

# EMF Bioeffects Debate Results from a Paradigmatic Shift

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## Summary

- 2 types of scientific reasoning (shift from 1 type)
- Different types used by EMF bioeffects disputants
- Correct reasoning type is ...

**Legal Brief  
by  
Nobel  
Prize  
Winners**

<http://www.sdge.com/hot/news/briefs/AMICUS.html>

**SUPREME COURT  
OF CALIFORNIA**

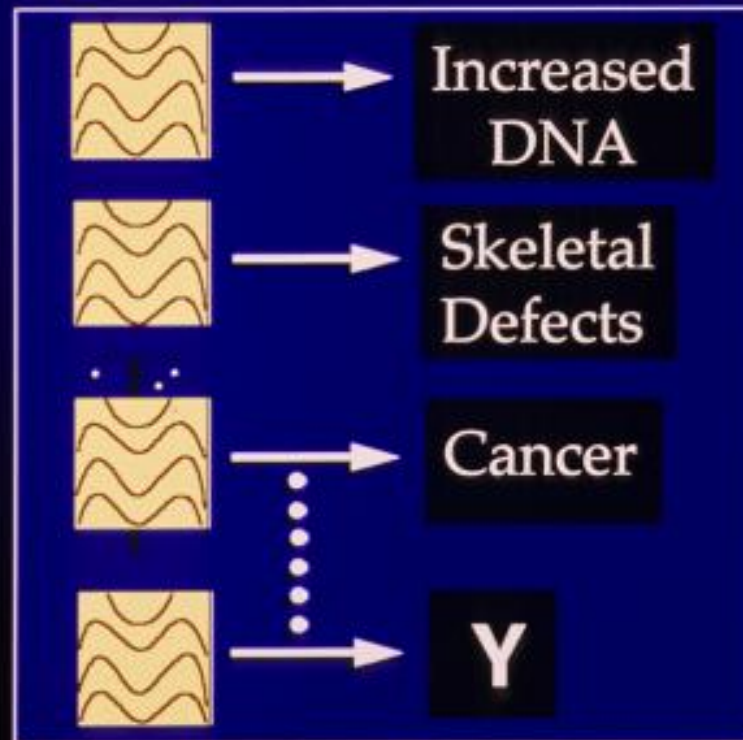
SAN DIEGO GAS & ELECTRIC  
v  
MARTIN COVALT, *ET AL.*

- NICOLAAS BLOEMBERGEN
- ALLAN CORMACK
- WALTER GILBERT
- SHELDON LEE GLASHOW
- GLENN T. SEABORG
- ROSALYN YALOW
- (+ 8 others)

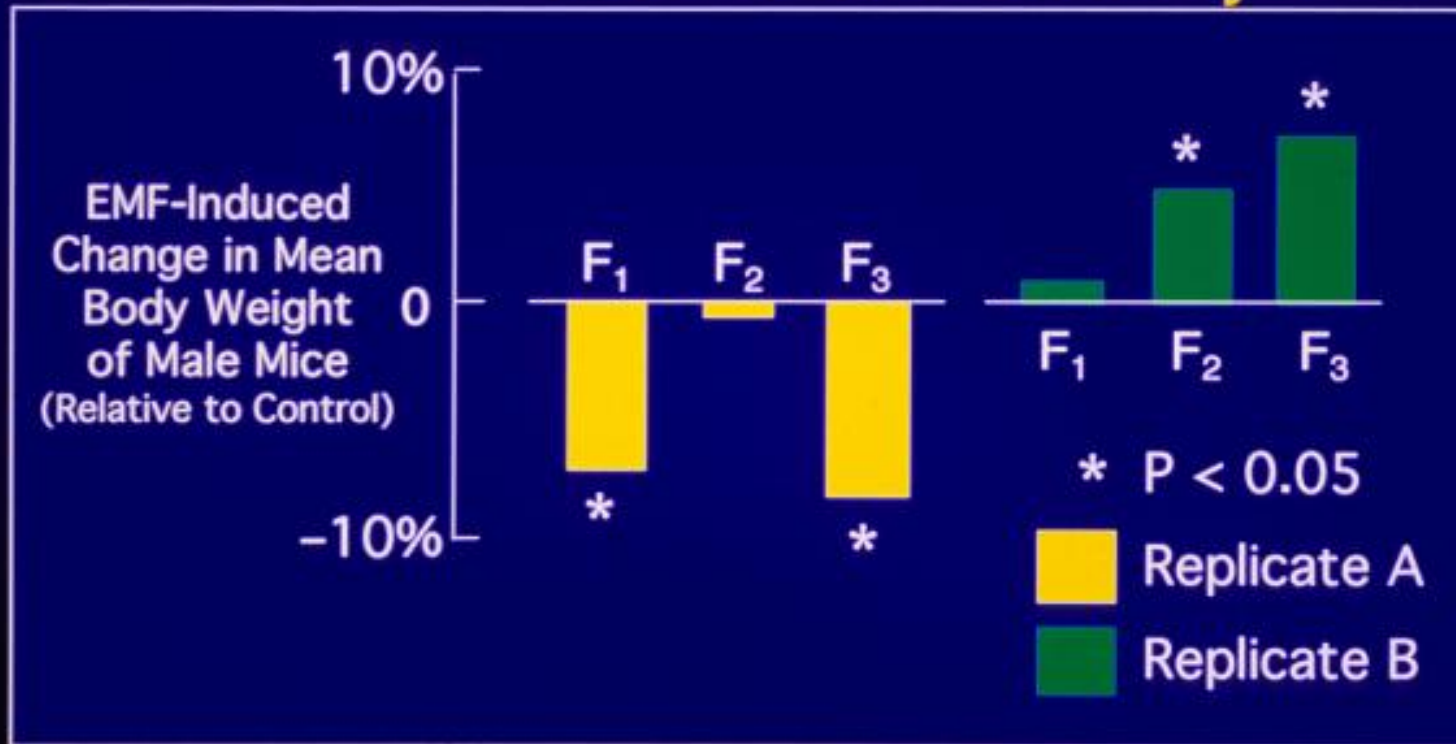
ATLANTIC LEGAL FOUNDATION  
New York, New York  
Attorneys for Friends of the Court

**72.5 ± 7.7 years**

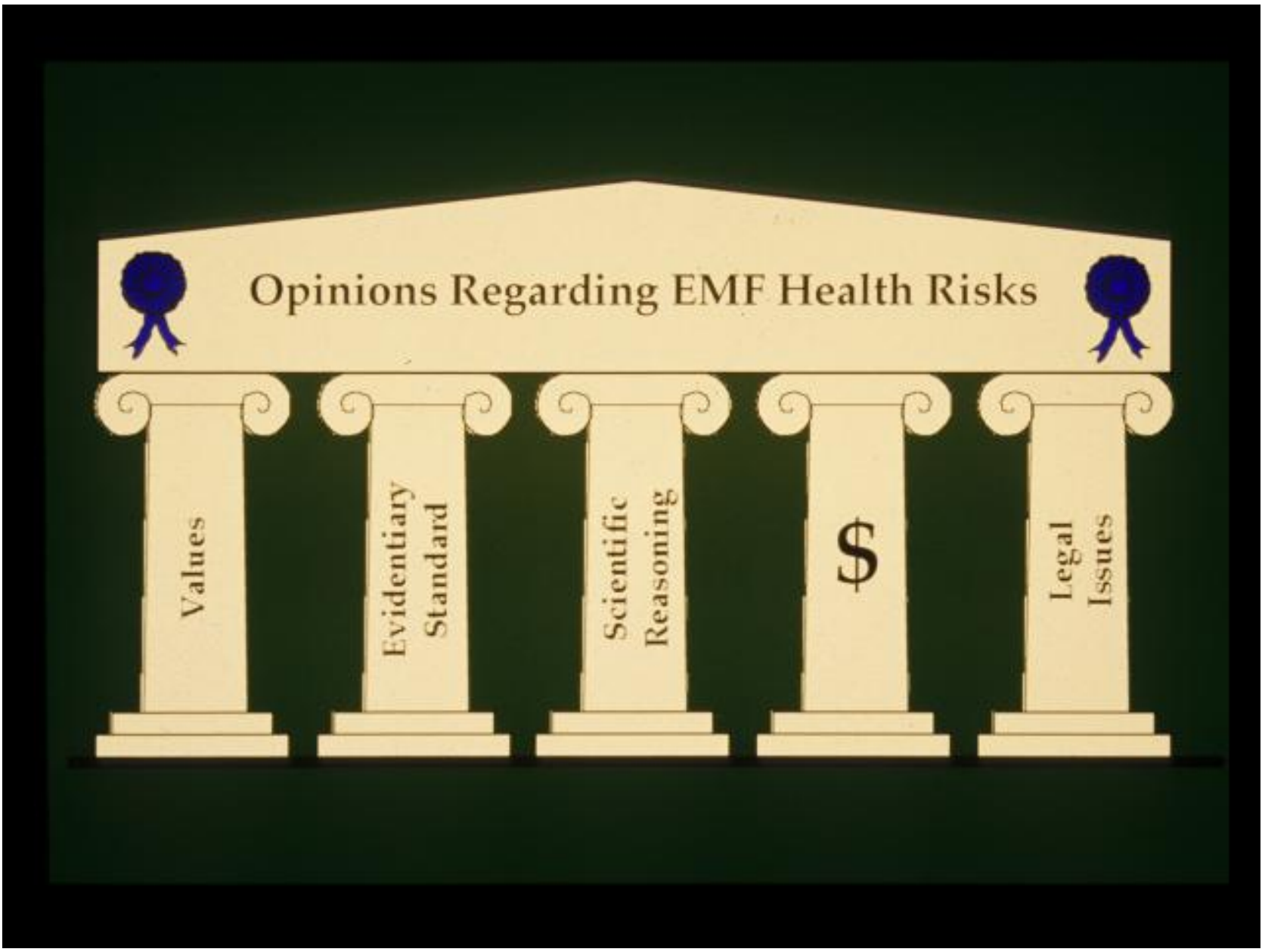
# Specific EMF-Induced Effects (Sometimes)



# How Should the Data Be Analyzed?



Data from PNL



Opinions Regarding EMF Health Risks

Values

Evidentiary  
Standard

Scientific  
Reasoning

\$

Legal  
Issues

?

How

Do



Not did

Scientists



Bench-top, not  
arm-chair

Reason

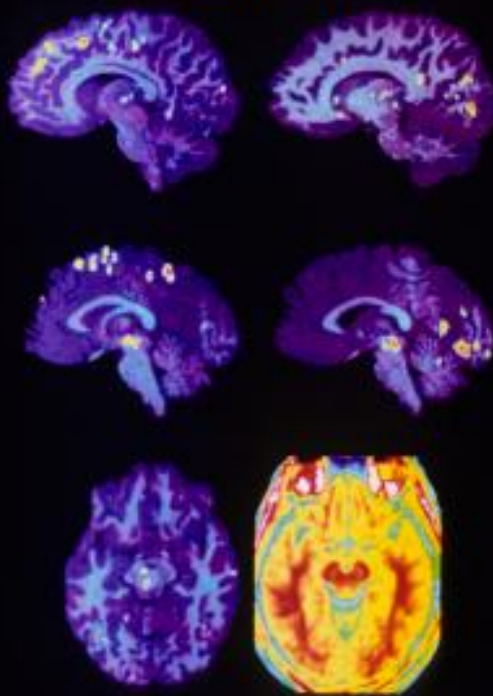
?

  
AMERICAN  
ASSOCIATION FOR THE  
ADVANCEMENT OF  
SCIENCE

# SCIENCE

26 JANUARY 1996  
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## *Science 271 (5248)*

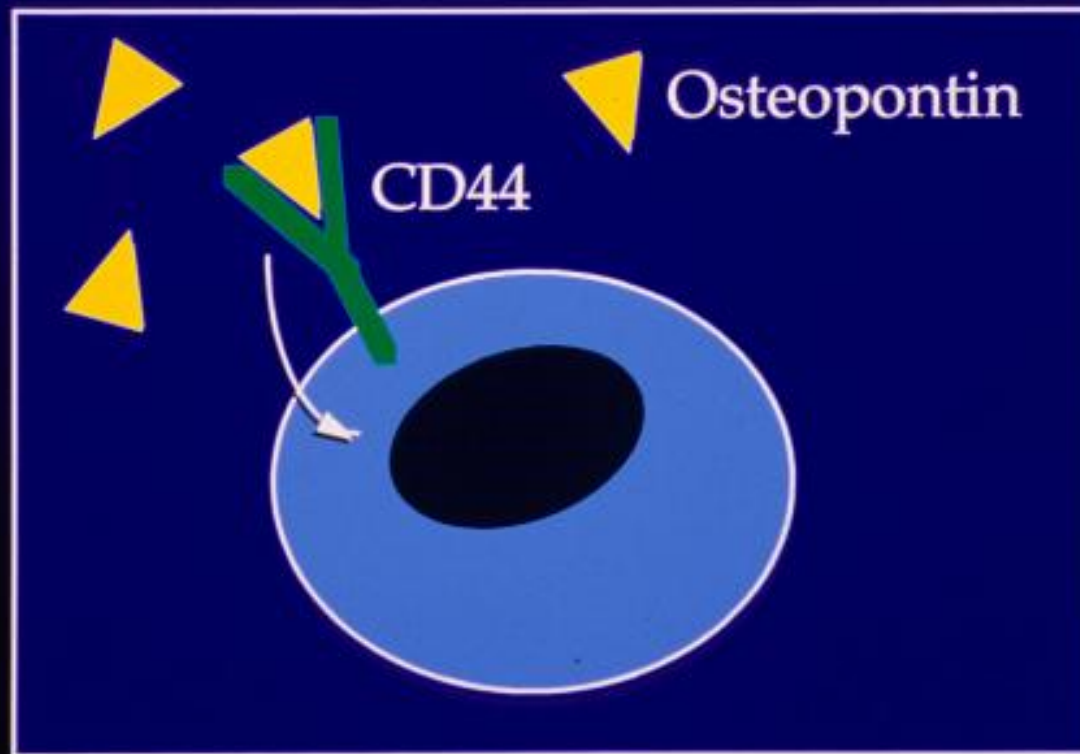
- Measured age of non-carbon-bearing rocks (No. 5)
- Discovered a new compound (No. 3 & 4)
- Discovered a new virus (No. 10)

## *Science 271 (5248)*

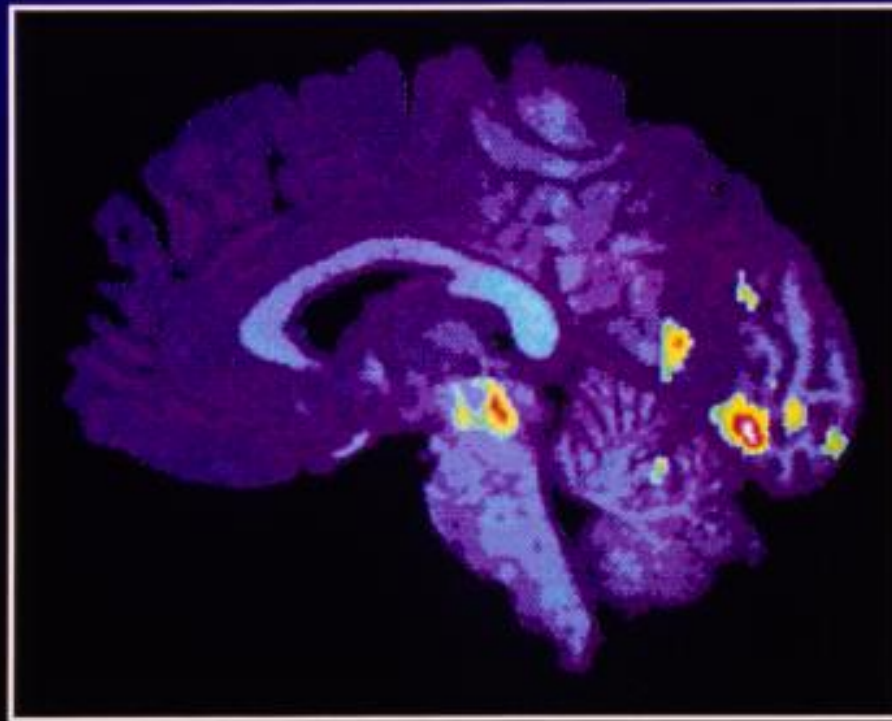
Assumed a Physical Model and Explained

- Energy-dissipation mechanisms during rupture of adhesive bonds (No. 1)
- Structure and stability of liquids (No. 2)
- Constancy of atmospheric O<sub>2</sub> during evolution (No. 6)

# Osteopontin Causes Transduction by CD44



# Vigilance Causes Increased Blood Flow



## Additional Reports Involving Causality

<u>Report No.</u>	<u>X</u>	<u>Y</u>
7	Non-specific immune processes	HIV decreases
8	CDK2 inhibitors	Loss of anchorage
9	Evolutionary pressure	Secondary functions in serine proteinases
13	Mutant enzyme	Lou Gehrig's Disease
14	HDL	Activation of SR-B1
15	ALB-2	Apoptosis
16	Newly learned auditory response	Activation of NMDA receptors

## Activity and Related Reasoning Process

ACTIVITY	REPORT NO.	REASONING
Measure	5	Convention
Discover / Invent	3,4,10	????
Explain	1,2,6	Deduction
Causality	7-9,11-16	Abduction & Induction

## Scientific Reasoning

<b>TYPE 1</b>	<b>Scientific Validity</b> $\equiv$ <b>Expectability under known physical laws</b>
<b>TYPE 2</b>	<b>Scientific Validity</b> $\equiv$ <b>Acceptable procedures Causal assessment Abductive arguments</b>

## \*Scientific Reasoning



INDUCTION

"All beans in this bag are white."



DEDUCTION

"These beans are white."



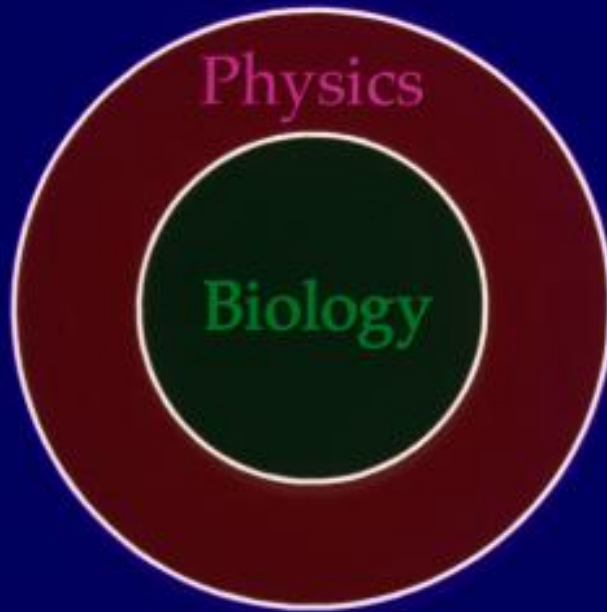
ABDUCTION

"These beans are from this bag."

\* Example from C.S. Peirce



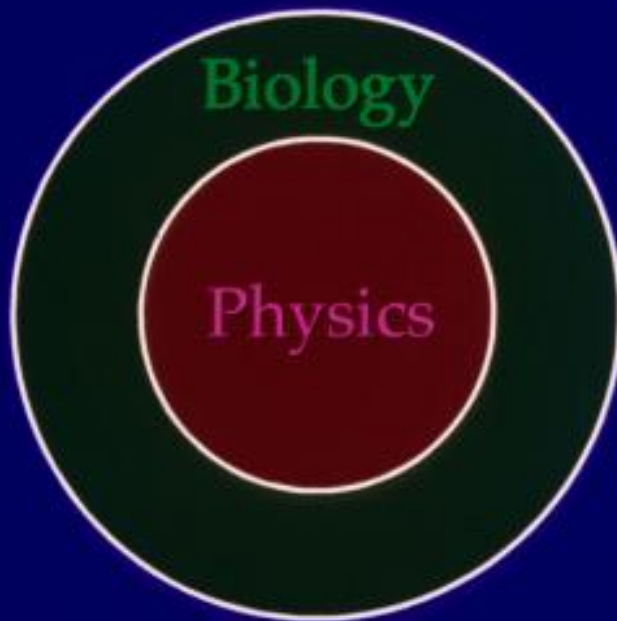
## Received View of Science's Hierarchy



All laws and mechanisms in biology are in physics, but not conversely

# Relevant Hierarchy of Science

*Circa 1996*



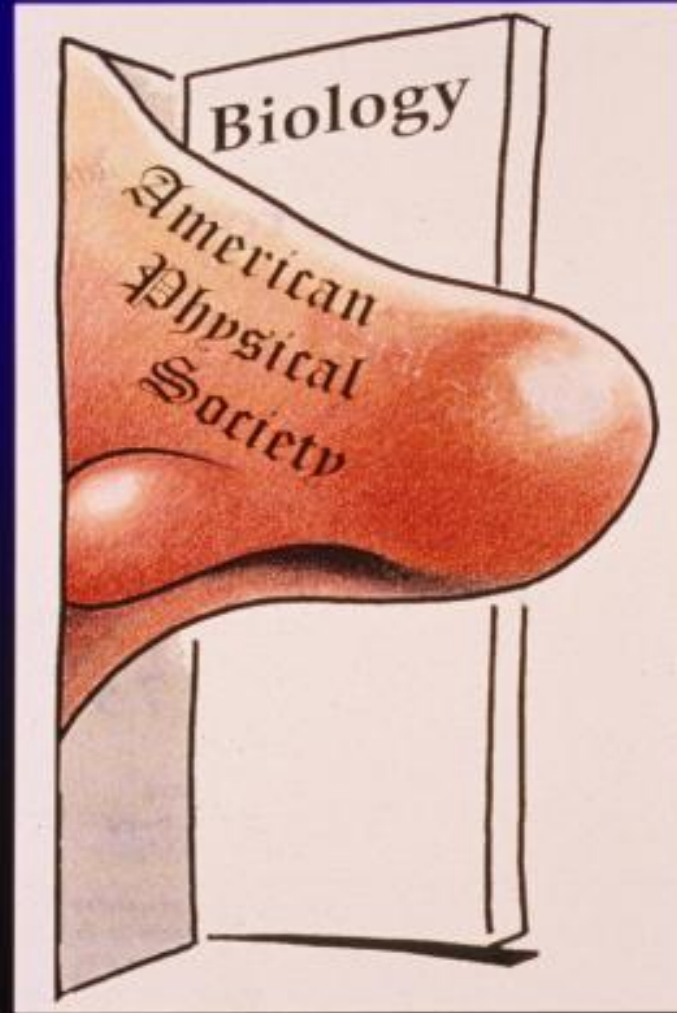
All valid reasoning processes in physics are in biology , but not conversely

## Conclusion

The APS and the Nobel Prize winners must sustain their position using Type 2 (biological) reasoning.

But they used Type 1 reasoning.

∴ Their conclusion is irrelevant even though it is correct by their criteria.



# Acknowledgements



**Robert O. Becker**



**Herman Schwan**



**Thomas Kuhn**



**Albert Szent-Gyorgyi**