	Uuq	Uur	Uus	Uut									
		La	Ce	Pr	Nd	Pm	Sm											Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
		Ac	Th	Pa	U	Np	Pu											Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

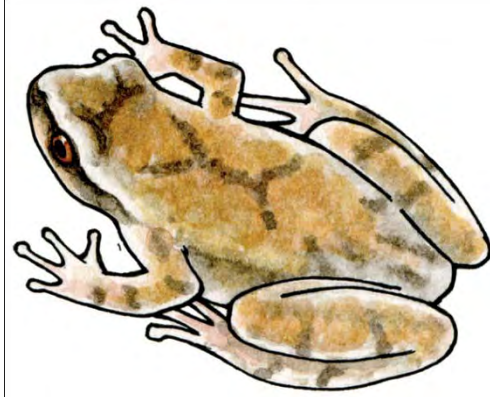
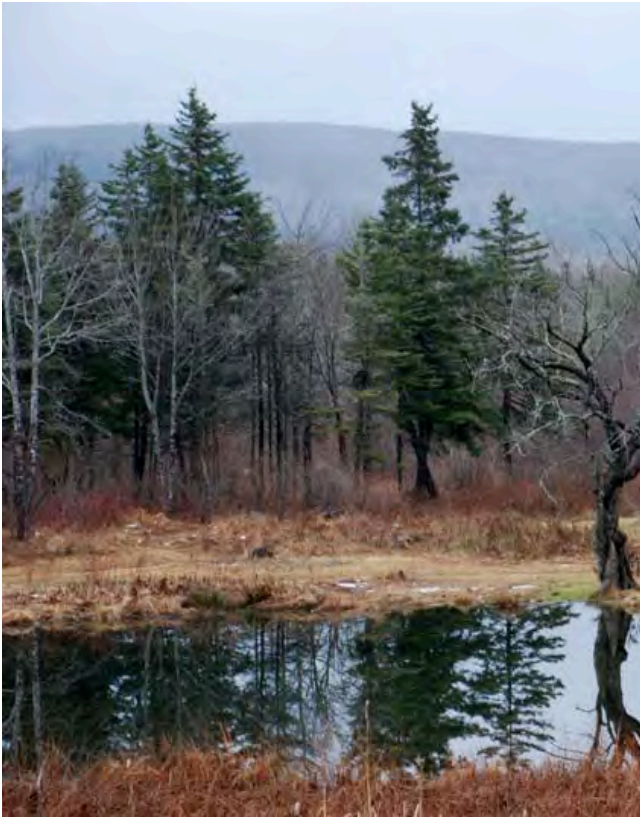
Setford, Steve. 1996. Science Facts. Firefly Books Ltd., Willowdale, ON. (pp. 36-37)

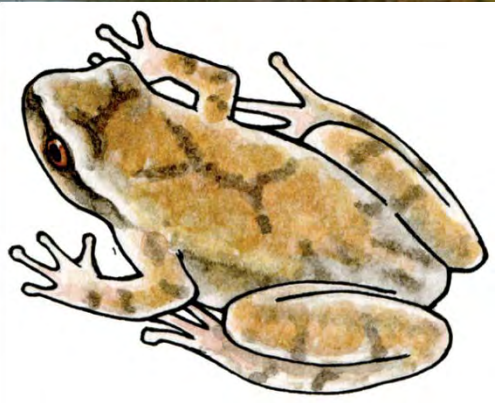


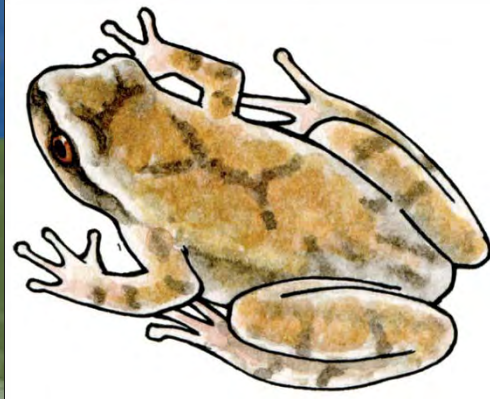
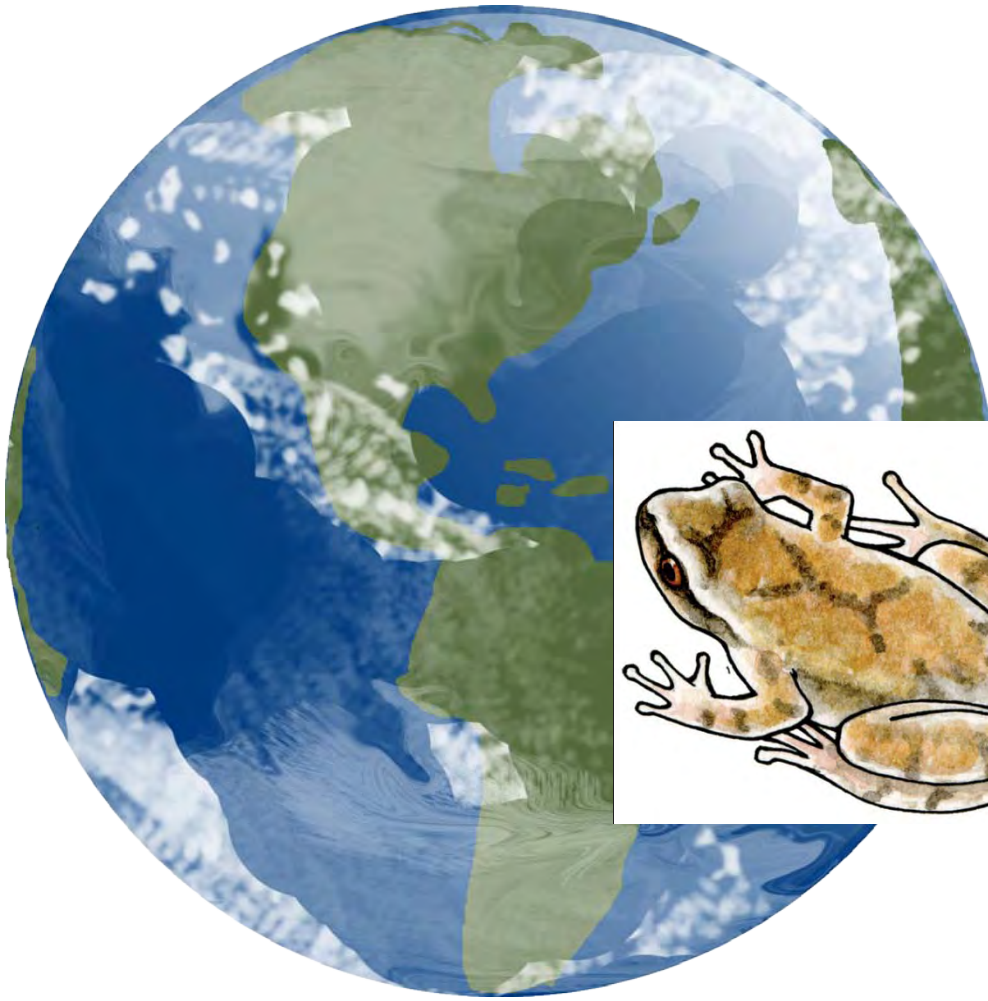


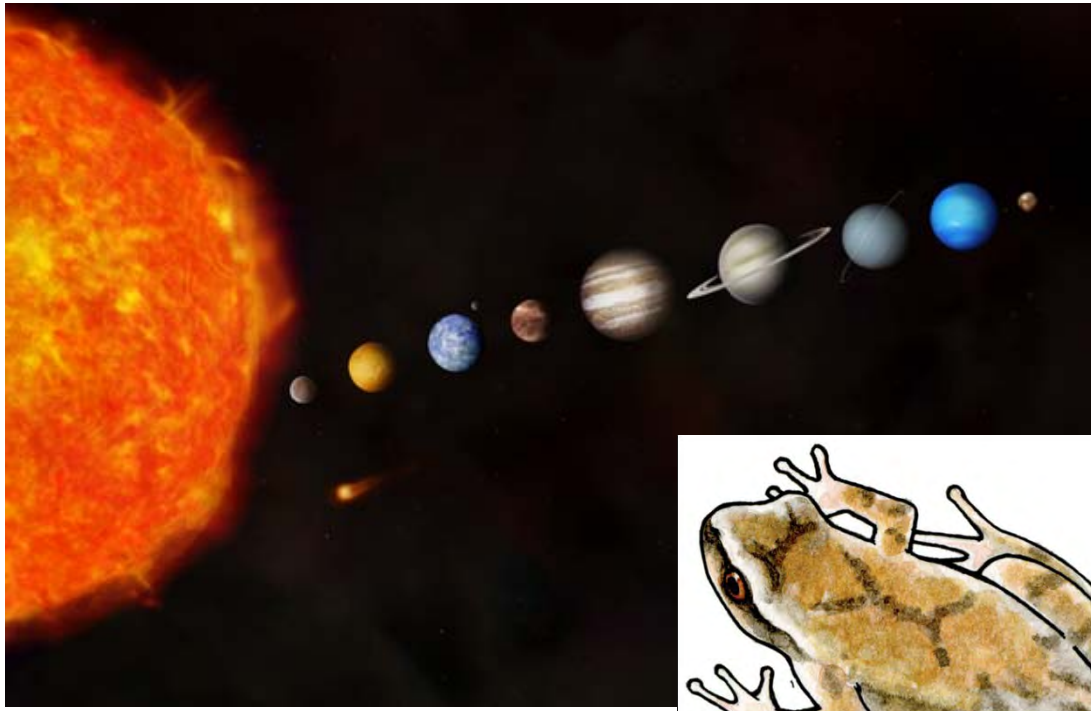






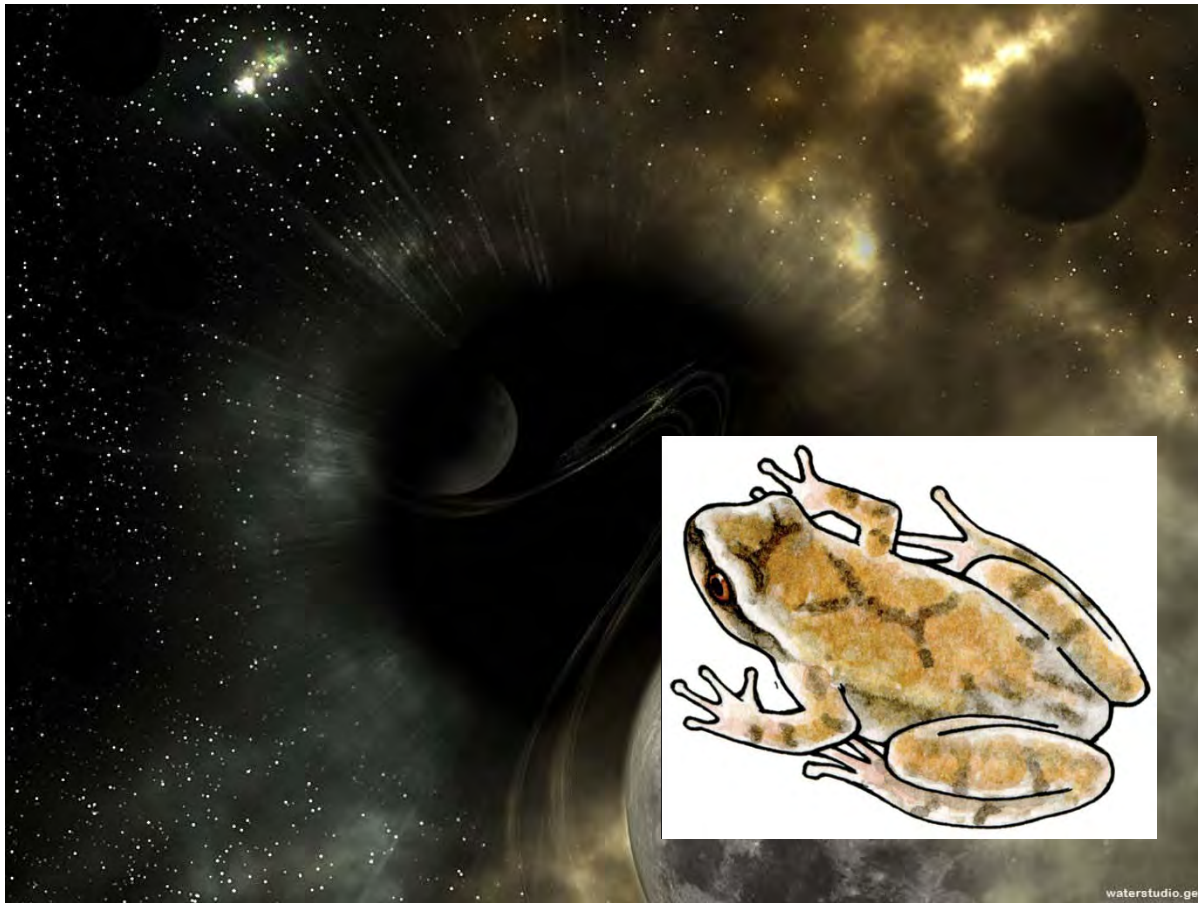




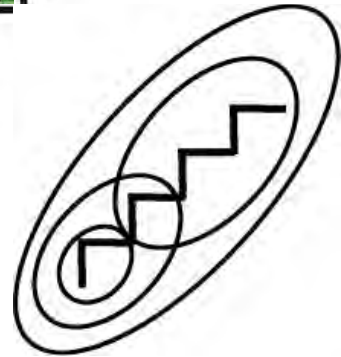


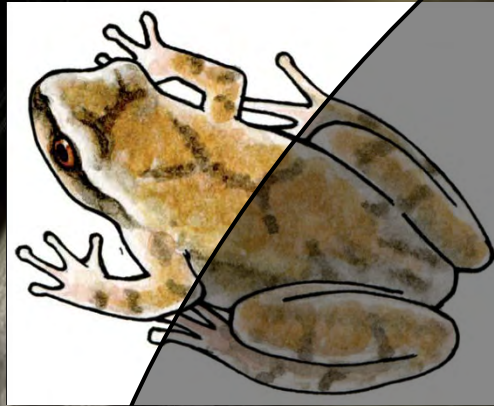
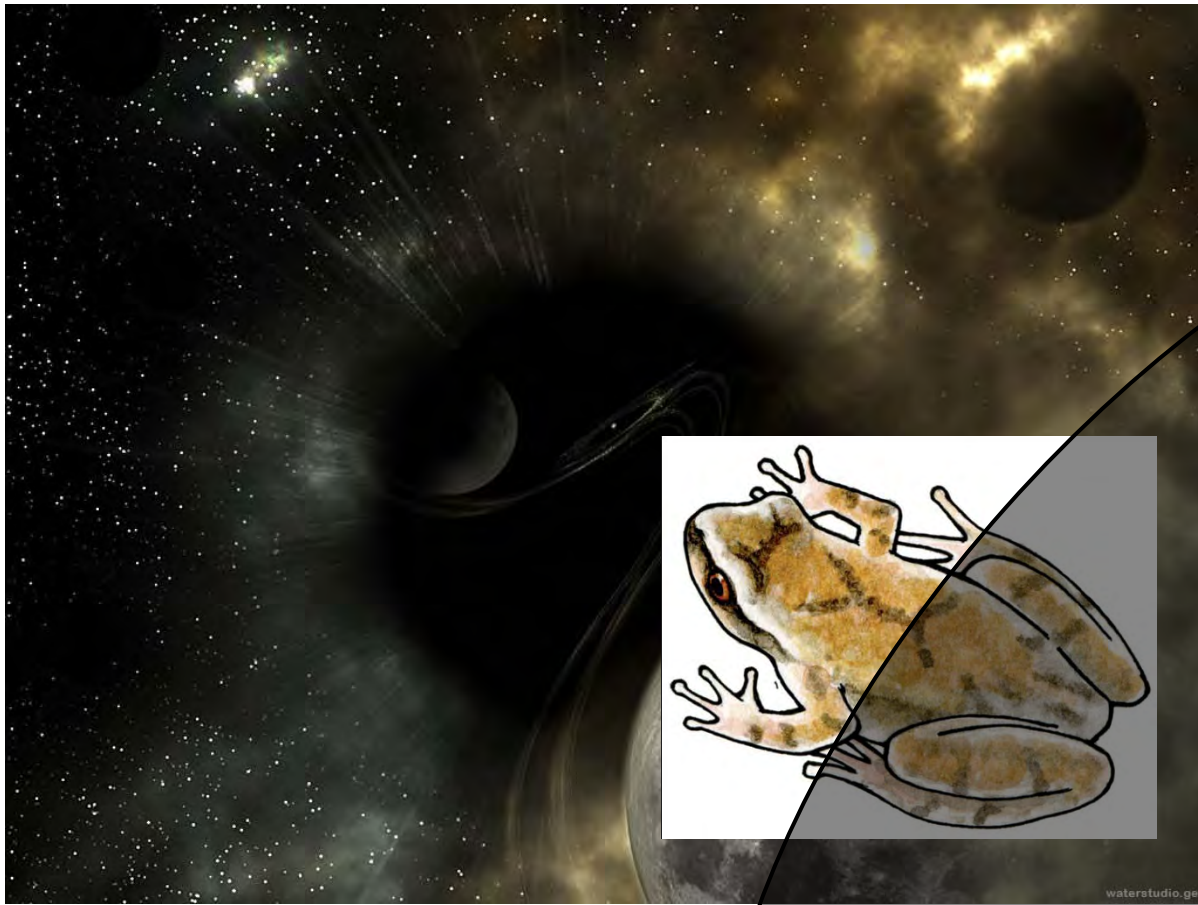




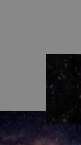
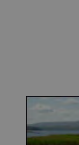
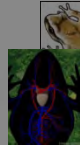
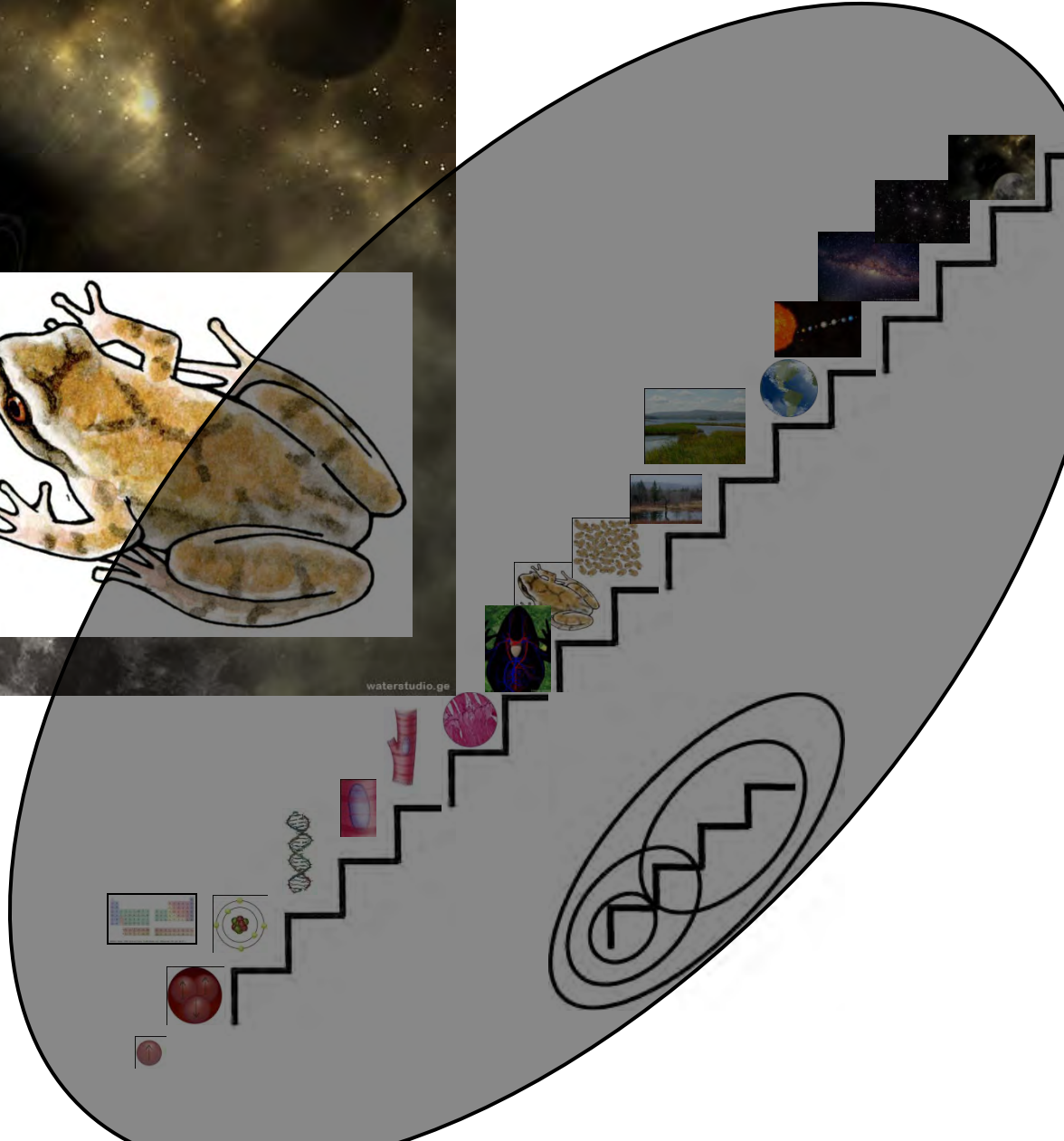


waterstudio.ge





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stories of our interactions with and within nature

Science

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Tl	Pb
												Ho	Er	Tm	Yb	Lu	
												Es	Fm	Md	No	Lr	



stories of our interactions with and within nature

Science

Life
Love
Land

ACCHS Regional Aboriginal Health Team

System

me of information see to

and the Promises

stories of our interactions with and within nature

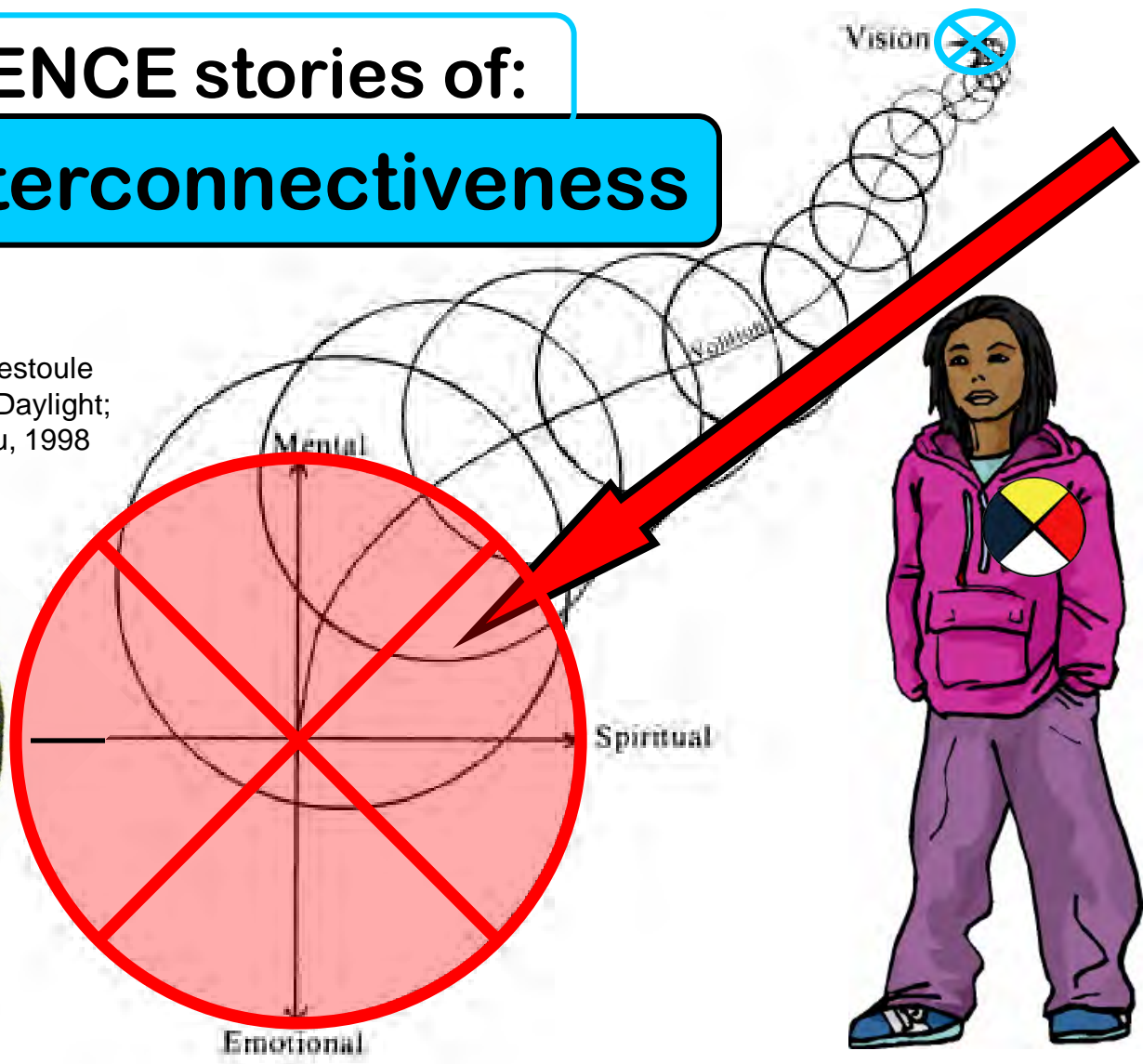
Science

H																	He					
Li	Be											B	C	N	O	F	Ne					
Na	Mg											Al	Si	P	S	Cl	Ar					
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Cu	Zn	Ga	Ge	As	Se	Br	Kr							
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe					
Cs	Ba											Pb	Bi	Po	At	Rn						
Fr	Ra																					
																		Ho	Er	Tm	Yb	Lu
																		Es	Fm	Md	No	Lr

**SCIENCE stories of:
interconnectiveness**

Vision 

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



my world is "all my relations" (subjects)

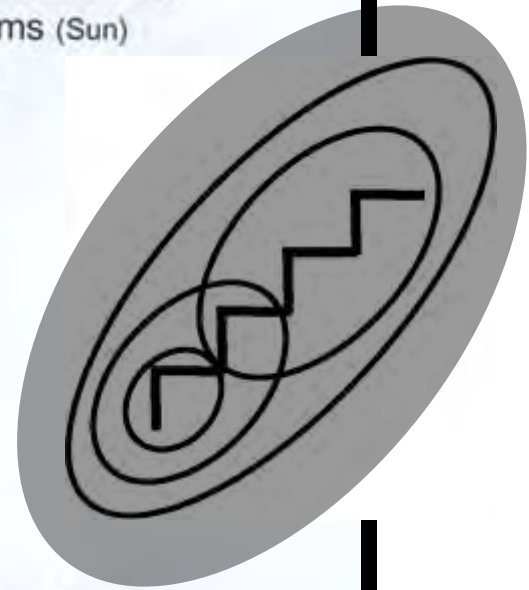
Universe: Visible Matter (levels of organization - biology)

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra	Unq	Unp	Unh	Uns	Uno	Unl										
		La	Ce	Pr	Nd	Pm	Sm										
		Ac	Th	Pa	U	Np	Pu										
		Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr							

Setford, Steve. 1996. Science Facts. Firefly Books Ltd., Willowdale, ON. (pp. 36-37)



- Universe
 - super clusters (Local)
 - clusters (Local Group)
 - galaxies (Milky Way)
 - star systems (Sun)
 - planet Earth
 - ecosystems
 - communities
 - populations
 - organisms
 - organ systems
 - organs
 - tissues
 - cells
 - organelles
 - molecules & minerals
 - atoms (natural elements #1-92;
 - baryons (neutrons & protons)
 - fundamental particles (quarks & leptons)

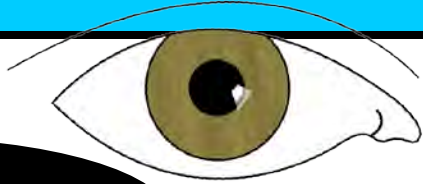


SCIENCE stories of:

parts & wholes

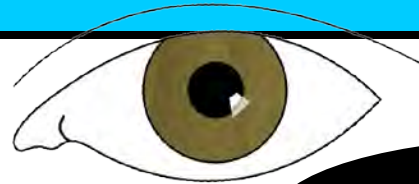
my world is many "its" (objects)

Two-Eyed Seeing how our world is



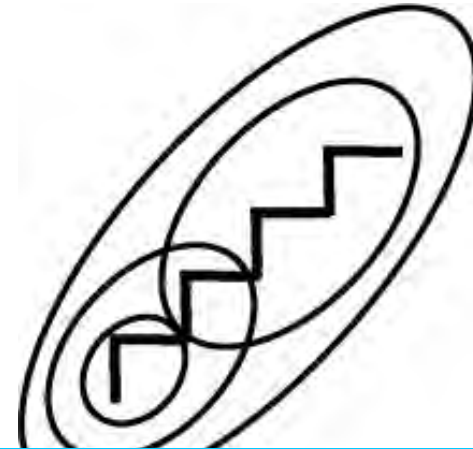
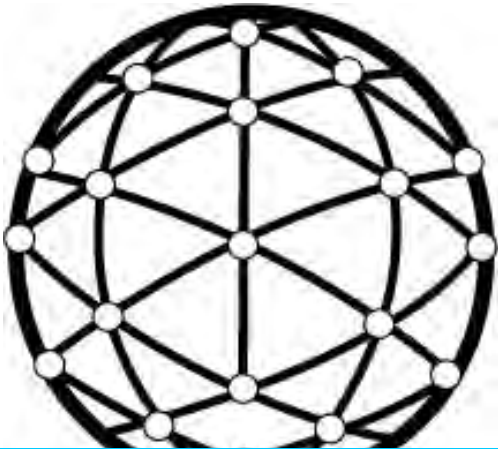
Indigenous

interconnective



Western

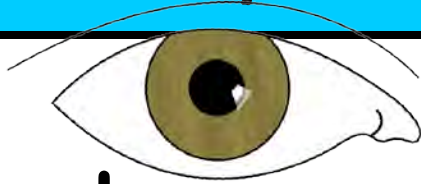
parts & wholes



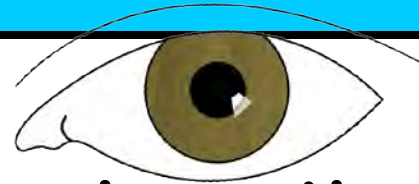
DYNAMIC, PATTERN-BASED KNOWLEDGE

Two-Eyed Seeing

our key concepts & actions



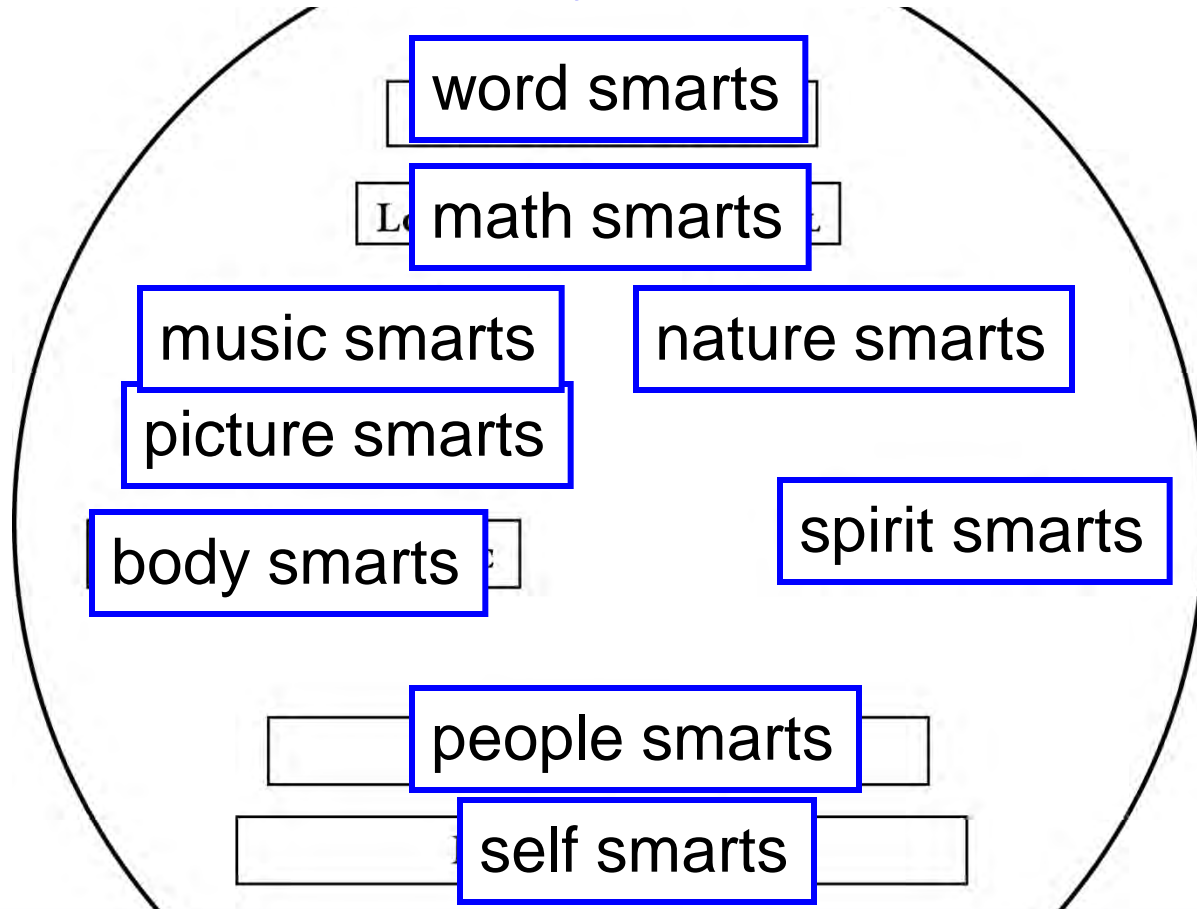
- respect
- relationship
- reverence
- reciprocity
- ritual (ceremony)
- repetition
- responsibility



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

DYNAMIC, PATTERN-BASED KNOWLEDGE




our science stories ...
draw upon our “**pattern smarts**”

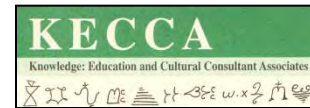


DYNAMIC, PATTERN-BASED KNOWLEDGE

CAPE BRETON
UNIVERSITY



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



Membertou
Elementary



Two-Eyed Seeing

science education for
children & youth

Wela'liog / Thank you