

PATHOLOGICAL SCIENCE

Langmuir Revisited

Ivan K. Schuller

Physics Department

University of California-San Diego

Pathology Types

- **Fraud**
(death penalty)
- **Dereliction of Scientific Responsibility**
(long term imprisonment)
- **Mistakes**
(long interrogations)
- **Wishful thinking**
(suspicion)
- **Hoax**
(secret applause)

Experimentalist's Responsibilities

- **No Mistakes:** No experimental mistake
- **Trivialities:** Wrong sample, dropped the sample, something breaking,
- **Materials Science Effects:** Disorder, interdiffusion, structural phase transition etc.
- **Violations:** Energy conservation, 2nd, etc
- **Obvious checks:** No excuses
- **Proper techniques:** Structure (diffraction), transport (resistance), magnetism(moment),....

Do experiments where there is no theory

Theorist's Responsibility

- **Independent of data**
- **Understand limitations of data** (Data is the test)
- **Violations:** conservation laws, thermodynamics
- **La Donna e Mobile** (change as the wind blows)
- **Be predictive**

Do theory where there is no experiment

NOT the experimentalists responsibility

- **Agree with the theory du jour**

Even Schon's experiments were explained by some theories

- **Prove that something is not there**

NOT the theorists responsibility

- **Explain every single experimental detail**

13 Schuller Pathology Criteria

1. **“Too good to be true”**
2. **Extreme accuracy**
3. **Excuses, excuses (Reproducibility ?)**
4. **“La droite du seigneur” (one data point)**
5. **Peculiar experimental conditions**
6. **Violation of statistical nature of data**
7. **Blah, blah, blah (violates common sense)**
8. **“What else could it be” (wishful thinking)**
9. **“Everybody can be Einstein” (extraordinary science)**
10. **“Bridges don’t fall down” (anything else changes?)**
11. **Multiple publications (obscure or sensationalist journals)**
12. **Jumping around (no follow-up)**
13. **Fashion**