Andrew Horn Testimony - Support & Three Proposed Amendments

HB 1524-FN

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Members of the committee, thank you for your time. I come before you today as a citizen who believes that teaching our kids to think clearly is the most patriotic thing we can do.

I'm here to support HB 1524-FN, and I want to start by addressing something directly: I know some of you may have reservations about this bill because of who sponsored it. I get it—I'm a progressive Democrat myself, and I've disagreed with plenty of bills based on their sponsors. But here's the thing: this bill isn't about left or right. It's about whether our kids can spot BS when they see it. And I think we can all agree that skill is in short supply right now.

Here's why this bill matters, regardless of politics:

First, it's about preserving liberty. We all believe that free people can govern themselves. But self-government only works if citizens can evaluate arguments. When our kids can't tell a valid argument from a slick manipulation, they're not free—they're just choosing which algorithm to obey. This bill gives them 54 hours of training in the actual mechanics of reasoning. That's less time than they'll spend on pep rallies this year, but it arms them for life.

Second, it's about economic survival. New Hampshire businesses are desperate for workers who can think. I talk to employers who say they can teach technical skills, but they can't teach someone to question assumptions or spot flawed reasoning. Meanwhile, our kids are competing with AI that can write essays and code. What they need is the one thing AI can't fake: the ability to ask "wait, what's the hidden assumption here?" This bill makes our graduates uniquely valuable in a world where clear thinking is the new scarce resource.

Third, it's about mental health. The Surgeon General has been warning us that social media is devastating teen mental health. Why? Because kids lack the psychological armor to recognize when they're being manipulated. This bill explicitly teaches them to identify "psychological traps and logical fallacies." That's not indoctrination—that's inoculation.

Now, about the amendments I'm proposing: These are technical improvements from someone who actually studied this stuff in college. They don't add cost, time, or bureaucracy. They just make sure we're teaching the *right* version of critical thinking.

- **The "soundness" amendment** ensures kids learn to check if an argument's *premises* are true, not just whether the logic is tight. Without this, you get kids who can spot a formal fallacy but still believe crazy conspiracy theories because they "follow the logic."
- **The "implicit premises" amendment** teaches them to find the hidden assumptions in any argument. This is the skill that lets you see through political spin, marketing, and those "common sense" claims that aren't so sensible when you dig.
- **The "falsifiability" amendment** helps them distinguish testable claims from nonsense. It's the difference between science and snake oil.

These aren't partisan additions. They're the difference between teaching critical thinking and teaching critical thinking *well*.

Here's my ask: Vote Ought To Pass on this bill. If you like the amendments, great. If you don't, pass it anyway and let the State Board handle the details. But don't let the perfect be the enemy of the good, and don't let politics be the enemy of our kids' future.

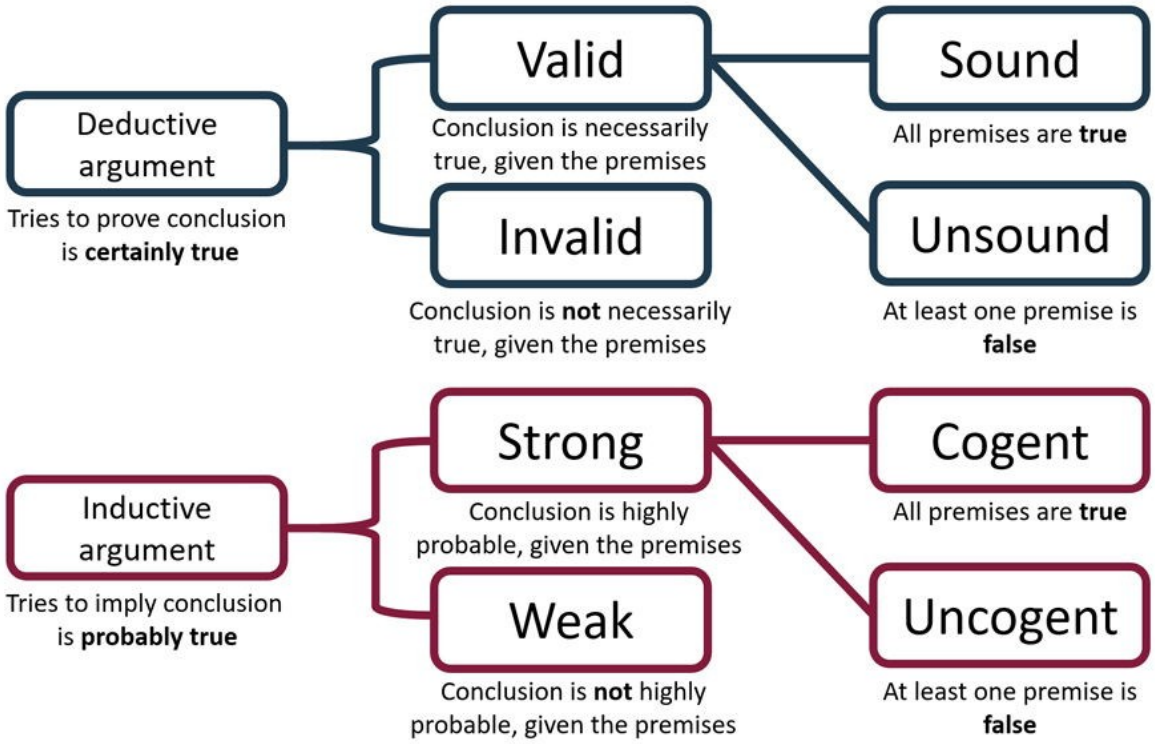
In New Hampshire, we pride ourselves on independent thinking. Let's make sure the next generation actually knows how to do it.

HB 1524-FN - Proposed Amendment 1 - Soundness

4 New Subparagraph; Education; Adequate Public Education; Substantive Educational Content of an Adequate Education. Amend RSA 193-E:2-a, VI by inserting after subparagraph (g) the following new subparagraph:

(h) "Critical thinking" means the skill in understanding and seeking out the appropriate kinds of evidence needed to support or challenge a given argument, the ability to distinguish valid from invalid arguments based on logic, ***the ability to distinguish sound from unsound arguments based on logic,*** the habit of questioning the evidence, rationale, and motivation of one's own and others' beliefs, and the awareness of how social media and other sources of information can often be unreliable and promulgate psychological traps and logical fallacies that lead to the formation of unreasonable beliefs.

HB 1524-FN - Proposed Amendment 1 – Soundness



HB 1524-FN - Proposed Amendment 2 - Implicit Premises

4 New Subparagraph; Education; Adequate Public Education; Substantive Educational Content of an Adequate Education. Amend RSA 193-E:2-a, VI by inserting after subparagraph (g) the following new subparagraph:

(h) "Critical thinking" means the skill in understanding and seeking out the appropriate kinds of evidence needed to support or challenge a given argument, the ability to distinguish valid from invalid arguments based on logic, ***the ability to discover implicit premises based on logic,*** the habit of questioning the evidence, rationale, and motivation of one's own and others' beliefs, and the awareness of how social media and other sources of information can often be unreliable and promulgate psychological traps and logical fallacies that lead to the formation of unreasonable beliefs.

Implicit premises

From "How to Think Critically" of the Open Educational Resources Collective
https://oercollective.caul.edu.au/howtothinkcritically/chapter/implicit-premises/

When people give arguments in ordinary language, they often leave parts of their arguments out. Often this is because something is so obvious it can be safely assumed that others will accept it, and so it doesn't need to be explicitly stated. Consider the following argument.

My pet Squeaky is a mouse, and all rodents have teeth that never stop growing. So, Squeaky's teeth will never stop growing.

There is an unstated assumption here. That is that mice are rodents. Without assuming this, the conclusion of the argument would not validly follow from the premises.

The difficulty with leaving premises unstated is that sometimes the unstated premise is not obvious or easily accepted, but is in fact a highly controversial claim. For this reason, we make any implicit premises explicit when reconstructing arguments. This means that when we assess the argument we can properly assess each premise as true or false.

With the above example, we begin by putting the argument into standard form.

P1) My pet Squeaky is a mouse.
P2) All rodents have teeth that never stop growing.

_____
C) Squeaky's teeth will never stop growing.

We then note that the argument is invalid. We could make it valid, however, by adding a premise, like so:

P1) My pet Squeaky is a mouse.
P2) All rodents have teeth that never stop growing.
P3) All mice are rodents.

_____
C) Squeaky's teeth will never stop growing.

The argument is now valid. And, this is a sensible addition to the argument: it's clearly something that the arguer intended, even though it wasn't explicitly said.

Sometimes an implicit premise is left out by the arguer because it is so obvious it is hardly worth saying. However, sometimes an unstated premise is doing a lot of work in the argument, and that isn't evident because it hasn't been explicitly stated. Sometimes the unstated premise is obviously false, or

highly controversial. By exposing implicit premises, and making them explicit, we're better positioned to assess the argument.

Consider this argument:

Co-sleeping is risky for the baby. So no one should do it.

An initial reconstruction might look like this:

P1) Co-sleeping with a baby carries a risk of harm to the baby.

_____

C) No one should co-sleep with a baby.

What is the missing premise here? What is needed to make the argument valid? To make the argument valid, a connection needs to be made between the risk of harming the baby, and what shouldn't be done. So to make the argument valid, we could add an implicit premise such as this:

P1) Co-sleeping with a baby carries a risk of harm to the baby.
P2) No one should do anything with a baby that carries a risk to the baby.

_____

C) No one should co-sleep with a baby.

This is the minimum that is required to make the argument valid. The arguer must have something like this in mind, otherwise the conclusion of the argument wouldn't follow. Here, the connecting premise is doing a lot of work in the argument, and it is false. It cannot be true that no one should do anything that would put a baby at risk. If that was true, people would never to be able to take a baby in a car, or an aeroplane, or do very much at all with them. Living a life free of risk would be paralysing, for a baby or for anyone else.

It's likely that the arguer really meant that the risk of co-sleeping is an unacceptable risk. However, given that their argument doesn't make an attempt to evaluate risk, or to explain what degree of risk would be acceptable, to adjust their argument in this way would be to do too much work for them. In the absence of any attempt to explicitly link the premise to the conclusion, there is not much we can do but provide the minimally necessary connection, and assess it.

Working out what premise needs to be added to an argument to make it valid is tricky. You need to think about how validity works, and how to connect together what has been provided to ensure that the conclusion follows. The following video gives you some hints to get you started. It's a good idea to watch it before attempting the questions.

HB 1524-FN - Proposed Amendment 3 - Falsifiability

4 New Subparagraph; Education; Adequate Public Education; Substantive Educational Content of an Adequate Education. Amend RSA 193-E:2-a, VI by inserting after subparagraph (g) the following new subparagraph:

(h) "Critical thinking" means the skill in understanding and seeking out the appropriate kinds of evidence needed to support or challenge a given argument, the ability to distinguish valid from invalid arguments based on logic, the habit of questioning the evidence, rationale, and motivation of one's own and others' beliefs, ***the ability to distinguish between falsifiable and unfalsifiable theories,*** and the awareness of how social media and other sources of information can often be unreliable and promulgate psychological traps and logical fallacies that lead to the formation of unreasonable beliefs. 512

Science as Falsification

by Karl R. Popper

Excerpt from *Conjectures and Refutations* (1963).

I decided to … give you a report on my own work in the philosophy of science, since the autumn 1919 when I first began to grapple with the problem, "*When should a theory be ranked as scientific?*" or "*Is there a criterion for the scientific character or status of a theory?*"

The problem which troubled me at the time was neither, "When is a theory true?" nor "When is a theory acceptable?" my problem was different. I *wished to distinguish between science and pseudo-science*; knowing very well that science often errs, and that pseudoscience may happen to stumble on the truth.

I knew, of course, the most widely accepted answer to my problem: that science is distinguished from pseudoscience—or from "metaphysics"—by its *empirical method*, which is essentially *inductive*, proceeding from observation or experiment. But this did not satisfy me. On the contrary, I often formulated my problem as one of distinguishing between a genuinely empirical method and a non-empirical or even pseudo-empirical method—that is to say, a method which, although it appeals to observation and experiment, nevertheless does not come up to scientific standards. The latter method may be exemplified by astrology, with its stupendous mass of empirical evidence based on observation—on horoscopes and on biographies.

But as it was not the example of astrology which lead me to my problem, I should perhaps briefly describe the atmosphere in which my problem arose and the examples by which it was stimulated. After the collapse of the Austrian empire there had been a revolution in Austria: the air was full of revolutionary slogans and ideas, and new and often wild theories. Among the theories which interested me Einstein's theory of relativity was no doubt by far the most important. The three others were Marx's theory of history, Freud's psycho-analysis, and Alfred Adler's so-called "individual psychology."

There was a lot of popular nonsense talked about these theories, and especially about relativity (as still happens even today), but I was fortunate in those who introduced me to the study of this theory. We all—the small circle of students to which I belong—were thrilled with the result of Eddington's eclipse observations which in 1919 brought the first important confirmation of Einstein's theory of gravitation. It was a great experience for us, and one which had a lasting influence on my intellectual development.

The three other theories I have mentioned were also widely discussed among students at the time. I myself happened to come into personal contact with Alfred Adler, and even to cooperate with him in his social work among the children and

young people in the working-class districts of Vienna where he had established social guidance clinics.

It was the summer of 1919 that I began to feel more and more dissatisfied with these three theories—the Marxist theory of history, psycho-analysis, and individual psychology; and I began to feel dubious about their claims to scientific status. My problem perhaps first took the simple form, "What is wrong with Marxism, psycho-analysis, and individual psychology? Why are they so different from physical theories, from Newton's theory, and especially from the theory of relativity?"

To make this contrast clear I should explain that few of us at the time would have said that we believed in the *truth* of Einstein's theory of gravitation. This shows that it was not my doubting the *truth* of those three other theories which bothered me, but something else. Yet neither was it that I nearly felt mathematical physics to be more *exact* than sociological or psychological type of theory. Thus what worried me was neither the problem of truth, at that stage at least, nor the problem of exactness or measurability. It was rather that I felt that these other three theories, though posing as science, had in fact more in common with primitive myths than with science; that they resembled astrology rather than astronomy.

I found that those of my friends who were admirers of Marx, Freud, and Adler, were impressed by a number of points common to these theories, and especially by their apparent *explanatory power*. These theories appear to be able to explain practically everything that happened within the fields to which they referred. The study of any of them seemed to have the effect of an intellectual conversion or revelation, open your eyes to a new truth hidden from those not yet initiated. Once your eyes were thus opened you saw confirmed instances everywhere: the world was full of *verifications* of the theory. Whatever happened always confirmed it. Thus its truth appeared manifest; and unbelievers were clearly people who did not want to see the manifest truth; who refuse to see it, either because it was against their class interest, or because of their repressions which were still "un-analyzed" and crying aloud for treatment.

The most characteristic element in this situation seemed to me the incessant stream of confirmations, of observations which "verified" the theories in question; and this point was constantly emphasize by their adherents. A Marxist could not open a newspaper without finding on every page confirming evidence for his interpretation of history; not only in the news, but also in its presentation—which revealed the class bias of the paper—and especially of course what the paper did *not* say. The Freudian analysts emphasized that their theories were constantly verified by their "clinical observations." As for Adler, I was much impressed by a personal experience. Once, in 1919, I reported to him a case which to me did not seem particularly Adlerian, but which he found no difficulty in analyzing in terms of his theory of inferiority feelings, although he had not even seen the child. Slightly shocked, I asked him how he could be so sure. "Because of my thousandfold experience," he replied; whereupon I could not help saying: "And with this new case, I suppose, your experience has become thousand-and-one-fold."

What I had in mind was that his previous observations may not have been much sounder than this new one; that each in its turn had been interpreted in the light of "previous experience," and at the same time counted as additional confirmation. What, I asked myself, did it confirm? No more than that a case could be interpreted in the light of a theory. But this meant very little, I reflected, since every conceivable case could be interpreted in the light Adler's theory, or equally of Freud's. I may illustrate this by two very different examples of human behavior: that of a man who pushes a child into the water with the intention of drowning it; and that of a man who sacrifices his life in an attempt to save the child. Each of these two cases can be explained with equal ease in Freudian and Adlerian terms. According to Freud the first man suffered from repression (say, of some component of his Oedipus complex), while the second man had achieved sublimation. According to Adler the first man suffered from feelings of inferiority (producing perhaps the need to prove to himself that he dared to commit some crime), and so did the second man (whose need was to prove to himself that he dared to rescue the child). I could not think of any human behavior which could not be interpreted in terms of either theory. It was precisely this fact—that they always fitted, that they were always confirmed—which in the eyes of their admirers constituted the strongest argument in favor of these theories. It began to dawn on me that this apparent strength was in fact their weakness.

With Einstein's theory the situation was strikingly different. Take one typical instance—Einstein's prediction, just then confirmed by the finding of Eddington's expedition. Einstein's gravitational theory had led to the result that light must be attracted by heavy bodies (such as the sun), precisely as material bodies were attracted. As a consequence it could be calculated that light from a distant fixed star whose apparent position was close to the sun would reach the earth from such a direction that the star would seem to be slightly shifted away from the sun; or, in other words, that stars close to the sun would look as if they had moved a little away from the sun, and from one another. This is a thing which cannot normally be observed since such stars are rendered invisible in daytime by the sun's overwhelming brightness; but during an eclipse it is possible to take photographs of them. If the same constellation is photographed at night one can measure the distance on the two photographs, and check the predicted effect.

Now the impressive thing about this case is the *risk* involved in a prediction of this kind. If observation shows that the predicted effect is definitely absent, then the theory is simply refuted. The theory is *incompatible with certain possible results of observation*—in fact with results which everybody before Einstein would have expected.[1] This is quite different from the situation I have previously described, when it turned out that the theories in question were compatible with the most divergent human behavior, so that it was practically impossible to describe any human behavior that might not be claimed to be a verification of these theories.

These considerations led me in the winter of 1919-20 to conclusions which I may now reformulate as follows.

1. It is easy to obtain confirmations, or verifications, for nearly every theory—if we look for confirmations.
2. Confirmations should count only if they are the result of *risky predictions*; that is to say, if, unenlightened by the theory in question, we should have expected an event which was incompatible with the theory—an event which would have refuted the theory.
3. Every "good" scientific theory is a prohibition: it forbids certain things to happen. The more a theory forbids, the better it is.
4. A theory which is not refutable by any conceivable event is non-scientific. Irrefutability is not a virtue of a theory (as people often think) but a vice.
5. Every genuine *test* of a theory is an attempt to falsify it, or to refute it. Testability is falsifiability; but there are degrees of testability: some theories are more testable, more exposed to refutation, than others; they take, as it were, greater risks.
6. Confirming evidence should not count *except when it is the result of a genuine test of the theory*; and this means that it can be presented as a serious but unsuccessful attempt to falsify the theory. (I now speak in such cases of "corroborating evidence.")
7. Some genuinely testable theories, when found to be false, are still upheld by their admirers—for example by introducing *ad hoc* some auxiliary assumption, or by reinterpreting the theory *ad hoc* in such a way that it escapes refutation. Such a procedure is always possible, but it rescues the theory from refutation only at the price of destroying, or at least lowering, its scientific status. (I later described such a rescuing operation as a "*conventionalist twist*" or a "*conventionalist stratagem*.")

One can sum up all this by saying that the criterion of *the scientific status of a theory is its falsifiability*, *or refutability*, *or testability*.

II

I may perhaps exemplify this with the help of the various theories so far mentioned. Einstein's theory of gravitation clearly satisfied the criterion of falsifiability. Even if our measuring instruments at the time did not allow us to pronounce on the results of the tests with complete assurance, there was clearly a possibility of refuting the theory.

Astrology did not pass the test. Astrologers were greatly impressed, and misled, by what they believed to be confirming evidence—so much so that they were quite unimpressed by any unfavorable evidence. Moreover, by making their interpretations and prophesies sufficiently vague they were able to explain away anything that might have been a refutation of the theory had the theory and the prophesies been more precise. In order to escape falsification they destroyed the testability of their theory.

It is a typical soothsayer's trick to predict things so vaguely that the predictions can hardly fail: that they become irrefutable.

The Marxist theory of history, in spite of the serious efforts of some of its founders and followers, ultimately adopted this soothsaying practice. In some of its earlier formulations (for example in Marx's analysis of the character of the "coming social revolution") their predictions were testable, and in fact falsified.[2] Yet instead of accepting the refutations the followers of Marx re-interpreted both the theory and the evidence in order to make them agree. In this way they rescued the theory from refutation; but they did so at the price of adopting a device which made it irrefutable. They thus gave a "conventionalist twist" to the theory; and by this stratagem they destroyed its much advertised claim to scientific status.

The two psycho-analytic theories were in a different class. They were simply non-testable, irrefutable. There was no conceivable human behavior which could contradict them. This does not mean that Freud and Adler were not seeing certain things correctly; I personally do not doubt that much of what they say is of considerable importance, and may well play its part one day in a psychological science which is testable. But it does mean that those "clinical observations" which analysts naïvely believe confirm their theory cannot do this any more than the daily confirmations which astrologers find in their practice.[3] And as for Freud's epic of the Ego, the Super-ego, and the Id, no substantially stronger claim to scientific status can be made for it than for Homer's collected stories from Olympus. These theories describe some facts, but in the manner of myths. They contain most interesting psychological suggestions, but not in a testable form.

At the same time I realized that such myths may be developed, and become testable; that historically speaking all—or very nearly all—scientific theories originate from myths, and that a myth may contain important anticipations of scientific theories. Examples are Empedocles' theory of evolution by trial and error, or Parmenides' myth of the unchanging block universe in which nothing ever happens and which, if we add another dimension, becomes Einstein's block universe (in which, too, nothing ever happens, since everything is, four-dimensionally speaking, determined and laid down from the beginning). I thus felt that if a theory is found to be non-scientific, or "metaphysical" (as we might say), it is not thereby found to be unimportant, or insignificant, or "meaningless," or "nonsensical."[4] But it cannot claim to be backed by empirical evidence in the scientific sense—although it may easily be, in some genetic sense, the "result of observation."

(There were a great many other theories of this pre-scientific or pseudo-scientific character, some of them, unfortunately, as influential as the Marxist interpretation of history; for example, the racialist interpretation of history—another of those impressive and all-explanatory theories which act upon weak minds like revelations.)

Thus the problem which I tried to solve by proposing the criterion of falsifiability was neither a problem of meaningfulness or significance, nor a problem of truth or acceptability. It was the problem of drawing a line (as well as this can be done)

between the statements, or systems of statements, of the empirical sciences, and all other statements—whether they are of a religious or of a metaphysical character, or simply pseudo-scientific. Years later—it must have been in 1928 or 1929—I called this first problem of mine the "*problem of demarcation*." The criterion of falsifiability is a solution to this problem of demarcation, for it says that statements or systems of statements, in order to be ranked as scientific, must be capable of conflicting with possible, or conceivable, observations.

Notes

8. This is a slight oversimplification, for about half of the Einstein effect may be derived from the classical theory, provided we assume a ballistic theory of light.

9. See, for example, my *Open Society and Its Enemies*, ch. 15, section iii, and notes 13-14.

10. "Clinical observations," like all other observations, are *interpretations in the light of theories*; and for this reason alone they are apt to seem to support those theories in the light of which they were interpreted. But real support can be obtained only from observations undertaken as tests (by "attempted refutations"); and for this purpose *criteria of refutation* have to be laid down beforehand; it must be agreed which observable situations, if actually observed, mean that the theory is refuted. But what kind of clinical responses would refute to the satisfaction of the analyst not merely a particular analytic diagnosis but psycho-analysis itself? And have such criteria ever been discussed or agreed upon by analysts? Is there not, on the contrary, a whole family of analytic concepts, such as "ambivalence" (I do not suggest that there is no such thing as ambivalence), which would make it difficult, if not impossible, to agree upon such criteria? Moreover, how much headway has been made in investigating the question of the extent to which the (conscious or unconscious) expectations and theories held by the analyst influence the "clinical responses" of the patient? To say nothing about the conscious attempts to influence the patient by proposing interpretations to him, etc.) Years ago I introduced the term "*Oedipus effect*" to describe the influence of a theory or expectation or *prediction upon the event which it predicts* or describes: it will be remembered that the causal chain leading to Oedipus' parricide was started by the oracle's prediction of this event. This is a characteristic and recurrent theme of such myths, but one which seems to have failed to attract the interest of the analysts, perhaps not accidentally. (The problem of confirmatory dreams suggested by the analyst is discussed by Freud, for example in *Gesammelte Schriften*, III, 1925, where he says on p. 315: "If anybody asserts that most of the dreams which can be utilized in an analysis…owe their origin to [the analyst's] suggestion, then no objection can be made from the point of view of analytic theory. Yet there is nothing in this fact, "he surprisingly adds, "which would detract from the reliability of our results.")

11. The case of astrology, nowadays a typical pseudo-science, may illustrate this point. It was attacked, by Aristotelians and other rationalists, down to Newton's day, for the

wrong reason—for its now an accepted assertion that the planets had an "influence" upon terrestrial ("sublunar") events. In fact Newton's theory of gravity, and especially the lunar theory of the tides, was historically speaking an offspring of astrological lore. Newton, it seems, was most reluctant to adopt a theory which came from the same stable as for example the theory that "influenza" epidemics are due to an astral "influence." And Galileo, no doubt for the same reason, actually rejected the lunar theory of the tides; and his misgivings about Kepler may easily be explained by his misgivings about astrology.

(Karl Popper, *Conjectures and Refutations*,
London: Routledge and Keagan Paul, 1963, pp. 33-39.)