



Some Thoughts

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Inductive reasoning vs. deductive reasoning

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Inductive reasoning vs. deductive reasoning

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- The sun is rising every morning

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Inductive reasoning vs. deductive reasoning

- Snow is white
- The sun is rising every morning
- Large earthquakes occur on known faults



No matter how many instances of white swans we may have observed, this does not justify the conclusion that all swans are white.

Karl Popper



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One black swan falsifies the hypothesis that all swans are white.

But why do we ignore the evidence?

- Kern County 1952
- Loma Prieta 1989
- Landers 1992
- Northridge 1994

A model should at least be able to explain past observations.

More and more earthquake myths, formerly derived inductively, are accepted as earthquake facts:

- Maximum magnitude
- Characteristic earthquake distributions
- Periodic recurrence

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Science must begin with myths, and with the criticism of myths.

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Critical rationalism introduced by Karl Popper

- Falsify (and reject) hypotheses
- Identify unscientific hypotheses

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When I speak of reason or rationalism, all I mean is the conviction that we can learn through criticism of our mistakes and errors, especially through criticism by others, and eventually also through self-criticism.

Karl Popper

- Observations in case studies
- Idea of a model
- Formulation of a falsifiable hypothesis
- Testing the hypothesis
- Provisional acceptance

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No immunization of theories

- All data and parameters need to be disclosed
- Comprehensive model description
- Best science comes from exposure to criticism

A first step would be to formulate hypotheses for resolving **open questions**, e.g.:

- Characteristic earthquakes vs. Gutenberg Richter vs. ?
- Are large earthquakes clustered or periodic in time?
- Elastic rebound theory
- Moment conservation

and test **earthquake myths**, e.g.:

- Maximum magnitude
- Periodic recurrence

Defining terms for formulating falsifiable hypotheses

- What is an earthquake sequence?
- Periodicity of what?
- What is an aftershock or foreshock or main shock?

Support experiments and rigorous scientific approaches like CSEP

Apply CSEP philosophy to the important hypotheses used in our field

- Earthquake scaling laws
- Ground motion prediction
- Coulomb triggering
- Seismic hazard assessment



End

This isn't right. This isn't even wrong.

Wolfgang Pauli