

A Broken Law Can Be Blamed on Any of the Assumptions

— When a conjunction of five assumptions is refuted, **31** subsets could bear the blame and logic alone chooses none — each separator that settles one assumption halves it, **15** $\rightarrow$ **7** $\rightarrow$ **3** $\rightarrow$ **1**, and only after **4** does the blame become unique — “what was thought one turned out to be two” is the work of writing those four — [Paper 481]

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— *From thinking to syncing.* —

Abstract

A failed prediction is taken to refute the theory. This paper shows that refutation falls on the whole conjunction and logic does not say which assumption failed—with five assumptions there are **31** candidates, and only **4** separators make the blame unique. No new theorem or law is claimed. First, refuting a conjunction of k assumptions leaves $2^k - 1$ subsets that could bear the blame (Section 2). Second, that is **31** at $k = 5$ and **63** at $k = 6$ (Section 2). Third, this is the core of the paper. Settling j assumptions leaves $2^{k-j} - 1$, reaching **1** only at $j = k - 1$ (Section 3). Fourth, at $j = 0$ nothing is reduced and **31** remain (Section 3). Fifth, the thirteen instances the corpus found of “one turned out to be two” are the work of writing those separators (Section 4). Sixth, the separator is whether refutation falls on the conjunction or on one assumption (Section 4). **Keywords:** Duhem-Quine thesis, falsifiability, auxiliary hypotheses, philosophy of science, Lakatos.

Scope of this paper (scope note): No new theorem or law is claimed—that refutation falls on the whole conjunction has long been discussed in the philosophy of science. No general philosophy is written—the merits of positions, their history and the course of the debates are not the subject; only a count and the corpus’s own instances. The corpus is not defended—whether its scope notes form a protective belt or a hard core is returned to the author. This paper goes as far as the numbers. Assumptions are treated as independent—the count $2^k - 1$ idealises them as independent and equally suspect. In practice they carry weights and an order. Probability is excluded—prior credences over which assumption failed are not the subject; only the number of combinations. Relation to earlier papers: Paper 241 said to ask whether there is a binary operation before asking whether it can be made into addition—writing separators has exactly that shape. Paper 300 showed that a common root can be decided—“one turned out to be two” is the discovery of a distinct root. Paper 480 showed that the five criteria disagree—there too, a verdict failed to be unique. Paper 479 split the seven appearances of $1/e$ into three—three roots beneath one number. What is added is counting the candidates as $2^k - 1$, tabulating $k = 1$ to 6, giving the effect of separators as $31 \rightarrow 15 \rightarrow 7 \rightarrow 3 \rightarrow 1$, showing that $k - 1$ are needed for uniqueness, and placing the separator at conjunction versus single assumption.

1. Notation and the Question

Setting: Let a prediction be drawn from assumptions $A_1, \dots, A_k$. The prediction P follows from their conjunction.

$$A_1 \wedge A_2 \wedge \dots \wedge A_k \Rightarrow P$$

If observation returns $\neg P$, the contrapositive yields only

$$\neg(A_1 \wedge \dots \wedge A_k)$$

that is, at least one is false, with no indication which. Count the subsets that could bear the blame.

Observation 1.1

A failed prediction is taken to refute the theory. Refutation lands on the theory—one arrow striking one target.

Observation 1.2

But a prediction does not follow from the theory alone. The apparatus working, auxiliary laws, approximations, initial conditions—any one of them failing makes the prediction fail.

Question: How many combinations could bear the blame.

2. Five Assumptions Leave Thirty-One

Computation 2.1: Count the subsets that could bear the blame when a conjunction of k assumptions is refuted.

Assumptions k	Candidate subsets
1	1
2	3
3	7
4	15
5	31
6	63

Observation 2.2

The closed form is $2^k - 1$. The number of non-empty subsets—31 at $k = 5$ and 63 at $k = 6$.

Observation 2.3

Enumeration agrees with the closed form. Listing every subset of size 1 to 5 gives 31—an independent check.

Observation 2.4

With a single assumption there is no ambiguity. $2^1 - 1 = 1$ —a boundary: without a conjunction, refutation has somewhere to land.

Observation 2.5

But an experiment with one assumption is rare. Calibration of instruments, statistical assumptions, estimates of systematic error—start counting and five is soon passed.

Observation 2.6

And each extra assumption nearly doubles the ambiguity. From 31 to 63—adding an assumption doubles the places blame can go.

3. Only Four Separators Make It Unique

Computation 3.1: With five assumptions, count what remains when separators settle j of them as unbroken.

Settled j	Remaining	Fraction of the original
0	31	1.0000
1	15	0.4839
2	7	0.2258
3	3	0.0968
4	1	0.0323

Observation 3.2

Each one settled nearly halves it. $31 \rightarrow 15 \rightarrow 7 \rightarrow 3 \rightarrow 1$ —the closed form is $2^{k-j} - 1$.

Observation 3.3

Uniqueness arrives at $j = 4$, that is $k - 1$. Four of five removed, leaving one—to say which assumption failed, every other must be defended.

Observation 3.4

At $j = 0$ nothing is reduced. Still 31—write no separator and the refutation carries no information.

Observation 3.5

So “the theory has been refuted” states a $j = 4$ conclusion from a $j = 0$ position. Four short—write the four that were skipped and the statement is supported.

Observation 3.6

The decline is exponential. Two more settled takes 31 to 7, a factor of 4.43—each separator buys the same again.

4. The Separator

The separator: does refutation fall on the conjunction, or on one assumption.

Observation 4.1

On the conjunction, and there are $2^k - 1$ destinations. Logic cannot choose—which to doubt becomes a judgement outside logic.

Observation 4.2

On one assumption, and it can be repaired. A unique destination—requiring the other $k - 1$ to be settled first.

Observation 4.3

These are distinct roots by the criterion of Paper 300. Both are called “refuted”—one the negation of a conjunction, one of a named assumption.

Observation 4.4

What the corpus has been doing is writing those $k - 1$. The shape “what was thought one turned out to be two” arose independently in thirteen fields—Moore and Dennard, melting point and glass transition, phase and group velocity, fit and predictive power. In each, one word named two quantities.

Observation 4.5

Then the refutation acquires a destination. Not “the law broke” but “two things were being called one”—one of the 31 is named.

Observation 4.6

Paper 241 has the same shape. Ask whether there is a binary operation before asking whether it can be made into addition—presume the operation and two quantities fold into one, and the refutation loses its destination.

Observation 4.7

Papers 479 and 480 did that work inside the corpus. 479 found three roots beneath one number, 480 counted the disagreements among five criteria—both have the shape of separating what looked like one.

Observation 4.8

To be honest—the count $2^k - 1$ is an idealisation. Assumptions were treated as independent and equally suspect—in practice they carry weights and an order, and “calibration of the instrument” does not stand equal with “the core of the theory”. What is counted is logical possibility, not actual suspicion.

5. Roll Call and Closing

1. $2^k - 1$ candidates (Observation 2.2): **non-empty subsets**.
2. 31 at $k = 5$ (Computation 2.1): **matching enumeration**.
3. No ambiguity at $k = 1$ (Observation 2.4): **the boundary**.

4. Nearly doubling with k (Observation 2.6): **31 to 63**.
5. $2^{k-j} - 1$ after j separators (Computation 3.1): **the core**.
6. Unique only at $j = 4$ (Observation 3.3): **defend all the others**.
7. $j = 0$ reduces nothing (Observation 3.4): **still 31**.
8. “Refuted” is four short (Observation 3.5): **write the skipped four**.
9. The separator is conjunction or one (Observation 4.3): **distinct roots by Paper 300**.
10. Logical possibility, not suspicion (Observation 4.8): **what was counted**.

Closing: A failed prediction is taken to refute the theory—one arrow striking one target. But a prediction does not follow from the theory alone: the apparatus working, auxiliary laws, approximations and initial conditions all enter, and any one of them failing makes the prediction fail. The destinations are surprisingly many—refuting a conjunction of k assumptions leaves $2^k - 1$ subsets that could bear the blame: **31** at $k = 5$ and **63** at $k = 6$. Listing every subset of size 1 to 5 also gives 31, so enumeration and closed form agree. With a single assumption there is no ambiguity, which is the boundary: without a conjunction, refutation has somewhere to land. But an experiment with one assumption is rare—calibration, statistical assumptions, systematic error, and five is soon passed. Each extra assumption nearly doubles the ambiguity: adding one doubles the places blame can go. Only four separators make it unique—settling j of five leaves **31** $\rightarrow$ **15** $\rightarrow$ **7** $\rightarrow$ **3** $\rightarrow$ **1**, nearly halving each time, with closed form $2^{k-j} - 1$. Uniqueness arrives at $j = 4$, that is $k - 1$: to say which assumption failed, every other must be defended. At $j = 0$ nothing is reduced and 31 remain—write no separator and the refutation carries no information. So “the theory has been refuted” states a $j = 4$ conclusion from a $j = 0$ position. It is four short, and writing those four supports it. One thing separates them—does refutation fall on the conjunction, or on one assumption. On the conjunction there are $2^k - 1$ destinations and logic cannot choose; which to doubt becomes a judgement outside logic. On one assumption the destination is unique, which requires the other $k - 1$ to be settled. They are distinct roots by the criterion of Paper 300, one the negation of a conjunction and one of a named assumption. And what the corpus has been doing is writing those $k - 1$: the shape “what was thought one turned out to be two” arose independently in thirteen fields—Moore and Dennard, melting point and glass transition, phase and group velocity, fit and predictive power. In each, one word named two quantities. Then the refutation acquires a destination: not “the law broke” but “two things were being called one”, and one of the 31 is named. Paper 241 has the same shape—ask whether there is a binary operation before asking whether it can be made into addition, since presuming the operation folds two quantities into one and the refutation loses its destination. Papers 479 and 480 did that work inside the corpus, one finding three roots beneath one number and the other counting disagreements among five criteria. To be honest—the count $2^k - 1$ is an idealisation treating assumptions as independent and equally suspect. In practice they carry weights and an order, and “calibration of the instrument” does not stand equal with “the core of the theory”. What is counted is logical possibility, not actual suspicion.

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