A Wolf in Sheep's Lab Coat

Pseudoscience in the 21st Century

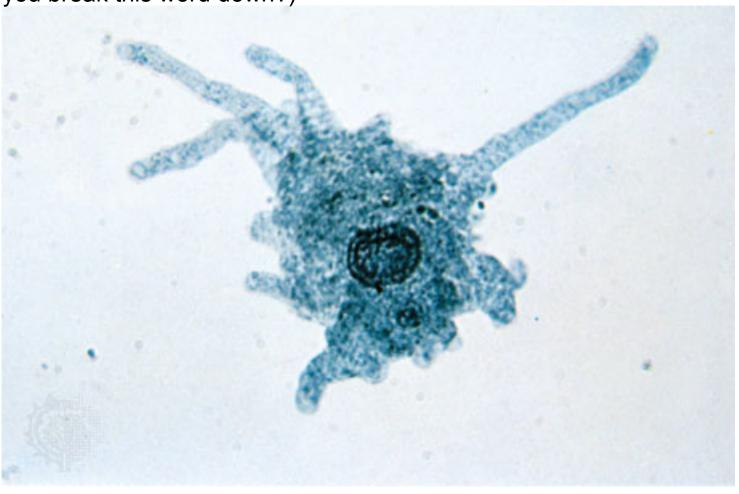
Adapted from files.criticalteaching.org



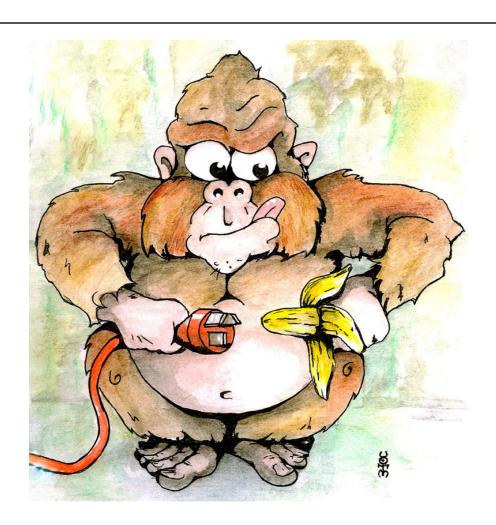
Pseudo = fake

pseudopod

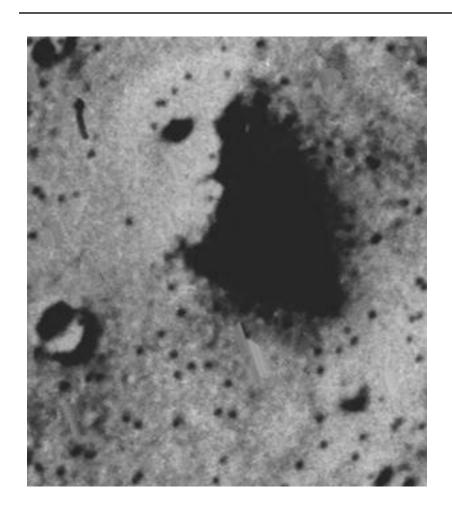
Can you break this word down?)



Science = ?



Pareidolia



A psychological phenomenon in which something random (here, shadows on Mars' surface) are given significance by the human viewer

From the Greek *para*-, meaning "alongside", and *eidos*, meaning "image"

A great example from "paleontology"

- □ Chonosuke Okamura and Silurian fossils
- □ Believed he had found the beginnings of all vertebrate life, including humans, 425 mya
- "There have been no changes in the bodies of mankind since the Silurian period . . . except for a growth in stature from 3.5 mm to 1,700 mm."



Empiricism

Observations experienced by the individual make for more useful ideas than those inherited directly from the social group.

Science is -

- A logical thought process
- Based on observing
- Best when those observations and logic are actively, rather than passively, combined (i.e. experimentation)
- Self-correcting (new observations can challenge old beliefs)

- Controls comparisons between variation and inaction
- Randomisation to remove selection bias
- Blinding to remove confirmation bias
- Repetition for reliability of method
- Peer review for critical analysis

What science is not

- An organisation
- A book of answers
- A moral code
- A dogma
- □ A fad
- A person in a lab coat

Pseudoscience describes any field that reflects some of the practices associated with science, however offers false confidence in its claims as a result of not applying others.

Why is there pseudoscience?



- Scientific illiteracy?
- Limited funding?
- Political pressure?
- Function of our psychology?

Social Thinking

Argument from popularity

X is true because a lot of people in my social group happen to believe it.

Argument from authority

X is true because an authority I trust happens to believe it.

Argument from history

X is true because it has been believed for so long.

Argument from emotional appeal

X is true because it makes me feel good / Y is false because it makes me feel bad.

10 Things to Look For

1) Language

Does the claim confuse terminology, use vague definitions or misleading jargon? e.g. Energy in physics, chemistry, biology = work done by a system. Energy in reiki = ?

2) Anecdotal support

Is the claim supported with reference to unsubstantiated anecdotes? e.g. I've heard lots of people say they benefited from taking St. John's Wort for chronic depression.

3) Vague references

Does the claim allude to 'many studies' non-specifically? *e.g.* Of course magnets cure arthritis – it's proven by a heap of studies.

4) Panacea

Does the claim suggest it has a wide range of multiple effects, some of which seem unrelated? e.g. Wheat grass will boost your immune system, detox your liver, improve circulation, help you think

Clearer, make your teeth whiter, make you sweat less, bring back your girlfriend, pay your taxes and raise the dead.

5) Unrelated comparisons

Does the claimant refer to commonly accepted claims that sound similar in support of their belief? e.g. Doctors have used magnets to diagnose ailments for decades, so of course magnetic therapy works.

6) Special pleas

Does the claim argue that it is beyond being evaluated scientifically? *e.g. The tools of science are too blunt to study ESP yet.*

7) **Conspiracy**

Does the claim allude to some authority or collective preventing good evidence from becoming common knowledge? e.g. Of course there's no evidence of perpetual motion – the oil companies suppress it all!

8) Social or 'folk' reasoning

Does the claim use arguments from history, authority or popularity? e.g. My mother says millions of people have rubbed butter into burns for centuries, so of course it works.

9) Throw out the textbooks

Is it more likely well established scientific laws are wrong, or that one person has made a mistake? e.g. My machine proves that the second law of thermodynamics is wrong!

10) God of the gap/ Argument from ignorance/ Shift of burden of proof

Does the claim refer to what is not known, or the problems with current theories, to support its case. e.g. Science can't explain how life arose from nothing, therefore it must have been magic – Prove it wasn't!

Alternative Medicine



- Homeopathy
- Naturopathy
- Acupuncture
- Chiropractic
- Reflexology
- Reiki/TherapeuticTouch
- Iridology

Religious

- Intelligent Design
- Scientology
- Young Earth Creationism



New Age

- Astrology
- Alien Encounters
- Crystals
- Past life memories



Critical thinking - the greatest brain tool on Earth!

- 1) Confidence, not certainty. All new information can make you more or less confident in what you already know. Certainty makes it harder for you to change your opinion.
- Why are you confident it is right? Oprah said so? You read it in The Courier Mail? You heard it at school? Weight of evidence some forms of evidence are weaker than others.
- 3) How do you feel about it? Would it affect your social relationships to be wrong?
- 4) What would it take for me to be wrong?
- 5) What are the arguments against my belief? Where can I look for more information?

Where's the harm?

Practical

Making decisions which could affect health, finance or relationships where the possibility of benefit is not matched by the risks.

Ethical

Employing the services of frauds, cheats and con artists.

Progressive

 Science demands acknowledging failure and focussing on those areas which offer the possibility of progress in understanding.

A closing thought from physicist Richard Feynman

"Science is a way of trying not to fool yourself."