Wisdom of the Body
Herbivore Culture

Palates Link Animals with Landscapes

Wisdom Body
Cultural Linkages
Satiety Variety
Flavor-Feedback

Food for Thought

Cows and Straw
✓ Age: 5 years
✓ Diet: Ammoniated Straw
✓ Fed: December to May
✓ Study: 3 years

Outcome
Half of the cows performed well, the other half didn't. Why?

Why do moose in Norway winter at high elevations?

Do white-tailed deer in the Adirondacks behave as gas molecules?

Herbivore Culture

THE BUFFALO HARVEST

FRANK H. MAYER AND CHARLES B. ROTH

What was the secret to bison hunters' success?

Suppose one wishes to know as much as possible about the foods another person likes and eats and can ask only one question.

What should that question be?
Paul Rozin

There is no doubt about it, the question should be, 'What is your culture or ethnic group?'

There is no other single question that would even approach the informativeness of the answer to this question.

What does it mean for creatures to be locally evolving with landscapes?

Landscape

Offspring

Culture

Mother

Ancestors

Cultural Inflection
Expressed behaviors occur within the context of ongoing adaptation in environments where creatures are conceived, born, and live over many generations.

Natal experiences affect food and habitat preferences in a broad range of animal taxa including insects, fish, birds, and mammals (Davis and Stamps, 2004).

Slide 1

A Mother's Lifelong Influence on Diet and Habitat Selection

In utero
Mother's Milk

Mother
as a Model

Slide 2

Family Dynamics

Mother adds stability

Offspring add creativity

Slide 3

Ewes, Lambs and Douglas-fir

Slide 4

Slide 5

Young goats reared by their mothers on blackbrush, a shrub high in fiber and tannins

Goats ate 2.5 times more blackbrush than did goats naive to blackbrush.

When allowed to choose, experienced goats ate 30% more blackbrush than did inexperienced goats at any level of alfalfa pellet availability, which ranged from 20% to 100% of ad libitum.

Slide 6

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Herbivore Culture

As adults, cattle and sheep exposed during winter to high-fiber diets in utero and early in life and then challenged to eat high-fiber diets…

…eat more, gain more weight, maintain better body condition, produce more milk, and breed back sooner than animals reared on higher-quality diets…

Cows fed straw for 2 months as calves had…
- ✓ higher body weight/condition
- ✓ produced more milk
- ✓ shorter post-partum intervals

…when fed straw as the bulk of the diet during pregnancies from 5 to 8 years of age.

Calves exposed to straw in utero eat more straw, digest straw better, and grow faster than calves not exposed to straw.

Nor is preference for forages high in secondary compounds due solely to differences in breeds, as illustrated in cross-fostering studies with two breeds of goats.

Offspring from one breed (Damascus) were reared from birth by females from the other breed (Mamber) and vice-versa.

Damascus eat high-tannin browse

Mamber don't eat high-tannin browse
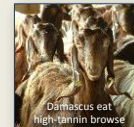
The preferences of the kids strongly reflected those of their foster mothers.

The browsing propensity of goats have been strengthened by domestication (Cazorla Natural Park of Spain; Garcia-Gonzalez and Cuartas, 1989)

Goat	Wild (*Capra pyrenaica*)	Domesticated (*Capra aegagrus hircus*)
Browse	41%	81%
Herbaceous	59%	19%

Calves exposed to sagebrush in utero or early in life and cows exposed as adults eat more sagebrush than their naïve counterparts.

Creating locally evolving cattle

Agee Smith Cottonwood Ranch

Chuck Petersen's Thesis

Herbivore Culture

Foraging behaviors develop as a function of history, necessity, and chance and then become part of a culture.

Goats eat woodrat houses to alleviate a protein deficiency.

Of 18 groups of goats during 3 winters, only 1 group learned to eat woodrat houses.

Learned patterns of behavior enable experienced animals to better use all of the forages in a landscape.
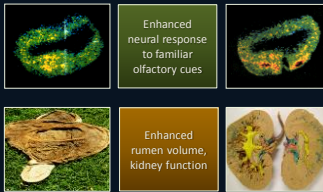
bitterbrush (tannins)

sagebrush (terpenes)

Bitterbrush as an appetizer helps the sagebrush go down.

Lambs exposed to saltbush *in utero* grow faster and handle a salt load better than lambs from mothers on pasture…

…they excrete salt more rapidly, drink less water and maintain higher intake when eating saltbush.

Environments influence gene expression, which influences form, function, behavior.

Enhanced neural response to familiar olfactory cues

Enhanced rumen volume, kidney function

Taste receptors are located in organs throughout the body, which explains changes in preference, experienced by people who have organ transplants, for foods preferred by their donors.

Humans who get organ transplants experience changes in preferences that reflect those

A CHANGE OF HEART
a memoir
CLAIRE SYLVIA
with WILLIAM NOVAK
Foreword by Bernie Siegel, M.D.

Cells and organ systems learn behaviors that influence the behavior of organisms.

Why do moose in Norway winter at high elevations?

The moose in Norway winter at high elevations due to traditions passed from generation to generation.

Do white-tailed deer in the Adirondacks behave as gas molecules?

Habitat Preferences
Experiences early in life have life-long influences on habitat selection in both sheep and cattle

Welsh Mountain
➢ 36 kg
➢ 90% lambing
➢ prefer native range

Clun Forest
➢ 54 kg
➢ 150% lambing
➢ prefer pastures

Habitat Preferences
Experiences early in life influence habitat selection by cattle grazing Forest Service administered allotment during summer.

	Maxfield	Thompson
Calf		
Yearling		
2 years age		
3 years age		

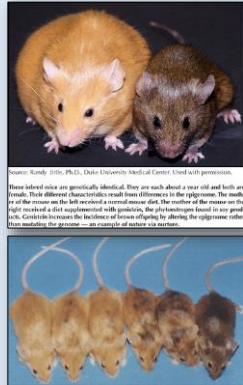Epigenetics, heritable changes in gene expression caused by mechanisms other than changes in the DNA sequence, illustrates the…

…temporal and spatial dynamics of these ongoing interrelationships.

GHOST IN YOUR GENES
Experts investigate how a mysterious "second genome" helps determine our biological fates.

HOW THE NINE MONTHS BEFORE BIRTH SHAPE THE REST OF OUR LIVES

ORIGINS

ANNIE MURPHY PAUL

Supplemental genistein changes coat color and incidence of obesity and diabetes.

Amount of nurturing early in life increases calmness and reduces stress-related diseases in adults.

Creating Locally Adapted Herbivores

The Last Ranch by Sam Bingham

1935:
• 75-lb lambs
• culled ewes with twins

1985:
• 90-lb lambs
• 150% lamb crop

San Luis Valley
"Our ewes [from 1935] were strong and as well muscled as deer, and yours wouldn't last a day where ours went."
George Whitten

"They were crazy.
Once the knowledge is gone, you can't get it back just like that.
They didn't even have a dog that knew anything. When they went through here you knew they were looking for trouble.
And they found it."

Herbivore Culture

Old dogs can learn new tricks,
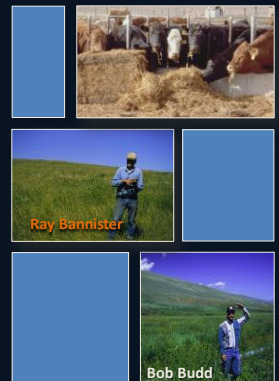
...but young dogs learn them quicker.
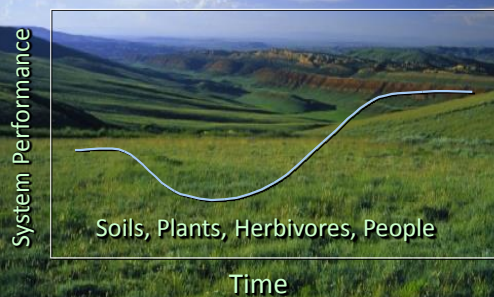
Age and challenge influence how quickly animals create.

The more complex the environment, the more difficult the challenge.
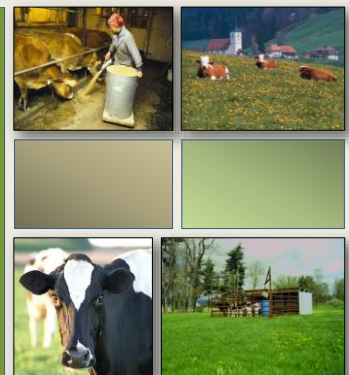
Changing
Food and Habitat
Selection Behaviors

Ray Bannister

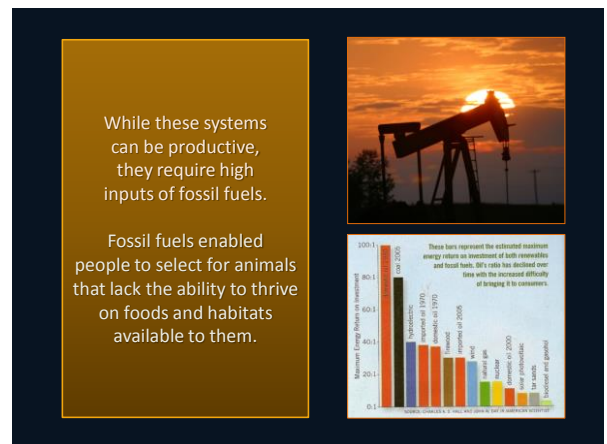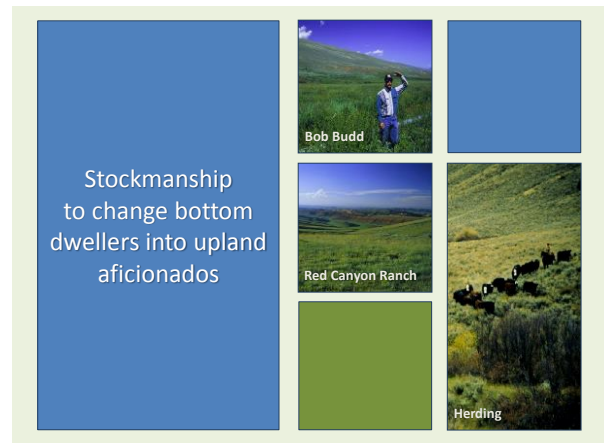Bob Budd

Learning Curves

System Performance

Soils, Plants, Herbivores, People

Time

Easing the transition from "traditional" to pasture-based dairies

Changing Grazing Management Practices

Stockmanship to change bottom dwellers into upland aficionados

Bob Budd

Red Canyon Ranch

Herding

Green Revolution
Pasture- and rangeland-based livestock production systems emphasized low diversity of high-producing forages, abandoning local species of plants and animals in favor of new strains and breeds.

While these systems can be productive, they require high inputs of fossil fuels.

Fossil fuels enabled people to select for animals that lack the ability to thrive on foods and habitats available to them.
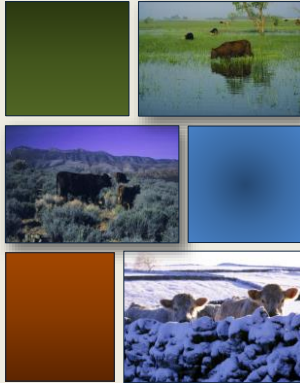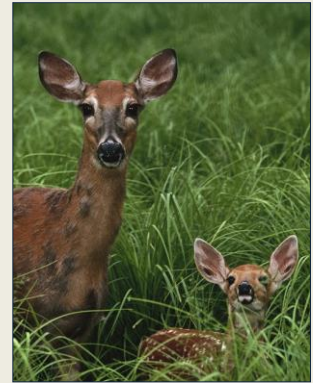
Herbivore Culture

Retain animals that can survive only on what nature provides seasonally in landscapes.

Match production cycles to seasonal availability of forage.
Fall-Winter: Maintenance
Spring-Summer: Reproduction

Rear offspring with their mothers where they will be expected to produce as adults. Create families based on epigenetic and learned abilities of matrilines to use diets and habitats.
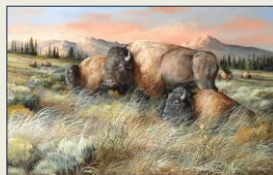
Extended Families

THE BUFFALO HARVEST

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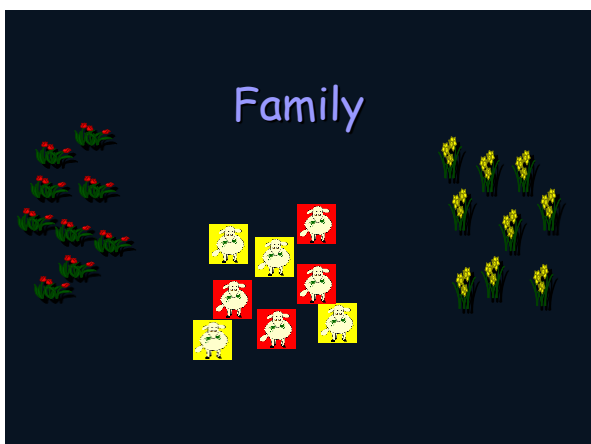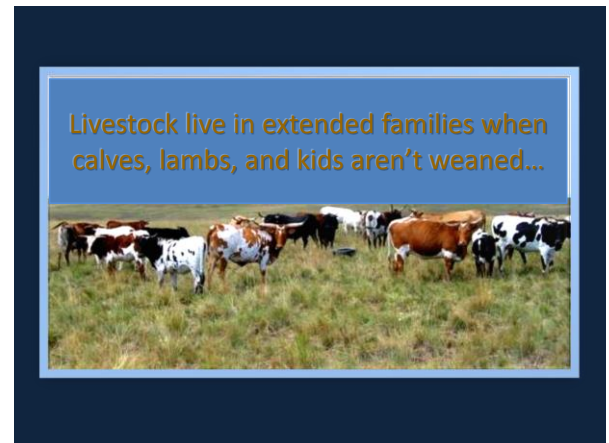
What was the secret to bison hunters' success?

Bison live in extended families

Ryan Shaw's PhD Thesis

They decide when to move **democratically** and where to move **despotically**

Extended Families

Moving Families

Moving Bulls

We've come to rely on fences and grazing systems to influence diet and habitat selection and in turn ecosystem processes.

Rotational Grazing Without Fences

By moving in circuits that emerge daily, weekly, and seasonally, social organization may lead to rotational grazing without fences.

Livestock live in extended families when calves, lambs, and kids aren't weaned…

Family

Strangers

Play ▶

Sony DVD Player/
Video Cassette Recorder

The least stressful and most profitable way to finish bison is to leave them on rangelands.

Confinement and Stress in Bison
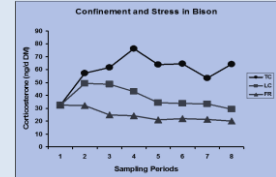
Compared with sheep fed a monotonous diet early in life, sheep fed a diversity of foods and flavors…

✓Less cribbing
✓Lower levels of stress
✓Greater intake of novel foods
✓Higher body weight gains

It's the diet that makes Argentine beef unique. "Argentine cattle are grass-fed," explains Ginger Gentile, director of a TV documentary titled *Beef Is Bueno*. A former vegetarian, she converted to meat after moving to Buenos Aires from New York in 2002.

"They walk around," she says of Argentine cattle. "They live in family groups. For their short lives, they live the way cows were meant to live."

Buenos Aires

ANIMAL WELFARE RATING: 5+
ANIMAL CENTERED; ENTIRE LIFE ON SAME FARM

ANIMAL WELFARE RATING: 5
ANIMAL CENTERED; NO PHYSICAL ALTERATIONS

ANIMAL WELFARE RATING: 4
PASTURE CENTERED

ANIMAL WELFARE RATING: 3
ENHANCED OUTDOOR ACCESS

ANIMAL WELFARE RATING: 2
ENRICHED ENVIRONMENT

ANIMAL WELFARE RATING: 1
NO CAGES, NO CRATES, NO CROWDING

NOT STEP RATED: DOES NOT MEET
WHOLE FOODS MARKET REQUIREMENTS

In Summary

Herbivore Culture

Animals aren't machines
Genes aren't destiny
Animals continually create relationships with the environments they inhabit.

What price do we pay when we ignore transgenerational linkages to social and biophysical environments?