

FAIR TESTS: A BASIC MODEL FOR CRITICAL THINKING IN SCIENCE

How Do Scientists Pick the Best Explanation?

1. Define the problem or question clearly.
2. List two or more alternative solutions or answers.
3. Find or develop "Fair Tests", which
 - a. do **not** have the same basis as any of the alternative solutions.
 - b. could have supported two or more of those alternatives.
4. Consider the results of the fair tests.
5. Apply advanced criteria, including (as appropriate)....
 - a. Strength of each fair test.
 - b. Concordance (agreement) among the fair tests.
 - c. Strength of the alternative solutions.

Seven Basic Scientific Criteria for Choosing the "Best Explanation"

A Scientific Explanation is Best if...

1. it best matches the data from a fair test.
2. it is confirmed by multiple independent fair tests.
3. initially conflicting data can be shown to agree.
4. the fair test that supports it is particularly strong.
5. there are no conflicting lines of scientific evidence.
6. the alternatives are seriously defective conceptually
7. the overall weight of evidence is greatly in its favor.

CONSIDER A SAMPLE PROBLEM

1. Problem: How did the great diversity of life originate?
2. Alternative Solutions:
 - a. All living things were created at the same time. Basis: traditional biblical interpretation
 - b. Different types of living things were created at different times. Basis: modified biblical interpretation
 - c. Different types evolved from earlier types. Basis: inferred from difficulties in the classification of living things: some organisms not fitting into discrete categories
3. Fair Test #1: Look at fossils and their existence in time (could support any of the alternatives)
 - a. If alt (a), should see fossils of all organisms mixed together at all levels (for all time), in no particular sequence.
 - b. If alt (b), should see staggered appearance of different types, with novel traits suddenly appearing, and showing little or no change to the present.
 - c. If alt (c), should see staggered appearance of different types, showing gradually accumulating modifications of traits from earlier forms to the present.
4. Result of Fair Test #1: Observations and dating of fossils clearly and consistently provide data consistent with alternate (c), and not with (a) or (b).
5. Other Fair Tests to Consider: Look at....
 - A. chromosome banding patterns, comparing different living groups.
 - B. amino acid sequences in proteins, comparing different living groups.
 - C. base pair sequences in DNA, comparing different living groups.
 - D. DNA hybridization tests between different groups.
 - E. comparative anatomy studies of different groups.
 - F. comparative studies of development of different groups.
 - G. comparative immune response studies of different groups.
6. Final Analysis: ALL of these fair tests have produced results consistent only with alternate (c).

Adapted from an unpublished report by Craig Nelson, Co-Director of ENSI, 26 October, 1995.

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