

"Life is too short to occupy oneself with the slaying of the slain more than once."

-- Thomas Huxley

"The plural of anecdote is *not* data."

pace Raymond Wolfinger (who actually said the opposite)

Wolfinger: I said 'The plural of anecdote is data' some time in the 1969-70 academic year while teaching a graduate seminar at Stanford. The occasion was a student's dismissal of a simple factual statement — by another student or me — as a mere anecdote. The quotation was my rejoinder.

What is Evidence?

(Science, Pseudoscience and Evidence)

Supplementary Material for CFB3333/PHY3333
Professors John Cotton and Stephen Sekula
February 13, 2012

Based on the following information on the web:

<http://www.physics.smu.edu/pseudo/Pscience>

Reviewing the Examples

- UFOs
 - lesson: just because you cannot explain an observation with all known hypotheses doesn't allow you to jump to extreme conclusions
 - e.g. a UFO cannot be explained by aircraft, satellites, astronomical phenomena, or hallucination; it *must* be aliens!
- Roswell and The Bermuda Triangle
 - lesson: look for the *primary sources* behind a “good story”
 - e.g. how can one test the validity of the details of a story (shipping records, weather reports, dates, times, people involved, statistics)?
 - direct appeal to primary sources of information is critical

The Scientific Method

A Brief Review

- Observation of a phenomenon
 - what kind of observations?
 - how reliable are the observations?
- Formulation of an hypothesis
 - how does one begin to form a causal explanation for the phenomenon?
 - what evidence is used to generate the hypothesis?
 - how reliable is the evidence?
- Performance of experiment
 - what means are available for testing different properties or ideas?
 - how does one setup a reliable experiment?
 - how does one gather information from the experiment?

The Scientific Method

A Brief Review

- Observation of a phenomenon
 - what kind of observations?
 - how reliable are the observations?
- Formulation of an hypothesis
 - how does one begin to form a causal explanation for the phenomenon?
 - what evidence is used to generate the hypothesis?
 - how reliable is the evidence?
- Performance of experiment
 - what means are available for testing different properties or ideas?
 - how does one setup a reliable experiment?
 - how does one gather information from the experiment?

What is Pseudoscience?

- Definition:
 - ***Something that claims to be scientific, but is not.***
- How do you spot it?
 - Pseudoscience is EVERYWHERE
 - The best way to spot it (not always a simple thing!) is to compare the practices involved in something claimed to be “scientific” with the actual standards and practices of science
 - compare their method to the REAL scientific method

Encapsulated Scientific Method

- Remember:
 - Observe a phenomenon
 - Develop an hypothesis for it (a possible explanation)
 - Use the hypothesis to predict other phenomena
 - Check the prediction by observation or experiment
- A process that requires CREATIVE THINKING
 - Induction: using all previous scientific training to formulate the hypothesis
 - Deduction: using the new hypothesis to generate a prediction

QUESTION:

Can the scientific process *ALWAYS* work this way?
What are some examples where it's not possible to exactly follow these steps?

Some guidelines for when you can't follow the prescription EXACTLY

- From Schick and Vaughn:

“... any procedure that serves systematically to eliminate reasonable grounds for doubt can be considered scientific.”

- From skeptic Michael Shermer:

“Scientific progress is the cumulative growth of a system of knowledge over time, in which useful features are retained and nonuseful features are abandoned, based on the rejection or confirmation of testable knowledge.”

So . . . what is Pseudoscience?

- Quick and dirty rule-of-thumb:
 - Pseudoscience is any procedure that ignores one or more of the steps
- But it SOUNDS like science...!
 - Pseudoscience is crafty – it uses a lot of scientific-sounding language
 - When you get past the words and know how to look closely, you'll see that they don't respect the METHOD.
 - e.g. objective evidence is ignored or lacking
- Real science is a process, not a result. The process matters more than the outcome.

Pseudoscience is identifiable

- Heavy reliance on testimonials or anecdotal evidence.
 - Fred or Jason - from Consumer Reports
 - Robin? - from Consumer Reports
- Built-in or ad-hoc excuses for failure.
- Non-falsifiable hypotheses.
- No serious attempt to disprove it.
- Attacks existing explanations without offering anything new.
- Patents cited as evidence.
- Evidence is used selectively; some is ignored, particularly that evidence which might disprove the hypothesis ("cherry picking").
- Misrepresentation of real scientific work.
- Claims of "It can't be _____, so it isn't."
- Makes no progress and generates no new knowledge, even over many decades.
- Claims of effects or forces never measured, or even observed.
- Claims of impossible precision of measurement.
- Makes no useful predictions.
- Tests that have VERY small samples.
- ...

Fred, meet Jason

Fred lost 175 pounds by following advice in a book called "Power Aging." Jason halted his migraines by following advice in a book called "The Gluten Connection." Way to go, guy(s).

From human whale to

WOW! What A Body!

Dr. Gary Null's revolutionary "non-diet" sheds up to 175 pounds in a matter of months and keeps it off!

the Whale...

-Fred, movie actor, case history #1
Audiences may have laughed, but it was nothing funny about it. Fred

you think it's tough losing 20 pounds, just imagine how desperate Fred felt. "Nobody wanted to hire me because of my size," he said. "Although I did get a job to a movie with DeNiro..."

"I played Jojo the Whale..."

...Fred made actor, Tom Hanks' *THE WHALE* a success. He lost 175 pounds in 9 months. "I was desperate to lose weight and I was literally crying for help. I was desperate to lose weight," he says. "I had a massive heart failure. I was sweating profusely, vomiting blood..."

"I couldn't be more desperate because of my heart attack. I was literally crying for help. I was desperate to lose weight. I was sweating profusely, vomiting blood..."

He thanks Dr. Gary Null, Fred's doctor, for his natural approach to health.

In 9 months, Fred lost 175 pounds without counting calories, carbs or fat...

And as soon as YOU learn Fred's secret, you'll never have to "diet" again.

DISCOVER that you'll learn what Fred did, starting on **PAGE 119** of your FREE **Freedom from Pain** book. **ORDER TODAY!** **ADD \$4.95.** **Dr. Gary Null's** **FREE** **BOOK** **REVEALS** **THE** **SECRET** **TO** **LOSE** **WEIGHT** **NATURALLY** **AND** **KEEP** **IT** **OFF!**

You simply avoid those foods that irritate your brain and cause

you'll never have to "diet" again.

DISCOVER that you'll learn what Fred did, starting on **PAGE 119** of your FREE **Freedom from Pain** book. **ORDER TODAY!** **ADD \$4.95.** **Dr. Gary Null's** **FREE** **BOOK** **REVEALS** **THE** **SECRET** **TO** **LOSE** **WEIGHT** **NATURALLY** **AND** **KEEP** **IT** **OFF!**

CHOCOLATE WALNUT SHAKE

CHOCOLATE WALNUT SHAKE

CHOCOLATE WALNUT SHAKE

CHOCOLATE WALNUT SHAKE

CHOCOLATE WALNUT SHAKE

CHOCOLATE WALNUT SHAKE

CHOCOLATE WALNUT SHAKE



10 Years

Jason suffered from agonizing migraines for more than 10 years. Drugs were no help. And his neurologists were mystified to find a cure. The pain kept getting worse. His three headaches a week escalated into one non-stop headache. It had gotten so bad, he considered early retirement.

Finally, Jason tried the natural program recommended by Dr. Shari Lieberman, MD. Within a few short months, he was 98% headache-free. Ten years of suffering was over.

relieve them once and for all.

Clinically PROVEN Relief!

Is **THE GLUTEN CONNECTION** what you'll learn about breakthrough medical research on headaches. A medical study examined gluten-sensitive patients who suffered from severe headaches. When patients were put on the program Dr. Lieberman recommends...

90% of Patients Found Relief from Headaches

Dr. Lieberman's program works naturally. And it's better than drugs because it doesn't just treat the symptoms.

Banish the Pain Trigger

For many people, gluten is the major trigger for headaches.

Make up your mind

In CR's January 2006 article about testimonials, we said we'd seen the woman at right in two different ads. One was for anti-wrinkle pads, in which she was called Dhyana Dahl; the other was for face-saving procedures such as Botox injections, in which she was unidentified. Now, she's popped up again, praising a "Botox alternative." And she has a new name. When we asked a Hydroxatone customer-service rep whether Robin B. was a real person who used the product, she said that the company "couldn't put her there legally otherwise" and that "all the t's are crossed and the i's are dotted." Which prompts a question: Who's going to tell Robin she has a clone?



What Our Customers Have To Say About Hydroxatone™ . . .

"Within two weeks of using Hydroxatone, I was getting compliments on my skin from friends and co-workers. My skin not only looks great, but it looks great too! You've made me a Hydroxatone™ believer!"

— Robin B., Los Angeles

Look at the list of forms of
bad and good evidence available here:

<http://www.physics.smu.edu/pseudo/Pscience/>

Testimonials and Anecdotes

HAIRBLAST!

(PATENT PENDING)

BEFORE HAIRBLAST
(I kan haz none date!)

AFTER HAIRBLAST
(Alice iz in Wonderland!)

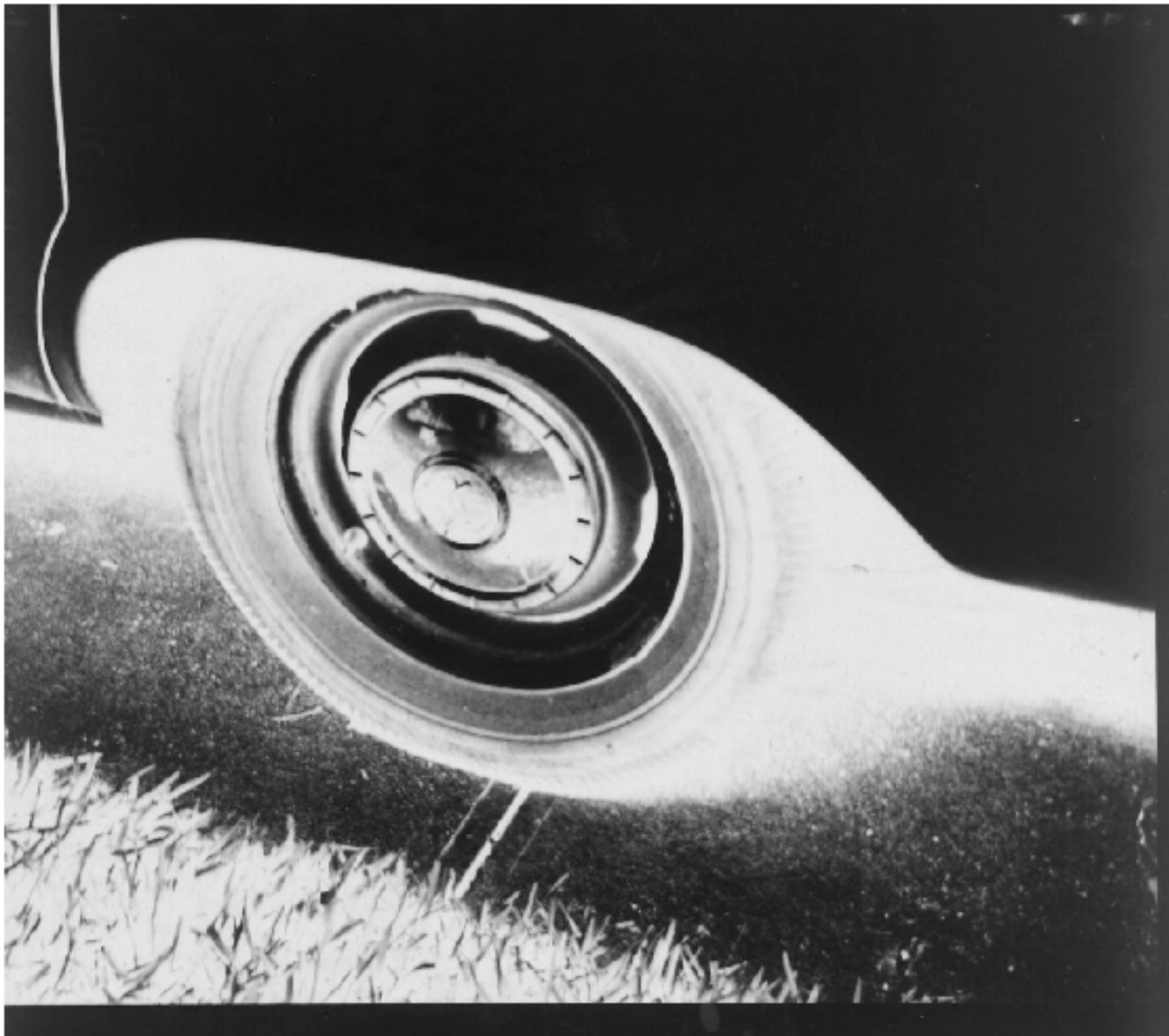


Photographs

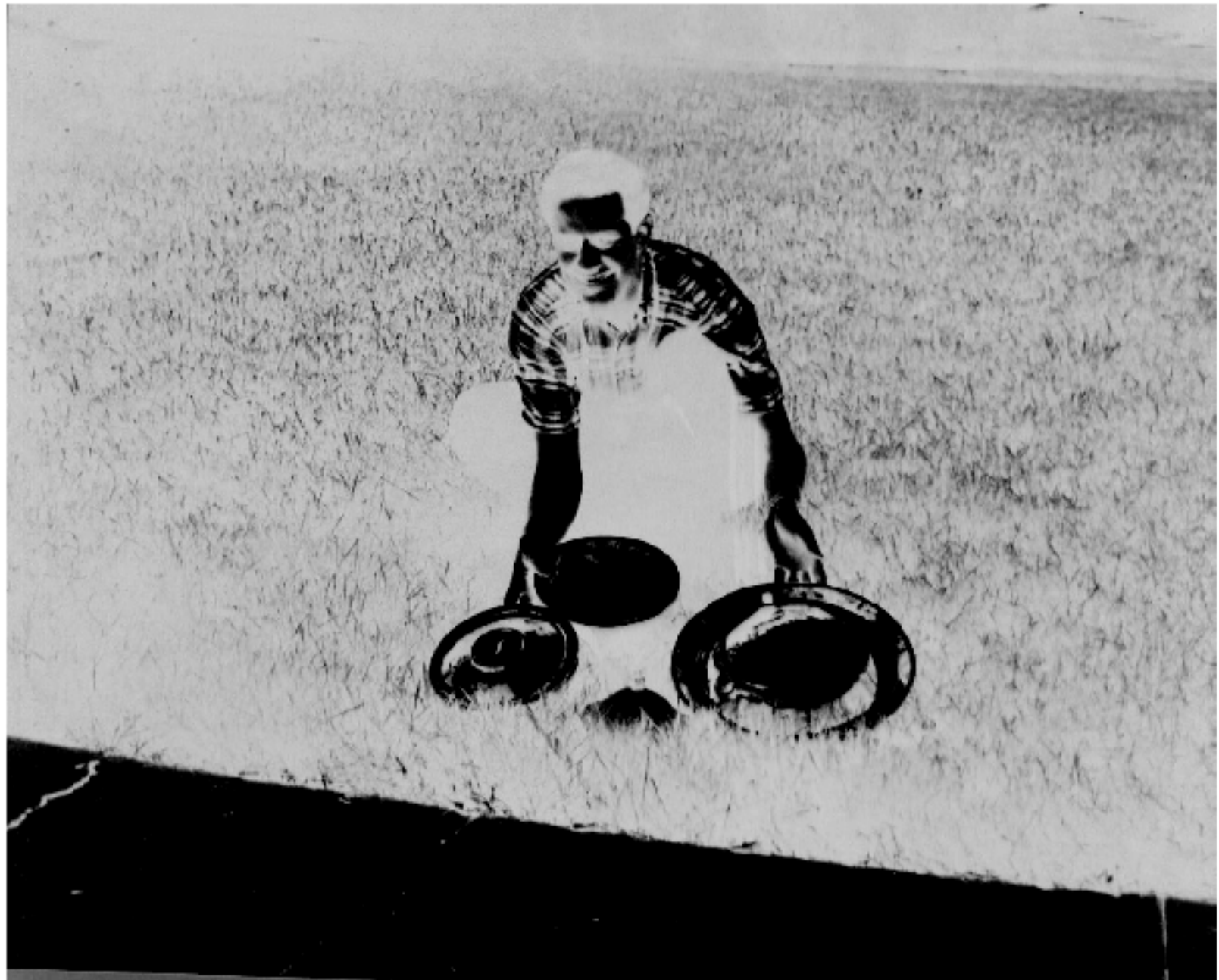
The UFO!



The IFO (?!)



The Perpetrator!



The Perpetrator!

