Gut, Brain and Planet

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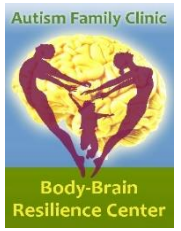
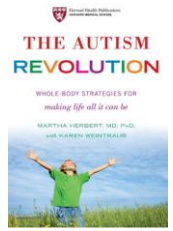




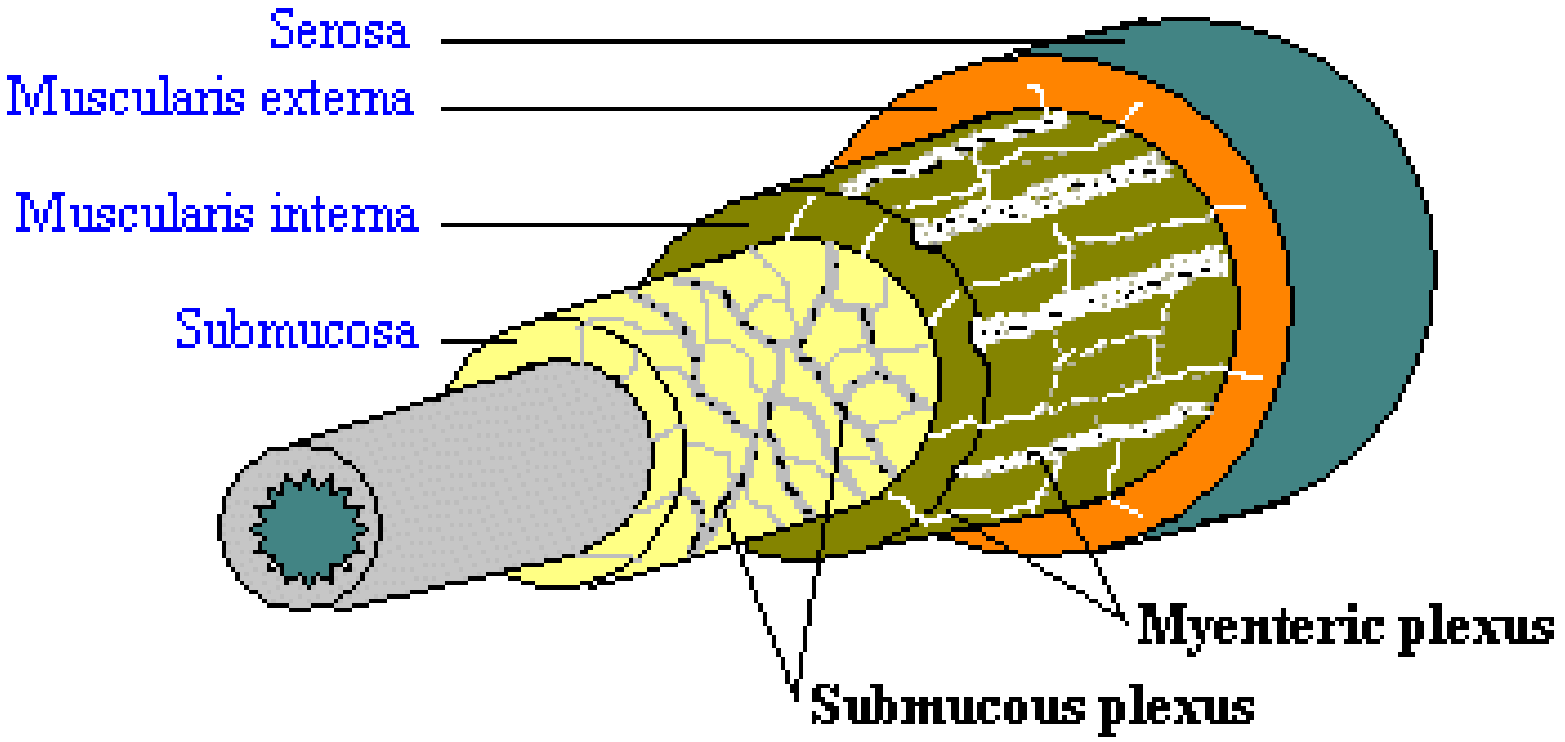
What do gut and brain have in common

FUNDAMENTAL PHYSIOLOGICAL PROCESSES in both gut and brain

- communication, both outside and inside the cell
- bioenergetics, or the transformation of food into energy
- replication
- repair
- maintenance of structural integrity, from the cellular to the whole body level
- elimination of waste
- protection and defense
- transport and circulation

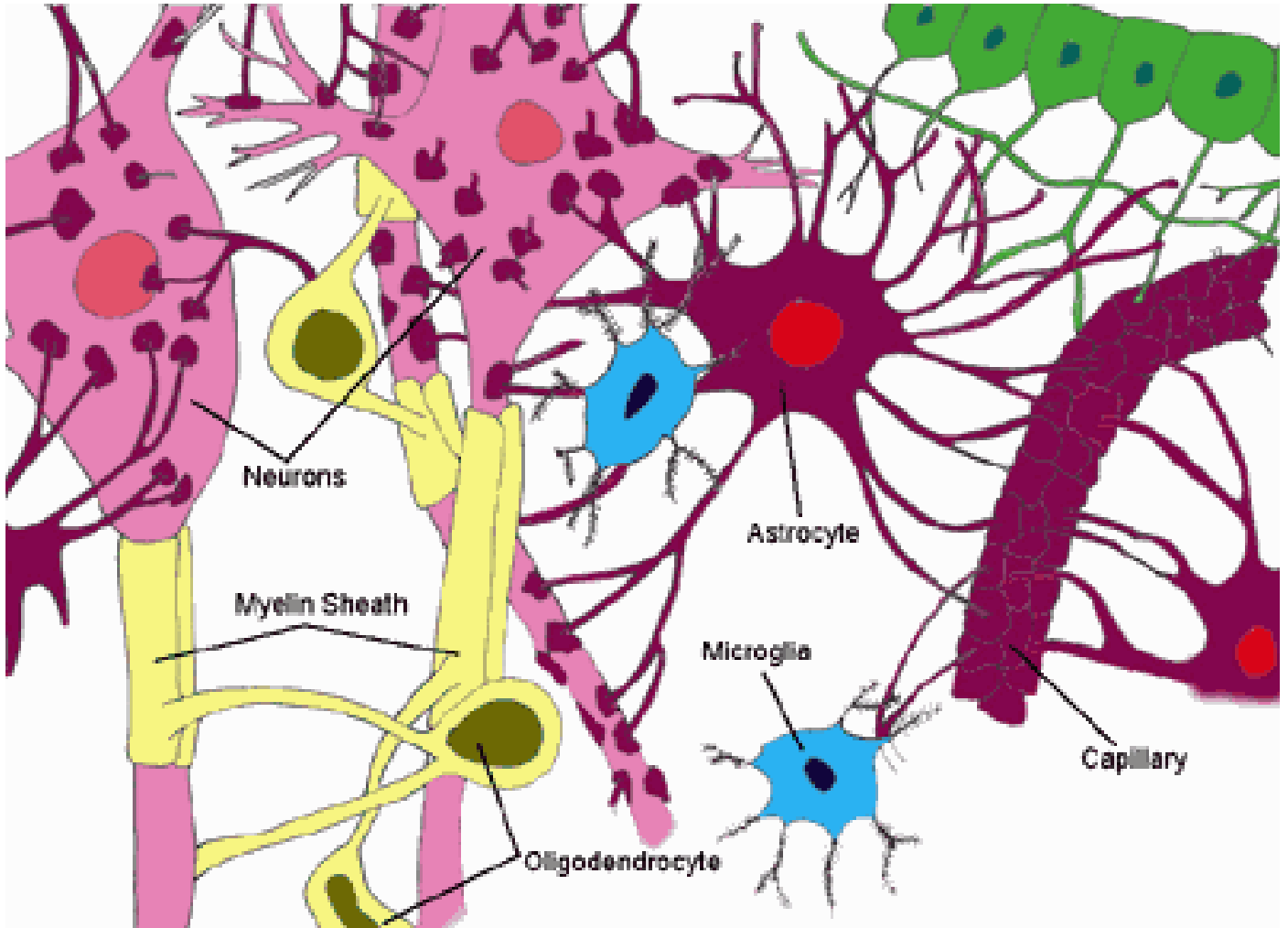
The nervous system of the gut

- The enteric nervous system of the gut



The housekeeping and trash collecting cells of the brain

- Glial cells



Glia in your gut

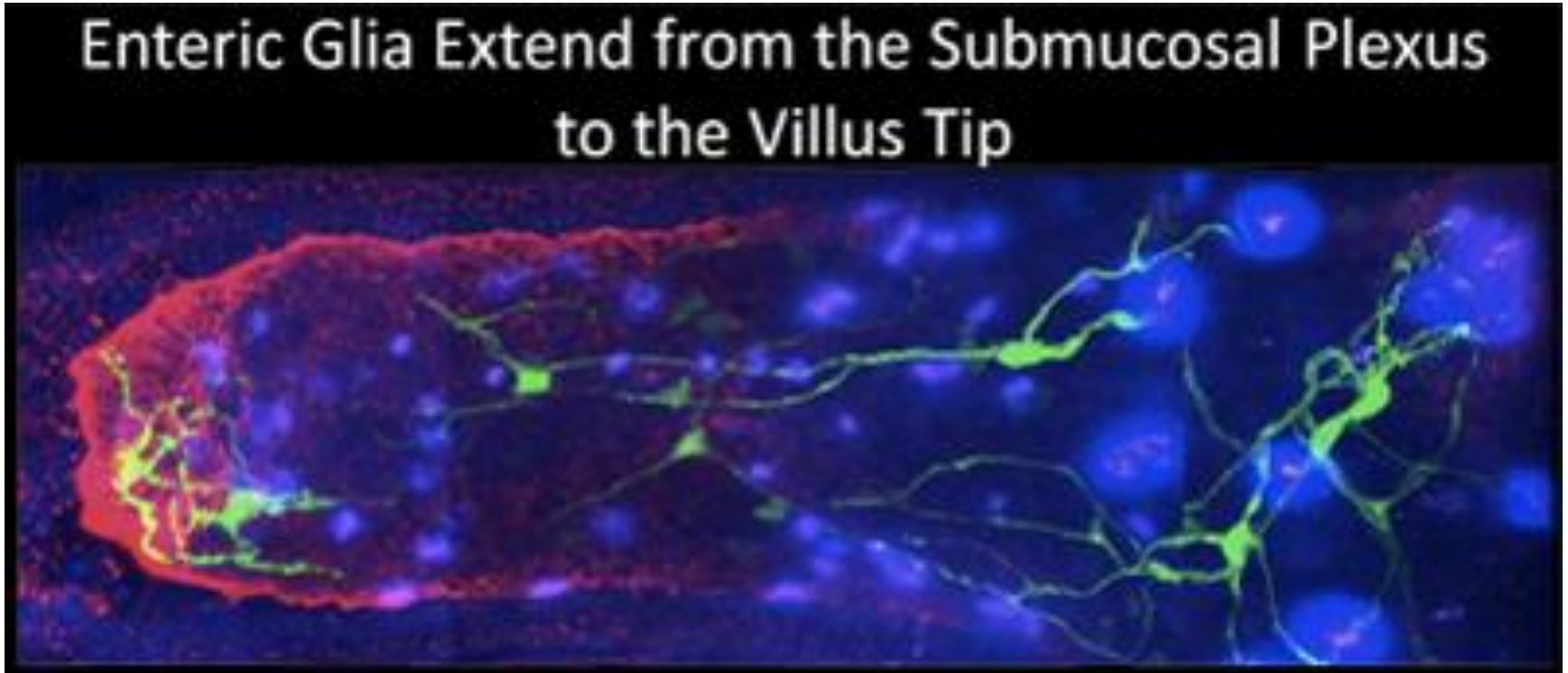
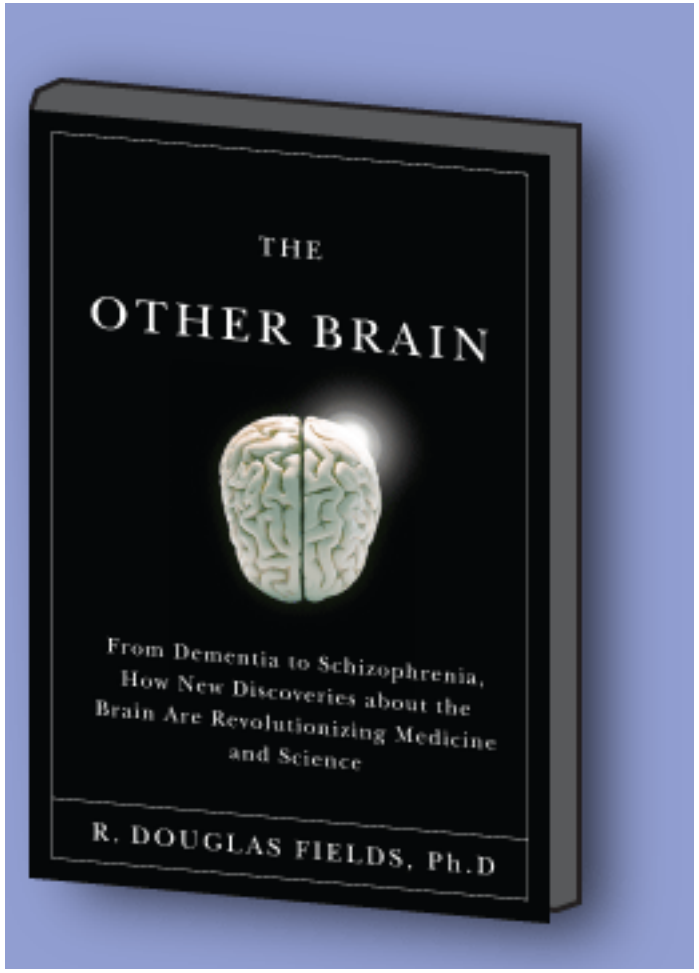


Figure 1: Enteric glia form a continuous network extending from the myenteric plexus, through the submucosal plexus to the villus tip. Image shows a lateral view of the villus (right), extending to the inner muscle layers of the GI tract (left), taken at x40 using GFEC mouse ileum stained for laminin (1:500, 568nm) and hirsch (1:500, 450nm).

THE OTHER BRAIN
by Douglas Fields, PhD, NIH scientist



ABOUT GLIAL CELLS

www.theotherbrainbook.com

Women in the Brain:
A History of Glial Cell Metaphors

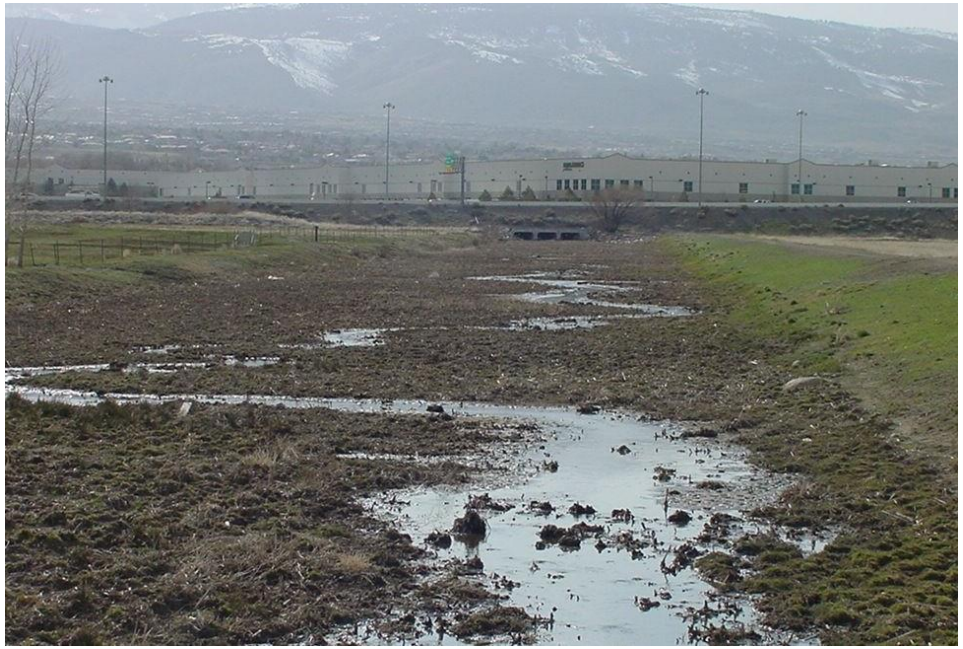
Meg Upchurch, Simona Fojtová

NWSA Journal, 21:2, 2009 pp1-20

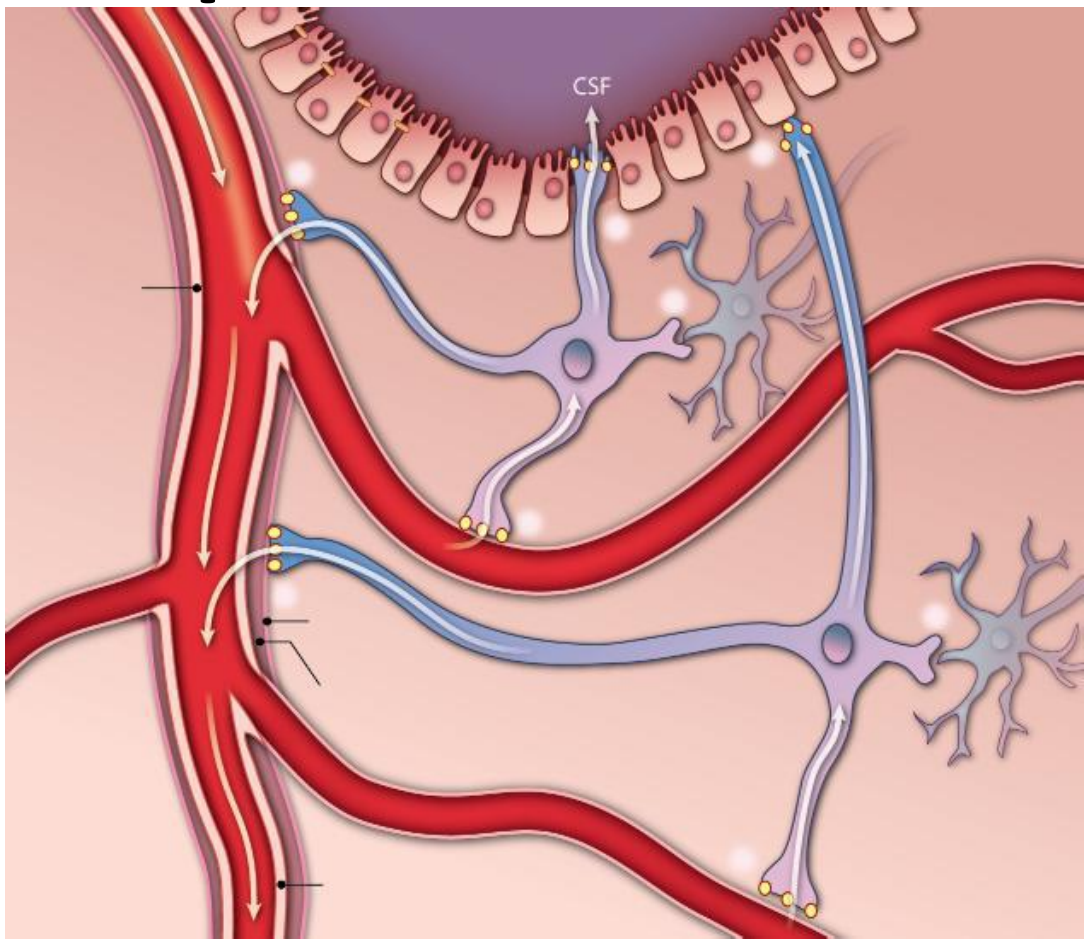
Cells within the nervous system are generally divided into two types: Neurons and glia. Neurons have the capacity to change their electrical potential, hence to be "active," and have received the bulk of attention from researchers. However, recent evidence shows that one form of glial cell, the astrocyte, contributes to communication within the nervous system in a fashion that is increasingly characterized as "active." Astrocytes were previously regarded as passive supporting elements. Metaphorical descriptions of the cells changed from lifeless "packing material" to "housekeepers," "nursemaids," and other social roles characterized by female gender and subordinate status.

A turning point in the conceptualization of glial cells came when researchers reported that chemicals released from glial cells appeared to regulate the formation of synapses, the communication points between neurons. With this evidence that glial cells not only contributed to, but actively regulated, a process highly valued by neuroscientists, glial cells moved up in social rank and changed gender, becoming "masters of the synapse" and "architects of the brain." The metaphors clearly imply that as cells become more valuable to nervous system function, they become metaphorically masculine.

The rivers and wetlands of the brain



Astrocytes facilitate CSF flow and help clear solutes



In the brain microcirculation, both astrocytes and tanycytes have long processes that run through the brain tissue and connect the cells with other structures. The tanycytes and astrocytes form endfeet (a) that are applied closely to the microvasculature that forms the BBB and express AQP4 adjacent to the endothelial basement membrane (basal lamina). The cells also bear processes that connect the cells with other brain structures. These processes may either interdigitate with the ependymal cells (c) that line the brain ventricles and directly contact the CSF (b) or may abut the ependymal cells and extend to the pial surface of the brain, which faces the subarachnoid CSF space (d). Other processes also terminate at neuronal cell bodies (e). The ependymal epithelium that covers the choroid plexuses across which CSF is secreted has tight junctions between the cells (f), as do the endothelial cells that form the BBB. Possible directions for water fl ow though the cells are indicated by the arrows.

Begley, DG, **Brain Superhighways**,

Science translational Medicine 4:147

J. J. Iliff et al., A paravascular pathway facilitates CSF fl ow through the brain parenchyma and the clearance of interstitial solutes, including amyloid β. Sci. Transl. Med. **4**, 147ra111 (2012).

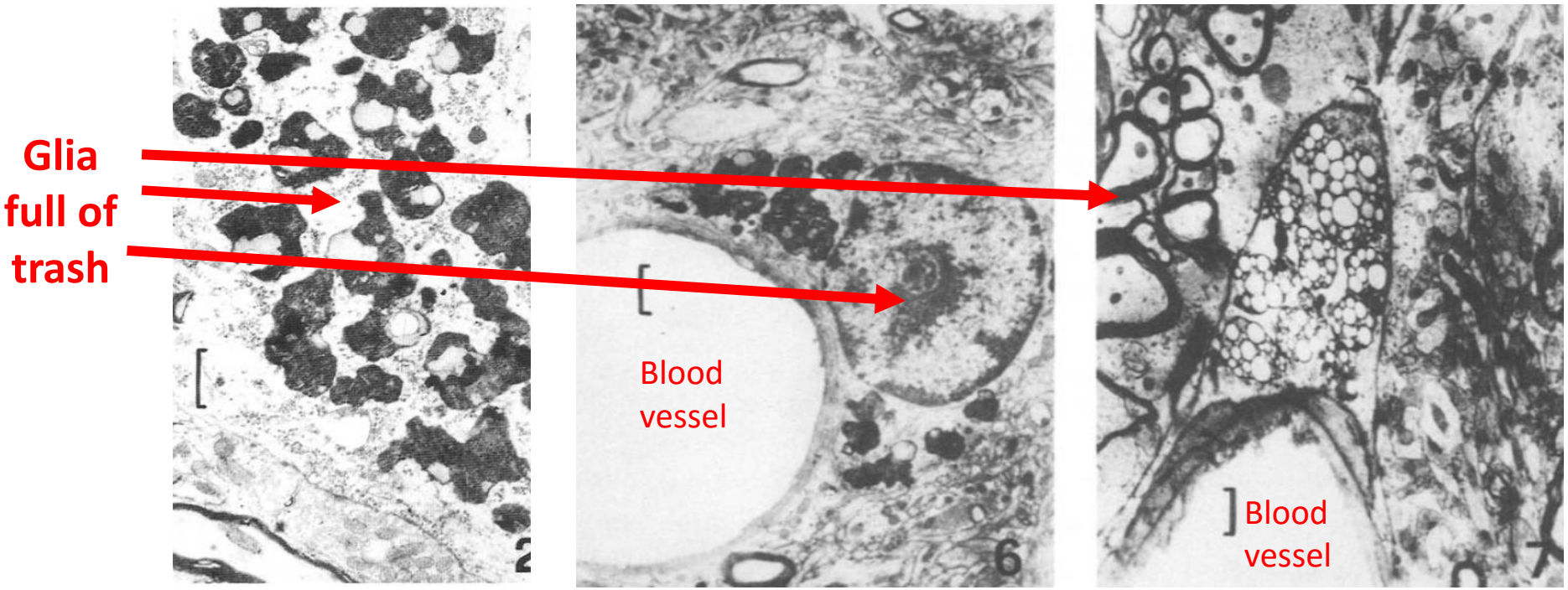
The brain’s waste management systems

Nutritionally activated glia can turn into "brain garbage collectors and transporters"

CELLS PICK UP CELLULAR DEBRIS, SIDLE OVER TO BLOOD VESSEL, AND DUMP DEBRIS INTO BLOOD VESSEL

They do this after receiving an intensive nutritional stimulation program

RIGA, S. et al., *Ann. N.Y. Acad. Sci.* 1067: 383–387 (2006) RIGA, S. et al., *Arch. Gerontol. Geriatr.* suppl. 4 (1994) 227-234



1. Collecting trash
2. Taking it to the curb (blood vessel)
3. DUMPING THE GARBAGE

Brain waste management depends on gut nutrient supply and absorption

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McDonald's Stock Slides As More Consumers Turn To Food

January 15, 2003 | Issue 39•01

OAK BROOK, IL—The McDonald's Corporation announced Tuesday that it will close 175 restaurants and cut nearly 600 corporate jobs, responding to a plunge in stock prices blamed on a depressed economy and rising consumer interest in actual food.

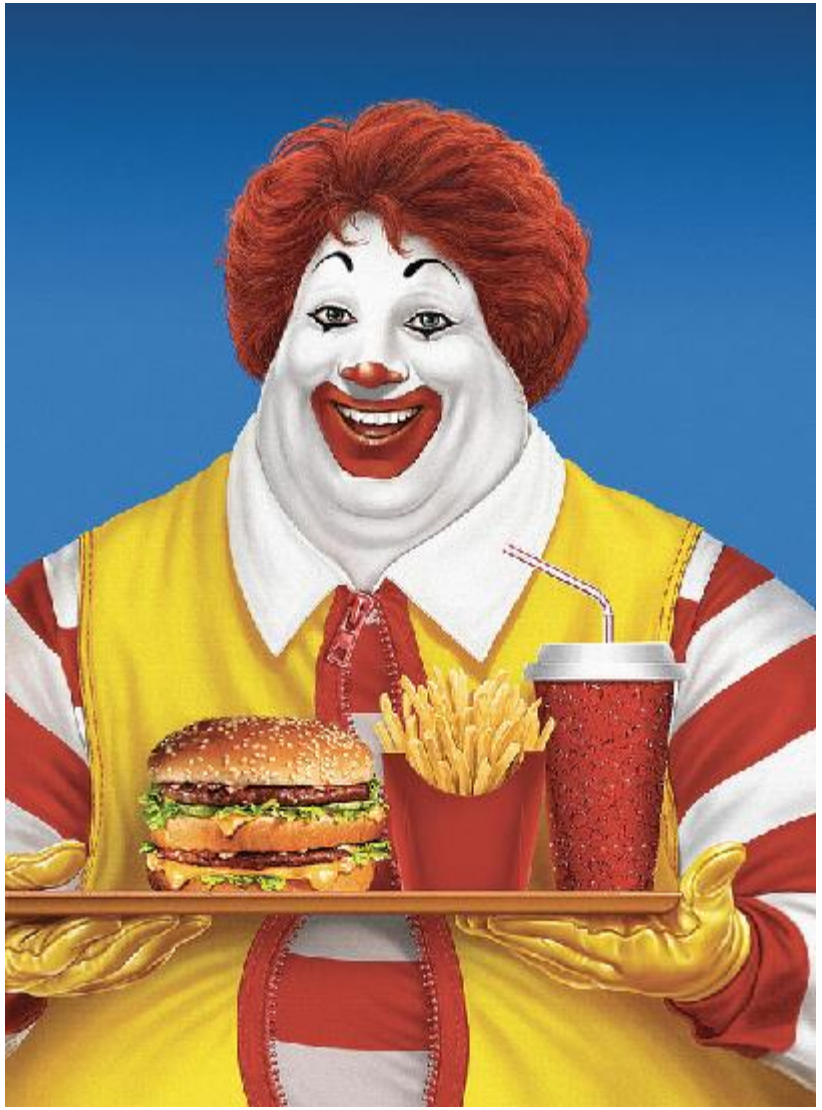
McDonald's Stock Graph

"Though still America's number-one hamburger retailer," McDonald's CEO Jim Cantalupo said, "we have entered a brief period of restructuring due to the steady growth of other convenience eateries and, more significantly, growing competition from producers and distributors of demonstrably nutritive matter, i.e. food."

In the fourth quarter of 2002, McDonald's posted the first quarterly loss in its 47-year history. Its stock closed Tuesday at $15.78, a seven-year low for the quasi-food giant.

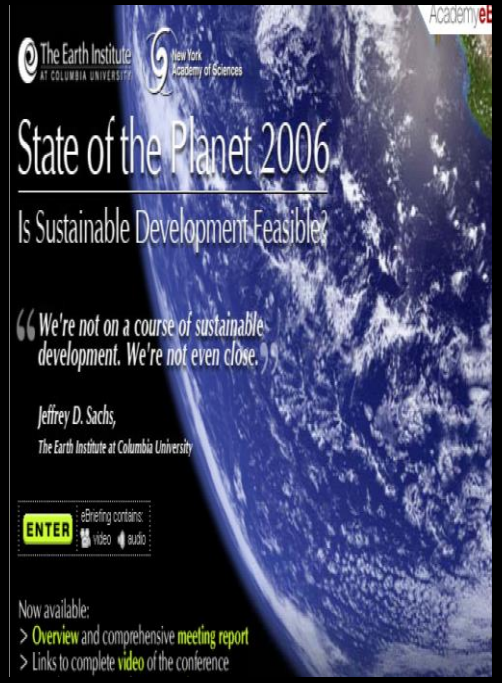
Analysts attribute the bleak financial picture to numerous factors, including the uncertain economy, poor management, eroding market share, and widespread health concerns about beef—a component sometimes used in the construction of McDonald's hamburger patties.

"Though well-accustomed to weathering recessions and changing tastes, the Golden Arches may be facing its toughest battle ever, given the surging public interest in leading healthy, active lives and consuming



Source: elias silveira ilustração & design

The planet is not stable.



UN Report by 1360 scientists :

Ecosystem damage is so severe that we can no longer be confident that the Planet Earth can support human life for more than two generations.

http://www.millenniumassessment.org

Our national faith so far has always been "There's always more." Our true religion is a sort of autistic industrialism.

- Wendell Berry, Harper's, May 2008

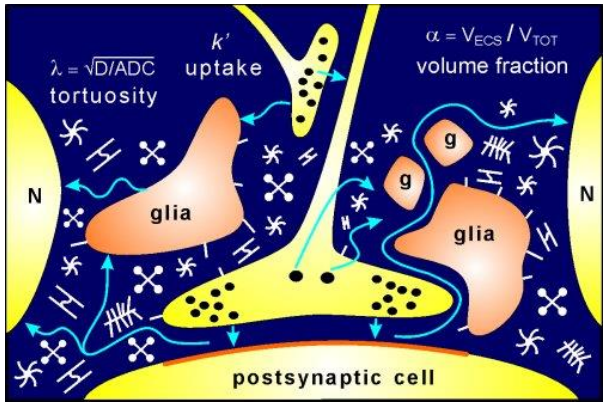
the ONION

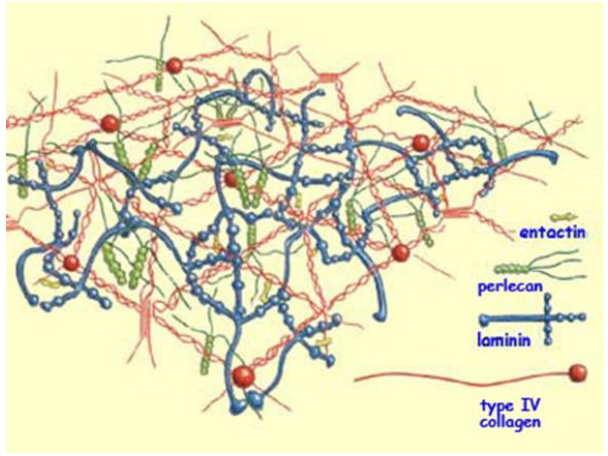
Al Gore Places Infant Son In Rocket To Escape Dying Planet

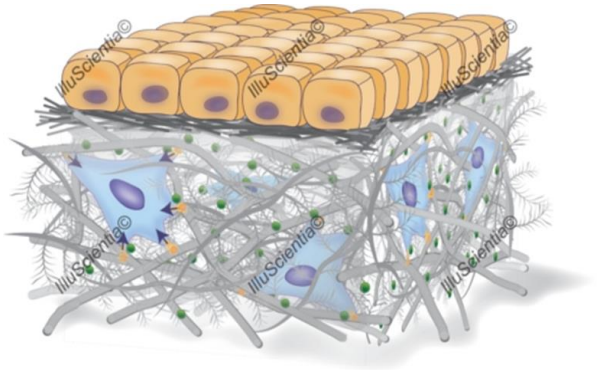
The Onion, **July 30, 2008**

The delicate and critical biophysical features of gut and brain

THE BIOPHYSICAL BRAIN

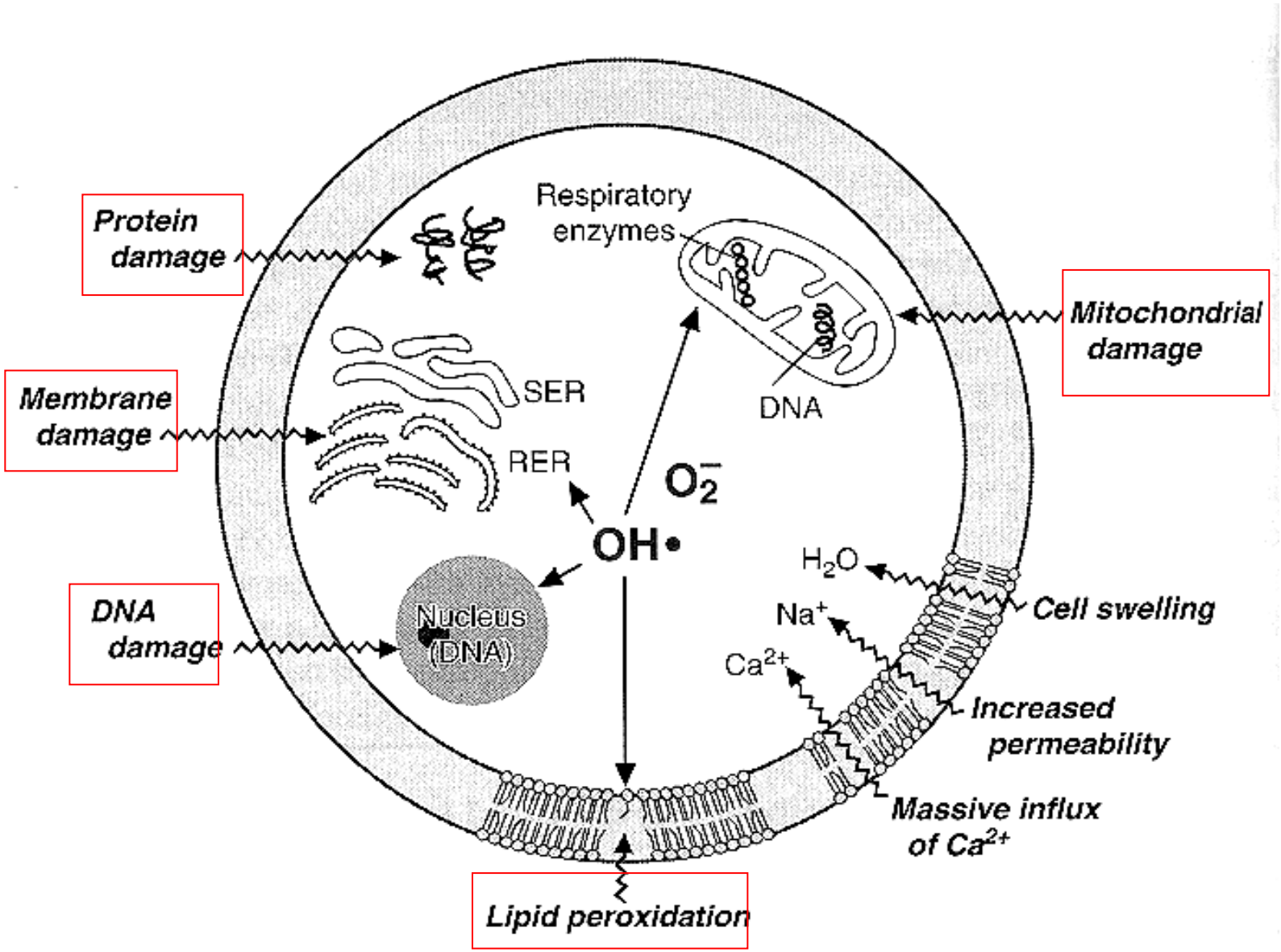


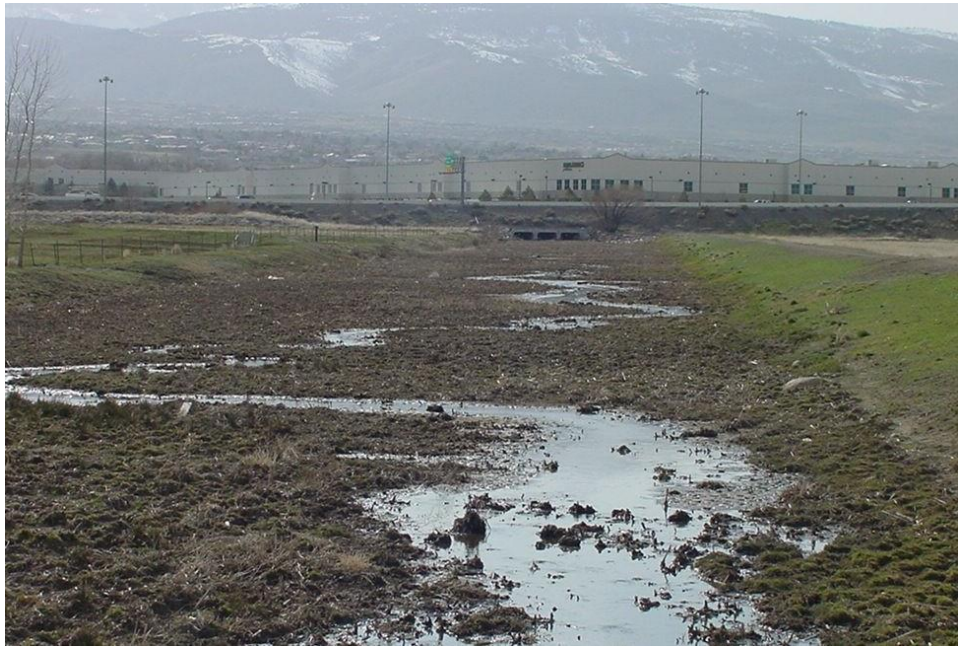




Membranes
Matrices
Permeability
Friability
Fluids
pH
Proximity
Tortuosity
Viscosity

Injury at the cellular level

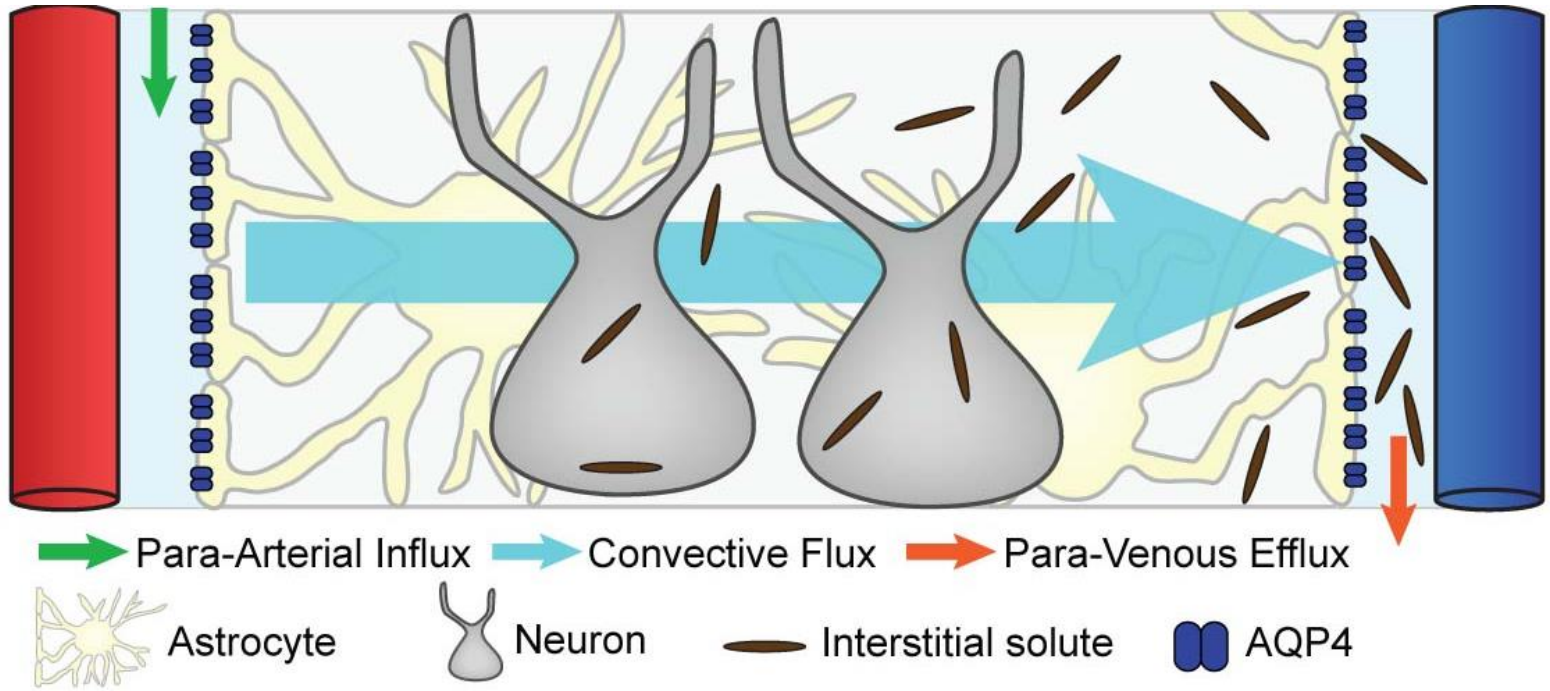




Malfunctions of gut and brain

Sewage backup in gut and brain

Glymphatic Pathway Function



- Alzheimers, Parkinson's and Huntingtons are proteinopathies, involving pile-up of misfolded or aggregated intracellular or extracellular proteins
- The proper function of the glymphatic clearance system is necessary to remove soluble amyloid-beta and other such proteins from the brain interstitium.

- Wikipedia

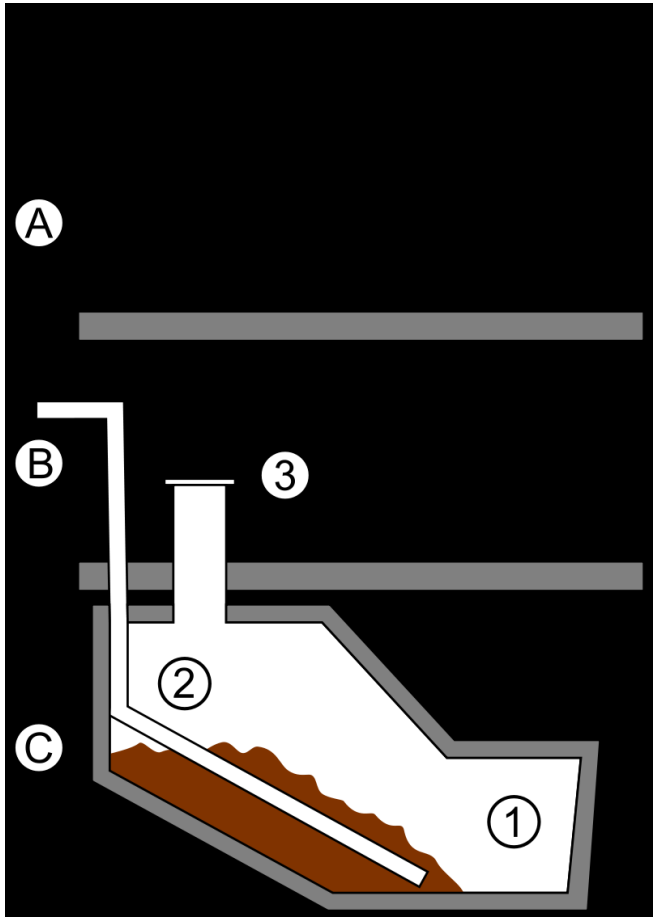
Coral Reefs and planet dysbiosis

“Coral reefs are like our intestines turned inside out”
-Dr. Liping Zhao, Microbiome scientist, Shanghai


BEFORE
AFTER

Short-sighted brains and foolish management of human waste products

From mixed waste streams of human and toxic wastes to composting toilets



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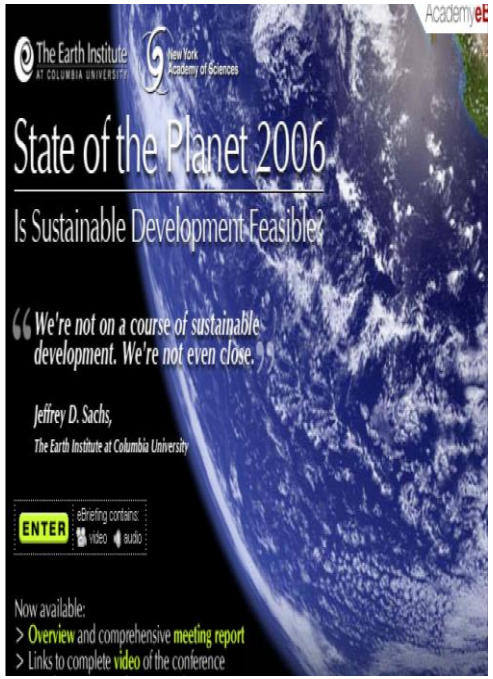
https://commons.wikimedia.org/w/index.php?curid=10209087

How our crazy ideas about human waste are contributing to destroying the planet

The planet is not stable.



http://www.millenniumassessment.org

autistic industrialism

the ONION

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The Onion, **July 30, 2008**

Bugs are our enemies?
Fact or confused narrative?

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VOLUME 34 ISSUE 12 AMERICA'S FINEST NEWS SOURCE™ 22 OCTOBER 1998

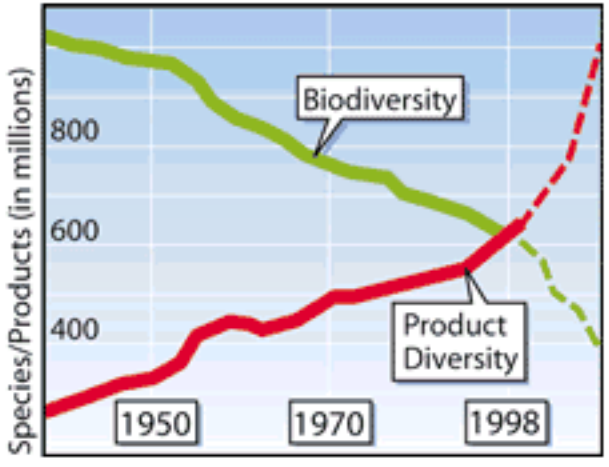
REPORT

Consumer-Product Diversity Now Exceeds Biodiversity

Complete story:
http://www.theonion.com/content/node/38901

WASHINGTON, DC—According to an EPA study conducted in conjunction with the U.N. Task Force On Global Developmental Impact, consumer-product diversity now exceeds biodiversity.

According to the study, for the first time in history, the rich array of consumer products available in malls and supermarkets surpasses the number of living species populating the planet.

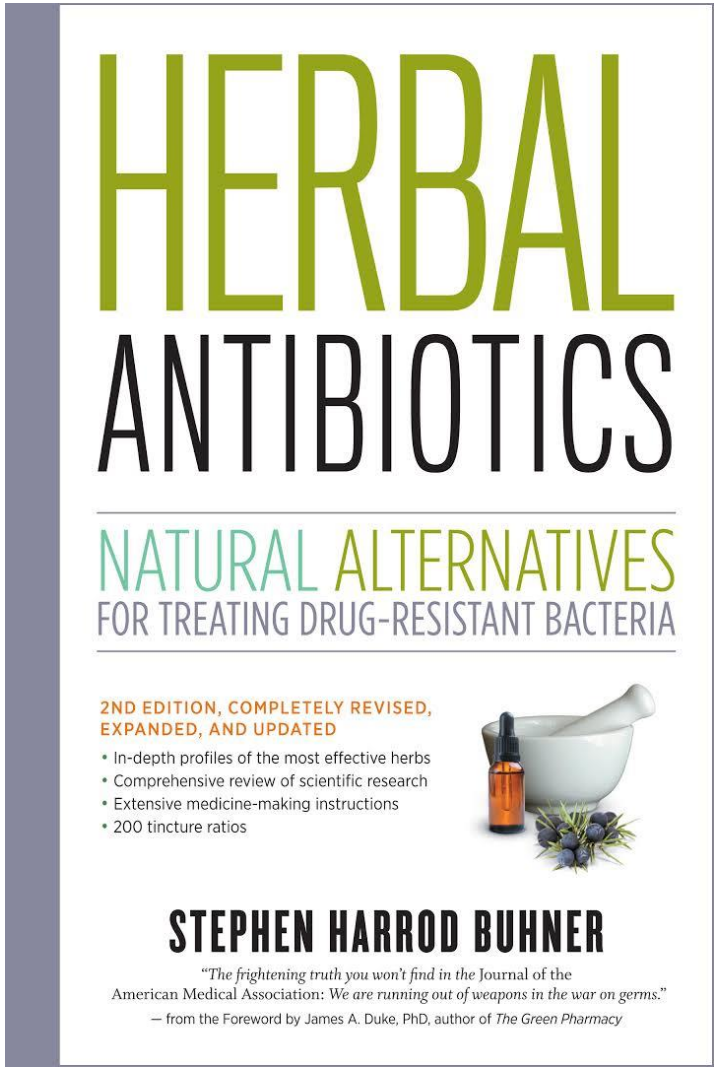


"Last year's introduction of Dentyne Ice Cinnamint gum, right on the heels of the extinction of the Carolina tufted hen, put product diversity on top for the first time," study chair Donald Hargrove said. "Today, the Procter & Gamble subphylum alone outnumbers insects two to one."

The sharp rise in consumer-product diversity—with more than 200 million new purchasing options generated since 1993—comes as welcome news for those upset over the dwindling number of plant and animal species.

"As more and more species fall victim to extinction, we face a grave crisis of decreased diversity, not only in America but across the globe," Hargrove said. "But the good news is, these losses in biodiversity are more than offset by a corresponding rise in consumer-product diversity. Though flora and fauna are dwindling, the spectrum of goods available to consumers is wider than at any time in planetary history. And that's something we can all be happy about."

From carpet-bombing microorganisms to rebalancing ecosystems: Beyond antibiotics



Source Separation of Waste

SOURCE SEPARATION

Compost toilets and greywater technologies represent a key concept for rational environmental behavior. By keeping large amounts of water and all commercial, industrial and household toxics separate from excreta, two things become possible:

1**. Nutrients in excreta become available for sustainable reuse in agriculture**. By returning these nutrients to agriculture we reduce the use of fossil fuel which is a major ingredient in the production of chemical fertilizer. We also broaden the spectrum of available plant nutrients: healthful food requires all the nutrients plants need, not just nitrogen, potassium, and phosphorous which are the only constituents of chemical fertilizers.

2. **Keeping toxic substances out of excreta makes it possible to reconsider their role in manufacturing processes**. If industry became responsible for the disposal of the toxic substances it uses, it could either use them in a closed-loop system or find less harmful, alternative substances. If alternative substances are not possible, then a decision can be made about whether the use of toxics is to be continued. That decision would be made properly with participation by all those potentially affected by it. At the moment, the decision is made surreptitiously thanks to the mostly unregulated opportunity for industry to use the sewer as a low-cost dump.

http://www.clivusmultrum.com/science-technology.php

The Rational Way Forward

Right now, the way our society currently handles human excreta, food production, and industrial waste is neither sustainable nor rational. The broad acceptance of these practices might make source separation seem naïve or impossible, but we at Clivus Multrum believe it is the only rational way forward.

Here are links to a fuller discussion of environmental issues addressed by Clivus Multrum technologies:

Omnivore's Dilemma, Michael Pollan *Discusses the problems factory food production in the US*

Enriching the Earth, Vaclav Smil *A background on the creation of the world agricultural fertilizer industry*

Unquenchable, Robert Glennon *The present water crisis in the US*

Toxic Sludge is Good for You, John Stauber and Sheldon Rampton *How the PR industry promotes the use of sludge*

The Big Necessity: The Unmentionable world of human waste and why it matters, Rose George *A highly readable look into the practices and politics surrounding human waste.*

Regenerative Biocultural Praxis

In order to fulfill its mission, the Higher Synthesis Foundation will document and analyze transformational successes achieved through regenerative bio-cultural practices — i.e., emergent health, food and ecological practices that are restoring the robustness and integrity of damaged biological systems. Often either consciously or implicitly systems-based, these methods and practices are

- producing recoveries of function and remissions from complex supposedly incurable health problems like autism, autoimmune disease, brain injury and cancer;
- greatly improving food quality; and
- restoring biodiversity and stability in ecosystems.

There appear to be common conceptual and process threads across these practices, which are often generated locally, indigenously, through networks, and/or in a community-based participatory fashion. These approaches to complex health and environmental challenges are helping parts of our planet and some of its inhabitants to get better even while many other things get worse.

By using science to identify the models, skills, assessments and sensibilities contributing to these successes, the Higher Synthesis Foundation aims to leverage transformation to help upgrade our approaches to critical problems.

The Pope on Having Courage to Make Big Changes

As often occurs in periods of deep crisis which require bold decisions, we are tempted to think that what is happening is not entirely clear. Superficially, apart from a few obvious signs of pollution and deterioration, things do not look that serious, and the planet could continue as it is for some time. Such evasiveness serves as a licence to carrying on with our present lifestyles and models of production and consumption. This is the way human beings contrive to feed their self-destructive vices: trying not to see them, trying not to acknowledge them, delaying the important decisions and pretending that nothing will happen. (Id at 17)