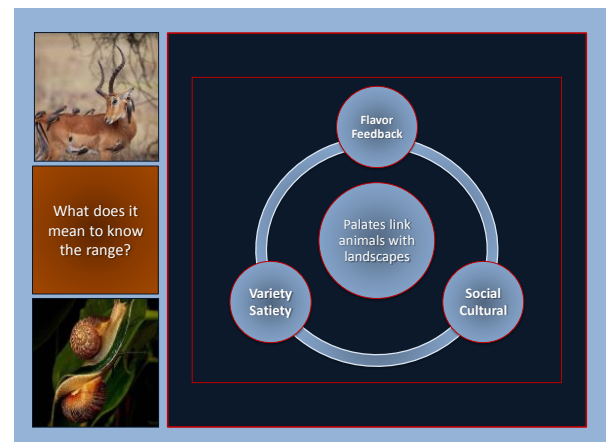
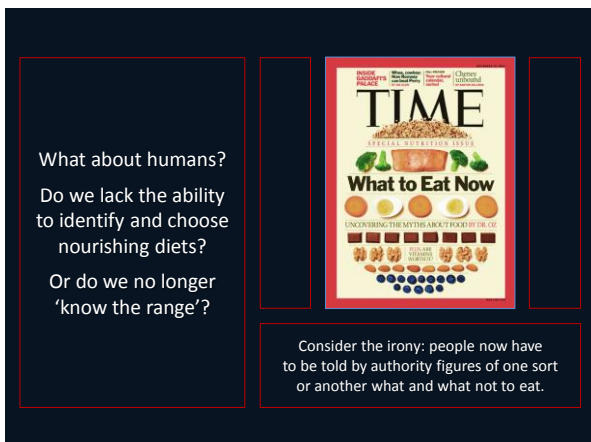
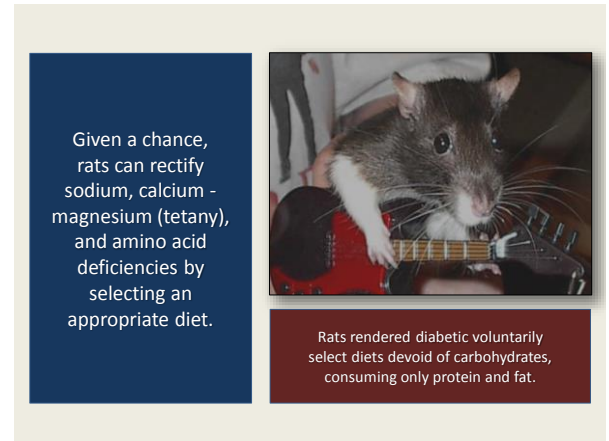
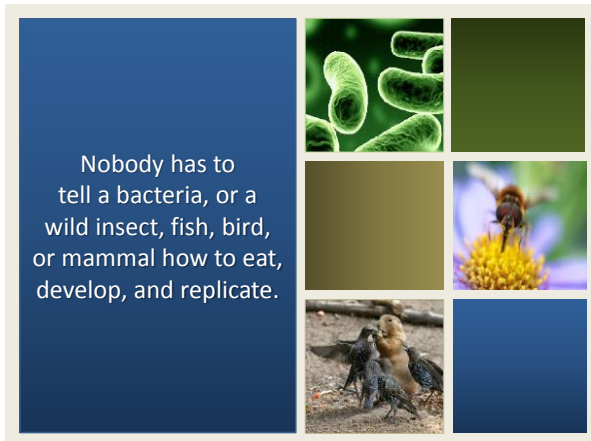
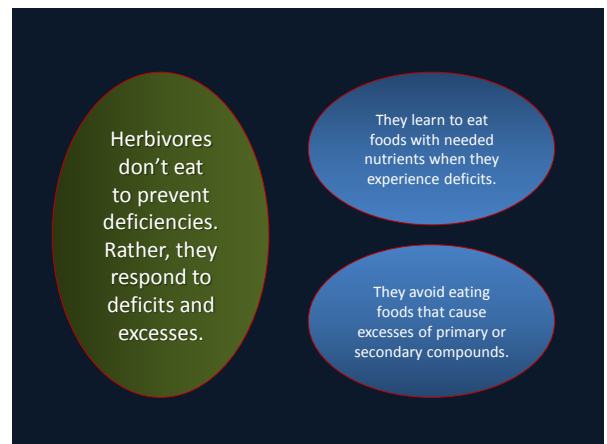
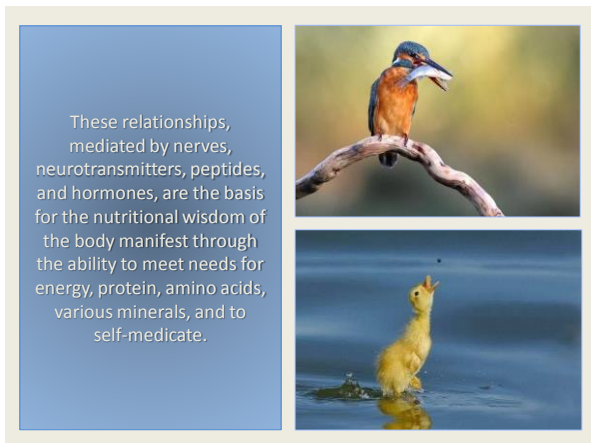
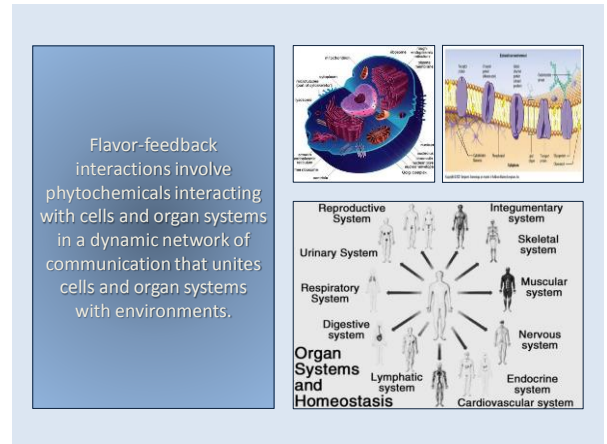
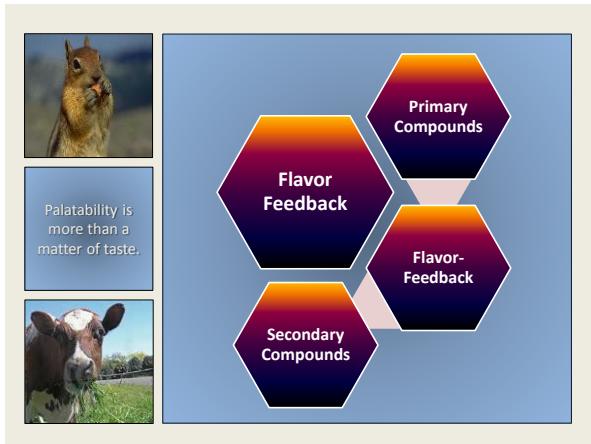


Mending Broken Links



Mending Broken Links



Mending Broken Links

What's fed in the barn influences what dairy cows eat on pasture.

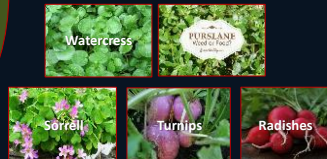


Mixed rations high protein fed in the barn cause cattle to eat less clover and high-protein plants and plant parts on pasture.

Does fortifying and enriching foods affect preferences?



Eighteenth-century sailors with scurvy craved fruits and vegetables.



Today, those sailors could drink vitamin C-fortified 'fruit' drinks.



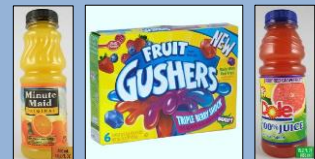
Their scurvy would disappear, along with their cravings for fruits and vegetables.

Rather than eat a rich array of phytochemicals, each sailor would consume a large quantity of sugar-sweetened calories...



...and he would likely be among the one of two American adults who are pre-diabetic or diabetic.

Link familiar flavors with high-fructose corn syrup to do two things...



- Lure kids to the novel food by dressing it in a known and liked flavor.
- Reinforce the flavor with a blast of energy.

Mending Broken Links

Target kids to change dietary habits of a culture



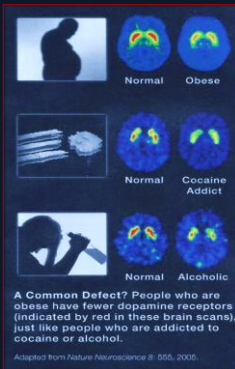
Two Kinds of Cravings



Cravings for foods and drinks high in refined carbohydrates are maintained by high levels of insulin (hyperinsulinemia), which signal the body to use glucose rather than fatty acids for energy.

We extract and purify primary and secondary compounds to amplify their effects, which can lead to addiction.

Dose and rate of release make the poison: chewing a coca leaf is different from sniffing cocaine.



A 284 g (90-kcal) portion of strawberries (cost \$1.50 U.S.) has 5 g of fiber, large amounts of minerals and vitamins and hundreds of phytochemicals.

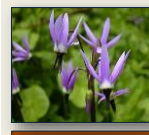
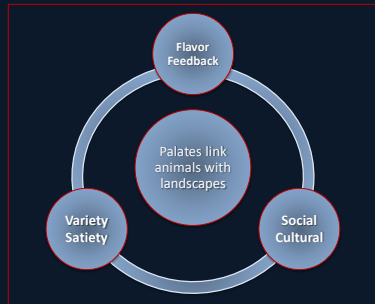


A 28 g (90-kcal) portion of Fruit Gushers (cost \$0.46 U.S.) has 9 g of sugar and 1 g of fat, but virtually no beneficial nutritional constituents of strawberries because a Strawberry Fruit Gusher has no strawberries.

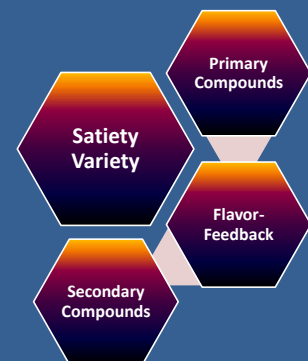
Rather, it consists of pears (from concentrate), sugar, dried corn syrup, corn syrup, modified corn starch, fructose, and grape juice (from concentrate).



What does it mean to know the range?



Explanations for why animals eat a variety of foods.



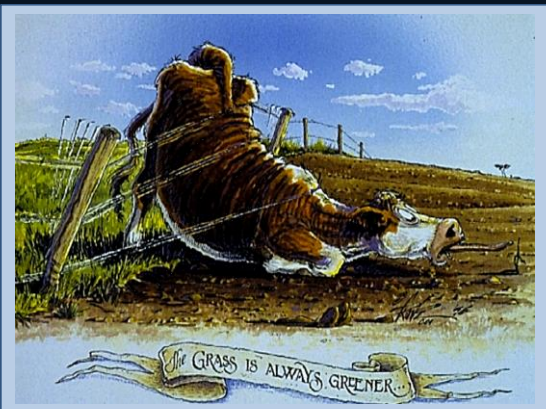
Mending Broken Links



Satiety



Assuming the foods on offer meet needs for energy, protein, minerals, and other phytochemicals, satiety leads to contentment and a lack of the cravings that cause animals to over-ingest foods.



Over-eating can be caused by a quest for nutrients in short supply.

Excess Mineral Consumption



Livestock eat more when they aren't given choices that enable them to balance their own rations.



Mixed Ration versus Free Choice
corn, barley, alfalfa, corn silage




Food systems based on *quantity* rather than *quality* have a destructive feedback loop built into them: the more low-quality food one eats, the more one wants to eat, in a highly profitable quest to obtain nutrients in low concentrations.

Mending Broken Links

Do people who eat phytochemically impoverished diets overingest foods in a futile quest for protein, minerals and other phytochemicals in low concentrations?



People overingest energy to meet needs for protein and minerals. Other phytochemicals?





When art and science meet: Integrating experiential knowledge of herders with science of foraging behavior for managing grazing lands. Rangeland Ecology & Management Meuret and Provenza

7. A few tricks to improve the flock's appetite

Alternation is a key concept in maximizing the appetite of the flock



If you want

Grazing Circuits for People



Which combinations of foods make meals most satiating-satisfying?

Dairy products, meat and poultry high in protein




Legumes and whole grains high in fiber



Fruits and vegetables phytochemically rich (caffeine and capsaicin)



Glycemic index (GI) glycemic load (GL) characterize rates of carbohydrate absorption after a meal.



(Glycemic Index Pyramid, Ludwig, 2000)




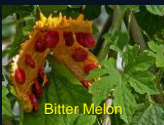

Foods high in refined carbohydrates are quickly converted to glucose, which stimulates production of insulin and boosts storage of energy in fat cells.

Meal courses can reduce glucose-insulin responses




Glucose and insulin are much lower when sequence is vegetables → chicken → bread and orange juice than when food order is reversed.


Some fruits and spices can reduce hyperglycemia and insulin resistance


Mending Broken Links

Meal patterns during the day affect glucose-insulin responses

A high-energy breakfast...




...and low-energy dinner decreases hyperglycaemia throughout the day.



That combination also increases GLP-1, a hormone that promotes insulin sensitivity, increases satiety, and reduces food intake.

Value of Fasting for Humans

FASTING & PRAYER




Intermittent Fasting
Limit eating to 6 to 8 hours each day.

- ✓ Normalize insulin and leptin sensitivity.
- ✓ Normalize ghrelin (hunger hormone) levels.
- ✓ Boost mitochondrial energy efficiency.
- ✓ Lower triglycerides and improve other biomarkers of disease.
- ✓ Reduce oxidative stress.

Variety

The flavor of plants and animals has gotten blander.

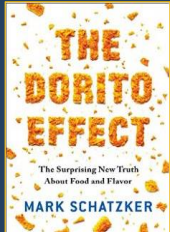


We add synthetic flavors to improve the taste of bland foods.




We have thus dis-incentivized 'real' foods, because they don't taste good, and we've made junk food all the more desirable.

THE DORITO EFFECT
The Surprising New Truth About Food and Flavor
MARK SCHATZKER




It's hard to get kids and adults to "eat your vegetables."


Offer a variety of vegetables in a meal



Hide vegetables in dishes



Flavor-flavor conditioning



We're all connected...

Resource Availability ↔ Soil Health ↔ Plant Diversity and Chemistry

Health and well-being of people is linked to the health of soil.

The Soil Food Web




Under Ground
How Microbes of Soil and Sea Shape Our World
Yvonne Raskin

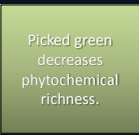


Mending Broken Links



Phytochemical richness declined from 10% to 50% in 43 fruits, vegetables, and grains from 1950 to 1999.



Water-fertilizer increase growth but decrease phytochemical richness.



Picked green decreases phytochemical richness.

Intensive breeding has reduced flavor, but people can select for phytochemical richness and flavor.






Over 5,000 volatile compounds in strawberries.



Flavor-enhancing volatiles improve flavor without increasing energy content.



We're all connected...

```

    graph LR
      A[Plant Diversity and Chemistry] --> B[Biochemical Richness Diet]
      B --> C[Quality Milk, Cheese, Meat]
  
```





Meat flavor reflects soil and diet, influenced by phytochemical richness of the diet.






Yet, no studies have assessed how that affects human health.

Studies don't consider the diets of herbivores and the origins of red meat.

Red meat consumption and mortality: results from 2 prospective cohort studies. (Pan et al. 2012. Arch. Intern. Med. 172:555-563)



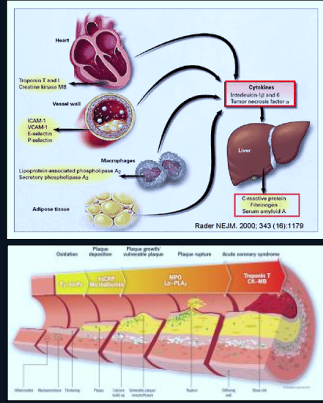
Six Arguments for a Greener Diet

Mending Broken Links

In humans, postprandial inflammatory responses are much greater for meat from cattle (wagyu) fed high-grain diets than for meat from a wild herbivore (kangaroo) eating a phytochemically rich diet.



Low-grade systemic inflammation, characterized by an increase in plasma levels of pro-inflammatory markers such as TNF- α , IL-6, and C-reactive protein, is linked with heart disease and cancer.



Roles of Phytochemicals in Meat and Fat


- ✓ Energy, Protein
- ✓ Fat-soluble vitamins
- ✓ Benefits of other phytochemicals that accumulate in fat?

Phytochemicals in fat are a source of health, especially for meat-eaters like the Inuit who lacked access to fresh fruits and vegetables.

People of the Deer
by Farley Mowat

STEAK
MARK SCHATZKER

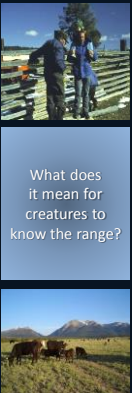
We know little about how phytochemical richness of the diet affects meat flavor, quality, satiety, and human health.



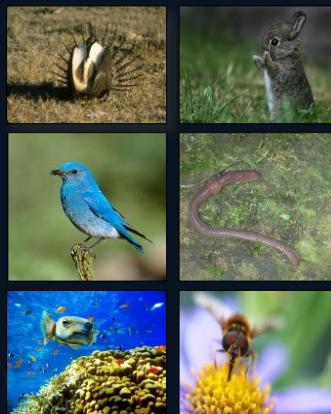
What does it mean to know the range?



What does it mean for creatures to know the range?

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



Mending Broken Links

A Mother's Lifelong Influence on Diet and Habitat Selection



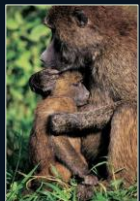




In utero
Mother's Milk

Mother
as a Model

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




Origins of Human Food Preferences

- Mother's diet *in utero* (amniotic fluid)
- Experiences early in life (milk, foods)


Clara Davis' Self-selection of Diets by Young Children

1. Water	18. Potatoes
2. Sweet milk	19. Lettuce
3. Sour milk	20. Oatmeal
4. Sea salt	21. Wheat
5. Apples	22. Corn meal
6. Bananas	23. Barley
7. Orange juice	24. Ry-Krisp
8. Fresh pineapple	25. Beef
9. Peaches	26. Lamb
10. Tomatoes	27. Bone marrow
11. Beets	28. Bone jelly
12. Carrots	29. Chicken
13. Peas	30. Sweetbreads
14. Turnips	31. Brains
15. Cauliflower	32. Liver
16. Cabbage	33. Kidneys
17. Spinach	34. Haddock




No child selected the same foods meal-to-meal and no two children selected the same combinations of foods, but they all ate foods that enabled fine health.

Clara concludes:
By this time you have all doubtless perceived that the "trick" in the experiment (if "trick" you wish to call it) was in the food list.



Lentils, Milk, Whole Milk, Cooked Mutton, Raw Beef, Cooked Beef, Chicken, Sea Salt, Pickled Salt, Corn Meal, Cooked Turnips, Cauliflower, Egg, Orange

Confined to natural, unprocessed and unpurified foods as it was, and without made dishes of any sort, it reproduced to a large extent the conditions under which primitive peoples in many parts of the world have been shown to have had scientifically sound diets and excellent nutrition.



"The results... leave the selection of the foods to be made available to young children in the hands of their elders where everyone has always known it belongs."

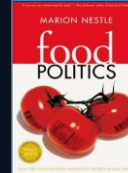
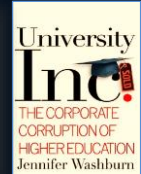
Mending Broken Links

Native peoples provided special foods to prospective parents, to the father and the mother before conception and to the mother during pregnancy, as well as to the children.



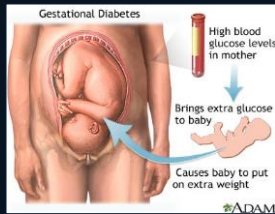
They carefully imparted their nutritional wisdom to the young, ensuring the health of future generations.

But that has not been so during the past half century. The choices people learn to make now are influenced by corporate, political, and academic elders.



Transgenerational Metabolic Syndrome

Mothers who gain excessive weight during pregnancy, mothers who are obese, and mothers who become diabetic during pregnancy are more likely to have fatter babies with higher incidence of diabetes, cardiovascular disease, cancer...



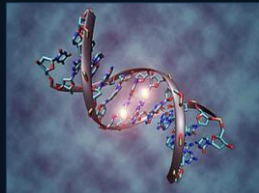
Pancreas develops more insulin-secreting cells. Baby over-secretes insulin and with age becomes insulin-resistant.

Epigenetic gene expression affects form, function, and behavior.

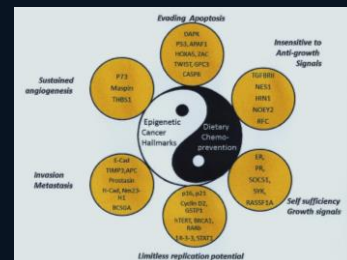


Fat mothers make fat babies make fat mothers...

Research to identify phytochemicals that can reverse epimutations and prevent diseases is promising because epigenetic changes are more easily reversible than genetic changes.

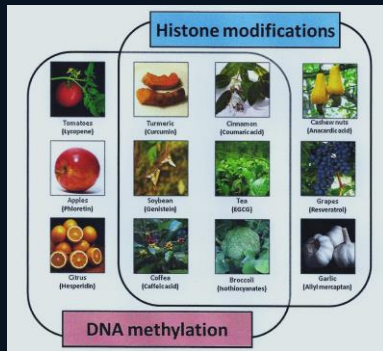


Diet-induced changes in DNA-methylation (epimutations) can counter all of the hallmarks of a cancer cell.

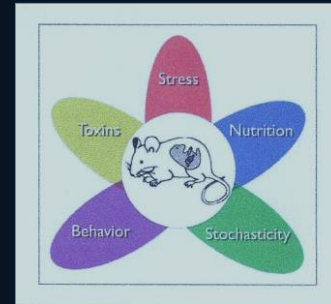


From Vanden Berghe Pharmacological Research 65, 565-576.

Mending Broken Links



From Link et al., Biochemical Pharmacology, 80, 1771-1792.



From Faulk & Dolinoy, Epigenetics, 6, 791-797.

Power of Beliefs

We experience the world through a cortex with thirty billion neurons capable of making one million billion synaptic connections. The number of neural circuits is ten followed by at least a million zeroes.



To put this number into context, the total number of particles in the universe is ten followed by seventy-nine zeroes.

We develop habits as 'neurons that fire together wire together' to create neural networks.



We begin to create neural nets at conception and experiences early in life influence how we perceive, what we believe, and how we behave.

Due to our penchant for analysis, many North Americans believe food is as much a toxin as it is a nutrient and that eating is as dangerous as not eating.



This contrasts with a relaxed, pleasure-oriented attitude toward food among the French, which is accompanied by high intake of fat-rich foods.

Mending Broken Links

Which food would you take if you were going to be stranded on a desert island for one year?



Bananas, Peaches
Corn, Alfalfa Sprouts
Hot Dogs, Chocolate Milk



As with the 'toxic' effects of fat and salt, many people believe they have adverse reactions to wheat.



People in all treatments (high-gluten, low-gluten, no-gluten) had pain, bloating, nausea, and gas to a similar degree, indicating strong nocebo effects.



Meat samples were paired with descriptions of animals raised on 'factory' or 'humane' farms.

'Factory farm' samples looked and smelled less pleasant and tasted saltier and greasier.



What we are told - negative, neutral, positive - influences our responses - adverse or positive - to medication or placebo.


Under each information condition, the placebo accounted for over 50 percent of the effect of the medication on migraines.

Mending Broken Links



Ghrelin, the hunger hormone, affects appetite and plays a key role in the rate of use and distribution of energy in the body.

Ghrelin decreases after an 80 calorie milkshake labeled 'indulgent, 620 calories' but not after an identical milkshake labeled 'sensible, 140-calories'.



What women expect influences side-effects with hormone therapies like tamoxifen for breast cancer.

When they expected adverse effects, women experienced twice as many side-effects during two years of therapy.



John Whitley had stage 4 pancreatic cancer. Determined to beat the odds, he entered a trial where some participants got an experimental drug and others got a placebo.

Every afternoon, as he sat in his apartment and took the drug, he told himself: "This is a miracle drug that is going to save my life."



Experiences and expectations influence how we perceive, what we believe, and how we behave.

Searching for Magic Bullets

Omega-3s were thought to be anti-inflammatory, and heart-protective.

Preliminary findings were encouraging...




...but more recent double-blind placebo controlled studies find no effects.




Mending Broken Links


Omega-3s
Omega-6s

Cardiovascular Disease




Memory Loss







Macular Degeneration

As Martijn Katan, renowned expert on diet and cardiovascular disease, points out...



"It's embarrassing, since we've been telling people to eat omega-3 fatty acids because they are wonderful for the heart..."

As Martijn Katan, renowned expert on diet and cardiovascular disease, points out...

"I am not ready to give up on omega-3s yet, but you're better off getting them from fish, not fish oil capsules."

Studies that compare the effects on health of specific compounds with combinations of compounds with individual foods with combinations of foods create synergies as complexity increases.





We've come to rely on nutrition supplements 'preventatively' to maintain health...




...but they often have no benefits, and at high doses, they can adversely affect health.

Moving beyond silver bullets...


Omega-3s





Supplements

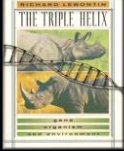


Antioxidants

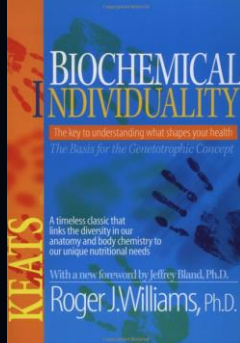
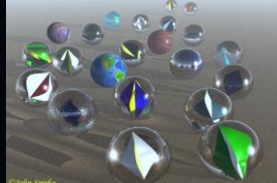


Mending Broken Links

Phytochemically rich combinations of foods -- not compounds or individual foods -- are etiologic in health.	Individual Compounds	
	Individual Foods	
	Combinations of Foods	



Nature fills vacuums with individuals and no two are alike.	Genes + Environments + Chance = Individuals	
		
		

	<p>A group of people is like a collection of marbles of all sizes and compositions. Try to "average" these marbles, and you come out with nonsense. You can "average" their color by mounting them on a circular disk and rotating it rapidly. The color comes back a dirty gray. But there isn't a dirty-gray marble in the lot!</p> 
---	--

Weight Loss Study (A to Z) assigned 311 overweight or obese premenopausal women to one of four diets.
Atkins Zone LEARN Ornish
Low Carbohydrate, High Fat → Low Fat, High Carbohydrate
Within each group, some women lost 40 to 50 pounds while other women gained 5 to 10 pounds over 12 months, a range of 60 pounds.

<ul style="list-style-type: none"> ➤ Roughly 25% of people have a greatly blunted response to glucose: they do not produce much insulin following a glucose challenge. ➤ Conversely, another 25% of people respond to a glucose challenge by producing far too much insulin: they are hyperinsulinemic. ➤ The other 50% of people are on a continuum between these two extremes. ➤ This suggests 25% of the population is adapted to a diet of refined carbohydrates, while 25% is at high risk of obesity and diabetes.
--

Mending Broken Links

Exercise Study assigned 35 overweight or obese men and women to one of four exercise regimes.

Exercise – on a stationary bike, treadmill, or stepping or rowing machine – strenuously enough to burn 500 calories per session, five times a week.

After 12 weeks, the 'average' person lost 8 pounds, but some people lost 32 pounds, while others gained 4 pounds.

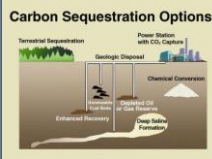
Reconnecting

We're all connected...

Animal Impacts

Plant Diversity and Chemistry

Carbon Sequestration

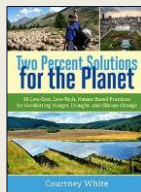
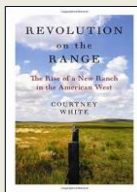
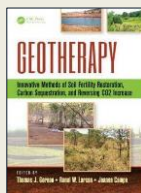
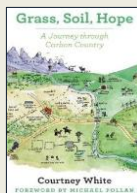


Two-thirds of the Earth's land mass is rangeland, and home to two billion people who depend on livestock at least partially for their livelihood.

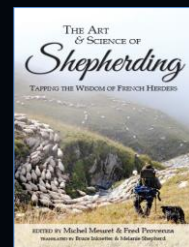
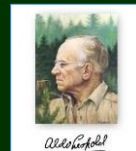


Managing land for CO₂ sequestration, even on a small scale, could have a big impact on people and the planet. Ranching and farming are key ecologically and economically.

No-Till Farming
Pasture Cropping
Managed Grazing




Ecological Doctors



In the hands of 'ecological doctors,' the Ax, the Cow, and the Plow become means for rejuvenating landscapes and communities.


Mending Broken Links

"There are two spiritual dangers in not owning a farm." Aldo Leopold wrote nearly 70 years ago in *A Sand County Almanac*.



One is the danger of supposing that breakfast comes from the grocery, and the other that heat comes from the furnace.

"To avoid the first danger, one should plant a garden, preferably where there is no grocer to confuse the issue."



"To avoid the second, he should lay a split of good oak on the andirons, preferable where there is no furnace, and let it warm his shins while a February blizzard tosses the trees outside."

Get Rid of Lawns and Grow Vegetable, Herbal, and Medicinal Gardens



Nothing can as simply re-create linkages as this humble act.

Resources Used to Grow Lawns Annually

Over 30 thousand tons of synthetic pesticides at a cost of well over \$2 billion.

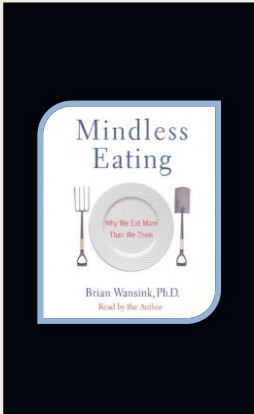
Over 800 million gallons of gasoline. The gas spilled refilling lawn mowers is 17 million gallons -- 1.57 times the amount spilled by the Exxon Valdez off the shores of Alaska.


Residential water use outside the home is 30% to 60% of total water use. Depending on the estimate, 7 billion to 9 billion gallons of water are used each day for suburban irrigation.

Shop and create meals mindfully




- ✓ Buy wholesome foods (healthful varieties vegetables, fruits)
- ✓ Pasture-reared meat, cheese









Mending Broken Links

Expose your body to a variety of whole foods and trust the wisdom of your body to select what it needs.



In some ways, the ever incomplete and conflicting understanding of foods and compounds in health, and the presumed adverse or beneficial consequences of eating them, is worse than no knowledge at all.

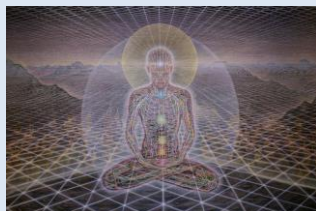


But the quest to understand is now vital given the many ways people have adversely modified foods during the past century.

As scientists delve deeper into genomics, molecular biology, anatomy, physiology, biochemistry, pharmacology, and so forth, we reflect less on the 'wisdom of the body' as the originator, integrator, and manifestation of all these processes.



In so doing, we fail to consider the most important point, one the body of every wild insect, bird, and mammal including hunter-gatherers who ever roamed the planet 'knows' from experience.



The body was the first geneticist, molecular biologist, physiologist, nutritionist, pharmacist, and physician. A body knows what to do regarding diet and health, given appropriate choices.