The Memetics of Radiation Protection

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Why No One Believes Us: Cognitive Neuroscience and Radiation Risk

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So what is a "meme"?

- **British evolutionary theorist Richard Dawkins, in "The Selfish Gene" (1976) proposed the existence of "memes": self-replicating ideas (spreading from brain to brain) that compete with each other for survival.**

- **Darwinian theory states that the meme best adapted to its environment will win the battle for survival and thus come to predominate.**

Cultural memes

- **Dawkins originally considered memes to be behaviours, such as rudimentary tool-making, e.g., chimpanzees will strip leaves from a narrow branch to make a probe for "termite fishing."**

- **He used this concept to describe the process of cultural evolution, such as stone tool making.**

Extending the concept

- **Dawkins and other scientists (e.g., Susan Blackmore) developed the concept of memetics as a theory of mental content.**

- **A meme is an information pattern, held in an individual's memory, which is capable of being copied to another individual's memory.**

- **The environment memes "live in" is human brains, or the "ideosphere", analogous to the "biosphere" in which other self-replicating things live, i.e. genes.**

A new science

- **"Memetics" is the study of ideas and concepts viewed as "living" organisms, and is an approach to evolutionary models of cultural information transfer.**

- **A meme is now considered a "unit of culture" and may be an idea, belief, pattern of behaviour, etc.**

- **Note that memetics is concerned with the success of ideas or behaviors, not their truth (defined as conformance to external reality.)**

When memes meet

- **As is the case with genes, a meme's success is likely tied to its contribution to the success of its host.**

- **In addition, also like genes, successful memes tend to work well with other memes whose environment they share.**

- **However, memes are much more powerful than genes.**

- **A collection of related memes that mutually support one another is called a "memeplex"**

A few memeplexes

- **Patriotism**

- **Religion**

- **Project Management**

- **Science**

- **Liberalism**

- **Conservatism**
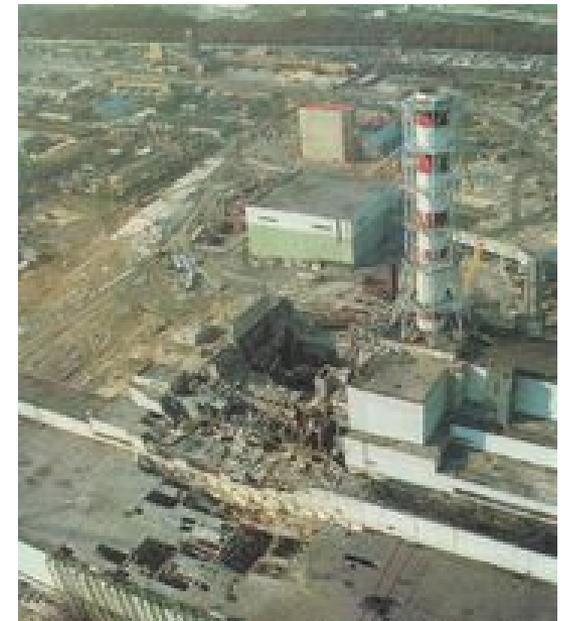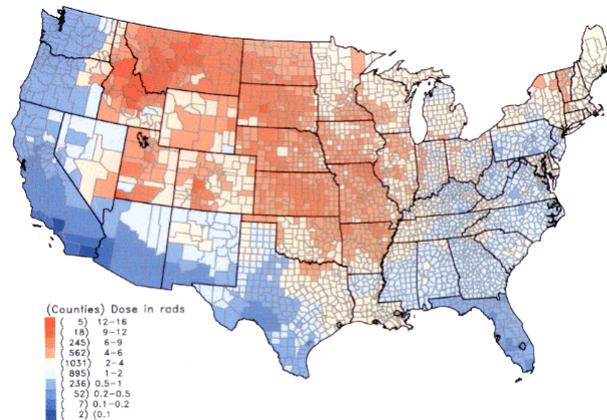
- **Radiation Protection**

What makes a good meme?

Adaptation to its environment

- The human brain has a number of hard-wired circuits that contribute to survival:
  - Risk avoidance (contagion)
  - Fight or flight
  - Tribalism (consanguinity)
  - Protection of offspring
  - Respect for authority
  - "Repetitio mater studiorum"

100 Years of Radiological Images

Some memes in RP

- **Time, distance and shielding**

- **Justification, limitation, optimization**

- **Equivalent dose**

- **Effective dose**

   And of course the biggest meme of all:

- **The linear-no threshold (LNT) model**

An interesting reading

From: "Environmental Injustice Inherent in Radiation Protection Standards"

By: Dr. Kristin Shrader-Frechette, Departments of Philosophy and Biological Sciences, University of Notre Dame

In: Social and Ethical Aspects of Radiation Risk Management, D. Oughton and S. O. Hansson, eds., Radioactivity in the Environment 19: 197-213 (2013)

Thus saith BEIR VII Phase 2 (2006):

"The BEIR VII committee concludes that current scientific evidence is consistent with the hypothesis that there is a linear dose-response relationship between exposure to ionizing radiation and the development of radiation-induced solid cancers in humans." (page 15)

What makes LNT a great meme?

- **LNT says there is no "safe" dose if "safe" means risk-free. Of course nothing is "safe" in that context, but this resonates with the risk avoidance neurons.**

- **Risks in children are higher, which hits our genes where they live, literally.**

- **An authoritative pronouncement from NAS**
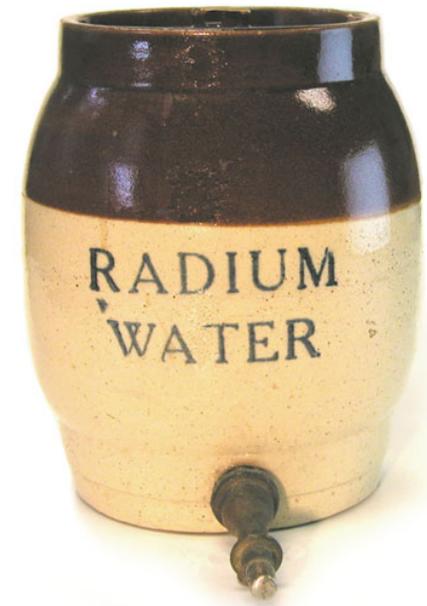
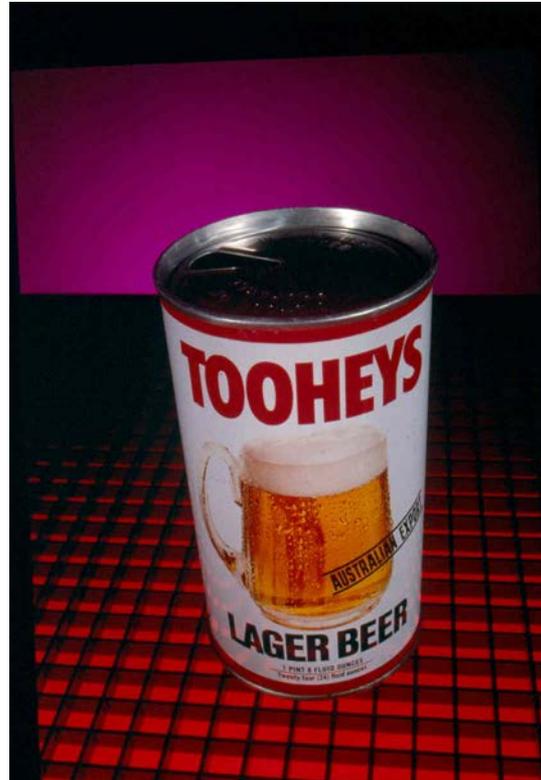- **And everybody knows this already.**

Problems with LNT

- **Biological processes are multifactorial and non-linear.**

- **Tumor development requires at least four different mutations: activate an oncogene, disable an anti-oncogene, enable angiogenesis, and enable metastasis, a process occurring over many years.**

- **The radium DP data rejects LNT at the 98%-ile confidence level.**

- **Adaptive response and hormesis disprove LNT.**

The biggest problem with LNT

- **One cannot un-ring a bell, especially when it is the memetic equivalent of a fire alarm.**

- **Basing RP standards on LNT is a policy decision, not a scientific one.**

- **The problem isn't that "no one believes us."**

- **The problem is that everyone believes us.**

- **"Deadly radiation" is a proven winner in the ideosphere.**

This Talk Brought to You by M. H.Chew & Associates, HPS and:

Further Reading

- Blackmore, Susan. The Meme Machine (1999).

- Brodie, Richard. Virus of the Mind: the New Science of the Meme (1996).

- Dawkins, Richard. The Selfish Gene (1976); The Extended Phenotype (1982); Viruses of the Mind (1991).

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- Lynch, Aaron. Thought Contagion: How Belief Spreads Through Society (1996).

- Moffett, Shannon. The Three-Pound Enigma (2006).

- Mukherjee: The Emperor of All Maladies (2010).

- Pinker, Steven. How the Mind Works (1997); The Blank Slate (2002).

- Weart, Spencer. Nuclear Fear: a History of Images (1988).